STREET TREE
SELECTION GUIDE

Greening, Landscape and Tree Management Section
Development Bureau

Version 1.1 September 2023

Street Tree Selection Guide

This version has incorporated the following amendments: -

Version	Issue Date	Amendment
First issue	December 2018	----

1.1	September 2023	- Chapter 5
		  - Section 5.4
		  - Figure 5-1
		  - Figure 5-2
		  - Figure 5-5
		
		- Enhancement of ecological value of species in Appendix E

Contents

Section **Title**

Foreword

The Greening, Landscape, and Tree Management Section (GLTMS) in the Development Bureau (DEVB) of the HKSAR commissioned a Consultancy Study to rationalise and guide the selection of street trees in Hong Kong. The purpose is to improve the resilience of the Territory's urban forest by maximising species diversity under the principle of "Right Tree, Right Place" to improve ecological health upstream and in turn, minimise tree risks downstream.

A number of trees planted in the past might have been suitable for a particular location at that time. Some trees, such as afforestation pioneer planting on slopes, have out-grown their compact urban environment or are reaching the end of their life-cycle and are no longer appropriate. As trees are gradually due for replacement, it presents opportunities for the adoption of sustainable landscape strategies and practices. The result is the Street Ecology Strategy for Hong Kong (the Study). It aims to provides a strategic framework for sustainable long-term management of our street trees in a holistic manner, and forms part of government's overall efforts in supporting the Hong Kong Biodiversity Strategy and Action Plan (BSAP), the Hong Kong's Climate Action Plan 2030+ (CAP) and the Hong Kong 2030+: Towards a Planning Vision and Strategy Transcending 2030 (Hong Kong 2030+). The Study includes a Street Tree Selection Guide (the Guide). It is a practical reference tool to assist designers in selecting tree species suitable for different common streetscape typologies in the urban area1 [1]of Hong Kong.

This Study provides an analysis and evaluation of the current urban Hong Kong streetscape conditions and recommends a more diverse tree species list for different street types2[2]. Methods of analysis include the overview of existing guidelines and ordinances, site observations, local experiences and valuable inputs from the landscape and arboriculture industry, relevant government departments and related disciplines.

The Study has found that the current Hong Kong roadside urban forest is dominated by a small range of 20 common tree species in large quantity and planted en-masse. Such homogenous planting or monoculture reduces plant diversity and make our urban forest more vulnerable to outbreaks of pests and diseases, and diminished soil quality. In response, 80 less commonly used but suitable tree species are recommended in the Guide to support a long term sustainable, healthy and resilient urban forest. Due to the scope and limitation of the Study, users are welcome to select other tree species not shortlisted using the same principles and methodology including the 20 common tree species, which are not in the Guide due to its abundance in stock. These commonly used species are however not encouraged to be widely planted as previously practised, to improve the vegetation diversity of our future urban forest.

The Guide is written for consultants, government works departments, professionals and practitioners, involved in street trees replacement and planting. To achieve a healthy and resilient urban forest, it recommends making reference to the 10-20-30 basic rule of plant diversity as a start, i.e. no more than 10% of any one species, 20% of any one genus and 30% of any one family. As roadside planting environment can be very different due to site specific landscape conditions such as narrow footpaths, underground utilities, microclimate, minimal air movement, etc., the Guide is not meant to be prescriptive. Professional advice from Landscape Architects and other relevant disciplines should be sought during the planning and design stages to ensure the overall street landscape as well as other supporting elements such as complementary vegetation community mixes (CVCM), tree pit details, structural soils or cells, drainage, below-ground infrastructure, etc. are duly taken into consideration.

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[1] For the purpose of this Study, urban area means built-up areas within the Hong Kong Island, Kowloon and the New Territories.

[2] Expressways, highways and trunk roads were excluded in the analysis as both are considered to have very specific requirements to be studied separately.

The health of trees and vegetation starts with a favourable landscape from the outset to facilitate their subsequent maintenance. Designers and departments are encouraged to widely apply the Guide in the replacement and new street tree planting projects. With more practical applications of the shortlisted species, more experience can be developed to review and update the Guide. Users are encouraged to provide comments to the GLTMS so that continual improvements can be made for the future of our urban ecology.

Structure of this Guide

The information in the below sections are structured to facilitate clear decision making for selecting suitable tree species under the principle of "Right Tree, Right Place".

Section 1 – Introduction
The introduction outlines main purpose of the report and its relationship with the Hong Kong Climate Action Plan 2030+ (CAP), Hong Kong 2030+: Towards a Planning Vision and Strategy Transcending 2030 (Hong Kong 2030+) and the Hong Kong Biodiversity Strategy and Action Plan (BSAP). It summarises the current roadside urban forest of Hong Kong today.

Section 2 – Challenges and Opportunities
This section summarises the key issues roadside tree planting in Hong Kong are facing both today and in the future.

Section 3 –Principles and Strategies
This section lays out the 3 basic principles and its strategies for selecting suitable tree species for Hong Kong urban streets.

Section 4 – Right Tree
This section identifies the process for selecting suitable roadside tree species for Hong Kong.

Section 5 – Right Place
This section identifies the typical street conditions for growing urban street trees in different street typologies and the process of analysing the suitability for tree planting within the street.

Section 6 – For Us
This section identifies the general tree selection considerations based on the community and people needs and desires. Examples of selection criteria to address community and people needs are given.

Section 7 – Street Tree Selection
This section lays out the different methods in selecting suitable tree species for different street typologies.

Section 8 - Life-cycle Maintenance and Management of Trees
This section gives a summary of general maintenance operations and requirements at each stage of the life-cycle of street trees.

Section 9 – Complementary Vegetation Community Mix (CVCM)
This section highlights the basic principles and strategies for selecting a complementary understorey planting to form a complete street ecology.

Section 10 – Conclusion
This section recommends actions for the next stage.

Appendix A to **C** provides the general tree species information, rating and life-cycle management for the 80 shortlisted tree species. This section is intended to be a 'living document' with the ability to be updated as more data, information and research become available.

Appendix D provides a summary for tree species recommended for each street sub-type. This section is intended to be a 'living document' with the ability to be updated as more data, information and research become available.

Appendix E provides examples of CVCM that can be used in urban streets. Professional advice from Landscape Architects is recommended for proper street planting planning and design in selecting the appropriate CVCM for the selected tree species.

Glossary of Abbreviations

AFCD	Agriculture, Fisheries and Conservation Department
ArchSD	Architectural Services Department
BSAP	Hong Kong Biodiversity and Strategy Action Plan 2016-2021
CAP	Hong Kong Climate Action Plan 2030+
CEDD	Civil Engineering and Development Department
CMGZ	Central Median Greening Zone
CVCM	Complementary Vegetation Community Mix
DBH	Diameter at Breast Height
DEVB	Development Bureau
DSD	Drainage Services Department
GLTMS	Greening, Landscape, Tree Management Section
GMP	Greening Master Plan
HD	Housing Department
HKO	Hong Kong Observatory
Hong Kong 2030+	Hong Kong 2030+: Towards a Planning Vision and Strategy Transcending 2030
HKPSG	Hong Kong Planning Standards and Guidelines
HyD	Highways Department
LCSD	Leisure and Cultural Services Department
RVGZ	Roadside Verge Greening Zone
UHI	Urban Heat Island Effect
ULE	Useful Life Expectancy
TMIS	Tree Management Information System
TPDM	Transport Planning and Design Manual
WSD	Water Supplies Department

1. Introduction

1.1 Overview

The Paris Agreement came into force on 4 November 2016. The Agreement calls for global actions to keep global average temperature increase below 2°C and achieve a balance between carbon sinks and sources within the second half of the 21st century. Hong Kong Climate Action Plan 2030+ (CAP) outlines the action plan for Hong Kong to achieve the targets set out in the Paris Agreement. One of the ways to achieve this is through the planning, creation and improvement of urban forests, green and blue spaces to enhance Hong Kong's overall liveability, biodiversity and climate-readiness.[3] Moreover, the Hong Kong Biodiversity and Strategy Action Plan 2016-2021 (BSAP), states that urban forests can serve as important ecological linkages with the countryside and encourage the movement of wildlife. To accomplish this, the following specific actions are recommended in BSAP and relevant to this Guide:

- Formulate an urban forestry strategy that contributes to a sustainable urban landscape, and promote the appreciation of urban biodiversity;

- Promote diversification of soft landscapes and optimise use of native species for enriching urban biodiversity; and

- Recognize the importance of street trees in urban forestry.[4]

In addition, the Hong Kong 2030+ advocates to uplift liveability in Hong Kong by enhancing green and blue space and bringing nature to the increasingly compact city. Under this initiative, the Hong Kong 2030+ seeks to provide a conducive environment for biodiversity to thrive.

The purpose of this Guide is to aid in selecting urban street trees suitable for common road hierarchies in Hong Kong to facilitate tree replacement or new tree planting. It is intended to support strategic street tree planning, urban forest strategy and management and promoting a sustainable built environment as recommended in the CAP, BSAP and Hong Kong 2030+.

1.2 Objective of the Guide

The objective of the Guide is to provide a practical guide to facilitate tree selection for different street typologies of Hong Kong.

The processes involved are summarised below:

- Establish criteria for selecting tree species for common street typologies in Hong Kong based on the principle of "Right Tree, Right Place" and the life-cycle planning of street trees.

- Shortlist suitable tree species based on the above principles.

- Recommend suitable tree species and complementary vegetation community mixes (CVCM) for common street typologies to achieve a sustainable healthy and resilient urban forest and minimise risk

[3] Environment Bureau, HKSAR Government. (2017). Hong Kong's Climate Action Plan 2030+.

[4] Environment Bureau, HKSAR Government. (2016). Hong Kong Biodiversity and Strategy Action Plan 2016-202.

of tree failure or premature decline (tree losing vigour before its expected time for its species). CVCM refers to the vegetation underneath the tree canopy, it will be discussed further in ***Section 9***..

A set of tree datasheets together with the tree selection criteria rating (***Appendix A-D***) are developed to aid the process of tree selection for Hong Kong streets. It is intended to be a living document with the ability to be updated as more information, data and research is available.

It should be noted that tree species selection should not be restricted to those given in ***Appendix A to C*** as due to the limitations of this Study, only 80 species were selected as an example. Under the "Right Tree, Right Place" principle, other suitable tree species can be selected using the same methodology proposed in this Guide.

1.3 What is Street Ecology?

> "A space of dynamic relationship that results from the complex web of interconnected activities and phenomena…a place that thrives on the co-existence of diverse people, activities, forms and objects and modes of control and negotiation, as it operates as a social, cultural, economic and political space. As a corollary, this also means not thinking the street as a complete and stable state of equilibrium but recognizing the street as a place in flux with some level of conflict." -- Vikas Mehta [5]

By definition, street ecology is applying the concept of ecology to the street context. For this Guide, it is the investigation of the relationships and interactions between a street and its immediate environs (carriageway, through-zone, parking spaces, bus stops, surrounding buildings and landscaped area), planting (trees and shrubs) and its users (people and urban wildlife).

1.4 What is Urban Forestry?

Urban forestry is a city wide, integrated, inter-disciplinary approach combining strategic planning and multi-managerial practices to improve the social, environmental and economic benefits to public through a sustainable long-term management of urban vegetation. The term 'urban' refers to the dense, built-up areas of the city. As recognized in CAP and Hong Kong 2030+, it is important for different government departments to work together to develop an urban forestry strategy as well as good management practices which are essential to achieve healthy urban forests and enhance Hong Kong's overall liveability, biodiversity and climate-readiness.

1.5 Benefits of Urban Forest

For this Guide, the main focus will be on street trees. Urban street trees are a major component of a city urban forest. They can provide a range of social, environmental and economic benefits that are often unnoticed and underappreciated. Understanding the benefits of urban street trees aid in making the right decisions in selecting and managing street trees. Possible benefits are summarised in ***Figure 1.1***.

[5] Zavestoski, Stephen and Julian Agyeman. (2015) Incomplete Streets: Processes, Practices and Possibilities. s.l. : Routledge.

1.6 Why is Biodiversity Important?

One of the important components to create and maintain a healthy and sustainable urban forest is to maintain biodiversity. Biodiversity is defined as the variety of living organisms in a habitat. A high level of biodiversity is desirable because it boosts ecosystem productivity, sustainability, climate resilience, urban forest benefits and urban forest health. Some species may be better at providing specific urban forest benefits due to intrinsic (morphological and physiological) and temporal (seasonal) characteristics. Thus, to optimise the multiple benefits of the urban forests, it is essential to have vegetation diversity. A broader diversity of urban trees can guard against the risk of large-scale devastation by pests and large-scale replacements due to ageing or environmental changes.

To achieve a resilient urban forest, Dr. Frank Santamour, a Research Geneticist at the US National Arboretum, had recommended in his paper that urban tree planning should follow the 10-20-30 rule for planting diversity. The rule of thumb suggests an urban tree population should include no more than 10% of any one species, 20% of any one genus, and 30% of any family. Following this rule can result in a more biologically diverse planting. [6]

1.7 An Overview of Existing Standards and Guidelines

As mentioned previously, street ecology studies the relationship and interactions between the street environs, planting and its users. In Hong Kong, the existing standards and guidelines related to the spatial consideration requirements for a safe, functional and comfortable street environs are listed below.

Street Tree Planting Spatial Consideration Requirements

- Transport Department, HKSAR Government, *Transport Planning and Design Manual,* 2015.
- Planning Department, HKSAR Government, *Hong Kong Planning Standard and Guidelines,* 2017.
- Civil Engineering and Development Department, HKSAR Government, *General Specification for Civil Engineering Works 2006 Edition Vol. 1, 2 and Guidance Notes*.
- Buildings Department, HKSAR Government, *Guide on Erection & Maintenance of Advertising Signs.*
- Development Bureau, HKSAR Government, *Development Bureau Technical Circular (Works) No.2/2012 – Allocation of Space for Quality Greening on Roads*, 2012.
- Greening, Landscape and Tree Management Section, Development Bureau, HKSAR Government, *Proper Planting Practice - Provide Sufficient Growing Space between Trees and Adjacent Buildings/Structures*, 2011.

Accordingly, planting, maintenance and user requirements can be broadly summarised in the existing standards, guidelines, specification and relevant studies listed below.

[6] Santamour, F.S., Jr. (1990). Trees for urban planting: diversity uniformity, and common sense. Procceedings of the 7th Conference of the Metropolitan Tree Improvement Alliance, pp.57 – 65.

Landscape Planting and Maintenance Work Requirements

- Civil Engineering and Development Department, HKSAR Government, *General Specification for Civil Engineering Works 2006 Edition Vol. 1, 2 and Guidance Notes*, 2006.
- Greening, Landscape and Tree Management Section, Development Bureau, HKSAR Government, *Guiding Principles on Use of Native Plant Species in Public Works Project,* 2010.
- Development Bureau, HKSAR Government, *Development Bureau Technical Circular (Works) No. 2/2012, Allocation of Space for Quality Greening on Roads,* 2012.
- Development Bureau, HKSAR Government, *Development Bureau Technical Circular (Works) No. 7/2015*, *Tree Preservation,* 2015.
- Urbis Ltd*., A Comprehensive Street Tree Management Plan for Hong Kong,* 2013.
- Greening, Landscape and Tree Management Section, Development Bureau, HKSAR Government, *Guidelines for Tree Risk Assessment and Management Arrangement*, 2015.
- Greening, Landscape and Tree Management Section, Development Bureau, HKSAR Government*, Handbook on Tree Management*, 2016.
- Agriculture, Fisheries and Conservation Department, HKSAR Government, *Summary of Pesticides Ordinance,* 2014.
- Working Group for Safe and Proper Use of Pesticides, HKSAR Government, *Code of Practice for the Safe and Proper Use of Pesticides in Public Areas,* 2014.
- Agriculture, Fisheries and Conservation Department, HKSAR Government, *Turf and Landscape Management,* 2017*.*
- Environment Bureau, HKSAR Government, *Hong Kong Biodiversity and Strategy Action Plan 2016-2021.*, 2016.
- Development Bureau, HKSAR Government, *Development Bureau Technical Circular (Works) No. 1/2018, Soft Landscape Provisions for Highway Structures,* 2018.

Based on these existing standards, guidelines and specification, key considerations relevant to roadside tree planting and maintenance works are summarised in ***Figure 5-1*** and ***Figure 5-2***.

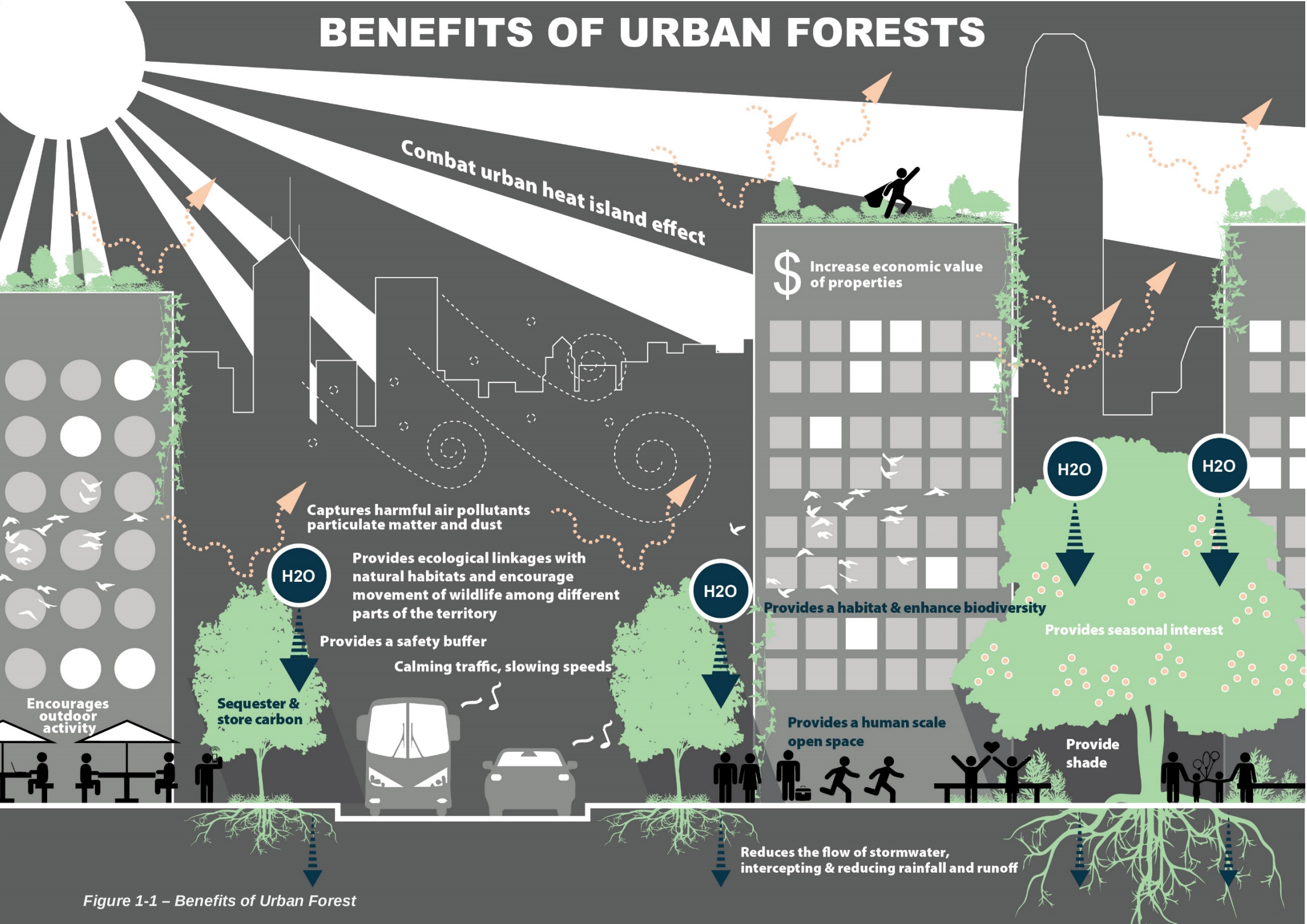


Figure 1-1 – Benefits of Urban Forest

2. Challenges and Opportunities

2.1 Challenges

This Section seeks to tackle the key challenges encountered in the existing and future roadside urban forest of Hong Kong to achieve a self-sustainable, resilient urban streetscape design as part of the initiatives set out in CAP. Many of these challenges are shaped from the harsh urban environment. These include, but not limited to microclimate, soil conditions, overhead and underground space, social and functional uses and surrounding land uses. Other challenges arise from past planting practices, lack of knowledge on proper planting and maintenance, limited available data and experience. Listed below are the most common challenges currently faced in Hong Kong.

Declining Vegetation Diversity

Biodiversity refers to the variety and abundance of living species within the ecosystem. It can be simply partitioned into 2 components – species richness (the abundance of species) and species evenness (variety of species). [7]

From the recent data gathered, it was discovered that our roadside urban forest scored high in species richness but low in species evenness. (Refer to *Section 4*) This is mainly due to the planting practices in the past, where there was an over-reliance on a limited variety of species, of which many were exotic species. One of the risks of homogenous planting practice is that any pest or disease affecting a single tree species may cause a domino effect of dying or diseased trees for multiple streets or districts.

As discovered from the desktop research, much of the original vegetation in Hong Kong was removed to make way for rapid urbanisation, particularly in the new towns. [8] In the older districts, carriageways and pedestrian footpath widths were kept to the minimum to maximise space for the increasing population. This inherited shortage of large planting spaces has led to general a lack of large-size trees that could have been planted on urban streets. Also, existing large trees in the urban streets are often seen growing in unfavourable conditions.

These issues lead to stressful growing environment for street trees, resulting in reduced Useful Life Expectancy (ULE) for street tree species and the gradual decline in vegetation diversity in Hong Kong. If the situation continues, this may further lead to a decrease in their pest and disease resilience and adaptability.

Diversifying the vegetation mixes in our roadside urban forests will improve the soil condition, plant health and their immunity to pests and diseases, and hence the subsequent maintenance efforts. A healthy roadside urban forest can also enhance biodiversity through generation of healthy urban ecosystems. Moreover, roadside urban forests with age diversity have shown that they can support a wide range of urban wildlife, including rare or endangered species. By having varying tree life spans and growth rates within the urban forest, it ensures that trees within the streetscape will not decline or need to be replaced all at the same time, thus reducing possible visual impact.

[7] Magurran, Anne E. (2011). Measuring biological diversity. Blackwell.

[8] Environment Bureau, HKSAR Government. (2016). Hong Kong Biodiversity and Strategy Action Plan 2016-2021.

Ageing Tree Population

An ageing or senescent tree is a tree that is near the end of its ULE. Different from the concept of life-cycle which stands for a measure of the biological life of the tree, ULE is an estimate of how long a tree is likely to contribute and remain in the landscape based on health, amenity and environmental services, cultural contributions and risks to the community. When the maintenance cost of a tree outweighs its contributions and benefits, it is deemed to be the ideal time that the tree should be replaced.

An ageing tree is more vulnerable to diseases, pests and other environmental factors before their inevitable decline. Due to the stressful urban environment, many urban trees reach the end of their ULE faster than those planted in their natural environment or a park. Many roadside trees in Hong Kong's urban areas are reaching the end of their ULE, in particular those planted in the early-1900s and the fast-growing pioneer tree species, such as *Acacia confusa*, planted for the purpose of reforestation in the late-1900s and early development of new towns. Timely replacement is critical to reduce tree failure risk in high trafficked areas, ensure slope stability, maintain tree canopy cover and streetscape design intent. Streets that are symmetrical avenues need to be carefully managed to ensure visual consistency and community consensus are achieved for the replacement planting.

Replacing trees reaching the end of the ULE requires good urban forestry management and practices. An appropriate replacement plan, community collaboration and a comprehensive management and monitoring program are essential to set out the framework for urban street tree replacement and planting.

Urban Heat Island

Urban heat island (UHI) effect occur in areas where there is lack of shade and vegetation cover causing increased heat retention and absorption by paved surfaces, buildings and roads. In Hong Kong, the UHI effect is primarily a night-time phenomenon, where the high heat capacity in the urban area reduces heat release back to higher atmosphere at night. Taller buildings also minimise wind speed and evaporation, which further inhibits cooling. Thus, larger nocturnal cooling rate can indicate a lower UHI effect.

From a study conducted by Hong Kong Observatory (HKO) in 2010, the urban-rural temperature difference or UHI intensity in the urban centre of Hong Kong can be more than 10°C. [9] In general, urban areas are observed to have higher UHI with a noticeably smaller nocturnal cooling rate in summer. On the other hand, the rural areas have a higher nocturnal cooling rate and daytime warming rate (***Figure 2-1***). [9]

Elevated temperatures resulting from UHI can affect a community's environment and quality of life. Some of these impacts are:

- Increased energy consumption – With the decreased nocturnal cooling rate resulting in hot nights, an increased overall electricity demand for air- conditioning and other cooling methods.

[9] H.Y. Mok, M.C. Wu and C.Y. Cheng. (2010). Spatial Variation of the Characteristics of Urban Heat Island Effect in Hong Kong. Hong Kong: Hong Kong Observatory, 2010.

- Increased air pollutants and greenhouse gases – Due to increased energy consumption, there is a greater demand for fossil fuel power plants which leads to increased air pollutants and greenhouse gas emissions. Additionally, some of these pollutants are temperature dependent and tends to form faster under warmer temperature, such as NOx and volatile organic compounds.

- Decreased human health and comfort – The elevated temperatures and increased air pollutants can cause general discomfort, respiratory difficulties, heat cramps, exhaustion, heat strokes and heat-related premature deaths.

Urban forests can become a key factor in combating UHI. Evapotranspiration and shade created from urban forests can cool the air to as much as 1°C to 5°C and reduce the production of temperature dependent pollutants.[10] Trees providing shade can contribute to regulate temperature extremes, and improve human health and comfort.

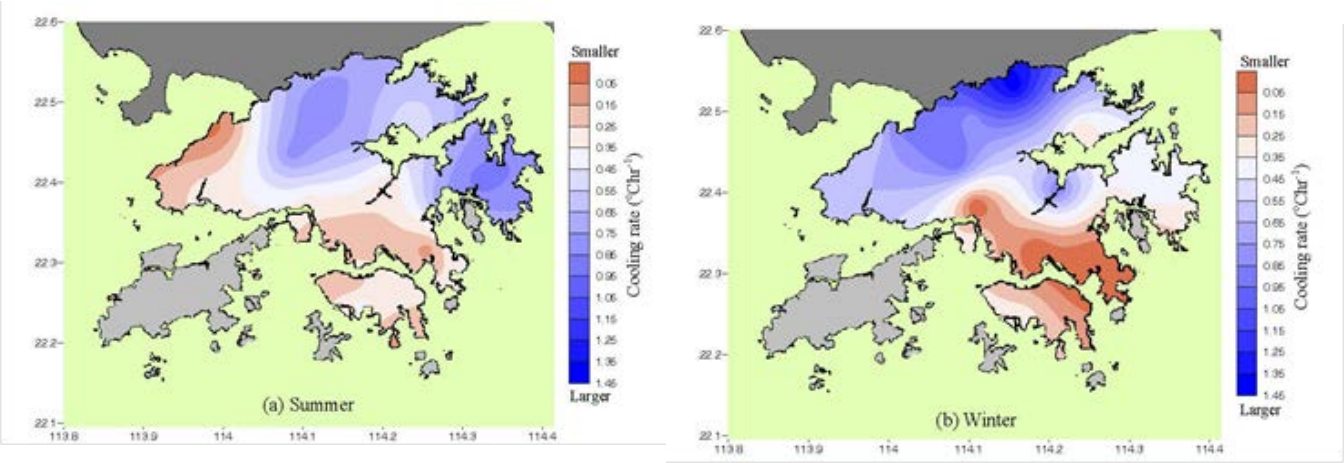


Figure 2-1 Urban Heat Island (UHI) in terms of Cooling Rate (CR). The CR of rural areas is higher than that of urban areas in general.[11]

Climate Change

> "Future proofing is about utilising and developing the capabilities of cities to respond to the risks associated with climate change, resource scarcities and damage to ecosystems in a way that catalyses inclusive urban development." – Future Proofing Cities [11]

Local climate extremes and UHI, both shown in studies conducted by HKO, are worsening. The frequency of temperature extremes, such as high hourly rainfall, hot days and nights, and extreme precipitation, has been increasing over the last hundred years. The annual number of hot nights

[10] Kurn, D. M., Bretz, S. E., Huang, B., & Akbari, H. (1994).The potential for reducing urban air temperatures and energy consumption through vegetative cooling (No. LBL--35320). Lawrence Berkeley Lab., CA (United States).

[11] Godfrey, Nick, and Roger Savage. (2012). Future Proofing Cities: Risks and Opportunities for Inclusive Urban Growth in Developing Countries. Epsom, Surrey, U.K: Atkins.

(days with minimum temperature of 28°C or above) has increased by twenty times and the annual number of cold days has decreased by 45% since the last 100 years. Extreme precipitation has become more frequent, with the hourly rainfall records increasing more than 60%, breaking past rainfall records at an unprecedented rate. HKO projected that the temperature and weather extremes will continue to rise due to global warming (refer to ***Figure 2-2***)[12]. Therefore, developing a long-term planting strategy will better equip Hong Kong to cater and withstand future local climate extremes.

It is also important to understand the future trends in climate change and how these might affect the future growth of the trees. As part of the planning strategy for Hong Kong's long-term vision of a sustainable and resilient landscape, tree species should be selected with due consideration to climate resilience.

Under the "Right Tree, Right Place" principle, we will not only need to select trees that can thrive in the existing Hong Kong climate, but also in the expected changes in future weather patterns until the end of its ULE.

[12] Hong Kong Observatory. (n.d.). Climate Change in Hong Kong: Extreme weather events. Retrieved 21 Mar 2016 from http://www.hko.gov.hk/climate_change/obs_hk_extreme_weather_e.htm

Figure 2-2 – More Extreme Weather in Hong Kong

Community Concerns

Most Hong Kong citizens like trees. On the other hand, they have some reservations or concerns of varying degrees in particular trees planted in urban street environs. These concerns include:

- Trees attract animals, causing nuisances like droppings and possible diseases passed from birds
- Trees cause a mess by dropping leaves, flowers or fruit
- Trees may block views
- Trees attract unwanted insects, such as mosquitoes
- Trees block footpaths and cause paving upheaval
- Trees may be dangerous

Currently, the government is educating the community on the benefits of trees and proper tree planting, maintenance and management procedures, through talks, exhibitions and advertising to ease most of the public's concern. However, it is equally important for the community to realise that trees are living organisms and eventually do age, die and need to be replaced. With appropriate life-cycle planning and planting under the principle of "Right Tree, Right Place", accompanied by proper urban forestry management and practices, it is possible to maximise a tree's ULE.

Spatial Constraints

According to the research conducted by The Centre for Urban Forest Research (2004), large trees have more positive impacts on urban ecology and our living environment than small trees in terms of conserving energy, reducing stormwater runoff, mitigating urban heat island effect, improving local microclimate, improving soil and water quality, enhancing visual attractiveness and promoting health and well-being. Although planting large trees may require a higher upfront cost from a long-term perspective, the considerable benefits brought by established mature large trees outweigh the cost of planting a group of small trees within the same space.

However, with a high density urban area and narrow streetscape, planting space in Hong Kong is largely constrained by various functional requirements and complex site situations, such as underground utilities, pedestrian and carriageway width requirements, barrier-free access requirements, building regulations, etc. Flyovers, building line extensions, advertising signboards, traffic headroom and street canopies in older neighbourhoods further compete with the existing trees for overhead growing space. Existing trees are sometimes scarified and extensively pruned to satisfy these functional requirements. Planting or replanting of trees that can reach large mature sizes may not always be possible.

Also, high-rise skyscrapers not only cast large shadows on the ground, but also create wind corridors and wind shields which may have negative impacts on trees. This situation increases the difficulty of selecting the right species for the right places.

Urban Environment

Many researches have proven the benefits of planting large trees in urban landscapes in terms of creating more shaded areas, absorbing more gaseous pollutants, reduced vulnerability to vandalism, cleaning the air and releasing oxygen. However, trees require more space and more years to grow and mature, and maintenance for these trees is essential and relatively expensive.

In urban area, restrictions on the time and frequency of certain horticultural maintenance operations may be imposed to some planting areas as in the case of the central median planters to minimise traffic disruption. This has rendered difficulties for a thorough maintenance services to be carried out to these planters. Understanding that the possibility of human injury and property damage from tree failure in urban areas is significantly higher than the rural areas because of the higher quantity of possible targets and frequent foot traffic, tree selection must balance between maintenance cost / requirements and the tree benefits including social, environmental, visual amenity, etc.

2.2 Opportunities for Hong Kong

Under CAP, Hong Kong 2030+ and BSAP, a strategic framework has been set out to guide Hong Kong into becoming a sustainable and resilient city. One of the strategies is to formulate an urban forestry management strategy. The first step is to formulate a baseline to the current situation and a basis for ensuring biodiversity within the urban forest as part of the management strategy. A sustainable, resilient urban forest will require selecting the most appropriate tree species to deal with current and future challenges.

The next step is to select the appropriate tree species for the location, and to further develop and implement an urban forest management programme that is committed to work in a tree life cycle and provide a better street environment for urban trees to grow. For example, the management programme should be able to allow the selection of appropriate tree species to replace ageing street trees or high-risk trees to form new, potential green corridors within the existing urban framework. Blue-green drainage concept can also be considered in the early planning stage for new streets and for replacement planting where the existing planting area can be improved, as blue-green drainage infrastructure could reduce surface runoff, water pollution, heat island effect, carbon footprint and energy consumption, and blend the natural water environment into the city.[13] These will all require close coordination and input across multi-disciplines to form an integrated and holistic approach that takes into consideration the planning, landscape design, engineering, economics, environmental and general community requirements. With the concerted efforts from different disciplines and professionals, our urban forests will be sustainable, resilient and healthy for passing on to the future generations.

[13] Drainage Services Department, HKSAR Government. (2018) *Stormwater Drainage Manual, Planning Design and Management*, 5th Ed.

3. Principles and Strategies

3.1 Principles and Strategies

The Government has committed to develop Hong Kong into a sustainable and enjoyable place to live and work through the promotion of resilient and adaptive landscapes, enriching vegetation diversity, applying robust urban forestry principles, and enhancing blue and green eco-services networks. In response to policy initiatives and action plans set out in CAP, Hong Kong 2030+ and BSAP, 3 considerations guiding the decision making in street tree selection have been identified. They are summarised in ***Figure 4-1***. Details are listed as follows:

RIGHT TREE (ensuring the suitable tree species are selected)

- Build a sustainable, resilient and adaptive urban forest – A healthy, biodiverse urban ecology is more resilient to climate change and potential pest outbreaks due to the widened gene pool. A rich vegetation diversity can support a higher diversity of fauna by providing a variety of different food and habitats for urban wildlife. With a smart selection of tree species mix and CVCM combined with proper planting and management practices, urban forest can help the city to cope and adapt with potential environmental challenges in the future.

- Minimise risk of tree failure – Trees should be assessed if they are high risk trees (Black or Red Category under TRIAGE, Tree Risk Assessment and Management Arrangement) or have reached the end or near the end of their ULE. High risk trees have high potential of tree failure and should be replaced as soon as feasible especially if targets are identified. For other trees, an assessment of the ULE should be conducted. This includes analysing the tree maintenance costs and the tree benefits provided in terms of monetary value. A tree is deemed to have reached the end of its ULE and ready for tree replacement when the tree maintenance costs outweigh the tree benefits provided.

- Improve vegetation and soil health by planting species that can coexist within the same niche – CVCM can further support similar fauna in terms of increased variety of food and habitat. Some CVCM can even aid in decreasing soil erosion and improve urban soil health through nitrogen fixation that will be beneficial to adjacent trees. Proper selection is required to ensure the CVCM do not overly compete with the tree for nutrients.

- Select planting species that can tolerate, mitigate and adapt to future climatic extremes and weather events – As reported by Hong Kong Observatory (HKO), there is evidence that local Hong Kong weather is already affected by climate change. Effects of climate change include summers becoming increasingly hot and for longer periods, higher average temperatures, higher annual rainfall and fiercer typhoons. Temperature changes can affect potential pests' life cycle or widen the pests' geographical range, enabling pest and disease dispersal via new flight routes or vectors. New pests and diseases, previously not found in Hong Kong, may also occur. Similarly, higher temperatures may cause foliage and trunk scorch in some tree species. Fiercer typhoon may cause a higher frequency of tree uprooting. As such, the tree species selection for the urban forest should give priority to trees with higher resistance to potential pest and pathogens outbreak and be able to tolerate the changing climate and extreme weather.

RIGHT PLACE (ensuring the planting place is suitable)

- Promote place-based landscape – Landscape is more than planting vegetation. Landscape encompasses all aspects of the outdoor environment including hard and soft elements such as landform, water, water bodies and vegetation. Moreover, landscape must consider making "places for people". The planning and design of our outdoor environment including street shall address human life in our city, with respect to the site context including physical environmental, social and cultural considerations, and relationship with adjacent land uses and building structures. Proper street design with appropriate planting is one of the important elements in creating an attractive place identity and sustainable landscape within our urban environment.

- Select plants adaptable to multiple urban street functions with a focus on walkability – Planting trees in tree pits may be preferable for certain street environs to maximise available open space at ground level for other street functions. Overhead space (e.g. signage, traffic lights, traffic sightlines) should also be studied for site specific considerations before selecting the appropriate tree species. To enhance walkability, a pleasant microclimate is crucial. With the increasingly hot summers in the city and the urban heat island effect, trees that cast shade in summer should be given priority in more heavily trafficked streets.

- Strengthen blue-green corridors – Identifying streets for possible blue-green corridor transformation or enhancing existing corridors with appropriate planting can greatly decrease the effects of habitat fragmentation. Planting tree species of higher ecological value and maintaining larger size trees in these blue-green corridors can increase habitat attractiveness to urban wildlife and facilitate wildlife movements.

- Maximise opportunities for blue-green infrastructure – Blue-green infrastructure aims to mimic natural water cycle through infiltration, evaporation and transpiration to capture rain, control flood and reuse stormwater. Stormwater can be captured and reused for street planting. Harvesting stormwater for landscape should be considered in the early stages of urban planning and in the planter design for successful incorporation into the maintenance and management program.

FOR US (ensuring the function of the tree is reached)

- Design for safety and liveability – Planting conducted under the "Right Tree, Right Place" principle with proper maintenance and management practices adopted should minimise tree risk failure, thus, making the streets safer. Improved liveability of a city can be achieved through appropriate street-level design that maximises human comfort, encourage outdoor activities and social interaction. Particular to the Hong Kong context, this includes maximising shade cast by trees in summer heat to create a more comfortable street micro-climate.

- Respect local identity – Appropriate tree selection, CVCM and streetscape design would strengthen and enhance the character of the district. The local environment, history, social dynamics and cultural specificities of the community can build a stronger relationship between the people and place and therefore promote place-ecology.

- Raise public awareness and understanding – Street trees are a valuable asset of our community. The Government will continue to foster an attitude of care of trees across the territory by the community and to cultivate proper values and attitude towards protecting the environment, including the protection of our street trees with the urban forests.

4. Right Tree

4.1 Roadside Urban Forest Today

A desktop literature review and investigation has been undertaken to understand the current situation of Hong Kong's roadside urban forest. Two major sources of research data have been thoroughly analysed and compared. They are:

1) "Multipurpose census methodology to assess urban forest structure in Hong Kong "(Jim,2008) – This is a large-scale tree survey conducted from 1985 to 2008 by a local university that provides comprehensive data on tree composition, conditions and environmental interactions of urban forests in Hong Kong. The study areas covered 124 km^2 of built-up parts of the core around Victoria Harbour that include ten urban districts. The ten districts are: 1) Central & Western; 2) Southern; 3) Eastern; 4) Wan Chai; 5) Yau Ma Tei & Tsim Sha Tsui; 6) Mong Kok; 7) Sham Shui Po; 8) Kowloon City; 9) Wong Tai Sin; 10) Kwun Tong. All roadside planting in public roads of the 10 districts were studied. Raw data on 19,154 roadside trees from 149 species distributed in 509 different streets was collected. [14]

2) Data gathered from the electronic Tree Management Information System (TMIS) on 2 Oct 2016 – The TMIS, developed by the Greening, Landscape, and Tree Management Section (GLTMS) of Development Bureau, is a tree inventory system of existing trees under the management of various government departments. Data was extracted on 2 October 2016, 698,523 trees from 554 different species were collected from all over Hong Kong, of which 12.27% (or 85,705 nos.) of trees were not identified to species level. The overall percentage of the surveyed tree numbers against the known existing tree numbers in TMIS at the date where the data extracted is approximately 70%.

As revealed from the above data sources, in the past, tree species selection tends to be towards a few dominant species. The top twenty species, out of the total 149 species, contributed to approximately 77.5% of the tree recorded as revealed by the tree survey data (Jim, 2008); while the top twenty species, out of the total 554 species, contributed to approximately 49% of the tree recorded by TMIS data (2016).

Variations were observed between the lists of top 20 common species presented by the roadside tree survey by Jim (2008) and the TMIS data (2016). 8 species have been found on both common species lists (refer to ***Table 4-1***) Variations in the species compositions between the two studies were likely accounted by different groups of tree population. In Jim's study, only street trees located in Victoria Harbour regions were covered, while TMIS's data covers slope plantation, park plantation and including New Territories and Outlying Islands areas. Moreover, the former study's dataset was last updated in 2008 versus the latter survey in 2016. Overall, a limited range of common species has dominated the tree population, and a broad range of uncommon species has enriched the species diversity.

There is a prominent increase in the native species population recorded when comparing the two data sources, from 18% in 2008 to 37% in 2016. The increase in native tree population may be accounted by a larger sampling size and the inclusion of roadside slope forests in the TMIS data. For example, native trees (e.g. *Schima superba; Machilus chekiangensis*) were strategically planted on slope reforestation projects.[15] This may also indicate the recent trend of increased adoption of native species in urban forest planting. For

[14] Jim, C. Y. (2008). Multipurpose census methodology to assess urban forest structure in Hong Kong. Arboriculture and Urban Forestry, 34(6), 366-378.

[15] Greening, Landscape and Tree Management Section, HKSAR Government. (2016). *Knowledge Sharing (Special Topics)*. Hong Kong: Greening, Landscape and Tree Management Section, Development Bureau. Retrieved on Feb 2017 from www.greening.gov.hk/en/knowledge_database/special_topics.html

instance, trial planting of native species (e.g. *Ailanthus fordii; Rhodoleia championii*) was noted in urban parks. In terms of genera diversity, the top three genera (*Acacia, Ficus* and *Bauhinia*) dominated over 21% of the total number of trees recorded in TMIS.

In terms of family diversity, the dominant families included Mimosaceae (10.79%), Myrtaceae (9.9%), Euphorbiaceae (9.11%) and Caesalpiniaceae (8.36%). The dominance of Mimosaceae family was largely contributed by the abundance of *Acacia confusa,* which had an occurrence of 7.87%. Other species in the Mimosaceae family include *Leucaena leucocephala* (0.78%), *Acacia auriculiformis* (0.77%), *Acacia mangium* (0.74%), *Albizia lebbeck* (0.48%), *Albizia julibrissin* (0.04%), *Archidendron lucidum* (0.04%), *Archidendron clypearia* (0.03%) and few minor species which had occurrence less than 0.01% (refer to ***Table 4.1, 4.2*** and ***4.3***).

TMIS did not include data on tree size and age. From Jim (2008), data showed that small-sized trees dominated roadside planting. Two-thirds of the trees surveyed had height less than 5m, crown spread less than 5m and diameter at breast height (DBH) less than 150mm. Only approximately 10% of trees were large in size (with DBH more than 300mm). Jim (2008) concluded that a majority of young and small-sized trees represented a recent spate of diligent planting efforts. Also, many trees failed to reach their maximum dimensions due to urban environmental constraints such as limited roadside planting space, close proximity to buildings and overhead structures. These harsh urban environment constraints also restricted the planting of trees with larger mature sizes.

Scientific Name	Chinese Common Name	Family	Provenance	Occurrence (%)
Acacia confusa *	台灣相思	MIMOSACEAE	Exotic	7.87
Melaleuca cajuputi subsp. *cumingiana* *	白千層	MYRTACEAE	Exotic	3.80
Bauhinia x *blakeana* *	洋紫荊	CAESALPINIACEAE	Native	3.62
Macaranga tanarius var. *tomentosa*	血桐	EUPHORBIACEAE	Native	3.59
Ficus microcarpa *	榕樹(細葉榕)	MORACEAE	Native	3.37
Schefflera heptaphylla	鵝掌柴(鴨腳木)	ARALIACEAE	Native	2.48
Casuarina equisetifolia	木麻黃	CASUARINACEAE	Exotic	2.41
Lagerstroemia speciosa	大花紫薇(洋紫薇)	LYTHRACEAE	Exotic	2.31
Livistona chinensis *	蒲葵	ARECACEAE	Exotic	2.27
Celtis sinensis	朴樹	ULMACEAE	Native	2.27
Sterculia lanceolata	假蘋婆	STERCULIACEAE	Native	2.17
Cinnamomum camphora	樟	LAURACEAE	Native	2.03
Lophostemon confertus	紅膠木	MYRTACEAE	Exotic	1.57
Delonix regia *	鳳凰木	CAESALPINIACEAE	Exotic	1.44
Eucalyptus spp.	桉屬	MYRTACEAE	Exotic	1.41
Mallotus paniculatus	白楸	EUPHORBIACEAE	Native	1.40
Aleurites moluccana *	石栗	EUPHORBIACEAE	Exotic	1.32
Hibiscus tiliaceus *	黃槿	MALVACEAE	Native	1.29
Spathodea campanulata	火焰樹	BIGNONIACEAE	Exotic	1.21
Bauhinia variegata	宮粉羊蹄甲	CAESALPINIACEAE	Exotic	1.19
Total			**Exotic: Native 1.2:1 (by species) 1:1 (by occurrence)**	**49.02%**

Note: * species also being the top 20 common species in the roadside tree survey by Jim (2008).

Table 4-1 - Frequency of Occurrence of the Top 20 Common Urban Trees in Hong Kong on TMIS (2 October 2016)

Genus	Genus (Chinese)	Family	Family (Chinese)	Occurrence (%)
ACACIA	金合歡屬	MIMOSACEAE	含羞草科	9.38
FICUS	榕屬	MORACEAE	桑科	6.09
BAUHINIA	羊蹄甲屬	CAESALPINIACEAE	蘇木科	5.80
MELALEUCA	白千層屬	MYRTACEAE	桃金娘科	3.82
MACARANGA	血桐屬	EUPHORBIACEAE	大戟科	3.59
CINNAMOMUM	樟屬	LAURACEAE	樟科	2.89
EUCALYPTUS	桉屬	MYRTACEAE	桃金娘科	2.62
SCHEFFLERA	鵝掌柴屬	ARALIACEAE	五加科	2.60
CASUARINA	木麻黃屬	CASUARINACEAE	木麻黃科	2.41
LAGERSTROEMIA	紫薇屬	LYTHRACEAE	千屈菜科	2.36
CELTIS	朴屬	ULMACEAE	榆科	2.30
LIVISTONA	蒲葵屬	ARECACEAE	棕櫚科	2.28
STERCULIA	蘋婆屬	STERCULIACEAE	梧桐科	2.18
LOPHOSTEMON	紅膠木屬	MYRTACEAE	桃金娘科	1.57
MALLOTUS	野桐屬	EUPHORBIACEAE	大戟科	1.44
DELONIX	鳳凰木屬	CAESALPINIACEAE	蘇木科	1.44
MACHILUS	潤楠屬	LAURACEAE	樟科	1.35
ALEURITES	石栗屬	EUPHORBIACEAE	大戟科	1.32
HIBISCUS	木槿屬	MALVACEAE	錦葵科	1.29
SPATHODEA	火焰木屬	BIGNONIACEAE	紫葳科	1.21
Total				57.95

Table 4-2 - Frequency of Occurrence of the Top 20 Genera of Urban Trees in Hong Kong on TMIS (2 October 2016)

Family	Family (Chinese)	Occurrence (%)
MIMOSACEAE	含羞草科	10.79
MYRTACEAE	桃金娘科	9.90
EUPHORBIACEAE	大戟科	9.11
CAESALPINIACEAE	蘇木科	8.36
MORACEAE	桑科	6.64
ARECACEAE	棕櫚科	6.03
LAURACEAE	樟科	5.09
ARALIACEAE	五加科	2.61
CASUARINACEAE	木麻黃科	2.41
LYTHRACEAE	千屈菜科	2.36
ULMACEAE	榆科	2.32
STERCULIACEAE	梧桐科	2.27
BIGNONIACEAE	紫葳科	1.50
MALVACEAE	錦葵科	1.32
CUPRESSACEAE	柏科	1.18
MELIACEAE	楝科	1.15
THEACEAE	山茶科	0.97
APOCYNACEAE	夾竹桃科	0.94
BOMBACACEAE	木棉科	0.88
SAPINDACEAE	無患子科	0.86
Total		**76.69**

Table 4-3 - Frequency of Occurrence of the Top 20 Families of Urban Trees in Hong Kong on TMIS (2 October 2016)

4.2 Limitation of Research Information

The survey conducted by Jim in 2008 is considered to be outdated as it was done 10 years ago and only selected urban areas were surveyed. Also, some urban trees may no longer exist due to various reasons, such as, collapsed during inclement weather, construction works, etc. As such, the TMIS has been used as the main basis for this Study as it is the best available and most comprehensive data source covering a large extent of Hong Kong urban areas at the time of the Study. The TMIS covers tree data from eight core tree management departments, namely AFCD, ArchSD, CEDD, DSD, HYD, HD, LCSD and WSD. It is noted that there are some unidentified tree species within the gathered TMIS data. However, these species only covered a small majority of tree data gathered and should not have a significant effect on the general analysis on the dominance of tree species planted. Also, the TMIS data does not include information on tree size, dimension, age, date of planting, and roadside trees under private maintenance and management. This information, if available could facilitate the analysis on the distribution of tree size diversity and tree age population within the urban area.

The TMIS tree data sorted covers roadside street trees, man-made slope plantation and trees with public parks and government properties under the management of ArchSD, CEDD, HyD, LCSD and other government departments. This data adopted gives a good baseline on the tree species mix of our existing urban forest. However, it does not provide analysis of tree health condition and their suitability of planting in different road hierarchies.

Finally, although many researches have been conducted on the benefits and ULE of urban trees, these studies are conducted outside of Hong Kong. The extent of benefits brought by urban trees, especially in the context of economic and social aspects, are not specific to Hong Kong.

4.3 Approach to the Guide

The urban environment is predominantly man-made built-up areas. Roadside planting environments are especially harsh for trees. The effects of climate change may make the environments even more difficult for trees to grow. In the Guide, the recommended tree species for Hong Kong urban streets shall be species that can establish and survive in stressful urban conditions and fulfil their required functions, rather than simply restricted to only native species. Vegetation diversity is essential for a resilient urban forest. Planting a mix of exotic and native species can help maintain the health and resilience of the urban forest. Basing on this, the Guide has examined both native and exotic tree species to match street planting requirements.

To promote vegetation diversity, this Guide seeks to explore lesser known species for urban street planting to enrich biodiversity based on the 10-20-30 rule (refer to ***Section 1.6***). The existing top 20 dominant roadside tree species are therefore not selected for further study and inclusion into the Guide (***Table 4-1***).

Under the principle of "Right Tree, Right Place" and the strategies mentioned in Section 3, the decision-making criteria affecting street tree selection were deduced (***Figure 4-1***).

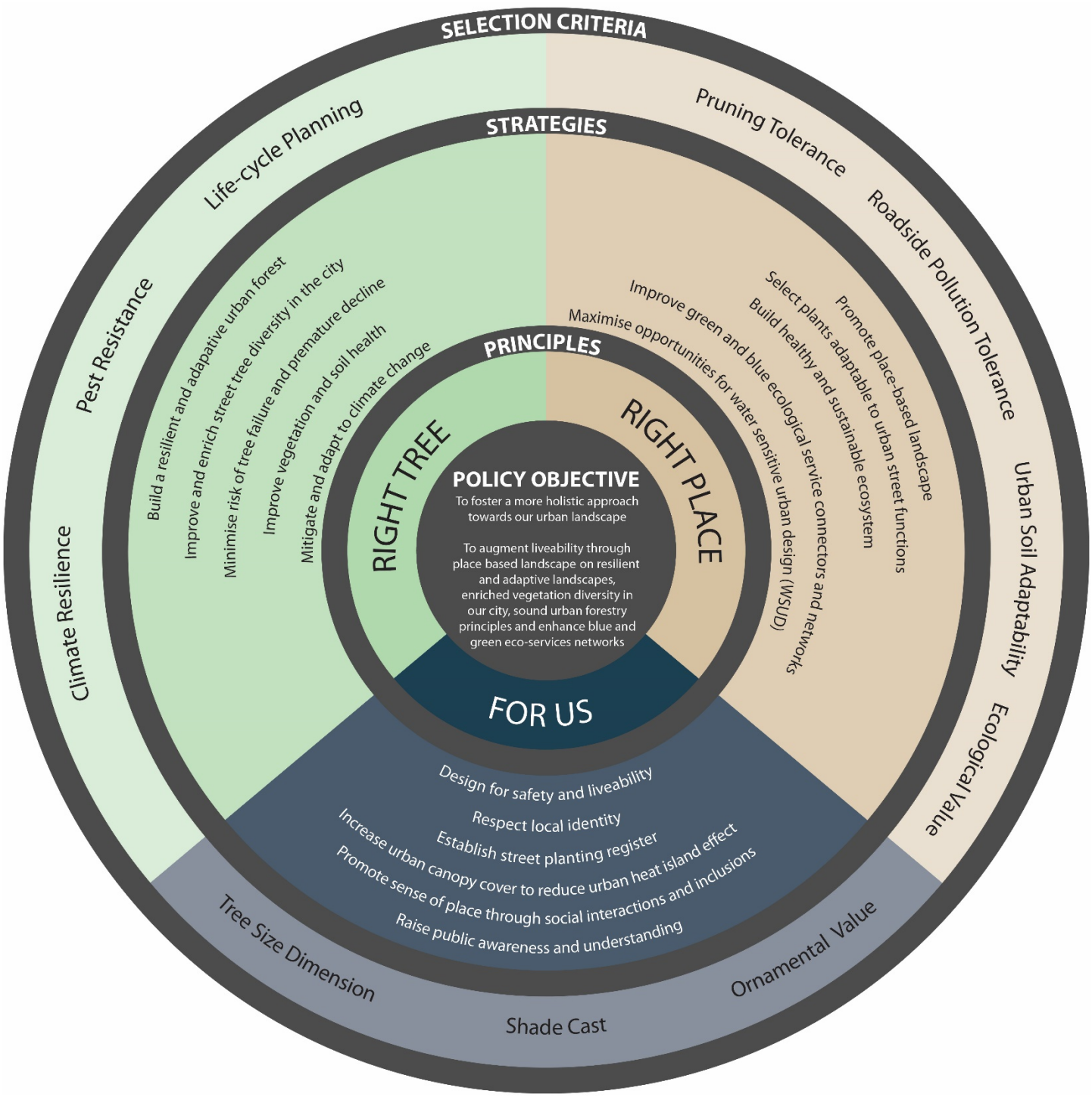


Figure 4-1 - Tree Selection Criteria

To summarise, the main strategies in selecting tree species appropriate for Hong Kong urban street planting are as follows:

- Non-dominant species to enhance urban forest diversity
- Tree species that nurture local biodiversity by providing ecological benefits to local fauna in Hong Kong
- Native tree species with good potential for street planting
- Species that can be propagated with existing technology or species that are currently commercially available
- Tree species planted in Hong Kong under similar roadside environments and observed to have relatively good tree health and condition. For instance, *Machilus spp.* is observed to do quite well in highly polluted areas.

4.4 Street Tree Selection Criteria – Essential Attributes

The Essential Attributes are the fundamental abilities of the tree to survive and maintain its physiological functions in the urban street environment. These are the basic requirements that need to be met before a tree species will be further considered. Species with a "low" rating in any essential attribute is regarded as not suitable and therefore has not been shortlisted. Details for the rating are included in ***Appendix B***. The Essential Attributes and their ratings are described below:

Climate Resilience

- **Heat tolerance**

Hong Kong has a sub-tropical climate, where mean temperature in summer is generally around 26°C but the temperature often exceeds 31°C in the afternoon. It is expected that the overall mean temperature to increase further by 1.5-3°C by mid-21st century[16] due to global warming. Recorded by the Hong Kong Observatory (HKO), the mean temperature for summer in Hong Kong is 29.1ºC in 2016.[17] Species that can withstand to 29ºC summer mean temperature but with sign of leaf or bark burn or abnormal health stresses are rated as "low" and have not been considered further as they are unable to tolerate mean summer temperature and anticipated adverse climatic conditions.

- **Drought tolerance**

Hong Kong experiences a hot and humid summer and relative dry and cool winter. Dry spells occasionally occur starting from November to February and can last up to 3 months. Severe drought may affect water supply and reliance on irrigation may not be sustainable in the long run. According to HKO, in the past 10 years, the longest dry spell with monthly rainfall below 10mm lasted for a period

[16] Byrne, L. B., & Grewal, P. (2008). Introduction to ecological landscaping: a holistic description and framework to guide the study and management of urban landscape parcels. Urban Horticulture. 2016, 10.1201/b21180-3, pp. 3-32

[17] Hong Kong Observatory. (2017). The Year's Weather - 2016. Retrieved from http://www.hko.gov.hk/wxinfo/pastwx/2016/ywx2016.htm

of 3 months. One of the measures to decrease water usage is through planting suitable tree species. According to HKO, maximum duration of absolute drought in Hong Kong is 60 days in the last century.[18] Established roadside tree species that can tolerate less than 1 month dry spell and require supplemental watering were rated "low" due to their high water demand and have not been considered further.

- **Waterlogging tolerance**

As reported by HKO, extreme precipitation has become more frequent in the last 100 years, with the hourly rainfall records increasing more than 60%, breaking past rainfall records at an unprecedented rate. It is predicted that the annual rainfall and occurrence for extremely wet years for Hong Kong and around southern China will increase. [19] Large volumes of stormwater runoff may cause sudden flooding and water-logged soil conditions. Most tree species can withstand one to four months of flooding during the dormant season. However, when flooding occurs during the growing season, especially during warmer weather, one to two weeks of flooding can cause major and long-term root damage to sensitive trees and shrubs, leading to tree decline and even death with some species.[20] Tree that require well-drained pit, or cannot survive in a saturated pit for less than one week were rated "low" and have not been considered further.

Life-Cycle Planning

Street tree planting should be designed for safety and liveability. One of the ways to do this is through proper life-cycle planning for urban trees. Life-cycle planning can be broken down into the following four key aspects:

- **Urban Useful Life Expectancy**

Urban Useful Life Expectancy (urban ULE) is an estimate of how long a tree is likely to beneficially contribute and remain in the urban landscape based on health, amenity, environmental services, cultural contributions to the community that warrants the cost of maintenance. The urban ULE gives the approximate time in which tree replacement should be considered, and thus continuing the life-cycle.

In general, a mixed ULE for urban street trees is preferable to minimize the potential loss of visual quality from sudden loss of a large group of trees at the same time. Choosing tree species with long urban ULE provide benefits to the community for a longer period with less cost. However, long urban ULE should be balanced against other tree selection criteria and the age of the tree community in the surrounding. Tree species with a very short urban ULE require higher maintenance cost as they need to be replaced sooner. Species projected with less than 20 year growth before senescence were rated "low" due to their short lifespan and have not been considered further.

- **Wind Tolerance**

[18] Royal Observatory (Hong Kong), & Starbuck, L. (1950). A statistical survey of Hong Kong rainfall. Noronha. Retrieved from http://www.hko.gov.hk/publica/tm/TM_2.pdf

[19] Cheung, M. S., Chan, H. S., & Tong, H. W. Rainfall Projection for Southern China in the 21st Century using CMIP5 Models.

[20] Flooding effects on trees. (2010). Retrieved from http://www.extension.umn.edu/environment/trees-woodlands/flooding-effects-on-trees/

Wind is the main mechanical stress on trees in Hong Kong due to tropical cyclones and monsoons typically occurring from April to October. They can cause severe damage to trees incurring risk to public safety and properties. There are two main types of tree damages. Brittle trees may lose their branches, leaves or even major limbs during intense winds; and shallow-rooted trees may blow over entirely. Adequate tree support can stabilise the trees during establishment and reduces the occurrences of tree limb failure. Nevertheless, trees that have brittle limbs and low mechanical stress requiring extra support throughout most of the tree's life-cycle were rated "low" and have not been considered further as they required high maintenance cost maintenance and lead to safety issues.

- **Manageability**

Newly planted street trees require regular maintenance (e.g. irrigation, weeding, fertilisation, etc.) during the establishment period. The need of maintenance lessens as the tree reaches establishment and maturity. Other maintenance issues may arise due to extensive tree branches, aggressive root system, leaf littering and fruit dropping on footpaths, blocked drains, etc. which would be a nuisance and safety concern to public. Tree species that do not require regular high maintenance frequency are preferred. Species with large amount of plant litter with potential to block drains, or with fruit or seed drops creating sticky footpath surfaces were rated "low" and have not been considered further.

- **Crown Management**

In urban roadside area, accessibility for pruning may be an issue in particularly for trees planted within the central median. Partial closure of a lane may be required to carry out tree pruning works as part of the normal horticultural maintenance and also to avoid obstruction to traffic sightlines. Smaller sized trees with fast growth rate and wide spreading crown will require frequent pruning and were rated "low" due to high maintenance cost.

Pest and Disease Resistance

Changes in temperature and moisture will directly affect the growth, spread, range and survival of pests, pathogens, vectors and competitors. As this will have significant direct effects on pests and pathogens' behaviour and population, the timing and severity of outbreaks may also be affected. Diseased trees require higher and more regular maintenance and may present hazards to pedestrians and vehicles alike. A "low" rating was given to tree species with a history of pathogen outbreaks in Hong Kong or require an aggressive regime of treatment and have not been considered further.

4.5 Street Tree Selection Criteria – Valued Attributes

Valued Attributes are the tree characteristics that will benefit ecological, human or/and other valued aspect. These are the desirable criteria and are applied depending on the local site context and road hierarchies and conditions. Details for the rating are included in ***Appendix B***. The Valued Attributes are described below:

Roadside Pollution Tolerance

Street trees in urban areas should be able to withstand the polluted roadside environments. For example, trees planted in the central median greening zone have to tolerate a high level of traffic density

which causes air and runoff pollution. Therefore, a highly valued attribute for street tree selection is the capability to tolerate urban pollution. Some tree species may even be effective in reducing pollutants and / or particulates. [21]

Pruning Tolerance

Most roadside trees require pruning from time to time to maintain clear headroom for pedestrians and vehicles, clear sightlines, reduce wind resistance, maintain or improve tree appearance and promote or reduce tree growth. Pruning tolerance of a species is assessed by its ability to compartmentalize and recover from pruning wounds over a period of time.

Urban Soil Adaptability

- **Soil Compaction Tolerance**

Soil compaction is defined as the mechanical increasing of soil density. Soil compaction is affected by soil type, changes in soil moisture content and the type of stress applied to the soil. Many urban planting sites are surrounded by hard paving with compacted sub-soil base. Soil compaction in urban streets may increase over time through regular foot traffic. Compacted soils have poor aeration and lower oxygen level. Tree selected for these sites should have the ability to tolerate relatively low soil oxygen levels and compacted soil conditions (e.g. *Taxodium distichum* & *Juniperus chinensis* cv. Kaizuka). Species that can survive with restricted soil aeration were rated “High”.

- **Root System (Manageability)**

Aggressive tree root system can uplift pavement causing tripping hazard to pedestrians. Species with aggressive root system should only be considered where there is sufficient space to accommodate the tree root system or where there is no significant limitation to soil volume.

- **Soil Volume Tolerance**

Confined planting sites (e.g. planting area with narrow width and/or closed, compacted bottom with defined volume of soil) are common to roadside planting situations. Trees with large rooting system in a confined planting site may result in root girdling, shallow rooting surface and pre-mature decline. Generally, species with larger mature size will have larger rooting system. Small-sized species with smaller root system would be more suitable for planting in sites with confined soil volume (e.g. *Polyalthia longifolia* & *Pongamia pinnata*). Tree species that can perform in small planting sites (1.2m to 1.5m dia. x 1.2m depth) are rated as “High”.

- **pH of Soil (Range)**

[21] Jin, S., Guo, J., Wheeler, S., Kan, L., & Che, S. (2014). Evaluation of impacts of trees on PM2. 5 dispersion in urban streets. *Atmospheric Environment*, 99, 277-287.

Urban soil with alkaline condition is common as soils are often contaminated by construction debris containing calcareous materials. Literature suggests that a pH in the range of 6.0 to 6.5 is generally favourable for most plants. Planting areas (either new or existing) will be filled with new topsoil with the acceptable soil pH level of 5.5 – 7.0, according to ArchSD GS 25.02 (a)(iii)[22] and CEDD GS 3.30 (2)(a)[23]. However even though soil pH level can be modified, for cost-effectiveness, soil pH tolerance should also be considered as one of the valued attributes.

Tree Size Dimension

Generally large trees provide more positive impacts on urban ecology and the living environment than small-sized trees. They can increase urban biodiversity by providing more habitat areas, mitigate UHI effect, conserve more energy, improving local microclimate, soil and water quality, reducing stormwater runoff, enhancing visual attractiveness, promoting health and well-being better than small trees. Under the main principle, the selection of tree species should be appropriate to local environment conditions and constraints of the planting site. Given due consideration to site constraints, tree species with large ultimate size are encouraged for planting as far as practicable.

Ecological Value

Trees that provide a stable food source or habitat for wildlife (e.g. birds, fruit bats, butterflies, etc) could create ecological corridors in urban areas and enhance the green linkage between natural habitats and improve urban biodiversity and genetic diversity for both plants and animals. Establishing a stable ecosystem can help regulate pests and diseases through activities of its natural predators and parasites.

Ornamental Value

Species that relate to Hong Kong's cultural or historical context, appeals to one of the 5 senses, have unique tree form, bear fragrant flowers or fruits and provide high ornamental value for a prolonged period of time were rated as having high ornamental value.

Shade Cast

Shade casted by trees can help to reduce heat absorption by paved surfaces, buildings and road and thus reduce UHI effect. This rating provides a qualitative estimate of the degree of shade cast projected by a tree. In general, the larger the crown spread coupled with higher foliage density and bigger leaf size/area, the better shade cast is expected to be provided by the tree. Since Hong Kong winters are usually mild, summer shade is considered to be of greater importance in offering a comfortable walking environment to the pedestrian. The ratings of shade cast in this Guide are primarily based on scientific and visual judgement of the canopy.

[22] Architectural Services Department, HKSAR Government. (2017). *General Specification for Building.*

[23] Civil Engineering and Development Department, HKSAR Government. (2006) *General Specification for Civil Engineering Works, Volume 1.*

5. Right Place

5.1 Introduction

Each street has its own spatial limitations set by relevant standards and guidelines which form the basic and fundamental requirements for safety of road users including pedestrian and motorist. In order to maximise tree planting opportunity and fulfil the fundamental safety requirements, early coordination between Engineers, Landscape Architects and Designers is required at planning and design stage.

Existing urban street spatial elements and surrounding conditions within urban Hong Kong areas were identified and analysed. These streets were first categorised into 3 main road hierarchies, Primary Distributor Road, District Distributor Road and Local Distributor Road as defined in the Transport Planning and Design Manual (TPDM) as a baseline. Further analysis was conducted on the spatial conditions and the surrounding environs of these 3 road hierarchies. These road hierarchies were then further categorized into 7 main street typologies and 14 sub-types based on the street surroundings.

Expressways, highways and trunk roads were not covered in this Study as they are considered to have very specific requirements and special needs different from the common street typologies. Pedestrianised streets were also excluded in this Study due to their special street characteristics. For the purpose of this Study, urban areas mean built-up areas within the Hong Kong Island, Kowloon and the New Territories.

5.2 Review of Existing Roadside Tree Planting Standards Requirements & Guidelines

To form a baseline for further study into the existing urban street conditions, the latest technical requirements, standards and guidelines relevant to roadside planting were analysed and summarised in ***Figure 5-1*** and ***5-2***.

RELEVANT ROADSIDE PLANTING REQUIREMENTS AND GUIDELINES

GENERAL NOTES

Tree Planting and other Form of Roadside Planting Aspects

- Landscape areas should be identified in the early planning stage, so long as the minimum clear width of footpath can be provided.
- Planting can be used to change the perceived width of a road, to define a gateway and to improve the overall environment.
- Trees should be planted clear of traffic signals and/or traffic signs to ensure their visibility. Furthermore, they should not be planted in such locations that may hinder the operation and maintenance of speed enforcement cameras and traffic surveillance equipment/facilities, such as CCTV cameras, automatic incident detectors, police observation spots, etc.
- Trees should be planted at least 5m (measured along the carriageway) away from the approach side of a pedestrian crossing, run-in or a bus stop.
- Trees should be planted at least 10m (measured along the carriageway) away from a road junction.
- A minimum lateral clearance of 500mm should be maintained between the outside part of the tree trunk including tree guard and kerbside. This dimension should be increased to 1.0m for high speed roads with a designed speed limit of 70km/h or above.
- Adequate footpath widths should be maintained to cater for pedestrian traffic.
- For avenue/street tree planting, the trees should normally be spaced at a minimum distance of 5m from centre to centre. However, such requirement is not applicable if the trees are planted at the back of a footpath or in the CMGZ.
- Lowest tree branch overhang the carriageway should have a minimum height clearance of 5.5m. If the branch overhang occurs above a footpath or cycletrack, it should have a minimum height clearance of 2.5m.
- Trees planted within visibility splays should have a high canopy and a single slender trunk to ensure obstruction of driver vision is minimised.
- Trees should be planted at least 5m from existing street lighting to avoid shading effect.
- Agreement should be obtained from the relevant maintenance authority for the future maintenance of trees, including trimming of branches, felling and transplanting, if necessary, due to traffic management schemes.
- Tree planting, including small canopy trees, upright tree/palm with narrow trunks, turf, groundcovers or low shrubs, is allowed along the kerbside as long as they will not cause sightline and visibility problems. Alternatively, trees can be planted away from the kerb, such as at the back of footpath.
- In the CMGZ of a dual carriageway approach to a roundabout and the central island of a roundabout with diameter less than 10m, tree planting is restricted for preservation of visibility. But groundcovers, turf or low shrubs can be planted.
- To ensure that the raised planters in the vicinity of crossings will not obscure pedestrians, in particular children, from the view of approaching vehicle drivers, nor interfere pedestrians' sightlines to coming traffic, the overall height of the planters including shrubs should not exceed 0.5m within 30m on the approach to a crossing.
- Recommended minimum widths for footpath are dependent on peak pedestrian volume and type of land use. They can be summarized as:
  - Commercial and Residential Land use - 2m to 4.5m
  - Industrial Land use - 3.5m to 4.5m
- Vertical clearance for structures over footpaths:
  - Over and within 0.6m of a carriageway - 5.1m
  - Over a footpath but not within 0.6m of a carriageway- 3.5m
- Projection of signage should not be more than 4.2m from the main building line or beyond the center of the street. Minimum clearance of 5.8m is needed if signage is projecting over a street. If signage is projecting over a pavement, it should have a minimum clear distance of 1m from the kerb and a minimum clearance of 3.5m. Two adjacent signs should have a lateral distance of 2.4m. Two signs erected from opposite sides of street should have a minimum clear distance of 3m.
- Building frontage zone minimum width is to be 1m for areas with shopping frontage.

Maintenance and Management Aspects

- The safe operation of the road as well as method of maintaining any planting or other elements associated with landscaping should be considered at the design stage. In this respect, the maintenance authorities should be consulted on the proposals before they are implemented and preferably during the design process.
- Landscape designs which require frequent and regular maintenance, whether by persons on foot or in slow moving vehicles, which increases the risk to operatives and other road users, must be avoided.
- If tree planting are planned for verges, embankment, cutting or similar, the provision of water supply is necessary.

REFERENCES

1. *"Development Bureau Technical Circular (Works) No. 2/2012 - Allocation of Space for Quality Greening on Roads", Development Bureau, 2012.*
2. *"Guide on Erection & Maintenance of Advertising Signs:, Building Department, HKSAR*
3. *"Hong Kong Planning Standards and Guidelines", Planning Department, HKSAR, 2022*
4. *"Transport Planning and Design Manual", Transport Department, HKSAR, 2015*

Figure 5-1 - Relevant Roadside Planting Requirement and Guidelines

ROAD HIERARCHY FUNCTIONAL REQUIREMENTS

		PRIMARY DISTRIBUTOR ROADS eg. Nathan Road, Tsim Sha Tsui			DISTRICT DISTRIBUTOR ROADS e.g. Tong Chun Street, Tseung Kwan O		LOCAL DISTRIBUTOR ROADS eg. On Pong Road, Tai Po	
Connection		Major network of the urban area; Connecting centres of main urban areas, main centres of population and activities			Main road network within district		Road network within districts	
General Design Characteristics		• High capacity roads • Limited to no frontage access • Segregation of pedestrians from vehicular traffic • Grade seperated junctions preferred • At grade junctions should be at least 300m apart			• High capacity junctions • Peak hour stopping restrictions • Some direct frontage access		• Direct frontage access • On street parking permitted	
Carriageway Min. Width	Single Carriageway				7.3 or 10.3m (2 lane)	13.5m (4 lane)	7.3 or 10m (2 lane)	13.5m (4 lane)
	Dual Carriageway	6.75-7.3m (2 lane)	10-11m (3 lane)	13.5-14.6m (4 lane)	6.75 (2 lane)	10m (3 lane)	6.75m (2 lane)	
Max. Speed		50km/h	80km/h		50km/h		50 km/h	
Sight Distance	Desirable Min.	70m	145m		70m		70m	
	Absolute min.	50m	110m		50m		50m	
24 Hour Stopping Restrictions		Yes			Peak hour stopping restrictions		May be required, but normally only in the vicinity of junctions.	
On-street Parking Provision		No			Restricted		May be permitted	
Minimum Headroom for On-street Parking	Private Cars				• On-street parking spaces may be provided where off-street facilities are inadequate to meet demand and where provision would not adversely affect the flow of traffic. • On-street spaces should generally cater for short term parking needs and parking meters should be installed to encourage such usage.			2.4m
	Light good Vehicles							3.6m
	Medium and Heavy goods Vehicles							4.7m
	Container Vehicles							4.7m
	Coaches and Buses							3.8m
	Light Buses							3.3m
Min.horizontal Clearance from the Carriageway to Obstruction	Away or towards object but not steeper than 2.5% carriageway crossfall	Height of object ≥ 3m above 1m	Height of object < 3m above 0.6m		Height of object ≥ 3m above 0.5m	Height of object < 3m above 0.5m	Height of object ≥ 3m above 0.5m	Height of object < 3m above 0.5m
	Towards object steeper than 2.5% carriageway crossfall	Height of object ≥ 3m above 1m	Height of object < 3m above 0.6m		Height of object ≥ 3m above 0.6-0.8m	Height of object < 3m above 0.6m	Height of object ≥ 3m above 0.6-0.8m	Height of object < 3m above 0.6m
Min. Width of Central Reserves		2.3m			1.8m		1.8m	
Min. Width of Roadside Verge Greening Zone		2m			2m		1.5m	
For Central Median Greening Zone		Visibility shall not be interfered and the width of central reserve shall be suitably widened to provide sufficient plant growing space with automatic irrigation system. Only low shrubs or small upright trees/palms with narrow trunks can be planted on the central reserve within the sight line envelope.						
Parking and/or loading /unloading space if likely to interfere with through traffic flow					An additional 3m width on one or both sides of the carriageway should be provided			

REFERENCES

1. "Hong Kong Planning Standards and Guidelines", Planning Department, HKSAR, 2022
2. "Technical Circular (Works) No.: 2/2012 - Allocation of Space for Quality Greening on Roads". Development Bureau, HKSAR
3. "Transport Planning and Design Manual". Transport Department, HKSAR, 2015

Figure 5-2 - Road Hierarchy Functional Requirements

5.3 Methodology

There are many spatial considerations from different government standards and guidelines related to the 3 main road hierarchies. Out of all steps, the first and most important step should be to examine the suitability and feasibility of tree planting in the street. Should tree planting be deemed possible, the next step is to identify the road hierarchy and the immediate street environs. This shall give a comprehensive baseline of the spatial considerations for that particular street. Methodology to determine the feasibility of street tree planting is shown in the flowchart below (***Figure 5-3***).

