

Landscape Qualities of Trees and their Canopies within an Urban Landscape

Landscape Report

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For: Christchurch City Council, Policy Team

Date: 13 May 2022

FINAL

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Revision History

Issue	NAME	DATE
Draft	Hilary Riordan; CCC Resource & Landscape Planner (NZILA Graduate Member)	2 May 2022
Review 1	Jennifer Dray; CCC Team Leader – Parks and Landscape Team (NZILA Registered Member)	3 May 2022
Review 2	Hilary Riordan	9 May 2022
Review 3	Jennifer Dray	13 May 2022
FINAL	Hilary Riordan	13 May 2022

Introduction

1. Christchurch City Council (The Council) is in the process of implementing the National Policy Statement – Urban Development (NPS-UD) and the Resource Management (Enabling Housing Supply and Other Matters) Act (the Act) which will enable higher density developments across the city as a permitted activity.
2. The Council is proposing a plan change to its District Plan to address the impacts of urban development on the environment and reduce the loss of existing trees and/or ensure provision of sufficient replacement trees through on-site planting or the payment of financial contributions in lieu of planting. The amendments to the Resource Management Act introduced by the Resource Management (Enabling Housing Supply and Other Matters) Act in December 2021, enable the Council to charge financial contributions to address adverse effects of activities on the environment.
3. Section 7 Other matters under the Resource Management Act 1991;
SECTION 7 Other matters
In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall have particular regard to—
 - *(c) the maintenance and enhancement of amenity values;*
 - *(f) maintenance and enhancement of the quality of the environment;*
 - *(g) any finite characteristics of natural and physical resources:*
4. Landscape embodies the relationship between people and place. It is the collective characteristic of an area, how the area is experienced and perceived, and what it means to people (NZILA, 2021). Urban landscapes comprise of the physical urban environment (its topography, streets, building, processes, and activities), how people perceive it (its legibility, memorability, aesthetics) and what it means to them (its identity, history, sense of place) (NZILA, 2021).
5. The purpose of this report is to provide expert evidence at a high-level overview on the contributing landscape attributes trees and their canopies can have within urban landscapes. The report focuses on the benefits of urban tree canopy cover in terms of maintaining and improving landscape amenity, and on how increased urban intensification may affect the amenity values of trees.

Landscape Qualities of Trees

6. Professional Landscape practice in New Zealand conceptualises landscape as the overlap of its physical, associative, and perceptual dimensions. The New Zealand Institute of Landscape Architects (NZILA) have recognised that while these terms (physical, associative, and perceptual) are not perfect or definitive, they help to provide a start to capturing the complexity of relationships between people and place (NZILA, 2021). However, these dimensions overlap, and below are separated to detail the contributions trees and their canopies make in an urban landscape. The discussion below also considers the change of amenity in the urban landscape, through tree removal due to development intensification.
7. As many landscape elements can be linked to visual elements, they are often singularly considered as “amenity values”. “Amenity” is defined in the Oxford Dictionary as “a desirable or useful feature or asset of a building or place”, and “the pleasantness or attractiveness of a place”. What is “desirable”, “pleasant”, or “attractive” is evoked by more human emotions, feelings, and senses which contribute to the concept of “amenity”. For the purposes of these comments, the concept of “amenity” is extended to include all sensory perception.

Physical

8. “Physical” means both the natural (Geological, topography and hydrology, vegetation and soil patterns, ecological and dynamic components, naturalness) and human features (Settlement and occupation, roads circulation, land use, buildings, archaeological and heritage, tāngata whenua), in addition to their processes and their interactions over time (NZILA, 2021).
9. Tree canopy refers to the above-ground layer of tree leaves, branches, and stems. Trees canopy provides unique physical forms and details through shape, colour, texture, and size. Trees are typically placed within three shape groups;
 - Pyramid (Figure 1), which form cone-like silhouettes - these include Conifer and Podocarp species.
 - Spreading (Figure 2), these trees typically branch into a thick round or oval-shaped crown. They provide strong shade and may have such dense foliage that the branches are concealed. They are commonly used as park trees and street trees. Examples include Pohutukawa (*Metrosideros excelsa*), Maple and Ash species.
 - Columnar (Figure 3), trees which are defined by their very narrow, upright shape and typically upright branches and a single trunk. They are commonly used to enhance and define structural features like doorways or riverbanks. Examples include Cabbage trees (*Cordyline australis*), Poplars and Cypress species.

