Forbes Ecology

Kākātangiata Master Plan: Ecology Advice

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Cover photograph:

Manderson's Bush contains several large diameter kahikatea trees (centre of cover picture) which are estimated to be 400-500 years old.

1.0 INTRODUCTION

1.1 Background and Scope

The Palmerston North City Council engaged Forbes Ecology Limited to advise on the ecological aspects of the Kākātangiata Master Plan. The Kākātangiata Master Plan area comprises predominantly flat farmland (Fig. 1) located on the southwestern outskirts of the existing Palmerston north suburbs Westbrook, Highbury, and Awapuni.

The scope of the assessment involved several site visits to the project area, including a dedicated site visit to Manderson's Bush in the company of a surveyor to accurately define the bush's extent. The scope also included advice to the project team on ecological constraints and opportunities to be reflected in the Master Plan. This report represents the culmination of the ecology assessment work to date meaning this report details the ecology advice for the Kākātangiata Master Plan.

Figure 1. The general character of the Kākātangiata Master Plan area is flat pastural land.

2.0 Kākātangiata Ecology Advice

2.1 Historic and Local Context

Prior to humans' arrival, the habitat in vicinity of Kākātangiata was native conifer-broadleaved semi-swamp forest. The landform was formed by alluvial processes (e.g., sediment deposition from meandering waterways) and traces of relict stream meanders are present in the Kākātangiata project area. Soils are a shallow loam and are poorly drained[1].

Forests of the area featured dominance by kahikatea, pukatea with tawa and titokī. Matai, rimu and tōtara would have been present. Today at a national scale the land environments of the Kākātangiata project contain <10% native cover and very little of these environments feature legal protection. As such, the land environments are classed at the national scale as an Acutely Threatened Environment[2]. A point of relevance on this is that Central Government (i.e., MfE & DOC) has declared the protection of Acutely Threatened Environments as National Priority One for protecting the full range of biodiversity on private land[3].

Due to mostly human drivers, only around 23% native vegetation cover remains in the Horizons region[4]. In 2007 it was estimated that only 2.45% (1,636 ha) of kahikatea-pukatea-tawa forest remained in the Horizons region. This estimate indicates that kahikatea-pukatea-tawa forest is the most threatened forest habitat type in the Horizons region. Further, most remnants of this habitat type are small and affected by the processes of domestic stock grazing, fragmentation, and ecological isolation. These effects tend to result in regeneration and recruitment failure of native flora, gradual loss of species, and pest invasions. To address the ongoing biodiversity decline in these forest ecosystems it is critical that management interventions are implemented which:

1. Retire forest from grazing,
2. Buffer planting to increase forest area and reduce fragmentation and isolation effects, and
3. Address browsing mammal and plant pests.

Forest loss and land use change has also had huge impacts on the freshwater ecosystems of the Kākātangiata area. Prior to urbanisation, waterways such as the Mangaone steam were unconstrained and altered course freely, maintaining a natural channel form and habitat. Riparian forests created a shaded microclimate which an instream fauna was adapted to. Modern

[1] Smap soil name Longbeach_22b.1.
[2] See https://www.landcareresearch.co.nz/uploads/public/Tools-And-Resources/Maps/Threatened-Environment-Classification/Threatened_Environment_Classification_guide.pdf
[3] See https://www.doc.govt.nz/globalassets/documents/getting-involved/volunteer-or-start-project/funding/biodiversity-funds/protecting-our-places-priorities-brochure.pdf
[4] See https://www.horizons.govt.nz/HRC/media/Media/One%20Plan%20Documents/Past-and-Current-Indigenous-Vegetation-Cover-and-the-Justification-for-the-protection-of-Terrestrial-Bio-in-the-MW-Reg.pdf?ext=.pdf

channelisation has now confined the stream to a set path and this along with urbanisation has altered the hydrology and habitat characteristics. For these reasons, development design to avoid further effects, and preferably reverse existing effects on freshwater ecosystems, are a high priority.