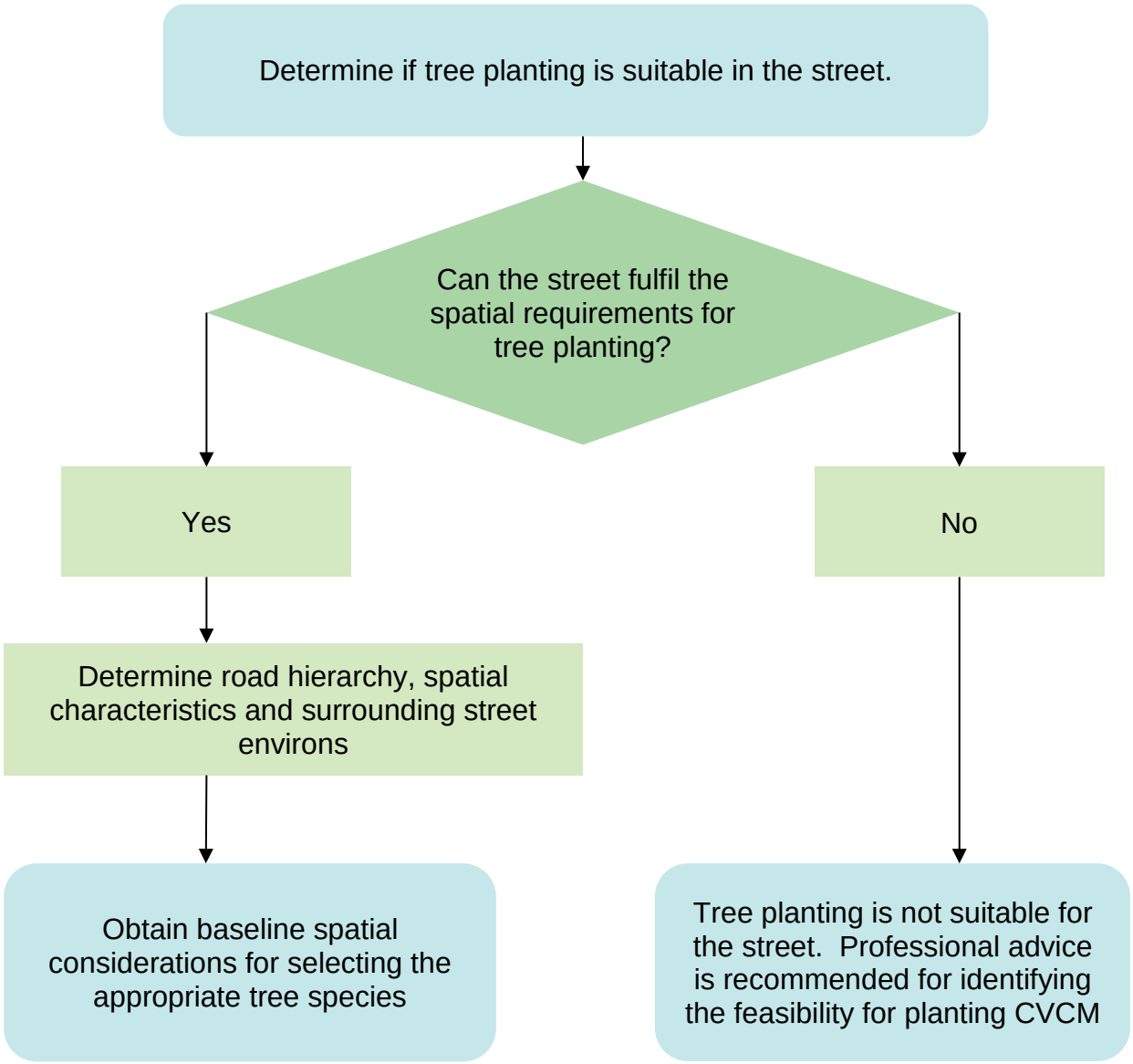


Figure 5-3 – Methodology to Determine Suitability of Tree Planting in a Street

5.4 Spatial Requirements for Tree Planting

Before considering the tree species, the street should first be analysed for their feasibility to support tree planting. There are 5 main spatial factors to determine the suitability of tree planting in a street location. These are existing underground utilities, through zones requirement and pedestrian flow, building frontage zone requirement, location of bus stops/loading and unloading bays and overhanging structures.

In order for street tree planting to be sustainable, it is essential to satisfy the requirements of these 5 main spatial factors to avoid conflict, creating obstruction and hence reducing subsequent maintenance and premature decline of trees. If these factors cannot be fulfilled, that particular street location is considered unsuitable for street tree planting. Details of these 5 main spatial factors are given below.

It should be noted that these 5 factors may not truly reflect the site context because each street environment is unique. Professional advice from Landscape Architects is recommended to be sought to ensure all suitable roadside planting areas are being explored.

Sufficient Soil Volume & Existing Underground Conditions

The presence of underground utilities, including telecommunications, electricity distribution, town gas pipes, traffic/street light cables, storm water drains, fresh water and wastewater pipes etc., usually located beneath footpaths and limited the underground space and thus available soil volume for tree root growth. Other underground conditions, such presence of boulders or man-made structures (e.g. basement ceilings) may further limit the underground space. Refer to the “Guidelines on Soil Volume for Urban Trees” by GLTMS, on the minimum soil volume for different desired tree size. Another factor to consider is the proximity of underground structures or utilities to the root growth zone. Additional maintenance difficulties may occur if excavation is required close by the tree protection area. Alternative measures to reduce conflict with underground utilities can be considered in the early planning and design stage, e.g. installation of root barriers to minimize future maintenance complications. Structural elements, such as structural frames and soil cells, can also be assembled underground to enlarge soil volume whilst providing a load-bearing structure to the footpath.

Through Zone

The basic function of a footpath in an urban street is to ensure pedestrian safety by providing a clear physical separation and demarcation from vehicular traffic (the carriageway) with the footpath. The width of the footpath (Through Zone) should be sufficient to cater for basic pedestrian flow and be freely accessible by the disabled. Ideally, this zone should be free of obstructions. In general, the minimum width requirement for the Through Zone is 2m, which is considered sufficient to provide an adequate environment for two-way flow by pedestrians and wheelchair users, especially on streets with moderate to low pedestrian flow. In general, footpaths with Through Zone less than 2m wide are not recommended to plant trees.

Building Frontage Zone

The Building Frontage Zone is the area between the Through Zone and the edge of buildings. It is a separate zone and cannot be calculated as part of the Through Zone. This zone accommodates cross movements into adjacent buildings, allows area for browsing and shopping frontages and provides pedestrians with additional moving space adjacent to buildings. As such, it is not recommended to

plant trees within this zone to prevent obstruction. According to HKPSG, Building Frontage Zone with width of 0.5m should be allowed for dead areas and increased to 1m for streets with active shopping frontages.

Location of Bus Stops, Loading and Unloading Bays, Pedestrian Crossings and Run-in

Bus stops and loading and unloading bays include areas dedicated to coaches, school buses, public buses and cars for passenger pick-up and drop-off. As these areas indicate regular and active pedestrian traffic, tree planting is not recommended as it may cause sightline blockage and safety issues. Trees should be planted at least 5m away from the approach side of a bus stop, loading and unloading bays, pedestrian crossing or run-in.

Overhanging Structure

Streets with overhanging structures covering part or an entire planting area of a street (e.g. above ground signs and building structures) may limit tree canopy growth. Depending on the extent of the overhead structures, the effect can be significant. It is noted that tree planting opportunities directly under overhanging structures are limited due to extended periods of overshadowing and space restrictions. There may also be conflicts with access requirements as certain types of overhanging structures may require frequent maintenance which will greatly limit the planting area size and thus the type of suitable planting species. Tree planting areas with overhanging structure covering the whole or part of the planting area along the street should be reviewed on a site-by-site basis.

5.5 Road Hierarchy

The road hierarchy classification system defined in the TPDM is adopted in this Guide for identifying the street location type because this system best reflects a set of standardised road dimensions and associated footpath standards that are well understood and typically used in Hong Kong across different professional disciplines.

The 3 main road hierarchies in urban areas (including Hong Kong, Kowloon and New Towns) comprise of the following:

(a) Primary distributor roads: Roads connecting the main centres of population. High capacity roads, with no frontage access or development, segregation of pedestrians, widely spaced grade-separated junctions, and 24 hour stopping restrictions [24];

(b) District distributor roads: Roads Linking Districts to the Primary Distributor Roads. High capacity at-grade junctions, with peak hour stopping restrictions and parking restrictions throughout the day[24]; and

(c) Local distributor roads: Roads within Districts linking developments to the District Distributor Roads[24].

[24] Transport Department, HKSAR Government. (2013). *Transport Planning & Design Manual.* Print.

5.6 Spatial Characteristics and Surrounding Street Environs

Spatial characteristic and functional requirements which affect tree species selection considerations in the 3 road hierarchies will be selected for further analysis. These spatial characteristics can be generalised into 3 major categories in which the street typology can be identified. (Refer to ***Figure 5-6***) These are summarised below:

Greening Zones

2 types of greening zones are associated with street tree planting. They are -

- Central Median Greening Zone (CMGZ) is the greening zone at the central median of a carriageway. According to DEVB TC(W) No. 2/2012, CMGZ only occurs in the primary distributor roads and district distributor roads [25].
- Roadside Verge Greening Zone (RVGZ) is the verge planting zone adjacent to the footpath. RVGZ is usually found along all 3 main road hierarchies. ***Figure 5-4*** shows the relationship between CMGZ/RVGZ and a typical road layout.

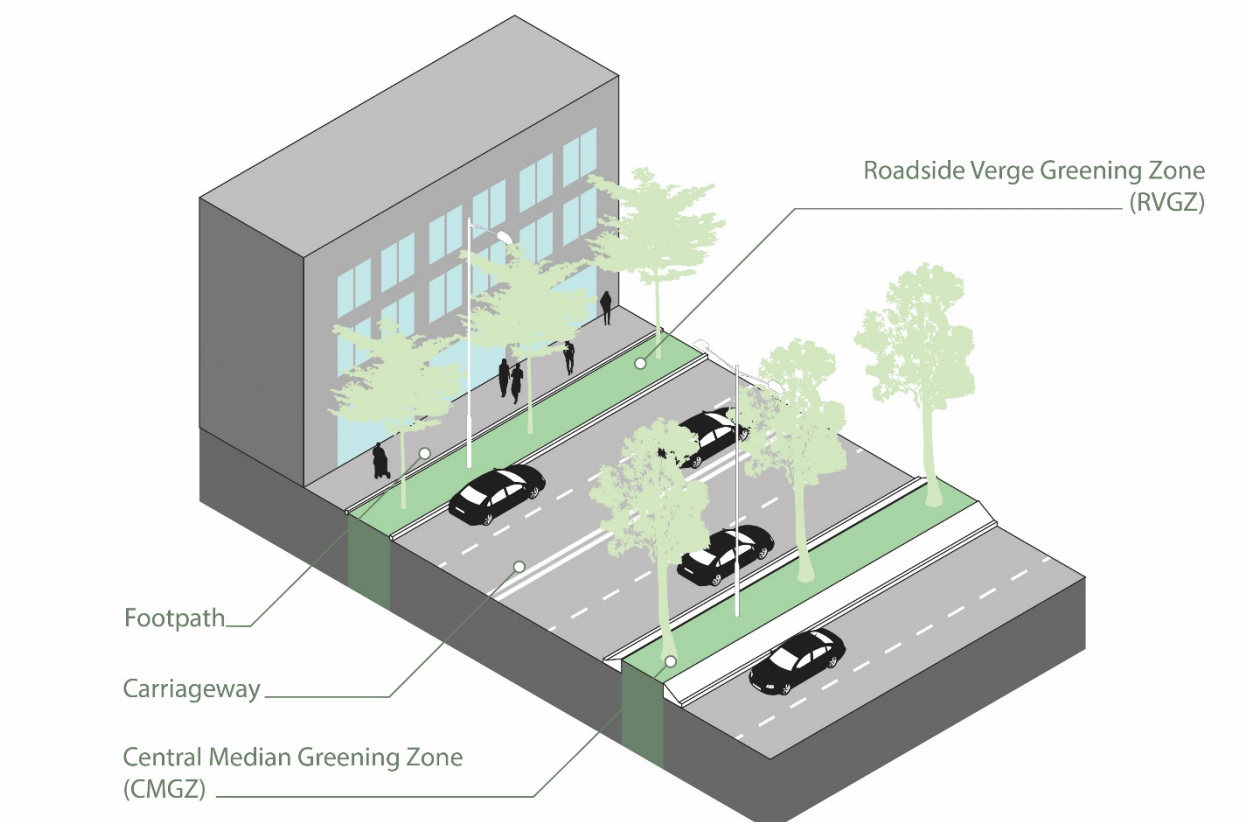


Figure 5-4 Relationship between CMGZ/RVGZ and a Typical Road Layout

[25] Development Bureau, HKSAR Government. (2012). *Development Bureau Technical Circular (Works) No. 2/2012 Allocation of Space for Quality Greening on Roads.*

The size of the greening zone can in future divided into 2 types – wide and narrow, illustrated below.

Greening Zone	Road Hierarchy	Planter Width	
		Wide	Narrow
CMGZ	Primary Distributor Road	≥2.5m	<2.5m
	District Distributor Road	≥2m	<2m
	Local Distributor Road	n/a	n/a
RVGZ	Primary Distributor Road	≥2m	<2m
	District Distributor Road	≥2m	<2m
	Local Distributor Road	≥1.5m	<1.5m

Table 5-1 Planter Width for Different Road Hierarchy

Kerbside Activities

Kerbside activities include loading/unloading, on-street parking and vehicle passenger drop-off at the kerb. To facilitate pedestrian movement, tree pits or shorter, non-continuous planters are recommended. Large trees with aggressive root systems may not be suitable for planting in a confined space as they may cause pavement upheaval.

Interface Conditions

Interface condition refers to the direct interface between footpath and the adjacent land use of a street. 2 types were identified - landscape area or property development.

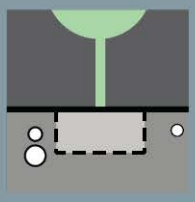
Landscape area refers to an area with no building development adjacent to the street, and it could be public open space, park, green belt, etc. With close proximity to the existing urban forest, species selection could give priority to those with a higher ecological value to enhance or extend the existing habitat areas.

Property development can be further generalised into 2 types – those with building frontage and those without. Building frontage is defined as buildings with active space adjacent to the footpath. This may include shop frontages, entrances, exits and windows. In these areas, visual and physical blockage must be carefully considered when selecting the appropriate tree species.

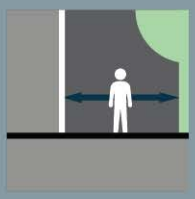
Buildings without frontage may be areas where a fence is surrounding the property development, or those parts of the building façade without entrances, exits or windows. Depending on the site context, utilising trees for visual screening can aid to soften the straight architectural lines and create a more human-scale space underneath the canopy.

CHECKLIST OF SPATIAL REQUIREMENTS FOR TREE PLANTING IN STREETS

If all boxes are checked, the street is suitable for tree planting. Professional advice should be sought to identify site specific considerations.



☐ **Sufficient soil volume, which is clear of underground utilities, other man-made structures or natural features, achieved**

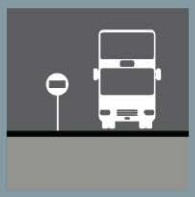


☐ **Through zone ≥ 2m achieved***

☐ **For active shopping frontage, building frontage zone ≥ 1m achieved**

OR

For deadzone, building frontage zone ≥ 0.5m achieved



☐ **≥ 5m from the approach side of a bus-stop/ pedestrian crossing/run-in**

☐ **≥ 2.4m from overhanging structures**

Note:

* In general, the min. width requirement for through zone is 2 m according to HKPSG Chapter 8. However, the min. through zone width depends on the land use type and the peak pedestrian volume. (pedestrians per minute). Refer to Table 9 of Section 5.8.15. Chapter 8 HKPSG for the recommended mi n. width standards for through zone width/ peak pedestrian volume for different land use type.

Figure 5-5 – Checklist of Spatial Requirements for Tree Planting in Streets

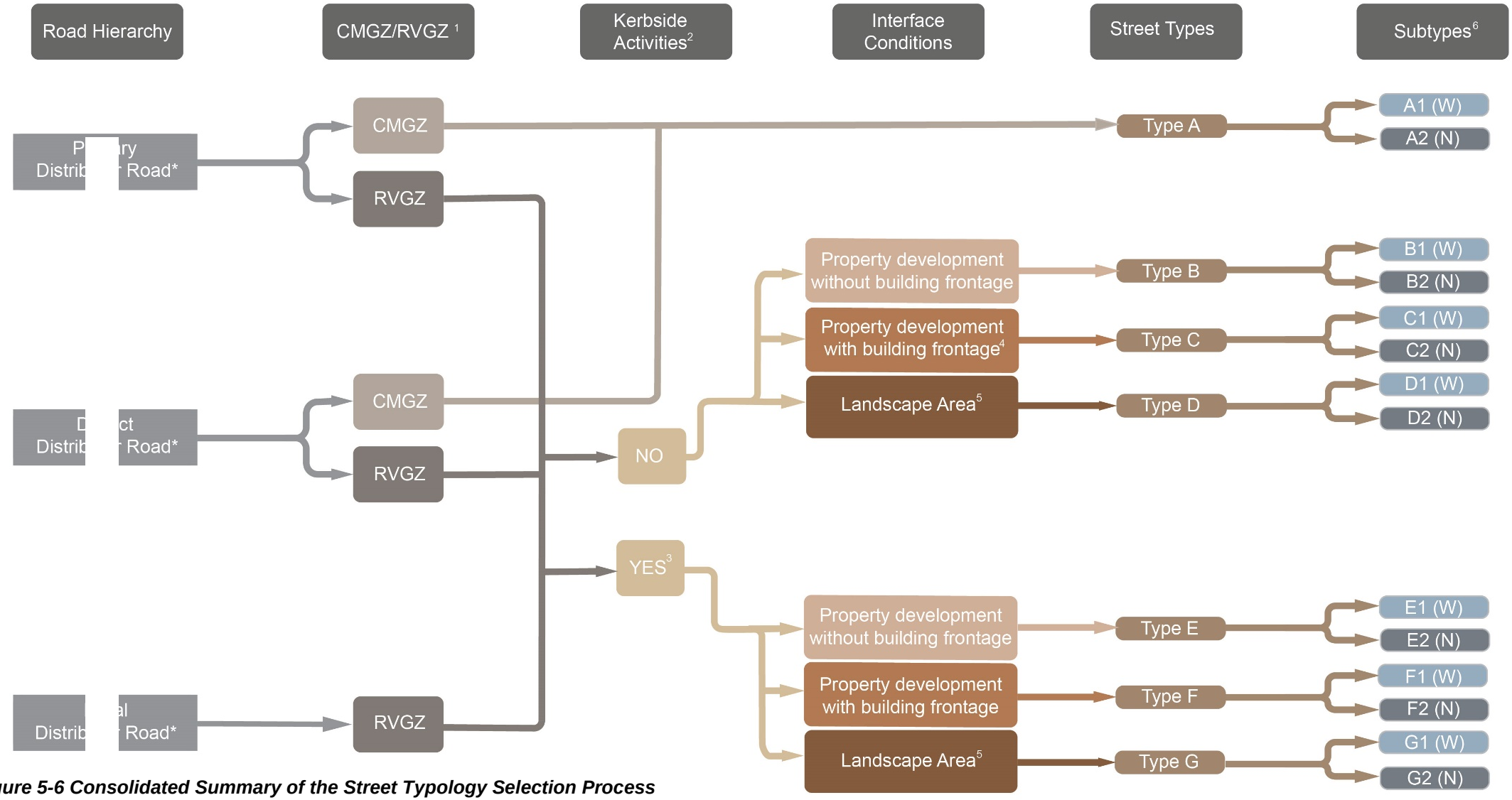


Figure 5-6 Consolidated Summary of the Street Typology Selection Process

* *Hierarchy ads, Chapter 8 Section 3.1 Hong Kong Planning Standards and Guidelines, Planning Department, HKSAR, 20 rint*

1. "CM means Central Median Greening Zone
   "RV means Roadside Verge Greening Zone
   (Ref *Allocation of Space for Quality Greening on Roads*", Development Bureau Technical Circular (Works) No. 2/2012)

2. "Kerbside activities" include loading/unloading, on street parking, bus stop or any other major activities taking place along the kerb side in the carriageway.

3. Tree pits and other discontinuous RVGZ are recommended for streets with kerbside activities.

4. "Building frontage" includes shopping frontage, doorways, windows, entrances (i.e. no visual/physical blockage required)

5. "Landscape Area" refers to an area with no building development, such as public open spaces, parks, green belt areas etc.

6. Subtype categorize the internal planter width, which means distance between inner wall of planter.

   "W" is wide internal planter width, where:
   (a) for Primary Distributor Road, the min. width should be 2.5m for CMGZ;
   (b) for District Distributor Road, the min. width should be 2m for CMGZ;
   (c) for Primary Distributor Road and District Distributor Road, the min. width should be 2m for RVGZ
   (d) for Local Distributor Road, the min. width should be 1.5m for RVGZ

   "N" is narrow internal planter width, where:
   (a) for Primary Distributor Road, the width is less than 2.5m for CMGZ;
   (b) for District Distributor Road, the width is less than 2m for CMGZ;
   (c) for Primary Distributor Road and District Distributor Road, the width is less than 2m for RVGZ
   (d) for Local Distributor Road, the width is less than 1.5m for RVGZ

   (Refers to "*Allocation of Space for Quality Greening on Roads*", Development Bureau Technical Circular (Works) No. 2/2012)

   The selection of tree species in accordance with wide or narrow planters, is to be determined by landscape architects or professional designers.

6. For Us

6.1 Introduction

People use streets for many activities, such as walking, sitting, cycling, moving goods, doing business or providing city services. These various activities that streets can accommodate aid to enhance the city's liveability. The types of users and volume of people in streets are dependent on many factors such as, time of day, size of street, the surrounding environs and local weather. Apart from a thoroughfare providing easy access, a street should also provide a safe and comfortable environment to its users. Although each user moves at a different speed and occupies a different amount of space over a time span for different purposes, the human comfort factor is common to all these users to foster a pedestrian-friendly environment.

6.2 Liveable City

Streets make up of a predominant part of urban landscape in Hong Kong. Streets are the most important element of the public domain in the city, and are fundamental to the appearance and function of the urban environment. In addition to moving vehicular and pedestrian traffic, streets provide the "Place" for social interaction, business activities and portray the image of the city.

Quality streets together with well-designed public spaces are integral to the social, economic and environmental sustainability of Hong Kong and to make a more liveable city for all. Apart from selecting the right trees for the right place, selection should therefore also aim for the users, i.e. the people that drive, walk and work in the streets every day. Tree selection and the associated landscape and planting design shall aim to improve the walkability or comfort of our street environment, encourage outdoor activities and social interaction to support the planning objective of a "liveable high-density city" and "smart, green and resilient Hong Kong" promoted under Hong Kong 2030+.

Some key factors to be considered are listed below as reference. The list is not meant to be exhaustive and should be reviewed / expanded depending on the prevailing street environment.

- Provide shade and moderate microclimate for pedestrian, drivers and buildings
- Contribute to a safer road through calming traffic, slowing speeds and providing buffer between pedestrians and cars
- Helps unify the road corridor environment
- Improve amenity and provide visual interest
- Screen undesirable views and helps filter air pollutants
- Foster sense of place
- Provide human scale within the urban setting with tall buildings and high-rises.

6.3 Site Specific Criteria

The roadside planting environment for each street, even with the same typology could be very different due to the site-specific criteria. Professional advice, such as from Landscape Architects should be sought during the planning and design stage to ensure that all site-specific criteria unique to that street are being considered during the street tree selection process.

Site-specific criteria may exist within a certain part or entirety of that street. Examples of some site-specific criteria are listed in ***Table 6-1*** as a reference. It should be noted that this list is not exhaustive and may not be applicable to all streets. Also, tree selection criteria should not be limited to those stated in this Guide.

Professional advice to ensure that associated supporting elements such as planter details, drainage and irrigation requirements, CVCM, etc. are properly designed/provided in providing suitable growing conditions for the trees. Further study to formulate a street urban forest precinct or master plan taking into consideration the ageing tree replacement can aid to further consolidate a holistic guide in the design, implementation, life-cycle planning and management of the urban forest.

Site-Specific Criteria	Design Considerations
Regulatory	● Consists of the understanding of regulatory, administrative and legal aspects dealing with Hong Kong urban streets. In Hong Kong, different street elements/furniture could be maintained by different government departments/parties. Relevant standards and guidelines related to planting on urban streets should be followed.
Stakeholders' feedbacks	● Specific tree species may be chosen for the location based on stakeholders' opinion or feedback.
Local historical and socio-cultural association	● Species should be carefully considered when planting new trees near to existing tree(s) with historical or socio-cultural associated valuable ● Planting at locations with significant historical, heritage and socio-cultural values to the neighbourhood, consultation with the community may be needed.
Interfacing with GMP	● Plant species should reference to the GMP themes of plant species palette if the roadside planting works forms part of the district based GMP.
Planting scheme in the neighbourhood	● The existing plant palette and planting scheme in the neighbourhood would influence the choice of species for specific purposes, such as planting alignment and ecological corridor preservation.
Land use	● Planting areas located in areas with higher degree of air pollution should consider species that are rated high in pollution tolerance selection criteria. ● Planting areas located in formal streets within a main commercial and retail district or in streets with a design theme, due consideration should be given in the number of species variety in the streetscape to maintain the identity and character of the streetscape. Proposed tree species should match with the existing design theme. ● Consider whether the tree species could fulfil functions of the street, e.g. trees with excessive litter drop should be avoided at footpaths with large pedestrian flows or within on-street parking lots.
Precinct topography	● Consider sloping gradient conditions for the given tree planting area. In general, it is not recommended to plant tree at street with steep sloping gradient (particularly streets in some hilly regions of the Hong Kong Island). Specialist advice should be sought.
Cycle tracks	● In areas, especially new towns or new development areas, where there are cycle

Site-Specific Criteria	Design Considerations
	tracks parallel to carriageways, considerations should be given for tree species which should have overhang of minimum 2.5m on the cycle track to maintain a vertical clearance for the cyclists (5.6.3.1(vii) Vol2 Ch.5 TPDM).
Physical form of planting areas	● Tree pit, flush planter and/or kerb planter is more susceptible to soil compaction problem in urban areas than raised planter. Soil compaction is mainly due to pedestrian traffic and activities. If the planting area of a typical street is a tree pit, flush planter and/or kerb planter, the soil compaction criterion should be considered carefully. ● In urban areas, topsoil pH in flush planter and tree pit is more susceptible to change than in kerb planter or raised planter because these planting areas are subject to direct storm water and surface runoff which contains high content of calcareous materials from construction debris. Therefore, creating more alkaline soil conditions (pH >7.0). Planting species which can perform well in slightly alkaline topsoil condition is required in addition to the general soil pH requirement range (pH 5.5 – 7.0)
Types of surface paving	● For tree pit planting, special care should be given for paver blocks or concreted surfaces surrounding the tree pit where tree root growth will affect the adjacent paving condition as this can cause tripping hazards to pedestrians and increase maintenance required.
Sunlight preference versus planting location	● Trees require sunlight to grow. However, the quality and duration of sunlight that each tree is receiving varies depending on its planting location. For example, for planting areas regularly under shade such as carriageway with heavy shade casted by adjacent high-rise buildings, consideration should be given to species that can perform well under shady conditions. It is suggested that the "Sunlight Preference" listed in **Appendix B** for each species be verified against its planting location to ensure suitability.
Other micro-climate considerations	● Other micro-climate conditions specific to the location, such as wind tunnel effect, proximity to seaside, etc. should be duly considered.
Existing Trees	● To enhance biodiversity, planting / re-planting shall make reference to the 10-20-30 rule. Surrounding existing tree species will need be examined and reviewed. ● The urban ULE of existing trees need to be considered to avoid sudden mass tree replacement due to new pests, diseases or the end of their life-cycle.

Table 6-1 – Examples of Site-specific Criteria and Design Considerations

7. Street Tree Selection

7.1 The Selection Process

After confirming the feasibility of street tree planting (***Figure 5-3)*** and identifying the type of street using the flowchart in ***Figure 5-6***, designers can follow one of the following four methods to identity suitable tree species for that street.

Method 1 - The Street Type Diagrams

With the known street typology, designer can look up in the corresponding Street Type Diagrams. Based on the "Right Tree, Right Place" principle as discussed in Section 4, 5 and 6, key street tree selection criteria for each of the 14 numbers of street typologies (i.e. Type A1/2 to Type G1/2) are pre-selected and detailed in the Street Type Diagrams.

These diagrams aim to assist designers in the decision-making process to ensure that critical factors related to that particular street type are being considered. Professional advice on site specific factors should also be sought at this point before finalizing the selection. Definitions of the rating (i.e. High, Medium and Low) are detailed in ***Appendix B*** – Selection Criteria Rating for Shortlisted Tree Species.

Method 2 - Summary Table - Suitable Tree Species for each Street Typology (Appendix D)

Apart from using the Street Type Diagrams, designer can also make reference to the summary table at ***Appendix D*** - Suitable Tree Species for each Tree Typology to select suitable trees for that particular street type.

Similarly, professional advice should be sought before finalising the selection.

Method 3 - Tree Datasheets (Appendix A)

Designer can also make use of the Tree Datasheets in ***Appendix A*** where detailed trees information together with their suitability to the respective street types is provided. Professional advice should be sought before finalising the selection.

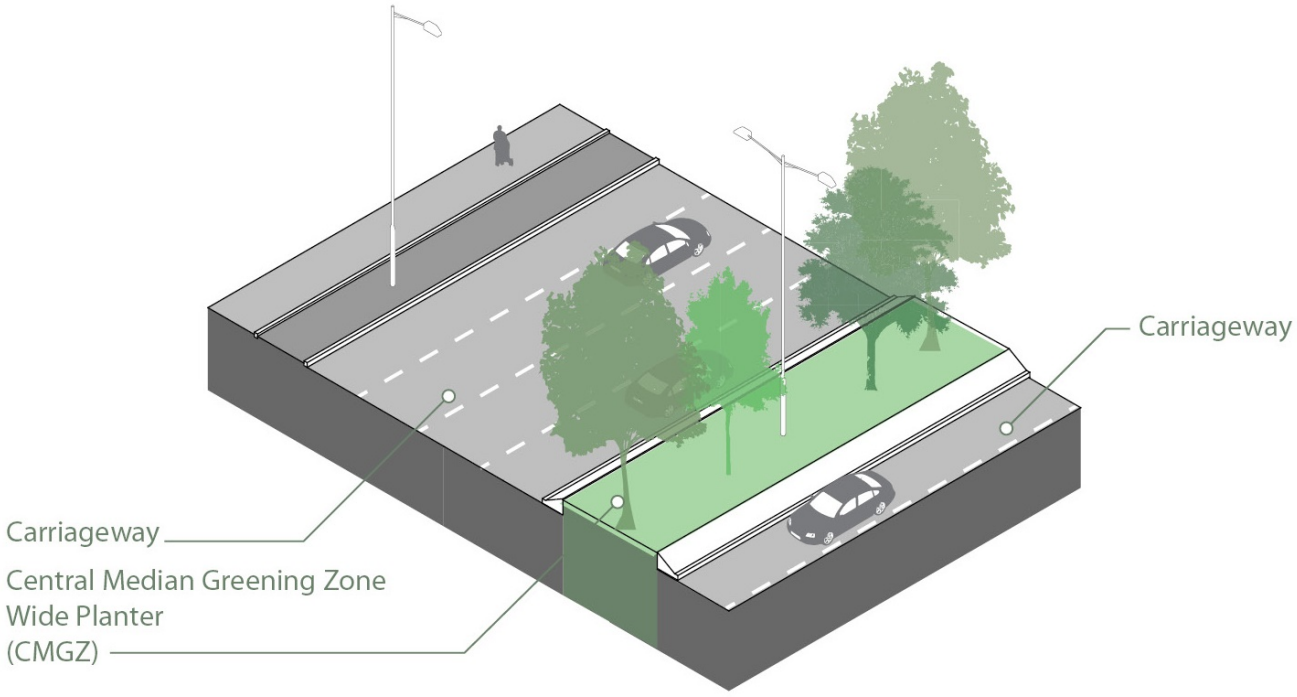
Method 4 - Complementary Tree Selection Software

This complementary software is designed for the use of designers wish to adjust the pre-selected criteria as defined in the Street Type Diagram to suit site specific requirements after seeking professional advice. A list of suitable tree species will be displayed according to the input selection criteria.

7.2 The Shortlisted Species

Due to the scope of this Study, only 80 species are shortlisted in the Guide. It is not the intention of the Study to limit the number of tree species for future planting to species in the shortlist. Designers are encouraged to use the selection criteria detailed in the Street Type Diagrams as a reference guide to review the suitability of other potential species that would support the long-term goal in achieving a sustainable, healthy and resilient urban forest for Hong Kong.

Street Type A1



Diagram

Street Characteristics

- CMGZ
- Wide planter

Key Selection Criteria*

Essential Attributes

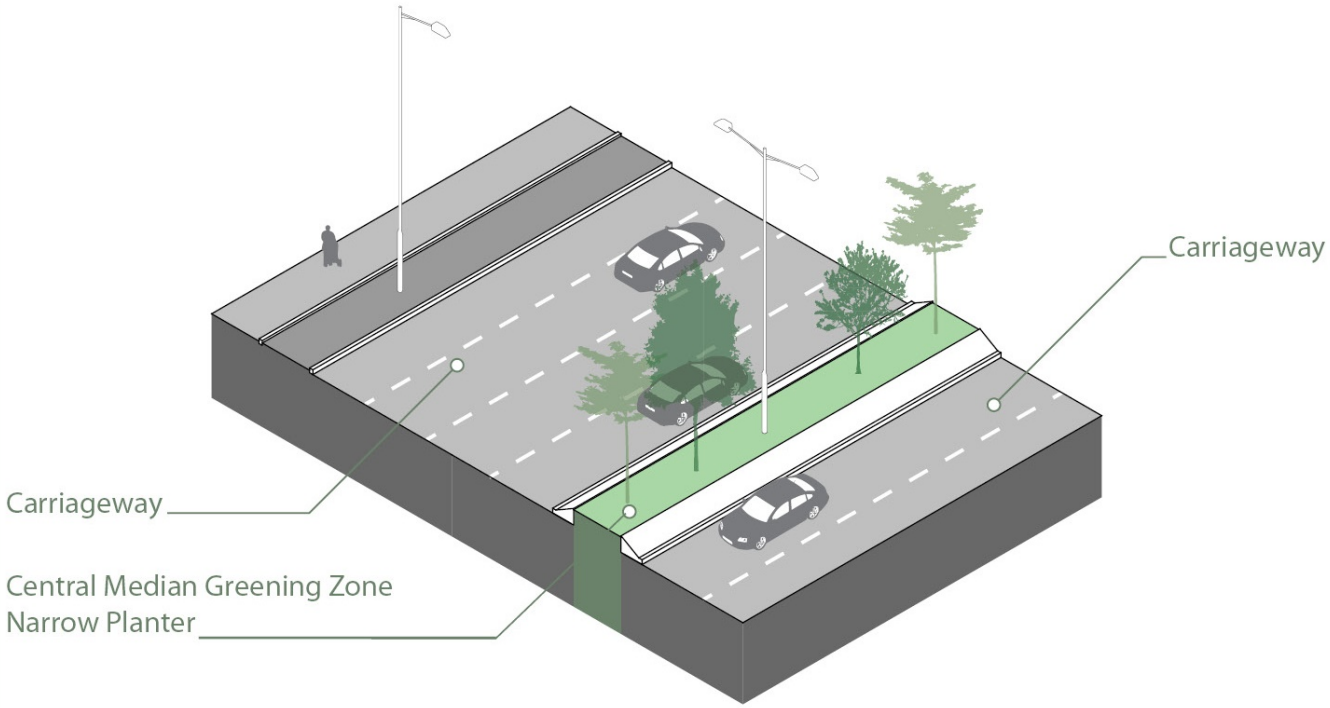
- minimal crown management
- high wind tolerance

Valued Attributes

- high roadside pollution tolerance
- medium to high ecological value

* The listed Selection Criteria are key concern for typical street type only. Please consider other site specific criteria and seek advice from relevant professional for selecting appropriate tree species.

Street Type A2



Diagram

Street Characteristics

- CMGZ
- Narrow planter

Key Selection Criteria*

Essential Attributes

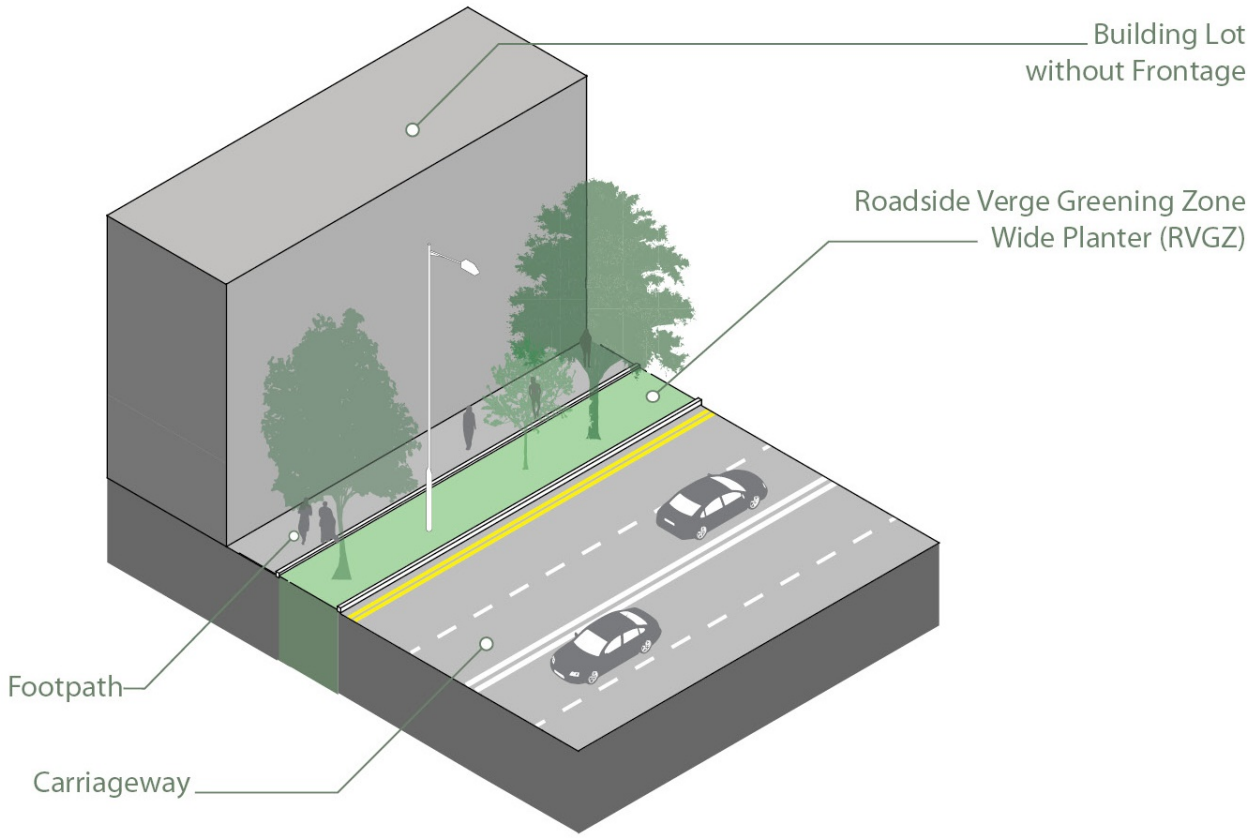
- minimal crown management
- high wind tolerance

Valued Attributes

- medium to high soil volume tolerance
- high roadside pollution tolerance
- small to medium tree size dimension

* The listed Selection Criteria are key concern for typical street type only. Please consider other site specific criteria and seek advice from relevant professional for selecting appropriate tree species.

Street Type B1



Diagram

Street Characteristics

- RVGZ
- Wide planter
- No kerbside activity
- No building frontage in building lot

Key Selection Criteria*

Essential Attributes

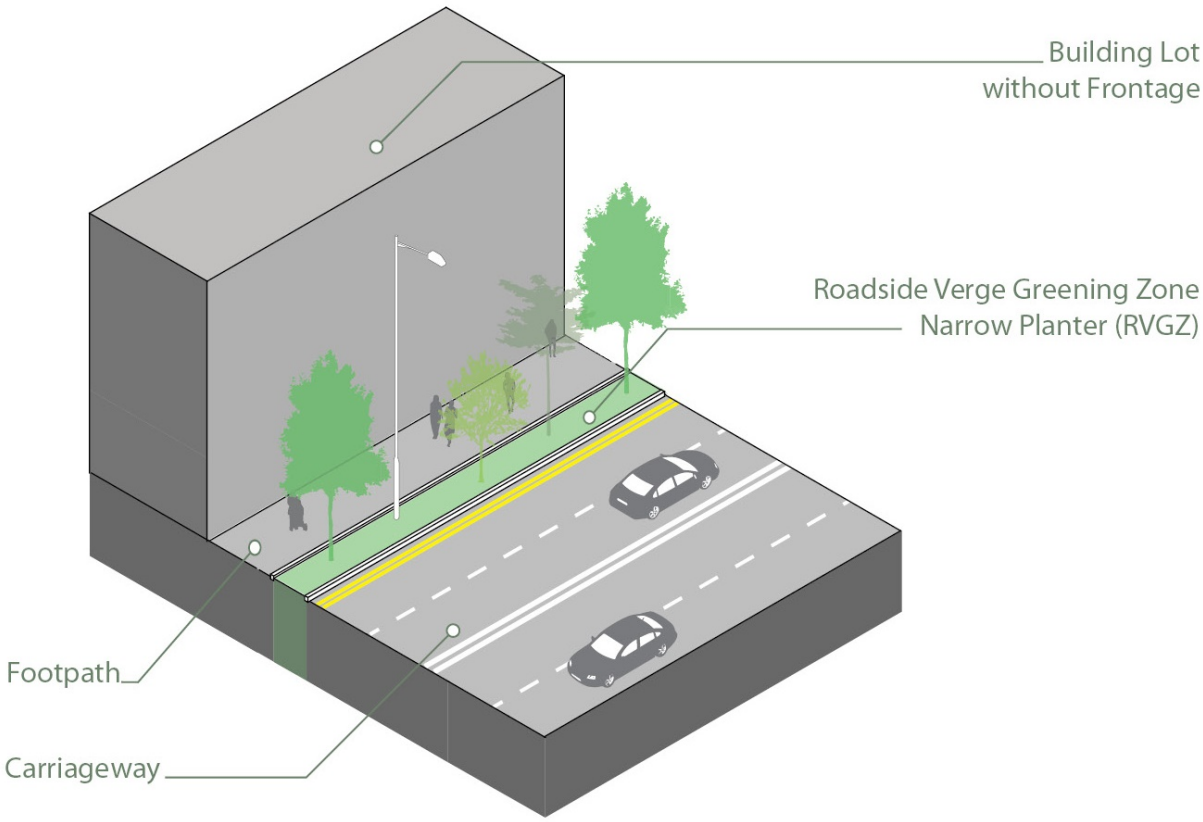
-

Valued Attributes

- medium to high ecological value

* The listed Selection Criteria are key concern for typical street type only. Please consider other site specific criteria and seek advice from relevant professional for selecting appropriate tree species.

Street Type B2



Diagram

Street Characteristics

- RVGZ
- Narrow planter
- No kerbside activity
- No building frontage in building lot

Key Selection Criteria*

Essential Attributes

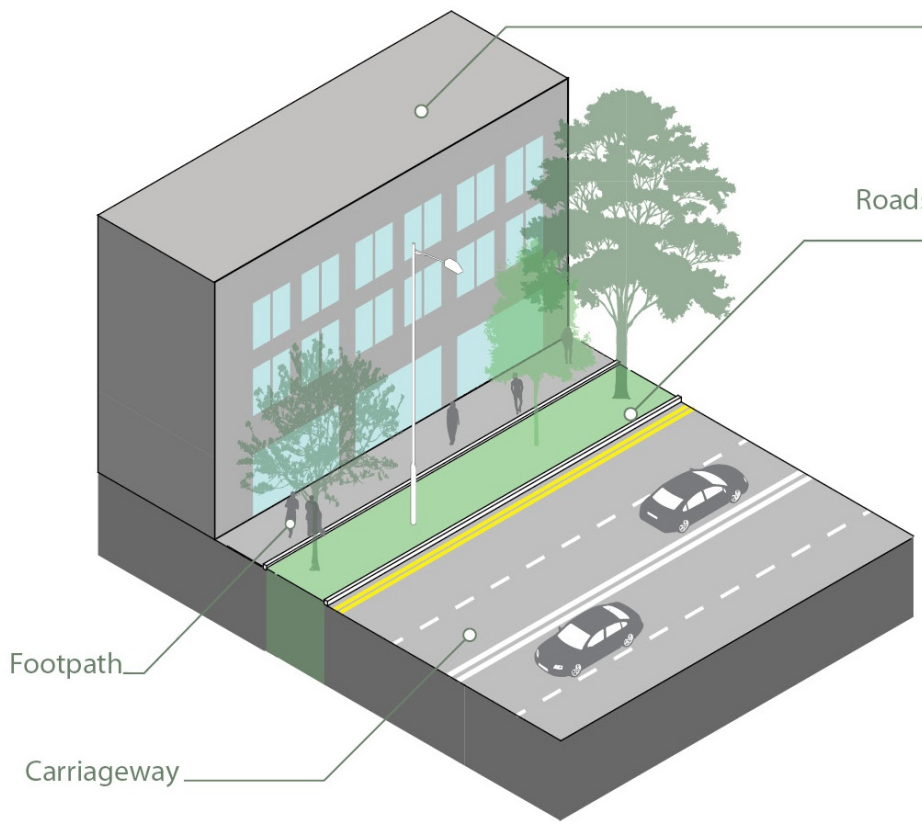
-

Valued Attributes

- medium to high soil volume tolerance
- medium to high ecological value
- small to medium tree size dimension

* The listed Selection Criteria are key concern for typical street type only. Please consider other site specific criteria and seek advice from relevant professional for selecting appropriate tree species.

Street Type C1



Diagram

Street Characteristics

- RVGZ
- Wide planter
- No kerbside activity
- Building lot with frontage

Key Selection Criteria*

Essential Attributes

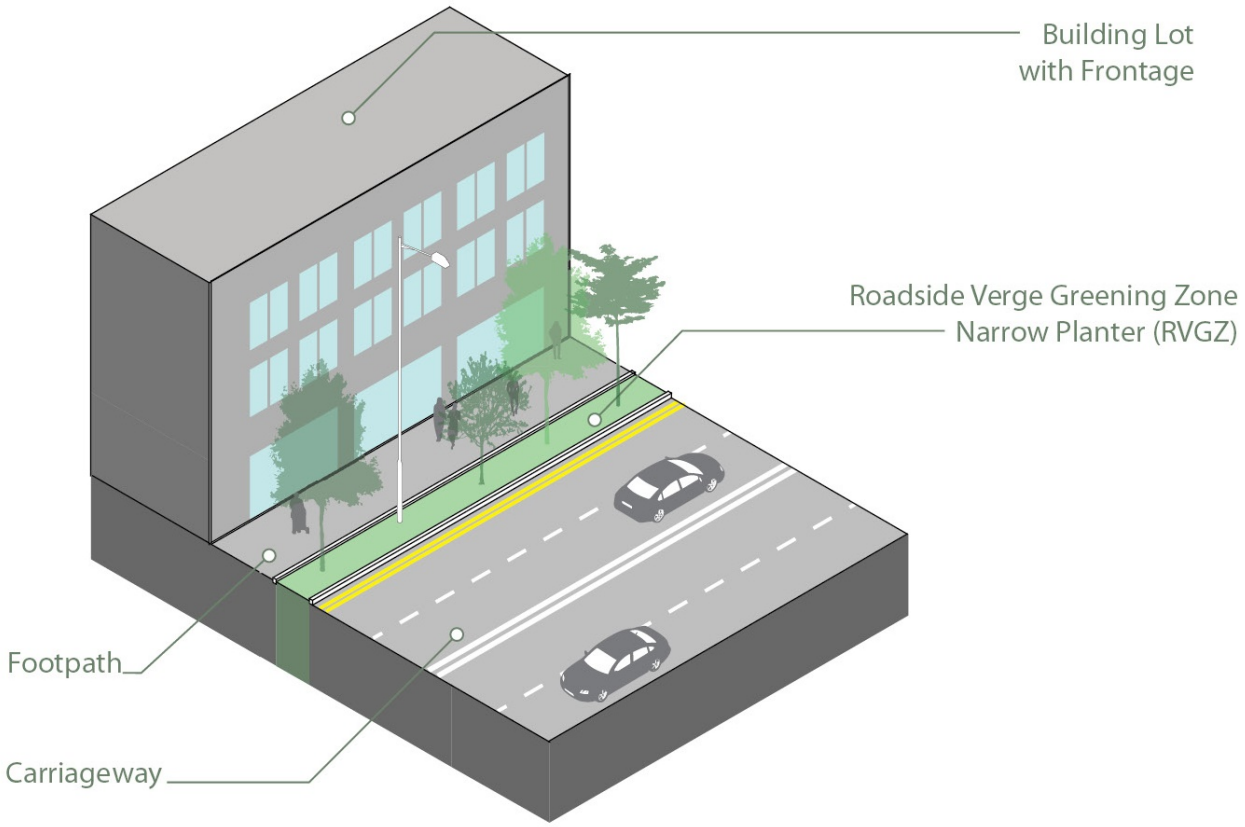
- high wind tolerance

Valued Attributes

- medium to high ornamental value
- avoid poisonous species
- medium to high pruning tolerance
- medium to large shade cast

* The listed Selection Criteria are key concern for typical street type only. Please consider other site specific criteria and seek advice from relevant professional for selecting appropriate tree species.

Street Type C2



Diagram

Street Characteristics

- RVGZ
- Narrow planter
- No kerbside activity
- Building lot with frontage

Key Selection Criteria*

Essential Attributes

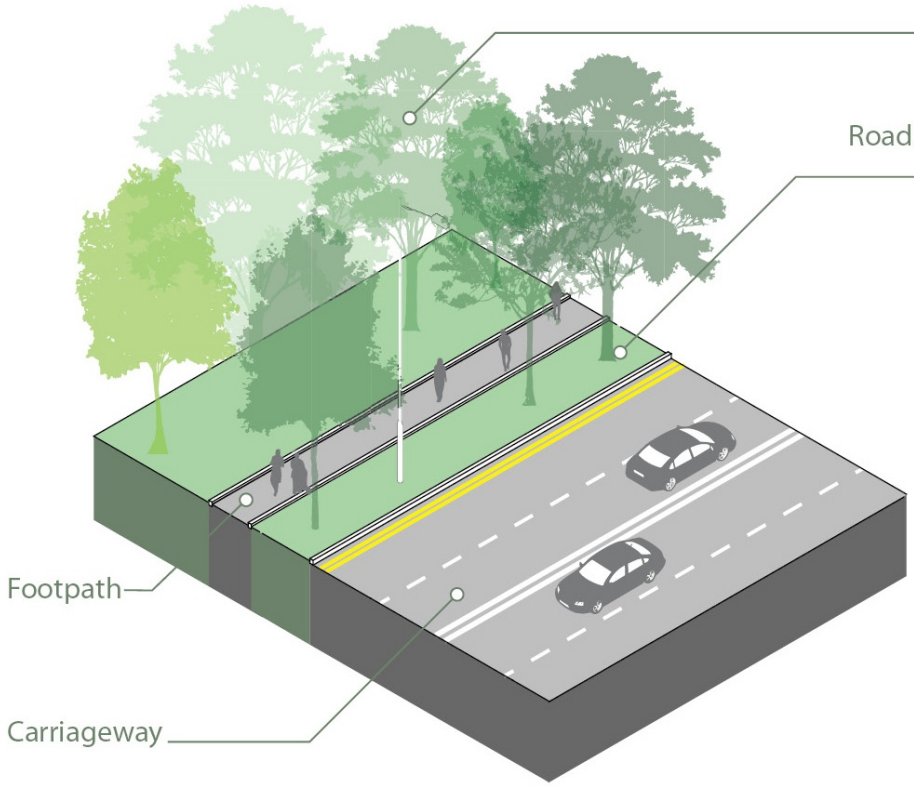
- high wind tolerance

Valued Attributes

- medium to high ornamental value
- medium to high soil volume tolerance
- avoid poisonous species
- medium to high pruning tolerance
- small to medium tree size dimension

* The listed Selection Criteria are key concern for typical street type only. Please consider other site specific criteria and seek advice from relevant professional for selecting appropriate tree species.

Street Type D1



Diagram

Street Characteristics

- RVGZ
- Wide planter
- No kerbside activity
- Landscape area

Key Selection Criteria*

Essential Attributes

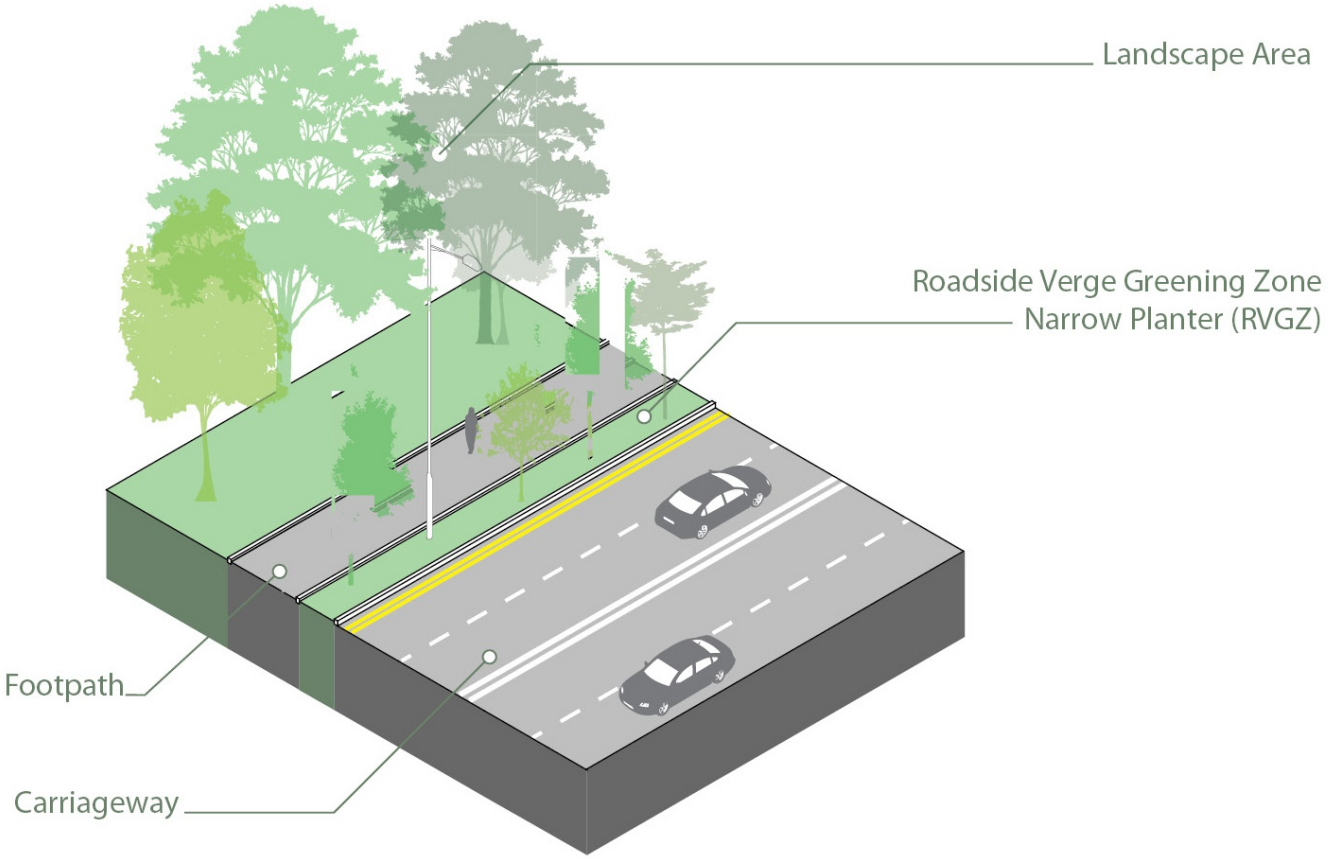
-

Valued Attributes

- high ecological value
- medium to large tree size dimension

* The listed Selection Criteria are key concern for typical street type only. Please consider other site specific criteria and seek advice from relevant professional for selecting appropriate tree species.

Street Type D2



Diagram

Street Characteristics

- RVGZ
- Narrow planter
- No kerbside activity
- Landscape area

Key Selection Criteria*

Essential Attributes

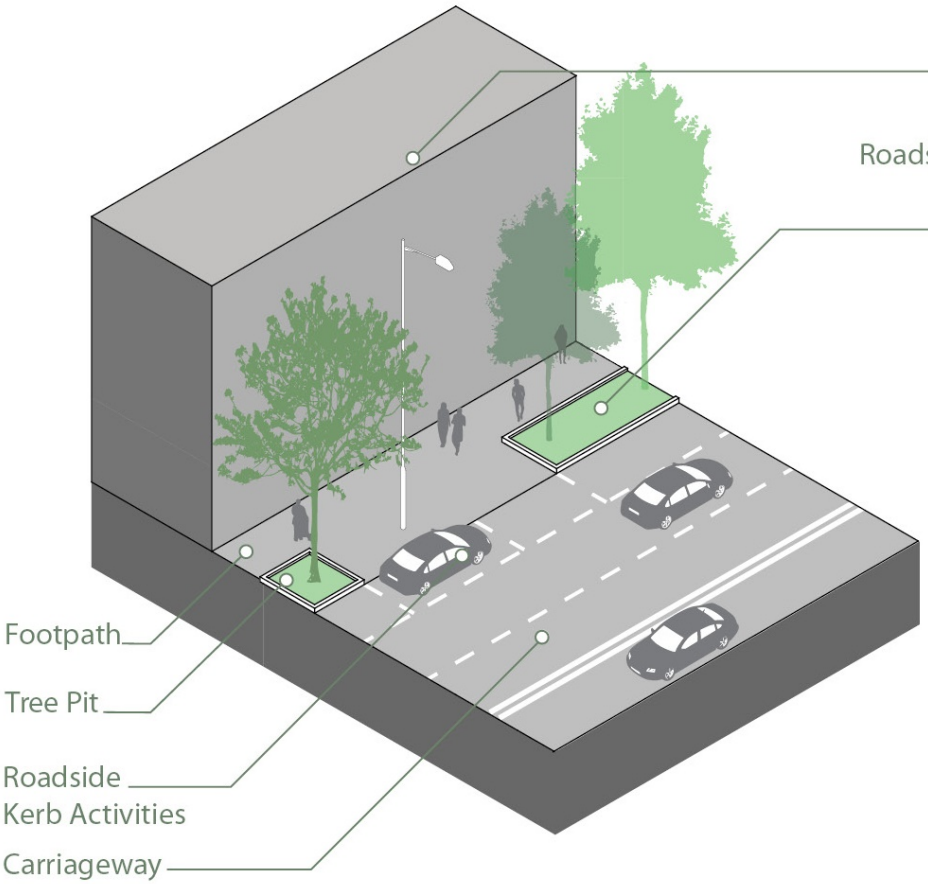
-

Valued Attributes

- high ecological value
- medium to high soil volume tolerance
- small to medium tree size dimension

* The listed Selection Criteria are key concern for typical street type only. Please consider other site specific criteria and seek advice from relevant professional for selecting appropriate tree species.

Street Type E1



Diagram

Street Characteristics

- RVGZ
- Wide planter
- Kerbside activity
- No building frontage in building lot

Key Selection Criteria*

Essential Attributes

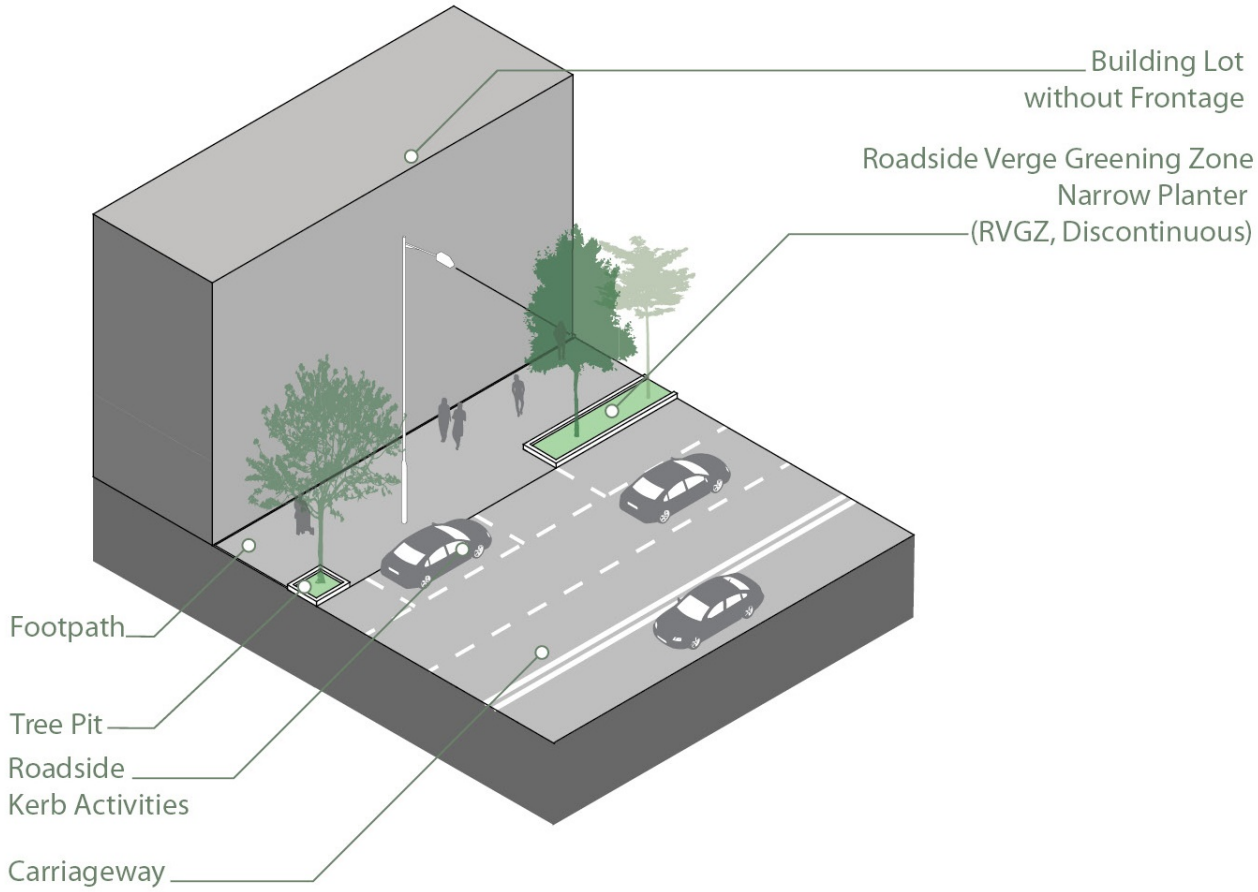
- high wind tolerance

Valued Attributes

- medium to high root system (manageability)
- medium to high soil compaction tolerance
- medium to high pH of soil (range)
- medium to high pollution tolerance
- small to medium tree size dimension

* The listed Selection Criteria are key concern for typical street type only. Please consider other site specific criteria and seek advice from relevant professional for selecting appropriate tree species.

Street Type E2



Diagram

Street Characteristics

- RVGZ
- Narrow planter
- Kerbside activity
- No building frontage in building lot

Key Selection Criteria*

Essential Attributes

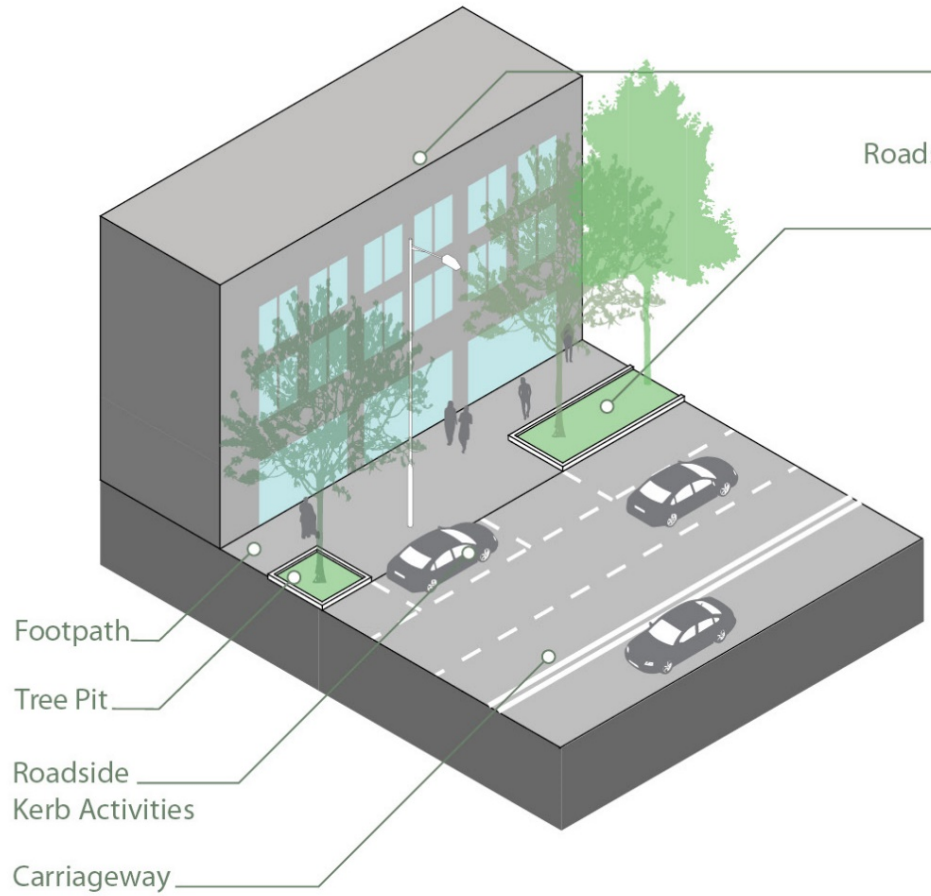
- high wind tolerance

Valued Attributes

- high root system (manageability)
- medium to high soil volume tolerance
- medium to high soil compaction tolerance
- medium to high pH of soil (range)
- medium to high pollution tolerance
- small to medium tree size dimension

* The listed Selection Criteria are key concern for typical street type only. Please consider other site specific criteria and seek advice from relevant professional for selecting appropriate tree species.

Street Type F1



Diagram

Street Characteristics

- RVGZ
- Wide planter
- Kerbside activity
- Building lot with frontage

Key Selection Criteria*

Essential Attributes

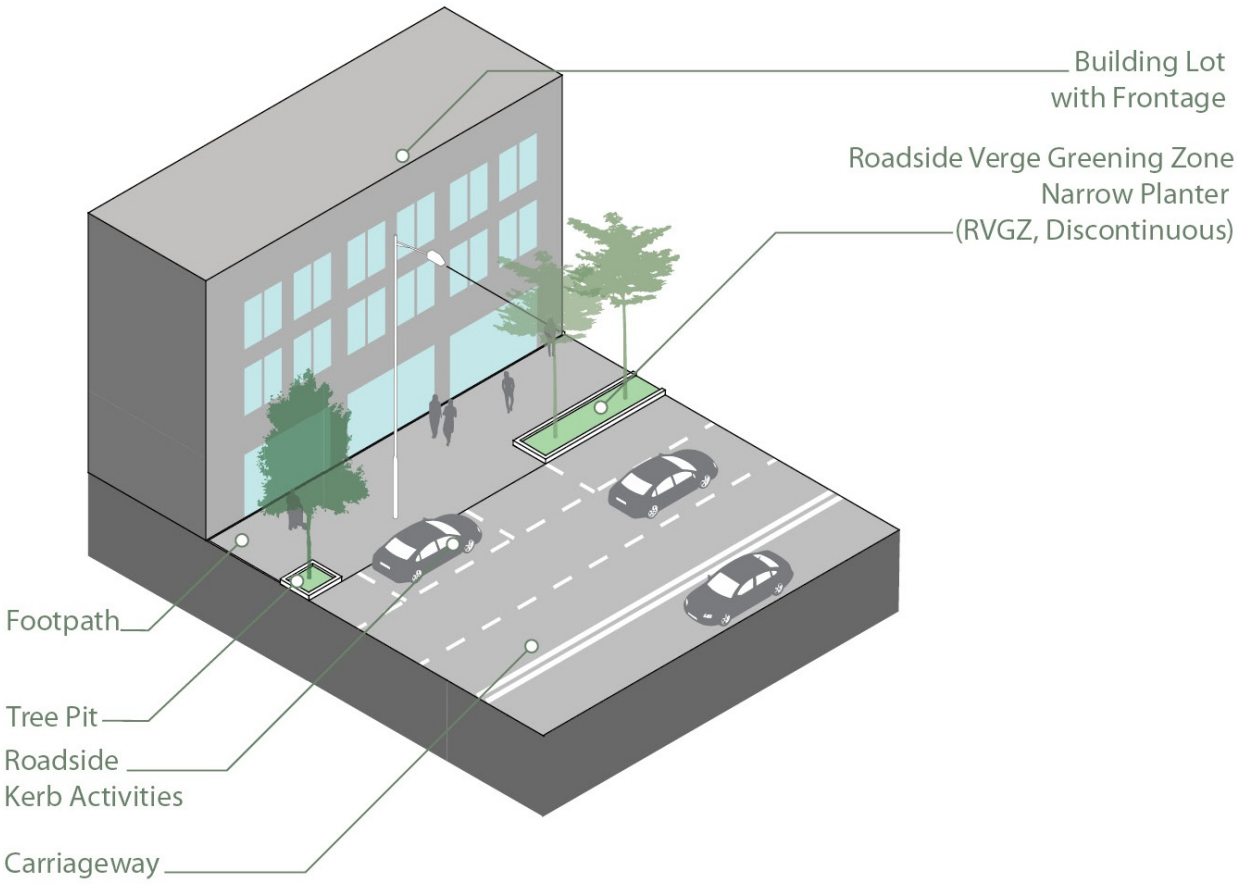
- high wind tolerance

Valued Attributes

- medium to high ornamental value
- medium to high pollution tolerance
- medium to high pH of soil (range)
- medium to high root system (manageability)
- medium to high pruning tolerance
- medium to high soil compaction tolerance
- avoid poisonous species
- medium to large shade cast
- small to medium tree size dimension

* The listed Selection Criteria are key concern for typical street type only. Please consider other site specific criteria and seek advice from relevant professional for selecting appropriate tree species.

Street Type F2



Diagram

Street Characteristics

- RVGZ
- Narrow planter
- Kerbside activity
- Building lot with frontage

Key Selection Criteria*

Essential Attributes

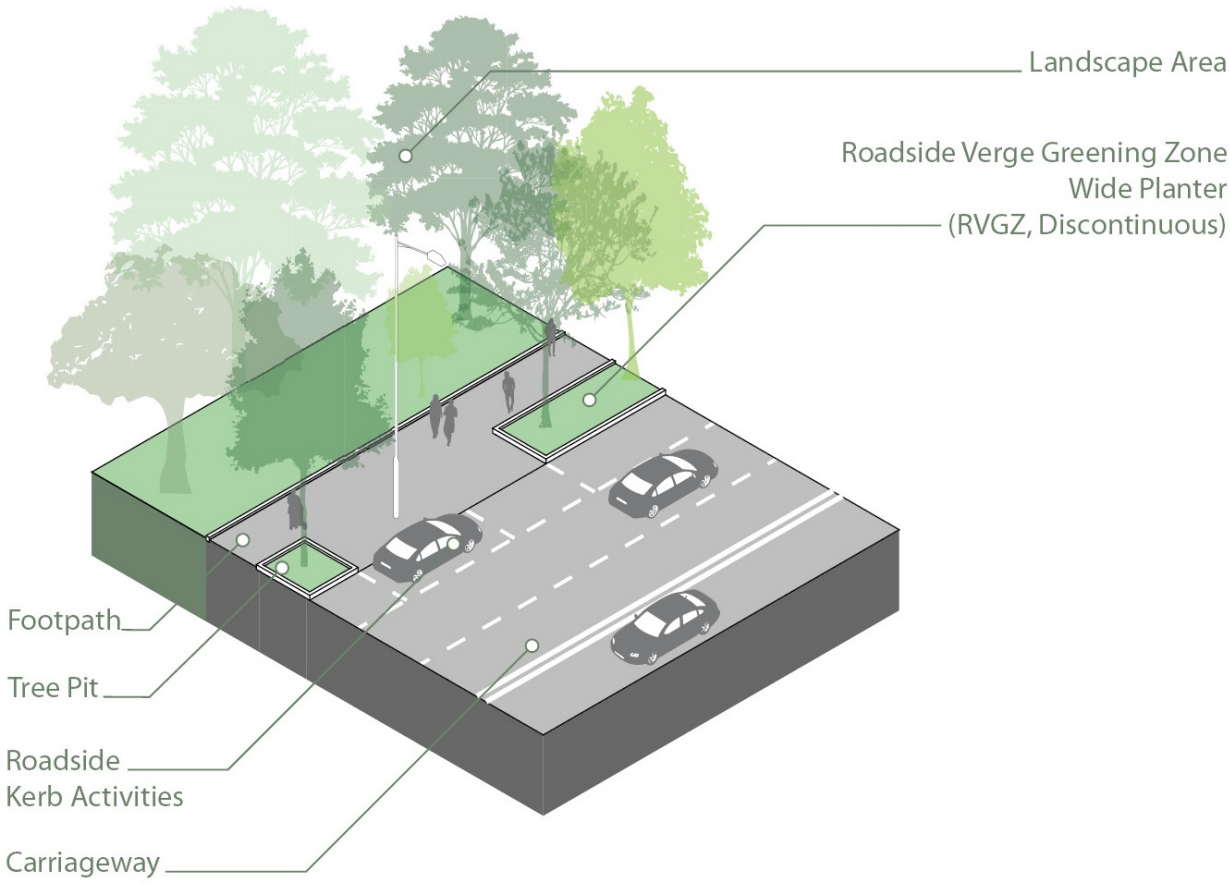
- high wind tolerance

Valued Attributes

- medium to high ornamental value
- medium to high pollution tolerance
- medium to high soil volume tolerance
- medium to high pH of soil (range)
- high root system (manageability)
- medium to high pruning tolerance
- high soil compaction tolerance
- avoid poisonous species
- small to medium tree size dimension

* The listed Selection Criteria are key concern for typical street type only. Please consider other site specific criteria and seek advice from relevant professional for selecting appropriate tree species.

Street Type G1



Diagram

Street Characteristics

- RVGZ
- Wide planter
- Kerbside activity
- Landscape area

Key Selection Criteria*

Essential Attributes

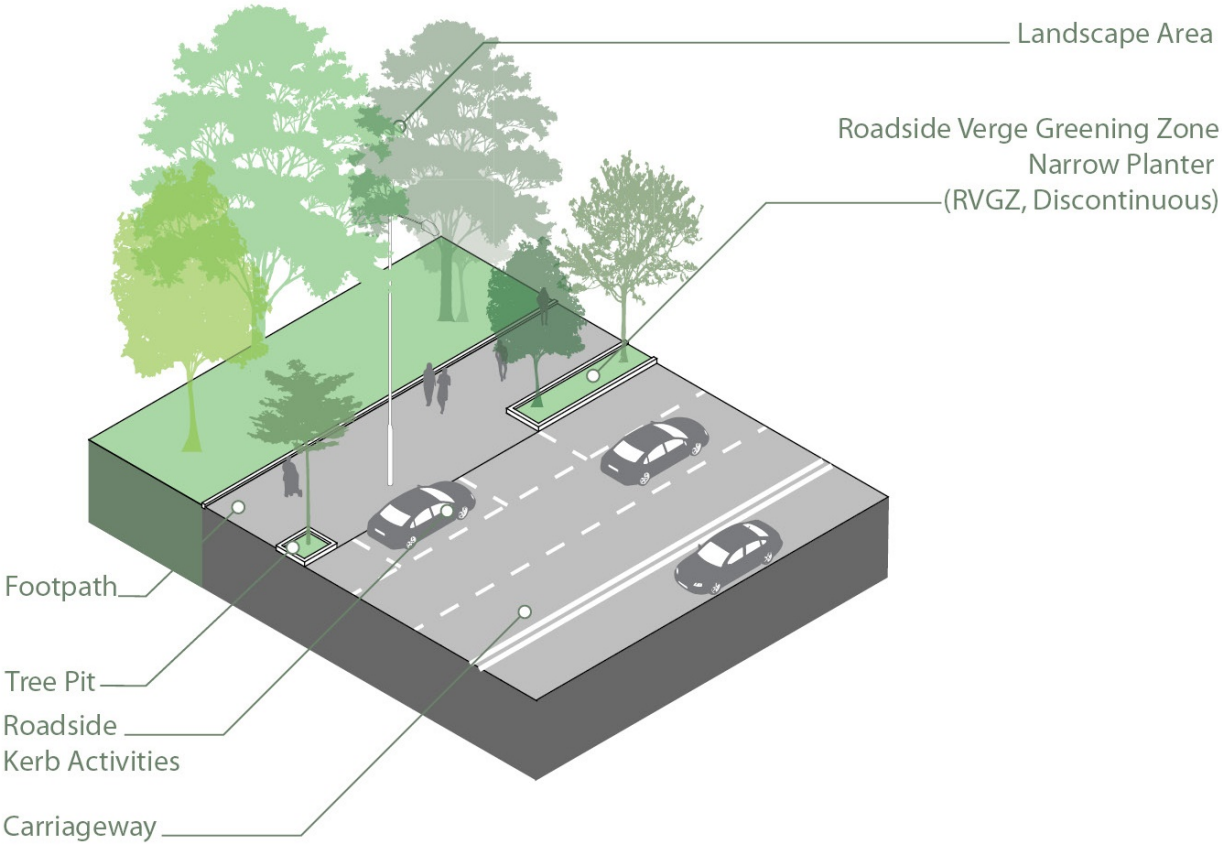
- high wind tolerance

Valued Attributes

- high ecological value
- medium to high soil compaction tolerance
- medium to high pH of soil (range)
- medium to high root system (manageablity)
- small to medium tree size dimension

* The listed Selection Criteria are key concern for typical street type only. Please consider other site specific criteria and seek advice from relevant professional for selecting appropriate tree species.