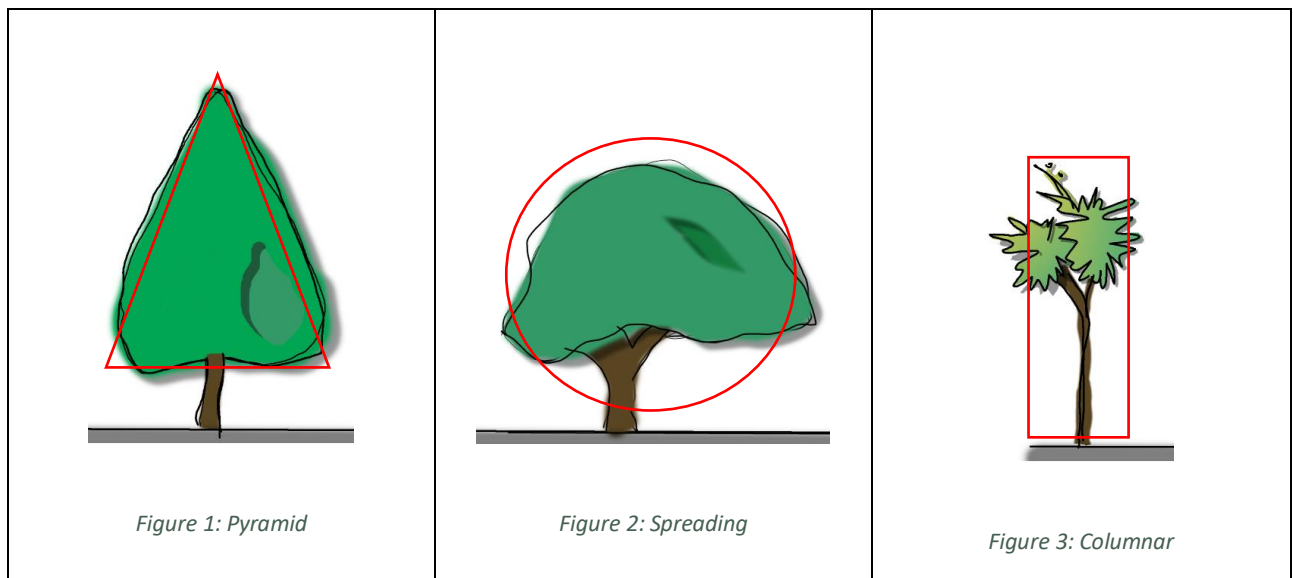


Figure 1: Pyramid

Figure 2: Spreading

Figure 3: Columnar

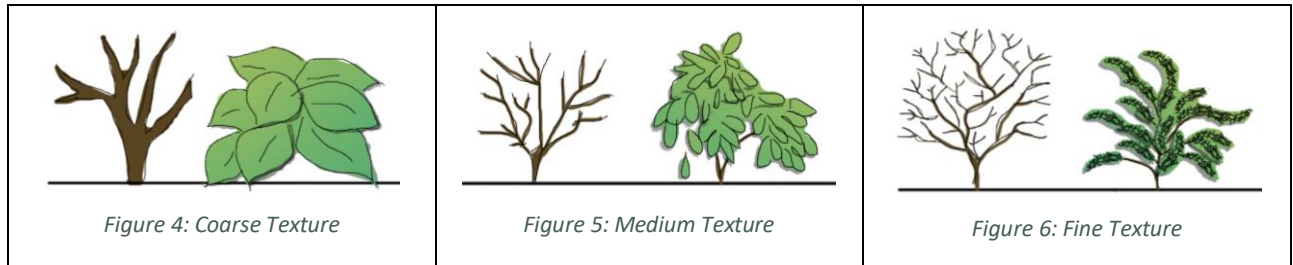
10. Trees are different shapes based on natural tendencies or as responses to their environment. A Ginkgo (*Ginkgo biloba*) may be a spreading tree in some environments or have a pyramidal shape in others. Trees can also have a juvenile form that changes as they mature (known as Heteroblasty), such as Kowhai (*Sophora microphylla*), Ribbonwood (*Plagianthus regius*) and Lancewood (*Pseudopanax crassifolius*). Human modification, particularly within urban settings, alter a tree's silhouette through pruning, and grafting to obtain desired visual shapes, sizes and attributes. These human alterations include; limbing up, where the lower branches of the tree are removed, hedging, and heavily clipped topiary designs.