Several national and regional policies are relevant to the Kākātangiata Masterplan. The draft National Policy Statement for Indigenous Biodiversity contains policy on identifying and managing effects to Significant Natural Areas (SNA), restoration and enhancement of SNAs, wetlands (including former wetlands) and areas that provide important connectivity and buffering, and increasing indigenous vegetation cover. The One Plan at Schedule F provides guidance on the identification of ecologically significant habitats and at Schedule B provides guidance on identifying significant aquatic habitats. These policies have been considered in the preparation of this report.

The National Policy Statement for Freshwater Management (2000) sets water quality thresholds for freshwater bodies and provides policy for regional councils regarding effects management regarding wetlands and waterways. Further work will be undertaken on these aspects shortly.

2.2 Manderson's Bush

2.2.1 Overview

Manderson's Bush is a remnant of the original forest cover (Fig. 2). As of 2021, the remnant comprised 2.20 ha of fenced forest (stock excluded by 644 m of existing fencing; Figs. 3 & 4) and 1.16 ha of unfenced forest and treeland (Fig. 5). In 2021, the larger kahikatea trees in the southern part of the fenced forest were estimated to be 400-500 years old, based on application of Hawke's Bay age-diameter regression data (Fig. 2). Regeneration within the fenced part of the remnant is healthy (Figs. 3 & 6) and a 2002 survey of Horizons Regional Council found 49 species of native vascular plants. Observations during 2021 noted abundant native birdlife (especially tūī) in and immediately around the bush.

2.2.2 Values to be Protected

In summary, Manderson's Bush is known to hold the following ecological values:

- An old-growth forest remnant of High ecological value (in terms of EIANZ (2018)[5] criteria).
- 2.2 ha of intact old-growth semi-swamp forest of Threatened status regionally (One Plan) and Acutely Threatened status nationally (Threatened Environments).
- 1.16 ha of grazed semi-swamp forest and treeland of Threatened status regionally and Acutely Threatened status nationally.
- Ecologically significant regarding One Plan ecological significance (Policy 13-5; RMA s6c) criteria (see Table 1).

[5] See https://www.eianz.org/document/item/4447

- Healthy regeneration of key canopy species, including pukatea, tawa, and titokī (e.g., within the fenced portion of the bush).
- Thirty native tree and shrub species, 7 native climbing species, 1 native sedge species and 11 native fern species.

A detailed ecological assessment covering herpetofauna, avifauna, flora, invertebrate, and bats would very likely yield additional values of Manderson's Bush.

Figure 2. A 400-500-year-old kahikatea tree in the northern part of the fenced area of Manderson's Bush (2021).

Figure 3. Prolific native forest regeneration at the northern forest edge. Regeneration in this photo includes titokī, tawa, māhoe, lancewood.

Figure 4. An example of successful stock exclusion at the northeastern boundary of the fenced section of Manderson's Bush.

Figure 5. Grazed forest where cattle have free access beyond the protective fence. Valuable old-age native trees exist in this area but will not replace themselves without restoration.

Figure 6. Pukatea regeneration in the interior of Manderson's Bush. Regeneration of this shade-requiring native tree species shows the ecological viability of the fenced forest.

Figure 7. Invasive English ivy, seen here climbing up an old titokī tree, is one of the serious plant pests present in Manderson's Bush.

Assessment of Manderson's Bush against One Plan Policy 13-5 ecological significance criteria indicates that the forest is significant in terms of RMA s6c. Specifically Manderson's Bush is significant in terms of both Policy 13-5 (a) Representativeness, Rarity, and Ecological Context criteria (Table 1).

Table 1. Ecological significance assessment following Horizons One Plan Policy 13-5 (a) evaluation criteria.

