

Kaipātiki Local Board Ngahere Analysis Update 2021

Canopy cover changes with the
2013 to 2016/2018 LiDAR data

Urban Ngahere Strategy 2019
Knowing Programme



A summary of the urban environment in Kaipātiki

Approximately

88,000

residents in 2018



Two areas - Chatswood and Birkenhead West - with more than **50%** canopy cover

Highest overall canopy cover for all urban local boards in Auckland

Approximately

3,400

hectares of land

562

hectares of parks, including destination parks like:

- **Onepoto Domain**
- **Chelsea Heritage Park**
- **Kauri Point Domain**
- **Birkenhead Domain**
- **Tuff Crater Reserve**

Only **1%** of canopy cover more than **30 metres** tall

40% of canopy cover with no statutory protection

Average canopy cover of

30%

across local board, including canopy cover of:

64% on public parkland **14%** on road reserves **34%** on other public land **25%** on private land

60 native forest reserves

such as Eskdale Reserve and Kauri Glen Reserve

1,032 hectares of urban forest in 2013, **increasing to 1,037 hectares in 2016/2018**

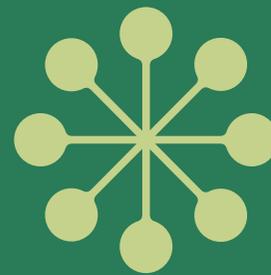
Around **150 parks** and **44 playgrounds**

506 hectares of Significant Ecological Area

401

Notable Tree records

More than **50%** of total canopy cover on private land



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Kaipātiki Local Board

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1.0 Preface

Tāmaki-Makaurau / Auckland is New Zealand’s largest city, and plantings of exotic and native trees have taken place as the region has developed. Early Māori settlers would have planted trees such as karaka, pūriri and tōtara to indicate a special place or to mark a celebration, while European settlers planted trees that were familiar and provided a sense of place. London Plane, English Oak, and European Lime trees were some of the earliest recorded plantings in Auckland. Settlers arriving from around the world commenced the history of Auckland’s diverse and unique tree cover.

When European settlers arrived to Tāmaki-Makaurau / Auckland, the gullies of the isthmus were filled with raupō, edged with a varied growth of sedges and other moisture loving plants; and slopes of gullies covered with karamū and cabbage trees. By the late nineteenth century, much of the Auckland area was under cultivation with a large number of

introduced plants. Along with residential development commencing in the mid-20th century, these actions have now reduced indigenous forest cover within the Kaipātiki Local Board to small fragments, primarily in local reserves.

The Kaipātiki Local Board has provided locally driven initiatives funding to Auckland Council’s Principal Advisor Urban Ngahere (Forest) in the Parks, Sports and Recreation Department to develop an analysis of the tree cover in its area of responsibility. This update report is the result of a programme of work by Auckland Council involving detailed analysis of urban tree coverages on public and private land, aiming to identify opportunities to nurture, grow and protect urban trees in the local board area. The analysis work is directed by the Auckland Council’s Urban Ngahere (Forest) Strategy 2019, which has 18 key objectives to help Council and local boards to deliver a healthy ngahere for a flourishing future.



2.0 Introduction

2.1 Kaipātiki Local Board

The Kaipātiki Local Board covers approximately (c.) 3,400 hectares (ha) and its boundaries are the northern motorway to the east, the inner Waitematā Harbour to the south-west, and Hellyers Creek to the north. The population of the local board was approximately 88,000 residents in 2018.

An information graphic summarising local board details related to urban forest is provided at the beginning of this report.

Kaipātiki has one of the largest areas of continuous urban native vegetation remaining in Auckland’s ecological region (Auckland Council 2012). Approximately 64% of the local board area is public parkland, with bush reserves containing pockets of remnant native forest. Leafy suburbs of south-eastern and eastern Kaipātiki, including Chatswood, Birkenhead, Bayview and Beach Haven, have been classified as ‘forested suburbs’ in the Urban Ngahere Strategy (Auckland Council 2019a).

There are about 60 native bush reserves in Kaipātiki (Wilcox 2012). They range in size from 0.1 to 83 ha but most are small (less than 2 ha). Some of the largest stands of native forest in Kaipātiki occur in Eskdale Reserve (Wilcox 2012; Stanley 2018). This patch of bush is an amalgam of eight gazetted reserves, i.e. ‘Eskdale Reserve Network’, which covers 63 ha.