11. Trees provide colour to an urban environment. Tree's standard colour of green varies in shades from greys to greens to browns; for example Eucalyptus (*Eucalyptus*) which are silver/grey, to Kowhai (*Sophora microphylla*) which has green vegetation, to Lancewoods (*Pseudopanax crassifolius*) which have brown leaves. The colour is predominantly green based due to the presence of chlorophyll in their leaves. However, trees may provide change through seasonal variations. Deciduous trees, known for their significant colour changes in autumn to winter, provide a change from greens to yellow, orange, red and brown. Evergreen trees provide more consistent green vegetation all year round. Seasonally, trees also reproduce; creating flowers, cones, fruit and seeds.

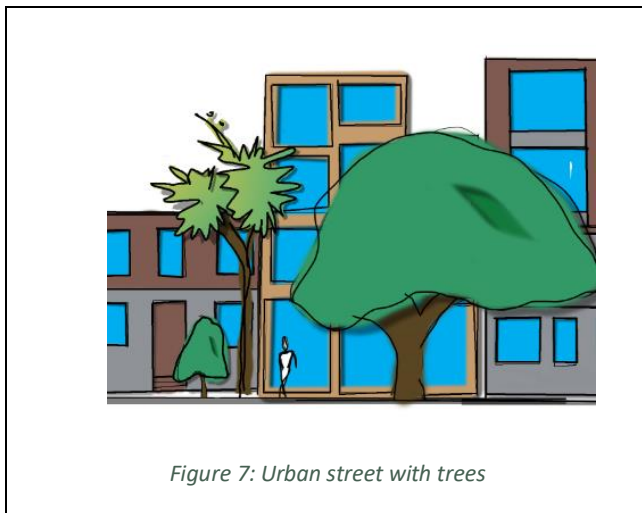
Trees have a varying range of texture, but are generally considered visually soft, fluid and flexible while buildings are visually hard, solid and sturdy. The texture of a tree can be further grouped as being fine, medium and coarse.

- Coarse (Figure 4), texture that is bold and is highly visible from a distance. Typically with large foliage and ridged growth patterns. Examples include Cabbage trees (*Cordyline australis*), Puka (*Meryta sinclairii*), and Kawakawa (*Marcopiper excelsum*).

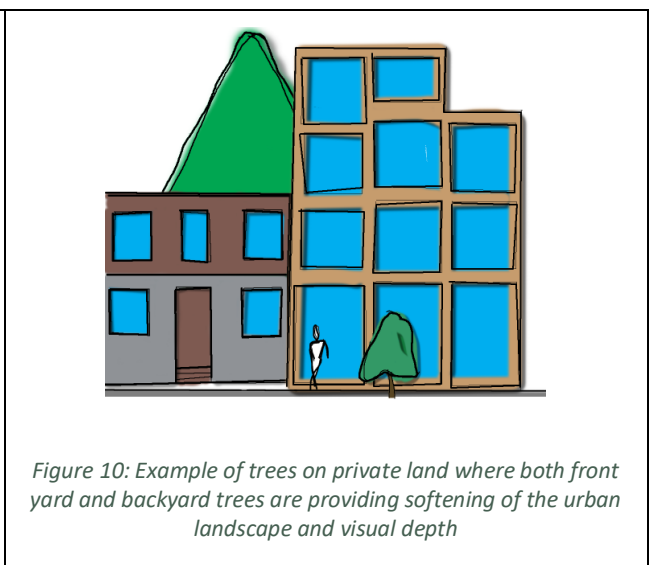
- Medium (Figure 5), have a mixture of both hard and soft textures within the trees from. They may have coarse branches with small leaves, such as Kowhai (*Sophora microphylla*) and Pohutakawa (*Metrosideros excelsa*).
- Fine (Figure 6), typically have a light or flowing form with soft small leaves. Examples include Pittosporum and Podocarp varieties.