Street Type G2



Diagram

Street Characteristics

- RVGZ
- Narrow planter
- Kerbside activity
- Landscape area

Key Selection Criteria*

Essential Attributes

- high wind tolerance

Valued Attributes

- high ecological value
- medium to high soil compaction tolerance
- medium to high pH of soil (range)
- medium to high soil volume tolerance
- high root system (manageability)
- small to medium tree size dimension

* The listed Selection Criteria are key concern for typical street type only. Please consider other site specific criteria and seek advice from relevant professional for selecting appropriate tree species.

8. Life-cycle Maintenance and Management of Trees

8.1 Introduction

Trees are living organisms that naturally grow and age with time. The life spans of trees vary with species and growing conditions. Also, different species have different requirements at each stage of their life-cycle. The life-cycle, by definition, refers to the developmental stages that occur during an organism's life-time. A life-cycle ends when an organism dies.

Trees health conditions will deteriorate with age and change with surroundings. Through proper design and works implementation including provision of adequate planting spaces, selection of quality plant stocks and suitable species, etc., and conducting proper tree care and management, the health of a tree and thus its urban ULE can be increased.

In this Section, the general maintenance and management operations (M&M) for the shortlist of tree species are reviewed. Examples of species that may require special attention are given in ***Section 8.3***. Detailed M&M information for each tree species shortlisted can be found in ***Appendix A*** and ***Appendix C***.

8.2 4 Stages of the Tree Life-cycle

The life-cycle of trees is divided into 4 main stages. The 4 stages life-cycle pattern of trees in this Guide is based on literature research and by experience of horticultural and landscape management practitioners to best reflect the current planting practice in urban streets of Hong Kong. It is recommended that professional advice (e.g. qualified arborist) to be sought when identifying the current stage of the tree life-cycle.

A brief description of each life-cycle stage is as below:

1. *Propagation to Seedling* – This life-cycle stage is assumed to be conducted in a tree nursery, where the seed has been germinated or cuttings have begun to grow new roots. Proper planting techniques and practices are to be adopted. At this stage, the tree is weakest and most sensitive to the surrounding environment.

2. *Sapling to Semi-mature* - In general, this is the stage where the tree is most adaptable and able to rapidly establish and grow. A light-standard or standard size tree is usually selected for planting at this stage due to their instant visual effects. Both sizes can be found in the sapling to semi-mature stage of the life-cycle. II It is common that the tree specimen at this stage will be selected for transplanting to the final receptor site, i.e. CMGZ or RVGZ. After transplanting, the tree may require 1-2 years to recover from transplant shock before resuming its normal growth, the selection of quality stock is therefore of great importance. Proper maintenance and management is also critical at this stage, especially in the first 2 years after transplanting to ensure proper tree establishment in urban street conditions. [26]

3. *Mature* - A mature tree is a fully-established tree that has achieved its full height and crown spread. They play an important role in environmental improvement and ecological enrichment. In general, trees in this stage of the life-cycle have a lower ability to tolerate stress when compared to sapling to semi-mature stage.

[26] Hitchmough, J., & Fieldhouse, K. (Eds.). (2008). *Plant user handbook: a guide to effective specifying*. John Wiley & Sons.

4. *Senescence* - At this stage, the tree is in the last stage of its life-cycle with declining vigour and will be most vulnerable to environmental and pathogenic stress. In general, a tree with long life-cycle may indicate a longer period of urban ULE.[27] Professional advice should be sought to determine if the tree has reached the end of its urban ULE and whether timely replacement of the tree should be considered.

If fact, life-cycle of trees can be extended beyond senescence by proper use of the felled trees such as recycling them into useful wood products. Further study on this topic is recommended to address the effective disposal of the felled trees.

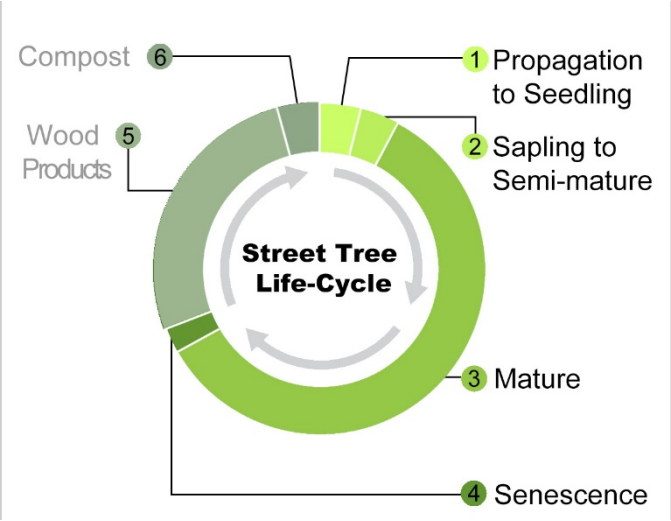


Figure 8-1 – The life-cycle of street trees

8.3 M&M Operations in 4 Stages of the Life-cycle

A holistic tree care plan can contribute to health and safety of a tree. Although M&M for each tree is dependent on its location, surrounding site environs, past M&M operations and tree species, some general M&M can be applied to most tree species. A summary of the M&M in each of the four stages are given in ***Table 8-1***. Details on each M&M is given on the next page.

[27] Useful Life Expectancy (ULE) is an estimate of how long a tree is likely to beneficially contribute and remain in the landscape based on health, amenity, environmental services, cultural contributions to the community that warrants the cost of maintenance. Choosing tree species with long ULE could provide benefits to the community for a longer period with less cost.

Maintenance and Management Operation	1. Propagation to Seedling	2. Sapling to semi-mature	3. Mature	4. Senescence*
Shading	✓			
Irrigation	✓	✓	✓	✓
Weed Control	✓	✓	✓	✓
Pest / Disease Control	✓	✓	✓	✓
Tree Protection	✓	✓		
Tree Staking / Guying		✓	✓	✓
Pruning		✓	✓	✓
Fertilisation & Soil Aeration	✓	✓	✓	✓
Tree Inspection and Monitoring & Tree Risk Assessment		✓	✓	✓

Note: * depends on tree health and state

Table 8-1 - Maintenance and Management Operations for 4 Life-cycle Stages

Shading

In general, shade can be provided through shade cloth or panels in the propagation to seedling stage. Shading prevents the build-up of high soil surface temperatures by intercepting solar radiation and insulating seedlings from the heat source. Shading can increase seedling survival. Germinating seed and recently transplanted seedlings need protection from hot sun and heavy rain. On the other hand, shading reduces the amount of water lost by seedlings.

For the other stages, the tree will need to be appropriately planted in the "right place" where there is adequate amount of sunlight for its growth. Shading in urban streets may occur due to surrounding tall buildings, bridges or fly-overs and / or other structures. These may be temporary, semi-permanent or permanent. Detailed examination of the surrounding environment, future development and the tree's life-cycle is essential when selecting the "right tree". Proper planting practices on providing adequate growing space for trees should follow GLTMS guidelines on Proper Planting Practices. [28]

1. Propagation to Seedling	Provide shade under existing trees, shade cloth or panels to increase seedling survival as it keeps seedlings cooler during the heat of the day, reduces moisture loss from soil and also benefit evergreens in winter by reducing desiccation. For shade cloth or panels, the specific shade percentage or density should be adjusted to suit the species. [29] Shade cloth is usually made of loosely woven polyester. The UV filtration factors of 50-60%, 64-75% or 90% are derived from the density of the weave. Cloth with more holes allows more UV light to filter through.
2. Sapling to semi-mature **3. Mature** **4. Senescence**	Each tree species has a specific shade tolerance level and a sunlight requirement level in order to grow properly. The tree species selected for each site should reflect their preferred environmental needs. For example, *Podocarpus macrophyllus* is shade tolerant, thus more suitable under partially shaded urban conditions. It can be suitably planted on a street with tall structures on both sides. Once the tree species has been determined, the selected tree specimen should be examined to ensure they are suitable for planting in that environment. This should be done in accordance to the "Select and Plant Good Specimens" promulgated by GLTMS (10/2010). [30]
Other Remarks	As a general rule of thumb, providing shade to common trees species in Hong Kong after seedling phase does not promote the growth of trees.

[28] Greening, Landscape and Tree Management Section, HKSAR Government. (2016). *Handbook on Tree Management*. Hong Kong: Greening, Landscape and Tree Management Section, Development Bureau. Appendix 10 & 11.

[29] Dumroese RK, Wenny DL, Barkley YC. (2001). *Plant your seedlings right*. Retrieved from http://www.lri-lb.org/sites/default/files/Plant%20Your%20Seedling%20Right.pdf

[30] Greening, Landscape and Tree Management Section, HKSAR Government. (2016). *Handbook on Tree Management*. Hong Kong: Greening, Landscape and Tree Management Section, Development Bureau. Appendix 9.

Irrigation

Irrigation is one of the most essential maintenance operations. The need for irrigation depends on the soil type, climate, planter type and the habit of plant species. Neutral pH water is best suited. Irrigation is best done in the early morning or late afternoon to minimize evaporation. [31] Night-time irrigation is not recommended. Care must be taken to avoid interfering with traffic or blocking pedestrian flow when conducting irrigation. Too much irrigation can just be as harmful as too little irrigation. Signs of overwatering, such as yellowing leaves or stunted growth, and underwatering, such as wilting, should be inspected regularly.

Isolated trees may transpire 2-3 times more than trees planted in large dense groups. If the tree is planted in a single row, more irrigation will generally be required.

A planter at grade may receive more surface run-off than a raised planter, therefore require less irrigation in periods after heavy rain. Similarly, a larger planting area may be able to retain more moisture and therefore, require less irrigation. Understorey planting should not be planted too close to the base of the tree trunk as they will compete with the tree for nutrients. A minimum 150-300mm clearance zone around the tree trunk is recommended. Proper planting practices around the base of the tree should follow GLTMS guidelines on Proper Planting Practices. [32]

1. Propagation to Seedling	Good draining soil is usually used if plants are grown in nurseries, since the root system of young trees will not become waterlogged after watering or heavy rain[33]. If planted in clay soils, watering is recommended once every 2-3 weeks after a thorough watering as clay soils hold moisture very well but do not drain well. [34] Watering thoroughly to moisten the root zone can encourage deep rooting because light watering may only encourage surface roots and make the tree more susceptible to drought.
2. Sapling to semi-mature	Watering thoroughly to moisten the root zone can encourage deep rooting and allows the tree to be structurally more stable by growing more anchor roots. Until the tree is established, regular irrigation is required.
3. Mature	Irrigation should be done when the top 15-20cm of the soil is dry and no rain is predicted for a few days.
4. Senescence	
Other Remarks	As a general rule of thumb, plants should be irrigated before they suffer from chronic drought stress and its attendant side effects on growth, appearance, and susceptibility to insects and diseases. Species which are drought-tolerant, on the other hand, do not need too much watering. Over-irrigating will lead to poor health of the tree and waterlogging problems; *Wodyetia bifurcata*, for example.

[31] Fini, Alessio, and Cecilia Brunetti. "Irrigation of Urban Trees." *Routledge Handbook of Urban Forestry*, Taylor and Francis Group, 2017, pp. 419–432.

[32] Greening, Landscape and Tree Management Section, HKSAR Government. (2016). *Handbook on Tree Management*. Hong Kong: Greening, Landscape and Tree Management Section, Development Bureau. Appendix 12.

[33] Food and Agriculture Organization of the United Nations, "*Planning a Tree Nursery," http://www.fao.org/docrep/006/AD228E/AD228E03.htm*

[34] Dumroese RK, Wenny DL, Barkley YC. (2001). *Plant your seedlings right*. Retrieved from http://www.lri-lb.org/sites/default/files/Plant%20Your%20Seedling%20Right.pdf

Weed Control

Weeds compete with trees for nutrients, water and light. Weeds also tend to grow faster and are more vigorous than the trees. As such, weed control should be conducted regularly. Once the tree is established, there will be limited resources for the weeds to grow. Therefore, in the later stages of the life-cycle, regular weed control may be unnecessary.

1. Propagation to Seedling	There are several ways to minimize weed growth. - The planting bed can be prepared up to 4 weeks in advance. The planting bed will be watered and any germinated weeds can be removed prior to planting the seedlings.[35] - Mulch can reduce evaporation from soil and lower soil temperature, inhibit weed growth but improve seedling growth and survival. To improve effectiveness, organic mulch is preferable since they can also release organic matter and nutrients into the soil. Apart from weed control, mulching can also prevent soil erosion, evaporation and compaction. - Hand-weeding is preferable to better avoid damage to the seedlings[36].
2. Sapling to semi-mature	Weed control is essential for every tree species for the first 1-2 years after it has been planted in the roadside planter. A vegetation clear zone around each tree should be kept. The zone should be 150mm-300mm or wider for larger trees, which also discourages a moist environment for weed or fungal growth around trunk base/root collar[37]. A thin layer of organic mulching can be added to in this zone under the tree to minimise the possibility of weed growth. Attention to the thickness of the mulch should be made as too much may cause tree rot. Manual removal of weeds in the vegetation clear zone is preferable in order to avoid damaging the root zone[38]. Climbers and parasitic plants may be found at the tree canopy or on the trunk. They scramble to the tops of tree and blocking the sunlight for photosynthesis. Their roots compete with trees for moisture and nutrients, stunting or even killing them. Hand weeding is recommended to avoid damage to the tree.
3. Mature	
4. Senescence	
Other Remarks	The handling of herbicides should follow AFCD (Cap. 133) Pesticides Ordinance on "Pesticide Registration and Control", General Specification by ASD Section 25, or General Specification (2006) by CEDD Section 3.9. Only herbicides registered in Hong Kong and distributed with a Pesticides License may be used.

[35] Krishnan, P. R., Kalia, R. K., Tewari, J. C., & Roy, M. M. (2014). *Plant Nursery Management: Principles and Practices*.

[36] Penn State College of Agricultural Sciences. (2017). *Herbicides (Introduction to Weeds and Herbicides)*. Retrieved from http://extension.psu.edu/pests/weeds/control/introduction-to-weeds-and-herbicides/herbicides

[37] Greening, Landscape and Tree Management Section, HKSAR Government. (2016). *Handbook on Tree Management*. Hong Kong: Greening, Landscape and Tree Management Section, Development Bureau. Appendix 12.

[38] Hitchmough, J., & Fieldhouse, K. (Eds.). (2008). *Plant user handbook: a guide to effective specifying*. John Wiley & Sons.

Pest and Disease Control

Examination on tree health treatment or removal of diseased trees can prevent spread of pests and diseases. Integrated Pest Management (IPM) approach should be undertaken. This is a long-term, ecosystem based strategy to suppress and control the pest population to an acceptable level, through a combination of physical, biological, cultural and chemical methods with the least risk to the environment. IPM is very site-specific. It is based on the identification of pests, accurate measurement of pest populations, assessment of damage and knowledge of available pest management strategies or tactics to make an informed decision.

Signs of pests and diseases and its corresponding treatment should be updated regularly in the maintenance record. If an outbreak occurs, treatment should be immediate. Spraying of pesticides or other chemical products should follow the "Code of Practice for the Safe and Proper Use of Pesticides in Public Areas" jointly issued by AFCD, FEHD and LCSD (Sept. 2014) and "Safe and Proper Use of Pesticides - Turf and Landscape Management" by AFCD (2017, 2nd Ed.). Spraying areas should be temporarily zoned and isolated from pedestrians for safety considerations. Do not apply pesticides when rain is expected within 24 hours, under windy conditions or if the day is expected to reach above 30°C.

1. Propagation to Seedling	Plant in sterilized / fumigated clean planting beds and selecting only healthy seedlings or propagules. Termites are one of the most common insects recorded in the nursery that can cause serious considerable damage. They eat the roots and stems of many tree species and seedlings are especially vulnerable. Termites can be controlled by regularly using pesticides, applying a thin layer of ash (2-3cm thickness) around the seedlings bed or physically removing the termite queen through the use of plant extracts and chemicals. [39]
2. Sapling to semi-mature	The selected sapling or semi-mature tree should be inspected closely to ensure it is pest and disease free before planting in its final receptor site. After planting, the tree still requires close monitoring for pests and disease to prevent spreading to adjacent trees.
3. Mature	Regular tree inspection for pests and disease should be conducted to control initial outbreaks and prevent spreading to adjacent trees.
4. Senescence	At this final stage of the life-cycle, trees spend a majority of their energy just to maintain themselves. Thus, senescent trees are more vulnerable due to their decreased resistance to pest and diseases.[40] Root decay and heart rot are common and can create an ideal habitat for bark beetles and wood boring insects. The affected tree can become a source of a pathogenic inoculum that may affect other nearby healthy trees. [41]
Other Remarks	*Fuscoporia senex*, fungus that cause tree canker, can result in symptoms such

[39] Mbora, Anne, et al. (2013). "Good Nursery Practices: A Simple Guide". *Establishing a tree nursery* | TECA, World Agroforestry Center. Retrieved from teca.fao.org/read/7808.

[40] Refer to AFCD (Cap. 133) Pesticides Ordinance on "Pesticide Registration and Control", General Specification by ASD Section 25, and General Specification (2006) by CEDD Section 3.9.

[41] Vince, S. W., Duryea, M. L., Macie, E. A., & Hermansen, A. (Eds.). (2004). *Forests at the wildland-urban interface: conservation and management*. CRC Press.

	as crown defoliation, cavities, cracks and eventually leading to death. In Hong Kong, species such as *Cassia javanica var. indochinensis* are prone to infection[42]. Brown Root Rot Disease caused by fungi pathogen, *Phellinus noxius,* can lead to rapid health and structural deterioration of trees, ultimately to tree failure. This pathogen has a wide host range and reported on more than 200 plant species, representing 59 families. Some of these plant families include, MORACEAE and LAURACEAE. [43] The management approach for this disease is promulgated by GLTMS "Guidelines on Brown Root Rot Disease" (Dec. 2012).[44] The handling of pesticide should follow AFCD (Cap. 133) Pesticides Ordinance on "Pesticide Registration and Control", General Specification by ASD Section 25, or General Specification (2006) by CEDD Section 3.9. Only pesticide registered in Hong Kong and distributed with a Pesticides License may be used.

[42] Greening, Landscape and Tree Management Section, HKSAR Government. (2015). *Note on Common Wood Decay Fungi on Urban Trees of Hong Kong*. Hong Kong: Greening, Landscape and Tree Management Section, Development Bureau.

[43] Ann, P. J., Chang, T. T., & Ko, W. H. (2002*). Phellinus noxius brown root rot of fruit and ornamental trees in Taiwan*. Plant Disease, 86(8), 820-826.

[44] Greening, Landscape and Tree Management Section, HKSAR Government. (2016). *Handbook on Tree Management*. Hong Kong: Greening, Landscape and Tree Management Section, Development Bureau. Appendix 20.

Tree Protection

Tree protection provides a physical barrier between the tree and the harsh environment. With suitable protection in place, it is possible to enhance and extend the urban ULE of street trees. Tree protection operations should be inspected regularly to ensure they are providing adequate protection and not being detrimental to tree health. Proper tree protection should be carried out in accordance with the following guidelines by GLTMS, "Tree Care During Construction," "Guidelines on Tree Preservation during Development" (4/2015) and "Design for Tree Protection Zone".

1. Propagation to Seedling	Protection from weather conditions such as fierce winds, heavy rains and sunlight is needed as this is a delicate stage in the tree's life-cycle. Fencing with mesh roof cover (usually doubled up as a cover for shade protection) may also protect against human, wild animals and insects damage. For example, wild animals, such as rodents, can cause serious damage by eating the seedlings. Birds may also eat seedlings that have just germinated.
2. Sapling to semi-mature	Protection for the tree in urban streets is usually in the form of tree guards, which are used to deter vandalism, urban traffic and provide support in windy conditions. Tree guards need to be large enough to avoid inhibiting the growth of the tree whilst not affecting the pedestrian or traffic flow. Water should be allowed to flow freely into the tree planting area so that the tree can receive irrigation naturally. Regular inspection of the tree guard and the trees are required to ensure they are properly in place and not inhibiting the growth of trees.
3. Mature	Removal of tree guard is necessary when the tree has reached the mature stage.
4. Senescence	
Other Remarks	Trees with buttress roots or large trunk flare, for example *Ficus virens*, should be planted in large planting areas where sufficient space is provided for their growth. Planting in tree pits is not recommended. Meanwhile, *Ficus spp.* are recommended for large planting areas as it would not only provide adequate space, but also allowing aerial roots to grow and reach the ground for stability.

Tree Staking / Guying

Tree stakes and guys should not be installed in areas where they can become a potential tripping hazard or safety concern to the public. Some movement should be allowed so that the tree is better able to adapt to the environment. Regular inspection should be conducted to adjust the staking or guying to benefit tree health. Once the tree can support itself, tree stakes and guys should be removed immediately. Proper tree staking and guying practices should be carried out in accordance to the following guideline by GLTMS, "Staking and Guying of Trees.

1. Propagation to Seedling	Nil
2. Sapling to semi-mature	Since Hong Kong is located in typhoon-prone zone, sapling and semi-mature street trees are usually supported by stakes. The staking method should avoid damaging the rootball. Connection of the stakes to the tree should be smooth, elastic and non-abrasive. The attachment should not be too high (around one third of the tree height) as this may result in smaller root systems and slender stems. [45] Most street trees require a maximum of 2 years of staking and should be removed after establishment. In windy areas, as many as 3-4 stakes might be required. The general exception to this is palms. Palms, such as *Wodyetia bifurcata*, may require some staking if planted in high wind areas in the first few years. [46]
3. Mature	Most trees should not require staking during this stage in the life-cycle, with the exception that if the tree is transplanted to the roadside during this stage. Similar to the previous stage of the life-cycle, the staking method should avoid damaging the rootball In some cases, cabling is used at this stage. Cabling is a way to stabilize a tree, which if otherwise left uncorrected, may shorten its urban ULE due to structural failure. As a tree matures, the weight of the canopy and additional load imposed by rain or wind may increase the stress of the limb. This is especially true if the tree species is prone to included bark or V-shaped crotch, for example, *Cassia javanica* var*. indochinensis*. Properly installed cables can aid in redistributing the load and allow the limbs to support each other. Cabling is used as an alternative to large pruning cuts that may otherwise be required to reduce risk of failure. Often, cabling is used to provide stability until the end of the tree urban ULE. The cabling system should be inspected regularly by a tree-care professional and determined if they need to be replaced or readjusted. [47]
4. Senescence	At this stage, the tree may become more vulnerable to limb breakage. A properly installed tree support system reduces the risk of tree failure and extends its lifespan. However, extensive metal frame supporting system is not recommended as it can compromise the ability of the tree to support itself by becoming more dependent on the metal support.
Other Remarks	In some cases, pavement renovation works may directly or indirectly affect tree roots and thus the tree stability. Proper inspection and planning is required before the works to assess whether tree staking is needed. "Guideline on Pavement Renovation Works and Tree Stability" by GLTMS (4/2013) should be followed.

[45] Greening, Landscape and Tree Management Section, HKSAR Government. (2016). *Handbook on Tree Management*. Hong Kong: Greening, Landscape and Tree Management Section, Development Bureau. Appendix 12.

[46] Roloff, A. (Ed.). (2016). *Urban tree management: for the sustainable development of green cities*. John Wiley & Sons.

[47] Gilman, E. F. (2011). An illustrated guide to pruning. Cengage Learning.

Pruning

Pruning involves the selective removal of certain parts of a tree, usually branches or twigs. Commonly done to street trees to improve health, reduce potential public risk, shaping, or ensuring sightlines are not blocked. Proper pruning techniques should refer the "General Guidelines on Tree Pruning" by ETWB, 2007, "Do's and Don'ts in Pruning" and "How to Prune a Tree" by GLTMS. Pruning should be performed by trained personnel and under proper supervision by experienced personnel with expertise in horticulture, arboriculture and tree care.

1. Propagation to Seedling	Nil
2. Sapling to semi-mature	Structural pruning is an essential practice for saplings in assisting the young and developing tree to provide a desirable and stable form at maturity. For instance, *Plumeria rubra* is a tree species which is more likely to develop two or more central leaders or stems, together with the presence of included bark. It is recommended to remove the weaker stems when the tree is still young so that the tree can develop a strong central stem. Some smaller lower branches may be kept temporarily for tree health reasons if they do not block traffic or pedestrian flow. These may eventually be pruned as the tree matures. Hong Kong is located in a typhoon-prone zone and strong winds can be experienced in urban streets. Regular thinning or reduction of tree crowns before the typhoon season begins can ensure less wind load. Thus, the tree can receive less damage during these tropical storms. [48] The percentage of crown thinning or reduction must be adjusted to account for inherent tolerance, age and condition and environmental factors. ANSI A300 Pruning Standards state that "not more that 25 percent of a tree's foliage should be removed within an annual growing season [49].
3. Mature	If trained properly in the early stages of growth, a mature tree usually does not need pruning often. However, they should be inspected annually to identify and remove hazards. Usually, during crown cleaning, crown thinning, crown raising or crown reduction a maximum of 25% of the foliage can be removed at any given time. Removal of too much foliage may affect the tree's health. [50] Proper pruning practices should follow the "Management Guidelines for Mature Trees" by GLTMS (12/2014). Due to the constraints of the street environment, regular pruning for most species is inevitable - including but not limited to removal of structural defects, dead or hazardous branches. The lower branches of tree species (e.g. *Polyspora axillaris*) may interfere with people or vehicles, or block visibility of signs or street lighting; sometimes their branches may grow into buildings, then pruning of overgrown branches is required. [51]
4. Senescence	Special care is needed when pruning senescence trees. Pruning should only be conducted if there is a safety concern or emergency. As senescent tree energy reserves are small, removing large amounts of wood is not recommended and can hasten tree decline.

[48] Gilman, E. F., Masters, F., & Grabosky, J. C. (2008). Pruning affects tree movement in hurricane force wind. *Arboriculture and Urban Forestry*, *34*(1), 20.

[49] Works Branch Development Bureau Government Secretariat, HKSAR Government. *"Development Bureau Technical Circular (Works) No. 7/2015 Tree Preservation."*

[50] Hartman, J. R., Pirone, T. P., & Sall, M. A. (2000). *Pirone's tree maintenance*. Oxford University Press.

[51] William, E. (2005). *Pruning Landscape Trees*. Retrieved from http://extension.psu.edu/natural-resources/forests/urban-community/publications/pruning-landscape-trees

	If the senescent tree is required to be kept, a qualified professional should inspect the tree for potential or existing hazards and create a long-term pruning plan for the tree if necessary. Crown-reduction may be recommended to reduce height and width of the canopy and encourage new interior growth. Weaker structures should be pruned away to make the tree safe. [52]
Other Remarks	Trees that develop aerial root or buttress root should not be planted in tree pits or small planters as this will restrict their growth or cause root girdling. Pruning of aerial roots may be necessary for some species. *Ficus spp.* (especially *Ficus religiosa*) requires aerial root management in their mature stage due to their "adventitious" growth habit. Aerial root management is important as aerial roots are used for water and nutrient absorption from the surroundings and provides additional lignified support. In this case, aerial roots should be retained unless they become a nuisance. For stonewall trees, pruning may result in wall or tree stability issues. Proper maintenance strategies and operations should refer to “Management Guidelines for Stonewall Trees” by GLTMS (12/2013). Other types of pruning include formative pruning, crown lifting, crown reduction, crown thinning and crown cleaning.[53] The frequency and type of pruning is dependent on tree species and the street typology. For example, *Pongamia pinnata* may require more frequent pruning because it is a fast-grower. It requires formative pruning in the sapling to semi-mature stage. Crown reduction pruning may be required depending on the site context.

[52] Roddick, C., & Hanson, B. (2007). *The Tree Care Primer (No. 186)*. Brooklyn Botanic Garden.

[53] Greening, Landscape and Tree Management Section, HKSAR Government. (2016). *Handbook on Tree Management*. Hong Kong: Greening, Landscape and Tree Management Section, Development Bureau.

Fertilisation & Soil Aeration

Misapplication of fertiliser can be detrimental to a tree's health. The best time to apply fertilizer is when the tree can use it, i.e. the active growing season. The type of fertiliser, application method and nutrients should be based on the species, life-cycle stage, tree health, soil ability to absorb nutrients and location factors.

Slow-release fertiliser is recommended for most tree species. Application of water-soluble fertiliser is not recommended during the rainy season as the fertiliser can quickly leach away before the tree can absorb the nutrients. Deep root fertilisation is preferable as this method can also reduce soil compaction and provide some degree of soil aeration. Also, it ensures that human activity or pets will not remove the fertiliser accidentally. [54]

Prevention is better than cure concerning soil compaction causing insufficient oxygen level reaching tree roots. Methods to prevent soil compaction include the application of mulch, tilling, replacement of soil or planting of complementary vegetation mix. Tree guards can be extended to protect not only the tree but the entire planting area from possible soil compaction due to foot traffic. Signs of soil compaction include hard soil, standing water, poor plant growth and surface crusting. If soil compaction occurs, it can be alleviated through soil aeration. Soil aeration can be done by core aeration, vertical mulching, radial trenching or air excavation. It is recommended to conduct soil aeration operations at the same time when applying fertiliser.

Application of structural elements in pavement, such as structural frames or root cell is an alternative measure to resolve the soil compaction problem. It also enables an integrated design for planting, paving and underground utilities where the soil volume and quality for tree growth could be maintained without compromising the structural integrity of the footpaths.

1. Propagation to Seedling	Mulch, a layer of material applied to surface soil, is used to protect seed beds to prevent overheating and rapid drying of surface soil, heavy raindrops, and washing or blowing away of fine soil particles. Fertilizers should be applied to growing nursery plants for needs of nutrient shortage or change of pH[55].
2. Sapling to semi-mature	Compacted soil, generally found in urban roadside planting sites, can greatly reduce the soil ability to hold onto nutrients. Additionally, root loss from tree transplant further limits the uptake of nutrients. Fertilisation at the planting stage may yield minimal results. However, if coupled with soil remediation practices such as raking and harrowing, fertilisation can aid in improving initial tree growth and establishment. A soil test should be performed prior to planting, to determine if there are nutrients deficiency and how the soil can be ameliorated. [56]
3. Mature	As the tree reaches maturity, the need for nitrogen drops as their growth rate naturally slows down. Application of fertilisation can be reduced and a low maintenance level is needed to maintain the tree in healthy condition without excessive vegetative growth. Where possible, it is recommended to conduct a soil test to determine the type of fertiliser is needed. Depending on species,

[54] IH, A. E. S., Koriesh, E. M., Moghazy, E. I., & Hefni, M. M. (2013). Comparison Between Two Methods of Fertilizer Applications and Fertilizer Rates for Young Urban Tree Ficus retusa, Linn. Implanted in Sandy Soil. *Hortscience Journal of Suez Canal University,* Hort. Dep. Suez Canal University, 2013.

[55] Food and Agriculture Organization of the United Nations. (n.d.). "*Planning a Tree Nursery". Retrieved from http://www.fao.org/docrep/006/AD228E/AD228E03.htm*

[56] Harris, J. R., Day, S. D., & Kane, B. (2008). Nitrogen fertilization during planting and establishment of the urban forest: a collection of five studies. *Urban Forestry & Urban Greening*, *7*(3), 195-206.

	fertilisation can be carried out once every 2-3 years to maintain foliage and vigour. [57]
4. Senescence	Nil
Other Remarks	For evergreen tree species, such as *Podocarpus macrophyllus*, a fertilizer mix that encourages foliar growth (one with a higher ratio of Nitrogen) is recommended to be added during the growing season which is in the early spring. In addition, extra supplements of iron and magnesium are beneficial to its health. [58] Similarly, for flowering tree species, a fertilizer mix that encourages blossoming and flowering (one with higher ratio for Phosphorous) should be applied

[57] Starbuck, C. J. (1999). Fertilizing shade trees.

[58] Jeff, C. & Carl, R. (2000). Tree fertilization: A guide for fertilizing new and established trees in the landscape. United States: University of Minnesota Extension. Retrieved from https://www.extension.umn.edu/garden/yard-garden/trees-shrubs/tree-fertilization-guide

Tree Inspection and Monitoring & Tree Risk Assessment

Proper inspection, monitoring and undertaking of tree risk assessment will minimise risk of tree failure. This should be conducted by qualified professionals for arboricultural works. The information should be gathered across different government departments and centralised for record keeping. Operations requiring emergency response should be done immediately.

1. Propagation to Seedling	Nil
2. Sapling to semi-mature	The mortality rate of a sapling or semi-mature tree is the highest in the first 3 years after transplanting to the roadside receptor site. Close monitoring during these first few years is crucial in identifying and mitigating site conditions linked to low rates of survival and establishment rate. [59]
3. Mature	Regular inspection should be carried out at least once a year to identify if there are any changes to the tree condition or surrounding site. Recommendation for treatment should be identified and carried out in accordance with the Guidelines for Tree Risk Assessment and Management Arrangement by GLTMS, DevB. [60].
4. Senescence	Close tree monitoring and inspection is recommended to be conducted by qualified professionals for arboricultural works. Injuries and decay that happened in the earlier stages of the life-cycle, can become more problematic as the tree reaches senescence. Senescent trees become less effective in compartmentalization, which leads to the spread of infection. Likewise, as the tree becomes more vulnerable, close inspection for pests and diseases should be conducted to prevent spreading. Depending on the tree species, detailed annual or half-yearly tree risk assessment may be necessary. For example, *Plumeria rubra* may require half-yearly assessments as it has relatively brittle branches and is a fast-grower. Some indicators may not be clearly visible and specialized instruments, e.g. resistographs, should be used to determine the amount of decay or other defects in the wood.
Other Remarks	The purpose of tree risk assessment is to identify potential tree risks and carry out mitigation measures in a timely manner to reduce risk. Tree management departments are required to carry out tree risk assessment in accordance with the "Guidelines for Tree Risk Assessment and Management Arrangement" promulgated by GLTMS (currently the November 2015 edition or the latest edition after).

[59] Koeser, A. K., Gilman, E. F., Paz, M., & Harchick, C. (2014). Factors influencing urban tree planting program growth and survival in Florida, United States. *Urban forestry & urban greening*, *13*(4), 655-661.

[60] Greening, Landscape and Tree Management Section, HKSAR Government. (2015). *Guidelines for Tree Risk Assessment and Management Arrangement*. Hong Kong: Greening, Landscape and Tree Management Section, Development Bureau.

9. Complementary Vegetation Community Mix

9.1 Layers of Vegetation

The Guide aims to promote an ecologically sustainable streetscape and vegetation diversity for a healthy urban forest. Ecologically sustainable refers to the biosphere to meet the needs of this current generation without hindering the needs of the future generation. Although this Guide mainly focuses on selecting the "right tree" for the "right place", having vegetation underneath the tree canopy is beneficial to the health and longevity of the urban forests, organisms and environment, ensuring the quality of the streetscape will be maintained or improved for future generations. The vegetation cover that is compatible with trees and other plant species to form a community is known as the Complementary Vegetation Community Mix (CVCM).

Vegetation underneath tree canopy can be arranged roughly in 3 layers according to the height and growth habit. These 3 layers are – tree layer, shrub layer and herbaceous / groundcover layer (***Figure 9-1***). The grouping of different vegetation layers and species which share a common environment and interact with inhabiting plants, animals, and the physical environment, is called "plant community".[61] Similarly, an animal community is the association of two or more different animal species occupying the same geographical area in a particular time. Plant communities can affect the different animal communities that inhabit in that particular area or enlarge existing urban habitats. To enhance street ecology and available habitats, the CVCM should be able to simulate natural habitats for the target animal community where appropriate.

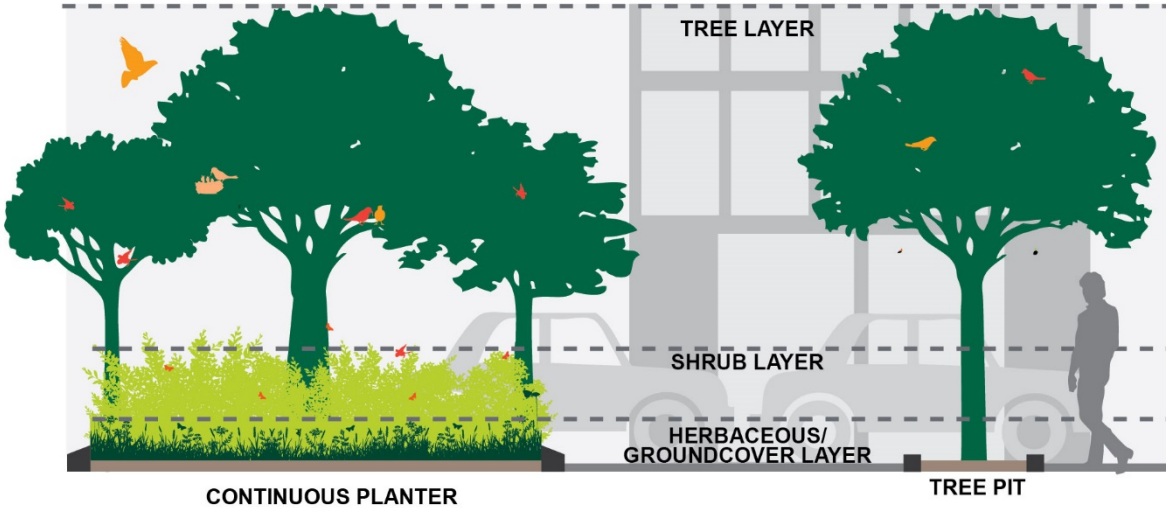


Figure 9-1 – The Three Layers of Vegetation

[61] Department of Conservation and Natural Resources, Pennsylvania Government. (2018). *Plant Communities*. Retrieved from www.dcnr.pa.gov/Conservation/WildPlants/PlantCommunities/Pages/default.aspx.

9.2 Urban Ecology

For the purpose of this Study, urban ecology refers to the co-existence of different urban vegetation in promoting the overall health of the urban soft landscape environment such as soil quality, floristic health, and increased contributions of fauna ecology. Improvements in this ecological cycle contribute towards the overall improvements to urban microclimates, tree safety, street comfort, improved visual amenity, and perceptions of a more liveable city.

Planting areas providing a continuous tree canopies with rich understories plants and interconnected with other vegetation can create an ecological corridor for the migration and habitation of wildlife. Connecting different areas of food and shelter can create larger living spaces and complex food webs that benefit wildlife higher up the food chain. (***Figure 9-2***). Recent studies found that the urban bird species richness directly correlates to heterogeneity of vegetation heights, which means the height diversity between layers of tree, shrub, and groundcover height [62] [63]. Therefore, besides the tree layers, evergreen shrubs should also be planted underneath deciduous trees to provide protection as well as maintaining aesthetic value during winter.

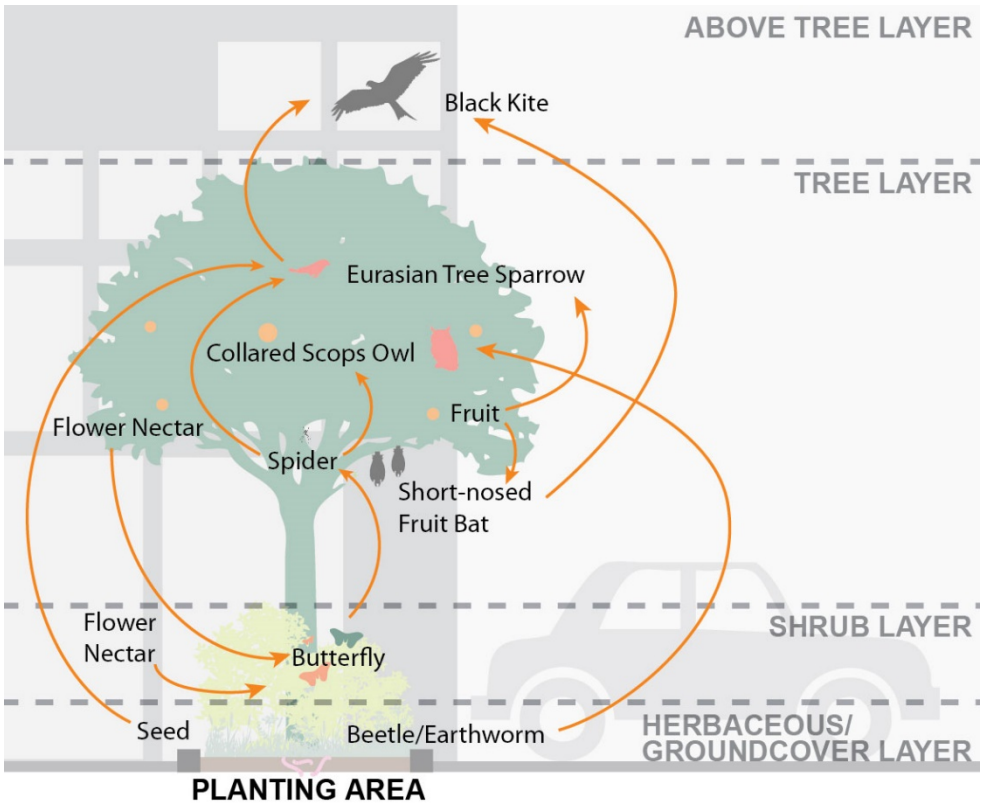


Figure 9-2 – Examples of Hong Kong Urban Wildlife Food Web in Different Vegetation Layers

[62] Williams, K. (2014). A Dozen "Must Have" Plants for Backyard Habitat. *New Jersey Audubon*. Retrieved from www.njaudubon.org/SectionBackyardHabitat/ADozenMustHavePlantsforBackyardHabitat.aspx

[63] Huang, Q., Swatantran, A., Dubayah, R., & Goetz, S. J. (2014). The influence of vegetation height heterogeneity on forest and woodland bird species richness across the United States. *PLoS One*, *9*(8), e103236.

9.3 Benefits of CVCM

Individual plant species have a natural disposition to some species and not to others. This ability of different species to co-exist creates the vegetation communities commonly found in natural landscapes, as well as the destruction of other plant species and vegetation communities when in conflict. In an urban setting where species are individually selected and then combined to make a larger planting area, it is essential to consider the entire planting plan as a holistic vegetation community. Benefits include:

- A healthy plant ecosystem
- Reduced maintenance
- Reduced weed infestation
- Improved soil quality

The planting of CVCM should take into account the vegetation clear zone as promulgated in the Proper Planting Practice "Keep Sufficient Space Clear of Vegetation at the Base of Trees" (08/2011) by the GLTM Section. This space is recommended to be filled with organic mulch to discourage weeds and decrease possible soil compaction and to ensure the complementary vegetation will not compete with the tree for nutrients. Professional advice from Landscape Architects should be sought during the design process to identify suitable CVCM for the planting area.

9.4 Selection Principles and Considerations

The main principles and considerations are as below. Examples of CVCM species with high ecological value in providing food source to the wildlife and less commonly used species but with long-term propagation potential is shown in ***Appendix E*** for reference.

- **Nature Knows Best:** vegetation communities found in natural landscapes make the best reference when selecting and composing species mix for urban landscapes. The species within vegetation communities are complementary because they have evolved to co-exist.
- **Near Enough is Actually Good Enough:** the CVCM does not require a literal species-to-species match with existing vegetation communities. Similar species of species within the same genus are also suitable. If in doubt, consult a horticulturalist or make advice from the AFCD herbarium.
- **Aim for Complexity:** increasing the vegetation diversity will always result in the natural selection of CVCM. If all else fails, aim for complexity by making reference to the 10-20-30 rule for planting diversity, especially in the shrub and herbaceous layers. Professional advice is recommended in order to design and plan for a visually appealing streetscape with a high biodiversity that requires minimal maintenance. (***Figure 9.3 to 9.7***)
- **Propagation Potential**: species that can be propagated is an indication of the plant's vigour, and will also improve commercial interest and supply.
- **Urban Compliance:** species that would comply with the visibility and sightline requirements through routine maintenance.

Example of 100 Plants Module

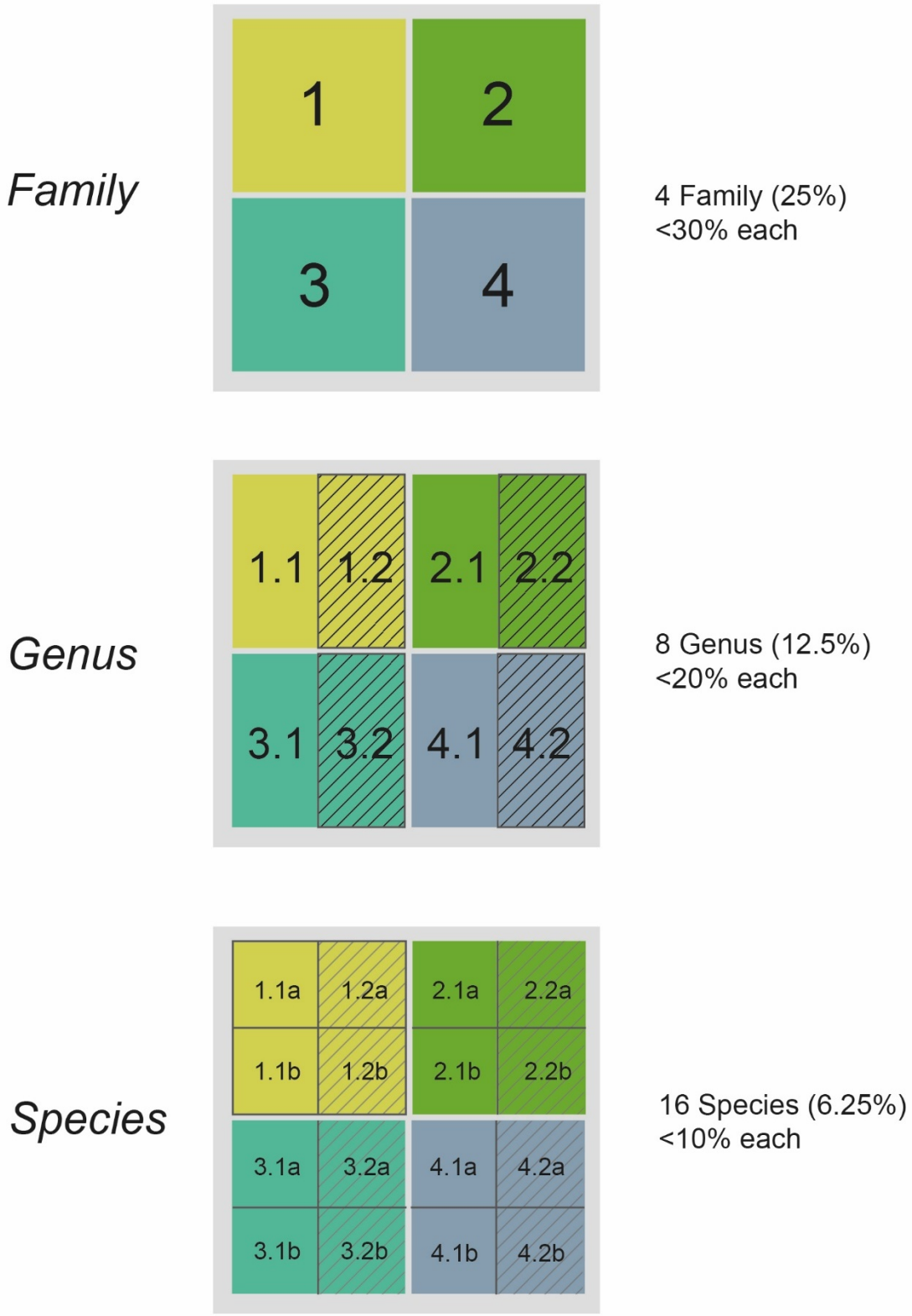


Figure 9.3 10-20-30 Rule for Planting Diversity

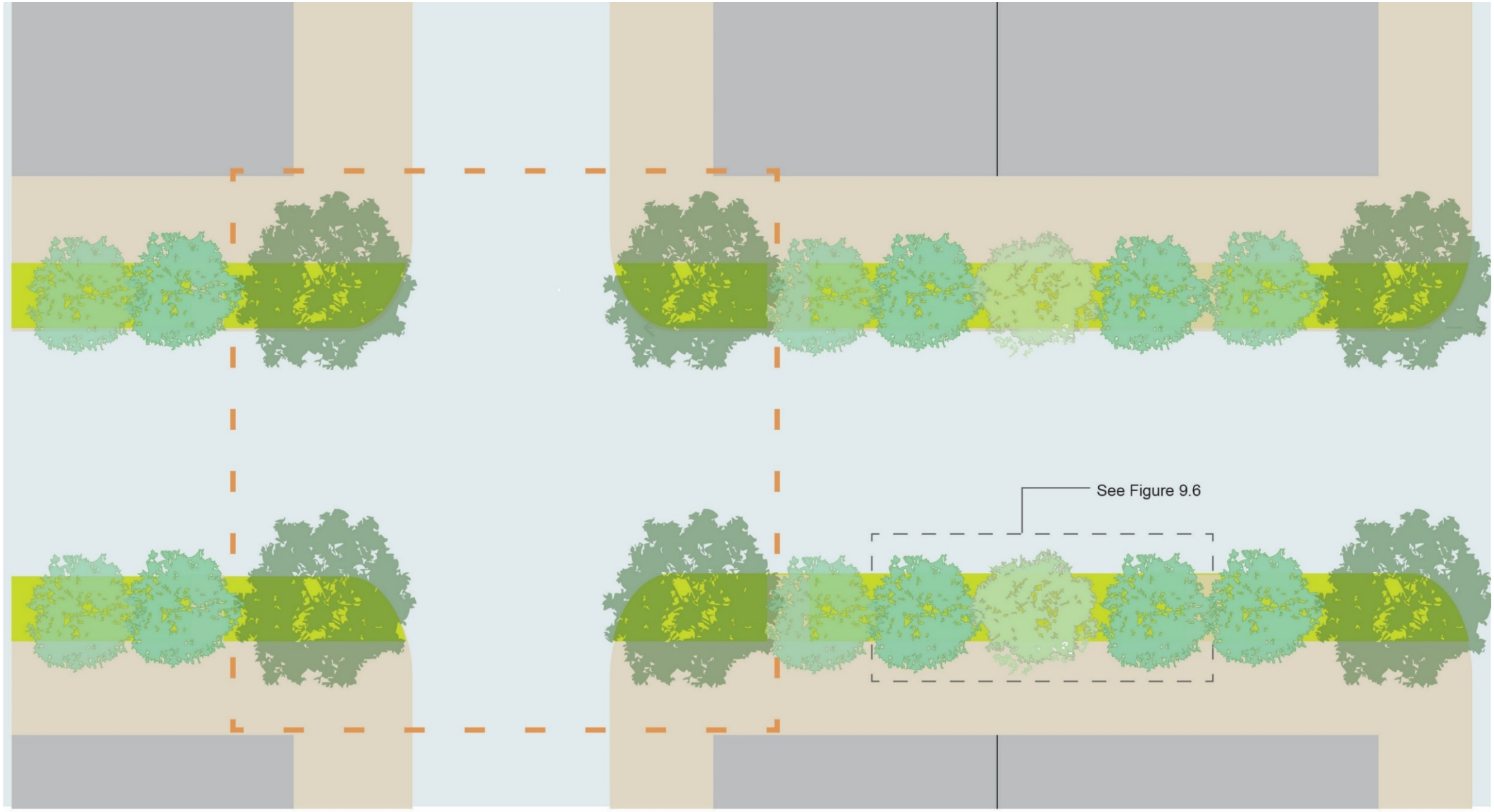


Figure 9.4 Examples to Showcase Planting Rhythm and Diversity (Plan)

A — Feature trees to anchor street corners and provide a visual reference to city blocks along major streets. Larger corner trees also maximises shade at intersections where people congregate. Functionally, these trees can be well suited to tree pits as soak wells – connecting to adjoining drainage infrastructure.

B C — Species B and C to create urban rhythm along the streetscape and maintain visual continuity.

Complementary Vegetation Community Mix (CVCM)

Figure 9.5 Examples to Showcase Planting Rhythm and Diversity (Section)

Note: The planting design should consider each street in its entirety, with the relationship between species' form defining the vertical rhythm of the streetscape. Depending on street length and type, considerations should also be given to seasonal colours and foliage texture, contrast, and leaf shape and size across the vegetation assemblage from tree, shrub, to herbaceous plants.

1. Continuous tree canopy at top layer
2. Understorey planting at lower layer

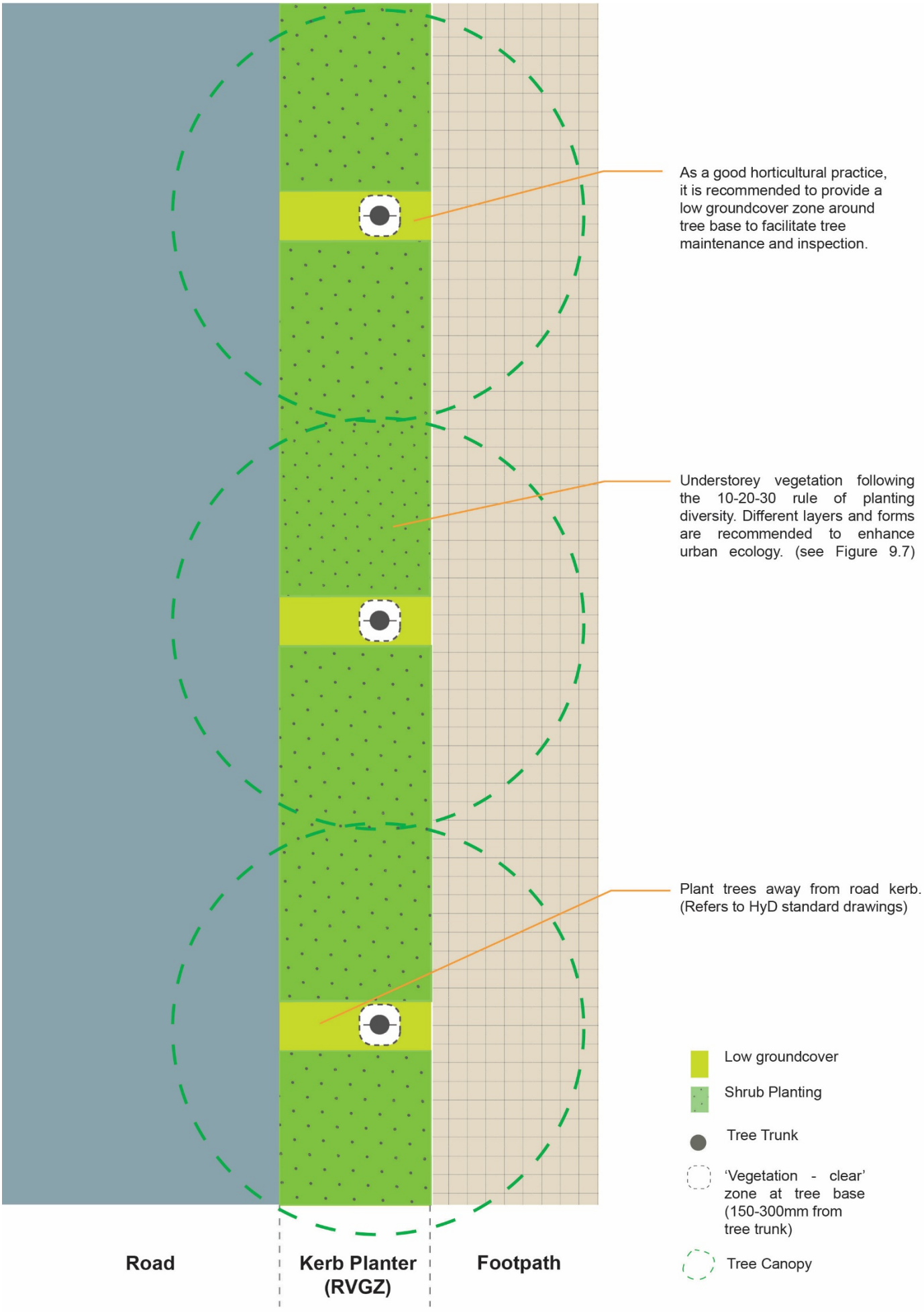


Figure 9.6 Roadside Planting - Good Practice

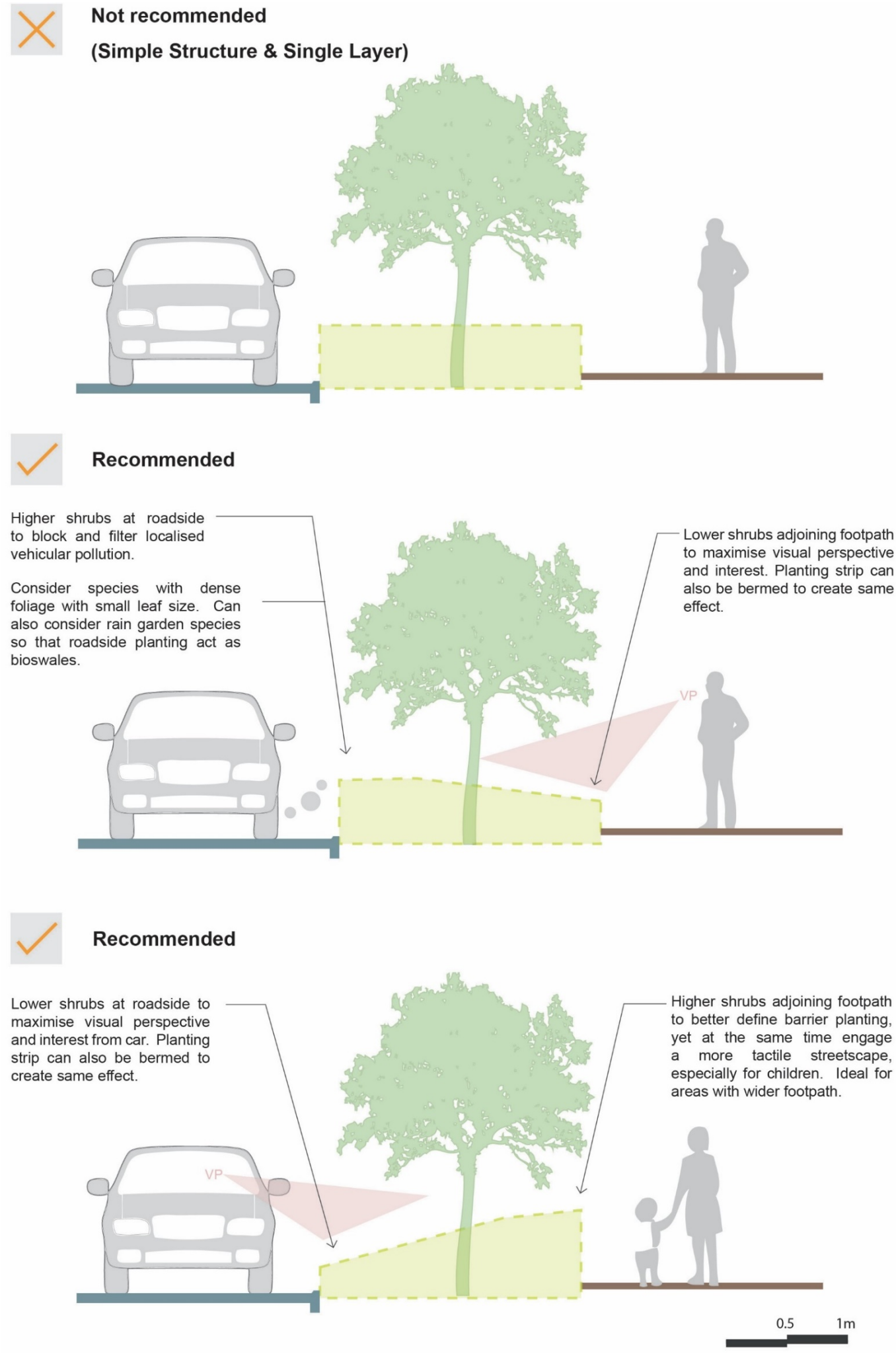


Figure 9-7 – Different Layers and Forms of Understorey Vegetation

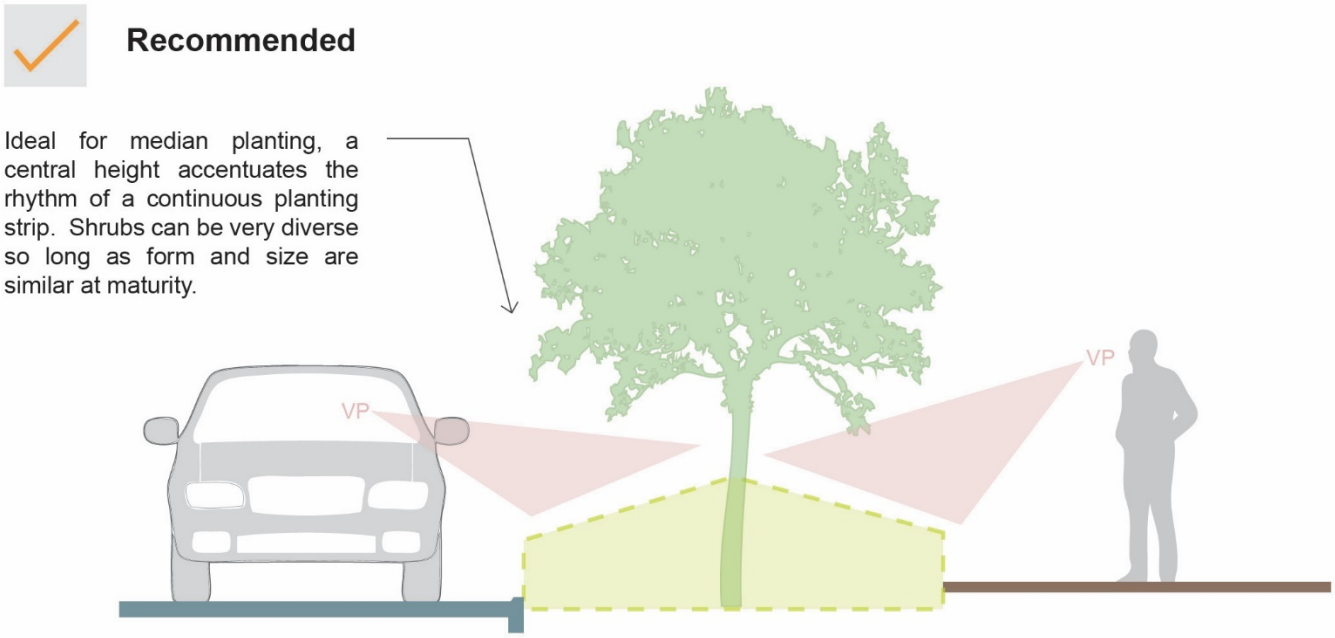


Figure 9-7 – Different Layers and Forms of Understorey Vegetation (continued)

10. Conclusion

As cities continue to rapidly urbanise and densify, street trees have become a focal point in our community's aspirations to maximise ecological benefits and our connection with nature. Having one of the most compact and dense urban environments in the world[64], Hong Kong is particularly challenged to maximise street tree planting in the face of progressive development, unpredictable climate, and ageing street tree assets. Indeed, the effects of climate change in Hong Kong can already be seen by the increased frequency of extreme hot days and rainfall[65], and some of our ageing trees planted decades ago may not be able to adapt to these changes. Increasing temperatures due to urban heat and climate change are proven a threat to some tree species in other economies[66]. Hong Kong needs to be prepared to ensure our urban forest is resilient, adaptable and sustainable to meet these changes.

This Guide proposes that roadside trees should be selected and planted under the principle of, "Right Tree, Right Place" to create an urban forest that can tackle the challenges brought about by future changes. To further future-proof this valuable asset, the 10-20-30 rule of plant diversity should be considered for wide application in new planting and replacement planting as far as practicable.

By increasing tree species diversity supported by CVCM, the on-ground outcomes of the Guide can contribute toward the reduction of risks associated with inadequate upstream life-cycle planning and design of street tree assets. Adoption of species diversity in urban city planting has been practised by international cities, with emerging landscape design re-imagining the traditional streetscape environment. The preparation and development of district-wide urban forest precincts or master plans are also recommended to better articulate landscape design themes, and more importantly to provide territory-wide cohesion of overall landscape strategy. The potential for design innovation is significant, as complexity demands creative solutions. This Guide offers designers in Hong Kong the unique opportunity to be at the forefront of streetscape design for compact and linear landscapes.

Professional advice from Landscape Architects, qualified Arborists, horticulturalists, and other relevant disciplines should be sought for further investigation on the suitability of species relative to the street type and design, in particular replacement planting of ageing tree assets. Proper hard and soft streetscape design with professional input from Landscape Architects is recommended across all work stages. This include, but not limited to, the allocation of sufficient planting space at the initial planning stage, proper designing of CVCM and supporting hard landscape elements such as tree pit details, structural soils or cells, drainage and irrigation requirements, specification of suitable planting media etc. at design stage, and selection of quality nursery stocks, and supervision of planting works to ensure proper workmanship etc. at implementation stage.

To consolidate a robust life-cycle inventory, the development of a holistic urban forest database with tree planting date, health condition, form, size and urban ULE, etc is strongly recommended to ensure continual assessment and review of tree species performance within different street types. Further studies into the propagation, procurement, growth characteristics and performance of tree and CVCM species, especially

[64] Wendell Cox Consultancy (Apr. 2018). *Demographia World Urban Areas 14th Annual Edition: 201804*. Retrieved from www.demographia.com/db-worldua.pdf.

[65] Hong Kong Observatory. (n.d.). *Climate Change in Hong Kong. What Is UV Radiation*. Retrieved 18 Jan. 2018 from www.hko.gov.hk/climate_change/obs_hk_temp_e.htm.

[66] Kendal, Dave, et al. (Nov. 2017) *Risks to Australia's Urban Forest from Climate Change and Urban Heat.* Clear Air and Urban Landscapes Hub, National Environmental Science Programme, The University of Melbourne. Retrieved from www.nespurban.edu.au/publications-resources/research-reports/CAULRR07_RisksAustralianUrbanForest_Oct2017.pdf.

native species are also recommended. With more experience gained in application and trial planting of the tree species in the shortlist, it will inform and enrich the updating of the species list in the Guide to maintain continual improvement of Hong Kong's urban forest stock. Supporting studies to modernise planting conditions include tree pit details, specification options of urban soils, drainage and planting practices will be required to minimise downstream tree management and maintenance risks. Tree planting along carriageways and pavements in the urban areas form an effective landscaped connector. However, other suitable locations for urban forestry planting not included in this Guide, such as man-made slopes, public parks, green spaces within government properties, etc., are equally as important. Apart from roadside planting, to explore planting opportunities at project planning stage to connect to the surrounding areas into a "Green and Blue System" network with eco-corridors as envisioned under the Hong Kong 2030+ is encouraged to multiply the landscape benefits.

We engage with the street every day, and given our streetscape can make up as much as 75% of our outdoor environment, its resilience, comfort, and safety greatly impact our perception of a quality city where the community can stay and enjoy. The importance and benefits of a healthy and resilient urban forest is an investment that should be more widely recognised. With the broader application of this Guide, it is hope that this investment in our urban forest will safeguard these valuable tree assets for passing on to our future generations.

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Appendix A. Tree Datasheets

HOW TO READ THE TREE DATASHEETS

Albizia julibrissin
合歡

Recommended Street Types

A 1/2 **B** 1/2 C 1/2 D 1/2 E 1/2 F 1/2 G 1/2

REFER TO SECTION 5 FOR STREET TYPOLOGY CLASSIFICATION

General Information

Native **Exotic** | Evergreen **Deciduous** | Partial Shade **Full Sun**

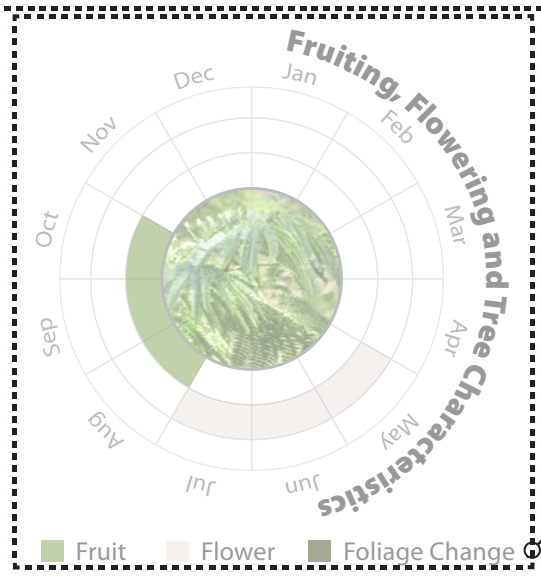
Family: MIMOSACEAE **Heat Tolerance:** Moderate

Special Properties : Pink fragrant flowers; Symbiotic relationship with nitrogen-fixing soil bacteria

GENERAL INFORMATION OF TREE CHARACTERISTICS SHOWN IN SHADE

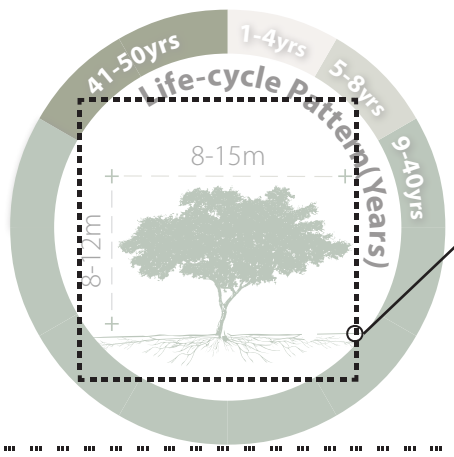
DISTINCTIVE ATTRIBUTE OR QUALITY OF THE TREE

Tree Bark



PERIOD IN WHICH A TREE NORMALLY PRODUCE FLOWERS/ FRUIT/ FOLIAGE INTEREST IN HONG KONG ARE SHOWN IN SHADE

Propagation to Seedling
Sapling to Semi-mature
Mature
Senescence



APPROXIMATE TREE SIZE, FORM AND ROOT SYSTEM AT MATURE STAGE

APPROXIMATE STARTING TIME FOR EACH LIFE CYCLE OF A TREE IF PLANTED IN URBAN HONG KONG STREETS. PROPAGATION TO SEEDLING STAGE IS ASSUMED TO TAKE PLACE IN THE NURSERY.