Despite these extensive areas of remnant natural vegetation and the large number of parks, there are large areas of Kaipātiki that are highly urbanised, particularly in Wairau Valley and Northcote Point, and much of Totara Vale, Glenfield and Hillcrest.

Kaipātiki is one of the stand-out areas in New Zealand for community-based conservation programmes with good environmental outcomes. Community cohesiveness and local identity have benefitted from the strong local community commitment to conservation programmes, which have been fortified by good partnerships with the Kaipātiki Local Board (Auckland Council 2014, 2017a). There are several well-established community groups, for example, the North Shore branch of Forest & Bird, the Kaipātiki Project, and the linked Pest Free Kaipātiki programme.



Urban forest in Kaipātiki



Street trees in Kaipātiki

2.2 Study Background

‘Urban ngahere’ (‘urban forest’) comprises all the trees within a city – including parks, coastal cliffs, stream corridors, private gardens and streets – both native and naturalised exotic species. For the purposes of this report, ‘urban ngahere’ is defined as all of the trees and other vegetation three metres or taller in stature within the Kaipātiki Local Board, and the soil and water systems that support these trees. This urban ngahere definition encompasses trees and shrubs in streets, parks, private gardens, stream banks, coastal cliffs, rail corridors, and motorway margins and embankments. It also includes both planted and naturally established plants, of both exotic and native provenance.

The scale of the tree and shrub cover across Auckland is sufficiently extensive on both public and private land to make a meaningful contribution to the liveability and sense of place for its residents. Benefits of the urban ngahere include:

Social

- Improve health and wellbeing
- Reduce the urban heat island effect
- Provide shade
- Enhance visual amenity

Environmental

- Enhance biodiversity
- Improve air quality
- Carbon sequestration
- Improve water quality

Economic

- Increase property values
- Reduce flood risk
- Reduce energy costs
- Reduce healthcare costs

Cultural

- Support education
- Local food growing
- Sustain and enhance mauri
- Cultural heritage

The Auckland Unitary Plan offers various degrees of protection to urban ngahere and groups of trees meeting specific characteristics (e.g., pre-identified significance, vegetation by coasts or streams); however, other important urban ngahere assets have no statutory protection and can therefore be removed. The completion of a study in urban canopy cover in Kaipātiki is important to provide information on baseline tree distribution that future canopy cover measurements can be compared to. This baseline data also provides information on where there are pressures on canopy cover and opportunities for tree planting. Increases in canopy cover are also intended to contribute to other Auckland Council programmes such as Te Tāruke-ā-Tāwhiri: Auckland’s Climate Plan (Auckland Council 2019c).

2.3 Data Collection

Urban canopy cover across Auckland was mapped in 2013 (Auckland Council 2019b), and again in 2016/18 by use of LiDAR (Light Detection and Ranging). Airborne LiDAR is an optical remote sensing technology that irradiates a target with a beam of light; usually a pulsed laser, to measure an object’s variable distances from the earth surface. Two LiDAR data sets are covered in this report, collected in the years 2013 and 2016/18. The second survey (2016/18) had to be completed over two years due to unfavourable weather conditions that limited data quality. As these two LiDAR data sets provide a solid baseline for future comparative work, investigations into alternatives to LiDAR for mapping urban ngahere are currently underway.

3.0 Results and Discussion

3.1 Urban Canopy Cover Overview

Based on the 2013 data set, urban ngahere covered 30% of the Kaipātiki Local Board area - the highest overall canopy cover across urban boards in Auckland - including 12% of roads, 63% of public parks, and 25% of private land. Further information on the 2013 data has been provided in a baseline report (Kaipātiki Local Board Urban Ngahere (Forest) Analysis Report September 2019; Auckland Council 2019b).

There was no net change in canopy cover based on the 2016/18 data set (Table 1).

In Kaipātiki, a large proportion (64%) of public land had canopy cover, the highest percentage of any urban local board. However, all but three statistical areas within the local board had over half their urban ngahere on private land, with the main exception

being Chelsea. This has important implications, as trees on public land are more accessible to the public and more likely to be protected. The parts of Kaipātiki that had low canopy cover on public land were Birkdale South, Birkdale North, Glenfield Central, and Sunnybrae.