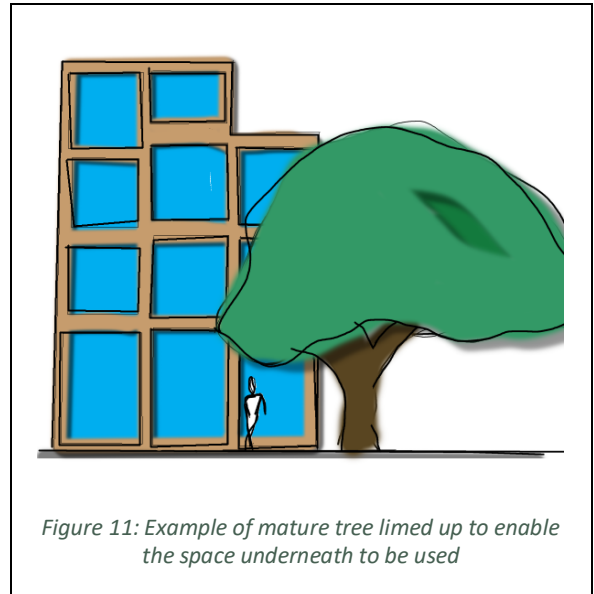
12. Tree's varying form, shape and varying textures contribute to the amenity and landscape values of a place. By providing specific landmarks within an urban landscape, the physical feature of a tree can help identify a specific location. Through physical responses to the environment, trees add micro changes to an urban landscape. They provide physical changes and amenity interest for people to observe on an incremental basis and experience change in the landscape daily and seasonally. They allow people to mark seasonal change over time, in comparison to urban structures that can be erected within months, but often provide very limited visual changes over time.
13. Trees can both screen and enhance built environments. Trees as hedging create green walls, and taller trees can screen windows and solid walls. Trees can be used to reduce visual pollution, screening unsightly and undesirable views such as overhead power lines and utility boxes. Trees that are able to grow to their natural shape enhance the urban landscape through naturalising built environments, softening of hard surfaces and harsh outlines of buildings, and complementing building development (Figure 7 & Figure 8). Trees that are also able to respond to their environment can create unique shapes that also enhance features of the urban landscape. Buildings without trees often considered to have a "naked look" (Appleyard, 1978). Heavily clipped trees or columnar trees are used to complement or create architectural features or to enhance and define features like doorways or riverbanks, and provide a sense of natural character (to a lesser degree).



14. Trees in the private and public realm contribute to visual amenity. Trees are recognised assets or “green infrastructure” within public urban spaces, for example park trees and street trees (Dixon & Wolf, 2007). The appearance of trees within private properties benefits the visual amenity for the residents as well as other users. Trees planted in front yards have a direct visual benefit to the streetscape, while trees in the back yards also provide breaks in the urban environment (particularly if they extend above the height of surrounding buildings and can be appreciated from public roads). Private trees have direct visual benefits to the landowners, internally providing breaks and screening from buildings.
15. Trees within private lots that extend above buildings and are visible to the public create visual perspective and depth, and a softening of the urban form. If trees are removed from private properties and reliance is placed solely on trees within public spaces, to provide amenity, both landscapes may become undesirable ones. This is because public spaces may become too densely populated with trees (creating dark spaces), and sparse tree growth within developed areas will fail to provide visual softening and interest.



16. Trees introduce human scale into the built landscape. As trees increase in height, they can be limbed up and have their lower branches removed. The canopy then creates a room and usable urban space underneath (Figure 11). When located adjacent to the road corridor, trees can provide a sense of enclosure and road narrowing, thus resulting in the reduction of the speed of moving traffic.