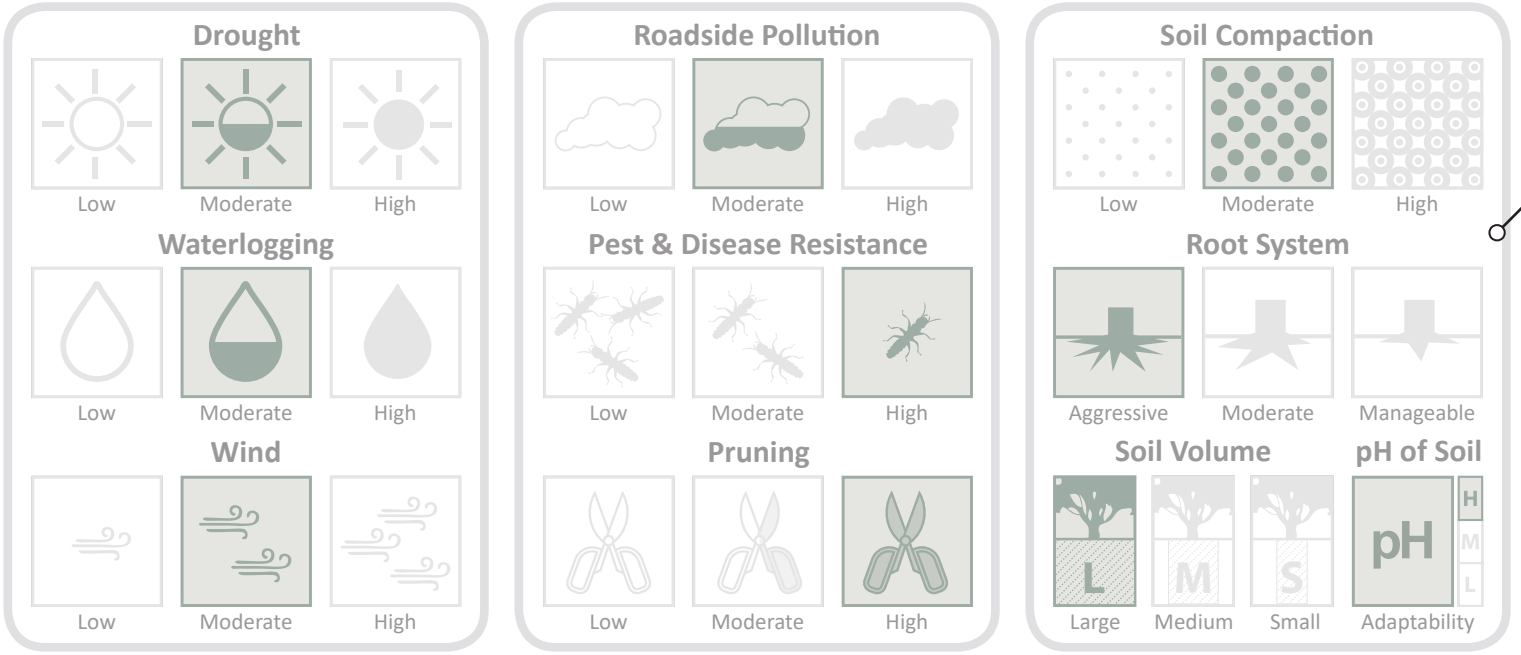
Feature

Special Maintenance Requirements

- Susceptible to wilt
- Installation of root barriers or guides is recommended

SPECIAL MAINTENANCE REQUIREMENTS UNIQUE TO THIS TREE

Tolerance



REFER TO APPENDIX B FOR DETAILED EXPLANATION OF THE RATINGS

Adenanthera microsperma
海紅豆, 孔雀豆

Recommended Street Types
A 1 2 | **B 1 2** | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

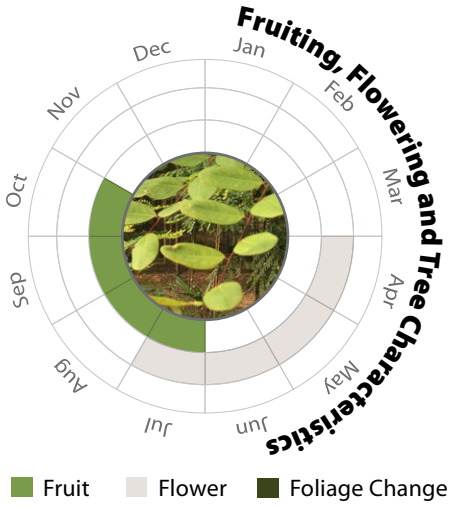
General Information

Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

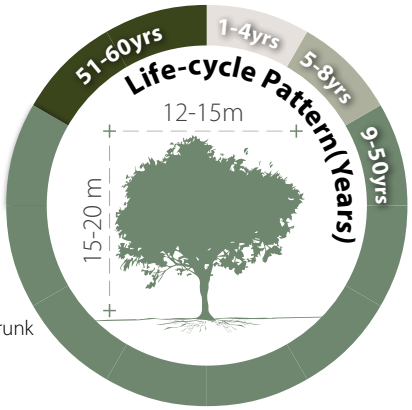
Family: MIMOSACEAE **Heat Tolerance:** Moderate
Special Properties: Attractive red fruits; Symbiotic relationship with nitrogen-fixing soil bacteria; Flower nectar attractive to wildlife


Flowers


Tree Bark



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence



Feature

Ecological Value | Ornamental | Shade Cast

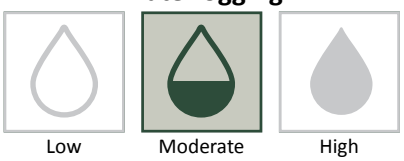
Special Maintenance Requirements

- Shrubby form may require formative pruning
- Mature trees may have slightly buttressed trunk
- Entire plant is poisonous

Tolerance

Drought

Low | Moderate | High

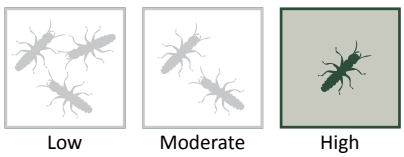
Waterlogging

Low | Moderate | High

Wind

Low | Moderate | High

Roadside Pollution

Low | Moderate | High

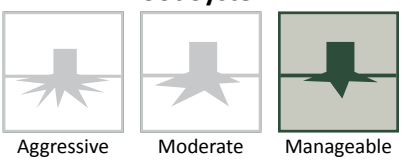
Pest & Disease Resistance

Low | Moderate | High

Pruning

Low | Moderate | High

Soil Compaction

Low | Moderate | High

Root System

Aggressive | Moderate | Manageable

Soil Volume


Large | Medium | Small

pH of Soil


Adaptability

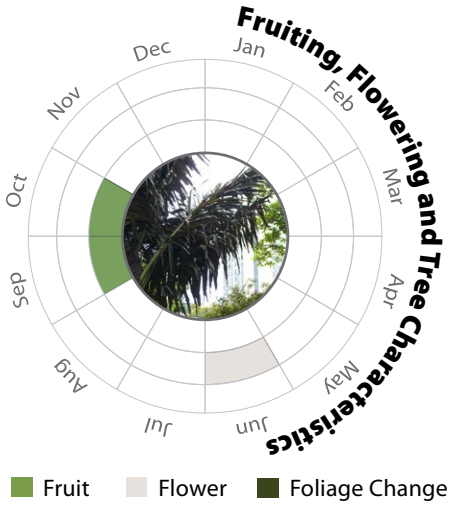
Arenga pinnata
砂糖椰子, 桄榔

Recommended Street Types
A 1/2 B 1/2 C 1/2 D 1/2 E 1/2 F 1/2 G 1/2

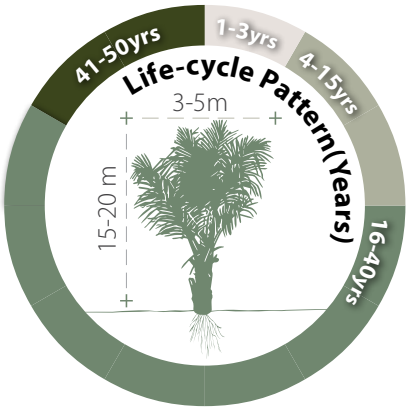
General Information

Native | **Exotic** | **Evergreen** | Deciduous | **Partial Shade** | **Full Sun**

Family: ARECACEAE **Heat Tolerance:** Moderate
Special Properties : Fruits attractive to wildlife; Fruiting period should be 2-3 years after flowering period



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence



Feature

Special Maintenance Requirements

- No Special Maintenance Requirements

Tolerance

Drought

Waterlogging

Wind

Roadside Pollution

Pest & Disease Resistance

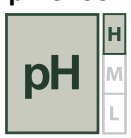
Pruning

Soil Compaction

Root System

Soil Volume

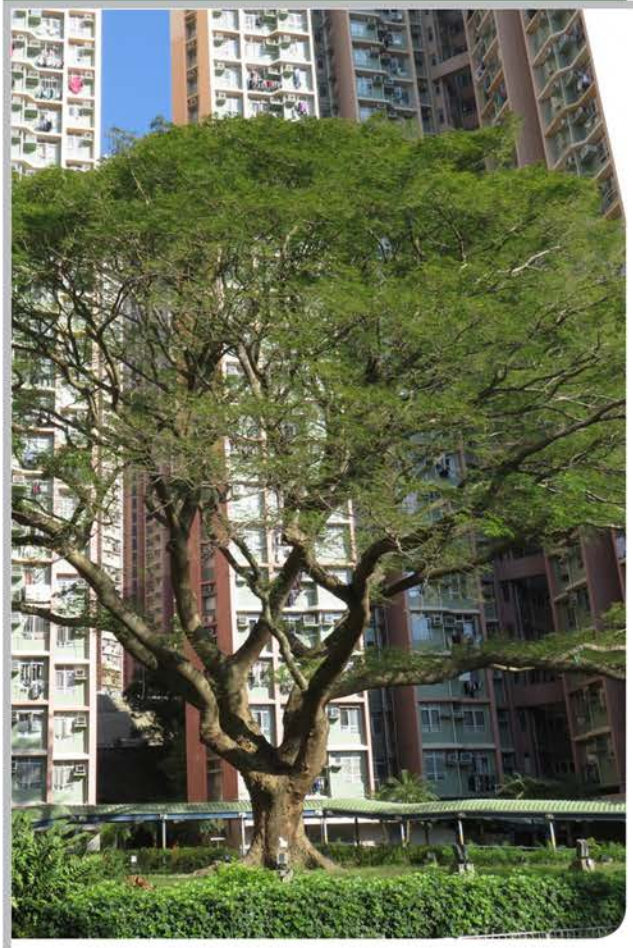
pH of Soil



Albizia julibrissin
合歡

Recommended Street Types

A 1/2 | **B 1/2** | C 1/2 | D 1/2 | E 1/2 | F 1/2 | G 1/2



General Information

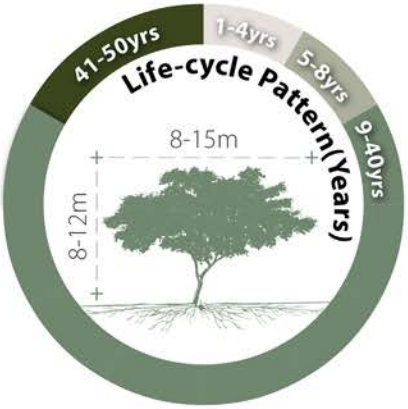
Native | **Exotic** | Evergreen | **Deciduous** | Partial Shade | **Full Sun**

Family: MIMOSACEAE **Heat Tolerance:** Moderate

Special Properties : Pink fragrant flowers; Symbiotic relationship with nitrogen-fixing soil bacteria

Tree Bark

Propagation to Seedling
Sapling to Semi-mature
Mature
Senescence

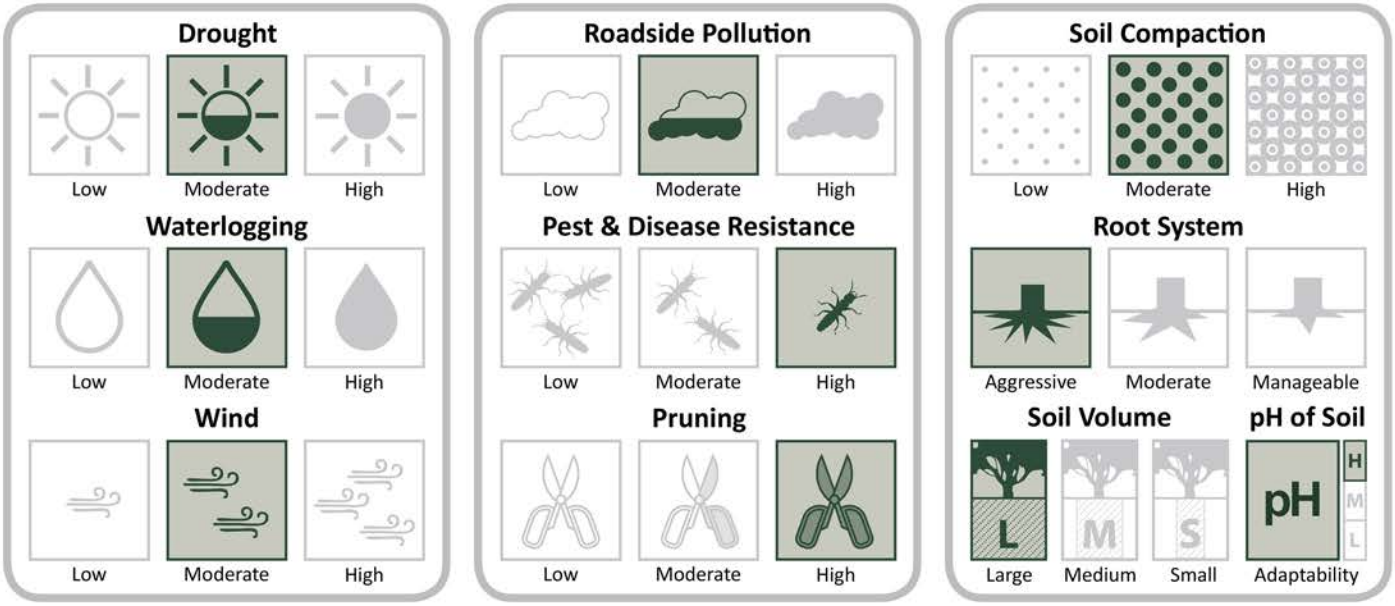


Feature

Special Maintenance Requirements

- Installation of root barriers or guides is recommended

Tolerance



Aporosa dioica
銀柴, 大沙葉

Recommended Street Types: A 1 2 | **B 1 2** | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

General Information

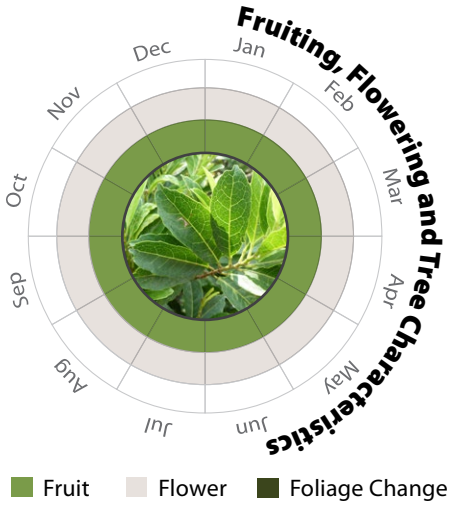
Native | Exotic | **Evergreen** | Deciduous | **Partial Shade** | **Full Sun**

Family: EUPHORBIACEAE **Heat Tolerance:** Moderate

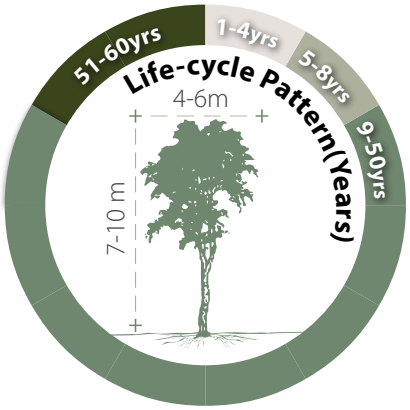
Special Properties : Fruits attractive to wildlife; Larval food plant of butterflies

Flowers

Fruits



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence



Feature

Ecological Value | Ornamental | Shade Cast

Special Maintenance Requirements

- Moderate maintenance manageability

Tolerance

Drought

Low | Moderate | High

Waterlogging

Low | Moderate | High

Wind

Low | Moderate | High

Roadside Pollution

Low | Moderate | High

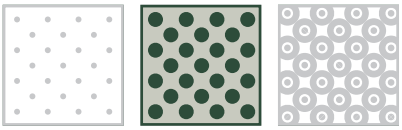
Pest & Disease Resistance

Low | Moderate | High

Pruning

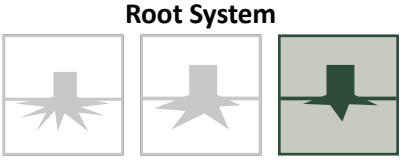
Low | Moderate | High

Soil Compaction



Low | Moderate | High

Root System

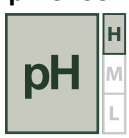


Aggressive | Moderate | Manageable

Soil Volume

Large | Medium | Small

pH of Soil



Adaptability

Bixa orellana
紅木

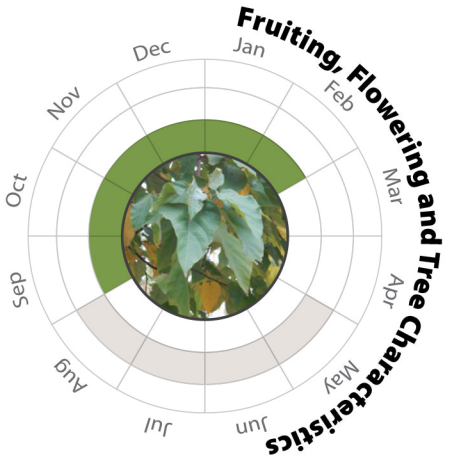
Recommended Street Types
A 1 2 | **B 1 2** | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

General Information

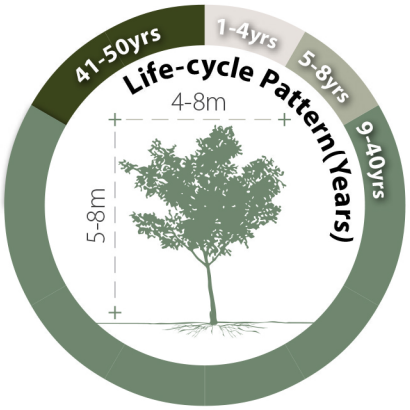
Native | **Exotic** | **Evergreen** | Deciduous | Partial Shade | **Full Sun**

Family: BIXACEAE **Heat Tolerance:** High
Special Properties : Pink flowers; Red fruit; Flower nectar attractive to wildlife


Fruits



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence



Feature

Special Maintenance Requirements

- Moderate maintenance manageability

Tolerance

Drought

Low | Moderate | High

Waterlogging

Low | Moderate | High

Wind

Low | Moderate | High

Roadside Pollution

Low | Moderate | High

Pest & Disease Resistance

Low | Moderate | High

Pruning

Low | Moderate | High

Soil Compaction

Low | Moderate | High

Root System

Aggressive | Moderate | Manageable

Soil Volume


Large | Medium | Small

pH of Soil


Adaptability

Brachychiton acerifolius
槭葉蘋婆

Recommended Street Types

A 1 2 | B 1 2 | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

General Information

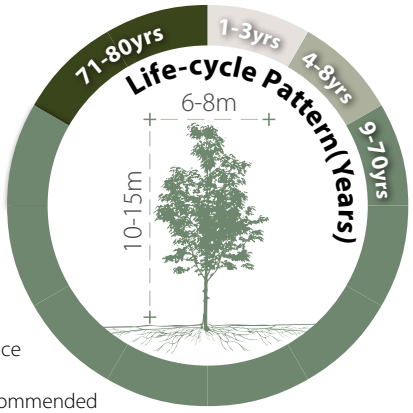
Native | **Exotic** | Evergreen | **Deciduous** | Partial Shade | **Full Sun**

Family: STERCULIACEAE **Heat Tolerance:** Moderate

Special Properties : Red bell-shaped flowers; Flower nectar attractive to wildlife

Flowers

- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence



Feature

Ecological Value | Ornamental | Shade Cast

Special Maintenance Requirements

- Hairs inside the seedpods may cause skin irritation
- Tree crown may require annual maintenance
- Moderate maintenance manageability
- Installation of root barriers or guides is recommended

Tolerance

Drought

Low | Moderate | High

Waterlogging

Low | Moderate | High

Wind

Low | Moderate | High

Roadside Pollution

Low | Moderate | High

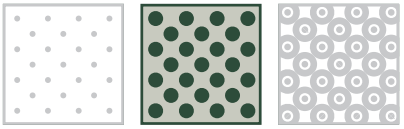
Pest & Disease Resistance

Low | Moderate | High

Pruning

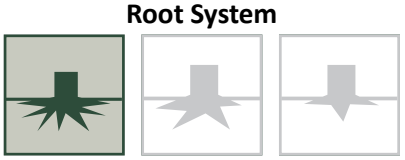
Low | Moderate | High

Soil Compaction



Low | Moderate | High

Root System

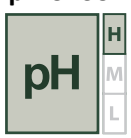


Aggressive | Moderate | Manageable

Soil Volume

Large | Medium | Small

pH of Soil



Adaptability

Bridelia tomentosa
土蜜樹, 逼迫仔

Recommended Street Types
A 1 2 B 1 2 C 1 2 D 1 2 E 1 2 F 1 2 G 1 2

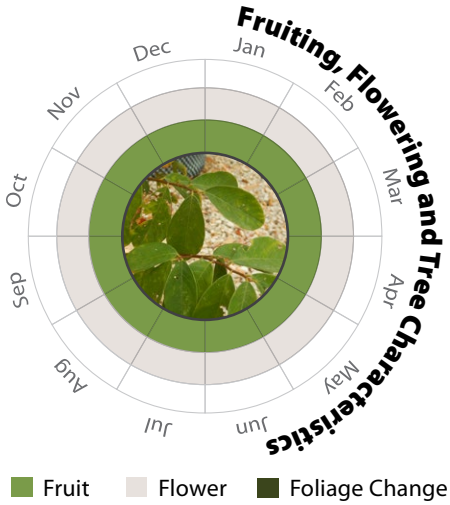
General Information

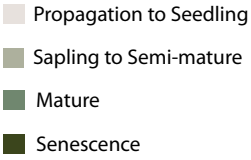
Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

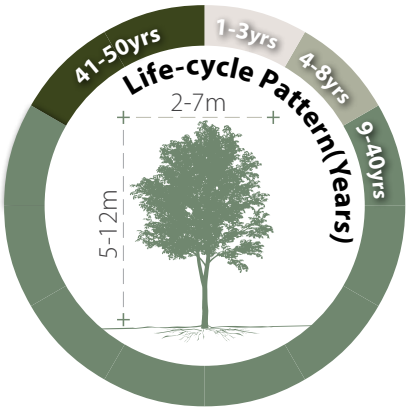
Family: EUPHORBIACEAE **Heat Tolerance:** Moderate
Special Properties : Fruits, seeds and leaves attractive to wildlife


Flowers


Fruits





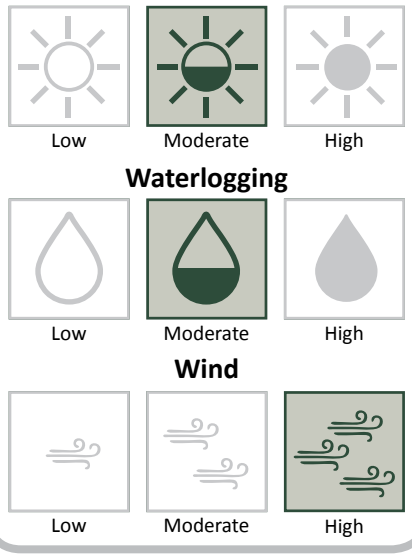


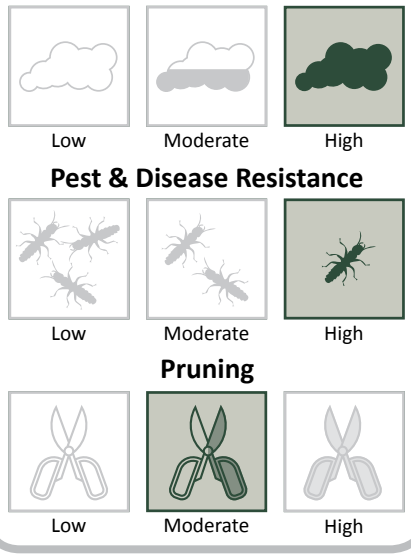
Feature

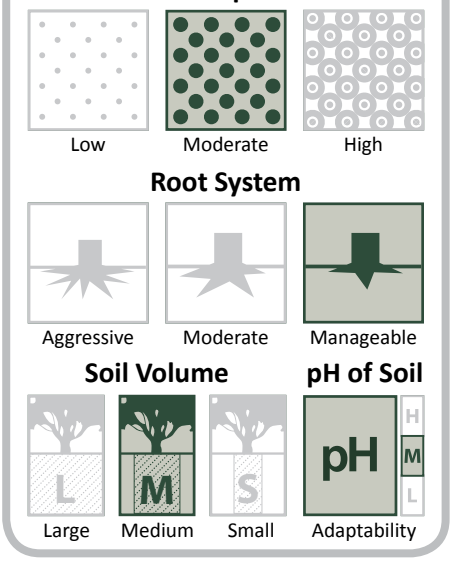
Special Maintenance Requirements

- Shrubby form may require formative pruning
- Moderate maintenance manageability

Tolerance







Caesalpinia ferrea
巴西鐵木

Recommended Street Types

A 1/2 | **B 1/2** | C 1/2 | D 1/2 | E 1/2 | F 1/2 | G 1/2

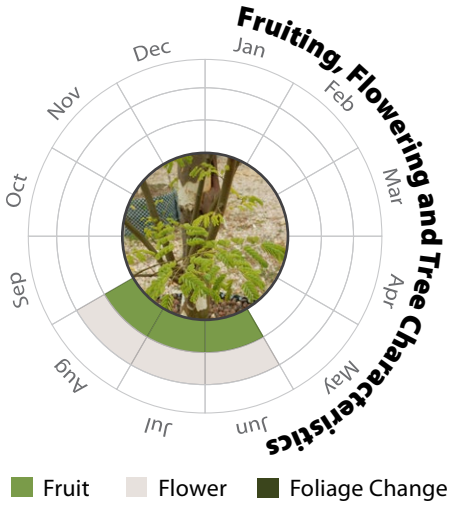
General Information

Native | **Exotic** | **Evergreen** | Deciduous | Partial Shade | **Full Sun**

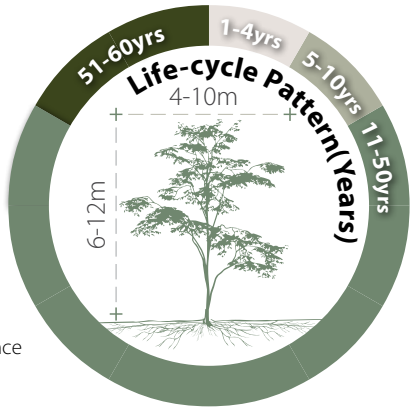
Family: CAESALPINIACEAE **Heat Tolerance:** Moderate

Special Properties : Ornamental tree bark; Symbiotic relationship with nitrogen-fixing soil bacteria

Tree Bark



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence

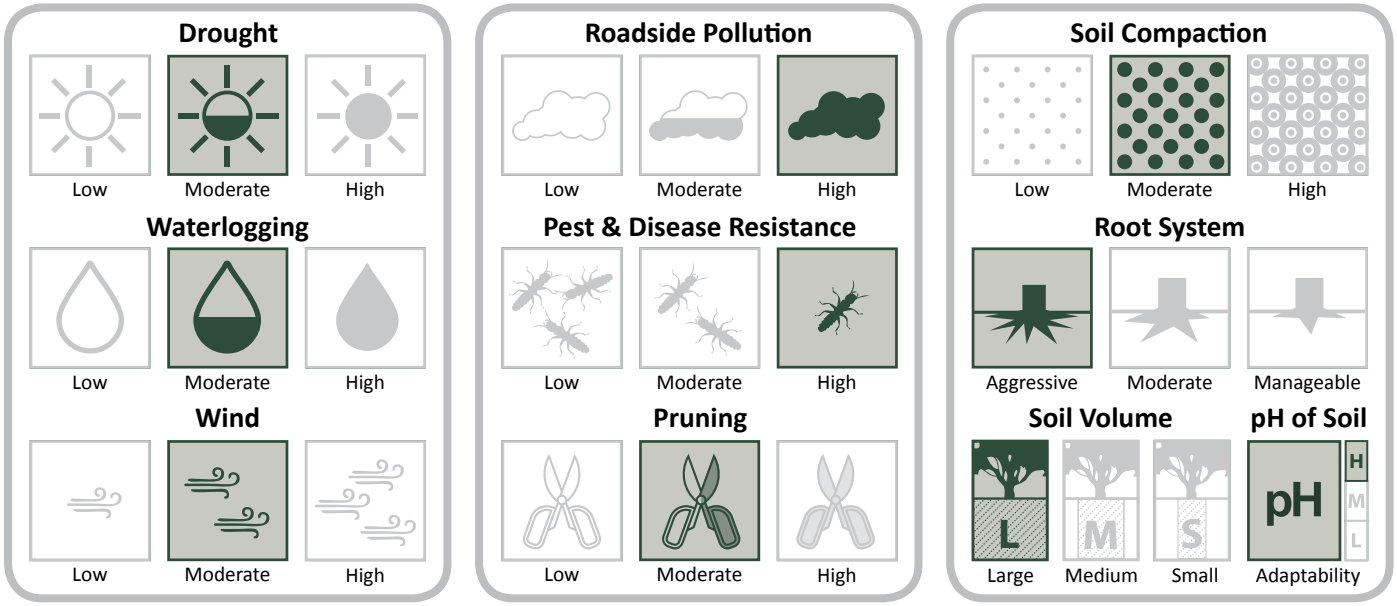


Feature

Special Maintenance Requirements

- Formative pruning to prevent narrow crotch angles
- Tree crown may require annual maintenance
- Installation of root barriers or guides is recommended

Tolerance



Carallia brachiata
竹節樹

Recommended Street Types
A 1 2 B 1 2 C 1 2 D 1 2 E 1 2 F 1 2 G 1 2

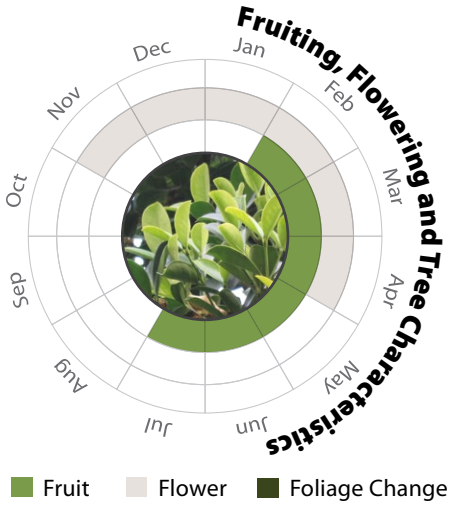
General Information

Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

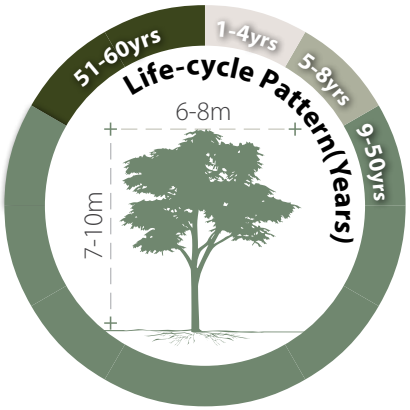
Family: RHIZOPHORACEAE **Heat Tolerance:** Moderate
Special Properties : Fruits attractive to wildlife


Flowers


Fruits



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence



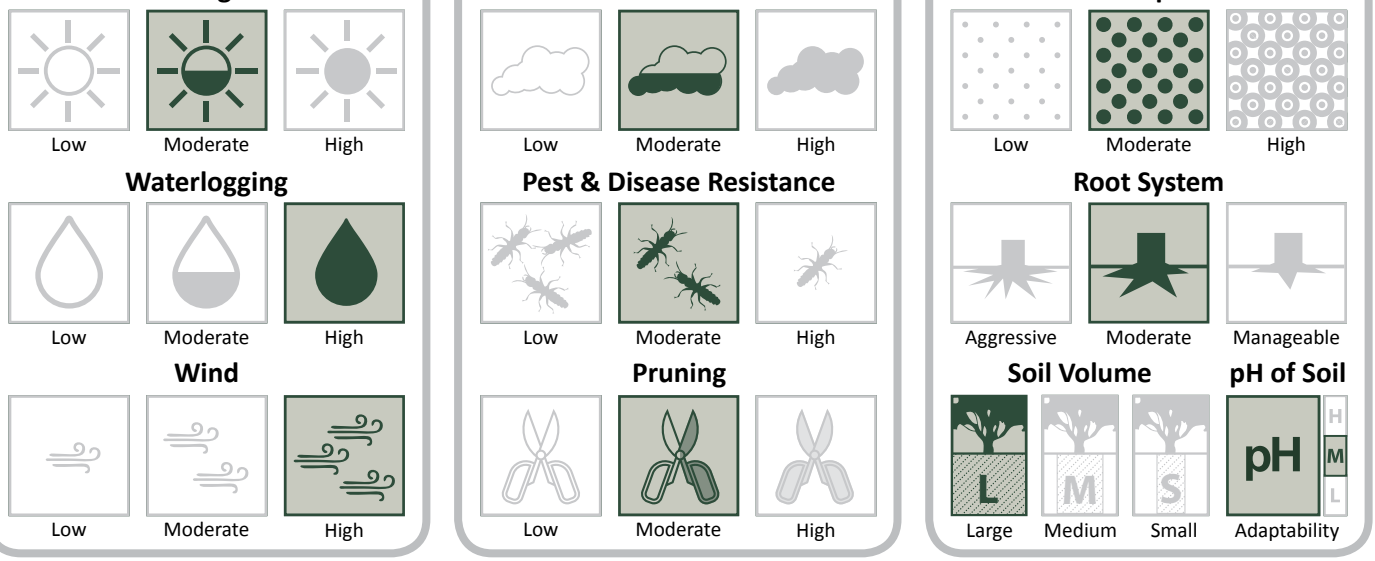
Feature

Ecological Value | Ornamental | Shade Cast

Special Maintenance Requirements

- No Special Maintenance Requirements

Tolerance



Cassia x nealiae
彩虹雨樹

Recommended Street Types

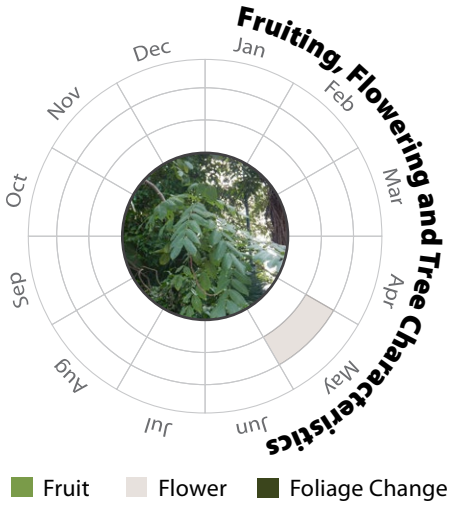
A 1 2 | **B 1 2** | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

General Information

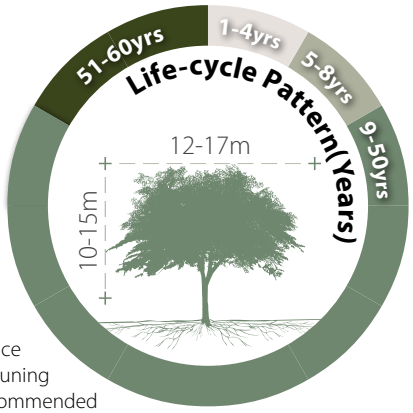
Native | **Exotic** | Evergreen | **Deciduous** | Partial Shade | **Full Sun**

Family: CAESALPINIACEAE **Heat Tolerance:** Moderate

Special Properties : Red and white flowers ;
Flower nectar attractive to wildlife



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence

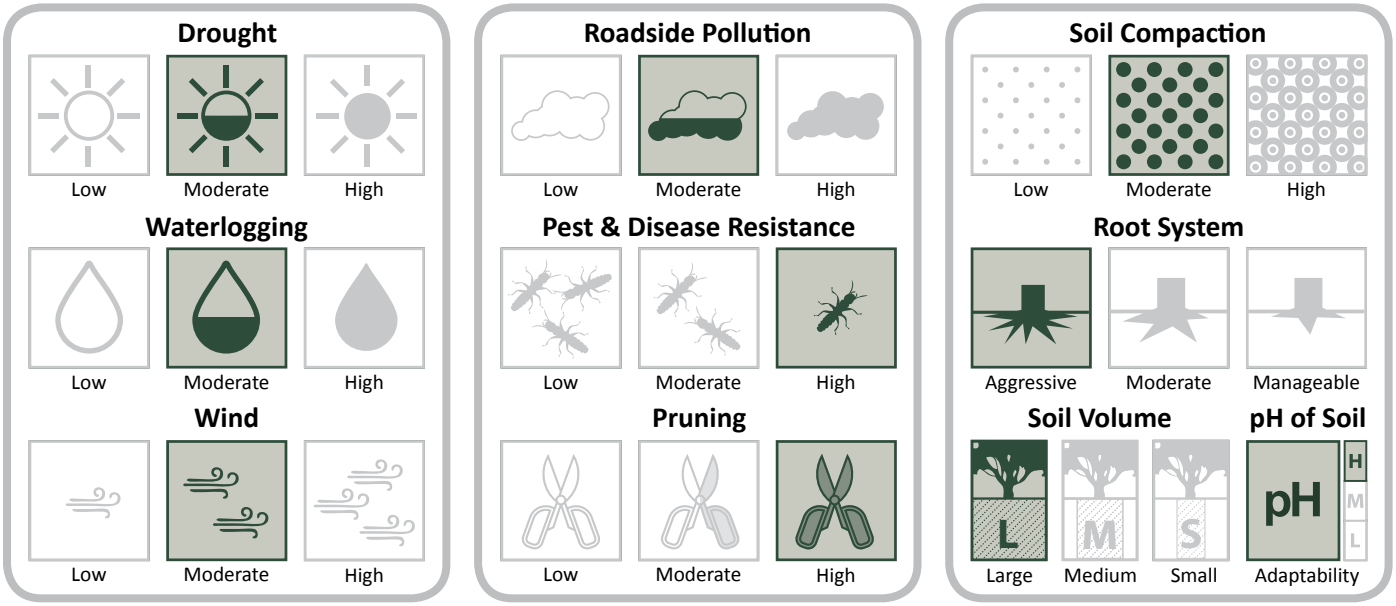


Feature

Special Maintenance Requirements

- Crown thinning may be needed to reduce wind resistance
- Tree crown may require annual maintenance
- Drooping branches may require regular pruning
- Installation of root barriers or guides is recommended

Tolerance



Cassia javanica var. *indochinensis*
節果決明

Recommended Street Types

A 1 2 | **B 1 2** | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

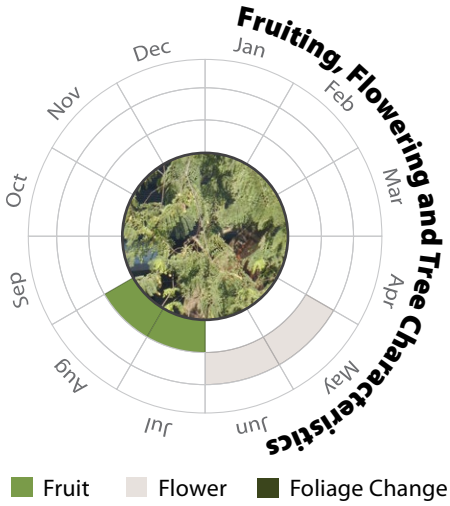
General Information

Native | **Exotic** | Evergreen | **Deciduous** | Partial Shade | **Full Sun**

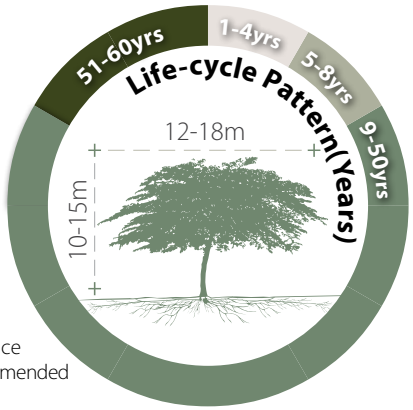
Family: CAESALPINIACEAE **Heat Tolerance:** Moderate

Special Properties : Pink and white flowers;
Larval food plant of butterflies

Flowers



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence



Feature

Ecological Value | Ornamental | Shade Cast

Special Maintenance Requirements

- Drooping branches may require regular pruning
- Tree crown may require annual maintenance
- Installation of root barriers or guides is recommended

Tolerance

Drought

Low | Moderate | High

Waterlogging

Low | Moderate | High

Wind

Low | Moderate | High

Roadside Pollution

Low | Moderate | High

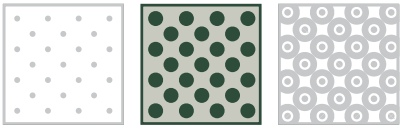
Pest & Disease Resistance

Low | Moderate | High

Pruning

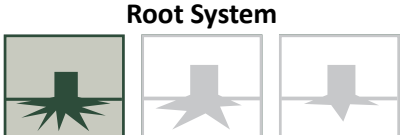
Low | Moderate | High

Soil Compaction



Low | Moderate | High

Root System

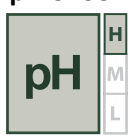


Aggressive | Moderate | Manageable

Soil Volume

Large | Medium | Small

pH of Soil

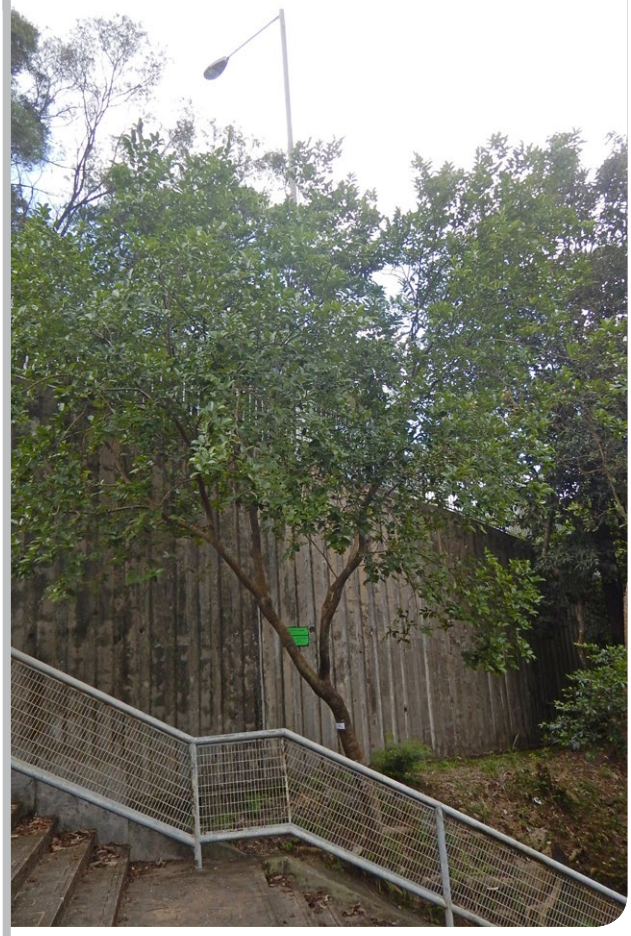


Adaptability

Celtis timorensis
假玉桂,樟葉朴

Recommended Street Types

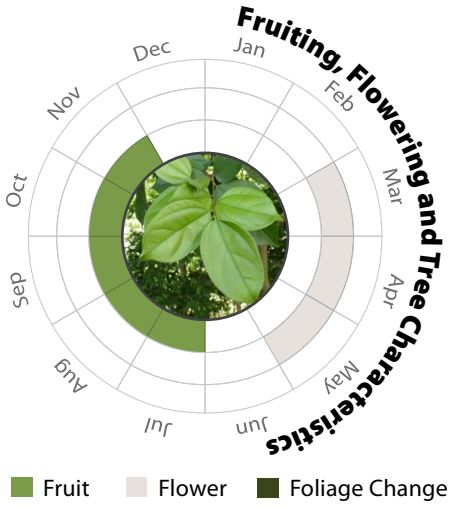
A 1 2 | **B 1 2** | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2



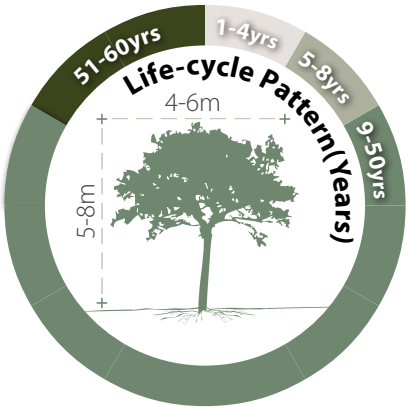
General Information

Native | Exotic | **Evergreen** | Deciduous | **Partial Shade** | **Full Sun**

Family: ULMACEAE **Heat Tolerance:** High
Special Properties : Fruits attractive to wildlife



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence



Feature

Special Maintenance Requirements

- Malodourous wood and tree sap

Tolerance

Drought

Waterlogging

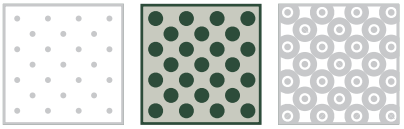
Wind

Roadside Pollution

Pest & Disease Resistance

Pruning

Soil Compaction



Root System

Soil Volume

pH of Soil

Choerospondias axillaris
南酸棗, 酸棗

Recommended Street Types

A 1 2 | **B 1 2** | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

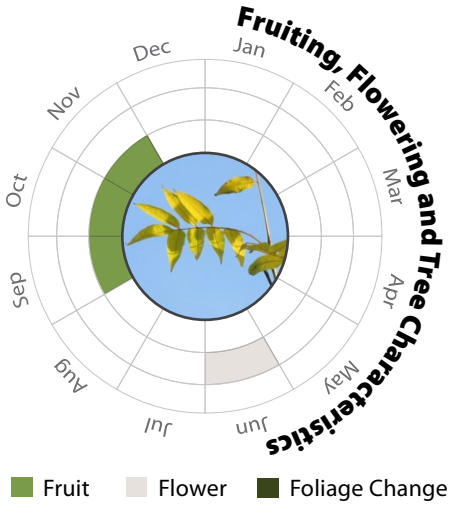
General Information

Native | Exotic | Evergreen | **Deciduous** | Partial Shade | **Full Sun**

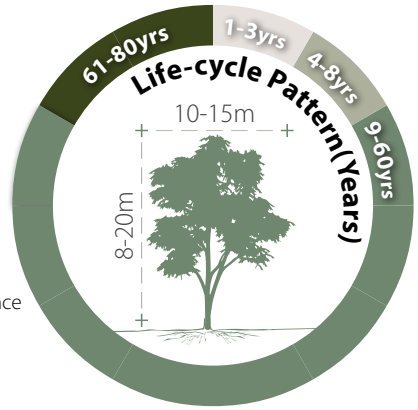
Family: ANACARDIACEAE **Heat Tolerance:** Moderate
Special Properties : Fibrous tree bark; Fruits attractive to wildlife


Flowers


Fruits



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence

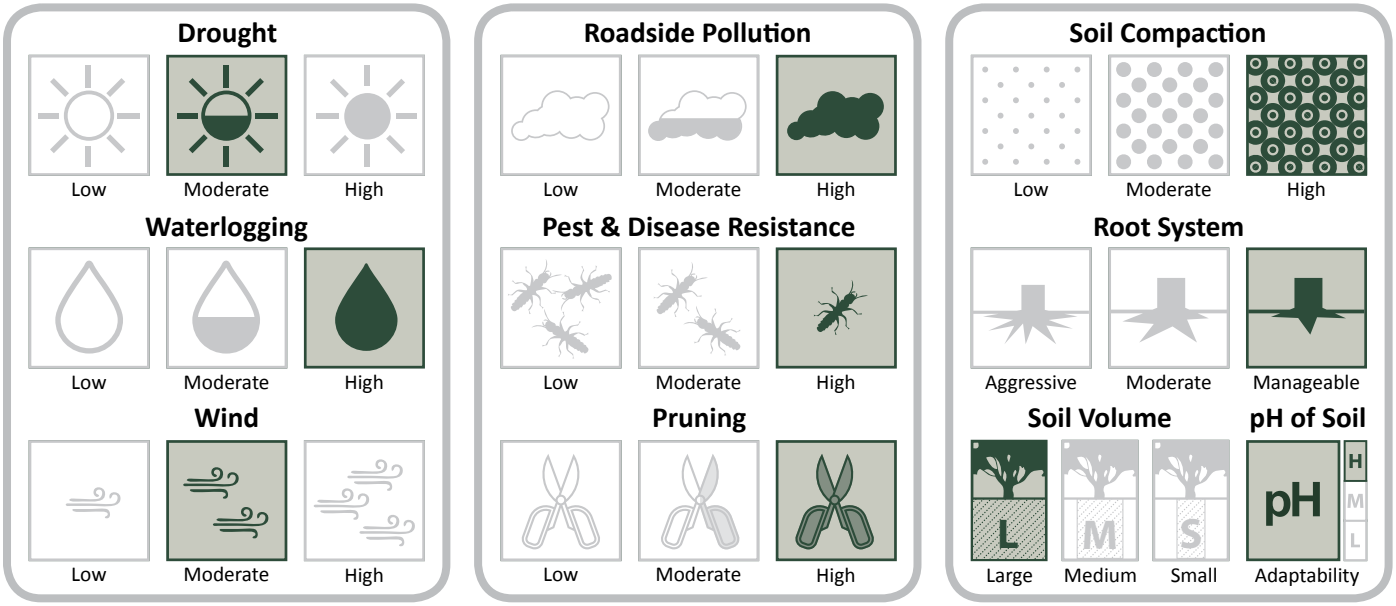


Feature

Special Maintenance Requirements

- Tree crown may require annual maintenance
- Moderate maintenance manageability

Tolerance



Chukrasia tabularis
麻楝

Recommended Street Types
A 1/2 B 1/2 C 1/2 D 1/2 E 1/2 F 1/2 G 1/2

General Information

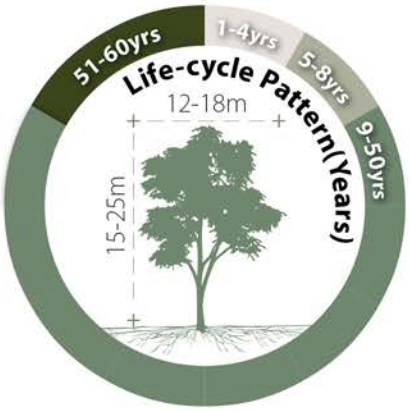
Native | **Exotic** | Evergreen | **Semi Deciduous** | **Partial Shade** | **Full Sun**

Family: MELIACEAE **Heat Tolerance:** Moderate
Special Properties : Roosting site


Flower


Fruits

Propagation to Seedling
Sapling to Semi-mature
Mature
Senescence

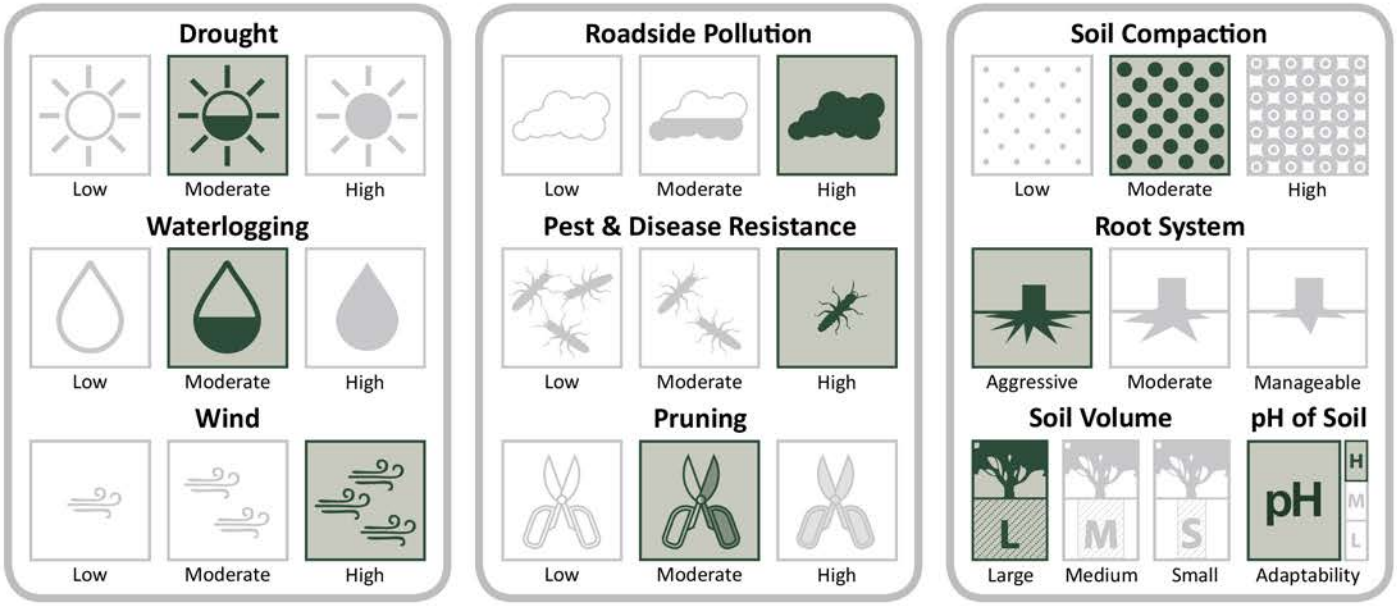


Feature

Special Maintenance Requirements

- Moderate maintenance manageability
- Installation of root barriers or guides is recommended

Tolerance



Cinnamomum parthenoxylon
黃樟

Recommended Street Types

A 1/2 B 1/2 C 1/2 D 1/2 E 1/2 F 1/2 G 1/2

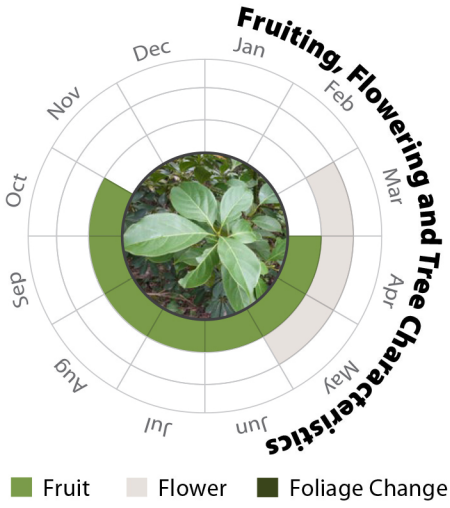
General Information

Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

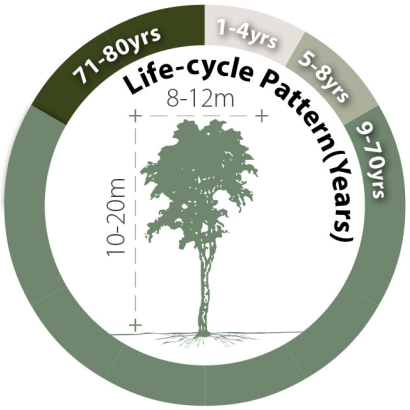
Family: LAURACEAE **Heat Tolerance:** Moderate

Special Properties : Fruits are attractive to wildlife

Tree Bark



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence

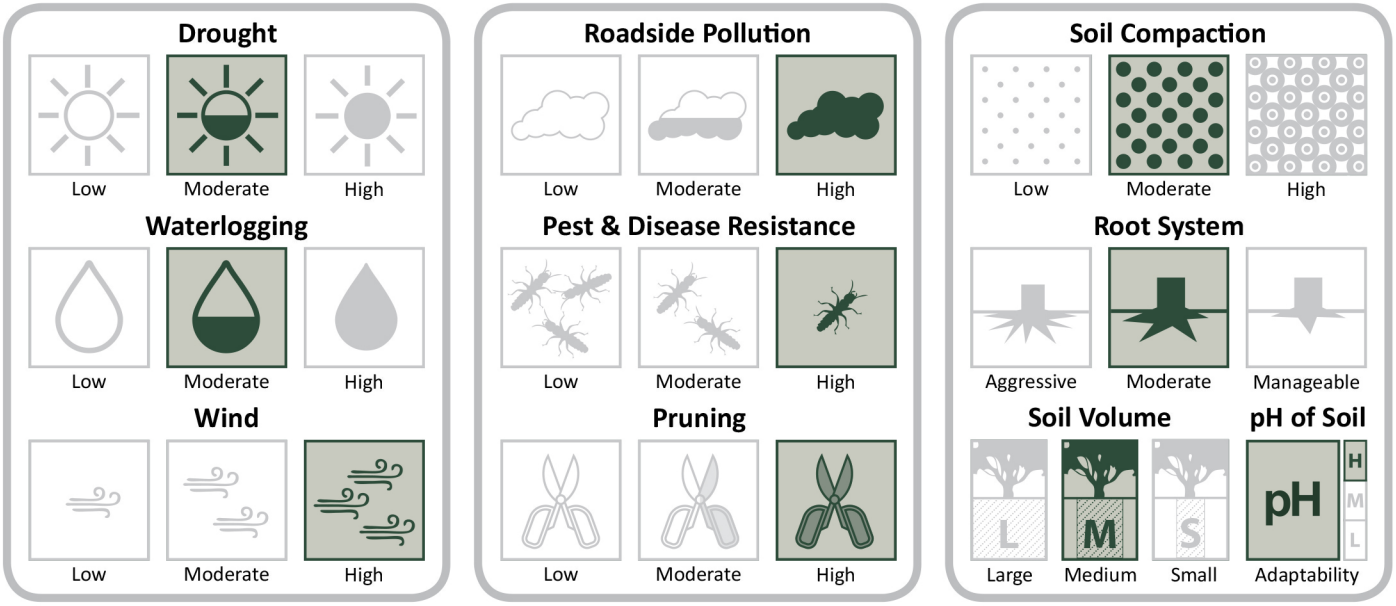


Feature

Special Maintenance Requirements

- No Special Maintenance Requirements

Tolerance



Cleistocalyx nervosum
水翁

Recommended Street Types: A 1 2 | B 1 2 | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

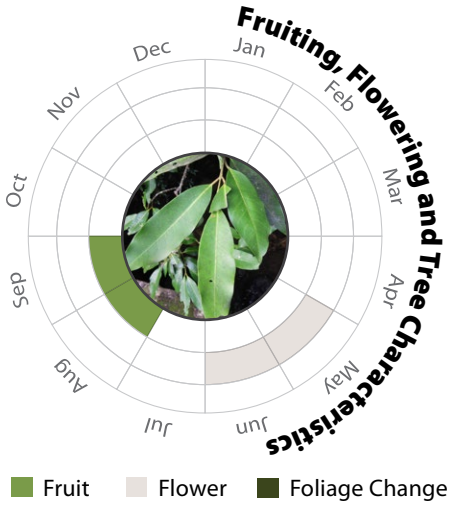
General Information

Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

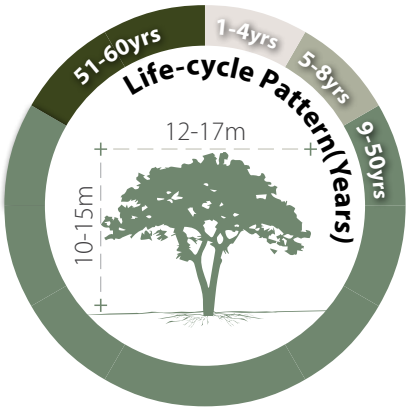
Family: MYRTACEAE **Heat Tolerance:** Moderate

Special Properties : Fruits, seeds and flower nectar are attractive to wildlife

Flowers



Propagation to Seedling
Sapling to Semi-mature
Mature
Senescence



Feature

Ecological Value | Ornamental | Shade Cast

Special Maintenance Requirements

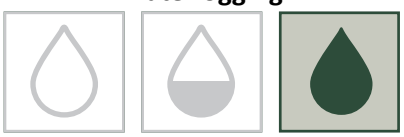
- Seed loses viability quickly and should be sown soon after harvesting
- Moderate maintenance manageability

Tolerance

Drought

Low | Moderate | High

Waterlogging



Low | Moderate | High

Wind

Low | Moderate | High

Roadside Pollution

Low | Moderate | High

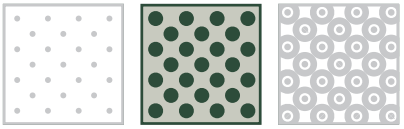
Pest & Disease Resistance

Low | Moderate | High

Pruning

Low | Moderate | High

Soil Compaction



Low | Moderate | High

Root System

Aggressive | Moderate | Manageable

Soil Volume

Large | Medium | Small

pH of Soil

Adaptability

Cordia dichotoma
破布木

Recommended Street Types

A 1 2 | B 1 2 | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

General Information

Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

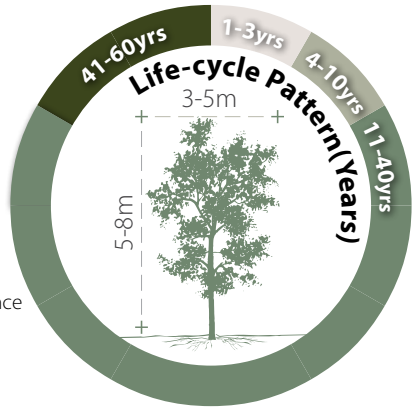
Family: BORAGINACEAE **Heat Tolerance:** Moderate

Special Properties : Fruits, seeds and flower nectar are attractive to wildlife

Fruits

All photos provided by AFCD

Propagation to Seedling
Sapling to Semi-mature
Mature
Senescence



Feature

Ecological Value | Ornamental | Shade Cast

Special Maintenance Requirements

- Tree crown may require annual maintenance
- Moderate maintenance manageability

Tolerance

Drought

Low | Moderate | High

Waterlogging

Low | Moderate | High

Wind

Low | Moderate | High

Roadside Pollution

Low | Moderate | High

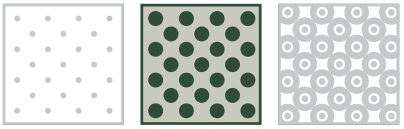
Pest & Disease Resistance

Low | Moderate | High

Pruning

Low | Moderate | High

Soil Compaction



Low | Moderate | High

Root System

Aggressive | Moderate | Manageable

Soil Volume

Large | Medium | Small

pH of Soil

Adaptability

Crateva trifoliata
鈍葉魚木

Recommended Street Types

A 1 2 | B 1 2 | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

General Information

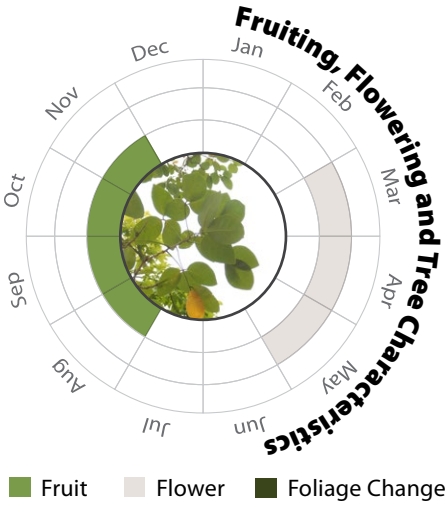
Native | **Exotic** | Evergreen | **Deciduous** | Partial Shade | **Full Sun**

Family: CAPPARACEAE **Heat Tolerance:** Moderate

Special Properties : White and yellow flowers; Fruits attractive to wildlife

Tree Bark

Fruits

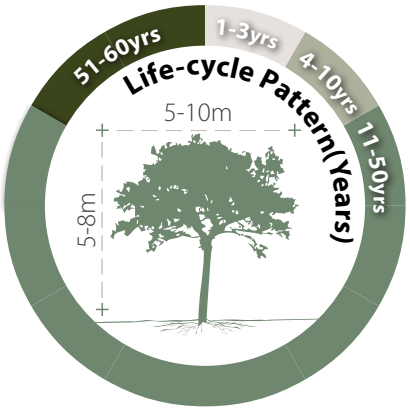


Propagation to Seedling

Sapling to Semi-mature

Mature

Senescence



Feature

Ecological Value | Ornamental | Shade Cast

Special Maintenance Requirements

- No Special Maintenance Requirements

Tolerance

Drought

Low | Moderate | High

Waterlogging

Low | Moderate | High

Wind

Low | Moderate | High

Roadside Pollution

Low | Moderate | High

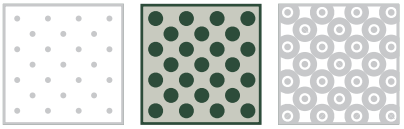
Pest & Disease Resistance

Low | Moderate | High

Pruning

Low | Moderate | High

Soil Compaction



Low | Moderate | High

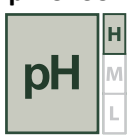
Root System

Aggressive | Moderate | Manageable

Soil Volume

Large | Medium | Small

pH of Soil



Adaptability

Crateva unilocularis
樹頭菜

Recommended Street Types

A 1 2 B 1 2 C 1 2 D 1 2 E 1 2 F 1 2 G 1 2

General Information

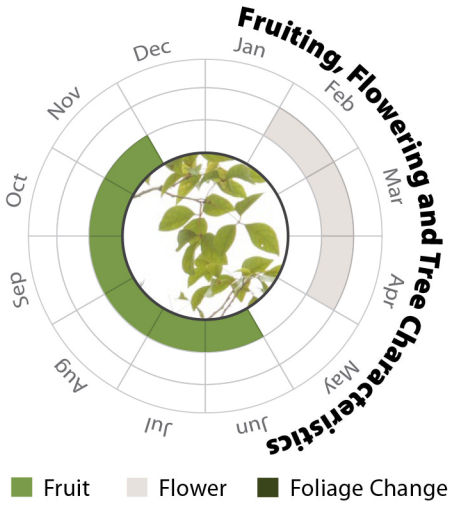
Native **Exotic** | Evergreen **Deciduous** | Partial Shade **Full Sun**

Family: CAPPARACEAE **Heat Tolerance:** Moderate

Special Properties : White and yellow flowers; Fruits attractive to wildlife

Flowers

Tree Bark

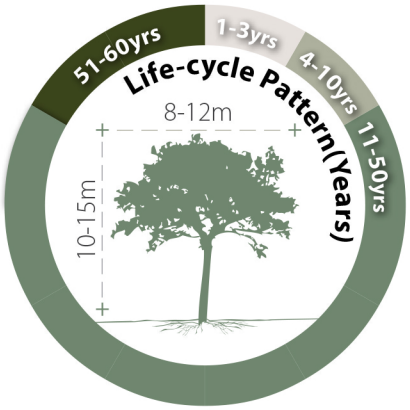


Propagation to Seedling

Sapling to Semi-mature

Mature

Senescence



Feature

Special Maintenance Requirements

- No Special Maintenance Requirements

Tolerance

Drought

Waterlogging

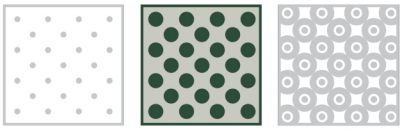
Wind

Roadside Pollution

Pest & Disease Resistance

Pruning

Soil Compaction



Root System

Soil Volume

pH of Soil

Cratoxylum cochinchinense
黃牛木

Recommended Street Types

A 1 2 B 1 2 C 1 2 D 1 2 E 1 2 F 1 2 G 1 2

General Information

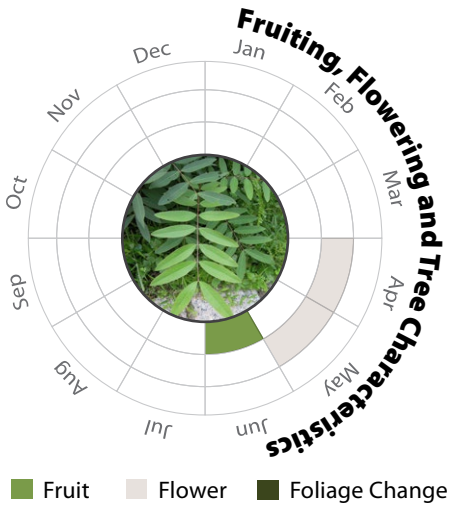
Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

Family: CLUSIACEAE **Heat Tolerance:** Moderate

Special Properties : Flowers nectar attractive to wildlife; Larval food plant for butterflies

Flowers

Tree Bark

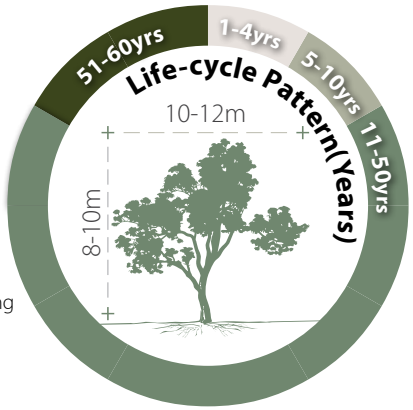


Propagation to Seedling

Sapling to Semi-mature

Mature

Senescence



Feature

Special Maintenance Requirements

- Shrubby form may require formative pruning
- Moderate maintenance manageability

Tolerance

Drought

Waterlogging

Wind

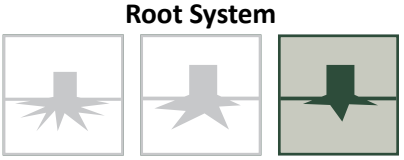
Roadside Pollution

Pest & Disease Resistance

Pruning

Soil Compaction

Root System



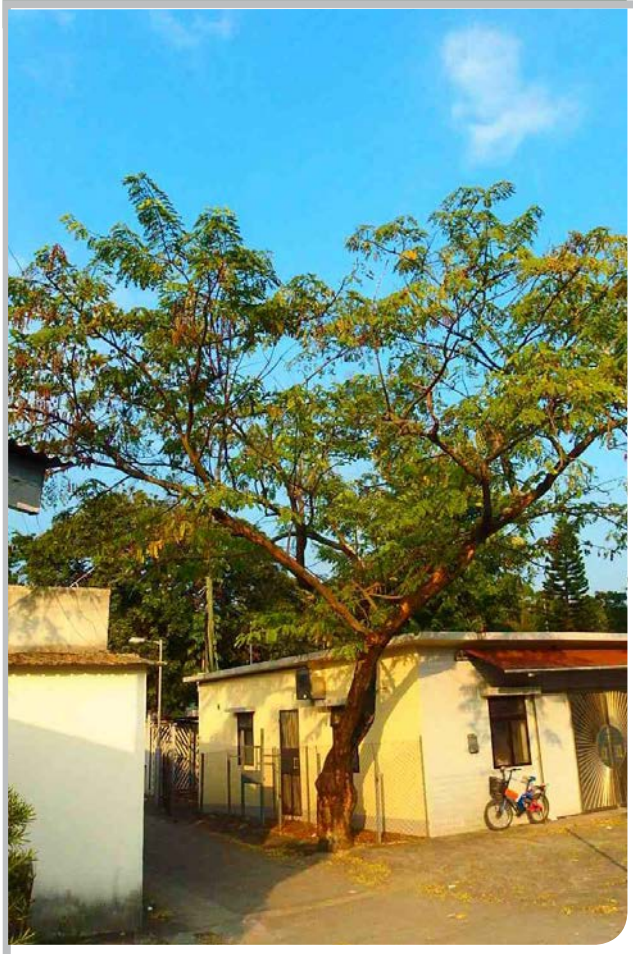
Soil Volume

pH of Soil

Dalbergia assamica
南嶺黃檀

Recommended Street Types

A 1 2 B 1 2 C 1 2 D 1 2 E 1 2 F 1 2 G 1 2

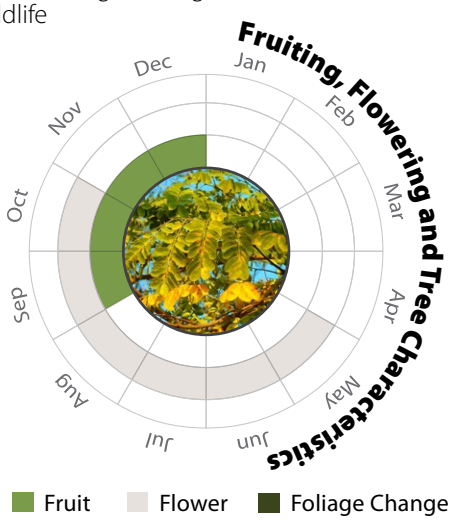


General Information

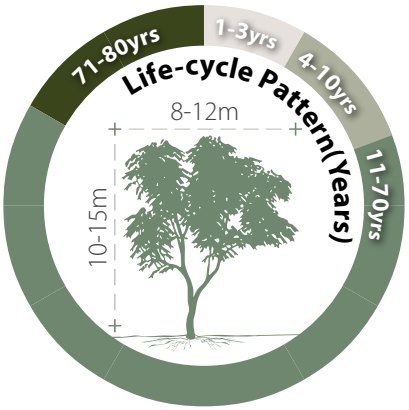
Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

Family: FABACEAE **Heat Tolerance:** Moderate

Special Properties : Good host tree for *Laccifer Lacca*; Symbiotic relationship with nitrogen-fixing soil bacteria; Flowers attractive to wildlife



Propagation to Seedling
Sapling to Semi-mature
Mature
Senescence

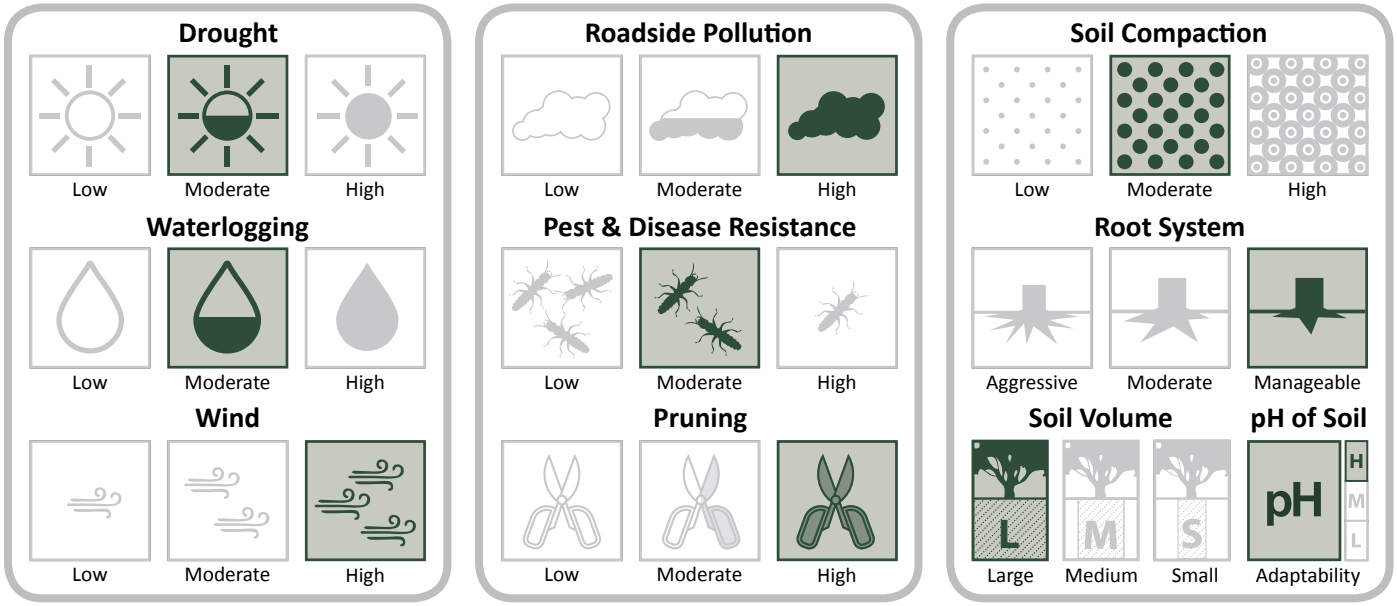


Feature

Special Maintenance Requirements

- No Special Maintenance Requirements

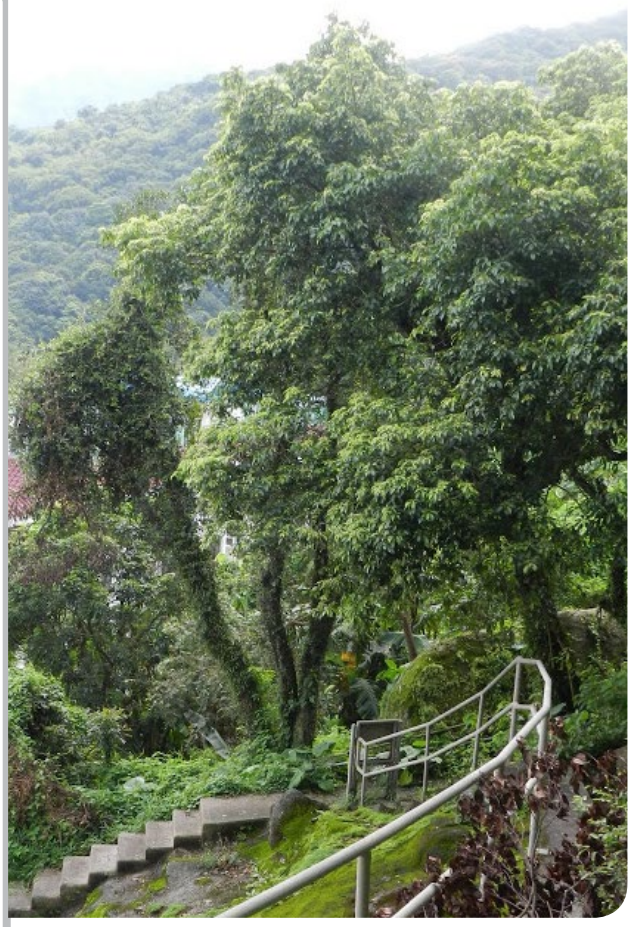
Tolerance



Diospyros morrisiana
羅浮柿

Recommended Street Types

A 1 2 | B 1 2 | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

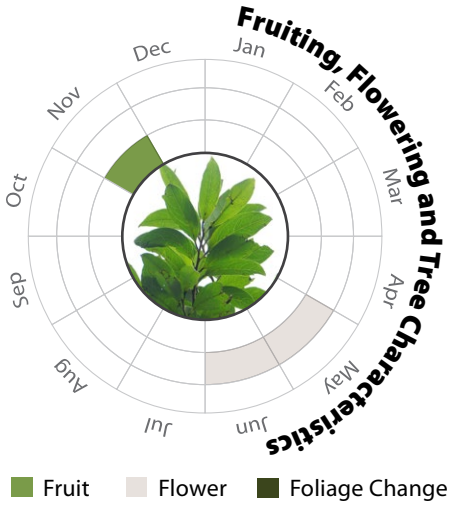


General Information

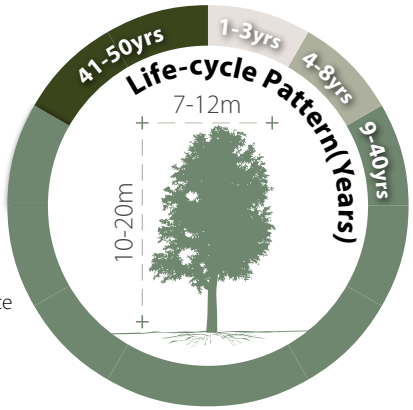
Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

Family: EBENACEAE **Heat Tolerance:** Moderate

Special Properties : Fruits and seeds are attractive to wildlife; Larval food plant of butterflies



Propagation to Seedling
Sapling to Semi-mature
Mature
Senescence

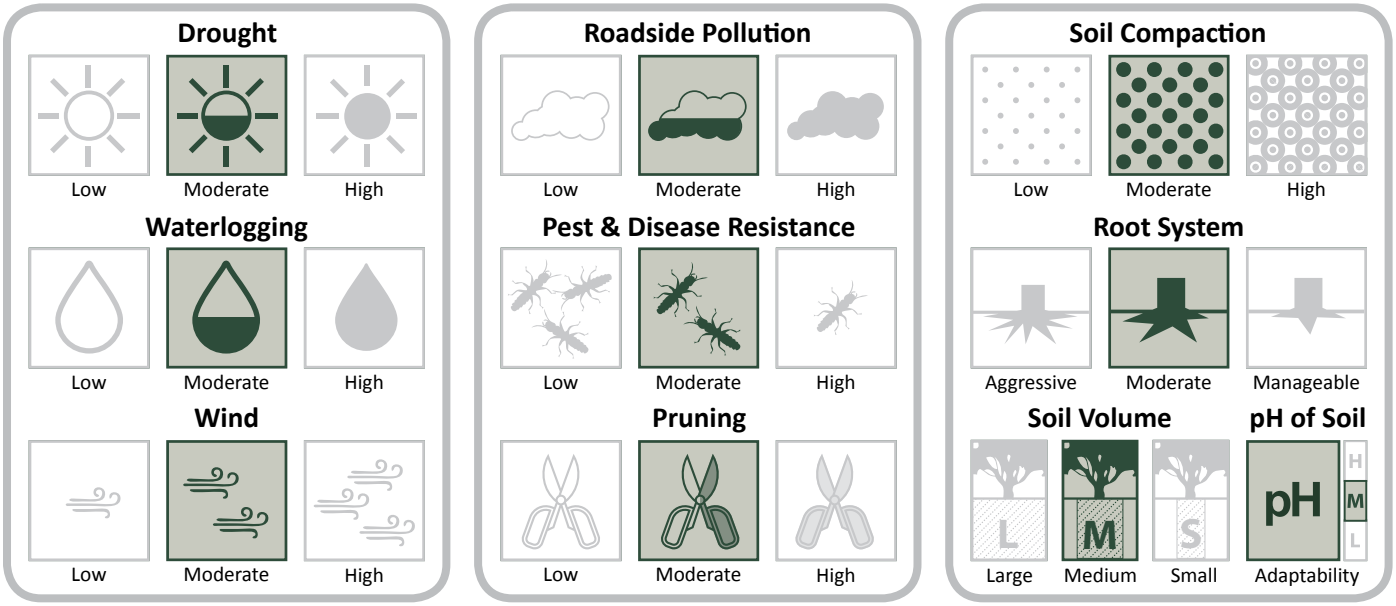


Feature

Special Maintenance Requirements

- Tree crown may require annual maintenance
- Moderate maintenance manageability

Tolerance



Dracontomelon duperreanum
人面子

Recommended Street Types

A 1/2 B 1/2 C 1/2 D 1/2 E 1/2 F 1/2 G 1/2

General Information

Native | **Exotic** | **Evergreen** | Deciduous | Partial Shade | **Full Sun**

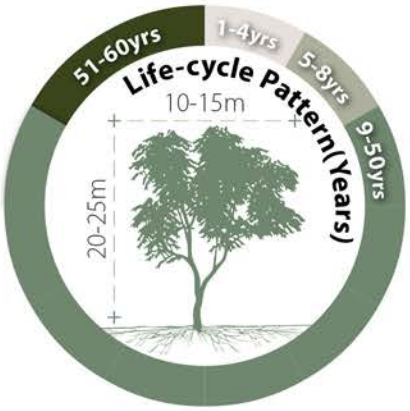
Family: ANACARDIACEAE **Heat Tolerance:** Moderate