Policy 13–5 (a)	Criteria Description	Manderson's Bush
Representativeness (i)	Habitat that: (A) Comprises indigenous habitat type that is underrepresented (20% or less of known or likely former cover), or (B) Is an area of indigenous vegetation that is typical of the habitat type in terms of species composition, structure and diversity, or large relative to other areas in the Ecological District or Ecological Region, or has functioning ecosystem processes.	Significant – only 2.45% of the forest habitat types remain in the Horizons region. The land environment is Acutely Threatened nationally.
Rarity and Distinctiveness (ii)	Habitat that supports an indigenous species or community that: (A) Is classed as threatened (as determined by the New Zealand Threat Classification System and Lists), or (B) Is distinctive to the region, or (C) Is at a natural distributional limit, or (D) Has a naturally disjunct distribution that defines a floristic gap, or (E) Was originally (i.e. prehuman) uncommon within New Zealand, and supports an indigenous species or community of indigenous species.	Significant – the forest is located in an Acutely Threatened Environment and is also Threatened at a regional scale.
Ecological Context (iii)	Habitat that provides: (A) Connectivity (physical or process connections) between two or more areas of indigenous habitat, or (B) An ecological buffer (provides protection) to an adjacent area of indigenous habitat (terrestrial or aquatic) that is ecologically significant, or (C) Part of an indigenous ecological sequence or connectivity between different habitat types across a gradient (e.g. altitudinal or hydrological), or (D) Important breeding areas, seasonal food sources, or an important component of a migration path for indigenous species, or	Significant – Manderson's Bush provides native forest habitat which has been eliminated from the surrounding landscape and on which a number of forest specialists are dependent.

Policy 13–5 (a)	Criteria Description	Manderson's Bush
	(E) Habitat for indigenous species that are dependent on large and contiguous habitats.	
	Significance assessment result	**Significant**

2.2.3 Manderson's Bush Restoration

The following points describe the essential management measures which are required to achieve successful ecological restoration of Manderson's Bush.

Pest control

Pest control is an important component of ongoing management. Pests will be either plants or animals, relevant species and issues are discussed here.

Animal pests

Parts of Manderson's Bush are currently grazed, and these grazed forest areas are gradually dying out as forest trees cannot establish and grow with the level of stock presence. Retirement from grazing of currently grazed pasture and forest areas is a key aspect of restoration.

Visits to the bush in 2021 noted possum faecal pellets indicating the presence of possums. Possums are omnivorous introduced mammals which browse on forest vegetation and also predate on birds' eggs. For this reason, possums are a serious threat to forest values and the possum population should be permanently eliminated.

Given the landscape context, insufficient habitat is available to support numbers of other common animal pests such as deer, goats, and pigs, meaning management of these species is unnecessary. Other animals that management could focus on are rodents and mustelids, although the relatively small size of the bush will make effective control difficult (without a predator exclusion fence) due to reinvasion of the controlled area from the surrounding landscape.

Plant pests

Several serious plant pests have been recorded in Manderson's Bush. Known plant pest species include the following:

- Ivy (*Hedera helix*),
- Japanese honeysuckle (*Lonicera japonica*),
- Boxthorn (*Lycium ferocissimum*),
- Blackberry (*Rubus fruticosus*),
- Elder (*Sambucus nigra*), and
- Jerusalem cherry (*Solanum pseudocapsicum*).

A common source of plant pests to forests in urban areas is via garden escapes. These are species escaping from domestic gardens either in dumped garden waste or otherwise spreading by dispersing seeds from gardens via birds or wind. Many plant pests have originated from domestic gardens and this

source of plant pests is an aspect that will require ongoing management and monitoring within the Master Plan area.

Retirement, revegetation, and remnant expansion

A major opportunity for restoration of Manderson's Bush is retirement of a buffer around the currently fenced forest and restorative forest planting of this buffer as well as underplanting the grazed forest areas (Fig. 8 & 9). The recommended approach (Fig. 10) is to retire and plant an area 50 m from the existing forest edge (see the white area in Fig. 10; this distance is required to stabilise existing microclimate edge effects[6]). This would require 6.6 ha of native planting and would effectively triple the aerial extent of Manderson's Bush[7]. This action is important as it directly addresses the depleted status of this forest ecosystem.

Figure 8. Example of restoration planting into pasture around an existing forest remnant on alluvial surfaces like those of Kākātangiata (location Nelson).

Figure 9. Grazed forest on the south side of the fenced area of Manderson's Bush.