The 2016/18 LiDAR data indicates growth in canopy cover on road reserves and parks in the Kaipātiki Local Board, with a combined net increase in canopy cover of c.13 hectares. On the other hand, data indicates a canopy cover decrease of c.8 hectares on private land. An example of this decrease has been observed on private land in Birkenhead South, where canopy cover has shown a reduction of c.3 hectares between 2013 and 2016/18.

Urban Local Board	Public open space		Private land		Roads		Other public land		Overall coverage	
	2013	2016/2018	2013	2016/2018	2013	2016/2018	2013	2016/2018	2013	2016/2018
Kaipātiki	63	64	25	25	12	14	33	34	30	30
Upper Harbour	50	52	29	30	11	13	10	11	27	28
Hibiscus and Bays	28	29	24	23	15	14	43	42	25	24
Puketāpapa	50	50	17	16	10	12	15	15	20	20
Albert-Eden	33	34	19	18	17	20	19	18	20	20
Ōrākei	25	25	20	19	14	16	20	20	20	19
Waitematā	42	43	16	15	15	17	11	10	19	19
Whau	34	34	17	16	12	13	12	12	17	17
Devonport-Takapuna	24	27	17	17	11	13	13	14	16	16
Howick	25	26	17	17	6	8	11	12	16	16
Henderson-Massey	30	32	14	14	7	8	11	12	15	15
Papakura	16	17	15	15	8	11	8	9	13	14
Manurewa	24	26	11	12	6	9	7	7	12	13
Maungakiekie-Tāmaki	21	23	9	9	10	12	11	11	11	12
Ōtara-Papatoetoe	13	14	8	8	7	9	10	10	9	10
Māngere-Ōtāhuhu	14	14	7	7	7	9	8	8	8	8

Table 1: Urban ngahere in Auckland's urban local board areas: data includes percentage cover (to nearest whole number) of urban ngahere for different land tenures, and the overall percentage cover of urban ngahere within each board, with a comparison between the 2013 and 2016/18 data sets.

3.2 Canopy Distribution across Kaipātiki Local Board

The urban ngahere is not distributed evenly throughout the local board, as shown in **Figures 1 and 2**, which display variation by statistical area. Leafy suburbs of south-eastern and eastern Kaipātiki have been classified as ‘forested suburbs’ (see Figure 2 of Auckland Ngahere Strategy for explanation of categories) with canopy covers of 54% for Chatswood, 42% for Birkenhead, 38% for Bayview, and 33% for Beach Haven. Eastern and central suburbs of Kaipātiki have ‘good cover’, including Birkdale (28%), Glenfield (23%), Northcote (24%), and Hillcrest (23%). The northern suburb of Totara Vale has ‘moderate cover’ (18%), while industrial Wairau Valley has ‘bare cover’ at (8%).

Over half (52%) of the local board is covered in impervious surfaces, which presents an opportunity to plant urban ngahere as a direct remedy. Trees are a well-known solution for stormwater management, as their extensive canopies and subsurface root systems are capable of capturing and pumping substantial amounts of water, providing cooling effects (Berland et al. 2017). Establishing trees within impervious surfaces will act to intercept rainfall before it reaches

the ground and slows inflow rates. This has follow on benefits for stormwater management systems such as underground pipes and nearby waterways (Dwyer and Miller 1999). Opportunities exist for new tree planting in the road corridor which will assist in stormwater management by capturing stormwater flows via interception and infiltration. Trees and other ‘green infrastructure’ solutions, including rain gardens, permeable pavements, bioswales, and green roofs are

worth implementing at a greater scale. More focus is required to plant trees within the road corridor.

The changes in tree canopy coverage have been minor on a local scale, as shown in **Figure 2**. In general, statistical areas of Kaipātiki have had only a minor net increase or minor net decrease in canopy cover since 2013.