Special Properties : Fruits attractive to wildlife

Fruits

Flowers

- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence



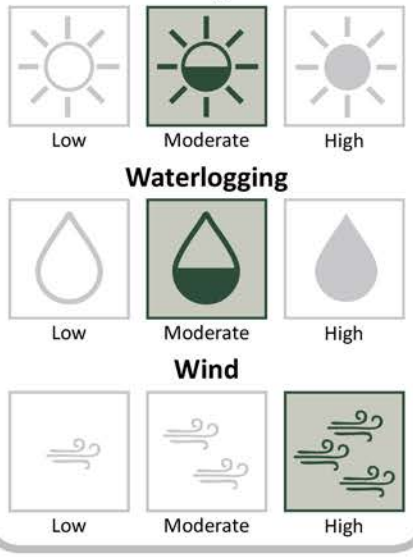
Feature

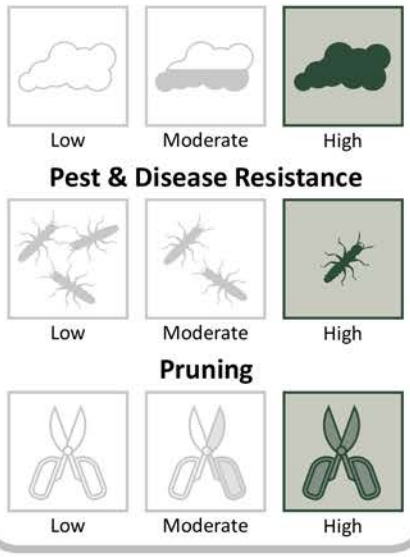
Ecological Value | Ornamental | Shade Cast

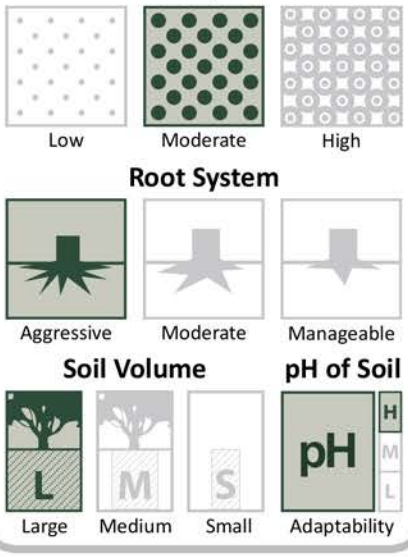
Special Maintenance Requirements

- Moderate maintenance manageability
- Installation of root barriers or guides is recommended

Tolerance







Ehretia longiflora
長花厚殼樹

Recommended Street Types

A 1/2 | **B 1/2** | C 1/2 | D 1/2 | E 1/2 | F 1/2 | G 1/2

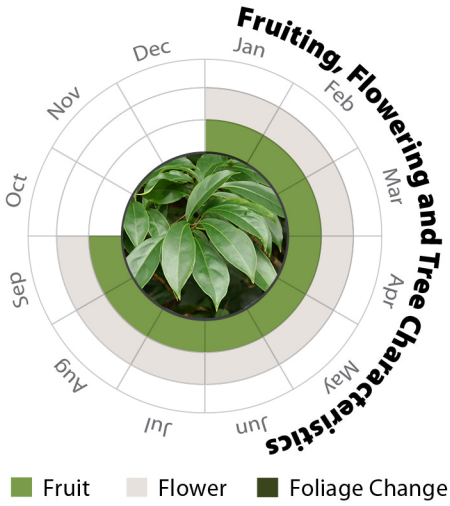
General Information

Native | Exotic | Evergreen | **Deciduous** | **Partial Shade** | **Full Sun**

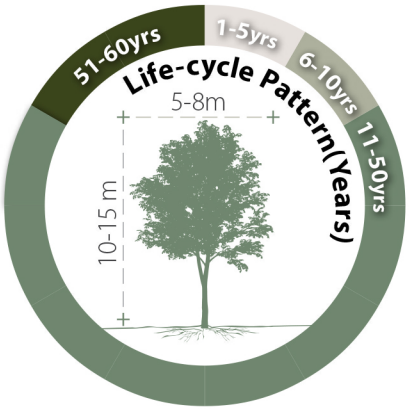
Family: BORAGINACEAE **Heat Tolerance:** Moderate
Special Properties : Fruits attractive to wildlife


Flowers


Tree Bark



Propagation to Seedling
Sapling to Semi-mature
Mature
Senescence



Feature

Special Maintenance Requirements

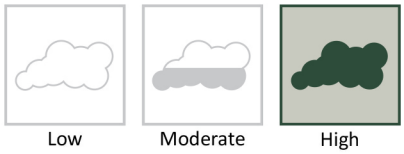
- No Special Maintenance Requirements

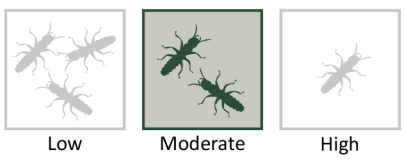
Tolerance

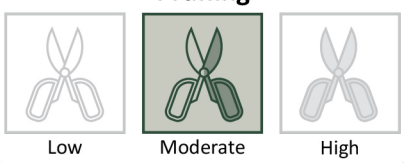
Drought

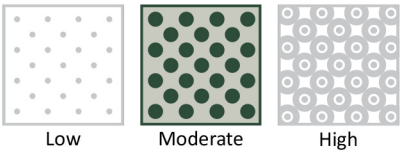

Waterlogging


Wind


Roadside Pollution


Pest & Disease Resistance


Pruning


Soil Compaction


Root System


Soil Volume


pH of Soil


Elaeocarpus apiculatus
長芒杜英,尖葉杜英

Recommended Street Types
A 1/2 | **B 1/2** | C 1/2 | D 1/2 | E 1/2 | F 1/2 | G 1/2

General Information

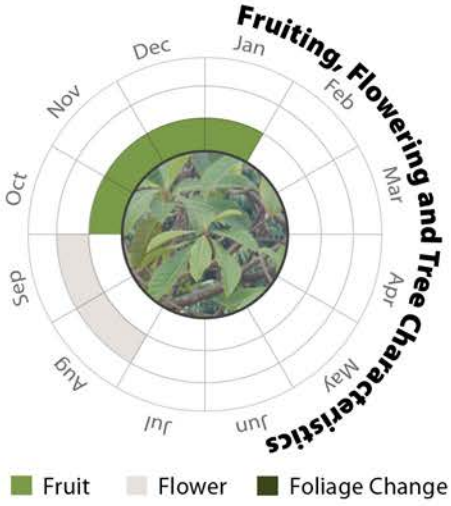
Native | **Exotic** | **Evergreen** | Semi Deciduous | **Partial Shade** | **Full Sun**

Family: ELAEOCARPACEAE **Heat Tolerance:** Moderate

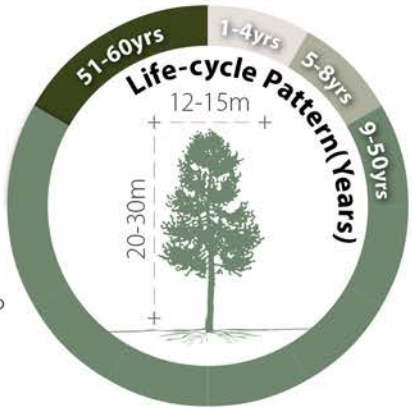
Special Properties : Crown naturally layered in symmetrical tiers; Fruits attractive to wildlife


Flowers


Fruits



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence

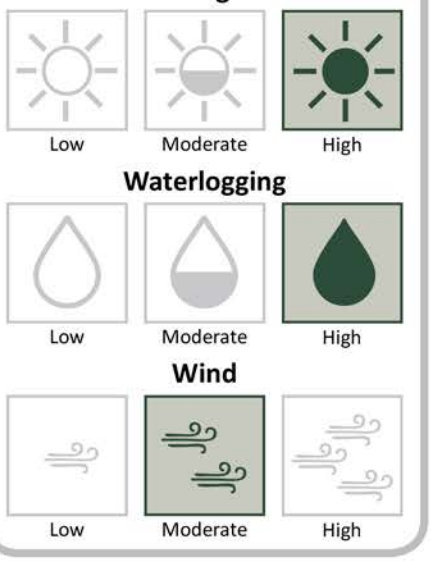


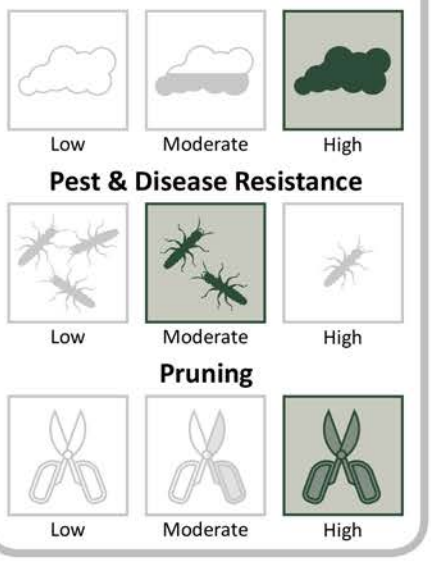
Feature

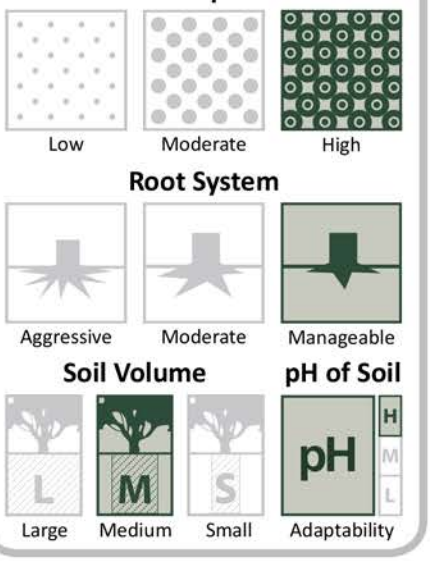
Special Maintenance Requirements

- Crown lifting may be required in sapling to semi-mature phase

Tolerance







Elaeocarpus chinensis
中華杜英

Recommended Street Types

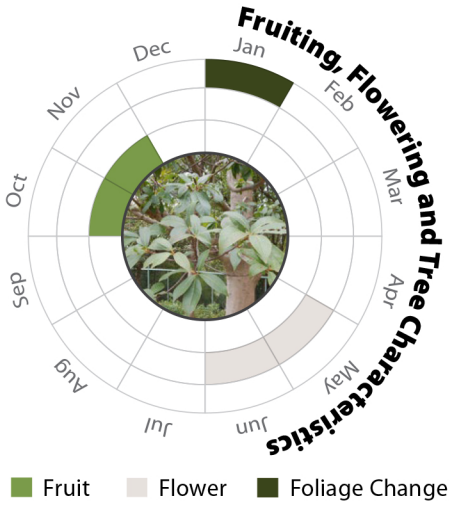
A 1/2 | B 1/2 | C 1/2 | D 1/2 | E 1/2 | F 1/2 | G 1/2

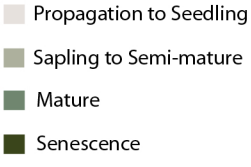
General Information

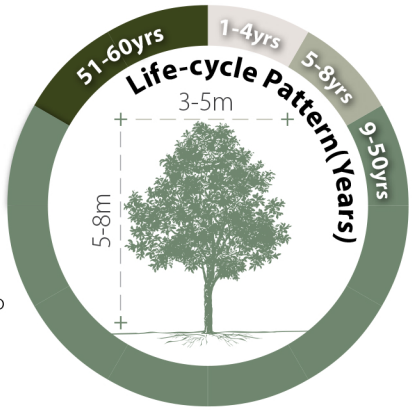
Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

Family: ELAEOCARPACEAE **Heat Tolerance:** Moderate

Special Properties : Fruits attractive to wildlife; often misidentified as other *Elaeocarpus spp.* eg. *E.dubius*





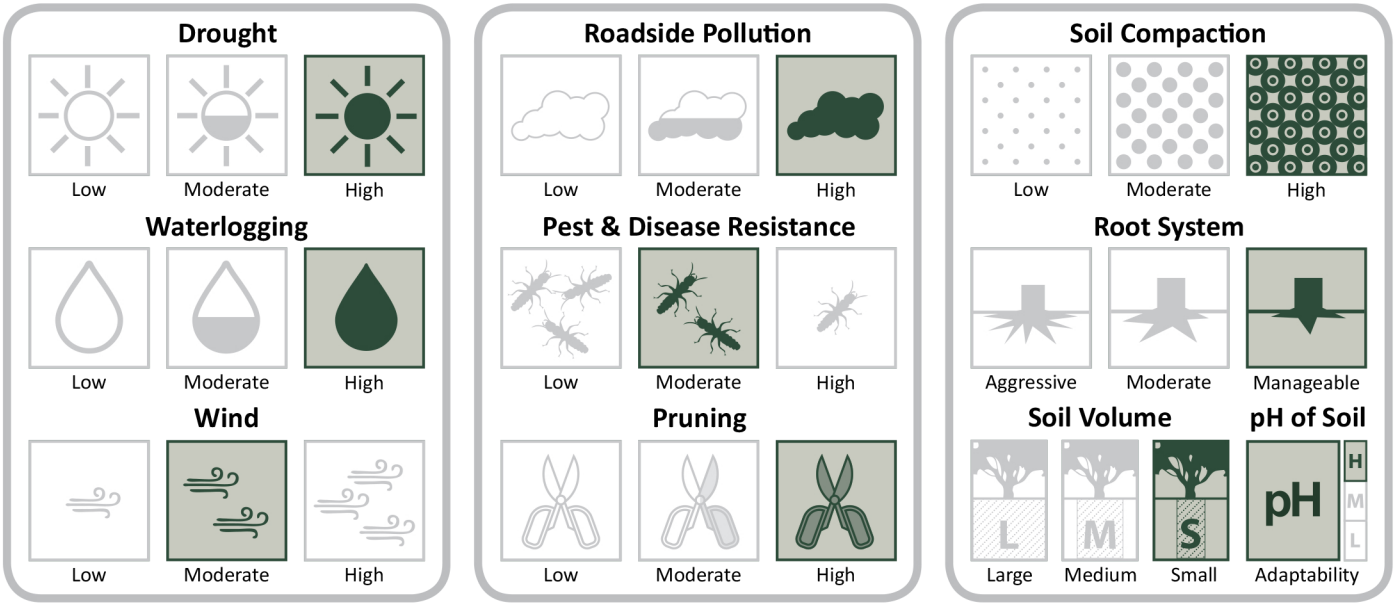


Feature

Special Maintenance Requirements

- Crown lifting may be required in sapling to semi-mature phase

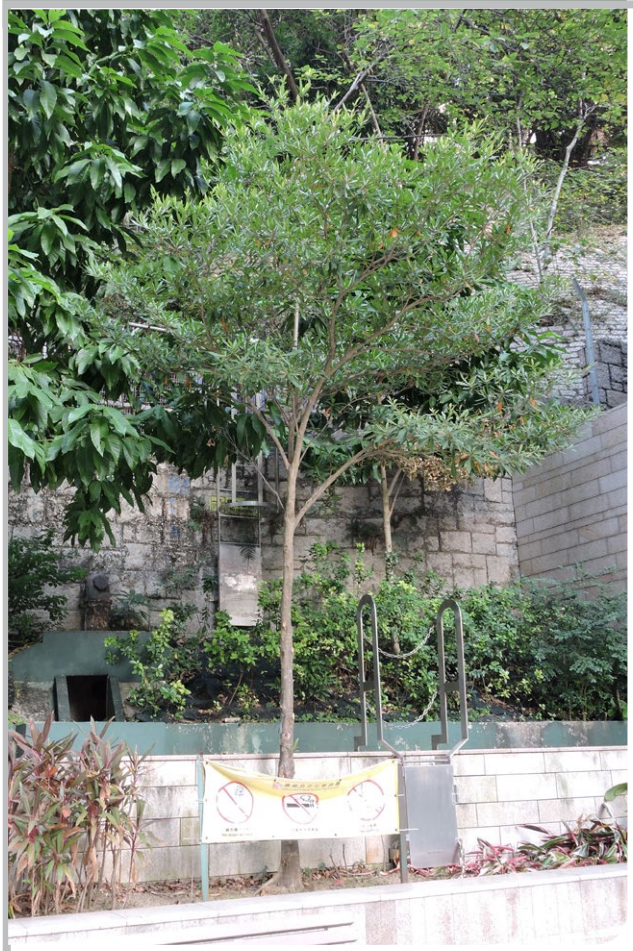
Tolerance



Elaeocarpus hainanensis
水石榕

Recommended Street Types

A 1 2 | B 1 2 | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2



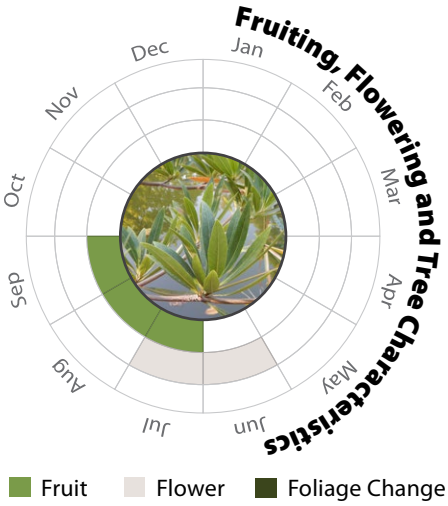
General Information

Native | **Exotic** | **Evergreen** | Deciduous | Partial Shade | **Full Sun**

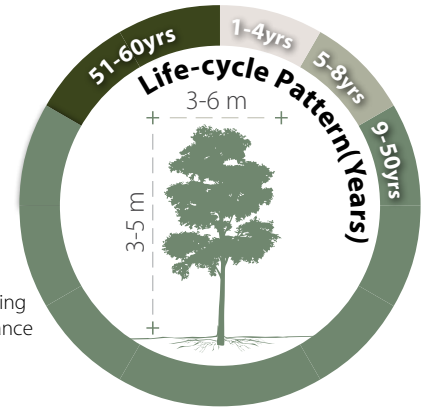
Family: ELAEOCARPACEAE **Heat Tolerance:** Moderate

Special Properties : Crown naturally layered in symmetrical tiers; Fruits attractive to wildlife

Flowers



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence



Feature

Special Maintenance Requirements

- Shrubby form may require formative pruning
- Tree crown may require annual maintenance

Tolerance

Drought

Waterlogging

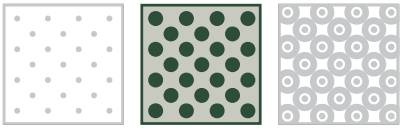
Wind

Roadside Pollution

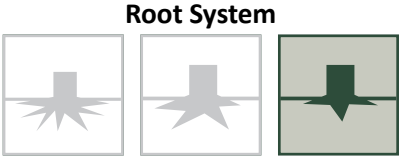
Pest & Disease Resistance

Pruning

Soil Compaction



Root System



Soil Volume

pH of Soil

Elaeocarpus japonicus
日本杜英

Recommended Street Types

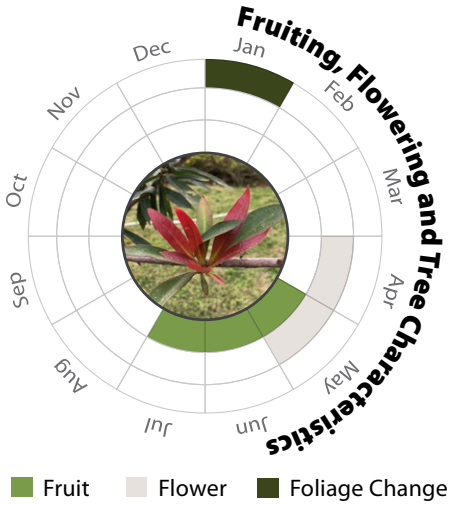
A 1 2 B 1 2 C 1 2 D 1 2 E 1 2 F 1 2 G 1 2

General Information

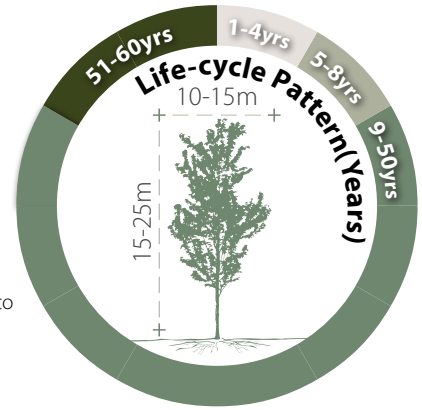
Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

Family: ELAEOCARPACEAE **Heat Tolerance:** Moderate

Special Properties : Crown naturally layered in symmetrical tiers; Fruits and flower nectar are attractive to wildlife



Propagation to Seedling
Sapling to Semi-mature
Mature
Senescence

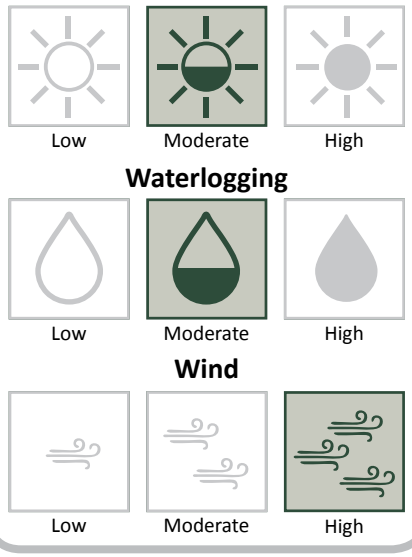


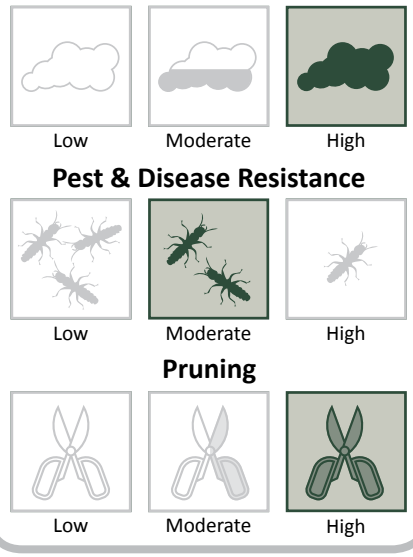
Feature

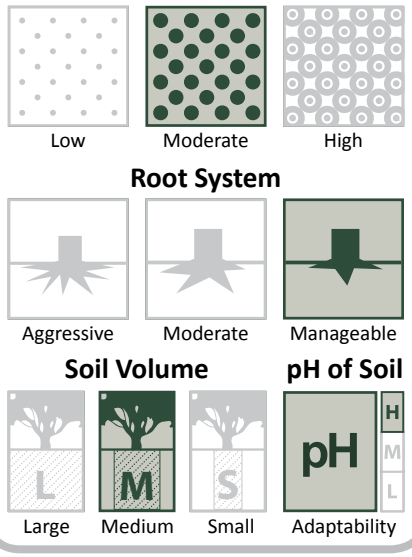
Special Maintenance Requirements

- Crown lifting may be required in sapling to semi-mature phase

Tolerance







Ficus altissima
高山榕, 雞榕

Recommended Street Types

A 1 2 | **B 1 2** | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

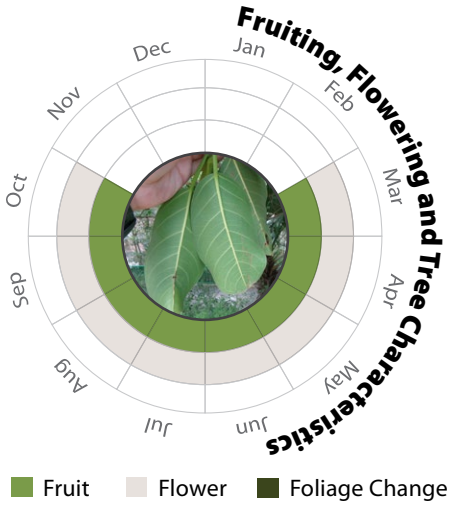
General Information

Native | **Exotic** | **Evergreen** | Deciduous | Partial Shade | **Full Sun**

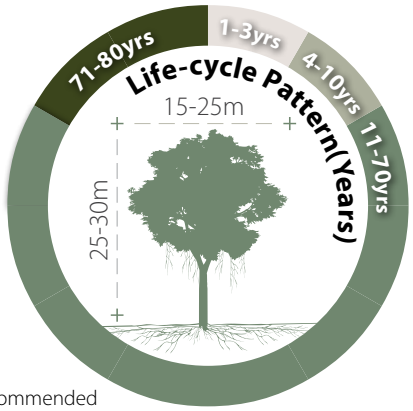
Family: MORACEAE **Heat Tolerance:** Moderate

Special Properties : Fruits attractive to wildlife, Dense foliage; Roosting site; Aerial roots

Fruits



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence



Feature

Ecological Value | Ornamental | Shade Cast

Special Maintenance Requirements

- Tree sap may cause skin irritation
- Crown thinning may be needed to reduce wind resistance
- Moderate maintenance manageability
- Installation of root barriers or guides is recommended

Tolerance

Drought

Low | Moderate | High

Waterlogging

Low | Moderate | High

Wind

Low | Moderate | High

Roadside Pollution

Low | Moderate | High

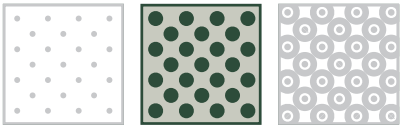
Pest & Disease Resistance

Low | Moderate | High

Pruning

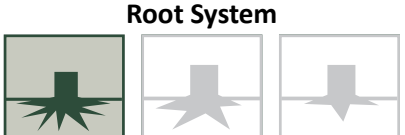
Low | Moderate | High

Soil Compaction



Low | Moderate | High

Root System



Aggressive | Moderate | Manageable

Soil Volume

Large | Medium | Small

pH of Soil

Adaptability

Ficus binnendijkii
阿里垂榕

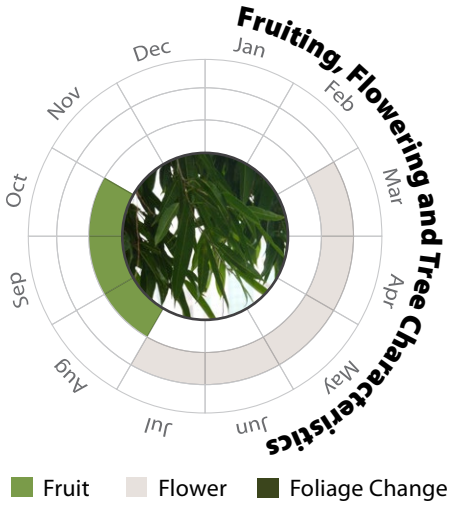
Recommended Street Types

A 1 2 | **B 1 2** | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

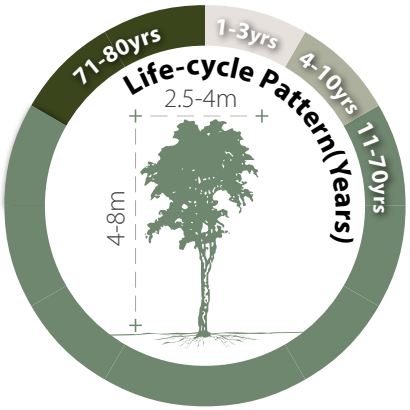
General Information

Native | **Exotic** | **Evergreen** | Deciduous | Partial Shade | **Full Sun**

Family: MORACEAE **Heat Tolerance:** Moderate
Special Properties : Fruits attractive to wildlife; Dense foliage



Propagation to Seedling
Sapling to Semi-mature
Mature
Senescence

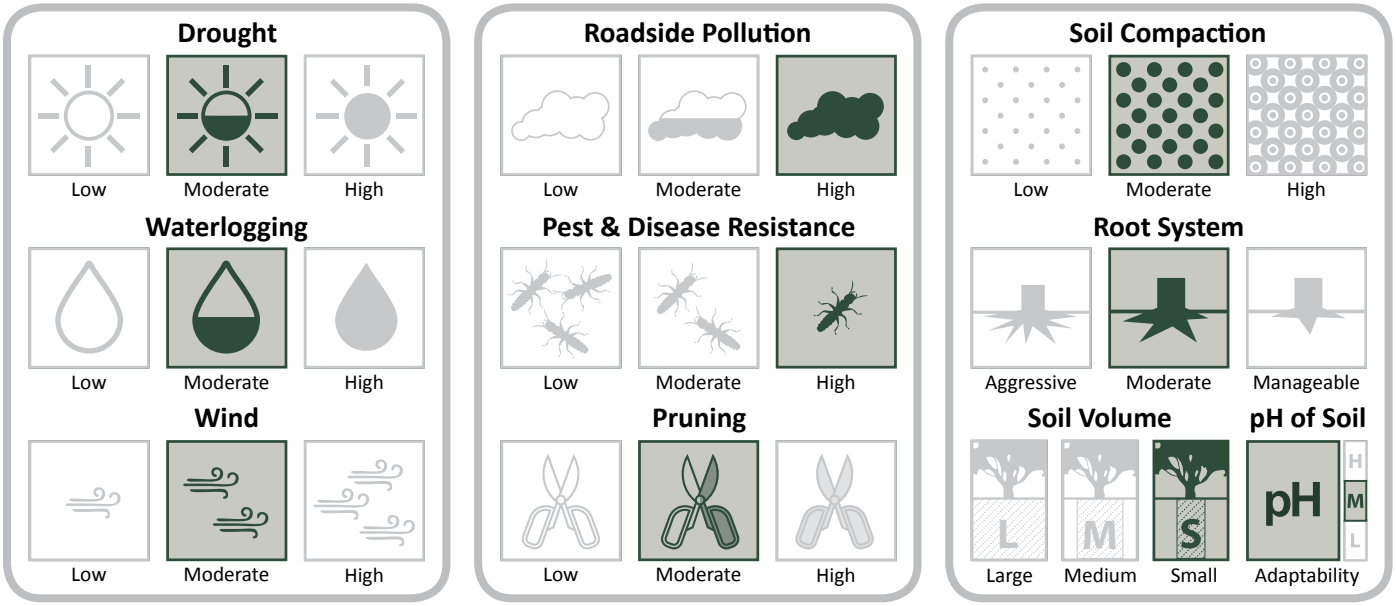


Feature

Special Maintenance Requirements

- Tree sap may cause skin irritation
- Crown thinning may be needed to reduce wind resistance

Tolerance



Ficus fistulosa
水同木

Recommended Street Types

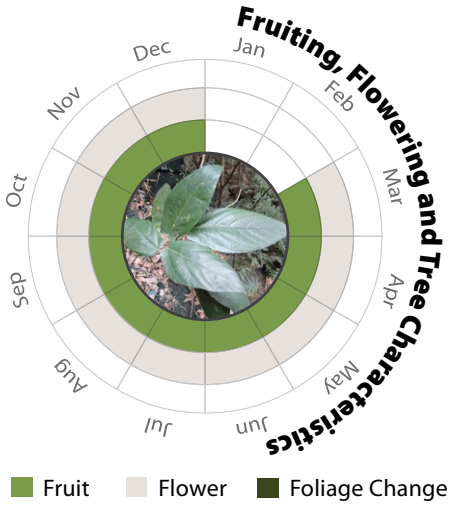
A 1 2 | **B 1 2** | C 1 2 | **D 1 2** | E 1 2 | F 1 2 | G 1 2

General Information

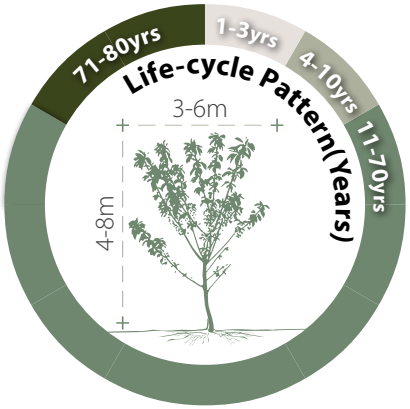
Native | Exotic | **Evergreen** | Deciduous | Partial Shade | **Full Sun**

Family: MORACEAE **Heat Tolerance:** Moderate
Special Properties : Fruits and seeds are attractive to wildlife

Fruits



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence

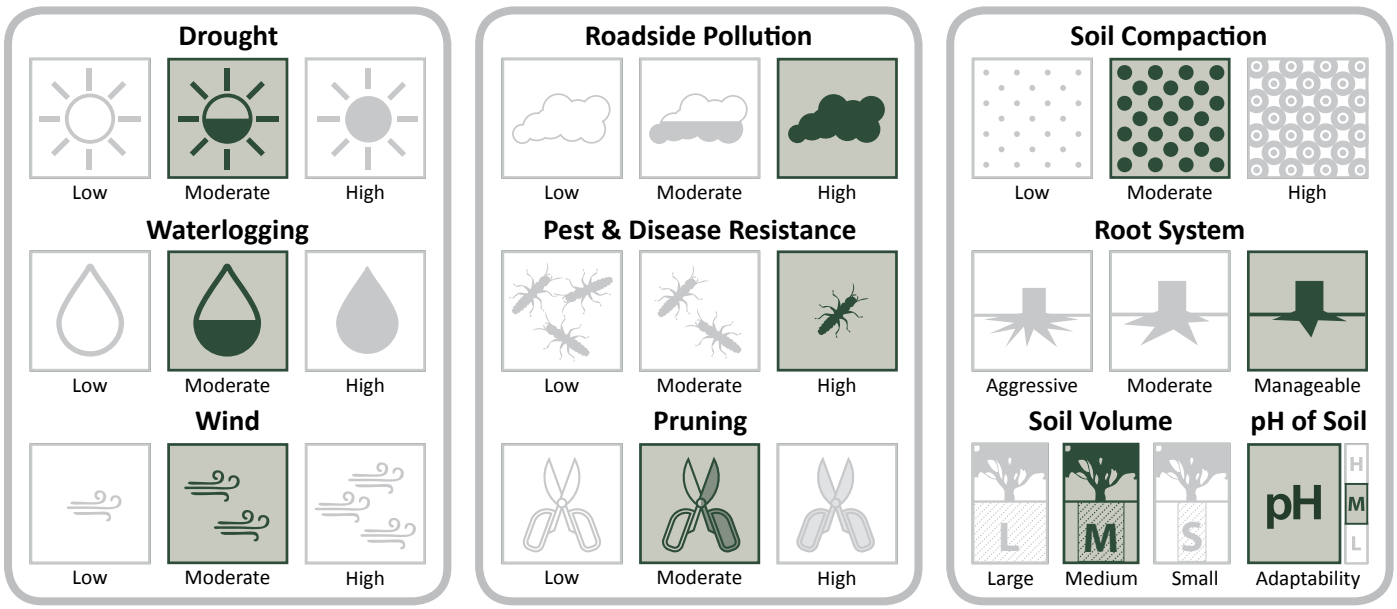


Feature

Special Maintenance Requirements

- Tree sap may cause skin irritation

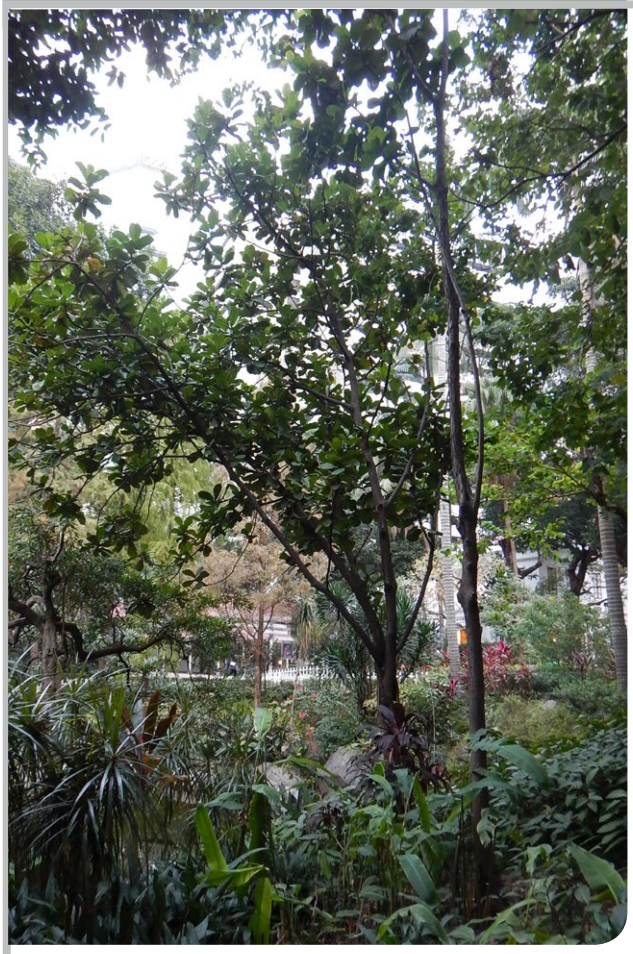
Tolerance



Ficus lyrata
大琴葉榕

Recommended Street Types

A 1 2 | **B 1 2** | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

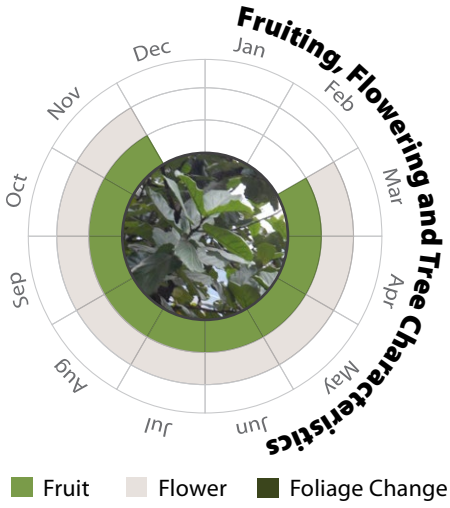


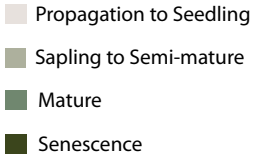
General Information

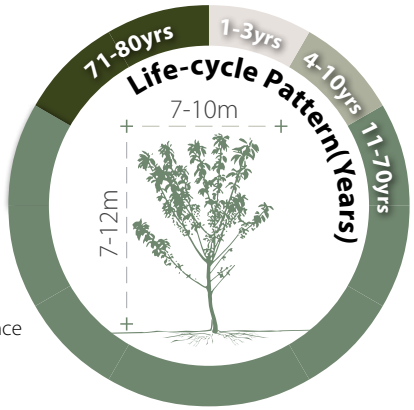
Native | **Exotic** | **Evergreen** | Deciduous | **Partial Shade** | **Full Sun**

Family: MORACEAE **Heat Tolerance:** Moderate

Special Properties : Larval food plant of butterflies; Fruit attractive to wildlife





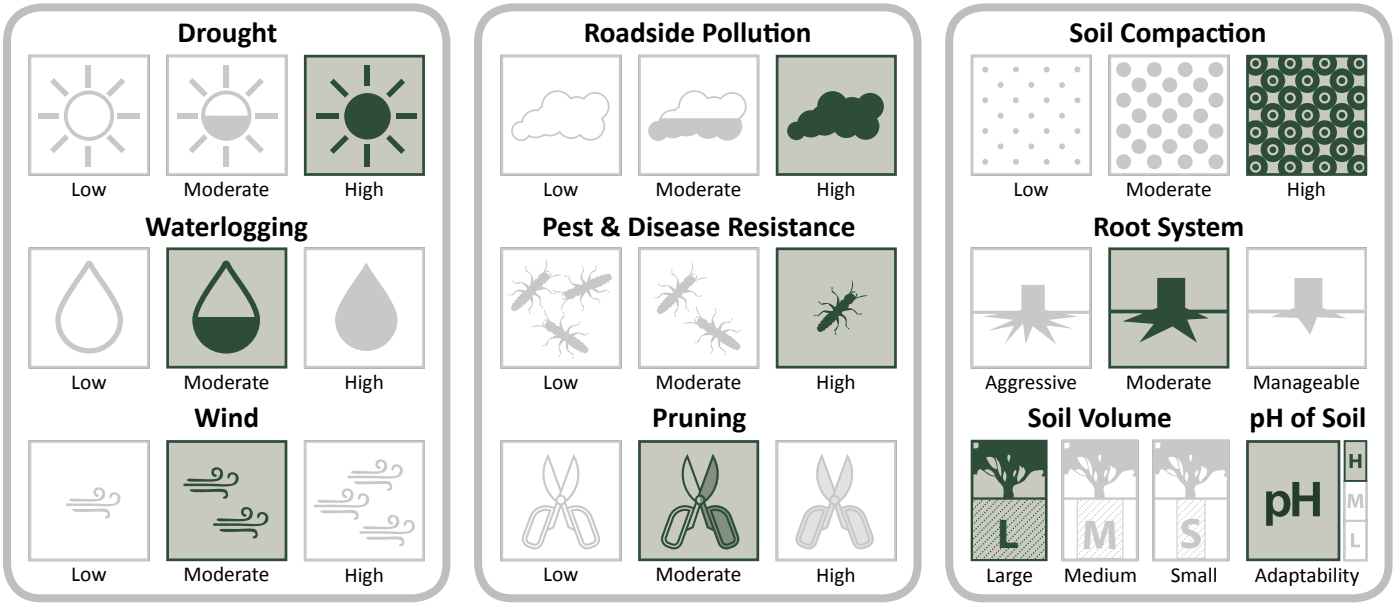


Feature

Special Maintenance Requirements

- Tree sap may cause skin irritation.
- Tree crown may require annual maintenance management

Tolerance



Ficus religiosa
菩提樹

Recommended Street Types

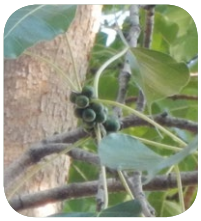
A 1 2 | **B 1 2** | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

General Information

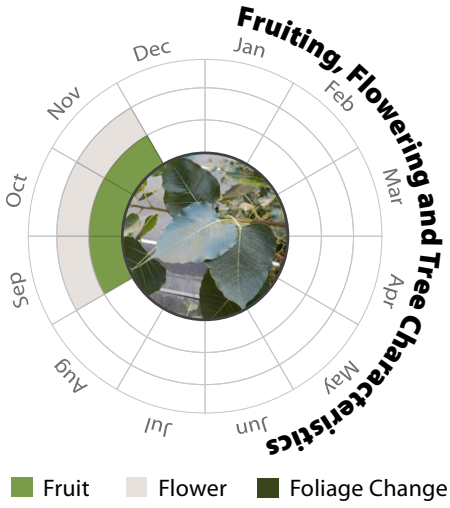
Native | **Exotic** | **Evergreen** | Deciduous | **Partial Shade** | **Full Sun**

Family: MORACEAE **Heat Tolerance:** Moderate

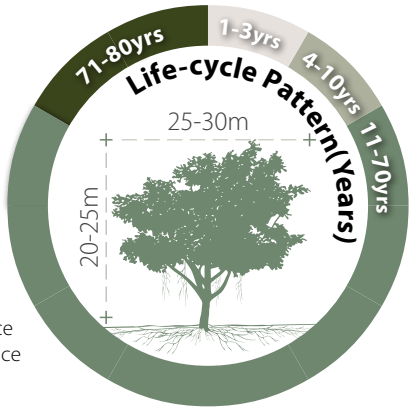
Special Properties : Fruits and seeds attractive to wildlife; Aerial roots; Roosting site



Fruits



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence

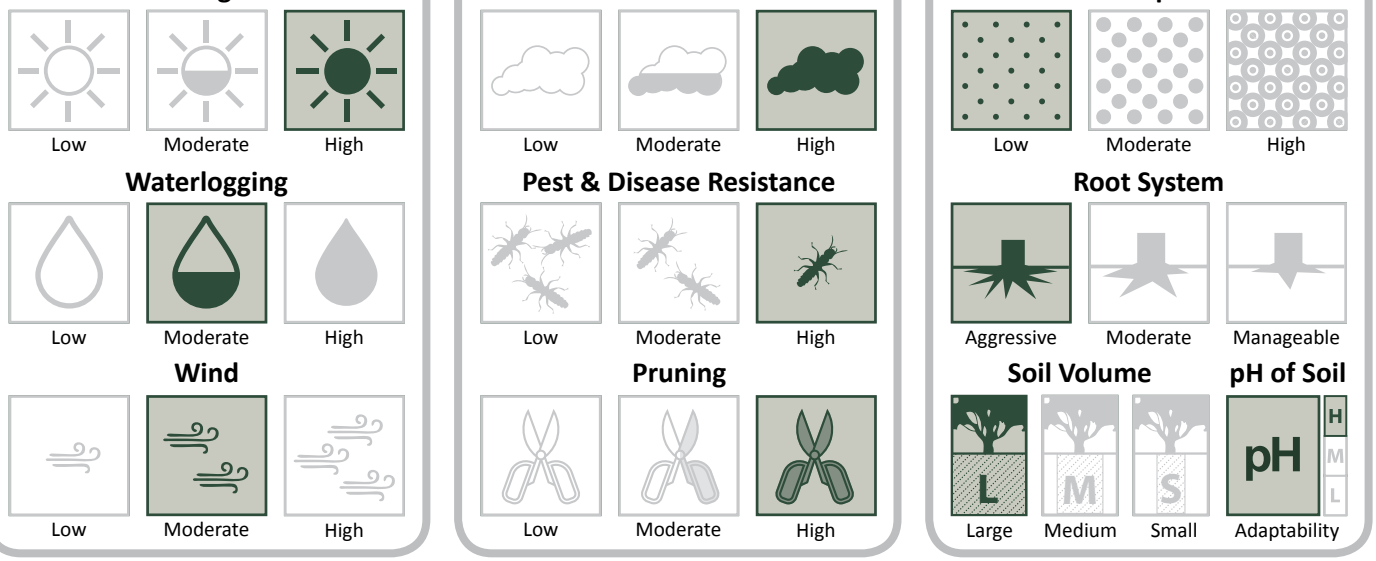


Feature

Special Maintenance Requirements

- Tree sap may cause skin irritation
- Buttress root requires a large planting space
- Tree crown may require annual maintenance
- Installation of root barriers or guides is recommended

Tolerance



Ficus subpisocarpa
筆管榕

Recommended Street Types

A 1 2 | **B 1 2** | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

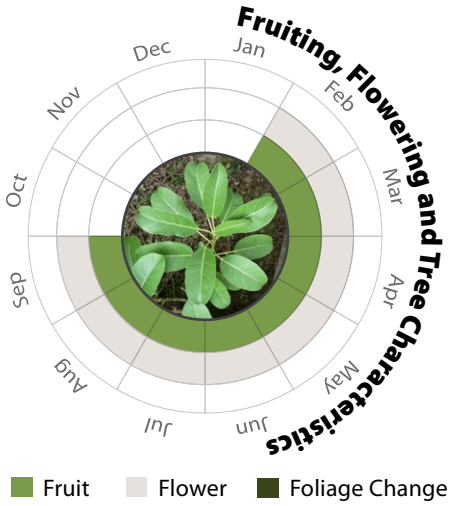
General Information

Native | Exotic | Evergreen | **Deciduous** | **Partial Shade** | **Full Sun**

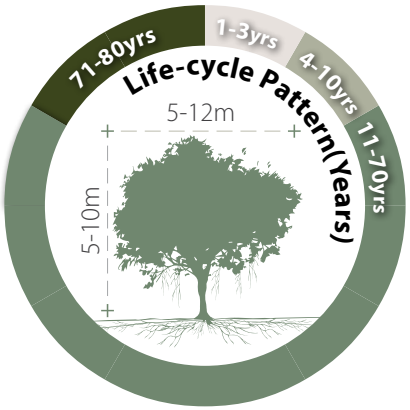
Family: MORACEAE **Heat Tolerance:** Moderate

Special Properties : Fruits attractive to wildlife; Aerial roots

Fruits



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence

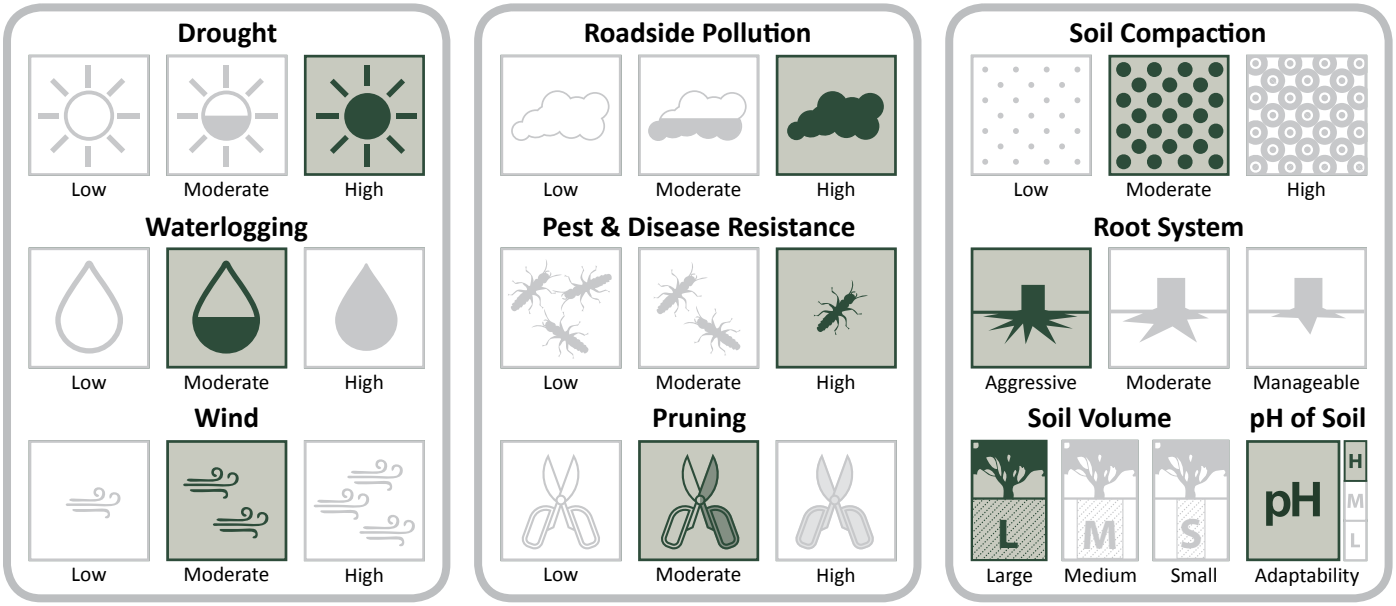


Feature

Special Maintenance Requirements

- Tree sap may cause skin irritation
- Installation of root barriers or guides is recommended

Tolerance



Ficus variegata
青果榕

Recommended Street Types

A 1/2 | B 1/2 | C 1/2 | D 1/2 | E 1/2 | F 1/2 | G 1/2

General Information

Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

Family: MORACEAE **Heat Tolerance:** Moderate

Special Properties : Fruits attractive to wildlife; Larval food plant of butterflies; Roosting site

Buttress Roots

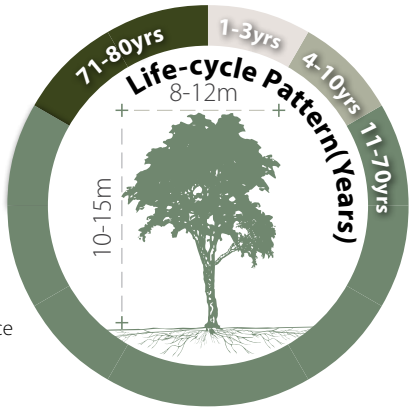
Fruits

Propagation to Seedling

Sapling to Semi-mature

Mature

Senescence



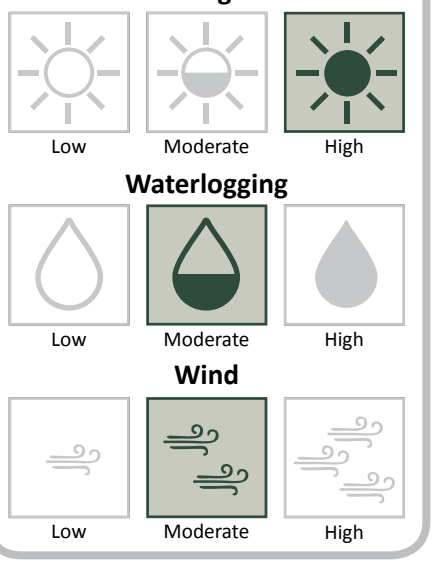
Feature

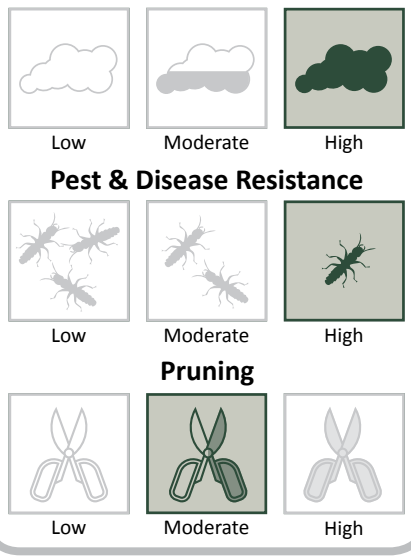
Ecological Value | Ornamental | Shade Cast

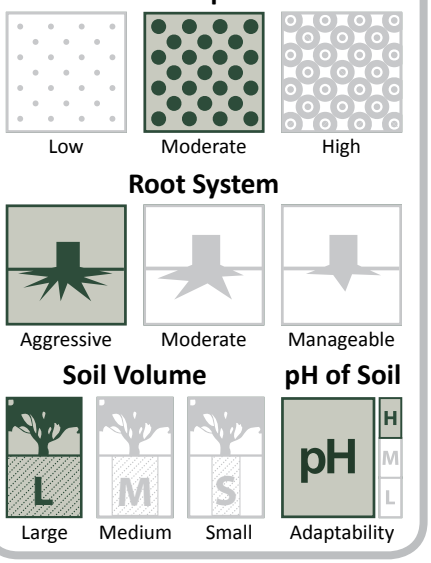
Special Maintenance Requirements

- Tree sap may cause skin irritation
- Buttress root requires a large planting space
- Installation of root barriers or guides is recommended

Tolerance



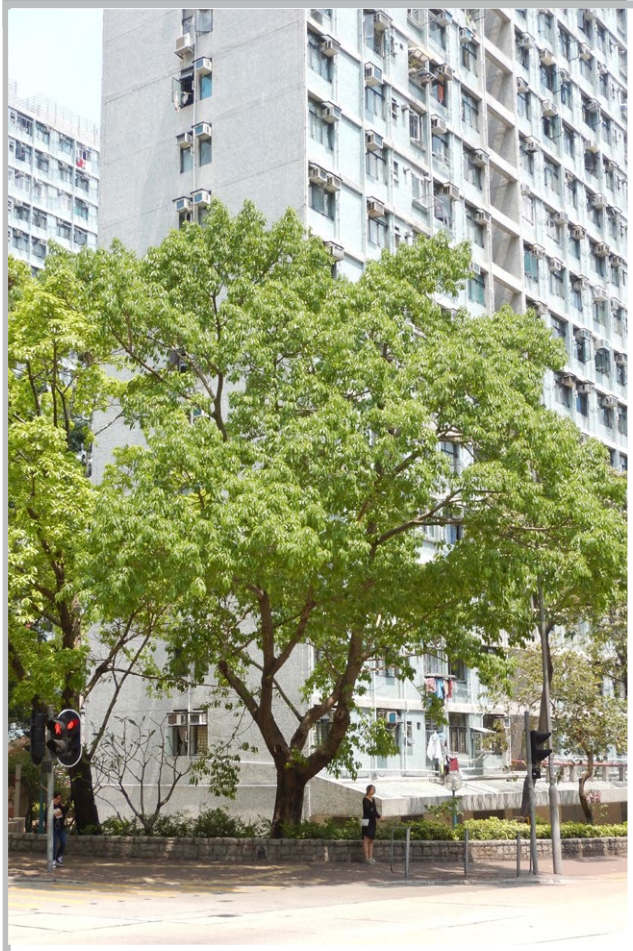




Ficus virens
大葉榕, 黃葛樹

Recommended Street Types

A 1 2 | **B 1 2** | C 1 2 | **D 1 2** | E 1 2 | F 1 2 | G 1 2



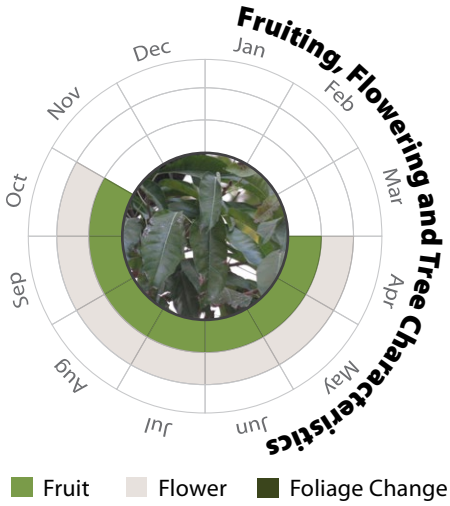
General Information

Native | Exotic | Evergreen | **Deciduous** | Partial Shade | **Full Sun**

Family: MORACEAE **Heat Tolerance:** Moderate

Special Properties : Fruits attractive to wildlife; Aerial roots; Roosting site

Buttress Roots

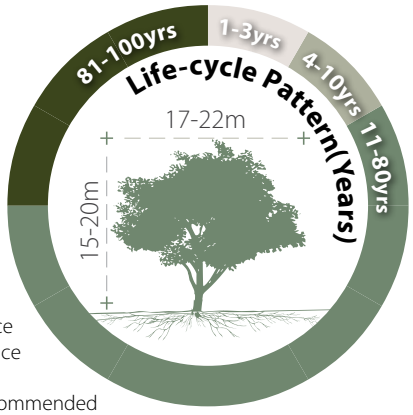


Propagation to Seedling

Sapling to Semi-mature

Mature

Senescence

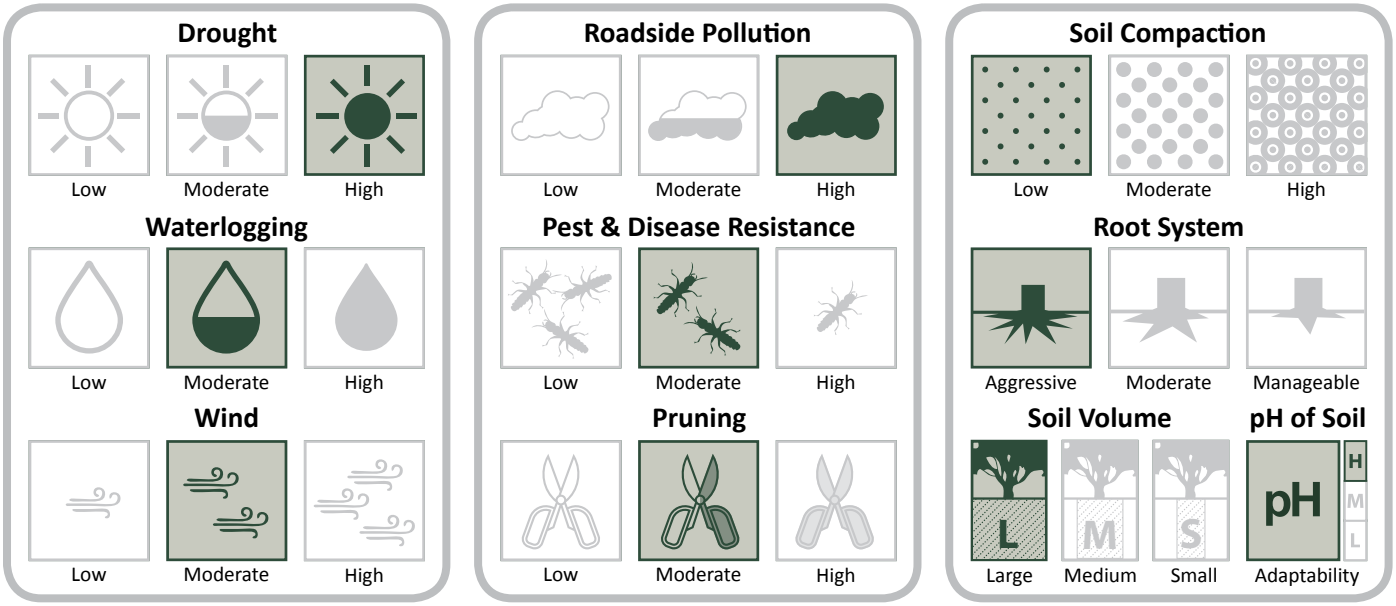


Feature

Special Maintenance Requirements

- Tree sap may cause skin irritation
- Buttress root requires a large planting space
- Tree crown may require annual maintenance
- Moderate maintenance manageability
- Installation of root barriers or guides is recommended

Tolerance



Garcinia subelliptica
菲島福木

Recommended Street Types: **A** 1 2 **B** 1 2 **C** 1 2 D 1 2 **E** 1 2 F 1 2 G 1 2

General Information

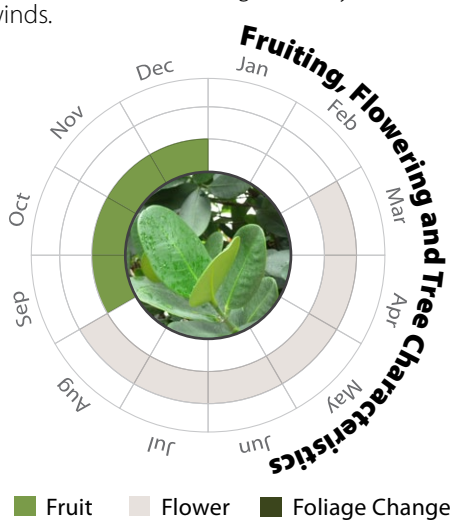
Native | **Exotic** | **Evergreen** | Deciduous | **Partial Shade** | **Full Sun**

Family: CLUSIACEAE **Heat Tolerance:** Moderate

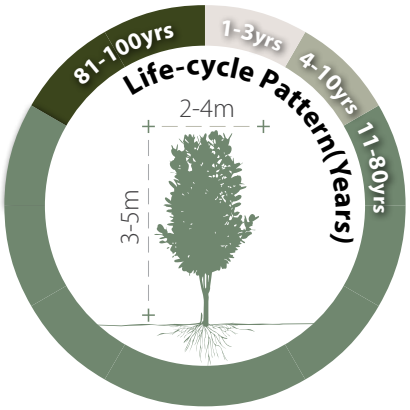
Special Properties: Dense tree with beautiful glossy foliage; Bright orange fruits are attractive to wildlife. Doubling fruit may occur. It tolerates salty coastal winds.

Flowers

Fruits



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence



Feature

Special Maintenance Requirements

- No Special Maintenance Requirements

Tolerance

Drought

Waterlogging

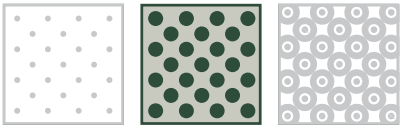
Wind

Roadside Pollution

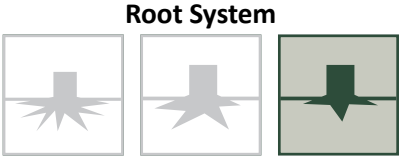
Pest & Disease Resistance

Pruning

Soil Compaction



Root System



Soil Volume

pH of Soil

Hyophorbe lagenicaulis
酒瓶椰子

Recommended Street Types

A 1/2 | B 1/2 | **C 1/2** | D 1/2 | **E 1/2** | F 1/2 | G 1/2

General Information

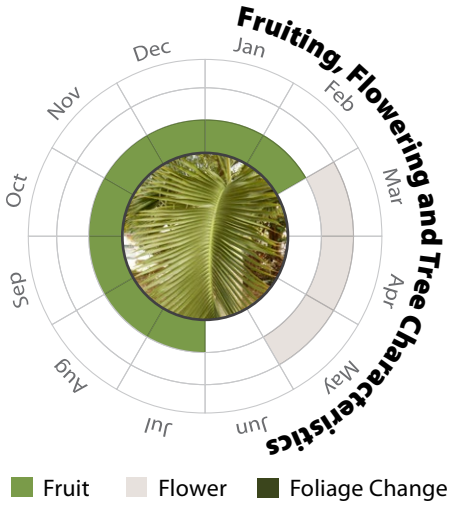
Native | **Exotic** | **Evergreen** | Deciduous | **Partial Shade** | **Full Sun**

Family: ARECACEAE **Heat Tolerance:** Moderate

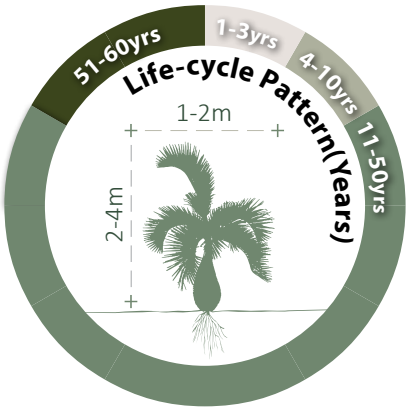
Special Properties : Distinctive swollen bottle-like trunk; Fruits attractive to wildlife

Flowers

Fruits



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence



Feature

Ecological Value | Ornamental | Shade Cast

Special Maintenance Requirements

- No Special Maintenance Requirements

Tolerance

Drought

Waterlogging

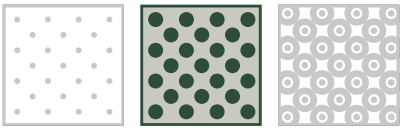
Wind

Roadside Pollution

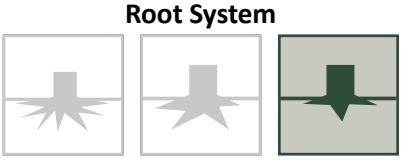
Pest & Disease Resistance

Pruning

Soil Compaction



Root System



Soil Volume

pH of Soil

Ilex rotunda var. *microcarpa*
小果鐵冬青

Recommended Street Types

A 1 2 B 1 2 C 1 2 D 1 2 E 1 2 F 1 2 G 1 2

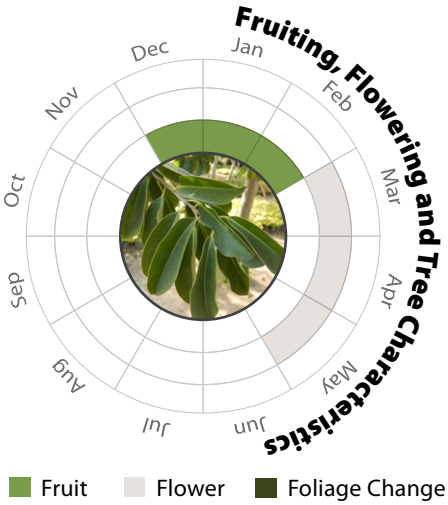
General Information

Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

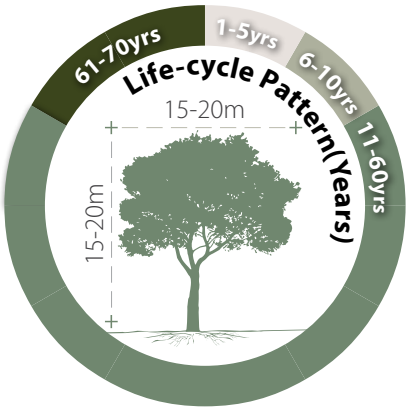
Family: AQUIFOLIACEAE **Heat Tolerance:** Moderate
Special Properties : Fruits attractive to wildlife

Flowers

Fruits



Propagation to Seedling
Sapling to Semi-mature
Mature
Senescence



Feature

Special Maintenance Requirements

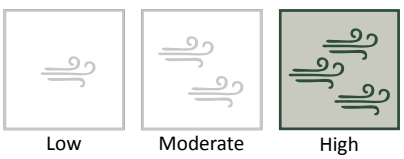
- No Special Maintenance Requirements

Tolerance

Drought

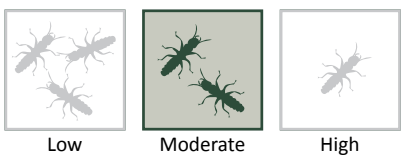
Waterlogging

Wind



Roadside Pollution

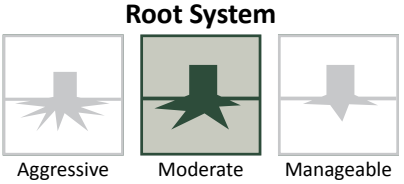
Pest & Disease Resistance



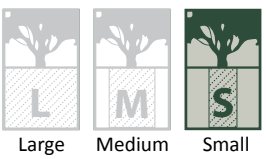
Pruning

Soil Compaction

Root System



Soil Volume



pH of Soil

Juniperus chinensis 'Kaizuka'
龍柏

Recommended Street Types: A 1/2 | B 1/2 | C 1/2 | D 1/2 | E 1/2 | F 1/2 | G 1/2

General Information

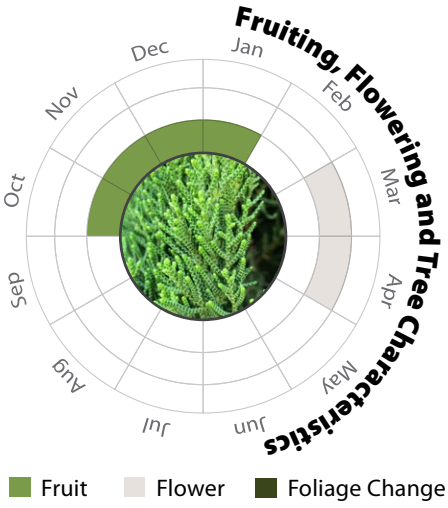
Native | **Exotic** | **Evergreen** | Deciduous | **Partial Shade** | **Full Sun**

Family: CUPRESSACEAE **Heat Tolerance:** Moderate

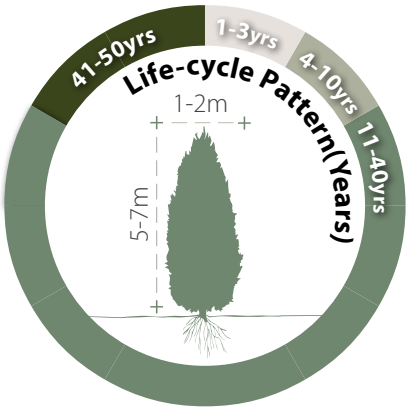
Special Properties : Dense foliage can be sculpted into topiaries; Attracts birds

Flowers

Fruits



Propagation to Seedling
Sapling to Semi-mature
Mature
Senescence



Feature

Ecological Value | Ornamental | Shade Cast

Special Maintenance Requirements

- Foliage may cause skin irritation

Tolerance

Drought

Waterlogging

Wind

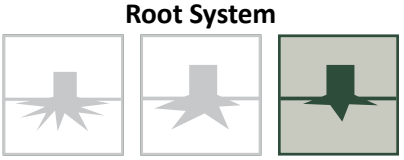
Roadside Pollution

Pest & Disease Resistance

Pruning

Soil Compaction

Root System



Soil Volume

pH of Soil

Khaya senegalensis
非洲楝

Recommended Street Types

A 1 2 B 1 2 **C 1 2** D 1 2 E 1 2 F 1 2 G 1 2

General Information

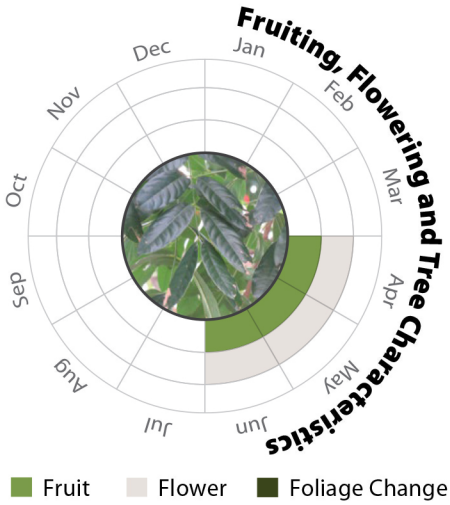
Native | **Exotic** | **Evergreen** | Deciduous | **Partial Shade** | **Full Sun**

Family: MELIACEAE **Heat Tolerance:** Moderate

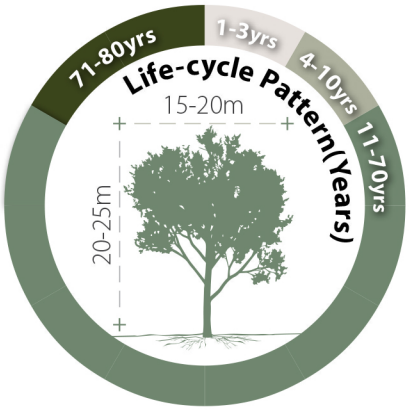
Special Properties : Fruits bear seed at 20-25 years old

Flowers

Tree Bark



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence



Feature

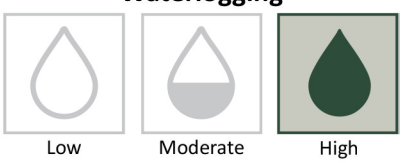
Special Maintenance Requirements

- No Special Maintenance Requirements

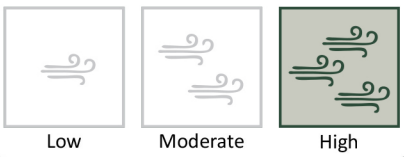
Tolerance

Drought

Waterlogging

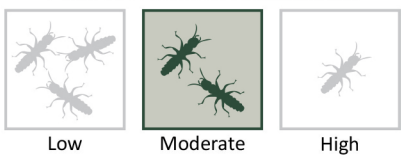


Wind

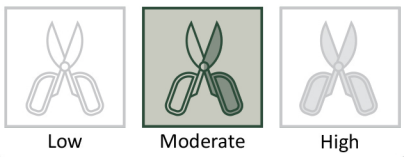


Roadside Pollution

Pest & Disease Resistance

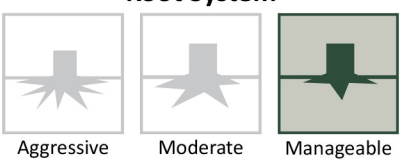


Pruning

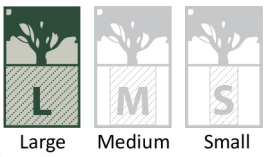


Soil Compaction

Root System



Soil Volume



pH of Soil

Koelreuteria elegans subsp. *formosana*
台灣欒樹

Recommended Street Types

A 1/2 | **B 1/2** | C 1/2 | D 1/2 | E 1/2 | F 1/2 | G 1/2

General Information

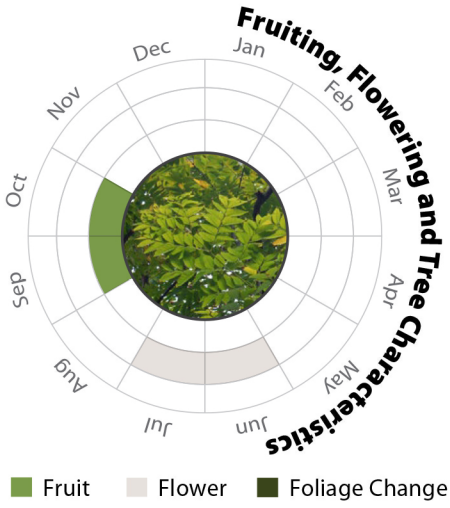
Native | **Exotic** | Evergreen | **Deciduous** | **Partial Shade** | **Full Sun**

Family: SAPINDACEAE **Heat Tolerance:** Moderate

Special Properties : Orange-red three-lobed capsule fruit, Fragrant flowers

Tree Bark

Fruits

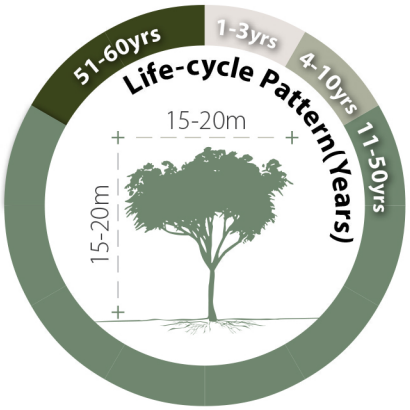


Propagation to Seedling

Sapling to Semi-mature

Mature

Senescence



Feature

Special Maintenance Requirements

- No Special Maintenance Requirements

Tolerance

Drought

Waterlogging

Wind

Roadside Pollution

Pest & Disease Resistance

Pruning

Soil Compaction

Root System

Soil Volume

pH of Soil

Liquidambar formosana
楓香

Recommended Street Types

A 1/2 B 1/2 C 1/2 D 1/2 E 1/2 F 1/2 G 1/2

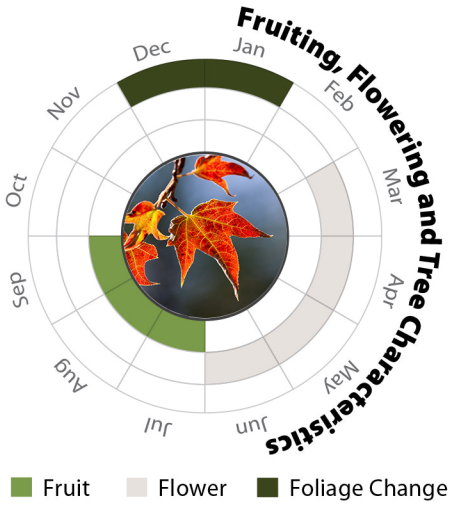
General Information

Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

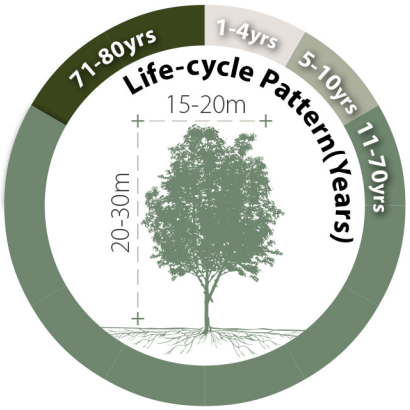
Family: HAMAMELIDACEAE **Heat Tolerance:** Moderate