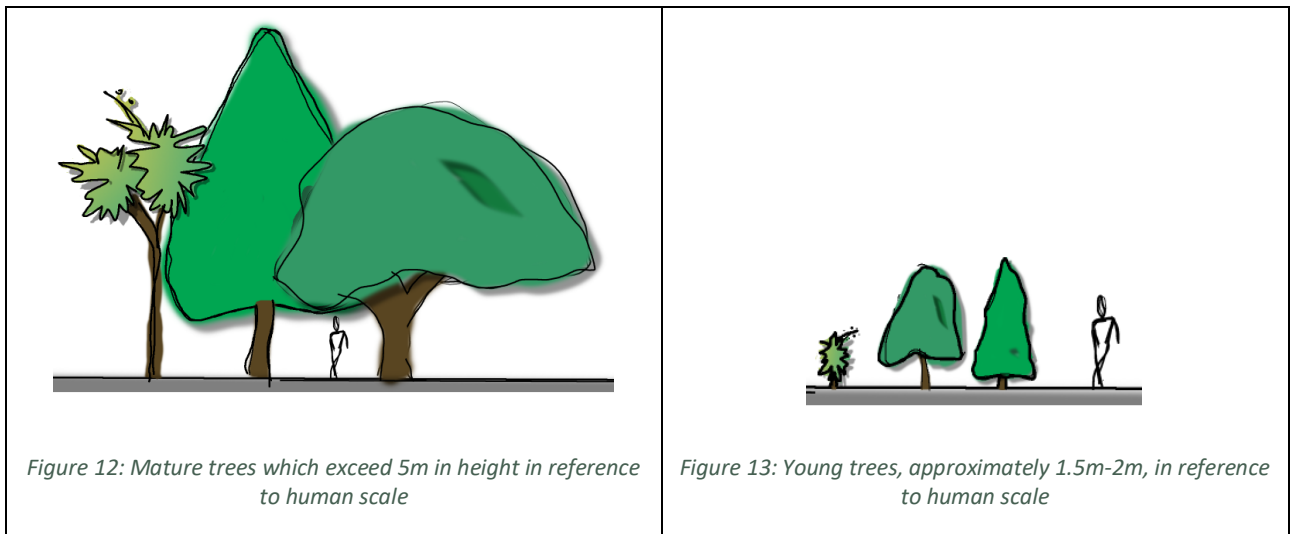
17. Trees provide physical shade and shelter within an urban landscape. Larger trees provide more substantial shade and shelter than small young trees. Mature trees in the urban landscape are often limbed up to enable

people to use the space underneath to shelter for shade during warm days, and to shelter from the rain and wind. Trees with less dense canopies provide lower levels of light penetration and can display dappled shade patterns on the ground and walls. As within a rural landscape, the use of trees as windbreaks is utilised within urban landscapes. Tree canopies also provide shelter and food sources for fauna, such as birds and insects, in turn adding to the visual amenity and biodiversity that trees can provide within the urban landscape.

18. Mature trees can provide substantial canopies with a noticeable physical impact to the landscape, while young trees are much smaller and have little to no canopy (Figure 12 & Figure 13). Mature trees provide immediate mitigation effects to the urban development establishing around them, compared with the planting of new trees. New trees require a lead in time of several years (depending on species and growth conditions) to become established and provide meaningful canopy cover, while the urban built form can be established at significant heights within short time frames (months to a year). New trees under the Christchurch District Plan are currently required to be planted at no less than 1.5m in height (Built Form Standards 14.6.2.6 & 14.5.2.2).

19. Different tree species grow at different rates; some of the faster trees like Pittosporum species can grow about 1m per year while slower trees like Lancewoods (*Pseudopanax crassifolius*) only mature out of their juvenile forms after about 15-20 years (Yates, 2021; Department of Conservation, 2022). Within an urban landscape or developing urban landscape, it is important to retain mature trees while also planting young trees. The mature trees provide instant visual amenity while the younger trees are able to grow and provide visual amenity for new generations. However, it is important to note that regular tree planting

ensures age diversity of trees, and mitigates the risk of the City’s tree population reaching the end of life at the same time.



20. In summary, the retention of mature trees in the urban landscape ensures that the existing level of visual amenity, biodiversity, and other values are retained. The removal and replacement of these trees, while providing amenity for new generations, and ensuring age diversity of trees, will result in a lag effect of a number of years, while these trees are maturing.