Northcote point looking west towards Hinemoa Park and Birkenhead ferry terminal

Te matomatotanga o Te Ngahere-a-Tāone Te Rohe o Kaipātiki

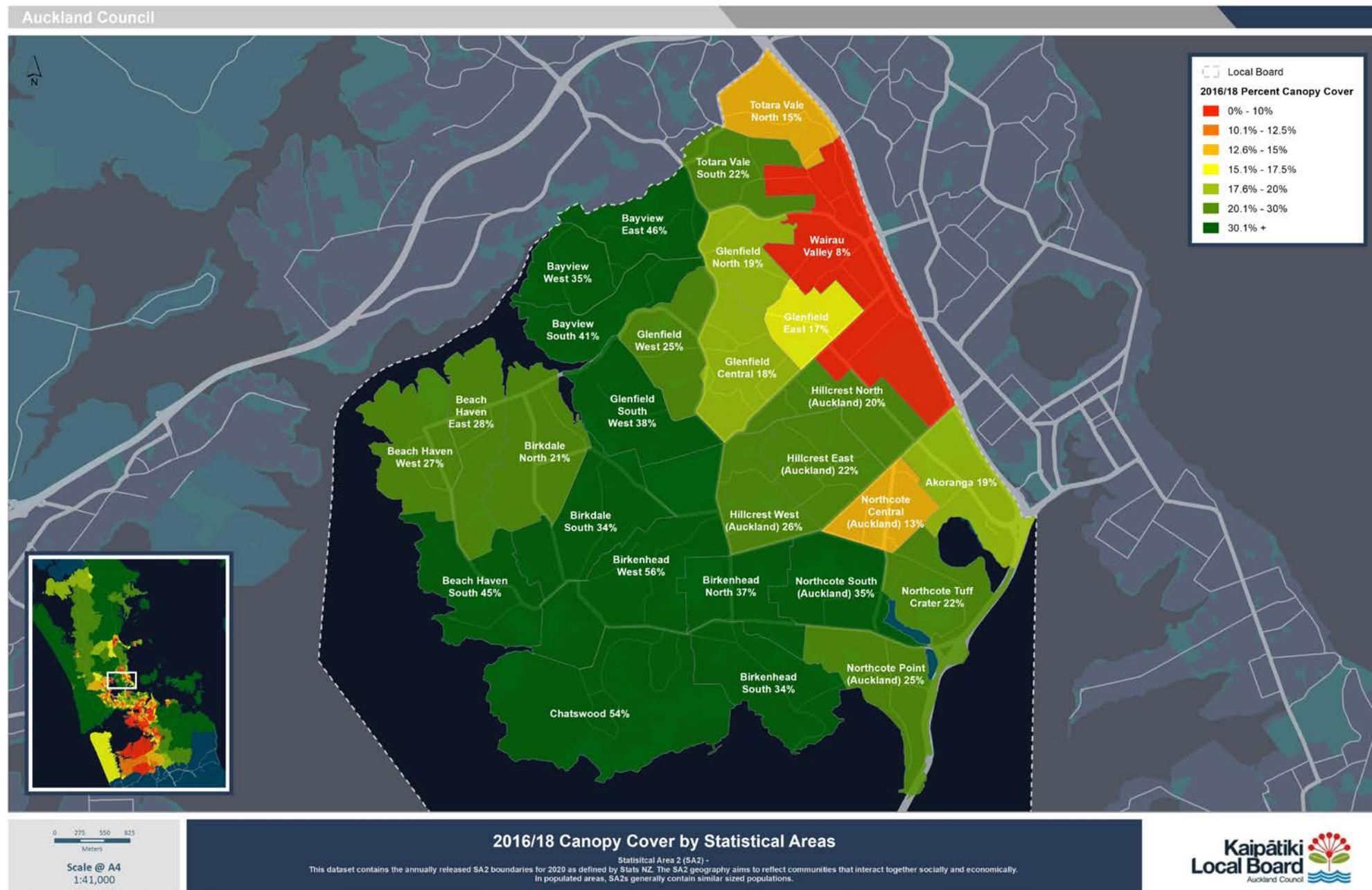


Figure 1: 2016/18 Canopy Cover by Statistical Areas

Te matomatotanga o Te Ngahere-a-Tāone Te Rohe o Kaipātiki

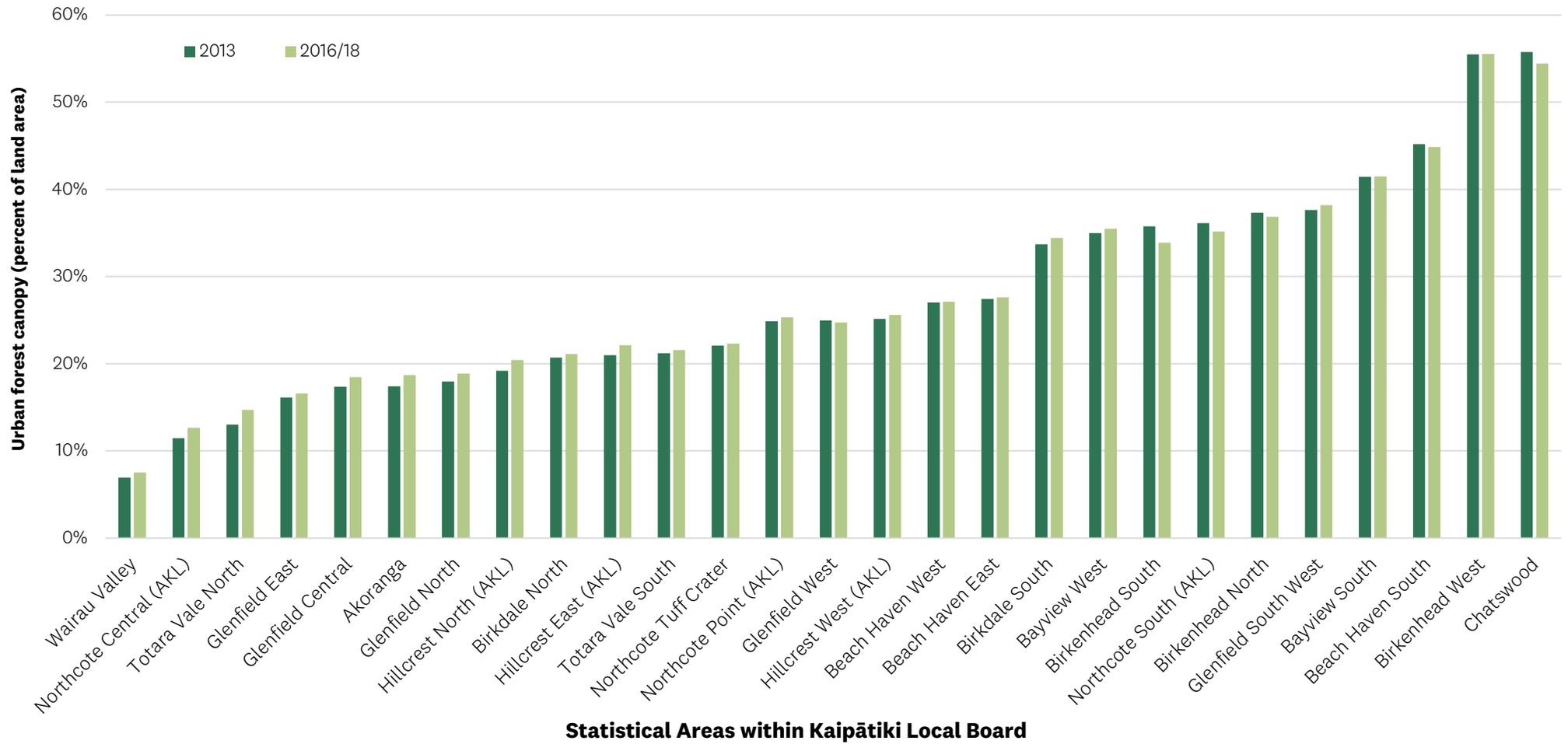


Figure 2: Spatial distribution of urban ngahere canopy within the statistical areas of Kaipātiki Local Board

3.3 Urban Ngahere Canopy Height

LiDAR data includes a height component, and this information was used to split the recorded canopy cover into different height categories: 3-5 metres; 5-10 metres; 10-15 metres; 15-20 metres; 20-30 metres; and taller than 30 metres. This data is representative of canopy cover height, rather than tree height, as each individual tree may be recorded in several categories.

The height class distribution of the urban ngahere canopy within Kaipātiki Local Board is displayed in **Figure 3**. In 2013, 19% of the canopy cover was between 3-5 metres tall, 39% 5-10 metres tall, and the remaining 43% was canopy taller than 10 metres. This distribution remained similar in the 2016/18 data sets, although the percentage of canopy cover over between 3-5 metres tall increased to 22% of the forest canopy. This data shows only low presence of tall canopy cover within the local board area, with all canopy cover taller than 15 metres (including height categories 15-20 metres, 20-30 metres, and 30 metres plus) representing approximately 15% of the total urban ngahere canopy cover assessed. Taller canopy cover is mainly found in Windy Ridge and Kauri Park, and to a lesser extent, Chelsea, Birkenhead East, Glendhu and Beach Haven South.