Special Properties : Fruits, seeds and flower nectar attractive to wildlife; Red and gold colored fall foliage

Fruits



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence

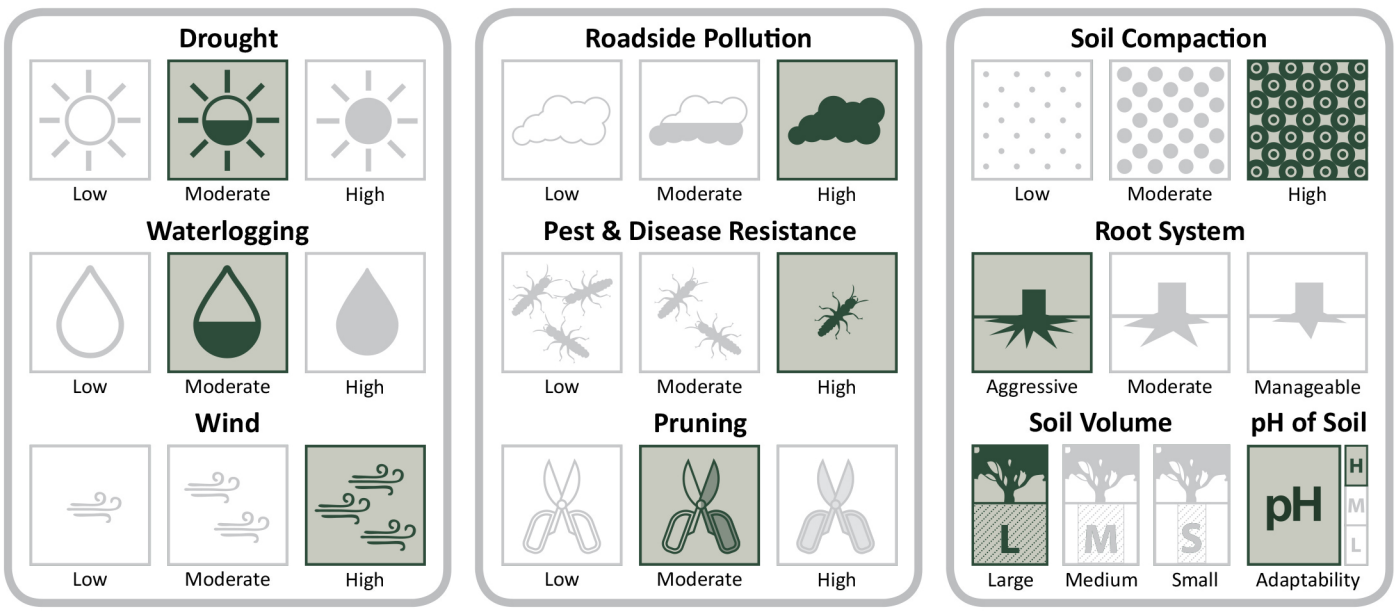


Feature

Special Maintenance Requirements

- Moderate maintenance manageability
- Installation of root barriers or guides is recommended

Tolerance



Litsea glutinosa
潺槁樹

Recommended Street Types

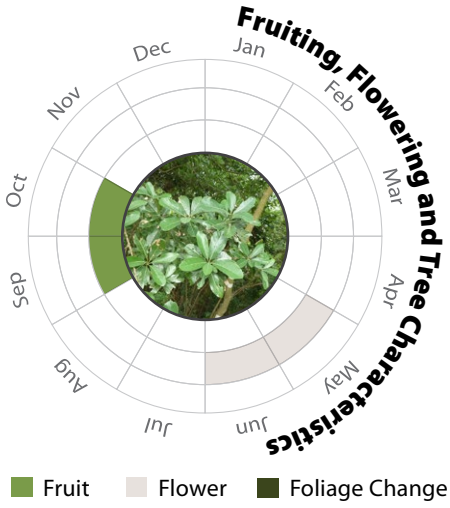
A 1 2 | **B 1 2** | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

General Information

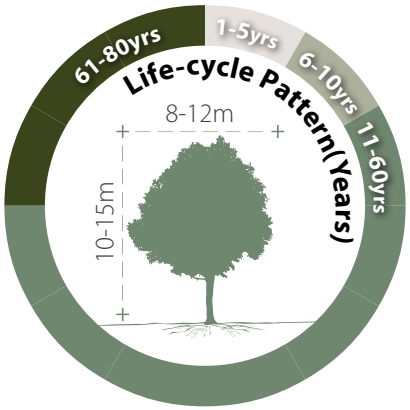
Native | Exotic | **Evergreen** | Deciduous | **Partial Shade** | **Full Sun**

Family: LAURACEAE **Heat Tolerance:** Moderate
Special Properties : Flower nectar and fruits attractive to wildlife

Flowers



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence



Feature

Special Maintenance Requirements

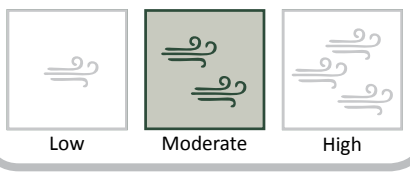
- No Special Maintenance Requirements

Tolerance

Drought

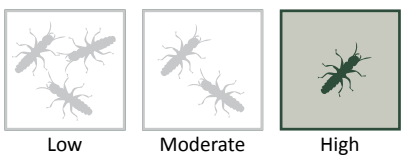
Waterlogging

Wind

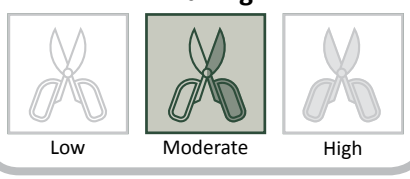


Roadside Pollution

Pest & Disease Resistance

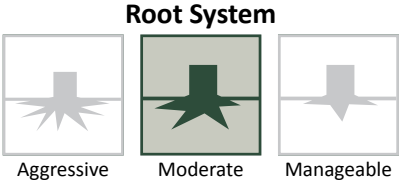


Pruning



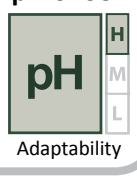
Soil Compaction

Root System



Soil Volume

pH of Soil



Litsea monopetala
假柿木薑子,假柿樹

Recommended Street Types

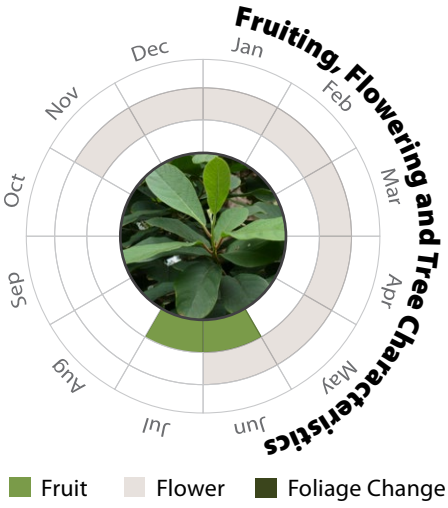
A 1 2 | B 1 2 | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

General Information

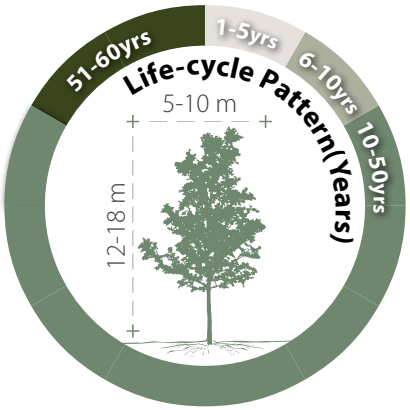
Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

Family: LAURACEAE **Heat Tolerance:** Moderate
Special Properties : Fruits attractive to wildlife

Flowers



Propagation to Seedling
Sapling to Semi-mature
Mature
Senescence

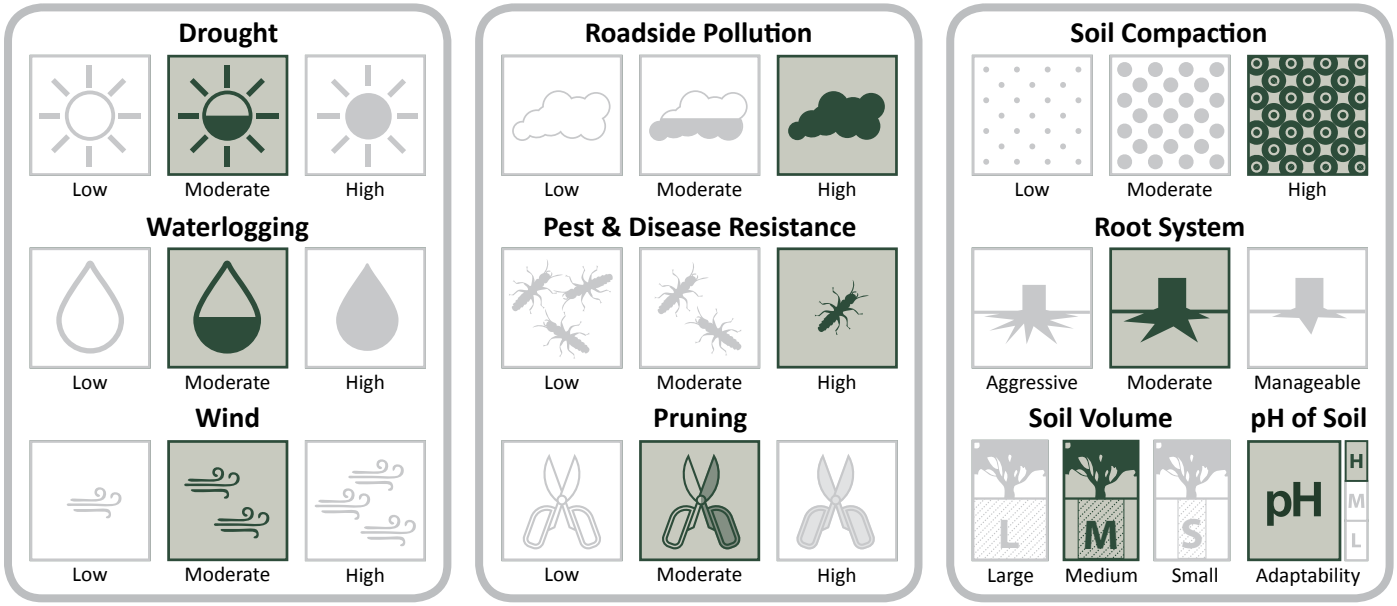


Feature

Special Maintenance Requirements

- No Special Maintenance Requirements

Tolerance



Machilus breviflora
短序潤楠, 短花楠

Recommended Street Types

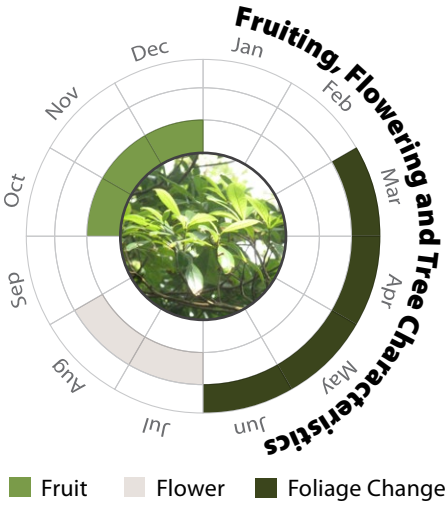
A 1 2 B 1 2 C 1 2 D 1 2 E 1 2 F 1 2 G 1 2

General Information

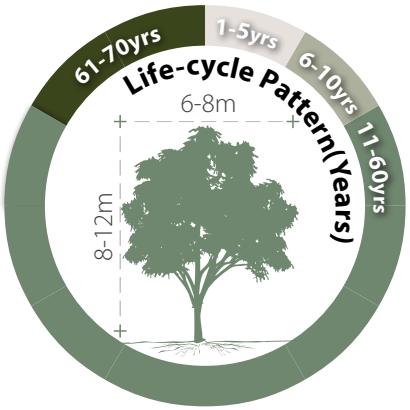
Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

Family: LAURACEAE **Heat Tolerance:** High
Special Properties : Flower nectar and fruits attractive to wildlife

Tree Bark



Propagation to Seedling
Sapling to Semi-mature
Mature
Senescence



Feature

Ecological Value | Ornamental | Shade Cast

Special Maintenance Requirements

- No Special Maintenance Requirements

Tolerance

Drought

Low | Moderate | High

Waterlogging

Low | Moderate | High

Wind

Low | Moderate | High

Roadside Pollution

Low | Moderate | High

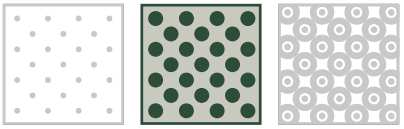
Pest & Disease Resistance

Low | Moderate | High

Pruning

Low | Moderate | High

Soil Compaction



Low | Moderate | High

Root System

Aggressive | Moderate | Manageable

Soil Volume

Large | Medium | Small

pH of Soil

Adaptability

Machilus chekiangensis
浙江潤楠

Recommended Street Types: A 1 2 | B 1 2 | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

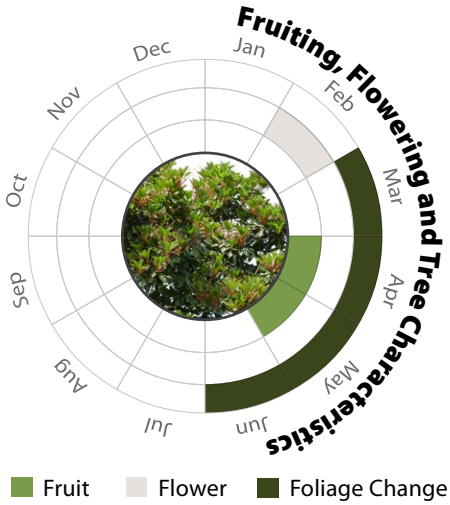
General Information

Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

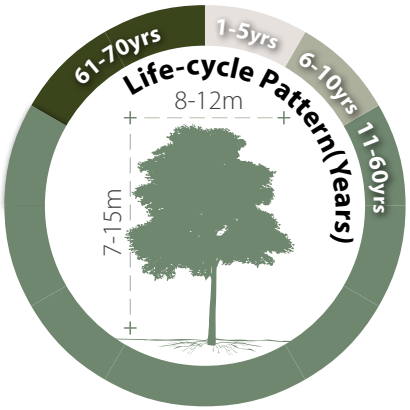
Family: LAURACEAE **Heat Tolerance:** High
Special Properties : Fruits attractive to wildlife


Flowers


Fruits



Propagation to Seedling
Sapling to Semi-mature
Mature
Senescence



Feature

Ecological Value | Ornamental | Shade Cast

Special Maintenance Requirements

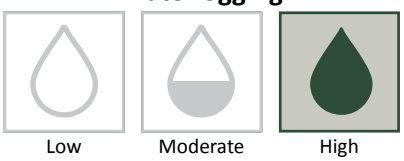
- No Special Maintenance Requirements

Tolerance

Drought


Low | Moderate | High

Waterlogging


Low | Moderate | High

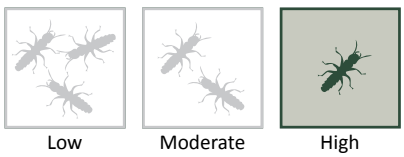
Wind


Low | Moderate | High

Roadside Pollution


Low | Moderate | High

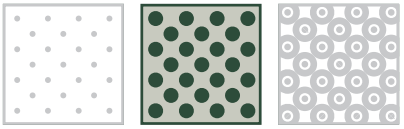
Pest & Disease Resistance


Low | Moderate | High

Pruning


Low | Moderate | High

Soil Compaction


Low | Moderate | High

Root System


Aggressive | Moderate | Manageable

Soil Volume

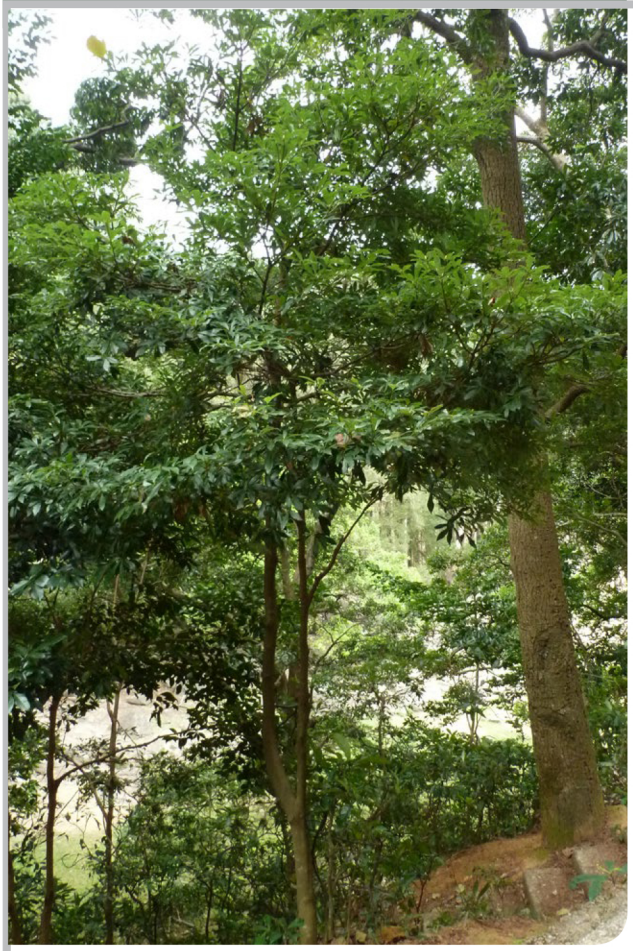
Large | Medium | Small

pH of Soil

Adaptability

Machilus chinensis
華潤楠, 香港楠

Recommended Street Types
A 1/2 B 1/2 C 1/2 D 1/2 E 1/2 F 1/2 G 1/2

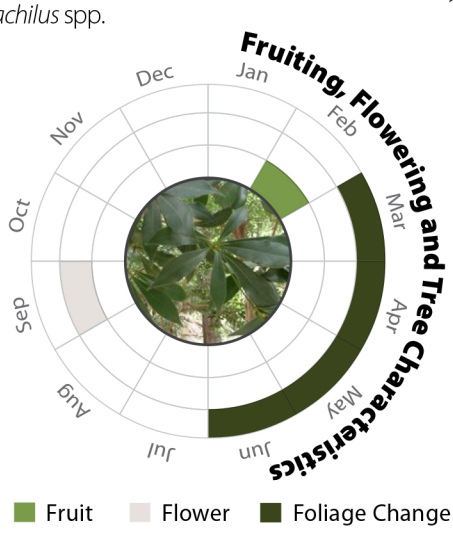


General Information

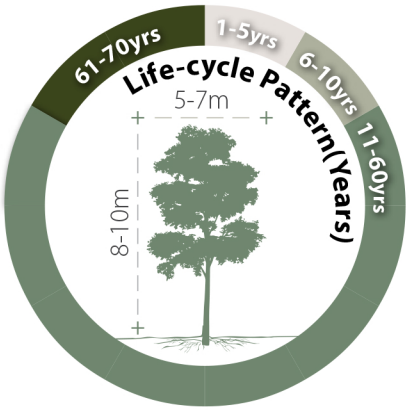
Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

Family: LAURACEAE **Heat Tolerance:** Moderate
Special Properties : Fruits attractive to wildlife; Sourcing should be carefully examined as *Machilus chinensis* has been mis-used extensively in China for almost all *Machilus* spp.


Fruits



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence

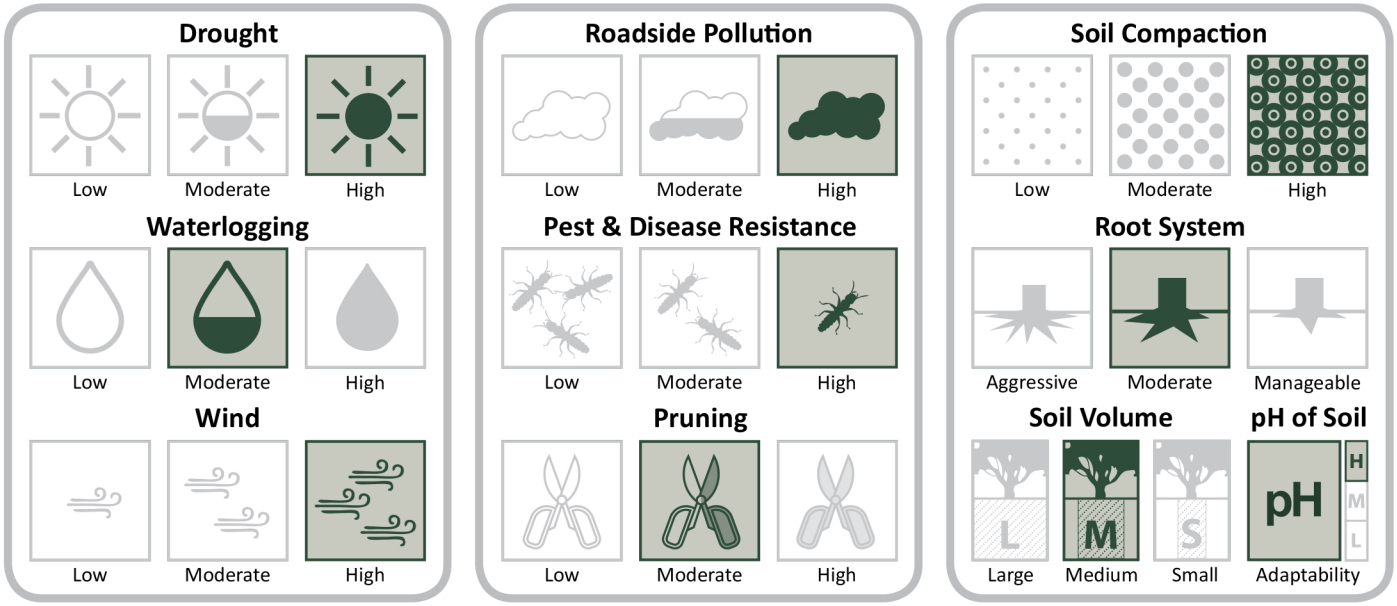


Feature

Special Maintenance Requirements

- No Special Maintenance Requirements

Tolerance



Machilus velutina
絨毛潤楠

Recommended Street Types

A 1/2 B 1/2 C 1/2 D 1/2 E 1/2 F 1/2 G 1/2

General Information

Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

Family: LAURACEAE **Heat Tolerance:** Moderate

Special Properties : Leaf blade leathery; fruits attractive to wildlife

Flowers

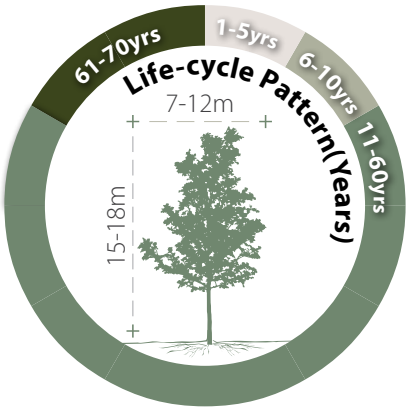
Tree Bark

Propagation to Seedling

Sapling to Semi-mature

Mature

Senescence

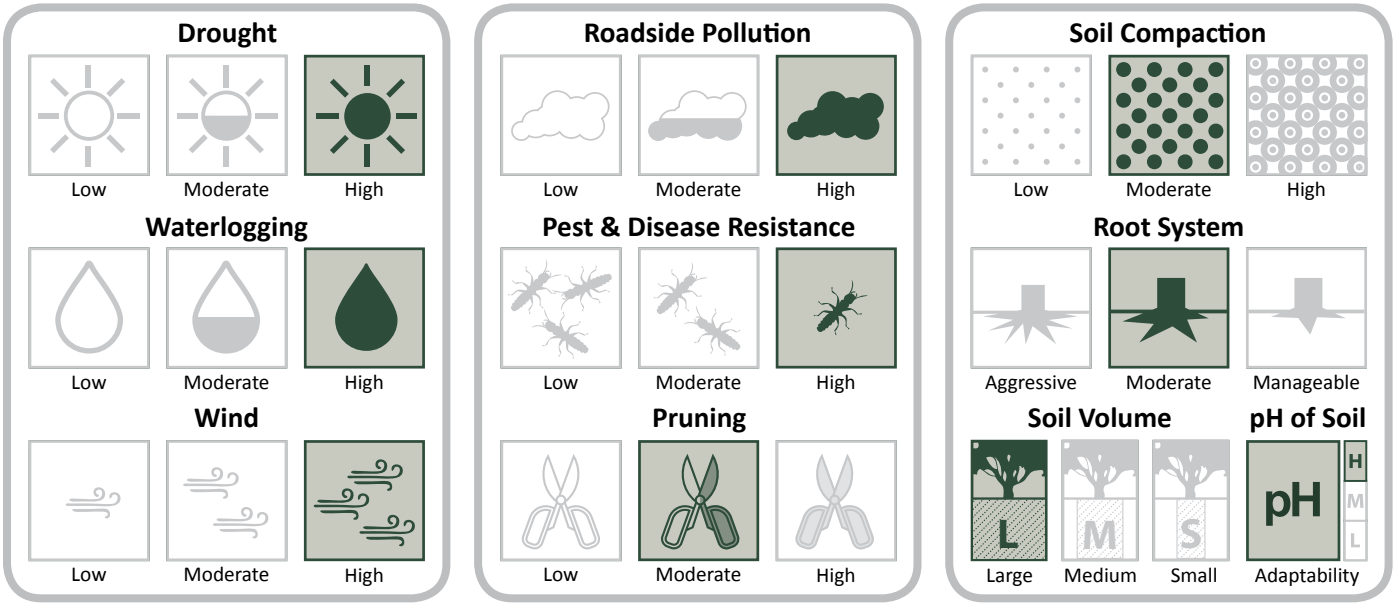


Feature

Special Maintenance Requirements

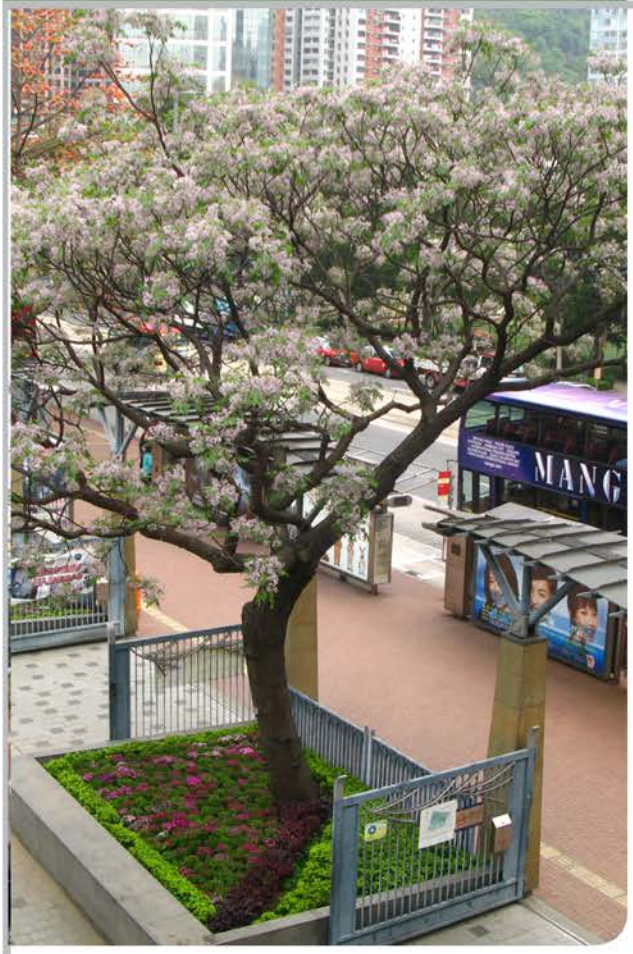
- No Special Maintenance Requirements

Tolerance



Melia azedarach
棟, 苦楝

Recommended Street Types
A 1/2 | **B 1/2** | C 1/2 | D 1/2 | E 1/2 | F 1/2 | G 1/2



General Information

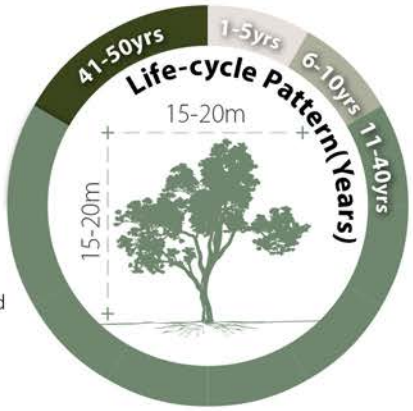
Native | **Exotic** | Evergreen | **Deciduous** | **Partial Shade** | **Full Sun**

Family: MELIACEAE **Heat Tolerance:** High
Special Properties : Fruits and flower nectar attractive to wildlife; tolerates salty coastal winds


Flowers


Tree Bark

Propagation to Seedling
Sapling to Semi-mature
Mature
Senescence

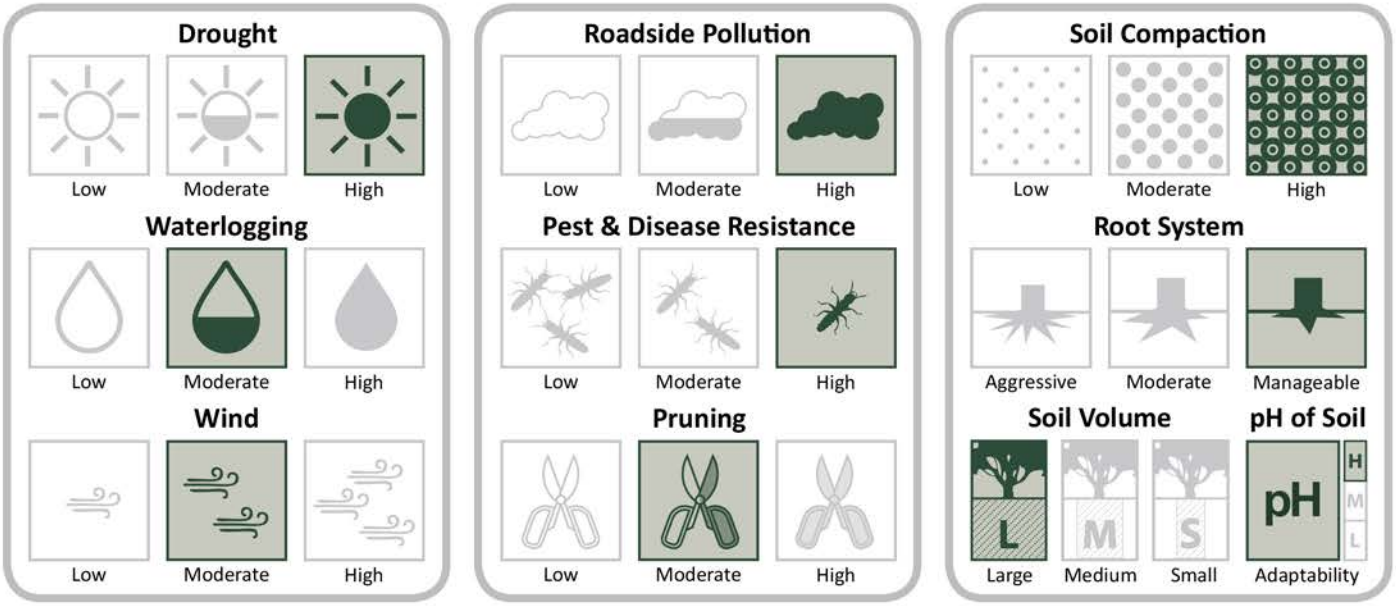


Feature

Special Maintenance Requirements

- Timely removal of leaf litter is recommended to avoid altering soil pH
- Moderate maintenance manageability
- Entire plant is poisonous

Tolerance



Michelia champaca
黃蘭

Recommended Street Types: A 1/2 | B 1/2 | C 1/2 | D 1/2 | E 1/2 | F 1/2 | G 1/2

General Information

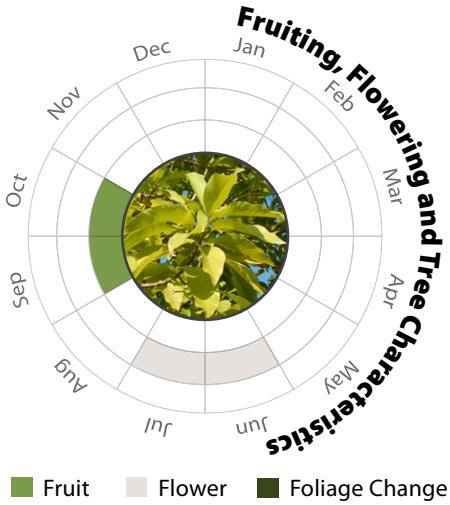
Native | **Exotic** | **Evergreen** | Deciduous | **Partial Shade** | **Full Sun**

Family: MAGNOLIACEAE **Heat Tolerance:** Moderate

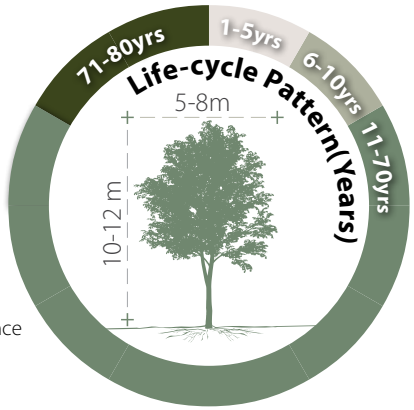
Special Properties : Larval foodplants of butterflies; Fragrant flowers, Roosting site; Dense foliage

Flowers

Fruits



Propagation to Seedling
Sapling to Semi-mature
Mature
Senescence



Feature

Special Maintenance Requirements

- Formative pruning is recommended
- Tree crown may require annual maintenance

Tolerance

Drought

Waterlogging

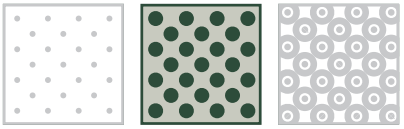
Wind

Roadside Pollution

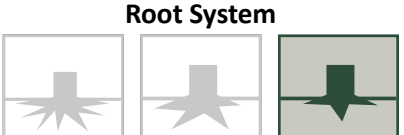
Pest & Disease Resistance

Pruning

Soil Compaction



Root System



Soil Volume

pH of Soil

Microcos nervosa
布渣葉

Recommended Street Types

A 1 2 B 1 2 C 1 2 D 1 2 E 1 2 F 1 2 G 1 2

General Information

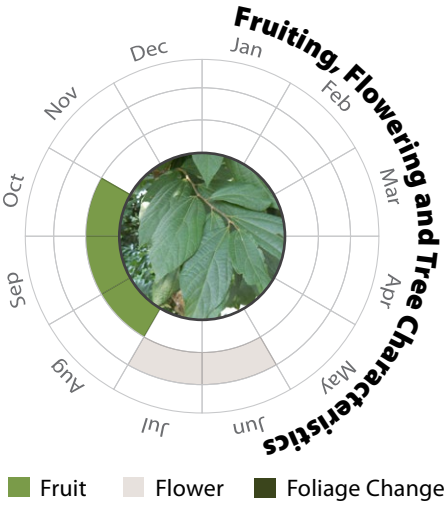
Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

Family: TILIACEAE **Heat Tolerance:** Moderate

Special Properties : Fruits attractive to wildlife; Larval food plant of butterflies

Flower

Fruits

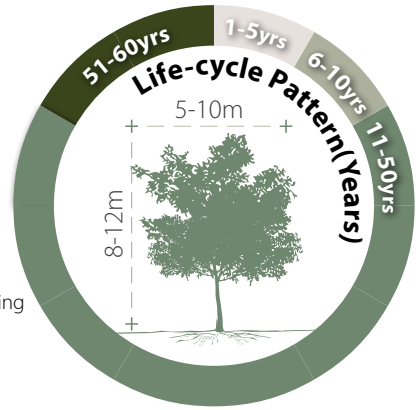


Propagation to Seedling

Sapling to Semi-mature

Mature

Senescence

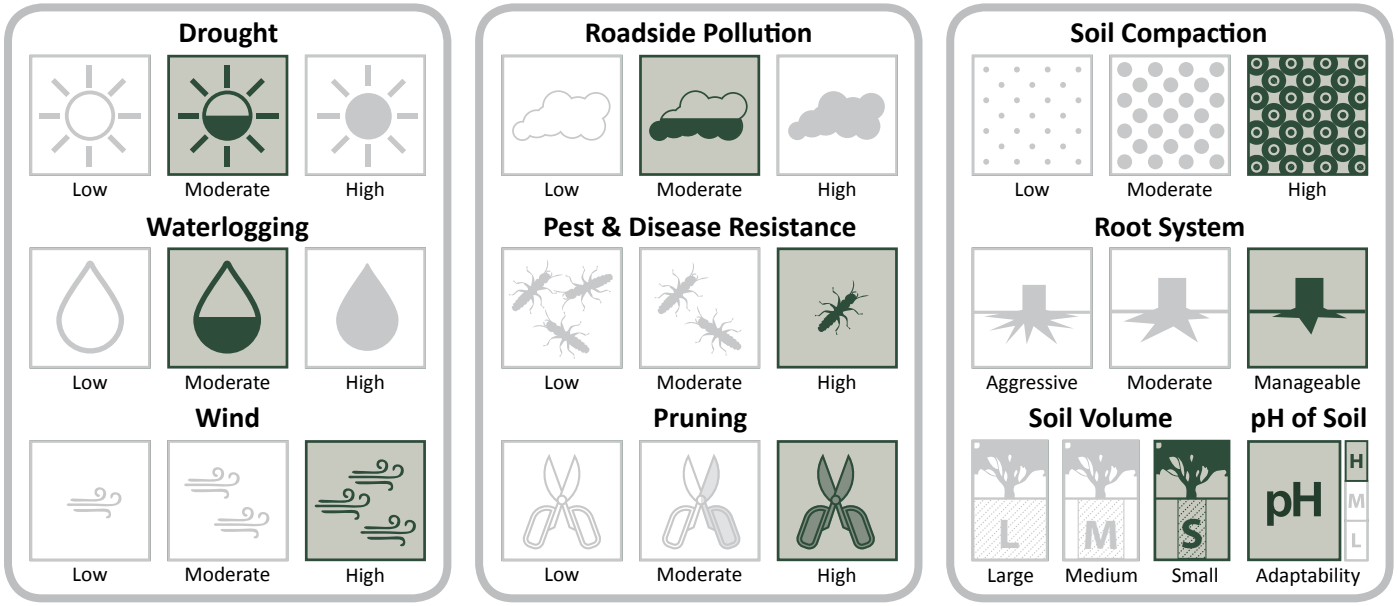


Feature

Special Maintenance Requirements

- Shrubby form may require formative pruning

Tolerance



Nageia nagi
竹柏

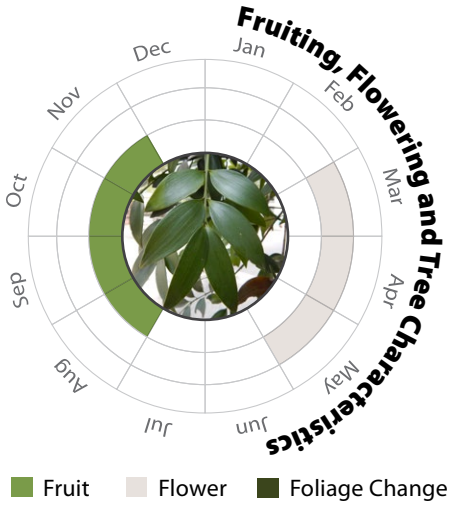
Recommended Street Types
A 1 2 B 1 2 C 1 2 D 1 2 E 1 2 F 1 2 G 1 2

General Information

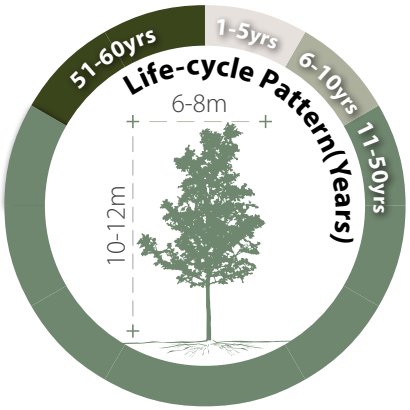
Native | **Exotic** | **Evergreen** | Deciduous | **Partial Shade** | Full Sun

Family: PODOCARPACEAE **Heat Tolerance:** High
Special Properties : Dense foliage; relatively shade tolerant


Fruits



Propagation to Seedling
Sapling to Semi-mature
Mature
Senescence



Feature

Ecological Value | Ornamental | Shade Cast

Special Maintenance Requirements

- No Special Maintenance Requirements

Tolerance

Drought

Waterlogging

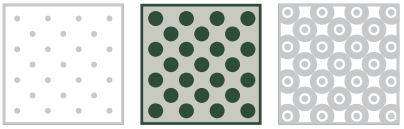
Wind

Roadside Pollution

Pest & Disease Resistance

Pruning

Soil Compaction



Root System

Soil Volume

pH of Soil

Palaquium formosanum
台灣膠木

Recommended Street Types

A 1/2 B 1/2 C 1/2 D 1/2 E 1/2 F 1/2 G 1/2

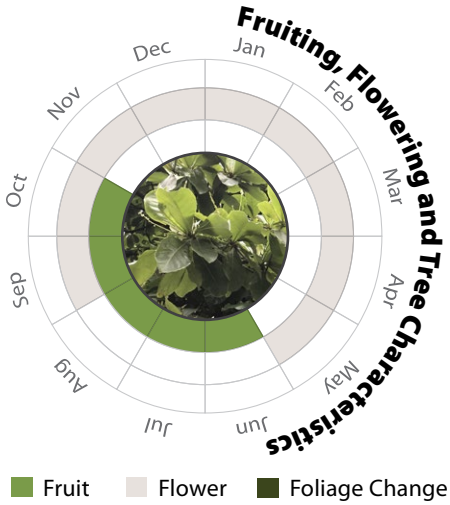
General Information

Native | **Exotic** | **Evergreen** | Deciduous | Partial Shade | **Full Sun**

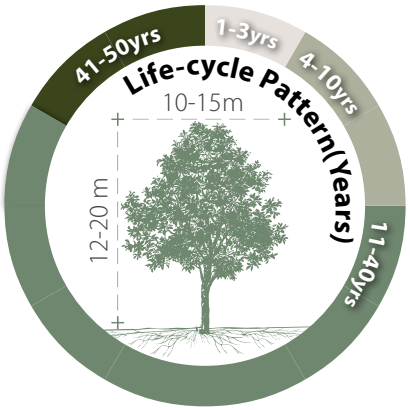
Family: SAPOTACEAE **Heat Tolerance:** Moderate
Special Properties : Dense foliage

Flowers

Tree Bark



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence



Feature

Ecological Value | Ornamental | Shade Cast

Special Maintenance Requirements

- Moderate maintenance manageability
- Installation of root barriers or guides is recommended

Tolerance

Drought

Low | Moderate | High

Waterlogging

Low | Moderate | High

Wind

Low | Moderate | High

Roadside Pollution

Low | Moderate | High

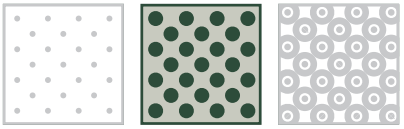
Pest & Disease Resistance

Low | Moderate | High

Pruning

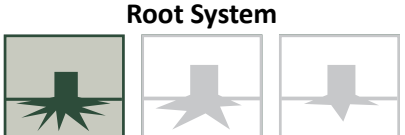
Low | Moderate | High

Soil Compaction



Low | Moderate | High

Root System

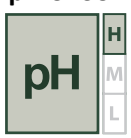


Aggressive | Moderate | Manageable

Soil Volume

Large | Medium | Small

pH of Soil



Adaptability

Peltophorum tonkinense
銀珠

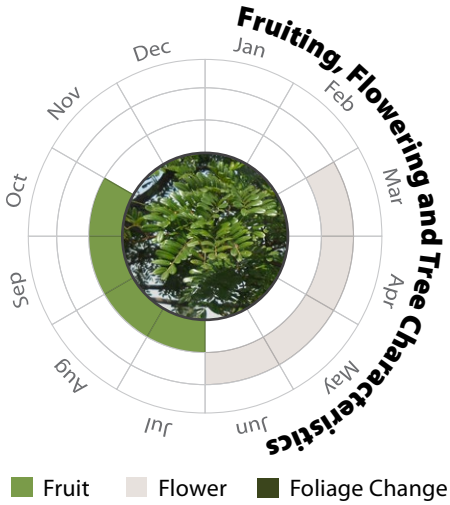
Recommended Street Types
A 1 2 | B 1 2 | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

General Information

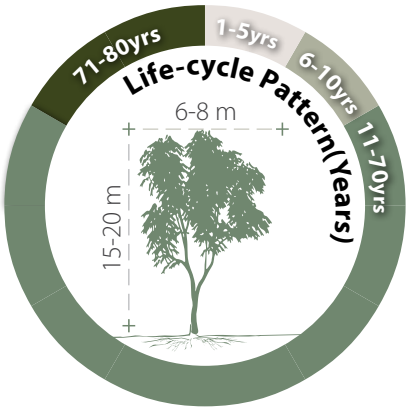
Native | **Exotic** | Evergreen | **Deciduous** | **Partial Shade** | **Full Sun**

Family: CAESALPINIACEAE **Heat Tolerance:** Moderate
Special Properties : Glossy leaves; Yellow flowers
Dense foliage


Fruits



Propagation to Seedling
Sapling to Semi-mature
Mature
Senescence



Feature

Special Maintenance Requirements

- Moderate maintenance manageability

Tolerance

Drought

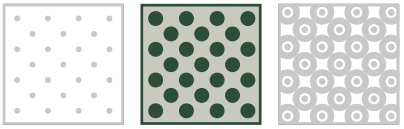

Waterlogging

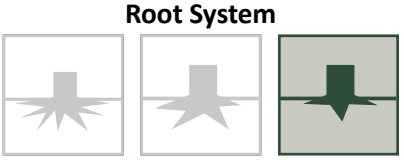

Wind


Roadside Pollution


Pest & Disease Resistance


Pruning


Soil Compaction


Root System


Soil Volume


pH of Soil

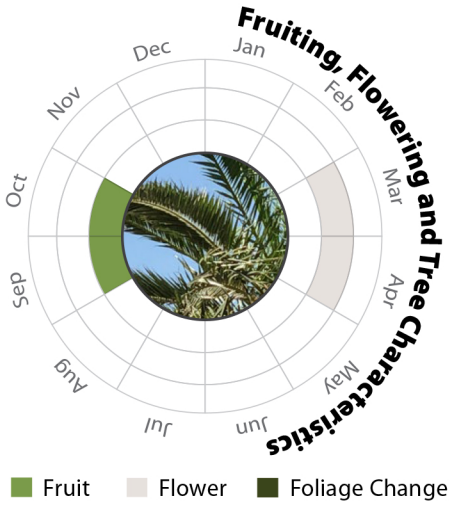

Phoenix dactylifera
海棗, 棗椰樹

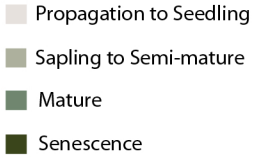
Recommended Street Types
A 1 2 B 1 2 C 1 2 D 1 2 E 1 2 F 1 2 G 1 2

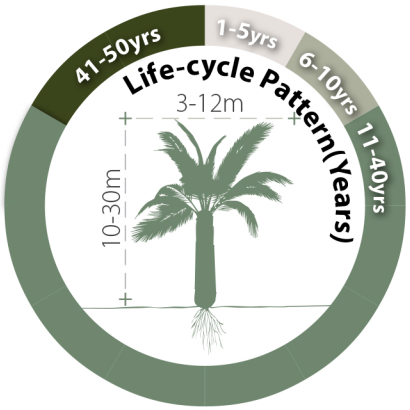
General Information

Native | **Exotic** | **Evergreen** | Deciduous | Partial Shade | **Full Sun**

Family: ARECACEAE **Heat Tolerance:** High
Special Properties : Fruits attractive to wildlife; Larval food plant of butterflies





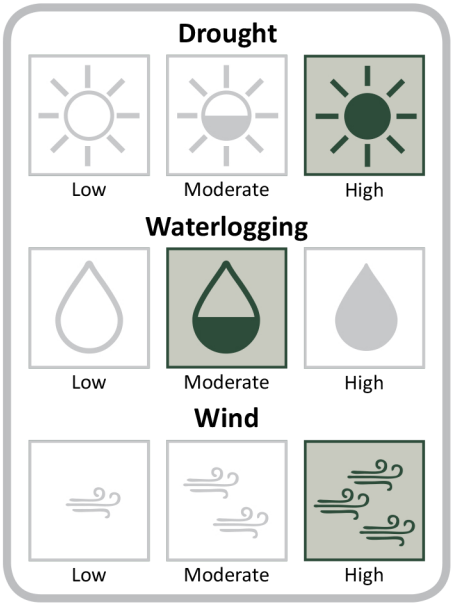


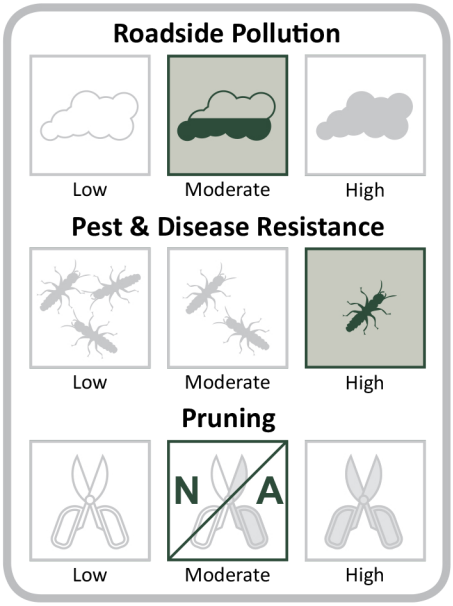
Feature

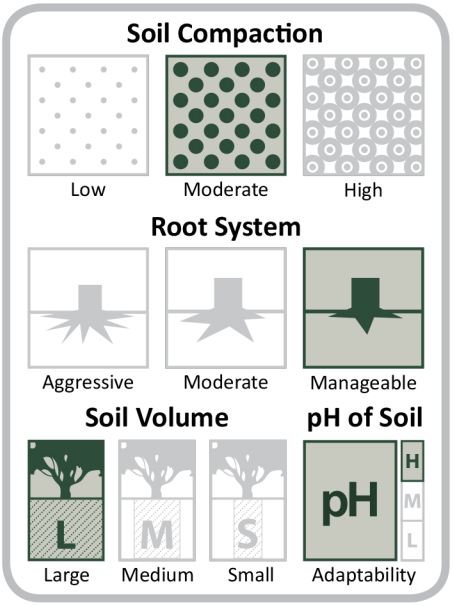
Special Maintenance Requirements

- Sharp spines near leaf bases
- Leaflets also spiny

Tolerance







Plumeria rubra
雞蛋花, 紅雞蛋花

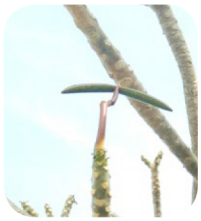
Recommended Street Types: A 1/2 | **B 1/2** | C 1/2 | D 1/2 | E 1/2 | F 1/2 | G 1/2

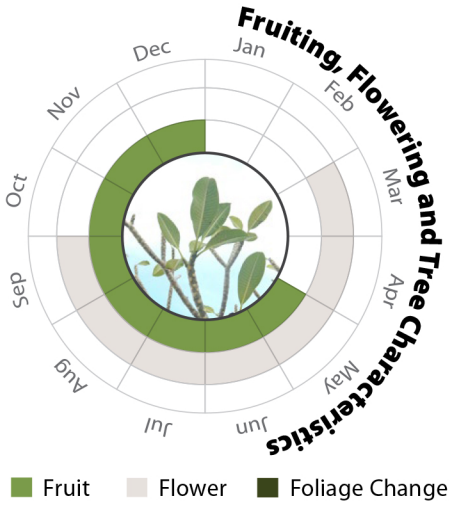
General Information

Native | **Exotic** | Evergreen | **Deciduous** | **Partial Shade** | **Full Sun**

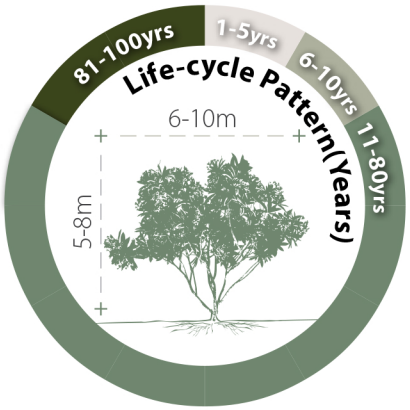
Family: APOCYNACEAE **Heat Tolerance:** High
Special Properties : Pink or red fragrant flower; Tolerates salty coastal winds


Flowers


Fruits



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence



Feature

Ecological Value | Ornamental | Shade Cast

Special Maintenance Requirements

- Moderate maintenance manageability
- Crown thinning may be needed to reduce wind resistance
- Tree sap may cause skin irritation

Tolerance

Drought

Low | Moderate | High

Waterlogging

Low | Moderate | High

Wind

Low | Moderate | High

Roadside Pollution

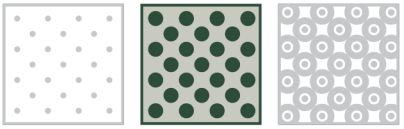
Low | Moderate | High

Pest & Disease Resistance

Low | Moderate | High

Pruning

Low | Moderate | High

Soil Compaction

Low | Moderate | High

Root System

Aggressive | Moderate | Manageable

Soil Volume


Large | Medium | Small

pH of Soil


Adaptability

Podocarpus macrophyllus
羅漢松

Recommended Street Types

A 1 2 | **B 1 2** | C 1 2 | **D 1 2** | E 1 2 | F 1 2 | G 1 2

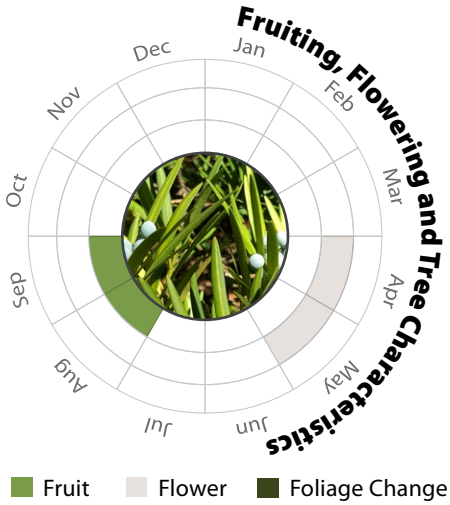
General Information

Native | Exotic | Evergreen | Deciduous | Full Shade | Full Sun

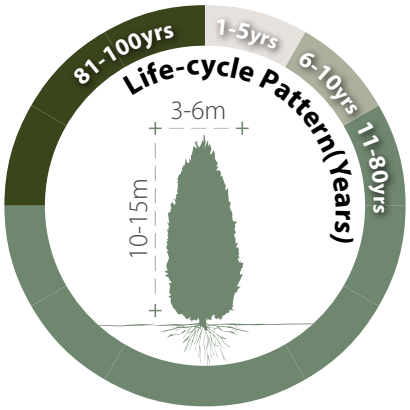
Family: PODOCARPACEAE **Heat Tolerance:** High
Special Properties : Regarded as a feng shui tree in Hong Kong; Dense foliage; Fruits attractive to wildlife

Flowers

Fruits



Propagation to Seedling
Sapling to Semi-mature
Mature
Senescence



Feature

Ecological Value | Ornamental | Shade Cast

Special Maintenance Requirements

- No Special Maintenance Requirements

Tolerance

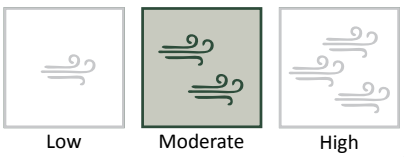
Drought

Low | Moderate | High

Waterlogging

Low | Moderate | High

Wind

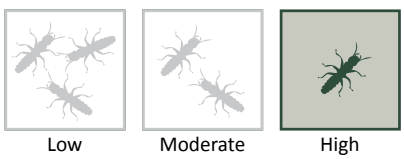


Low | Moderate | High

Roadside Pollution

Low | Moderate | High

Pest & Disease Resistance

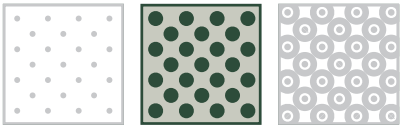


Low | Moderate | High

Pruning

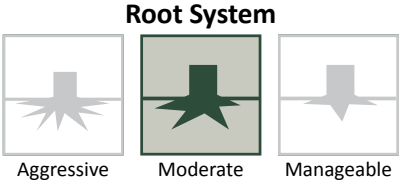
Low | Moderate | High

Soil Compaction



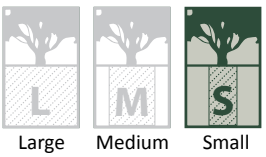
Low | Moderate | High

Root System



Aggressive | Moderate | Manageable

Soil Volume



Large | Medium | Small

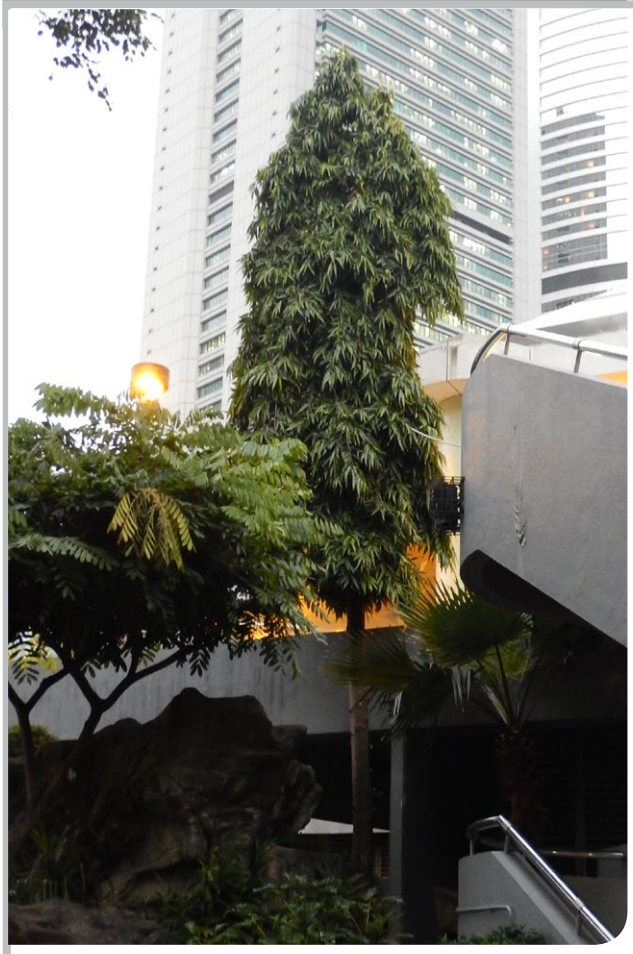
pH of Soil

Adaptability

Polyalthia longifolia
長葉暗羅

Recommended Street Types

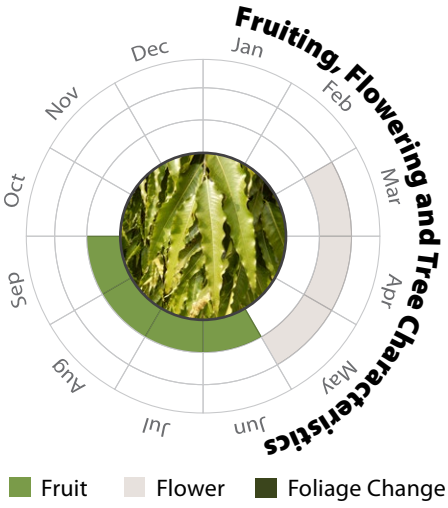
A 1 2 | **B 1 2** | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2



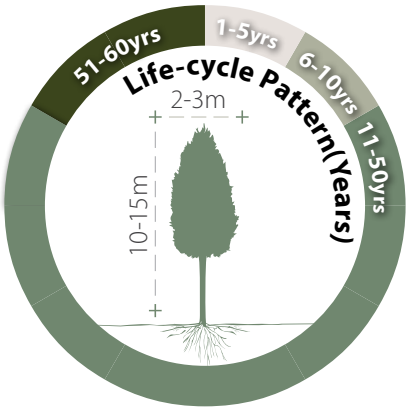
General Information

Native | **Exotic** | **Evergreen** | Deciduous | **Partial Shade** | **Full Sun**

Family: ANNONACEAE **Heat Tolerance:** High
Special Properties : Dense foliage; Fruits attractive to wildlife



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence



Feature

Special Maintenance Requirements

- No Special Maintenance Requirements

Tolerance

Drought

Waterlogging

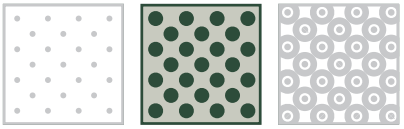
Wind

Roadside Pollution

Pest & Disease Resistance

Pruning

Soil Compaction



Root System

Soil Volume

pH of Soil

Polyspora axillaris
大頭茶

Recommended Street Types

A 1/2 B 1/2 C 1/2 D 1/2 E 1/2 F 1/2 G 1/2

General Information

Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

Family: THEACEAE **Heat Tolerance:** Moderate

Special Properties : Fruits, seeds and flowers attractive to wildlife; Larval food plant of butterflies

Flowers

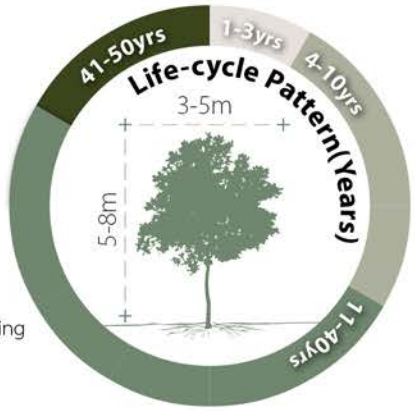
Fruits

Propagation to Seedling

Sapling to Semi-mature

Mature

Senescence

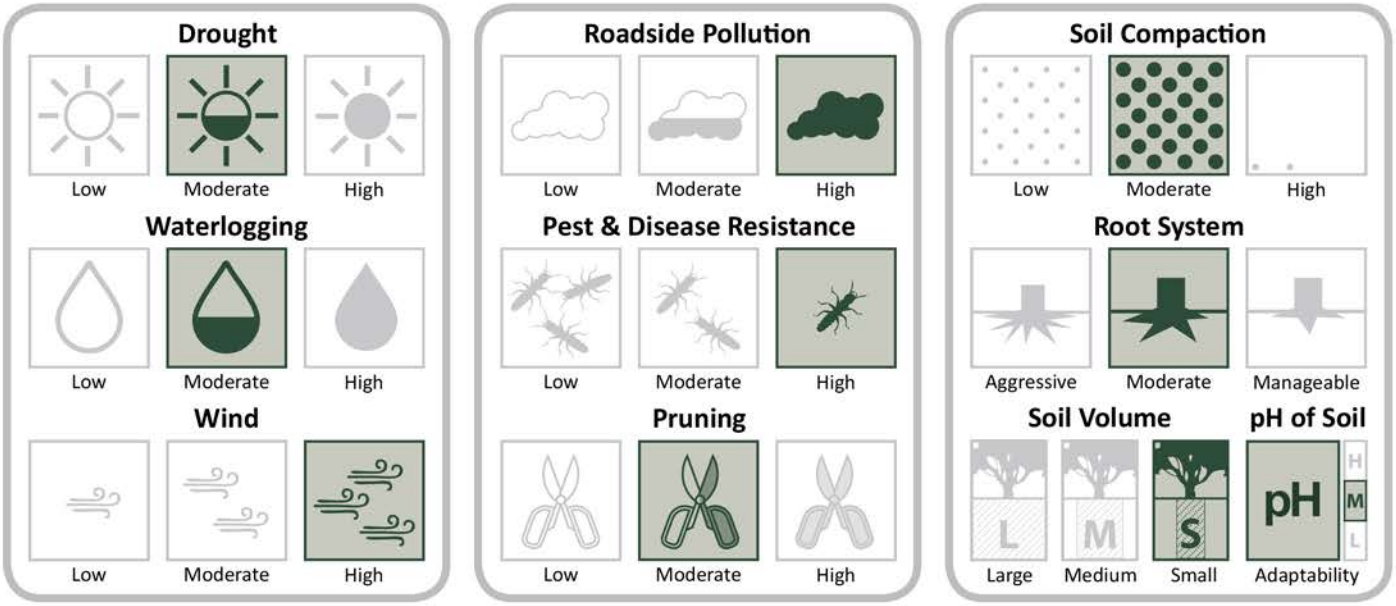


Feature

Special Maintenance Requirements

- Needs to be trained to have single trunk
- Shrubby form may require formative pruning

Tolerance



Pongamia pinnata
水黃皮

Recommended Street Types

A 1/2 | B 1/2 | C 1/2 | D 1/2 | E 1/2 | F 1/2 | G 1/2

General Information

Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

Family: FABACEAE **Heat Tolerance:** Moderate

Special Properties : Pink or white fragrant flowers; Symbiotic relationship with nitrogen-fixing soil bacteria

Flowers

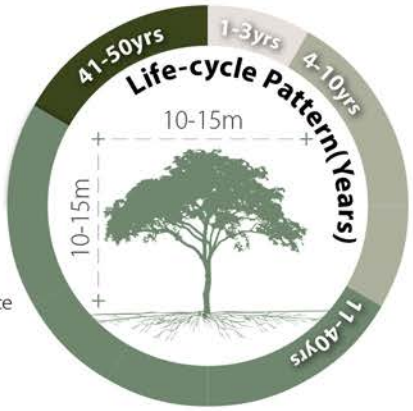
Fruits

Propagation to Seedling

Sapling to Semi-mature

Mature

Senescence

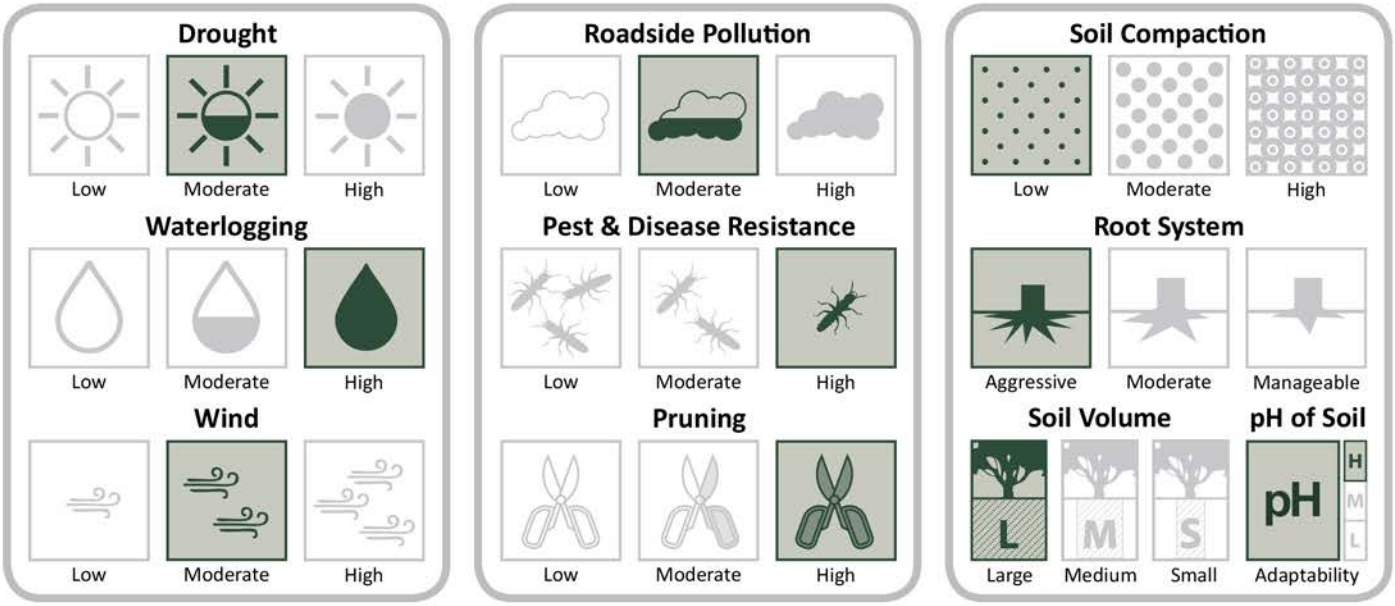


Feature

Special Maintenance Requirements

- Tree crown may require annual maintenance
- Moderate maintenance manageability
- Installation of root barriers or guides is recommended

Tolerance



Pterocarpus indicus
紫檀

Recommended Street Types

A 1/2 | **B 1/2** | C 1/2 | D 1/2 | E 1/2 | F 1/2 | G 1/2

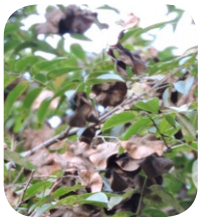
General Information

Native | **Exotic** | Evergreen | **Semi Deciduous** | **Partial Shade** | **Full Sun**

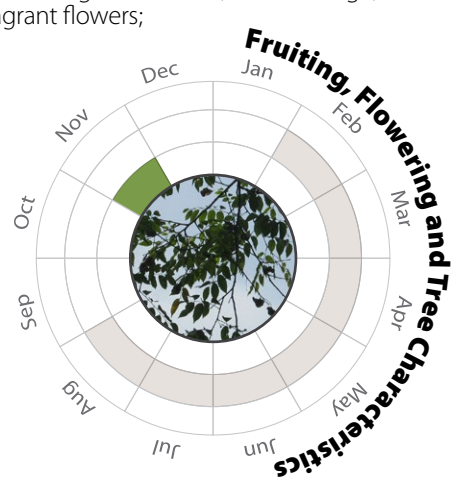
Family: FABACEAE **Heat Tolerance:** Moderate

Special Properties : Larval food plant of butterflies; Symbiotic relationship with nitrogen-fixing soil bacteria; Dense foliage; Fruits attractive to wildlife; Fragrant flowers;

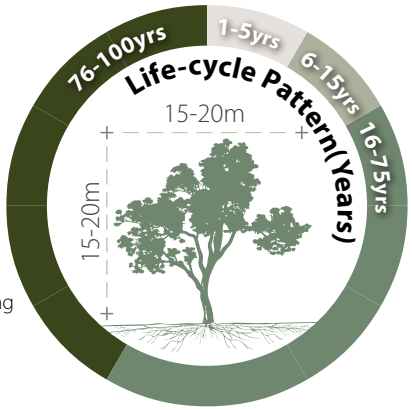
Flowers



Fruits



Propagation to Seedling
Sapling to Semi-mature
Mature
Senescence

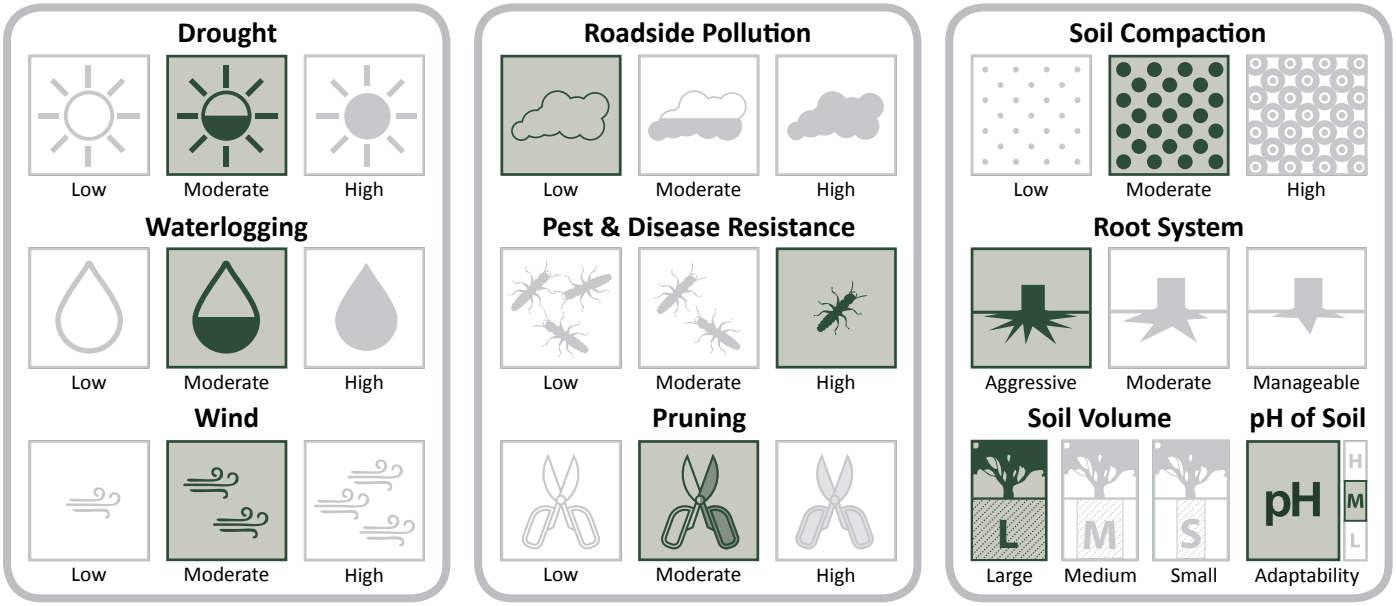


Feature

Special Maintenance Requirements

- Fungi cause root and stem disease of young seedlings
- Moderate maintenance manageability
- Installation of root barriers or guides is recommended

Tolerance



Pterospermum heterophyllum
翻白葉樹

Recommended Street Types

A 1 2 | B 1 2 | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

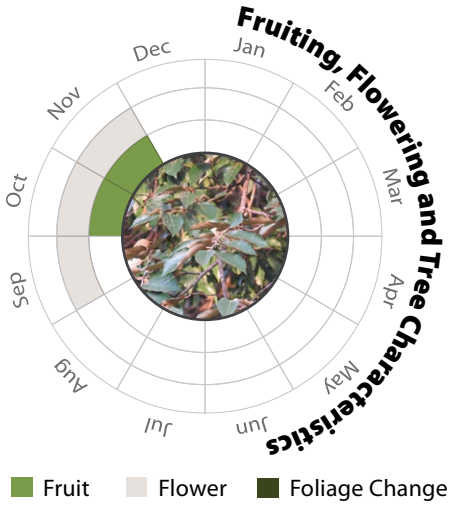
General Information

Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

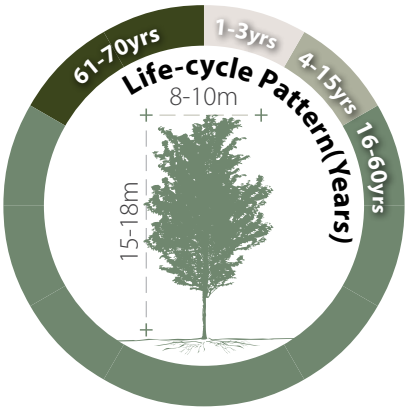
Family: STERCULIACEAE **Heat Tolerance:** Moderate

Special Properties : Distinctive white colour on abaxial surface of leaf

Fruits



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence



Feature

Special Maintenance Requirements

- Moderate maintenance manageability

Tolerance

Drought

Waterlogging

Wind

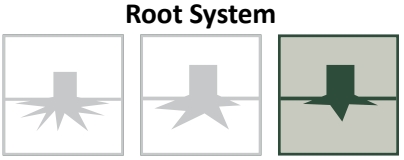
Roadside Pollution

Pest & Disease Resistance

Pruning

Soil Compaction

Root System



Soil Volume

pH of Soil

Radermachera hainanensis
海南菜豆樹

Recommended Street Types

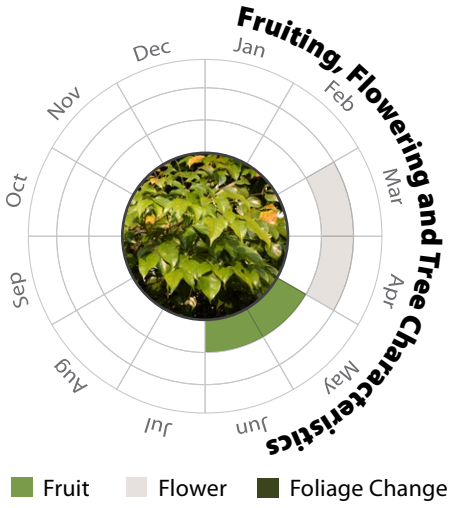
A 1 2 | B 1 2 | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