Associative Values

21. “Associative” means the intangible thing arising from the relationship between people and place – such as history, identity, customs, laws, narrative, creation of stories and activities specifically associated with a landscape (NZILA, 2021).

22. Trees are highly valued components of urban settings, a key contributor to a “liveable city” (Dixon & Wolf, 2007). Liveability is defined in the Oxford Dictionary as “the degree to which a place is suitable or good for living in”. The term describes the conditions that frame a decent life for all inhabitants of cities, regions and communities including their physical and mental wellbeing. The “liveable city” concept has spawned a large area of research into how, or what, makes a city more liveable (Mouratidis & Yiannakou, 2022; Kuchelmeister, 2000; Dixon & Wolf, 2007; Hooper, et al., 2020). The presence of trees in urban landscapes generally enhances public perception of visual quality in cities; people express more positive emotions and judgements for urban places having trees (Dixon & Wolf, 2007). Studies have found that urban greening is valued in residential landscapes; people prefer to live in urban landscape with more trees. This is often a quantifiable element through correlations with property values (Holt & Borsuk, 2020; Kuchelmeister, 2000; Sander, Polasky, & Haight, 2010; Dixon & Wolf, 2007; Gwedla & Shackleton, 2019).

23. Trees with large canopies can provide an appealing space for people to engage in outdoor activities (places to meet, eat, play and shelter, walk) and engage with physical activities such as walking and cycling (Dixon & Wolf, 2007). Trees with the varying textures, colours, silhouettes can make physical activities more visually enjoyable, interesting and varying through time and seasons. Trees spread through private and public land encourages people to move through landscapes, enjoying the journey not just the destination. Trees associated with the streetscape, through street trees and private trees located on the street boundaries/front yard, provide shade and greenery to users. Lifestyles that are more active, combat obesity, improve cardiovascular health, and increase longevity (Dixon & Wolf, 2007). Streets with denser tree canopies are associated with road calming as they provide a sense of enclosure and road narrowing, thus reducing the speed of moving traffic (Harthoorn, 2017).
24. This association is also consistent with the benefits of walkable environments that introduce more “eyes on the streets” (Holt & Borsuk, 2020; Ministry of Justice, 2005). This in turn creates a public realm that fosters spontaneous, casual, and deliberate social interactions, increased interaction and a greater sense of community, passive surveillance and safety from crime (Hooper, et al., 2020; Holt & Borsuk, 2020). Tree canopy was significantly associated with lower levels of both violent and property street crime (Holt & Borsuk, 2020). However, too dense planting of trees can have negative effects, creating dark landscapes with little visibility and reduced surveillance, associated with feelings of being unsafe (Ministry of Justice, 2005).
25. Landscapes provide a sense of place, a particular experience and feeling that a person has in a particular setting. This experience provides a place with an identity. This identity could be at the local level, city, regional, national, or international level. Trees as individual or as a collective provide identification with a particular place, like Chestnuts in Paris, Cypresses in Rome, Palms in Hawaii, the Pohutukawa in New Zealand and Oak tree lined paths of Hagley Park, Christchurch.
26. The area of Christchurch was used and occupied by Ngāi Tahu. Their connection with the natural environment is critical to their identity, sense of unique culture and their ongoing ability to keep tikanga and mahinga kai practices alive (Mahaanui Kurataiao Ltd, 2013). The use of native, indigenous trees strengthens a sense of place with 80% of New Zealand’s trees, ferns and flowering plants being endemic (Department of Conservation, 2022). The Christchurch area was a rich mahinga kai site for Ngāi Tahu and the trees in the landscape provided important navigational cues. Trees within urban landscapes can be a source of food to human and fauna, and they are able to provide wayfinding functions either as individuals or as groups.