Research has shown that many of the benefits attributed to urban ngahere are disproportionately provided by larger trees (Davies et al. 2011, Moser et al. 2015). Large trees typically create more shade per tree due to a larger and wider canopy spread (Moser et al. 2015); intercept larger amounts of particulate pollutants and rainfall due to significantly larger leaf areas; contain more carbon and have higher carbon sequestration rates (Beets et al. 2012, Schwendenmann and Mitchell 2014, Dahlhausen et al. 2016).

Additionally, trees are often less susceptible to careless or malicious vandalism by the general public once established; can be pruned to provide higher canopy clearance over roadways; carparks and pedestrian footpaths; typically contribute more to calming and slowing traffic on local streets than small trees; and absorb more gaseous pollutants. It is therefore an immediate priority to retain existing large trees across the local board area to ensure the positive benefits of these are not lost, as also emphasised in the Urban Ngahere Strategy (Auckland Council 2019a).

The relatively high proportion of shorter canopy cover across the local board (22% in the 3-5m category and 39% in the 5-10m category) in the 2016/18 data set, indicates a relatively recent surge of tree planting, assuming the smaller stature canopy corresponds to younger trees, rather than a large proportion of shrubs with a limited mature height. In the case of Tuff Crater in Northcote, the former situation is more likely as there have been major efforts with ecological restoration in the area since 2013.

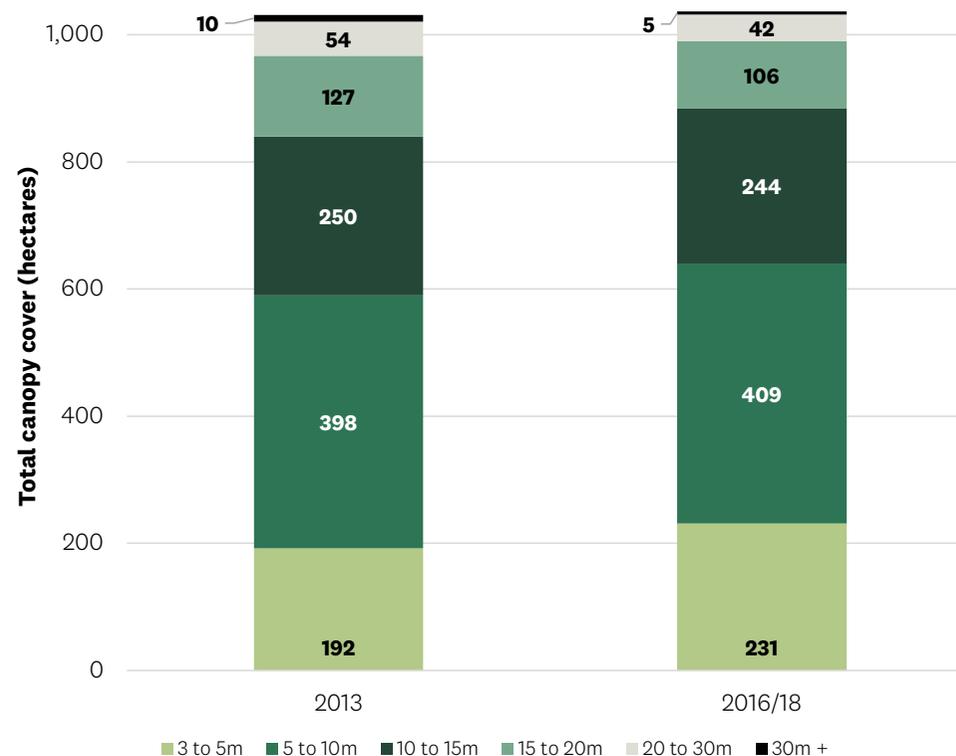


Figure 3: Height class distribution of urban ngahere canopy across all land tenures within Kaipātiki Local Board

3.4 Urban Ngahere Tenure

The tenure of urban ngahere described in this report relates to the zoning and ownership of different land parcels within the local board. Publicly owned land is described as either ‘public parks’ or ‘other public land’ (e.g. schools, Council-owned property), trees in the road corridor/road reserves are described as ‘street trees’, and privately owned land (residential or commercial) is described as ‘private land’.