General Information

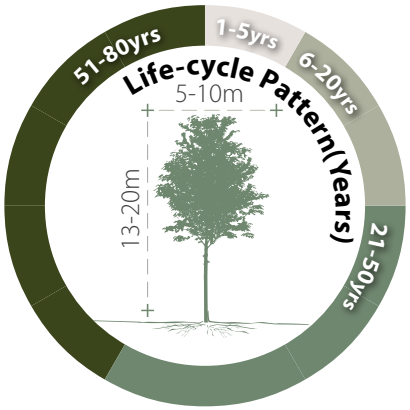
Native | **Exotic** | **Evergreen** | Deciduous | **Partial Shade** | **Full Sun**

Family: BIGNONIACEAE **Heat Tolerance:** High

Special Properties : Glossy ornamental leaves and fragrant apricot coloured flowers; Flower nectar attractive to wildlife



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence

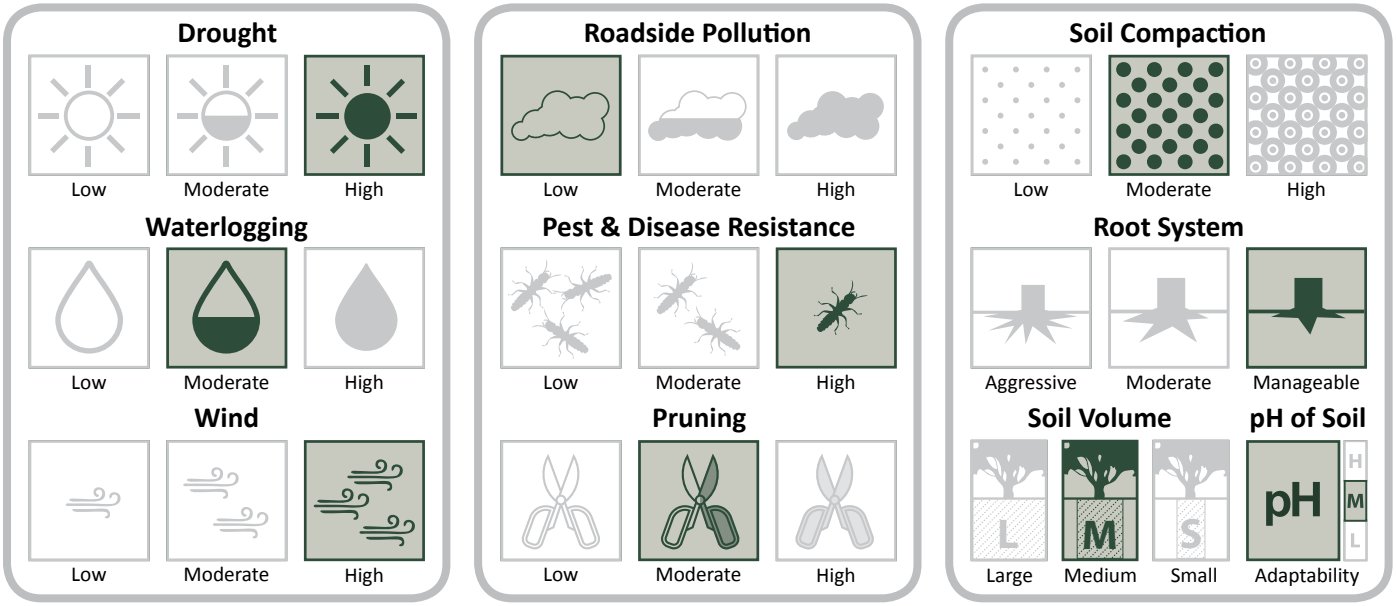


Feature

Special Maintenance Requirements

- No Special Maintenance Requirements

Tolerance



Rhus hypoleuca
白背鹽膚木

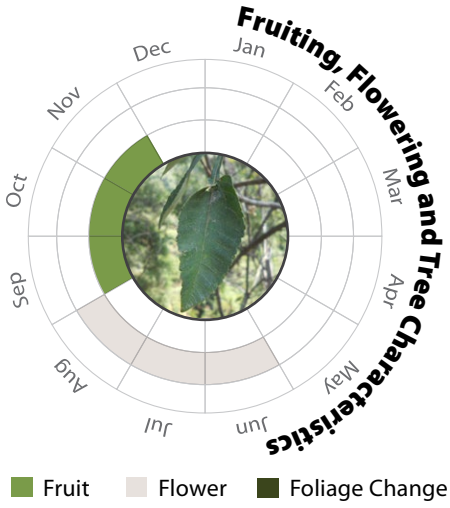
Recommended Street Types

A 1 2 | **B 1 2** | C 1 2 | D 1 2 | **E 1 2** | F 1 2 | G 1 2

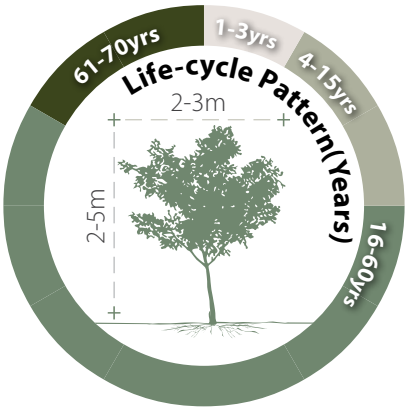
General Information

Native | Exotic | Evergreen | **Deciduous** | Partial Shade | **Full Sun**

Family: ANACARDIACEAE **Heat Tolerance:** Moderate
Special Properties : Larval food plant of butterflies



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence

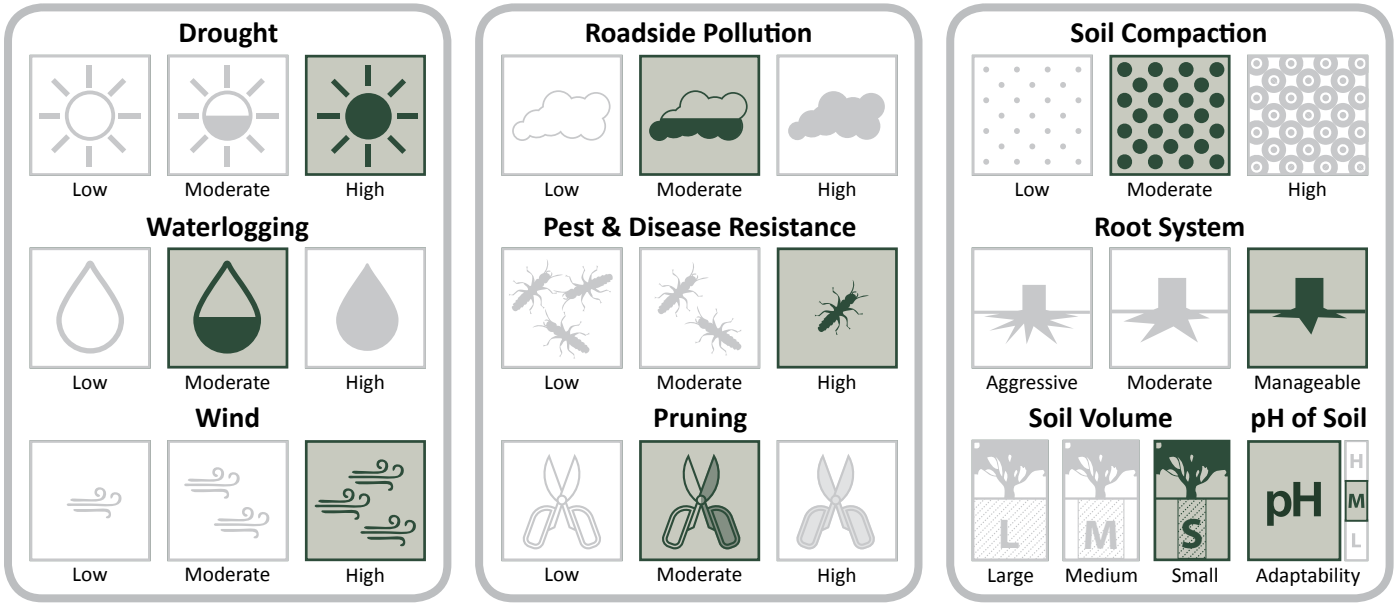


Feature

Special Maintenance Requirements

- Tree sap may cause skin irritation

Tolerance



Sapindus saponaria
無患子, 木患子

Recommended Street Types
A 1/2 B 1/2 C 1/2 D 1/2 E 1/2 F 1/2 G 1/2

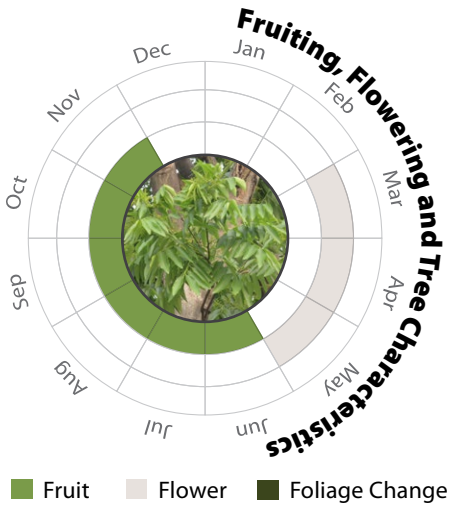
General Information

Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

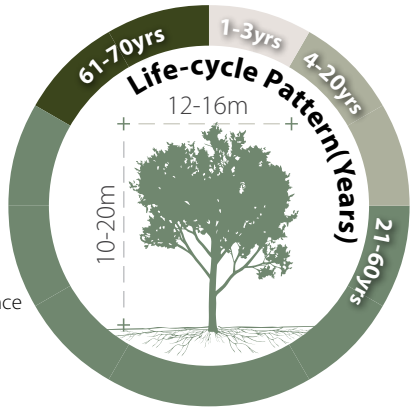
Family: SAPINDACEAE **Heat Tolerance:** High
Special Properties : Golden coloured fruits; Dense foliage; Tolerant of coastal salty wind


Flowers


Tree Bark



Propagation to Seedling
Sapling to Semi-mature
Mature
Senescence

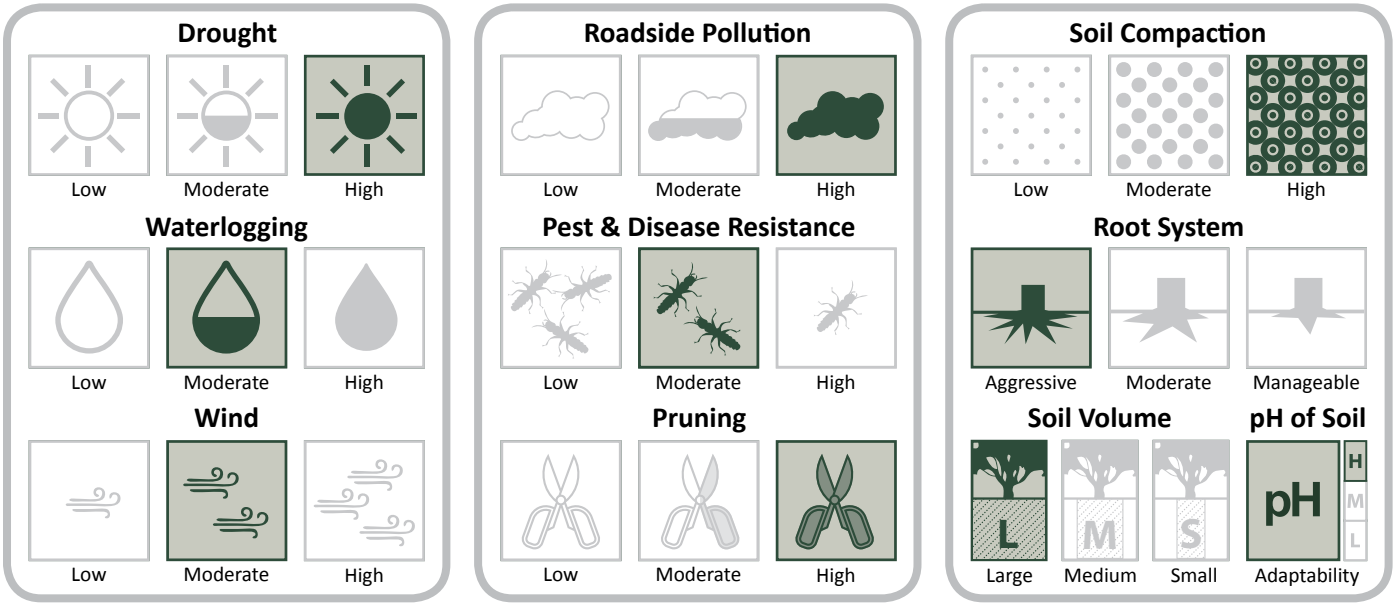


Feature

Special Maintenance Requirements

- Tree crown may require annual maintenance
- Moderate maintenance manageability
- Installation of root barriers or guides is recommended
- Fruit and seeds are poisonous

Tolerance



Sapium discolor
山烏桕

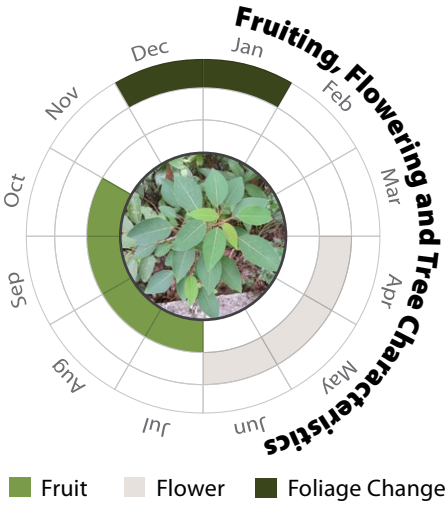
Recommended Street Types

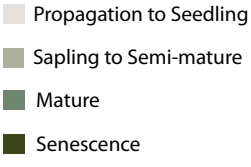
A 1 2 | B 1 2 | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

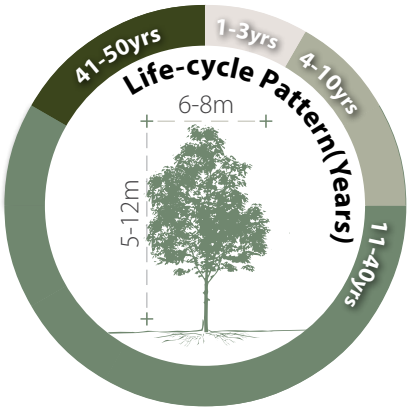
General Information

Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

Family: EUPHORBIACEAE **Heat Tolerance:** Moderate
Special Properties : Larval food plant of butterflies; fruits flower nectar and seeds attractive to wildlife





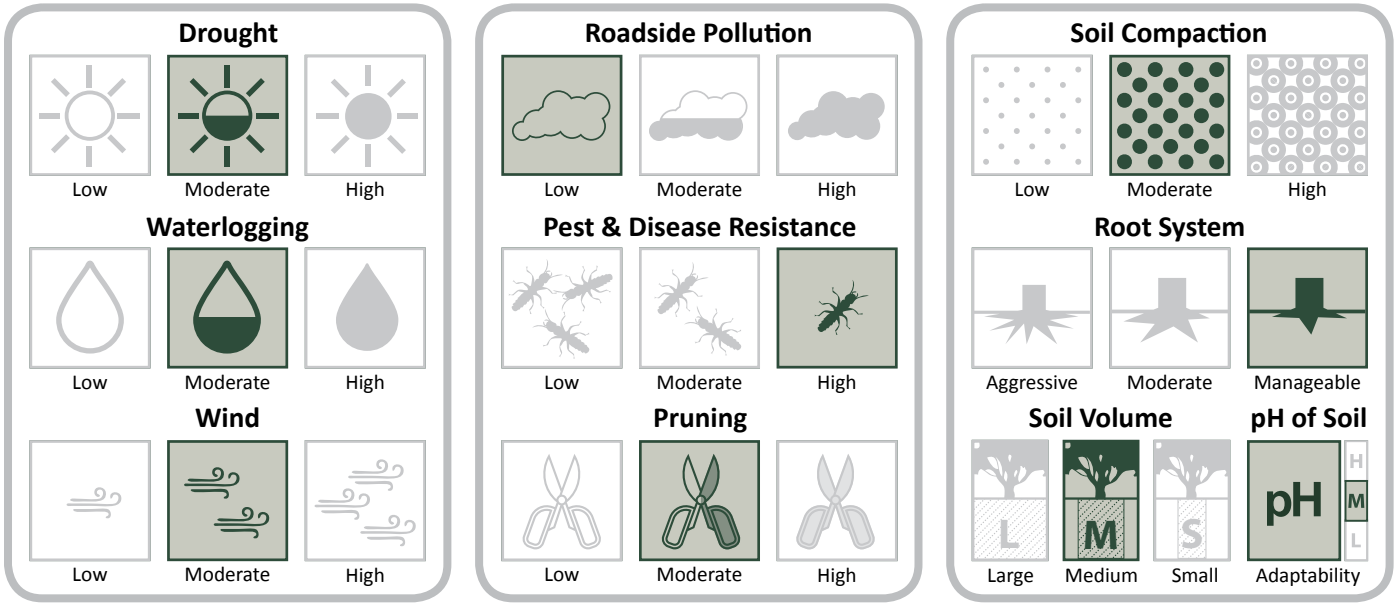


Feature

Special Maintenance Requirements

- No Special Maintenance Requirements

Tolerance



Sapium sebiferum
烏桕

Recommended Street Types
A 1 2 B 1 2 C 1 2 D 1 2 E 1 2 F 1 2 G 1 2

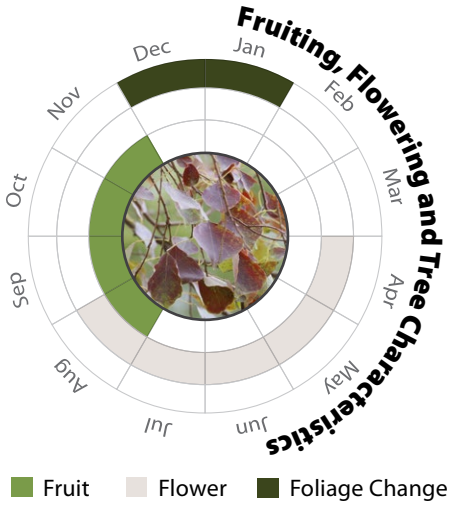
General Information

Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

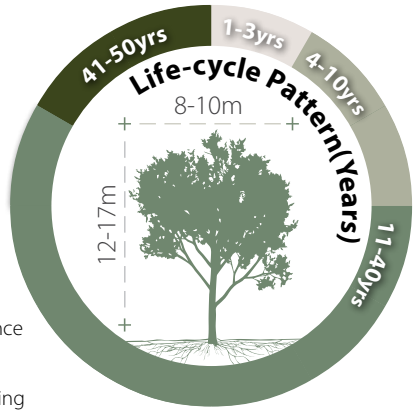
Family: EUPHORBIACEAE **Heat Tolerance:** Moderate
Special Properties : Fruits, flower nectar and seeds attractive to wildlife; Colourful fall foliage


Flowers


Fruits



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence

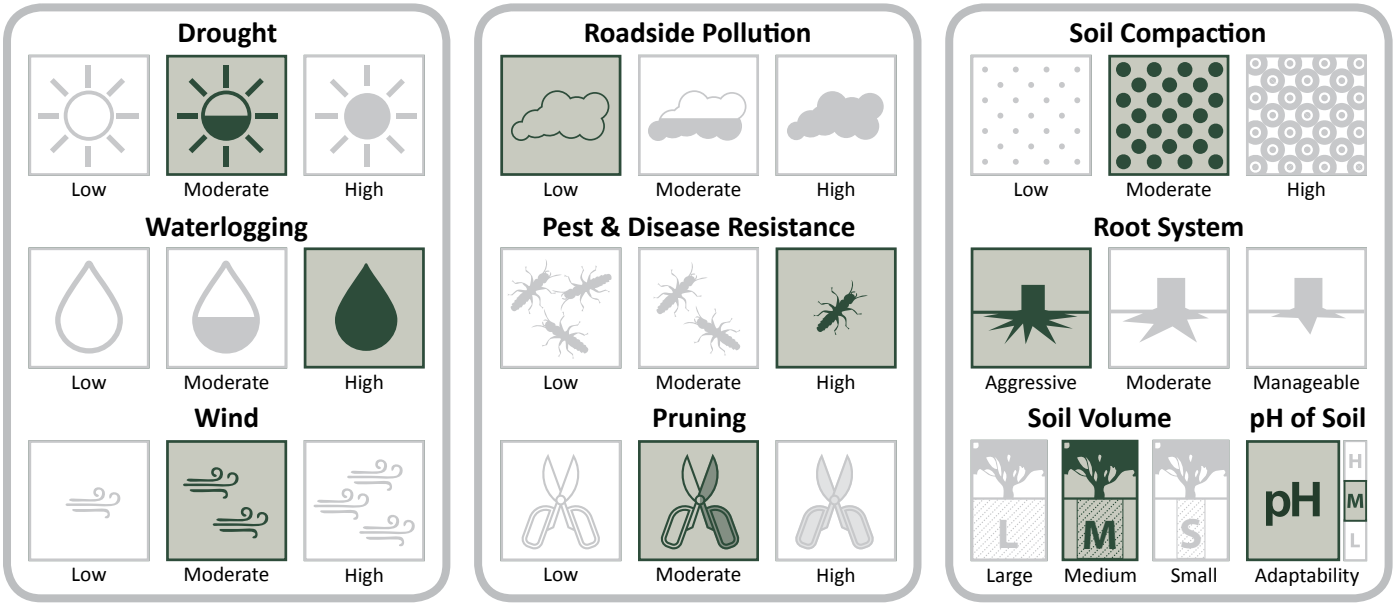


Feature

Special Maintenance Requirements

- Tree sap is poisonous
- Tree crown may require annual maintenance
- Installation of root barriers or guides is recommended
- Shrubby form may require formative pruning

Tolerance



Schima superba
木荷, 荷樹

Recommended Street Types
A 1 2 B 1 2 C 1 2 D 1 2 E 1 2 F 1 2 G 1 2

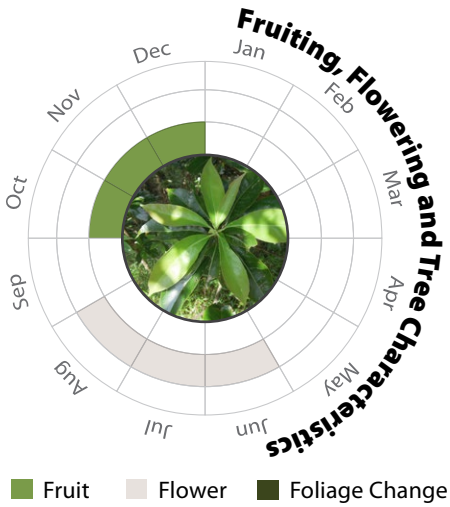
General Information

Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

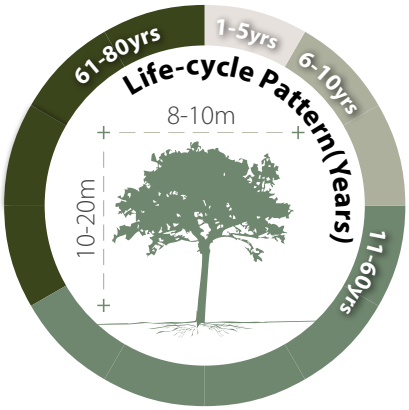
Family: THEACEAE **Heat Tolerance:** Moderate
Special Properties : Flower nectar, fruits and seeds attractive to wildlife; Dense foliage; Showy cluster of white flowers


Flowers


Fruits



Propagation to Seedling
Sapling to Semi-mature
Mature
Senescence



Feature

Ecological Value | Ornamental | Shade Cast

Special Maintenance Requirements

- Bark may cause skin irritation

Tolerance

Drought

Low | Moderate | High

Waterlogging

Low | Moderate | High

Wind

Low | Moderate | High

Roadside Pollution

Low | Moderate | High

Pest & Disease Resistance

Low | Moderate | High

Pruning

Low | Moderate | High

Soil Compaction

Low | Moderate | High

Root System

Aggressive | Moderate | Manageable

Soil Volume

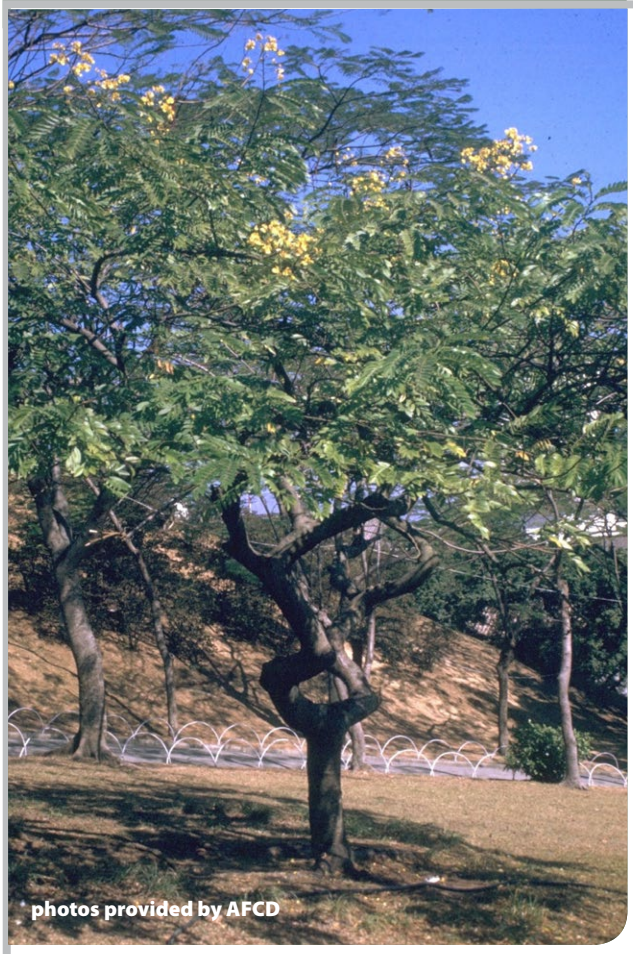

Large | Medium | Small

pH of Soil


Adaptability

Senna spectabilis
美麗決明, 美洲槐

Recommended Street Types: A 1 2 | **B 1 2** | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

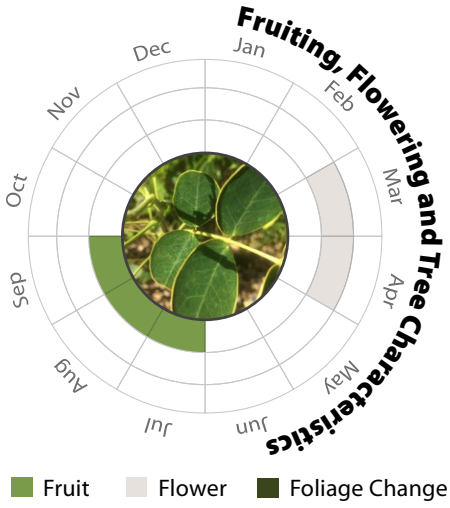


General Information

Native | **Exotic** | **Evergreen** | Deciduous | **Partial Shade** | **Full Sun**

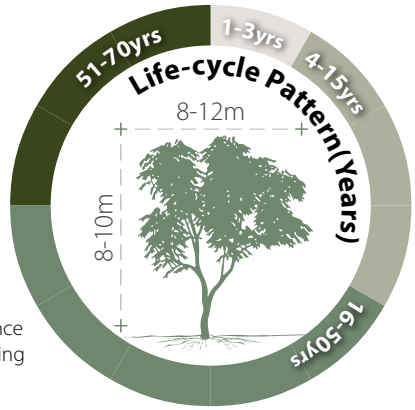
Family: CAESALPINIACEAE **Heat Tolerance:** Moderate
Special Properties: Bright yellow flowers; Dense foliage

Flowers



All photos provided by AFCD

- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence

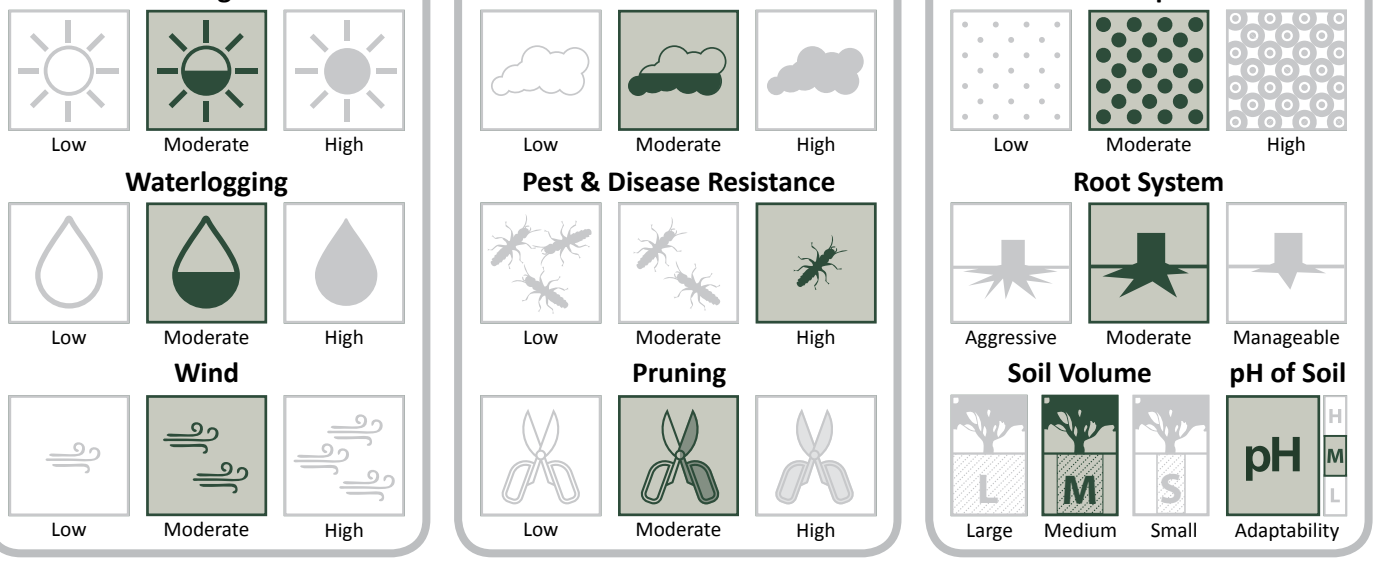


Feature

Special Maintenance Requirements

- Susceptible to fungal disease
- Tree crown may require annual maintenance
- Shrubby form may require formative pruning

Tolerance



Swietenia mahagoni
桃花心木

Recommended Street Types

A 1 2 | B 1 2 | **C 1 2** | D 1 2 | E 1 2 | F 1 2 | G 1 2

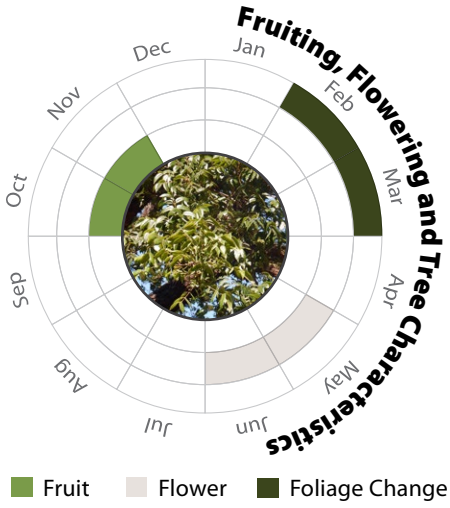
General Information

Native | **Exotic** | **Evergreen** | Deciduous | **Partial Shade** | **Full Sun**

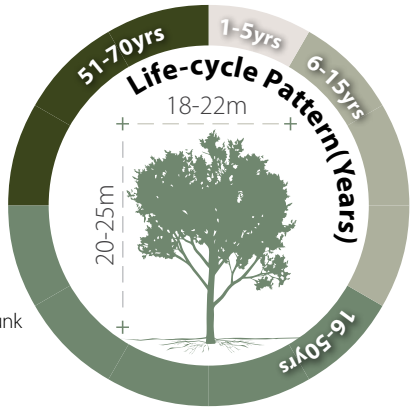
Family: MELIACEAE **Heat Tolerance:** Moderate

Special Properties : Tree bark has coarse fissured texture ; distinctive buttress root; tolerates coastal salty winds

Tree Bark



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence

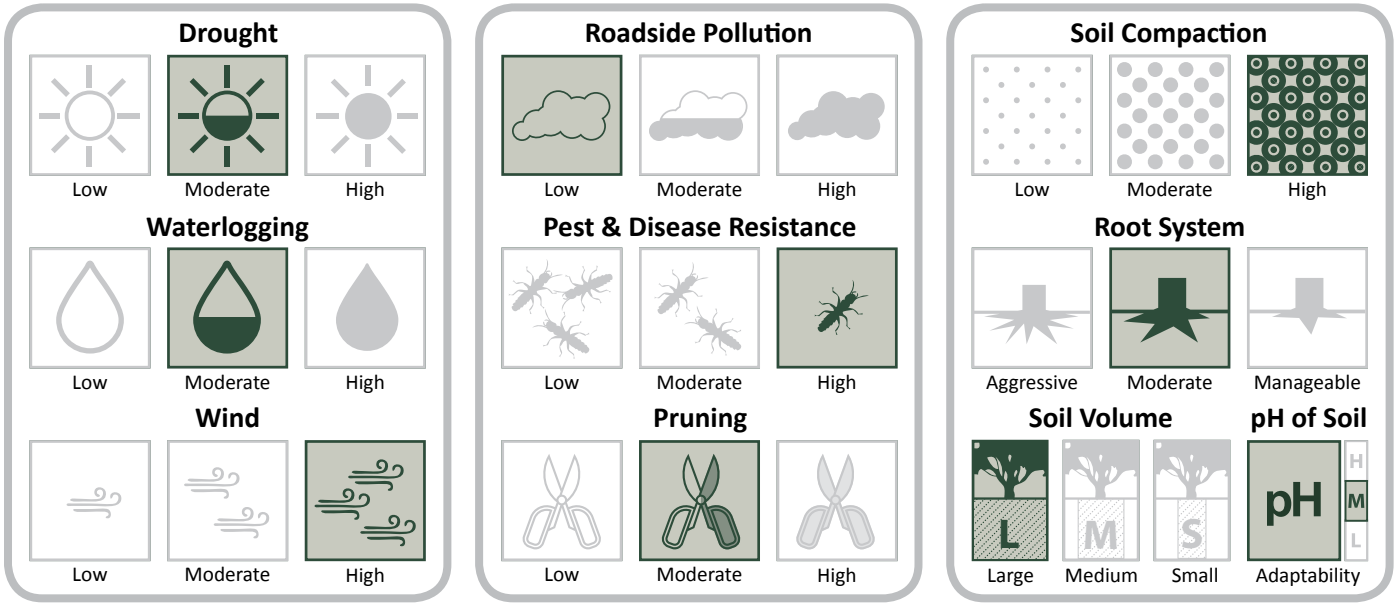


Feature

Special Maintenance Requirements

- Branches should not be allowed to grow larger than two-thirds the diameter of the trunk
- Formative pruning is recommended

Tolerance



Syzygium cumini
烏墨, 海南蒲桃

Recommended Street Types
A 1 2 B 1 2 C 1 2 D 1 2 E 1 2 F 1 2 G 1 2

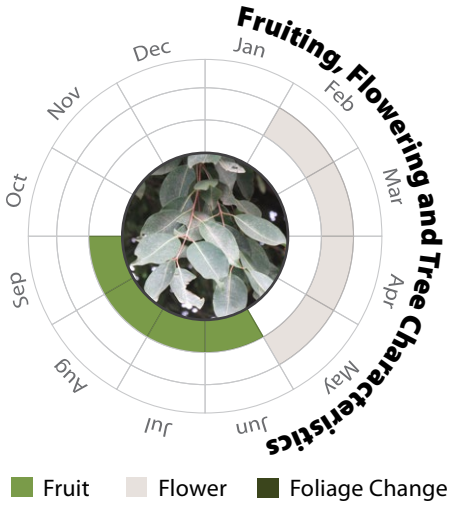
General Information

Native | **Exotic** | **Evergreen** | Deciduous | Partial Shade | **Full Sun**

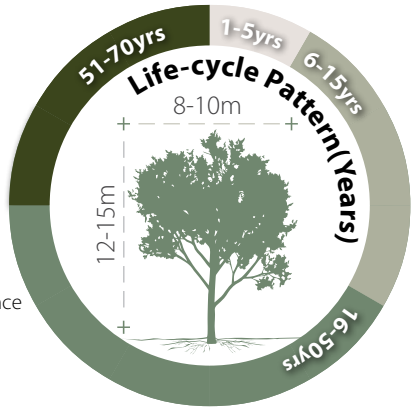
Family: MYRTACEAE **Heat Tolerance:** Moderate
Special Properties : Fruits and flower nectar attractive to wildlife; Larval food plant of butterflies


Flowers


Fruits



Propagation to Seedling
Sapling to Semi-mature
Mature
Senescence



Feature

Special Maintenance Requirements

- Tree crown may require annual maintenance
- Moderate maintenance manageability

Tolerance

Drought

Low | Moderate | High

Waterlogging

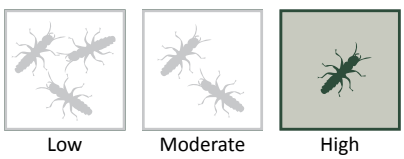
Low | Moderate | High

Wind

Low | Moderate | High

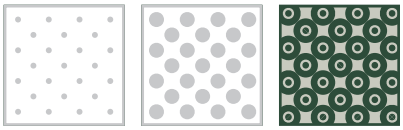
Roadside Pollution

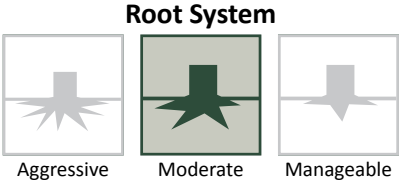
Low | Moderate | High

Pest & Disease Resistance

Low | Moderate | High

Pruning

Low | Moderate | High

Soil Compaction

Low | Moderate | High

Root System

Aggressive | Moderate | Manageable

Soil Volume


Large | Medium | Small

pH of Soil


Adaptability

Syzygium hancei
韓氏蒲桃, 紅鱗蒲桃

Recommended Street Types: A 1 2 | B 1 2 | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

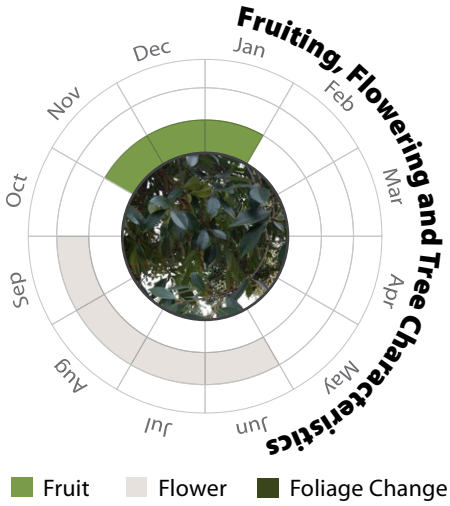
General Information

Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

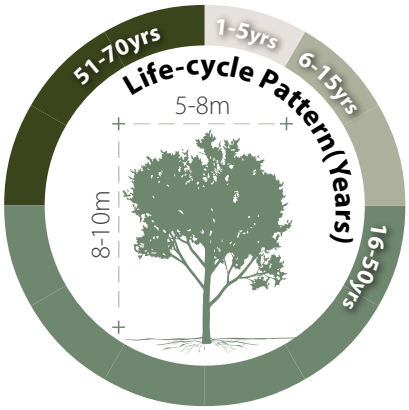
Family: MYRTACEAE **Heat Tolerance:** Moderate
Special Properties : Flower nectar and fruits attractive to wildlife

Flowers

Tree Bark



Propagation to Seedling
Sapling to Semi-mature
Mature
Senescence



Feature

Ecological Value | Ornamental | Shade Cast

Special Maintenance Requirements

- Moderate maintenance manageability

Tolerance

Drought

Low | Moderate | High

Waterlogging

Low | Moderate | High

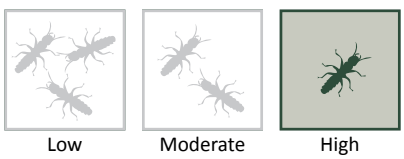
Wind

Low | Moderate | High

Roadside Pollution

Low | Moderate | High

Pest & Disease Resistance

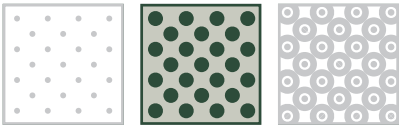


Low | Moderate | High

Pruning

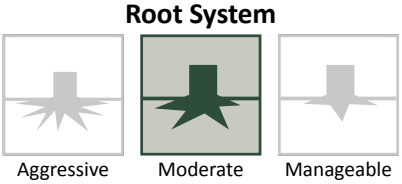
Low | Moderate | High

Soil Compaction



Low | Moderate | High

Root System



Aggressive | Moderate | Manageable

Soil Volume

Large | Medium | Small

pH of Soil

Adaptability

Syzygium jambos
蒲桃

Recommended Street Types: A 1 2 | B 1 2 | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

General Information

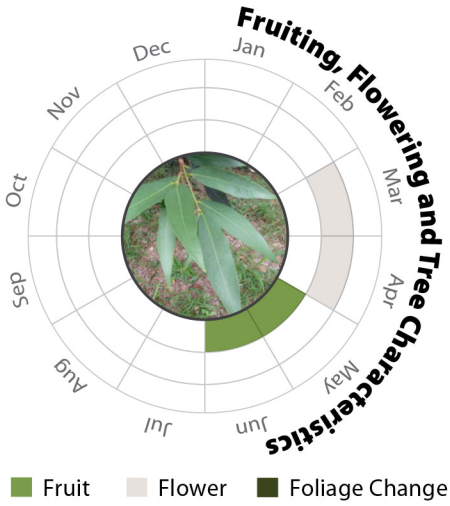
Native | **Exotic** | **Evergreen** | Deciduous | **Partial Shade** | **Full Sun**

Family: MYRTACEAE **Heat Tolerance:** Moderate

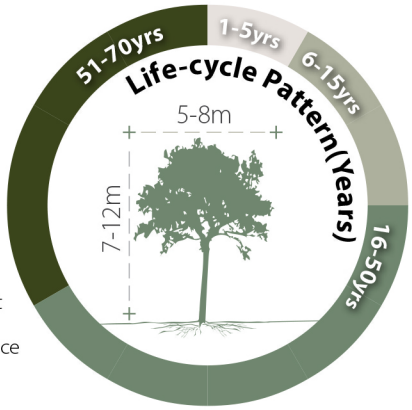
Special Properties : Fruit and flower nectar attractive to wildlife; Large pom-pom shaped flowers

Flowers

Fruits



Propagation to Seedling
Sapling to Semi-mature
Mature
Senescence



Feature

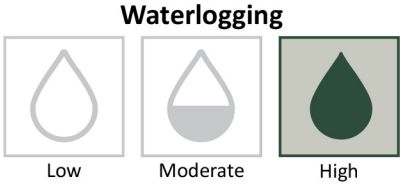
Special Maintenance Requirements

- Susceptible to fungal diseases such as root rot, leaf spot and anthracnose
- Tree crown may require annual maintenance
- Moderate maintenance manageability

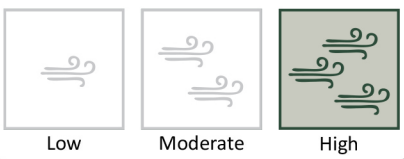
Tolerance

Drought

Waterlogging

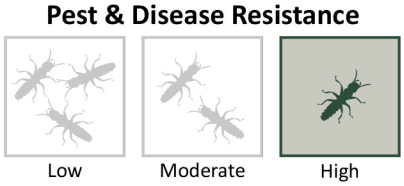


Wind

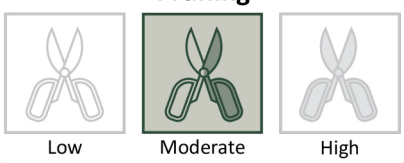


Roadside Pollution

Pest & Disease Resistance

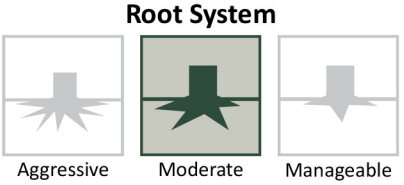


Pruning



Soil Compaction

Root System



Soil Volume

pH of Soil

Syzygium levinei
山蒲桃

Recommended Street Types

A 1 2 B 1 2 C 1 2 D 1 2 E 1 2 F 1 2 G 1 2

General Information

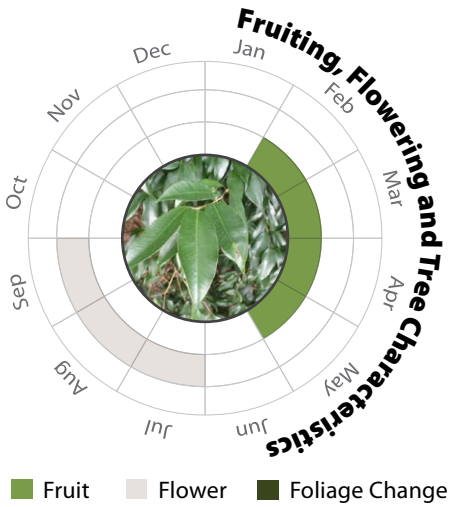
Native | Exotic | Evergreen | Deciduous | Partial Shade | Full Sun

Family: MYRTACEAE **Heat Tolerance:** Moderate

Special Properties : Larval food plant of butterflies; Fruit and flower nectar attractive to wildlife

Fruits

Tree Bark

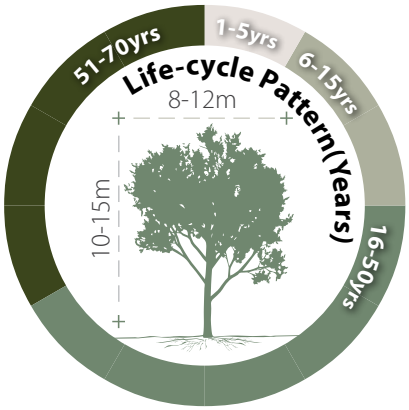


Propagation to Seedling

Sapling to Semi-mature

Mature

Senescence



Feature

Ecological Value | Ornamental | Shade Cast

Special Maintenance Requirements

- Moderate maintenance manageability

Tolerance

Drought

Low | Moderate | High

Waterlogging

Low | Moderate | High

Wind

Low | Moderate | High

Roadside Pollution

Low | Moderate | High

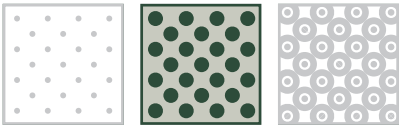
Pest & Disease Resistance

Low | Moderate | High

Pruning

Low | Moderate | High

Soil Compaction



Low | Moderate | High

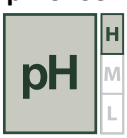
Root System

Aggressive | Moderate | Manageable

Soil Volume

Large | Medium | Small

pH of Soil



Adaptability

Thespesia populnea
恒春黃槿, 繖楊

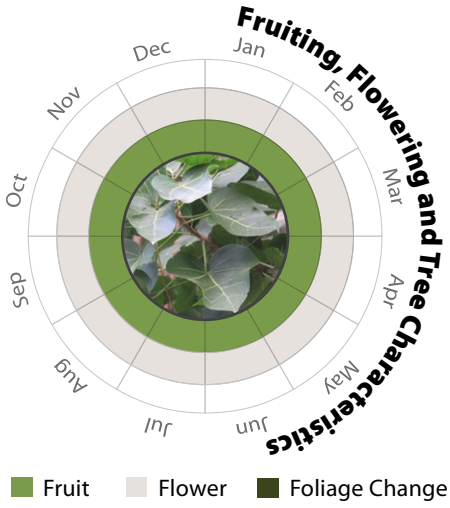
Recommended Street Types
A 1 2 | **B 1 2** | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

General Information

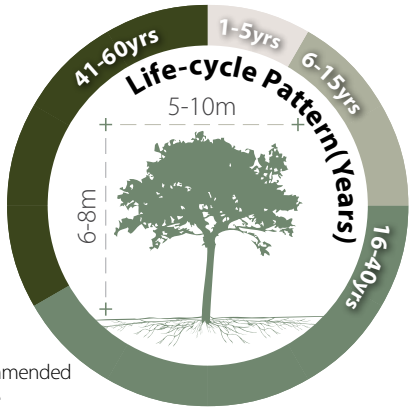
Native | Exotic | **Evergreen** | Deciduous | Partial Shade | **Full Sun**

Family: MALVACEAE **Heat Tolerance:** Moderate
Special Properties : Mangroves tree; Dense foliage; Tolerates coastal salty winds, showy flowers


Flowers



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence

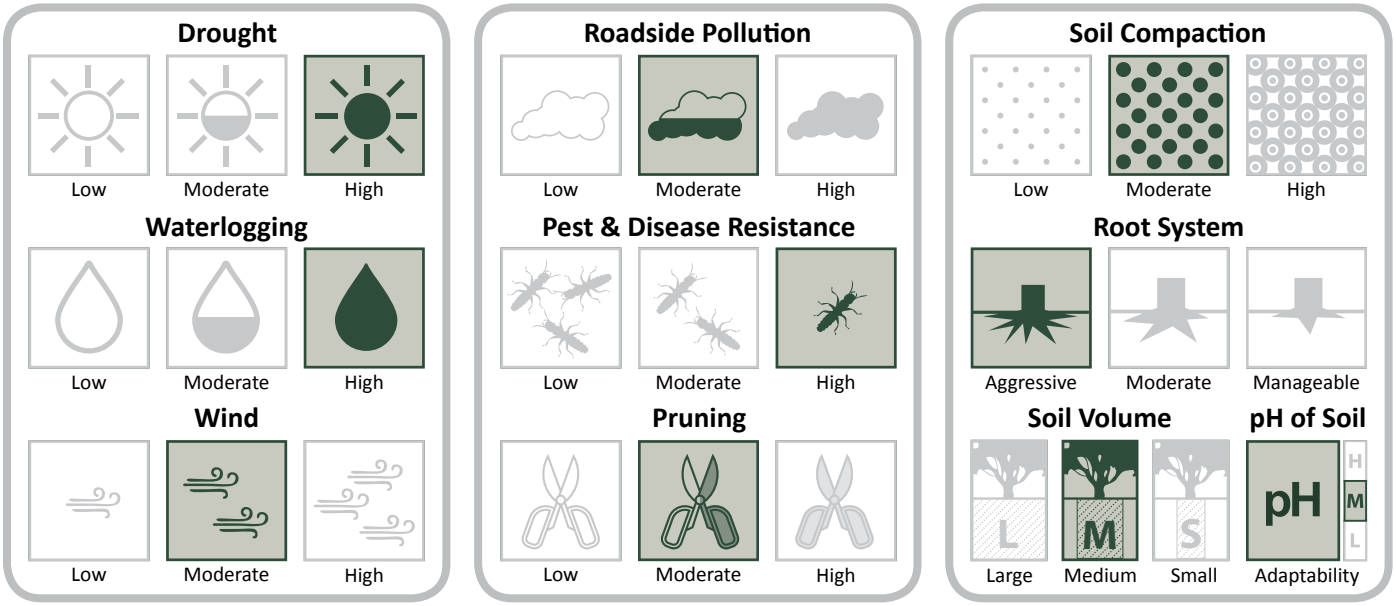


Feature

Special Maintenance Requirements

- Prone to fungal root and butt rot caused by *Phellinus noxius*
- Moderate maintenance manageability
- Installation of root barriers or guides is recommended
- Tree crown may require annual maintenance

Tolerance



Ulmus parvifolia
榔榆

Recommended Street Types

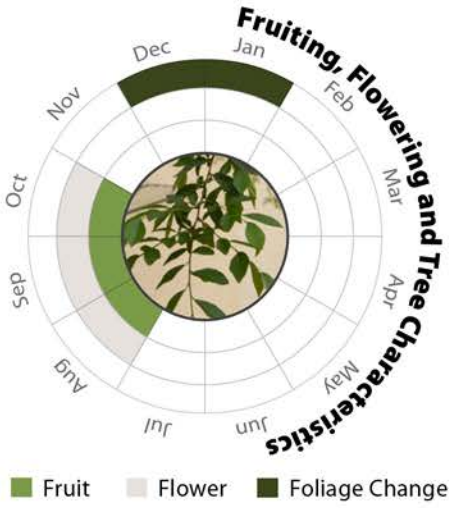
A 1/2 B 1/2 C 1/2 D 1/2 E 1/2 F 1/2 G 1/2

General Information

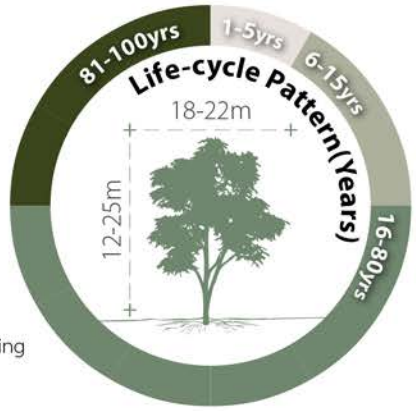
Native | **Exotic** | Evergreen | **Deciduous** | **Partial Shade** | **Full Sun**

Family: ULMACEAE **Heat Tolerance:** Moderate
Special Properties : Mottled tree bark

Tree Bark



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence

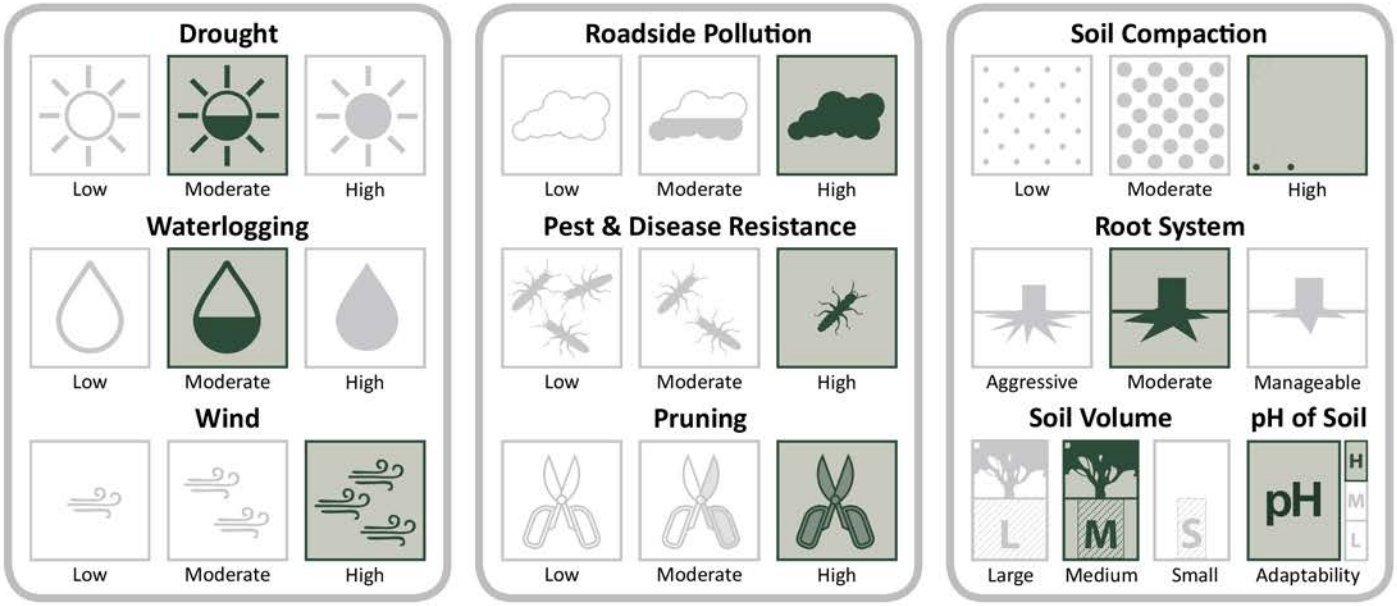


Feature

Special Maintenance Requirements

- Frequent irrigation is recommended in extended hot and dry periods
- Shrubby form may require formative pruning

Tolerance



Wodyetia bifurcata
狐尾椰子

Recommended Street Types: A 1/2 | B 1/2 | C 1/2 | D 1/2 | E 1/2 | F 1/2 | G 1/2

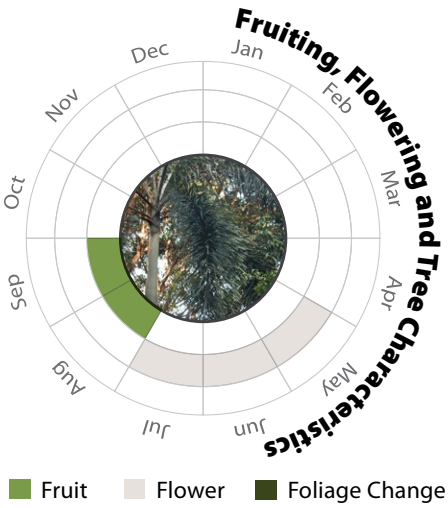
General Information

Native | **Exotic** | **Evergreen** | Deciduous | Partial Shade | **Full Sun**

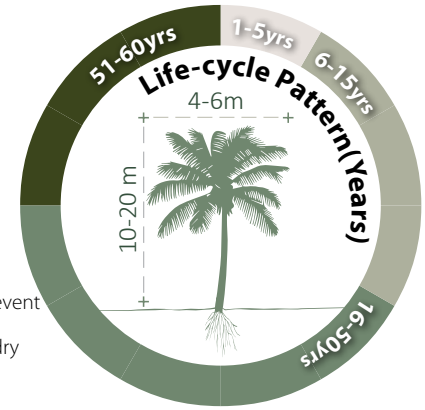
Family: ARECACEAE **Heat Tolerance:** Moderate
Special Properties : Foxtail-like fronds; Attractive red fruits


Flowers


Fruits



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence

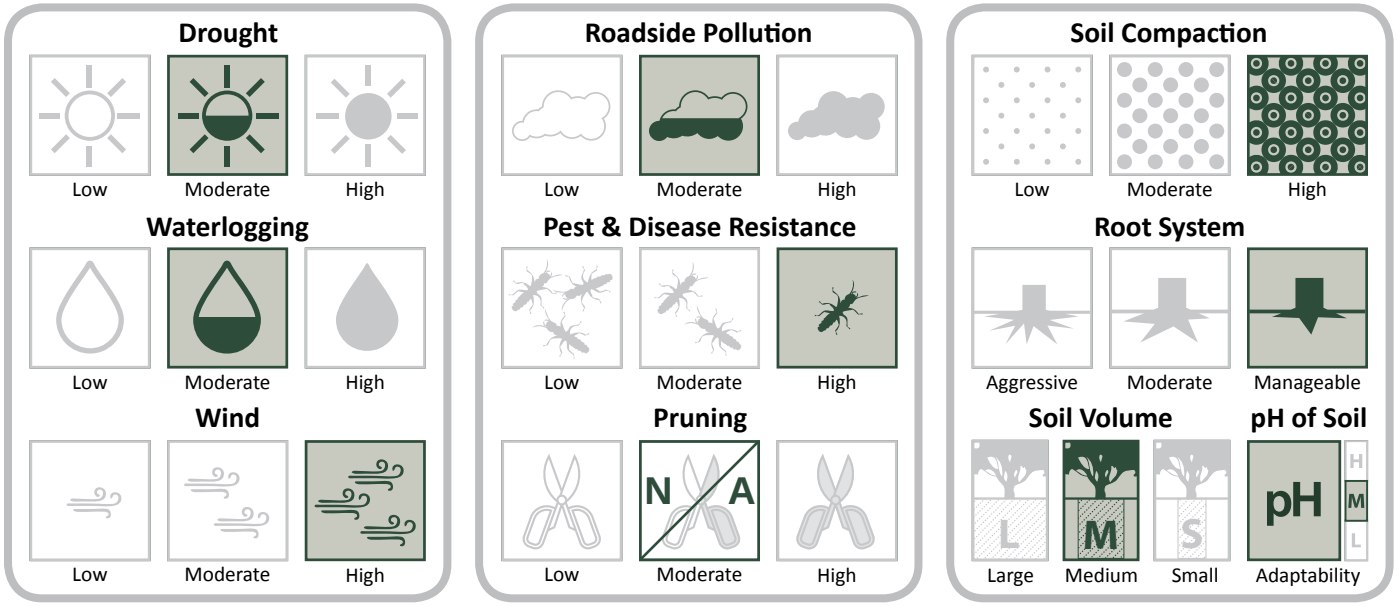


Feature

Special Maintenance Requirements

- Monitoring of old leaves is needed to prevent injury from falling leaves
- Irrigation is recommended in extended dry periods

Tolerance



Xanthostemon chrysanthus
金蒲桃

Recommended Street Types: A 1 2 | **B 1 2** | C 1 2 | D 1 2 | E 1 2 | F 1 2 | G 1 2

General Information

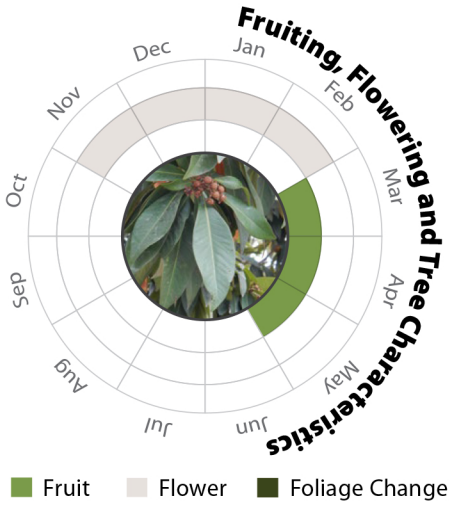
Native | **Exotic** | **Evergreen** | Deciduous | Partial Shade | **Full Sun**

Family: MYRTACEAE **Heat Tolerance:** Moderate

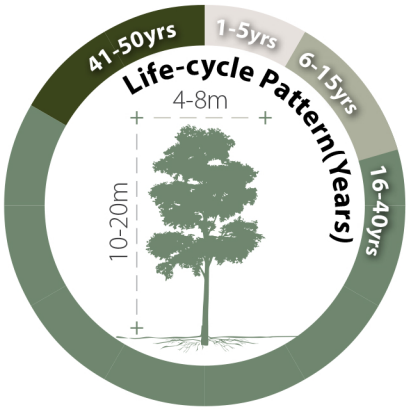
Special Properties : Larval food plant of butterflies; Flower nectar attractive to wildlife; Bright yellow flowers

Flowers

Fruits



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence



Feature

Ecological Value | Ornamental | Shade Cast

Special Maintenance Requirements

- No special maintenance requirement

Tolerance

Drought

Waterlogging

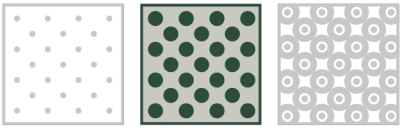
Wind

Roadside Pollution

Pest & Disease Resistance

Pruning

Soil Compaction



Root System

Soil Volume

pH of Soil

Zanthoxylum avicennae
筋檻花椒, 筋檻

Recommended Street Types

A 1 2 | **B 1 2** | C 1 2 | **D 1 2** | E 1 2 | F 1 2 | G 1 2

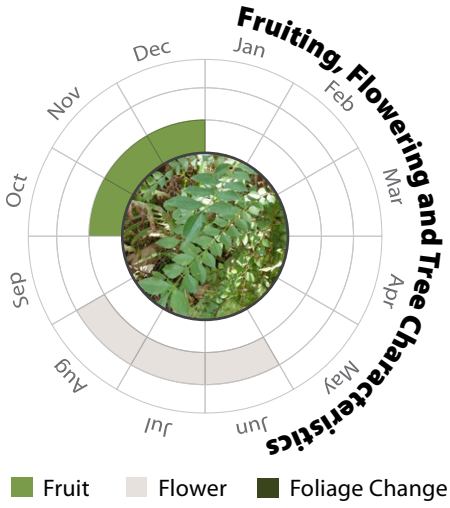
General Information

Native | Exotic | Evergreen | **Deciduous** | Partial Shade | **Full Sun**

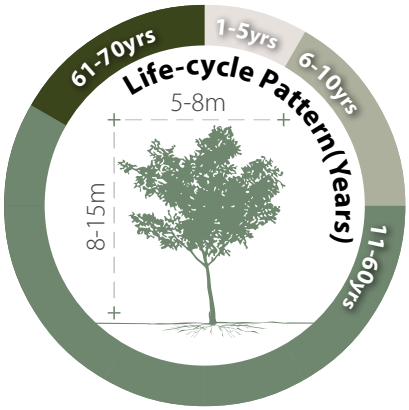
Family: RUTACEAE **Heat Tolerance:** Moderate

Special Properties : Fruits attractive to wildlife; Larval food of butterflies; Tree trunk and branches has thorns

Tree Bark



- Propagation to Seedling
- Sapling to Semi-mature
- Mature
- Senescence



Feature

Ecological Value | Ornamental | Shade Cast

Special Maintenance Requirements

- Poisonous fruits

Tolerance

Drought

Low | Moderate | High

Waterlogging

Low | Moderate | High

Wind

Low | Moderate | High

Roadside Pollution

Low | Moderate | High

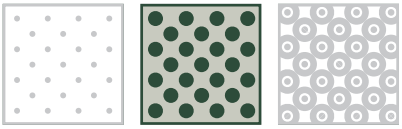
Pest & Disease Resistance

Low | Moderate | High

Pruning

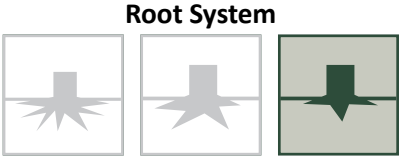
Low | Moderate | High

Soil Compaction



Low | Moderate | High

Root System



Aggressive | Moderate | Manageable

Soil Volume

Large | Medium | Small

pH of Soil

Adaptability

Appendix B. Tree Selection Criteria Rating

Explanation for Selection Criteria Ratings

Selection Criteria			Rating			
			High	Medium	Low	Unknown
Essential Attributes	Climate Resilience	Heat Tolerance	1. Ability to withstand transitory or constantly high temperature in summer at ≥35°C for 2 weeks time without leaf or bark burn; abnormal health stresses	1. Ability to withstand summer mean temperature (29°C) for more than 2 weeks without leaf or bark burn; abnormal health stresses	1. Ability to withstand summer mean temperature (29°C) with sign of leaf or bark burn; abnormal health stresses	1. Species not known to have adapted to climatic conditions
		Drought Tolerance	1. Can tolerate dry spell ≥2 months without supplementary irrigation, and 2. Can quickly recover from temporary wilting without any means of irrigation, and / or 3. Can thrive when consistently exposed to drought stress during growing season.	1. Can tolerate dry spell ≥1 month without supplementary irrigation	1. Can only tolerate dry spell <1 month without supplementary irrigation	1. Species not known to have adapted to dry conditions
		Waterlogging Tolerance	1. Adapted to waterlogged tree pit, and / or 2. Can recover within annual season after flooding	1. Can survive fortnightly Amber rainstorm or above signals and inundation events, and 2. Can recover within annual season after flooding.	1. Require well-drained tree pit.	1. Species not known to have adapted to waterlogging conditions
	Life-Cycle Planning	Urban Useful Life Expectancy	1. Projected at least 40 year growth before senescence in location	1. Projected 20-40 year growth before senescence in location	1. Projected <20 year growth before senescence in location	1. Unknown years of growth before over-maturity in location
		Wind Tolerance	1. Require supporting structure up to sapling stage, and / or 2. High mechanical stress tolerance - strong and stiff or strong and moderately stiff, and / or 3. High structural strength; low tree limb brittleness.	1. Require supporting structure up to semi-mature stage, and / or 2. Moderate mechanical stress tolerance - Moderately strong but not stiff or moderately strong and stiff, and / or 3. Moderate structural strength; moderate tree limb brittleness.	1. Require supporting structure from propagation to maturity stage, and / or 2. Low mechanical stress tolerance - Not strong but stiff or Not strong but moderately stiff, and / or 3. Low structural strength; high tree limb brittleness.	1. Not known whether supporting measures are necessary throughout species' life span, and / or 2. Species not known to have mechanical stress tolerance
		Manageability	1. Fruit or seed drops are non-staining, sticky, or not a safety hazard or no fruit or seed drops, and / or 2. Limited amounts of plant litter, and / or 3. Low maintenance frequency in order for tree to survive.	1. Fruit or seed drops are not a safety hazard, maybe staining or sticky, and / or 2. Moderate amounts of plant litter, and / or 3. Moderate maintenance frequency in order for tree to survive.	1. Fruit and seed drops are staining; sticky or safety hazard, and / or 2. Large amounts of plant litter, and / or 3. High maintenance frequency in order for tree to survive.	1. Species not known to have fruit or seed drops
		Crown Management	1. **(Minimal)** Minimal crown management is required within a year for traffic headroom	1. **(Moderate)** Annual management of crown for traffic headroom	1. **(Frequent)** Crown management is required half-yearly or less for traffic headroom	1. Not known whether crown management is necessary for traffic headroom
	Pest and Disease Resistance		1. Without known common pests and diseases in Hong Kong, and / or 2. Containment and management achievable through established treatment mechanisms	1. With infection/infestation record of common pests and diseases in Hong Kong, and 2. Containment and management achievable through established treatment mechanisms	1. With known pests and diseases outbreak in local history, and / or 2. Require aggressive treatment and management processes	1. Species with no pest outbreak record in local history, and / or 2. Unknown treatment and management for pest and disease
Valued Attributes	Roadside Pollution Tolerance [1]		1. High tolerance to pollution; does not wilt, die or deteriorate in health, and / or 2. Tolerates atmospheric pollution at high traffic areas or industrial areas	1. Moderate tolerance to pollution; does not wilt or die	1. Poor tolerance to pollution; high chance of mortality	1. Species not known to have atmospheric pollution tolerance
	Pruning Tolerance		1. Foliage can easily and rapidly recover from pruning within the same growing season, and / or 2. Can maintain fair tree form within the same growing season after pruning, and / or 3. Can recover from pruning cuts with sound wood within one growing season.	1. Foliage can easily and rapidly recover from pruning during the following growing season, and / or 2. Can maintain fair tree form during the following growing season after pruning, and / or 3. Can progressively recover from pruning cuts with sound wood growth during the following growing season.	1. Take more than 3 growing seasons to slowly recover its foliage growth and/or tree form after pruning, and / or 2. Slowly recovers from after-effect of crown pruning, and / or 3. Species suffer from poor health after pruning.	1. Unknown consequences to species after pruning
	Urban soil adaptability	Soil Compaction Tolerance	1. Survive in soil with bulk density (x≥1.92 Mg/cubic meter)[2]; or 2. Can survive with restricted soil aeration	1. Survive in soil with bulk density (1.42 Mg/cubic meter< x ≤1.92Mg/cubic meter)[2]	1. Survive in soil with bulk density (x≤1.42 Mg/cubic meter)[2]	1. Species not known to have soil compaction tolerance
		Root System (Manageability)	1. **(Manageable)** Root system seldom causes pavement upheaving or conflict with adjacent structures	1. (**Moderate)** Root system causes some degree of pavement upheaving	1. **(Aggressive)** Root system can easily to cause pavement upheaving and conflict with adjacent structures	1. Species with unknown root system
		Soil Volume Tolerance	1. **(Small)** Species can maintain fair tree health, condition and form in small planting sites (average soil surface area for each tree: 1.2m to 1.5m dia. X 1.2m depth)	1. **(Medium)** Species can maintain fair tree health, condition and form in medium-sized planting sites (average soil surface area for each tree: 1.5m to 2m dia. X 1.2m depth), and 2. Species may be unable to maintain fair tree health, condition and form in small planting sites (average soil surface area for each tree: 1.2m to 1.5m dia. X 1.2m depth)	1. **(Large)** Species can maintain fair tree health, condition and form in large-sized planting sites only (average soil surface area for each tree > 4m dia. X 1.2m depth)	1. Unknown performance in different size of planting sites
		pH of Soil (Range)	1. Species that is most favourable to grow / perform well in the general topsoil pH requirement range (pH 5.5 – 7.0)[3] and can also perform well in moderate acidic and slightly alkaline topsoil pH	1. Species that can grow properly / well perform only in either medium to slightly acidic (pH 5.5 - 6.5)[4] or slightly to moderate alkaline (pH 7.5 - 8.5)[4] topsoil	1. Species that can grow properly / well perform only in either strongly acidic (pH 4.0 - 5.5)[4] or strongly alkaline (pH 8.5 - 10.0)[4] topsoil	1. Species not known to have adapted to various pH conditions
	Tree Size Dimension (for urban environment)		1. **(Large)** Species with large mature size: diameter of crown greater than 10m or height over 15m	1. **(Medium)** Species with medium mature size: diameter of crown 5-10m or height between 8-15m	1. **(Small)** Species with small mature size: diameter of crown less than 5m and height less than 8m	N/A
	Ecological Value		1. Native species that provide a variety of habitat values, or 2. Species of scientific value to the location	1. Naturalised or Exotic species that provide a variety of habitat values, or 2. Natives species that provide less variety of habitat values	1. Exotic species that provide less variety of habitat values	1. Species not known to have habitat values
	Ornamental Value (seasonal interest, colour, tree form, cultural, historical context and function)		1. Can relate to Hong Kong's cultural or historical context, or 2. Unique tree form, leaves, flowers or fruit, seasonal foliage, seeds, or 3. Has high ornamental value for a prolonged period of time (more than 3 months), or 4. Species with botanical interest, or 5. Has functional values such as visual screening, noise absorption, barrier and exhaust outlet buffering), or 6. Appeals to more than one of the five sensory senses	1. Has moderate feature value for a short period of time (less than 3 months), or 2. Appeals to one of the five sensory senses	1. Has little or no feature value, or 2. Cannot be distinguished amongst surrounding vegetation as a feature.	N/A
	Shade Cast		1. Species with heavy shade cast by large and spreading crown (diameter of crown greater than 10m) and dense foliage at mature stage in summertime	1. Species with moderate shade cast by medium-sized spreading crown (diameter of crown 5-10m) or moderate foliage density at mature stage in summertime	1. Species with low shade cast by small tree spreading crown (diameter of crown less than 5m) or low foliage density at mature stage throughout year	N/A

Note: Tree species which do not fulfil minimum acceptance level are excluded from this rating process and are not considered. This includes species being inadaptable to Hong Kong climate, invasive to local ecosystem or with brittle limbs or branches

[1] Pollution ratings of species are primarily based on literature reference and biological/horticultural experience

[2] Bulk density (x) is an indicator for soil compaction from Jim, C.Y. (1998). Soil compaction at tree-planting sites in urban Hong Kong. In: D. Neely and G.W. Watson (eds.) The Landscape Below Ground II. International Society of Arboriculture, Champaign, Illinois, pp. 166-178.

[3] ArchSD GS 25.02 (a)(iii), the general topsoil pH should have a pH value between 5.5 – 7.0.