Planting should be of locally sourced native tree seedlings at the composition shown in Table 2, and at 1.5 × 1.5 m spacing (4,444 stems ha^{-1}). This planting composition provides 35% made up by four old-growth species (kahikatea, tōtara, titokī, & matai) which have light requirements suited to restoration plantings. The remaining 10 species are early- to mid-successional species which will grow rapidly to form a native forest cover. Species of greater shade tolerance, such as tawa and pukatea, will enter the native plantings naturally (from seeding

[6] Young, A., & Mitchell, N. (1994). Microclimate and vegetation edge effects in a fragmented podocarp-broadleaf forest in New Zealand. *Biological Conservation*, *67*(1), 63-72.

[7] The existing grazed and ungrazed forest = 3.36 ha. An additional 6.64 ha of native planting would bring restored Manderson's Bush to 10 ha.

trees in Manderson's Bush) over time once the overhead canopy has developed sufficiently.

Table 2. Recommended species composition for Manderson's Bush restoration planting.

Treeland/pasture planting	Code	Composition
Kahikatea	DACDAC	0.15
Lowland tōtara	PODTOT	0.1
Tītokī	ALEEXC	0.1
Whauwhaupaku	PSEARB	0.07
Kōhūhū	PITTEN	0.07
Karamu	COPROB	0.07
Kānuka	KUNROB	0.07
Mapou	MYRAUS	0.07
Māhoe	MELRAM	0.07
Rewarewa	KNIEXC	0.05
Lacebark	HOHPOP	0.05
Lacebark	HOHSEX	0.05
Ti kouka	CORAUS	0.05
Mātai	PRUTAX	0.03

Figure 10. Manderson's Bush with proposed native planted buffer/underplanting (white fill), existing grazed remnants (white outlines), fenced remnant (green outline), and existing fence (purple line).

2.2.4 Level / Methods of Protection Required

Restored Manderson's Bush should be legally protected for conservation purposes. Common mechanisms for legal protection are the Queen Elizabeth II National Trust[8], Nga Whenua Rāhui (for māori owned land)[9], or there are other protective mechanisms specifically available to Local Government agencies. Public access to the forest is important and access should be provided in a manner that protects the forest. Aspects requiring specific attention include aligning and designing walking tracks in a manner that avoids adverse effects to the forest (impacts to valuable vegetation, soil compaction, & altered hydrology), measures to encourage people to stay on tracks, adequate visitor facilities (e.g., rubbish bins), and educational resources to nurture an understanding and encourage appropriate use of the forest. A management plan would provide an ideal means of planning restoration and prescribing ongoing management and protection of the forest.

2.3 Ecological Corridors

New ecological features proposed in the Kākātangiata Masterplan have been designed and arranged so they relate to existing or historical features and maximise ecological functionality. Examples include the alignment of the three green belts (e.g., Fig. 11 A & B) which have been aligned northeast-southwest to coincide with former water courses and wetlands and provide green corridors through the proposed urban areas. Another main corridor would run roughly north-south from Manderson's Bush to the Mangaone Stream and would continue south to the Manawatū River. These corridors will provide avenues for people and wildlife to move around Kākātangiata interacting with nature. Palmerston North City Council has a green corridor plan[10] and the proposed corridors would make a valuable contribution to this plan at the city scale.

Critical elements of the ecological corridor proposals include their spatial spread and connectivity with existing and historical ecological features and their native species and ecosystem composition (see Appendix for the recommended species composition). Native vegetation within corridors would be >30 wide to ensure plantings are self-sustaining and resilient to light-demanding weed invasions (Young & Mitchell, 1994; Wildland Consultants 2000[11]). The arrangement of the corridors would boost ecological functionality by spanning the Kākātangiata Masterplan area across both main axes. One example of boosted functionality is increased native bird habitat at the landscape scale enabling expansion of bird populations among the residential areas with the Kākātangiata Masterplan area.