The tenure distribution of urban ngahere canopy within the Kaipātiki Local Board is displayed in **Figure 4**. Just over half (52%) of the urban ngahere in Kaipātiki is located on private property. Public parks make up for 34% of the urban ngahere, while other publicly owned land (e.g., schools) contain 15% of the total urban ngahere cover.

Kaipātiki Local Board has a lower canopy cover in road corridors/road reserves compared to other land tenures in the board area. This situation presents an opportunity for enhancing the urban ngahere by infill planting of carefully chosen street trees.

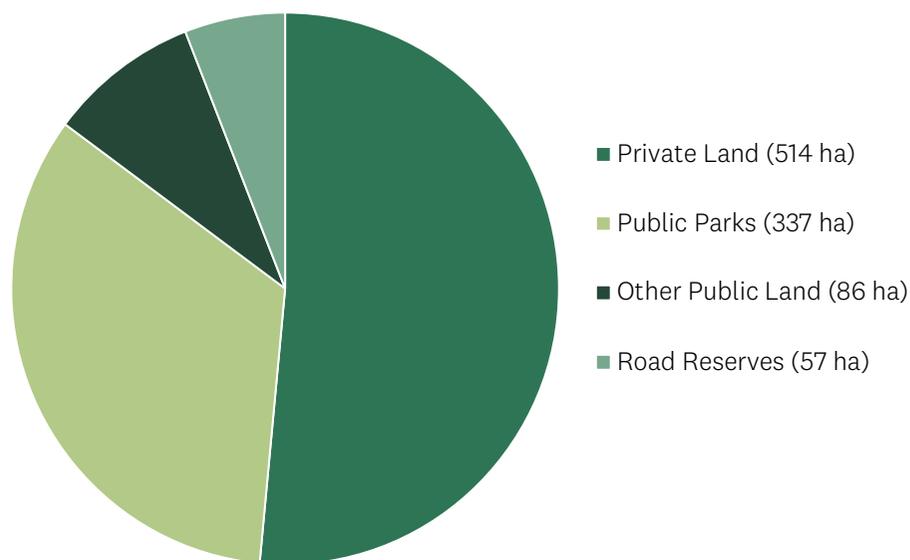


Figure 4: Tenure of urban ngahere canopy within Kaipātiki Local Board (2013 data set)

In addition to having lower levels of canopy cover, roads also exhibit generally smaller tree size. This is reflective of the more cramped growing environment within the road corridor (particularly below ground) and may be indicative of the more frequent cycling of tree stock as trees are regularly removed and replaced to allow for infrastructure works.

Public parks have the highest proportion of urban ngahere relative to area out of all the land tenures, as shown in **Figure 5**, followed by other public land. There has been a slight increase in urban ngahere canopy in public parks, as well as road reserves and other public land, between the two survey data sets. The percentage canopy cover of private land has stayed the same (**Figure 5**).

Public parks are good place to focus additional urban ngahere planting as they comprise approximately 17% of the local board land area and are widely distributed. In addition, public parks offer the best opportunities for long-term sustainable management of the urban ngahere due to the lower chance of conflict with future housing intensification.