[4] General Soil pH categories

Appendix B - Tree Selection Criteria Rating

Tree Information and Characteristics

No.	Botanical name	Chinese description	Family name	Provenance	Deciduous/ Evergreen	Flowering period	Fruiting period	Height	Canopy Spread	Sunlight preference	Tree contains poisonous parts
1	*Adenanthera microsperma*	海紅豆, 孔雀豆	MIMOSACEAE	Native	Deciduous	Apr-Jul	Jul-Oct	15-20m	12-15m	full sun to partial shade	✓
2	*Arenga pinnata*	砂糖椰子, 桄榔	ARECACEAE	Exotic	Evergreen	Jun	Sept-Oct	15-20m	3-5m	full sun to partial shade	-
3	*Albizia julibrissin*	合歡	MIMOSACEAE	Exotic	Deciduous	May-Jul	Aug-Oct	8-12m	8-15m	full sun	-
4	*Aporosa dioica*	銀柴, 大沙葉	EUPHORBIACEAE	Native	Evergreen	Jan-Dec	Jan-Dec	7-10m	4-6m	full sun to partial shade	-
5	*Bixa orellana*	紅木	BIXACEAE	Exotic	Evergreen	May-Aug	Sep-Feb	5-8m	4-8m	full sun	-
6	*Brachychiton acerifolius*	槭葉蘋婆	STERCULIACEAE	Exotic	Deciduous	April	April-May	10-15m	6-8m	full sun	-
7	*Bridelia tomentosa*	土蜜樹, 逼迫仔	EUPHORBIACEAE	Native	Evergreen	Jan-Dec	Jan-Dec	5-12m	2-7m	full sun to partial shade	-
8	*Caesalpinia ferrea*	巴西鐵木	CAESALPINIACEAE	Exotic	Evergreen	Jun-Aug	Jun-Aug	6-12m	4-10m	full sun	-
9	*Carallia brachiata*	竹節樹	RHIZOPHORACEAE	Native	Evergreen	Nov-Apr	Feb-Jul	7-10m	6-8m	full sun	-
10	*Cassia* x *nealiae*	彩虹雨樹	CAESALPINIACEAE	Exotic	Deciduous	May	no fruit	10-15m	12-17m	full sun	-
11	*Cassia javanica* var. *indochinensis*	節果決明	CAESALPINIACEAE	Exotic	Deciduous	May-Jun	July-Aug	10-15m	12-18m	full sun	-
12	*Celtis timorensis*	假玉桂, 樟葉朴	ULMACEAE	Native	Evergreen	March-May	July-Nov	5-8m	4-6m	full sun to partial shade	-
13	*Choerospondias axillaris*	南酸棗, 酸棗	ANACARDIACEAE	Native	Deciduous	Jun	Sep-Nov	8-20m	10-15m	full sun	-
14	*Chukrasia tabularis*	麻楝	MELIACEAE	Exotic	Semi-Deciduous	Apr-May	Jul-Jan	15-25m	12-18m	full sun to partial shade	-
15	*Cinnamomum parthenoxylon*	黃樟	LAURACEAE	Native	Evergreen	Mar-May	Apr-Oct	10-20m	8-12m	full sun to partial shade	-
16	*Cleistocalyx nervosum*	水翁	MYRTACEAE	Native	Evergreen	May-June	Aug-Sept	10-15m	12-17m	full sun to partial shade	-
17	*Cordia dichotoma*	破布木	BORAGINACEAE	Native	Deciduous	April-Jun	Jun-Sept	5-8m	3-5m	full sun to partial shade	-
18	*Crateva trifoliata*	鈍葉魚木	CAPPARACEAE	Exotic	Deciduous	Mar-May	Aug-Nov	5-8m	5-10m	full sun	-
19	*Crateva unilocularis*	樹頭菜	CAPPARACEAE	Exotic	Deciduous	Feb-Apr	Jun-Nov	10-15m	8-12m	full sun	-
20	*Cratoxylum cochinchinense*	黃牛木	CLUSIACEAE	Native	Deciduous	Apr-May	June	8-10m	10-12m	full sun to partial shade	-
21	*Dalbergia assamica*	南嶺黃檀	FABACEAE	Native	Deciduous	May-Oct	Sept-Dec	10-15m	8-12m	full sun to partial shade	-
22	*Diospyros morrisiana*	羅浮柿	EBENACEAE	Native	Deciduous	May-Jun	Nov	10-20m	7-12m	full sun to partial shade	-

Appendix B - Tree Selection Criteria Rating

No.	Botanical name	Chinese description	Family name	Provenance	Deciduous/ Evergreen	Flowering period	Fruiting period	Height	Canopy Spread	Sunlight preference	Tree contains poisonous parts
23	*Dracontomelon duperreanum*	人面子	ANACARDIACEAE	Exotic	Evergreen	Apr-May	Jun-Nov	20-25m	10-15m	full sun	-
24	*Ehretia longiflora*	長花厚殼樹	BORAGINACEAE	Native	Deciduous	Jan-Sep	Jan-Sep	10-15m	5-8m	full sun to partial shade	-
25	*Elaeocarpus apiculatus*	長芒杜英, 尖葉杜英	ELAEOCARPACEAE	Exotic	Evergreen	Aug-Sept	Oct-Jan	20-30m	12-15m	full sun to partial shade	-
26	*Elaeocarpus chinensis*	中華杜英	ELAEOCARPACEAE	Native	Evergreen	May-Jun	Oct-Nov	5-8m	3-5m	full sun	-
27	*Elaeocarpus hainanensis*	水石榕	ELAEOCARPACEAE	Exotic	Evergreen	Jun-Jul	Jul-Sept	3-5m	3-6m	full sun	-
28	*Elaeocarpus japonicus*	日本杜英	ELAEOCARPACEAE	Native	Evergreen	Apr-May	May-Jul	15-25m	10-15m	full sun	-
29	*Ficus altissima*	高山榕, 雞榕	MORACEAE	Exotic	Evergreen	Mar-Oct	Mar-Oct	25-30m	15-25m	full sun	-
30	*Ficus binnendijkii*	阿里垂榕	MORACEAE	Exotic	Evergreen	Mar-Jul	Aug-Oct	4-8m	2.5-4m	full sun	-
31	*Ficus fistulosa*	水同木	MORACEAE	Native	Evergreen	Mar-Dec	Mar-Dec	4-8m	3-6m	full sun	-
32	*Ficus lyrata*	大琴葉榕	MORACEAE	Exotic	Evergreen	Mar-Nov	Mar-Nov	7-12m	7-10m	full sun to partial shade	-
33	*Ficus religiosa*	菩提樹	MORACEAE	Exotic	Evergreen	Sept-Nov	Sept-Nov	20-25m	25-30m	full sun to partial shade	-
34	*Ficus subpisocarpa*	筆管榕	MORACEAE	Native	Deciduous	Feb-Sept	Feb-Sept	5-10m	5-12m	full sun to partial shade	-
35	*Ficus variegata*	青果榕	MORACEAE	Native	Deciduous	Mar-Dec	Mar-Dec	10-15m	8-12m	full sun to partial shade	-
36	*Ficus virens*	大葉榕, 黃葛樹	MORACEAE	Native	Deciduous	Apr-Oct	Apr-Oct	15-20m	17-22m	full sun	-
37	*Garcinia subelliptica*	菲島福木	CLUSIACEAE	Exotic	Evergreen	Mar-Aug	Sep-Dec	3-5m	2-4m	full sun to partial shade	-
38	*Hyophorbe lagenicaulis*	酒瓶椰子	ARECACEAE	Exotic	Evergreen	Mar-May	Jul-Feb	2-4m	1-2m	full sun to partial shade	-
39	*Ilex rotunda* var. *microcarpa*	小果鐵冬青	AQUIFOLIACEAE	Native	Evergreen	Mar-May	Dec-Feb	15-20m	15-20m	full sun to partial shade	-
40	*Juniperus chinensis* 'Kaizuka'	龍柏	CUPRESSACEAE	Exotic	Evergreen	Mar-Apr	Oct-Jan	5-7m	1-2m	full sun to partial shade	-
41	*Khaya senegalensis*	非洲楝	MELIACEAE	Exotic	Evergreen	Apr-Jun	Apr-Jun	20-25m	15-20m	full sun to partial shade	-
42	*Koelreuteria elegans* subsp. *formosana*	台灣欒樹	SAPINDACEAE	Exotic	Deciduous	Jun-Jul	Sept-Oct	15-20m	15-20m	full sun to partial shade	-
43	*Liquidambar formosana*	楓香	HAMAMELIDACEAE	Native	Deciduous	Mar-Jun	Jul-Sept	20-30m	15-20m	full sun to partial shade	-
44	*Litsea glutinosa*	潺槁樹	LAURACEAE	Native	Evergreen	May-Jun	Sept-Oct	10-15m	8-12m	full sun to partial shade	-
45	*Litsea monopetala*	假柿木薑子, 假柿樹	LAURACEAE	Native	Evergreen	Nov-Jun	Jun-Jul	12-18m	5-10m	full sun to partial shade	-

Appendix B - Tree Selection Criteria Rating

No.	Botanical name	Chinese description	Family name	Provenance	Deciduous/ Evergreen	Flowering period	Fruiting period	Height	Canopy Spread	Sunlight preference	Tree contains poisonous parts
46	*Machilus breviflora*	短序潤楠, 短花楠	LAURACEAE	Native	Evergreen	Jul-Aug	Oct-Dec	8-12m	6-8m	full sun to partial shade	-
47	*Machilus chekiangensis*	浙江潤楠	LAURACEAE	Native	Evergreen	Feb	Apr-May	7-15m	8-12m	full sun to partial shade	-
48	*Machilus chinensis*	華潤楠, 香港楠	LAURACEAE	Native	Evergreen	Sept	Feb	8-10m	5-7m	full sun to partial shade	-
49	*Machilus velutina*	絨毛潤楠	LAURACEAE	Native	Evergreen	Oct-Dec	Feb-Mar	15-18m	7-12m	full sun	-
50	*Melia azedarach*	楝, 苦楝	MELIACEAE	Exotic	Deciduous	Apr-May	Oct-Dec	15-20m	15-20m	full sun to partial shade	✓
51	*Michelia champaca*	黃蘭	MAGNOLIACEAE	Exotic	Evergreen	Jun-Jul	Sept-Oct	10-12m	5-8m	full sun to partial shade	-
52	*Microcos nervosa*	布渣葉	TILIACEAE	Native	Evergreen	Jun-Jul	Aug-Oct	8-12m	5-10m	full sun to partial shade	-
53	*Nageia nagi*	竹柏	PODOCARPACEAE	Exotic	Evergreen	Mar-May	Aug-Nov	10-12m	6-8m	partial shade	-
54	*Palaquium formosanum*	台灣膠木	SAPOTACEAE	Exotic	Evergreen	Sept-May	Jun-Oct	12-20m	10-15m	full sun	-
55	*Peltophorum tonkinense*	銀珠	CAESALPINIACEAE	Exotic	Deciduous	Mar-Jun	Jul-Oct	15-20m	6-8m	full sun to partial shade	-
56	*Phoenix dactylifera*	海棗, 棗椰樹	ARECACEAE	Exotic	Evergreen	Mar-Apr	Sep-Oct	10-30m	3-12m	full sun	-
57	*Plumeria rubra*	雞蛋花, 紅雞蛋花	APOCYNACEAE	Exotic	Deciduous	Mar-Sept	May-Dec	5-8m	6-10m	full sun to partial shade	-
58	*Podocarpus macrophyllus*	羅漢松	PODOCARPACEAE	Native	Evergreen	Apr-May	Aug-Sept	10-15m	3-6m	full sun to full shade	-
59	*Polyalthia longifolia*	長葉暗羅	ANNONACEAE	Exotic	Evergreen	Mar-May	Jun-Sep	10-15m	2-3m	full sun to partial shade	-
60	*Polyspora axillaris*	大頭茶	THEACEAE	Native	Evergreen	Sept-Oct	Nov-Dec	5-8m	3-5m	full sun to partial shade	-
61	*Pongamia pinnata*	水黃皮	FABACEAE	Native	Evergreen	May-Jun	Aug-Oct	10-15m	10-15m	full sun	-
62	*Pterocarpus indicus*	紫檀	FABACEAE	Exotic	Semi-Deciduous	Feb-Aug	Nov	15-20m	15-20m	full sun to partial shade	-
63	*Pterospermum heterophyllum*	翻白葉樹	STERCULIACEAE	Native	Evergreen	Sep-Nov	Oct-Nov	15-18m	8-10m	full sun to partial shade	-
64	*Radermachera hainanensis*	海南菜豆樹	BIGNONIACEAE	Exotic	Evergreen	Mar-Apr	May-Jun	13-20m	5-10m	full sun to partial shade	-
65	*Rhus hypoleuca*	白背鹽膚木	ANACARDIACEAE	Native	Deciduous	Jun-Aug	Sept-Nov	2-5m	2-3m	full sun	-
66	*Sapindus saponaria*	無患子, 木患子	SAPINDACEAE	Native	Deciduous	Mar-May	Jun-Nov	10-20m	12-16m	full sun	✓
67	*Sapium discolor*	山烏桕	EUPHORBIACEAE	Native	Deciduous	Apr-Jun	July-Oct	5-12m	6-8m	full sun to partial shade	-
68	*Sapium sebiferum*	烏桕	EUPHORBIACEAE	Native	Deciduous	Apr-Aug	Aug-Nov	12-17m	8-10m	full sun to partial shade	✓

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No.	Botanical name	Chinese description	Family name	Provenance	Deciduous/ Evergreen	Flowering period	Fruiting period	Height	Canopy Spread	Sunlight preference	Tree contains poisonous parts
69	*Schima superba*	木荷, 荷樹	THEACEAE	Native	Evergreen	Jun-Aug	Oct-Dec	10-20m	8-10m	full sun to partial shade	-
70	*Senna spectabilis*	美麗決明, 美洲槐	CAESALPINIACEAE	Exotic	Evergreen	Mar-Apr	Jul-Sept	8-10m	8-12m	full sun to partial shade	-
71	*Swietenia mahagoni*	桃花心木	MELIACEAE	Exotic	Evergreen	May-Jun	Oct-Nov	20-25m	18-22m	full sun to partial shade	-
72	*Syzygium cumini*	烏墨, 海南蒲桃	MYRTACEAE	Exotic	Evergreen	Feb-May	Jun-Sept	12-15m	8-10m	full sun	-
73	*Syzygium hancei*	韓氏蒲桃, 紅鱗蒲桃	MYRTACEAE	Native	Evergreen	Jul-Sept	Nov-Jan	8-10m	5-8m	full sun to partial shade	-
74	*Syzygium jambos*	蒲桃	MYRTACEAE	Exotic	Evergreen	Mar-Apr	May-Jun	7-12m	5-8m	full sun to partial shade	-
75	*Syzygium levinei*	山蒲桃	MYRTACEAE	Native	Evergreen	Jul-Sept	Feb-May	10-15m	8-12m	full sun to partial shade	-
76	*Thespesia populnea*	恒春黃槿, 繖楊	MALVACEAE	Native	Evergreen	Jan-Dec	Jan-Dec	6-8m	5-10m	full sun	-
77	*Ulmus parvifolia*	榔榆	ULMACEAE	Exotic	Deciduous	Aug-Oct	Aug-Oct	12-25m	18-22m	full sun to partial shade	-
78	*Wodyetia bifurcata*	狐尾椰子	ARECACEAE	Exotic	Evergreen	May-Jul	Aug-Sept	10-20m	4-6m	full sun	-
79	*Xanthostemon chrysanthus*	金蒲桃	MYRTACEAE	Exotic	Evergreen	Nov-Feb	Mar-May	10-20m	4-8m	full sun	-
80	*Zanthoxylum avicennae*	簕欓花椒, 簕欓	RUTACEAE	Native	Deciduous	Jun-Aug	Oct-Dec	8-15m	5-8m	full sun	✓

Appendix B - Tree Selection Criteria Rating

Rating of Selection Criteria for Tree Species

No.	Botanical name	Chinese description	Selection Criteria*	Essential Attributes								Valued Attributes									
				Climate Resiliance			Life-Cycle Planning							Urban soil adaptability							
				Heat Tolerance	Drought Tolerance	Waterlogging Tolerance	Urban Useful Life Expectancy	Wind Tolerance	Manageability	Crown management	Pest & Disease Resistance	Roadside Pollution tolerance	Pruning tolerance	Soil compaction tolerance	Root system (manageability)	Soil volume tolerance	pH of Soil (Range)	Tree size dimension (for urban environment)	Ecological Value	Ornamental Value	Shade cast
1	*Adenanthera microsperma*	海紅豆, 孔雀豆		M	H	M	H	H	H	H	H	M	M	H	H	M	H	H	M	M	H
2	*Arenga pinnata*	砂糖椰子, 桄榔		M	M	M	M	H	H	H	M	M	-	H	H	M	H	M	M	M	L
3	*Albizia julibrissin*	合歡		M	M	M	M	M	H	H	H	M	H	M	L	L	H	H	M	M	H
4	*Aporosa dioica*	銀柴, 大沙葉		M	H	M	H	M	M	H	H	M	M	M	H	M	H	M	M	L	M
5	*Bixa orellana*	紅木		H	M	M	M	M	M	H	H	H	H	H	H	M	H	M	M	H	M
6	*Brachychiton acerifolius*	槭葉蘋婆		M	H	M	H	H	M	M	H	H	H	M	L	M	H	M	M	H	M
7	*Bridelia tomentosa*	土蜜樹, 逼迫仔		M	M	M	M	H	M	H	H	H	M	M	H	M	M	M	H	L	L
8	*Caesalpinia ferrea*	巴西鐵木		M	M	M	H	M	H	M	H	H	M	M	L	L	H	M	M	H	M
9	*Carallia brachiata*	竹節樹		M	M	H	H	H	H	H	M	M	M	M	M	L	M	M	H	L	M
10	*Cassia* x *nealiae*	彩虹雨樹		M	M	M	H	M	H	M	H	M	H	M	L	L	H	M	M	H	H
11	*Cassia javanica* var. *indochinensis*	節果決明		M	M	M	H	M	H	M	H	H	M	M	L	L	H	M	M	H	H
12	*Celtis timorensis*	假玉桂, 樟葉朴		H	H	M	H	M	H	H	M	M	H	M	M	M	M	L	M	M	M
13	*Choerospondias axillaris*	南酸棗, 酸棗		M	M	H	H	M	M	M	H	H	H	H	H	L	H	H	M	H	H
14	*Chukrasia tabularis*	麻楝		M	M	M	H	H	M	H	H	H	M	M	L	L	H	H	M	M	H
15	*Cinnamomum parthenoxylon*	黃樟		M	M	M	H	H	H	H	H	H	H	M	M	M	H	H	M	M	H
16	*Cleistocalyx nervosum*	水翁		M	M	H	H	H	M	H	H	M	H	M	M	L	M	M	H	M	H
17	*Cordia dichotoma*	破布木		M	M	M	M	M	M	M	M	M	M	M	M	H	M	L	H	M	L
18	*Crateva trifoliata*	鈍葉魚木		M	M	M	H	H	H	H	M	H	M	M	M	M	H	M	M	H	M
19	*Crateva unilocularis*	樹頭菜		M	H	M	H	H	H	H	M	M	H	M	H	L	H	M	M	H	M
20	*Cratoxylum cochinchinense*	黃牛木		M	M	M	H	H	M	H	H	H	H	H	H	M	M	M	H	H	M
21	*Dalbergia assamica*	南嶺黃檀		M	M	M	H	H	H	H	M	H	H	M	H	L	H	M	H	H	M
22	*Diospyros morrisiana*	羅浮柿		M	M	M	M	M	M	M	M	M	M	M	M	M	M	H	H	M	H
23	*Dracontomelon duperreanum*	人面子		M	M	M	H	H	M	H	H	H	H	M	L	L	H	H	M	M	H

Appendix B - Tree Selection Criteria Rating

No.	Botanical name	Chinese description	Selection Criteria*	Essential Attributes								Valued Attributes									
				Climate Resiliance			Life-Cycle Planning							Urban soil adaptability							
				Heat Tolerance	Drought Tolerance	Waterlogging Tolerance	Urban Useful Life Expectancy	Wind Tolerance	Manageability	Crown management	Pest & Disease Resistance	Roadside Pollution tolerance	Pruning tolerance	Soil compaction tolerance	Root system (manageability)	Soil volume tolerance	pH of Soil (Range)	Tree size dimension (for urban environment)	Ecological Value	Ornamental Value	Shade cast
24	*Ehretia longiflora*	長花厚殼樹		M	M	M	H	M	H	H	M	H	M	M	M	M	M	M	M	M	M
25	*Elaeocarpus apiculatus*	長芒杜英, 尖葉杜英		M	H	H	H	M	H	H	M	H	H	H	H	M	H	H	M	H	M
26	*Elaeocarpus chinensis*	中華杜英		M	H	H	H	M	H	H	M	H	H	H	H	H	H	L	M	H	L
27	*Elaeocarpus hainanensis*	水石榕		M	H	M	H	H	H	M	H	H	H	M	H	L	H	L	M	H	L
28	*Elaeocarpus japonicus*	日本杜英		M	M	M	H	H	H	H	M	H	H	M	H	M	H	H	H	H	M
29	*Ficus altissima*	高山榕, 雞榕		M	M	M	H	M	M	H	H	H	H	M	L	L	M	H	M	M	H
30	*Ficus binnendijkii*	阿里垂榕		M	M	M	H	M	H	H	H	H	M	M	M	H	M	L	M	H	L
31	*Ficus fistulosa*	水同木		M	M	M	H	M	H	H	H	H	M	M	H	M	M	L	H	L	L
32	*Ficus lyrata*	大琴葉榕		M	H	M	H	M	H	H	H	H	M	H	M	L	H	M	M	H	M
33	*Ficus religiosa*	菩提樹		M	H	M	H	M	H	M	H	H	H	L	L	L	H	H	M	H	H
34	*Ficus subpisocarpa*	筆管榕		M	H	M	H	M	H	H	H	H	M	M	L	L	H	M	M	L	M
35	*Ficus variegata*	青果榕		M	H	M	H	M	H	H	H	H	M	M	L	L	H	M	H	M	M
36	*Ficus virens*	大葉榕, 黃葛樹		M	H	M	H	M	M	M	M	H	M	L	L	L	H	H	H	M	H
37	*Garcinia subelliptica*	菲島福木		M	M	M	H	H	H	H	H	H	M	M	H	M	H	M	M	H	L
38	*Hyophorbe lagenicaulis*	酒瓶椰子		M	M	M	H	H	H	H	M	M	-	M	H	H	H	L	L	H	L
39	*Ilex rotunda* var. *microcarpa*	小果鐵冬青		M	H	M	H	H	H	H	M	H	M	H	M	H	H	H	M	H	H
40	*Juniperus chinensis* 'Kaizuka'	龍柏		M	H	M	M	H	H	H	M	H	H	H	H	H	H	L	M	H	L
41	*Khaya senegalensis*	非洲楝		M	H	H	H	H	H	H	M	H	M	H	H	L	M	H	L	M	H
42	*Koelreuteria elegans* subsp. *formosana*	台灣欒樹		M	H	M	H	M	H	H	M	H	M	M	H	L	H	H	M	H	H
43	*Liquidambar formosana*	楓香		M	M	M	H	H	M	H	H	H	M	H	L	L	H	H	H	H	M
44	*Litsea glutinosa*	潺槁樹		M	H	M	H	M	H	H	H	H	M	H	M	M	H	M	M	M	H
45	*Litsea monopetala*	假柿木薑子, 假柿樹		M	M	M	H	M	H	H	H	H	M	H	M	M	H	M	H	M	M
46	*Machilus breviflora*	短序潤楠, 短花楠		H	H	M	H	H	H	H	H	H	H	M	M	M	H	M	M	H	M

Appendix B - Tree Selection Criteria Rating

No.	Botanical name	Chinese description	Selection Criteria*	Essential Attributes								Valued Attributes									
				Climate Resiliance			Life-Cycle Planning							Urban soil adaptability							
				Heat Tolerance	Drought Tolerance	Waterlogging Tolerance	Urban Useful Life Expectancy	Wind Tolerance	Manageability	Crown management	Pest & Disease Resistance	Roadside Pollution tolerance	Pruning tolerance	Soil compaction tolerance	Root system (manageability)	Soil volume tolerance	pH of Soil (Range)	Tree size dimension (for urban environment)	Ecological Value	Ornamental Value	Shade cast
47	*Machilus chekiangensis*	浙江潤楠		H	H	H	H	H	H	H	H	H	M	M	M	L	M	M	H	H	H
48	*Machilus chinensis*	華潤楠, 香港楠		M	H	M	H	H	H	H	H	H	M	H	M	M	H	M	M	H	M
49	*Machilus velutina*	絨毛潤楠		M	H	H	H	H	H	H	H	H	M	M	M	L	H	H	H	H	M
50	*Melia azedarach*	楝, 苦楝		H	H	M	M	M	M	H	H	H	M	H	H	L	H	H	M	H	H
51	*Michelia champaca*	黃蘭		M	M	H	H	H	H	M	H	H	M	M	H	M	H	M	M	H	M
52	*Microcos nervosa*	布渣葉		M	M	M	H	H	H	H	H	M	H	H	H	H	H	M	H	M	M
53	*Nageia nagi*	竹柏		H	M	M	H	H	H	H	H	M	H	M	M	L	H	M	M	M	M
54	*Palaquium formosanum*	台灣膠木		M	M	M	M	H	M	H	H	H	M	M	L	L	H	H	M	M	H
55	*Peltophorum tonkinense*	銀珠		M	M	M	H	H	M	H	H	L	M	M	H	L	H	H	M	H	M
56	*Phoenix dactylifera*	海棗, 棗椰樹		H	H	M	H	H	H	H	H	M	-	M	H	L	H	M	H	M	L
57	*Plumeria rubra*	雞蛋花, 紅雞蛋花		H	M	M	H	M	M	H	H	H	H	M	H	H	M	M	M	H	M
58	*Podocarpus macrophyllus*	羅漢松		H	H	M	H	M	H	H	H	H	M	M	M	H	H	M	H	H	L
59	*Polyalthia longifolia*	長葉暗羅		H	M	M	H	M	H	H	H	H	M	M	M	H	M	M	M	H	L
60	*Polyspora axillaris*	大頭茶		M	M	M	M	H	H	H	H	H	M	M	M	H	M	L	H	H	L
61	*Pongamia pinnata*	水黃皮		M	M	H	M	M	M	M	H	M	H	L	L	L	H	M	H	H	H
62	*Pterocarpus indicus*	紫檀		M	M	M	H	M	M	H	H	L	M	M	L	L	M	H	M	M	H
63	*Pterospermum heterophyllum*	翻白葉樹		M	H	M	H	H	M	H	H	L	M	L	H	M	M	H	M	M	M
64	*Radermachera hainanensis*	海南菜豆樹		H	H	M	H	H	H	H	H	L	M	M	H	M	M	M	M	H	M
65	*Rhus hypoleuca*	白背鹽膚木		M	H	M	H	H	H	H	H	M	M	M	H	H	M	L	M	L	L
66	*Sapindus saponaria*	無患子, 木患子		H	H	M	H	M	M	M	M	H	H	H	L	L	H	H	M	H	H
67	*Sapium discolor*	山烏桕		M	M	M	M	M	H	H	H	L	M	M	H	M	M	M	H	H	M
68	*Sapium sebiferum*	烏桕		M	M	H	M	M	H	M	H	L	M	M	L	M	M	M	H	M	M
69	*Schima superba*	木荷, 荷樹		M	H	H	H	H	H	H	H	M	M	H	M	L	M	M	H	H	M

Appendix B - Tree Selection Criteria Rating

No.	Botanical name	Chinese description	Selection Criteria*	Essential Attributes								Valued Attributes									
				Climate Resiliance			Life-Cycle Planning							Urban soil adaptability							
				Heat Tolerance	Drought Tolerance	Waterlogging Tolerance	Urban Useful Life Expectancy	Wind Tolerance	Manageability	Crown management	Pest & Disease Resistance	Roadside Pollution tolerance	Pruning tolerance	Soil compaction tolerance	Root system (manageability)	Soil volume tolerance	pH of Soil (Range)	Tree size dimension (for urban environment)	Ecological Value	Ornamental Value	Shade cast
70	*Senna spectabilis*	美麗決明, 美洲槐		M	M	M	H	M	H	M	H	M	M	M	M	M	M	M	M	M	M
71	*Swietenia mahagoni*	桃花心木		M	M	M	H	H	H	H	H	L	M	H	M	L	M	H	L	M	H
72	*Syzygium cumini*	烏墨, 海南蒲桃		M	H	M	H	H	M	M	H	L	M	H	M	M	M	M	H	H	M
73	*Syzygium hancei*	韓氏蒲桃, 紅鱗蒲桃		M	H	M	H	H	M	H	H	L	M	M	M	M	M	M	H	M	M
74	*Syzygium jambos*	蒲桃		M	M	H	H	H	M	M	H	H	M	H	M	M	M	M	M	M	M
75	*Syzygium levinei*	山蒲桃		M	H	M	H	H	M	H	M	H	M	M	M	M	H	M	M	M	H
76	*Thespesia populnea*	恒春黃槿, 繖楊		M	H	H	M	M	M	M	H	M	M	M	L	M	M	M	M	M	M
77	*Ulmus parvifolia*	榔榆		M	M	M	H	H	H	H	H	H	H	H	M	M	H	H	M	H	H
78	*Wodyetia bifurcata*	狐尾椰子		M	M	M	H	H	H	H	H	M	-	H	H	M	M	M	L	M	L
79	*Xanthostemon chrysanthus*	金蒲桃		M	M	M	M	M	H	H	H	H	M	M	M	M	M	M	M	H	L
80	*Zanthoxylum avicennae*	簕欓花椒, 簕欓		M	H	M	H	M	H	H	H	M	M	M	H	M	M	M	H	M	M

* Refer to Appendix B - Explanation for Selection Criteria Ratings

Appendix C. Maintenance Requirements at Different Phases of Trees' Life-cycle

Appendix C – Maintenance Requirements at Different Phases of Trees' Life-cycle

Seed Propagation

Type of Seed (N / F)

(N) - Naked seed is the seed borne by Gymnosperms woody plant (non-flowering seed plants) such as cedar, pine, redwood, hemlock, and firs. These seeds are best to be sowed in late winter. Giving the seeds a short cold stratification can aid in germination rate.

(F) - Fleshy seed is the seed enclosed in a protective covering called a fruit that borne by Angiosperms plants. The fleshy fruit needs to removed as much as possible and wash with fresh water. If the fruit is a seed pod, allow the pods to split open naturally by laying them in a semi-shaded area.

Seed Pre-treatment (0 / +1 / -)

(0) – Yes, pretreatment is required for seed immediately after harvesting before sowing. Pretreatment may include Mechanical treatment, Water treatment, Temperature treatment, Chemical treatment in order to improve germination rate, accelerate the germination process and improve seed growth

(+1) – Yes, pretreatment is required for seed within one year of harvesting before sowing Pretreatment may include, Mechanical treatment, Water treatment, Temperature treatment, Chemical treatment in order to improve germination rate, accelerate the germination process and improve seed growth

(-) – No, pretreatment is not required.

Non-Seed Propagation

Cutting (Y / -)

(Y) – Yes, propagation through cutting is viable

(-) – No, propagation not viable by cutting or unknown.

Layering (Y / -)

(Y) – Yes, propagation through layering is viable

(-) – No, propagation not viable by layering or unknown.

Grafting (Y / -)

(Y) – Yes, propagation through grafting is viable

(-) – No, propagation not viable by grating or unknown.

***Thinning out* (Y / -)**

(Y) – Yes, thinning out required for small seeds with direct sowing only

(-) – No, thinning out is not required or unknown.

Tree Staking (L / M / H)

To stabilize newly planted tree, sometimes tree staking is used to protect young trees from mechanical damage and to reduce vandalism and theft. Tree staking needs to be checked and adjusted regularly.

(L) – Low maintenance – tree staking is not required

(M) - Medium maintenance – tree staking is required for one growing season;

(H) - High maintenance – tree staking is required more than one growing season.

Pest/Disease Control (L / H)

(L) - Low maintenance - Pest/disease control inspection is required every six months. Pesticides should be applied if necessary.

(H) - High maintenance - Pest/disease control inspection is required every three months. Pesticides should be applied if necessary.

Formative Pruning (L / M / H)

(L) - Low maintenance – formative pruning is not required (tree form with single main leader naturally)

(M) - Medium maintenance – light formative pruning is required (Tree tends to develop co-dominant leaders)

(H) – High maintenance – moderate formative pruning is required. (Tree tends to develop more than 2 nos. of multiple leaders)

Irrigation (L / M / H)

(L) - Low maintenance – Low demand of irrigation. Tree can tolerate dry spell ≥ 2 months without supplementary irrigation

(M) - Medium maintenance - Medium demand of irrigation. Tree can tolerate ≥ 1 month without supplementary irrigation

(H) - High maintenance– High demand of irrigation. Tree can tolerate < 1 month without supplementary irrigation

Appendix C – Maintenance Requirements at Different Phases of Trees' Life-cycle

Fertilization

Type (N / P / K / Mg)

Emphasis on particular nutrient in fertilizer ratio.

(N) – Nitrogen

(P) – Phosporous

(K) – Potassium

(Mg) - Magnesium

Period of Application (L / F)

(L) – apply fertilizer when leaves are budding, usually early spring

(F) – apply fertilizer before flower budding

Tree Inspection & Risk Assessment (L / H)

(L) - Low maintenance– annual inspection for tree with slow to moderate growth rate / trees with higher wind tolerance / small size

(H) - High maintenance – inspection at every 6 months for tree with a fast growth rate / large tree with low wind tolerance / tree with weaker root system

Tree Protection (Y / -)

(Y) Yes, tree protection is required due to large tree with low wind tolerance / tree with weaker root system

(-) No, tree protection is not required due to higher wind tolerance / small tree size / lighter foliage density

Tree Pruning

(L) - Low maintenance - slow growing tree species seldom require pruning

(M) - Medium maintenance - moderate growers do not often require pruning

(H) - High maintenance - fast growers need to be pruned often.

Roots Management (L / M / H)

(L) - Low maintenance – tree seldom require root or aerial root pruning

(M) - Medium maintenance - tree do not often require root or aerial root pruning

(H) - High maintenance - tree often require root or aerial root pruning.

Appendix C – Maintenance Requirements at Different Phases of Trees' Life-cycle

No.	Scientific Name	Chinese Name	Life cycle pattern (year)				Maintenance Operations at Different Stages of the Life-cycle																								
							Propagation to Seedling						Sapling to Semi-mature							Mature							Senescence						
							Seed Propagation		Non-Seed Propagation								Fertilisation							Fertilisation							Fertilisation			
			Propagation to Seedling	Sapling to Semi-mature	Mature	Senescence	Type of Seed	Seed Pre-treatment	Cutting	Layering	Grafting	Thinning out	Tree Staking	Pest/Disease Control	Formative Pruning	Irrigation	Type	Period of Application	Tree Inspection & Risk Assessment	Tree Protection	Pest/Disease Control	Tree Pruning	Type	Period of Application	Roots Management	Tree Inspection & Risk Assessment	Tree Protection	Pest/Disease Control	Tree Pruning	Type	Period of Application	Roots Management	Tree Inspection & Risk Assessment
1	*Adenanthera microsperma*	海紅豆, 孔雀豆	1-4	5-8	9-50	51-60	F	1+	-	-	-	-	L	L	M	L	N	L	L	-	L	L	N	L	L	L	-	L	L	N	L	L	L
2	*Arenga pinnata*	砂糖椰子, 桄榔	1-3	4-15	16-40	41-50	F	0	-	-	-	-	M	L	L	M	N,P,K,Mg	L	L	-	L	L	N,P,K,Mg	L	L	L	-	L	L	N	L	L	L
3	*Albizia julibrissin*	合歡	1-4	5-8	9-40	41-50	F	1+	Y	-	-	Y	M	L	M	M	N	L	H	Y	L	M	N	L	H	H	Y	L	M	N	L	M	H
4	*Aporosa dioica*	銀柴, 大沙葉	1-4	5-8	9-50	51-60	F	0	-	-	-	-	M	L	M	L	N	L	L	-	L	M	N	L	L	L	-	L	M	N	L	L	L
5	*Bixa orellana*	紅木	1-4	5-8	9-40	41-50	F	1+	Y	-	-	-	M	L	L	M	P	F	H	Y	L	L	P	F	L	L	Y	L	L	N	L	L	H
6	*Brachychiton acerifolius*	槭葉蘋婆	1-3	4-8	9-70	71-80	F	1+	Y	-	Y	-	L	L	H	L	P	F	L	-	L	H	P	F	H	L	-	L	M	N	L	M	L
7	*Bridelia tomentosa*	土蜜樹, 逼迫仔	1-3	4-8	9-40	41-50	F	0	-	-	-	-	L	L	H	M	N	L	H	Y	L	H	N	L	L	L	Y	L	M	N	L	L	H
8	*Caesalpinia ferrea*	巴西鐵木	1-4	5-10	11-50	51-60	F	1+	Y	-	-	-	M	L	H	M	N,P,K	L	H	-	L	H	N,P,K	L	H	L	-	L	M	N	L	M	H
9	*Carallia brachiata*	竹節樹	1-4	5-8	9-50	51-60	F	0	Y	-	-	-	L	H	M	M	N	L	L	-	H	M	N	L	M	L	-	H	M	N	L	M	L
10	*Cassia* x *nealiae*	彩虹雨樹	1-4	5-8	9-50	51-60	F	1+	-	-	-	-	M	L	M	M	P	F	L	-	L	H	P	F	H	L	-	L	M	N	L	M	L
11	*Cassia javanica* var. *indochinensis*	節果決明	1-4	5-8	9-50	51-60	F	1+	Y	-	-	-	M	L	M	M	P	F	L	-	L	H	P	F	H	L	-	L	M	N	L	M	L
12	*Celtis timorensis*	假玉桂, 樟葉朴	1-4	5-8	9-50	51-60	F	0	Y	-	-	-	M	H	M	L	N	L	L	-	H	M	N	L	M	L	-	H	M	N	L	M	L
13	*Choerospondias axillaris*	南酸棗, 酸棗	1-3	4-8	9-60	61-80	F	0	Y	-	-	-	M	L	H	M	P	F	H	Y	L	H	P	F	L	H	Y	L	M	N	L	L	H
14	*Chukrasia tabularis*	麻楝	1-4	5-8	9-50	51-60	F	1+	-	Y	-	Y	L	L	M	M	N	L	L	-	L	M	N	L	H	L	-	L	M	N	L	M	L
15	*Cinnamomum parthenoxylon*	黃樟	1-4	5-8	9-70	71-80	F	0	-	-	-	-	L	L	L	M	P	F	L	-	L	L	P	F	M	L	-	L	L	N	L	M	L
16	*Cleistocalyx nervosum*	水翁	1-4	5-8	9-50	51-60	F	0	-	-	-	-	L	L	L	M	P	F	L	-	L	L	P	F	M	L	-	L	L	N	L	M	L
17	*Cordia dichotoma*	破布木	1-3	4-10	11-40	41-60	F	1	Y	-	-	-	M	L	M	M	N,P,K	L	L	-	L	H	N,P,K	L	M	L	-	L	M	N,P,K	L	M	L
18	*Crateva trifoliata*	鈍葉魚木	1-3	4-10	11-50	51-60	F	0	-	-	-	-	L	L	H	M	P	F	L	-	L	H	P	F	M	L	-	L	M	N	L	M	L
19	*Crateva unilocularis*	樹頭菜	1-3	4-10	11-50	51-60	F	0	-	-	-	-	L	L	H	L	P	F	L	-	L	H	P	F	L	L	-	L	M	N	L	L	L
20	*Cratoxylum cochinchinense*	黃牛木	1-4	5-10	11-50	51-60	F	1+	Y	-	-	-	L	L	H	M	P	F	L	-	L	M	P	F	L	L	-	L	M	N	L	L	L
21	*Dalbergia assamica*	南嶺黃檀	1-3	4-10	11-70	71-80	F	1	-	-	-	-	L	H	H	M	N	L	H	Y	H	H	N	L	L	H	Y	H	M	N	L	L	H
22	*Diospyros morrisiana*	羅浮柿	1-3	4-8	9-40	41-50	F	1	Y	-	Y	-	M	L	H	M	NPK+CaO	L	H	Y	L	H	NPK+CaO	L	M	L	Y	L	M	NPK+CaO	L	L	H
23	*Dracontomelon duperreanum*	人面子	1-4	5-8	9-50	51-60	F	0	-	-	-	-	L	L	L	M	P	F	L	-	L	L	P	F	H	L	-	L	L	N	L	M	L
24	*Ehretia longiflora*	長花厚殼樹	1-5	6-10	11-50	51-60	F	0	-	-	-	-	M	L	M	M	N	L	L	-	L	M	N	L	M	L	-	L	M	N	L	L	L
25	*Elaeocarpus apiculatus*	長芒杜英, 尖葉杜英	1-4	5-8	9-50	51-60	F	0	Y	-	-	-	M	H	M	L	P	F	H	Y	H	L	P	F	L	L	Y	H	L	N	L	L	H
26	*Elaeocarpus chinensis*	中華杜英	1-4	5-8	9-50	51-60	F	0	Y	-	-	-	M	H	M	L	P	F	H	-	H	L	P	F	L	L	-	H	L	N	L	L	H
27	*Elaeocarpus hainanensis*	水石榕	1-4	5-8	9-50	51-60	F	0	Y	-	-	-	L	L	M	L	P	F	L	-	L	H	P	F	L	L	-	L	M	N	L	L	L
28	*Elaeocarpus japonicus*	日本杜英	1-4	5-8	9-50	51-60	F	0	Y	-	-	-	L	L	M	M	P	F	H	Y	L	L	P	F	L	L	Y	L	L	N	L	L	H
29	*Ficus altissima*	高山榕, 雞榕	1-3	4-10	11-70	71-80	F	0	Y	Y	Y	Y	M	L	M	M	N	L	H	Y	L	H	N	L	H	L	Y	L	M	N	L	M	H
30	*Ficus binnendijkii*	阿里垂榕	1-3	4-10	11-70	71-80	F	0	Y	Y	Y	Y	M	L	M	M	N	L	L	-	L	H	N	L	M	L	-	L	M	N	L	M	L
31	*Ficus fistulosa*	水同木	1-3	4-10	11-70	71-80	F	0	Y	Y	Y	Y	M	L	M	M	N	L	L	-	L	M	N	L	L	L	-	L	M	N	L	L	L
32	*Ficus lyrata*	大琴葉榕	1-3	4-10	11-70	71-80	F	0	Y	Y	Y	Y	M	L	M	L	N	L	L	-	L	H	N	L	M	L	-	L	M	N	L	L	L
33	*Ficus religiosa*	菩提樹	1-3	4-10	11-70	71-80	F	0	Y	Y	Y	Y	M	L	M	L	N	L	H	Y	L	H	N	L	H	L	Y	L	M	N	L	H	H

Appendix C – Maintenance Requirements at Different Phases of Trees' Life-cycle

No.	Scientific Name	Chinese Name	Life cycle pattern (year)				Maintenance Operations at Different Stages of the Life-cycle																								
							Propagation to Seedling						Sapling to Semi-mature							Mature						Senescence						
							Seed Propagation		Non-Seed Propagation								Fertilisation												Fertilisation			
			Propagation to Seedling	Sapling to Semi-mature	Mature	Senescence	Type of Seed	Seed Pre-treatment	Cutting	Layering	Grafting	Thinning out	Tree Staking	Pest/Disease Control	Formative Pruning	Irrigation	Type	Period of Application	Tree Inspection & Risk Assessment	Tree Protection	Pest/Disease Control	Tree Pruning	Type	Period of Application	Roots Management	Tree Inspection & Risk Assessment	Tree Protection	Pest/Disease Control	Tree Pruning	Type	Period of Application	Roots Management	Tree Inspection & Risk Assessment
34	*Ficus subpisocarpa*	筆管榕	1-3	4-10	11-70	71-80	F	0	Y	Y	Y	Y	M	L	M	L	N	L	L	-	L	L	N	L	H	L	-	L	M	N	L	M	L
35	*Ficus variegata*	青果榕	1-3	4-10	11-70	71-80	F	0	Y	Y	Y	Y	M	L	M	L	N	L	L	Y	L	L	N	L	H	H	Y	L	M	N	L	M	H
36	*Ficus virens*	大葉榕, 黃葛樹	1-3	4-10	11-80	81-100	F	0	Y	Y	Y	Y	M	H	M	L	N	L	H	Y	H	H	N	L	H	L	Y	H	M	N	L	H	H
37	*Garcinia subelliptica*	菲島福木	1-3	4-10	11-80	81-100	F	0	-	-	-	-	L	L	L	M	N,P,K	L	L	-	L	M	N,P,K	L	L	L	-	L	L	N	L	L	L
38	*Hyophorbe lagenicaulis*	酒瓶椰子	1-3	4-10	11-50	51-60	F	0	-	-	-	-	L	H	L	M	K	L	L	-	H	L	K	L	L	L	-	H	L	N	L	L	L
39	*Ilex rotunda* var. *microcarpa*	小果鐵冬青	1-5	6-10	11-60	61-70	F	0	-	-	-	-	L	H	L	L	P	F	L	-	H	L	P	F	M	L	-	H	L	N	L	L	L
40	*Juniperus chinensis* 'Kaizuka'	龍柏	1-3	4-10	11-40	41-50	N	0	-	-	-	-	L	H	L	L	N	L	L	-	H	L	N	L	L	L	-	H	L	N	L	L	L
41	*Khaya senegalensis*	非洲楝	1-3	4-10	11-70	71-80	F	1+	-	-	-	-	L	L	M	L	N,P,K	L	L	-	L	M	N,P,K	L	L	L	-	L	M	N	L	L	L
42	*Koelreuteria elegans* subsp. *formosana*	台灣欒樹	1-3	4-10	11-50	51-60	F	1	-	-	-	-	M	L	L	L	P	F	H	Y	L	M	P	F	L	L	Y	L	M	N	L	L	H
43	*Liquidambar formosana*	楓香	1-4	5-10	11-70	71-80	F	1+	-	-	-	-	L	L	H	M	N	L	L	-	L	H	N	L	H	L	-	L	M	N	L	M	L
44	*Litsea glutinosa*	潺槁樹	1-5	6-10	11-60	61-80	F	0	-	-	-	-	M	L	M	L	N	L	L	-	L	M	N	L	M	L	-	L	M	N	L	L	L
45	*Litsea monopetala*	假柿木薑子, 假柿樹	1-5	6-10	11-50	51-60	F	0	-	-	-	-	M	L	M	M	N	L	L	-	L	M	N	L	M	L	-	L	M	N	L	L	L
46	*Machilus breviflora*	短序潤楠, 短花楠	1-5	6-10	11-60	61-70	F	0	-	-	-	-	L	L	L	L	P	F	L	-	L	M	P	F	M	L	-	L	M	N	L	M	L
47	*Machilus chekiangensis*	浙江潤楠	1-5	6-10	11-60	61-70	F	0	-	-	-	-	L	L	L	L	P	F	L	-	L	L	P	F	M	L	-	L	L	N	L	M	L
48	*Machilus chinensis*	華潤楠, 香港楠	1-5	6-10	11-60	61-70	F	0	-	-	-	-	L	L	L	L	N	L	L	-	L	L	N	L	M	L	-	L	L	N	L	L	L
49	*Machilus velutina*	絨毛潤楠	1-5	6-10	11-60	61-70	F	0	-	-	-	-	L	L	L	L	P	F	L	-	L	L	P	F	M	L	-	L	L	N	L	M	L
50	*Melia azedarach*	楝, 苦楝	1-5	6-10	11-40	41-50	F	0	Y	-	-	-	M	L	H	L	P	F	H	Y	L	H	P	F	L	H	Y	L	M	N	L	L	H
51	*Michelia champaca*	黃蘭	1-5	6-10	11-70	71-80	F	1+	-	-	-	-	L	L	H	M	P	F	L	-	L	H	P	F	L	L	-	L	M	N	L	L	L
52	*Microcos nervosa*	布渣葉	1-5	6-10	11-50	51-60	F	0	-	-	-	-	L	L	H	M	P	F	L	-	L	H	P	F	L	L	-	L	M	N	L	L	L
53	*Nageia nagi*	竹柏	1-5	6-10	11-50	51-60	N	0	Y	-	-	-	L	L	L	M	N	L	L	-	L	L	N	L	M	L	-	L	L	N	L	M	L
54	*Palaquium formosanum*	台灣膠木	1-3	4-10	11-40	41-50	F	0	-	-	-	-	L	L	L	M	N,P,K	L	L	-	L	L	N,P,K	L	H	L	-	L	L	N	L	M	L
55	*Peltophorum tonkinense*	銀珠	1-5	6-10	11-70	71-80	F	1+	Y	-	-	-	L	L	L	M	P	F	L	-	L	L	-	-	L	L	-	L	L	N	L	L	L
56	*Phoenix dactylifera*	海棗, 棗椰樹	1-5	6-10	11-40	41-50	F	0	-	-	-	-	L	L	L	L	N	L	L	-	L	L	N	L	L	L	-	L	L	N	L	L	L
57	*Plumeria rubra*	雞蛋花, 紅雞蛋花	1-5	6-10	11-80	81-100	F	1+	Y	Y	-	-	M	L	M	M	P	F	L	-	L	M	P	F	L	L	-	L	L	N	L	L	L
58	*Podocarpus macrophyllus*	羅漢松	1-5	6-10	11-80	81-100	N	0	Y	Y	-	-	M	L	L	L	N,P,K	L	L	-	L	L	N,P,K	L	M	L	-	L	L	N	L	M	L
59	*Polyalthia longifolia*	長葉暗羅	1-5	6-10	11-50	51-60	F	0	Y	Y	-	-	M	L	L	M	N	L	H	-	L	L	N	L	M	L	-	L	L	N	L	M	H
60	*Polyspora axillaris*	大頭茶	1-3	4-10	11-40	41-50	F	0	Y	Y	-	Y	L	L	H	M	P	F	L	-	L	L	P	F	M	L	-	L	M	N	L	M	L
61	*Pongamia pinnata*	水黃皮	1-3	4-10	11-40	41-50	F	1+	Y	-	-	-	M	L	M	M	N	L	L	-	L	H	N	L	H	L	-	L	M	N	L	H	L
62	*Pterocarpus indicus*	紫檀	1-5	6-15	16-75	76-100	F	1+	Y	-	-	-	M	L	M	M	P	F	H	Y	L	M	P	F	H	H	Y	L	M	N	L	M	H
63	*Pterospermum heterophyllum*	翻白葉樹	1-3	4-15	16-60	61-70	F	1+	-	-	-	-	L	L	M	L	N	L	L	-	L	M	N	L	L	L	-	L	M	N	L	L	L
64	*Radermachera hainanensis*	海南菜豆樹	1-5	6-20	21-50	51-80	F	1+	-	-	-	-	L	L	M	L	P	F	L	-	L	M	P	F	L	L	-	L	M	N	L	L	L
65	*Rhus hypoleuca*	白背鹽膚木	1-3	4-15	16-60	61-70	F	1	Y	-	-	-	L	L	H	L	P	F	L	-	L	H	P	F	L	L	-	L	M	N	L	L	L
66	*Sapindus saponaria*	無患子, 木患子	1-3	4-20	21-60	61-70	F	0	-	-	-	-	M	L	M	L	N,P,K	L	H	Y	L	M	N,P,K	L	H	L	Y	L	M	N	L	M	H

No.	Scientific Name	Chinese Name	Life cycle pattern (year)				Maintenance Operations at Different Stages of the Life-cycle																								
							Propagation to Seedling						Sapling to Semi-mature							Mature							Senescence						
							Seed Propagation		Non-Seed Propagation								Fertilisation							Fertilisation						Fertilisation			
			Propagation to Seedling	Sapling to Semi-mature	Mature	Senescence	Type of Seed	Seed Pre-treatment	Cutting	Layering	Grafting	Thinning out	Tree Staking	Pest/Disease Control	Formative Pruning	Irrigation	Type	Period of Application	Tree Inspection & Risk Assessment	Tree Protection	Pest/Disease Control	Tree Pruning	Type	Period of Application	Roots Management	Tree Inspection & Risk Assessment	Tree Protection	Pest/Disease Control	Tree Pruning	Type	Period of Application	Roots Management	Tree Inspection & Risk Assessment
67	*Sapium discolor*	山烏桕	1-3	4-10	11-40	41-50	F	1+	-	-	-	-	M	L	M	M	P	F	L	-	L	H	P	F	L	L	-	L	L	N	L	L	L
68	*Sapium sebiferum*	烏桕	1-3	4-10	11-40	41-50	F	1+	Y	-	-	-	M	L	H	M	P	F	L	-	L	H	P	F	H	L	-	L	M	N	L	M	L
69	*Schima superba*	木荷, 荷樹	1-5	6-10	11-60	61-80	F	1+	Y	-	-	-	L	L	M	L	P	F	L	-	L	M	P	F	M	L	-	L	M	N	L	L	L
70	*Senna spectabilis*	美麗決明, 美洲槐	1-3	4-15	16-50	51-70	F	1+	-	-	-	Y	M	L	H	M	P	F	H	Y	L	H	P	F	M	L	Y	L	M	N	L	M	H
71	*Swietenia mahagoni*	桃花心木	1-5	6-15	16-50	51-70	F	1+	Y	-	-	-	L	L	H	M	N,P,K	L	L	-	L	M	N,P,K	L	M	L	-	L	M	N	L	M	L
72	*Syzygium cumini*	烏墨, 海南蒲桃	1-5	6-15	16-50	51-70	F	0	Y	-	-	-	L	L	M	L	P	F	L	-	L	H	P	F	M	L	-	L	M	N	L	L	L
73	*Syzygium hancei*	韓氏蒲桃, 紅鱗蒲桃	1-5	6-15	16-50	51-70	F	0	-	-	-	-	L	L	M	L	P	F	L	-	L	M	P	F	M	L	-	L	M	N	L	M	L
74	*Syzygium jambos*	蒲桃	1-5	6-15	16-50	51-70	F	0	-	Y	Y	-	L	L	M	M	P	F	L	-	L	H	P	F	M	L	-	L	M	N	L	L	L
75	*Syzygium levinei*	山蒲桃	1-5	6-15	16-50	51-70	F	0	-	-	-	-	L	L	M	L	P	F	L	-	H	M	P	F	M	L	-	H	M	N	L	M	L
76	*Thespesia populnea*	恒春黃槿, 纖楊	1-5	6-15	16-40	41-60	F	0	Y	Y	-	-	M	L	M	L	N	L	L	-	L	H	N	L	H	L	-	L	M	N	L	M	L
77	*Ulmus parvifolia*	榔榆	1-5	6-15	16-80	81-100	F	1+	Y	-	-	-	L	L	H	M	N	L	L	-	L	L	N	L	M	L	-	L	L	N	L	M	L
78	*Wodyetia bifurcata*	狐尾椰子	1-5	6-15	16-50	51-60	F	0	-	-	-	-	M	L	L	M	N,P,K,Mg	L	L	-	L	L	N,P,K,Mg	L	L	L	-	L	L	N	L	L	L
79	*Xanthostemon chrysanthus*	金蒲桃	1-5	6-15	16-40	41-50	F	1+	Y	-	-	-	M	L	M	M	K	F	L	-	L	M	K	F	M	L	-	L	M	N	L	M	L
80	*Zanthoxylum avicennae*	簕欓花椒, 簕欓	1-5	6-10	11-60	61-70	F	0	-	-	-	-	M	L	M	L	P	F	L	-	L	M	P	F	L	L	-	L	M	N	L	L	L

Appendix D. Suitable Tree Species for each Street Typology

Suitable Tree Species for each Street Typology

No.	Botanical name	Chinese description	Suitable Street Type	Street Sub-type													
				A1	A2	B1	B2	C1	C2	D1	D2	E1	E2	F1	F2	G1	G2
				CMGZ (Wide)	CMGZ (Narrow)	No Kerbside Activity No Building Frontage (Wide)	No Kerbside Activity No Building Frontage (Narrow)	No Kerbside Activity With Building Frontage (Wide)	No Kerbside Activity With Building Frontage (Narrow)	No Kerbside Activity With Landscape Area (Wide)	No Kerbside Activity With Landscape Area (Narrow)	With Kerbside Activity No Building Frontage (Wide)	With Kerbside Activity No Building Frontage (Narrow)	With Kerbside Activity With Building Frontage (Wide)	With Kerbside Activity With Building Frontage (Narrow)	With Kerbside Activity With Landscape Area (Wide)	With Kerbside Activity With Landscape Area (Narrow)
1	*Adenanthera microsperma*	海紅豆, 孔雀豆				✓											
2	*Arenga pinnata*	砂糖椰子, 桄榔				✓	✓		✓			✓	✓		✓		
3	*Albizia julibrissin*	合歡				✓											
4	*Aporosa dioica*	銀柴, 大沙葉				✓	✓										
5	*Bixa orellana*	紅木				✓	✓										
6	*Brachychiton acerifolius*	槭葉蘋婆				✓	✓	✓	✓								
7	*Bridelia tomentosa*	土蜜樹, 逼迫仔		✓	✓	✓	✓			✓	✓	✓	✓			✓	✓
8	*Caesalpinia ferrea*	巴西鐵木				✓											
9	*Carallia brachiata*	竹節樹				✓				✓		✓				✓	
10	*Cassia* x *nealiae*	彩虹雨樹				✓											
11	*Cassia javanica* var. *indochinensis*	節果決明				✓											
12	*Celtis timorensis*	假玉桂, 樟葉朴				✓	✓										
13	*Choerospondias axillaris*	南酸棗, 酸棗				✓											
14	*Chukrasia tabularis*	麻楝		✓		✓		✓									
15	*Cinnamomum parthenoxylon*	黃樟		✓		✓		✓									
16	*Cleistocalyx nervosum*	水翁				✓		✓		✓		✓		✓		✓	
17	*Cordia dichotoma*	破布木				✓	✓				✓						
18	*Crateva trifoliata*	鈍葉魚木		✓	✓	✓	✓	✓	✓			✓		✓			
19	*Crateva unilocularis*	樹頭菜				✓		✓				✓					
20	*Cratoxylum cochinchinense*	黃牛木		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
21	*Dalbergia assamica*	南嶺黃檀		✓		✓		✓		✓		✓		✓		✓	
22	*Diospyros morrisiana*	羅浮柿				✓				✓							
23	*Dracontomelon duperreanum*	人面子		✓		✓		✓									
24	*Ehretia longiflora*	長花厚殼樹				✓	✓										
25	*Elaeocarpus apiculatus*	長芒杜英, 尖葉杜英				✓											
26	*Elaeocarpus chinensis*	中華杜英				✓	✓										
27	*Elaeocarpus hainanensis*	水石榕				✓						✓					
28	*Elaeocarpus japonicus*	日本杜英		✓		✓		✓		✓						✓	
29	*Ficus altissima*	高山榕, 雞榕				✓											

Appendix D - Suitable Tree Species for each Street Typology

No.	Botanical name	Chinese description	Suitable Street Type	Street Sub-type													
				A1	A2	B1	B2	C1	C2	D1	D2	E1	E2	F1	F2	G1	G2
				CMGZ (Wide)	CMGZ (Narrow)	No Kerbside Activity No Building Frontage (Wide)	No Kerbside Activity No Building Frontage (Narrow)	No Kerbside Activity With Building Frontage (Wide)	No Kerbside Activity With Building Frontage (Narrow)	No Kerbside Activity With Landscape Area (Wide)	No Kerbside Activity With Landscape Area (Narrow)	With Kerbside Activity No Building Frontage (Wide)	With Kerbside Activity No Building Frontage (Narrow)	With Kerbside Activity With Building Frontage (Wide)	With Kerbside Activity With Building Frontage (Narrow)	With Kerbside Activity With Landscape Area (Wide)	With Kerbside Activity With Landscape Area (Narrow)
30	*Ficus binnendijkii*	阿里垂榕				✓	✓										
31	*Ficus fistulosa*	水同木				✓	✓			✓	✓						
32	*Ficus lyrata*	大琴葉榕				✓											
33	*Ficus religiosa*	菩提樹				✓											
34	*Ficus subpisocarpa*	筆管榕				✓											
35	*Ficus variegata*	青果榕				✓				✓							
36	*Ficus virens*	大葉榕, 黃葛樹				✓				✓							
37	*Garcinia subelliptica*	菲島福木		✓	✓	✓	✓		✓			✓	✓				
38	*Hyophorbe lagenicaulis*	酒瓶椰子							✓			✓	✓				
39	*Ilex rotunda* var. *microcarpa*	小果鐵冬青		✓		✓		✓									
40	*Juniperus chinensis* 'Kaizuka'	龍柏		✓	✓	✓	✓		✓			✓	✓		✓		
41	*Khaya senegalensis*	非洲楝						✓									
42	*Koelreuteria elegans* subsp. *formosana*	台灣欒樹				✓											
43	*Liquidambar formosana*	楓香		✓		✓		✓		✓							
44	*Litsea glutinosa*	潺槁樹				✓	✓										
45	*Litsea monopetala*	假柿木薑子, 假柿樹				✓	✓			✓	✓						
46	*Machilus breviflora*	短序潤楠, 短花楠		✓	✓	✓	✓	✓	✓			✓		✓			
47	*Machilus chekiangensis*	浙江潤楠		✓		✓		✓		✓		✓				✓	
48	*Machilus chinensis*	華潤楠, 香港楠		✓	✓	✓	✓	✓	✓			✓		✓			
49	*Machilus velutina*	絨毛潤楠		✓		✓		✓		✓							
50	*Melia azedarach*	楝, 苦楝				✓											
51	*Michelia champaca*	黃蘭				✓	✓	✓	✓			✓	✓	✓			
52	*Microcos nervosa*	布渣葉				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
53	*Nageia nagi*	竹柏				✓		✓				✓					
54	*Palaquium formosanum*	台灣膠木		✓		✓		✓									
55	*Peltophorum tonkinense*	銀珠				✓		✓									
56	*Phoenix dactylifera*	海棗, 棗椰樹				✓				✓							
57	*Plumeria rubra*	雞蛋花, 紅雞蛋花				✓	✓										
58	*Podocarpus macrophyllus*	羅漢松				✓	✓			✓	✓						
59	*Polyalthia longifolia*	長葉暗羅				✓	✓										

Appendix D - Suitable Tree Species for each Street Typology

No.	Botanical name	Chinese description	Suitable Street Type	Street Sub-type													
				A1	A2	B1	B2	C1	C2	D1	D2	E1	E2	F1	F2	G1	G2
				CMGZ (Wide)	CMGZ (Narrow)	No Kerbside Activity No Building Frontage (Wide)	No Kerbside Activity No Building Frontage (Narrow)	No Kerbside Activity With Building Frontage (Wide)	No Kerbside Activity With Building Frontage (Narrow)	No Kerbside Activity With Landscape Area (Wide)	No Kerbside Activity With Landscape Area (Narrow)	With Kerbside Activity No Building Frontage (Wide)	With Kerbside Activity No Building Frontage (Narrow)	With Kerbside Activity With Building Frontage (Wide)	With Kerbside Activity With Building Frontage (Narrow)	With Kerbside Activity With Landscape Area (Wide)	With Kerbside Activity With Landscape Area (Narrow)
60	*Polyspora axillaris*	大頭茶		✓	✓	✓	✓		✓		✓	✓				✓	
61	*Pongamia pinnata*	水黃皮				✓				✓							
62	*Pterocarpus indicus*	紫檀				✓											
63	*Pterospermum heterophyllum*	翻白葉樹				✓		✓									
64	*Radermachera hainanensis*	海南菜豆樹				✓	✓	✓	✓								
65	*Rhus hypoleuca*	白背鹽膚木				✓	✓					✓	✓				
66	*Sapindus saponaria*	無患子, 木患子				✓											
67	*Sapium discolor*	山烏桕				✓	✓			✓	✓						
68	*Sapium sebiferum*	烏桕				✓	✓			✓	✓						
69	*Schima superba*	木荷, 荷樹				✓		✓		✓		✓				✓	
70	*Senna spectabilis*	美麗決明, 美洲槐				✓											
71	*Swietenia mahagoni*	桃花心木						✓									
72	*Syzygium cumini*	烏墨, 海南蒲桃				✓	✓	✓	✓	✓	✓					✓	
73	*Syzygium hancei*	韓氏蒲桃, 紅鱗蒲桃				✓	✓	✓	✓	✓	✓					✓	
74	*Syzygium jambos*	蒲桃				✓	✓	✓	✓			✓		✓			
75	*Syzygium levinei*	山蒲桃		✓		✓		✓				✓		✓			
76	*Thespesia populnea*	恒春黃槿, 繖楊				✓	✓										
77	*Ulmus parvifolia*	榔榆		✓		✓		✓									
78	*Wodyetia bifurcata*	狐尾椰子							✓			✓	✓		✓		
79	*Xanthostemon chrysanthus*	金蒲桃				✓	✓										
80	*Zanthoxylum avicennae*	簕欓花椒, 簕欓				✓				✓							

Appendix E. Recommended List of Complementary Vegetation Community Mix

Appendix E - Recommended List of Complementary Vegetation Community Mix

Groundcover Species																																						
Botanical name	**Chinese name**	**Origin**	**Characteristic**								**Growth rate**			**Normal Height /Length**			**Normal Spread**		**Ecological value**						**Ornamental Value**				**Tolerance - environmental factor**									
			Evergreen	**Semi-deciduous**	**Deciduous**	**Woody**	**Herbaceous**	**Annual**	**Biennial**	**Perennial**	**Fast**	**Medium**	**Slow**	**<0.3m**	**0.3-0.6m**	**>0.6m**	**<0.1m**	**0.1-0.3m**	**Flower nectar for insects (including butterflies)**	**Larval foodplants for insects (including butterflies)**	**Fruits for birds/bats**	**Fruits for other mammals**	**Seeds for birds/bats**	**Seeds for other mammals**	**Flower**	**Foliage**	**Fruit**	**Form**	**Wind tolerant**	**Salt spray tolerant**	**Fire tolerant**	**Drought tolerant**	**Pollution tolerant**	**Sunlight tolerant**	**Shade tolerant**	**Feasible for current nursery procurement**	**Feasible for long-term propagation potential**	**Poisonous species**
Asparagus cochinchinensis	天門冬	Native	✓				✓			✓	✓			✓				✓	✓						✓	✓						✓				✓	✓	
Asparagus densiflorus 'Sprengeri'	非洲天門冬	Exotic	✓				✓			✓	✓			✓							✓				✓	✓	✓		✓				✓		✓	✓	✓	
Lantana montevidensis	小葉馬纓丹	Exotic	✓			✓				✓	✓				✓			✓	✓						✓				✓			✓	✓	✓		✓	✓	
Melastoma dodecandrum	地菍	Native	✓			✓	✓			✓	✓			✓			✓				✓				✓										✓			

Appendix E - Recommended List of Complementary Vegetation Community Mix

Herbaceous Species																																										
Botanical name	**Chinese name**	**Origin**	**Characteristic**								**Growth rate**			**Normal Height**			**Normal Spread**			**Ecological value**						**Ornamental Value**				**Tolerance - environmental factor**							**Tolerance - soil condition**					
			Evergreen	**Semi-deciduous**	**Deciduous**	**Woody**	**Herbaceous**	**Annual**	**Biennial**	**Perennial**	**Fast**	**Medium**	**Slow**	**<0.3m**	**0.3-0.6m**	**>0.6m**	**<0.1m**	**0.1-0.3m**	**>0.3m**	**Flower nectar for insects (including butterlies)**	**Larval foodplants for insects (including butterlies)**	**Fruits for birds/bats**	**Fruits for other mammals**	**Seeds for birds/bats**	**Seeds for other mammals**	**Flower**	**Foliage**	**Fruit**	**Form**	**Wind tolerant**	**Salt spray tolerant**	**Fire tolerant**	**Drought tolerant**	**Pollution tolerant**	**Sunlight tolerant**	**Shade tolerant**	**Infertile soil**	**Loamy soil**	**compacted soil**	**Feasible for current nursery procurement**	**Feasible for long-term propagation potential**	**Poisonous species**
Alocasia macrorrhiza	海芋	Native	✓				✓			✓	✓					✓			✓				✓				✓									✓					✓	✓
Amaranthus spinosus	刺莧	Exotic	✓				✓	✓			✓				✓			✓			✓					✓	✓			✓			✓	✓	✓							
Amaranthus tricolor	莧菜	Exotic	✓				✓	✓			✓				✓			✓			✓					✓	✓			✓			✓	✓	✓					✓	✓	
Amaranthus viridis	綠莧	Native	✓				✓	✓			✓				✓			✓			✓		✓			✓	✓			✓			✓	✓	✓							
Asclepias curassavica	連生桂子花	Exotic	✓				✓			✓	✓				✓			✓		✓						✓				✓			✓							✓	✓	✓
Axonopus fissifolius	類地毯草	Exotic	✓				✓			✓	✓			✓			✓										✓			✓				✓						✓	✓	
Crotalaria pallida var. *obovata*	猪屎豆	Exotic				✓	✓			✓	✓					✓			✓		✓					✓		✓					✓		✓							✓
Cynodon dactylon	狗牙根	Native	✓				✓			✓	✓			✓			✓										✓				✓		✓		✓		✓	✓	✓	✓	✓	
Desmodium triflorum	三點金	Native	✓				✓			✓	✓			✓					✓							✓	✓			✓					✓		✓			✓	✓	
Eremochloa ciliaris	蜈蚣草	Native					✓			✓	✓			✓			✓										✓			✓	✓		✓		✓	✓	✓		✓	✓	✓	
Eremochloa ophiuroides	假儉草	Native					✓			✓	✓			✓			✓										✓			✓	✓		✓		✓	✓	✓		✓	✓	✓	
Hedychium coronarium	薑花	Exotic	✓				✓			✓	✓					✓			✓	✓	✓					✓	✓													✓	✓	
Nephrolepis auriculata	腎蕨	Native	✓				✓			✓		✓		✓			✓										✓									✓				✓	✓	
Ophiopogon japonicus	麥冬	Native	✓				✓			✓		✓		✓			✓				✓												✓			✓				✓	✓	
Oxalis corniculata	酢漿草	Native					✓			✓			✓	✓			✓				✓					✓	✓			✓			✓		✓	✓	✓		✓	✓	✓	✓
Panicum maximum	大黍	Exotic			✓		✓			✓	✓			✓			✓							✓			✓			✓						✓				✓	✓	
Polygonum chinense	火炭母	Native	✓				✓			✓	✓			✓			✓				✓					✓	✓			✓	✓		✓			✓						
Rorippa indica	蔊菜	Native	✓				✓	✓	✓		✓			✓				✓			✓					✓				✓								✓				
Ruellia coerulea	蘭花草	Exotic	✓				✓			✓	✓					✓			✓	✓						✓														✓	✓	
Sesbania javanica	沼生田菁	Native	✓				✓	✓			✓					✓			✓																							
Solanum americanum	少花龍葵	Exotic	✓				✓	✓								✓			✓			✓				✓	✓															✓
Tarenaya hassleriana	醉蝶花	Exotic	✓				✓	✓			✓					✓			✓		✓					✓							✓							✓	✓	
Tropaeolum majus	旱金蓮	Exotic	✓				✓	✓			✓				✓			✓			✓					✓							✓							✓	✓	
Zingiber officinale	薑	Exotic	✓				✓			✓	✓					✓			✓		✓					✓														✓	✓	
Zornia gibbosa	丁癸草	Native					✓			✓	✓				✓			✓			✓					✓							✓									

Appendix E - Recommended List of Complementary Vegetation Community Mix

Shrub Species

Scientific name	Chinese name	Origin	Characteristic								Growth rate			Form							Normal Height			Normal Spread			Ecological value						Ornamental Value				Tolerance - environmental factor							Tolerance - soil condition			Feasible for current nursery procurement	Feasible for long-term propagation potential	Poisonous species
			Evergreen	Semi-deciduous	Deciduous	Woody	Herbaceous	Annual	Biennial	Perennial	Fast	Medium	Slow	Rounded	Oval	Spreading	Domed	Vase	Columnar	Pyramidal	0-0.5m	0.5-1m	1-2m	0-0.3m	0.3-0.6m	>0.6m	Flower nectar for insects (including butterflies)	Larval foodplants for insects (including	Fruits for birds/bats	Fruits for other mammals	Seeds for birds/bats	Seeds for other mammals	Flower	Foliage	Fruit	Form	Wind tolerant	Salt spray tolerant	Fire tolerant	Drought tolerant	Pollution tolerant	Sunlight tolerant	Shade tolerant	Infertile soil	Loamy soil	compacted soil			
Artabotrys hexapetalus	鷹爪花	Exotic	✓							✓	✓												✓			✓		✓					✓										✓						
Barleria cristata	假杜鵑	Exotic			✓	✓				✓						✓						✓			✓			✓					✓																
Boehmeria densiflora	密花苧麻	Native	✓			✓				✓									✓				✓		✓			✓					✓																
Boehmeria nivea	苧麻	Exotic	✓			✓	✓			✓									✓				✓		✓			✓																					
Breynia fruticosa	黑面神	Native	✓			✓				✓		✓				✓					✓				✓			✓						✓						✓		✓		✓					
Calliandra haematocephala	朱纓花(紅絨球)	Exotic			✓	✓				✓	✓			✓								✓	✓		✓	✓	✓		✓				✓									✓					✓	✓	
Capparis cantoniensis	廣州槌果藤	Native	✓			✓				✓													✓	✓				✓					✓																
Clerodendrum cyrtophyllum	大青	Native			✓	✓				✓													✓		✓			✓																					
Desmodium heterocarpon	假地豆	Native	✓			✓	✓			✓									✓			✓			✓			✓					✓														✓	✓	
Desmodium reticulatum	顯脈山綠豆	Native	✓			✓	✓			✓												✓			✓			✓					✓																
Desmos chinensis	假鷹爪	Native	✓			✓				✓	✓												✓			✓		✓		✓		✓	✓		✓	✓													
Duranta erecta	假連翹	Exotic	✓			✓				✓	✓					✓							✓			✓	✓		✓				✓	✓			✓				✓	✓			✓		✓	✓	✓
Ficus hirta	粗葉榕	Native	✓			✓				✓		✓			✓							✓			✓				✓	✓		✓		✓									✓					
Flemingia macrophylla	大葉千斤拔	Native	✓			✓				✓													✓			✓		✓					✓																
Fortunella hindsii	山橘	Native	✓			✓				✓													✓			✓		✓							✓												✓	✓	
Gardenia jasminoides	梔子	Native	✓			✓				✓	✓				✓							✓				✓			✓	✓			✓				✓			✓		✓		✓			✓	✓	
Hibiscus rosa-sinensis	朱槿	Exotic	✓			✓				✓	✓				✓							✓				✓	✓						✓								✓	✓					✓	✓	
Ilex asprella	梅葉冬青	Native			✓	✓				✓						✓						✓				✓		✓	✓													✓	✓						
Ixora chinensis	龍船花	Native	✓			✓				✓	✓			✓							✓				✓		✓						✓				✓			✓	✓	✓					✓	✓	
Lantana camara	馬纓丹	Exotic	✓			✓				✓	✓										✓			✓			✓		✓				✓							✓	✓						✓	✓	✓
Lespedeza formosa	美麗胡枝子	Native	✓			✓				✓	✓												✓			✓		✓					✓							✓			✓	✓					
Ligustrum sinense	山指甲	Exotic	✓			✓				✓		✓				✓						✓	✓		✓	✓				✓		✓	✓	✓						✓	✓		✓	✓			✓	✓	✓
Litsea rotundifolia var. *oblongifolia*	豺皮樟	Native	✓			✓				✓	✓				✓							✓			✓				✓					✓								✓		✓					
Malvaviscus penduliflorus	垂花懸鈴花	Exotic	✓			✓				✓	✓												✓			✓	✓						✓							✓			✓						
Melastoma malabathricum	野牡丹	Native	✓			✓				✓	✓				✓						✓					✓	✓		✓				✓				✓			✓	✓	✓		✓			✓	✓	
Melastoma sanguineum	毛菍	Native	✓			✓				✓	✓				✓								✓			✓	✓		✓				✓				✓				✓	✓		✓			✓	✓	
Michelia figo	含笑	Exotic	✓			✓				✓				✓									✓			✓		✓					✓												✓		✓	✓	
Millettia nitida	亮葉崖豆藤	Native	✓			✓				✓													✓			✓	✓	✓					✓																
Mussaenda pubescens	玉葉金花	Native	✓			✓				✓	✓										✓			✓									✓	✓						✓		✓	✓						
Nerium oleander	夾竹桃	Exotic	✓			✓				✓									✓				✓			✓		✓					✓							✓	✓						✓	✓	✓
Polyspora axillaris	大頭茶	Native	✓			✓				✓		✓			✓							✓	✓			✓	✓						✓				✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	
Psychotria asiatica	九節, 山大刀	Native	✓			✓				✓	✓				✓							✓			✓				✓					✓									✓	✓					
Rhaphiolepis indica	石斑木	Native	✓			✓				✓			✓			✓						✓		✓			✓		✓				✓	✓						✓	✓	✓		✓			✓	✓	
Rhododendron mucronatum	白杜鵑	Exotic	✓			✓				✓			✓		✓							✓			✓		✓						✓							✓		✓	✓			✓	✓	✓	
Rhododendron pulchrum	錦繡杜鵑	Exotic	✓			✓				✓			✓		✓							✓			✓		✓						✓							✓		✓	✓			✓	✓	✓	
Rhododendron pulchrum var. *phoeniceum*	紫杜鵑花	Exotic	✓			✓				✓			✓		✓							✓			✓		✓						✓							✓		✓	✓	✓			✓	✓	
Rhododendron simsii	紅杜鵑	Native	✓			✓				✓			✓		✓						✓				✓		✓						✓							✓		✓	✓			✓	✓	✓	✓
Rhodomyrtus tomentosa	桃金娘	Native	✓			✓				✓	✓			✓							✓			✓			✓		✓	✓			✓				✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	
Ricinus communis	蓖麻	Exotic	✓			✓		✓		✓													✓			✓		✓						✓															✓
Sarcandra glabra	草珊瑚	Native	✓			✓				✓		✓				✓					✓			✓					✓				✓	✓	✓								✓		✓		✓	✓	
Scaevola taccada	草海桐	Native	✓			✓				✓		✓			✓							✓			✓		✓		✓				✓				✓	✓		✓	✓			✓					✓
Urena lobata	肖梵天花	Native	✓			✓																✓			✓			✓					✓																

Appendix E - Recommended List of Complementary Vegetation Community Mix

Shrub Species																																																															
Scientific name	Chinese name	Origin	Characteristic								Growth rate			Form							Normal Height			Normal Spread			Ecological value						Ornamental Value				Tolerance - environmental factor							Tolerance - soil condition					
			Evergreen	Semi-deciduous	Deciduous	Woody	Herbaceous	Annual	Biennial	Perennial	Fast	Medium	Slow	Rounded	Oval	Spreading	Domed	Vase	Columnar	Pyramidal	0-0.5m	0.5-1m	1-2m	0-0.3m	0.3-0.6m	>0.6m	Flower nectar for insects (including butterflies)	Larval foodplants for insects (including	Fruits for birds/bats	Fruits for other mammals	Seeds for birds/bats	Seeds for other mammals	Flower	Foliage	Fruit	Form	Wind tolerant	Salt spray tolerant	Fire tolerant	Drought tolerant	Pollution tolerant	Sunlight tolerant	Shade tolerant	Infertile soil	Loamy soil	compacted soil	Feasible for current nursery procurement	Feasible for long-term propagation potential	Poisonous species
Uvaria macrophylla	紫玉盤	Native	✓			✓				✓													✓		✓			✓					✓								✓			✓					