27. Christchurch City often has links and references to being a Garden City. The title “Garden City” has been in use for more than a century, and was first coined by Sir John Gorst, a special commissioner from England at the 1906 International Exhibition. Since the Christchurch Earthquakes, promotion of the title has been less frequent, and there have been questions as to whether Christchurch can retain the Garden City title (Clarke, 2018; Newsroom, 2022; Truebridge, 2017). The Garden City concept is linked to the European ideal, the picturesque landscape; an idealised style of landscape popularised in the 18th century within urban landscape. It can be characterised by grassed lawns and large (traditionally English) canopy trees. Trees are a valuable contribution to a Garden City, and are part of Christchurch’s history. If Christchurch is to continue as the “Garden City”, trees will play an important part. Trees enhance neighbourhood character and the “Garden City” identity through seasonal colour changes, different shapes, forms, patterns, textures, flowers and seeds.

Perceptual

28. “Perceptual” means both sensory experience and direct interpretation. While the sense of sight is most typically applied to landscape assessment, sensory perception importantly includes all the senses such as sound, smell, touch and taste (NZILA, 2021).
29. Trees provide visual symbolic functions in the landscape, beyond the practical functions they offer. Trees have different meaning to different people; bound up with personal and group identity (Appleyard, 1978). Trees evoke emotion and can be connected with symbols of self and others (Dixon & Wolf, 2007). People connect with trees, as they are often identifiable as having unique personalities and similar human traits as they too change. Old trees look wise, a tree that provides shelter evokes feeling of nurturing, young trees seem fresh and sick trees evoke feelings of sadness and empathy. The human connection is also related to the human scale that trees provide within the urban landscape. Though a tree can grow to large heights, they appear less daunting than an urban building as they grow slowly (as people do), and change occurs over time.
30. People become sentimental about certain trees as they connect with people’s memories. Trees within the urban landscapes are easily accessible on a daily basis as they are located in a place where people live (in comparison to trees within the rural landscape). Private trees are often planted for sentimental or cultural reasons. For Maori and many other cultures, it is cultural practice to bury the placenta to symbolise a baby’s link to the earth. The location is often marked with a tree that is watched over and grows with the child. Public and private trees are also planted as markers, records of notable events and memorials such as

the Memorial oak tree and plaque¹ in the Park of Remembrance, Christchurch. Over time, these trees become more valuable to the community and provide a human connection with history. In addition to maintaining old trees, the planting of new trees is also essential to continue this cycle for new generations.

31. The evidence supporting how natural green infrastructure assists people to thrive is published across many journals representing numerous academic and scientific disciplines (Dixon & Wolf, 2007; Ta, Li, Zhu, & Wu, 2021). More tree cover in neighbourhoods, independent from access to green space, was found to be associated with multiple health benefits, including better overall health and better social cohesion (Holt & Borsuk, 2020). The presence of trees generally enhances public judgment of visual quality in cities, as trees are highly valued components of urban settings (Ta, Li, Zhu, & Wu, 2021). Views of trees can also help restore or improve mental health including reducing physical stress and feelings of depression, and increasing concentration, productivity and feeling of satisfaction (Lee, 2021; Dixon & Wolf, 2007; Sander, Polasky, & Haight, 2010). These studies demonstrate the importance of having nature accessible. As people spend most of their time within urban landscapes, at home or at work, trees should also be part of the urban landscape.

Summary

32. Trees and their canopies provide beneficial contribution to amenity values of urban landscapes. They provide physical attributes, but they also provide strong links with associative and perceptual dimension that humans place on landscapes as a whole or as individual features. Trees provide physical attributes to an urban landscape, through texture, colour, shape and size. They are able to provide these physical attributes over time, as they change through seasons and grow. Trees contribute to associative values, providing connections and recognition to a place. They provide a connection with nature that benefits human wellbeing, reducing stress and evoking positive emotions. Having trees within urban landscapes enable the trees and their positive attributes to be readily accessible to humans.

33. The loss of trees from within an urban landscape with increasingly larger built forms will likely create undesirable spaces. The amenity benefits of mature trees and their canopies, and creative architectural landscape responses, would be lost in the urban landscape. While planting of young trees would help to transform and soften the visual landscape, and ensure age diversity of trees in the future, they provide reduced character and amenity in their juvenile state.

¹ The oak was planted in 1924 and grew from an acorn sent back from Gallipoli in 1918 by Lieutenant Douglas Deans.

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