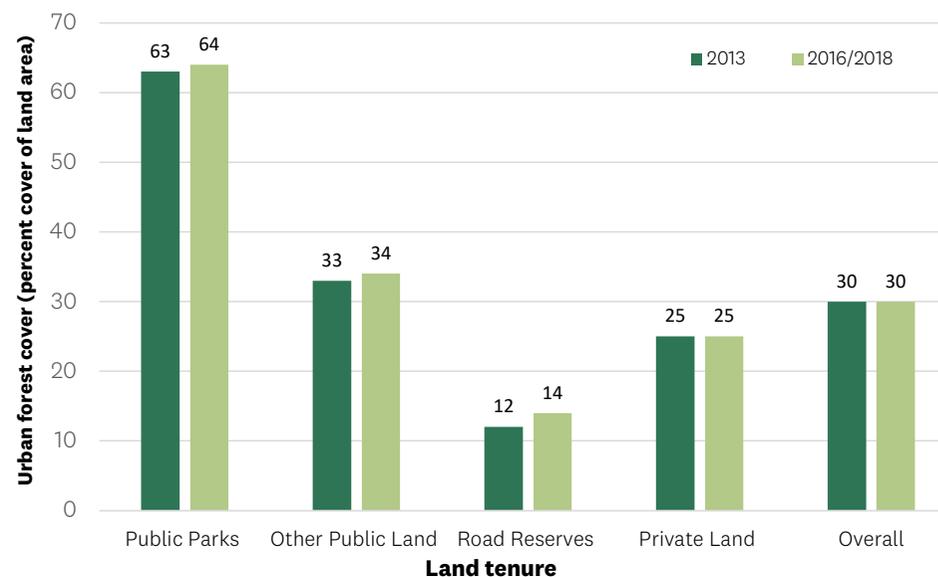


Figure 5: Change in urban ngahere cover of different land tenures in Kaipātiki Local Board between 2013 and 2016/18

3.5 Urban Ngahere in Relation to Growth Pressures

The Significant Ecological Area overlay (SEA; **Figure 6**) prioritises the areas of urban ngahere in Kaipātiki with the highest ecological value, providing a starting point for protection. With future development and urban intensification, however, SEA and other continuous areas of urban ngahere are at risk. Canopy cover in relation to the Auckland Future Urban Land Supply Strategy (Auckland Council 2017b) forecasting areas of growth is shown in **Figure 7**.

In most suburb areas in Kaipātiki, more than half of the urban ngahere (per person) is on private land. Further intensification of development is predicted in Kaipātiki, and across Auckland as a whole, and the concern is that there will be further loss of green space and canopy cover (Auckland Council 2019).

Low street tree numbers are a common theme in a number of areas across the local board area; opportunities exist to plant new trees in the road corridor to provide benefits to local communities and to help with the continued work that is necessary to improve and retain the overall tree canopy coverage across the local board area. Adding to the numbers of trees in the road corridor is an important and ongoing measure to retain and extend urban ngahere cover, as the tree cover in the road corridor is currently low. The importance of trees in the street environment is going to increase, and will, in time, incorporate the only accessible trees for some residents.

The next step for the Kaipātiki Local Board is to identify priority areas for the urban ngahere work programme. This needs to be considered within the context of current and proposed future land use, local planning requirements, and the local environmental, demographic and socioeconomic issues. Kaipātiki has excellent tree cover overall, compared with Auckland's other local board areas. However, there are parts of Kaipātiki where there is less than ideal forest cover, and a high proportion of the tree cover is in the smaller size classes.



Regenerating Kauri Forest, Hadfield Street Reserve, Birkenhead

Te matomatotanga o Te Ngahere-a-Tāone Te Rohe o Kaipātiki



Figure 6: 2016/18 Canopy Height & Significant Ecological Areas



Figure 7: 2016/18 Canopy & Sequencing and Timing of Growth

3.6 Recommendations

The assessment of urban tree cover in the Kaipātiki Local Board presented in this update report aims to assist in the knowing phase of the Auckland Urban Forest Strategy. The analysis of existing tree cover distribution, structure, tenure, and protection, provides the local board with a basis for determining where to focus efforts in improving urban ngahere cover during the growing phase, to be initiated in the near future.

Recommendations for future urban ngahere management to the Kaipātiki Local Board include:

- Carry out additional tree planting in road corridors, aligned with recommendations in the Kaipātiki Urban Ngahere Action Plan 2020
- focus efforts for maintaining and improving tree cover where it is currently low, such as Wairau Valley
- focus efforts for improving tree cover in areas that are expected to grow and intensify in the future and areas with a low number of large trees
- promote the value of large trees and protected vegetation (e.g. Notable Trees, Significant Ecological Area) in the Kaipātiki Local Board area

- recommend the board seek to place a submission on the new RMA (later in 2021) to advocate for the inclusion of rules to enable additional tree protection to take place at a local scale
- identify opportunities to improve ecological corridors, i.e., Kaipātiki Connections Network Plan and the North-West Wildlink project
- carry out ongoing restoration of wetlands and tree planting to boost green infrastructure
- continue carrying out urban canopy cover analysis on a regular basis to monitor trends and increases throughout the local board area.

The metrics of the canopy analysis will be used to help inform and prioritise the efforts of the Kaipātiki Local Board Urban Ngahere Action Plan. The action plan highlights the areas to plant new trees and sets out the process to fund, implement, and find ways to protect and nurture existing ngahere on public and private land.



Tawāpou / *Planchonella costata* in native planting, Birkenhead Library

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