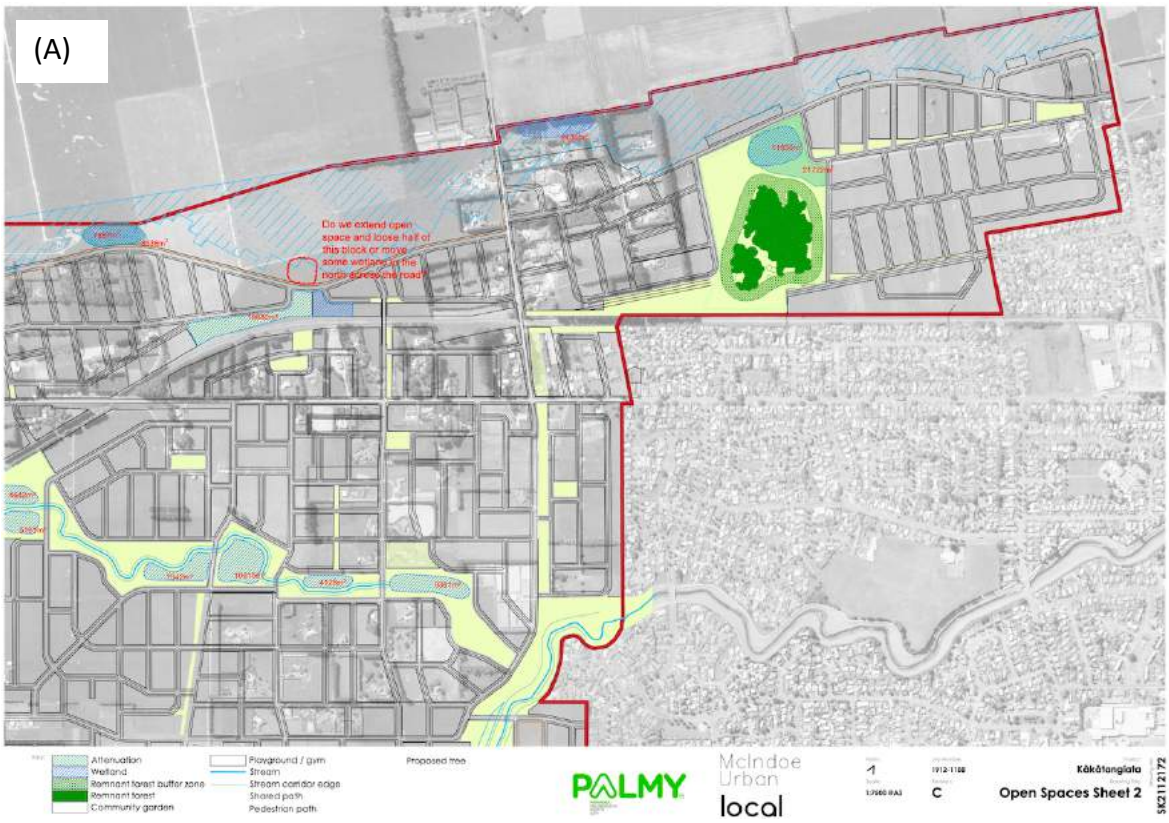
The freshwater and wetland component of the corridors is significant. Wetlands will assist with the treatment and control of stormwater runoff. Wetland creation and restoration is a valuable aspect of the proposal as wetlands provide significant biodiversity values and have been greatly reduced in

[8] See https://qeiinationaltrust.org.nz
[9] See https://www.doc.govt.nz/get-involved/funding/nga-whenua-rahui/
[10] See https://www.pncc.govt.nz/council-city/what-were-doing/ongoing-projects-and-programmes/green-corridors/
[11] See http://www.aucklandcity.govt.nz/council/documents/districtplanmanukau/changes/29NIWA.pdf

number and extent in the Horizons Region. Creation of wetlands and waterways add habitat and species diversity to the Masterplan. The existing farm drainage network will be replaced with specifically designed waterways within the corridors which aim to provide multifunctionality with respect to ecological, cultural, stormwater, landscape and recreational values.

In total, the proposed corridors would boost native cover in the Kākātangiata Masterplan area from <1% to >10%. This is a major achievement in terms of ecological restoration and provision of an adequate level of native habitat to support urban biodiversity (and is in accordance with direction provided in the draft National Policy Statement for Indigenous Biodiversity). The corridor proposed along the Mangaone Stream delivers multiple benefits as native riparian restoration will improve the existing degraded stream health and provide wider ecological benefits as part of corridor functionality. A project to naturalise the bed and banks of the Mangaone Stream should be a component of the Kākātangiata development.

Overall, the Kākātangiata Masterplan provides a holistic approach to ecological design within corridors. Corridors are designed to not only deliver ecological outcomes but also provide multifunctionality and integrate at a landscape scale into existing green corridors around Palmerston North city.



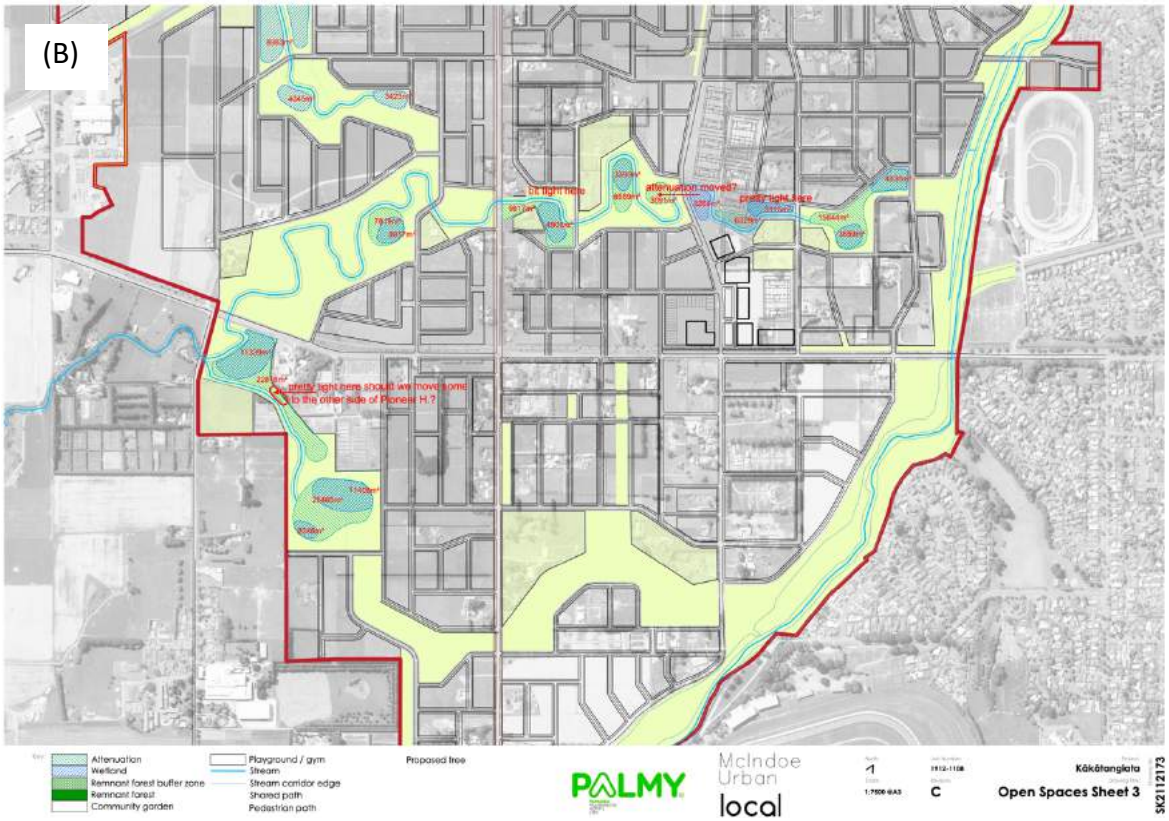


Figure 11 A & B. Examples from the draft Master Plan showing (A) remnant restoration and integration into green corridors and (B) incorporation of green corridors along former stream and wetland ecosystems spanning the proposed Master Plan area.

2.4 Residential and Open Space Planting

The Manawatu Plains were prior to human arrival cloaked in swamp forest and wetland vegetation. Today most of this vegetation and habitat has been eliminated. A key means of restoring biodiversity is through the restoration in indigenous cover. This is consistent with the direction given in the draft National Policy Statement for Biodiversity requiring urban areas to exceed 10% native vegetation cover. Work by Palmerston North City Council has determined that most urban trees in Palmerston North are located on the rear boundary of residential sections[12]. This indicates a main opportunity for habitat provision is by encouraging planting of native vegetation on residential sections in the masterplan area.

Parks and streets are two other important opportunities for the restoration of native vegetation. Emphasis should be placed on establishing species representative of the former

[12] See page 8 of this document:
https://www.pncc.govt.nz/files/assets/public/documents/council/plans/vegetation-framework-2016.pdf

vegetation cover (see the Appendix) as these species provide the resources and ecological function to support adapted biota.

2.5 District Plan Provisions to Achieve the Ecology Outcomes of the Master Plan

It is recommended that the following aspects be addressed in District Plan provisions and other methods to achieve the ecology outcomes envisaged by the Master Plan.

1. Requirement to implement the general layout and composition of corridors as currently drawn.
2. A minimum Master Plan-wide native vegetation cover extent of >10%.
3. The following restoration measures for Manderson's Bush:
    a. Retirement from grazing of all native forest areas at Manderson's Bush,
    b. Retirement from grazing and planting a minimum 50 m buffer around the existing edge of Manderson's Bush to enlarge the bush to a total of 10 ha,
    c. Native underplanting of the currently grazed forest stands,
    d. Plant pest control within the forest,
    e. Provision of public access to the bush in an ecologically sustainable manner, and
    f. Preparation of a restoration and management plan advancing the concepts detailed in this report and implementing points a-e above,
4. Minimum riparian planting width of 20 m on each bank of the Mangaone Stream where it occurs on the Master Plan area,
5. Stormwater wetland design which provides ecological habitats in addition to stormwater functions.

2.6 Demonstrating Delivery of Whanau Ora Outcomes

Whanau ora principles are reviewed considering the ecological recommendations of this report. The most relevant aspects are highlighted here:

- Tiaki Taiao – responsible stewards of their natural environment: naturalisation of the Mangaone Stream provides an opportunity for Rangitāne input and stewardship. Restoration of Manderson's Bush and the Mangaone stream can be conducted in conjunction with Rangitāne, and so that taonga will thrive.
- Hauoranga – leading healthy lifestyles: native revegetation presents opportunities for kai forests and the sustainable harvest of mahinga kai.

3.0 Conclusions

The Kākātangiata Master Plan presents significant opportunities to restore natural ecosystems for the benefit of nature and people. The overall level of native cover can be increased from <1% to >10% helping to boost urban biodiversity values. Manderson's Bush, a significant and threatened semi-swamp forest ecosystem can be enlarged, buffered, and connected to a wider green corridor network. Historical and remnant waterways and wetlands can be incorporated into a green corridor network within the site and connecting to the wider city green corridors. Stormwater management can be designed to provide wetland habitats. These opportunities can be planned and implemented in conjunction with Rangitāne with the guidance of whanau ora principles.

APPENDIX – PLANT SPECIES GENERALLY APPLICABLE TO PLANTING IN THE KĀKĀTANGIATA MASTERPLAN AREA

Common/Maori name	Code
Harakeke	PHOTEN
Hīnau	ELADEN
Horoeka	PSECRA
Kahikatea	DACDAC
Kānuka	KUNROB
Karamu	COPROB
Kawakawa	PIPEXC
Kōhūhū	PITTEN
Kōwhai	SOPMIC
Lacebark	HOHPOP
Lacebark	HOHSEX
Lowland tōtara	PODTOT
Māhoe	MELRAM
Mapou	MYRAUS
Mātai	PRUTAX
Miro	PECFER
Porokaiwhiri	HEDARB
Pukatea	LAUNOV
Purei	CARSEC
Rewarewa	KNIEXC
Rimu	DACCUP
Tawa	BEITAW
Ti kouka	CORAUS
Tītokī	ALEEXC
Toetoe	AUSFLU
Whauwhaupaku	PSEARB