

2 Topic: Indigenous terrestrial and aquatic ecosystems

2.1 What is included in this topic

The 'Ecosystems and Ecosystem Services' topic in the 2013 Monitoring Report is referred to as the 'Indigenous terrestrial and aquatic ecosystems' topic in this report. This change reflects the reference in section 7(2) (a) of the Act to indigenous terrestrial and aquatic ecosystems as heritage features. Figure 1 above shows the relationship and content of the topics in the 2013 Monitoring Report with the topics in the 2018 report.

This section reports on the state of indigenous terrestrial and aquatic ecosystems by assessing the health of key ecosystem features (such as vegetation, threatened species, protected areas, fauna and water quality) and the threats to them (such as kauri dieback, pest plants and animals and catchment activities).

A new section has been included in this topic on water quality in coastal lagoons (within the heritage area) and beaches adjacent to the heritage area.

2.2 Key findings

Relevant heritage features (section 7 of the Act): 2(a), (c), (d), (g)

Summary – state of terrestrial and aquatic ecosystems

- An additional 98 hectares of 'protected' land has been added (either as regional park land, local reserve, or as covenanted land); 87 hectares of this land is dominated by indigenous vegetation and 34 hectares contains ecologically significant indigenous habitat.
- The proportion of threatened animal and plant species with stable or increasing population sizes is likely to have increased between 2012 and 2017.
- Key roosting sites of the long-tailed bat within the heritage area have been identified.
- A diverse range of ecosystems have been identified (as Biodiversity Focus Areas) to ensure their long-term retention and to focus pest plant and animal control and restoration activities.
- Pest plants and animals are a major threat to the terrestrial and aquatic ecosystems of the heritage area. Ongoing pest plant and animal control is required at a level that, at a minimum, retains the biodiversity and ecosystem values of the heritage area.
- The council and the Waitākere Ranges Local Board continue to fund and undertake programmes aimed at retaining the ecosystems of the heritage area.
- Community groups and landowners continue to play an important and significant role in protecting and restoring the ecosystems of the heritage area through ongoing pest plant and animal control, restoration activities and programmes to manage kauri dieback disease.
- Kauri dieback disease presents the most significant threat to kauri forest ecosystem of

the heritage area; all kauri forest within the heritage area is now considered to be at very high risk of infection and there is currently no proven method to combat the disease or its spread.

- Mature (~1000 year old) kauri trees are the preferred roosting sites of the long-tailed bat, of which only small fragmented pockets remain, and these are threatened by kauri dieback disease.
- The water quality of many coastal lagoons and beaches adjoining the heritage area is degraded and not safe for swimming; failing septic tanks been identified as the main contributing source.

Progress made towards achieving the objectives:

- Additions to the extent of land protected in reserves are positive gains in achieving the ecosystem and recreational objectives of the Act.
- The council and community initiatives relating to weed and animal pest control and restoration activities continue to make a vital contribution towards achieving the objectives of the Act in maintaining the significant values of the ecosystems of the heritage area.
- Overall, aside from the significant threat presented to forest ecosystems across the heritage area by the spread of kauri dieback disease, monitoring results indicate that the biodiversity within the heritage area has been retained over the past five years.

2.3 What we measure changes against

Environmental indicators are used to:

- measure the state of the natural environment of the heritage area
- determine the threats and changes to the environment
- provide an overview of the environmental management activities undertaken by the local community and the council.

The indicators used in the 2013 Monitoring Report have been used as the baseline for measuring changes in terrestrial and aquatic ecosystems between 2012 and 2017.

Between 2012 and 2017 there have been changes in the data collected by the council namely:

- monitoring pest animals in the forest plot network across the region (including the heritage area) was stopped in 2015 due to funding constraints but is intended to be reinstated during the 2018 to 2023 period
- monitoring of residual possum catch undertaken as part of the biosecurity monitoring has been undertaken
- regular, plot-based forest monitoring by the council within Ark in the Park has been discontinued (as forest health indicators show the value of forest to be very high and relatively secure from most weed and pest threats) and as there is ongoing extensive

monitoring by community groups within Ark in the Park (the council is prioritising data collection for more threatened or less understood ecosystems)

- monitoring of the Te Henga / Bethells Beach wetland has increased
- monitoring of the dune systems at multiple locations along the west coast commenced in 2017
- monitoring of critically threatened coastal turf ecosystems commenced in 2016.

The council's environmental monitoring programmes⁶ are designed to detect relatively large-scale changes in environmental indicators over a longer time span than five yearly reporting (i.e. in the order of over a period of 20-30 years) to robustly establish numerical trends. Numerical data for a number of indicators was not available for this report. The summarised results and data status for each of the 52 indicators used in the 2013 Monitoring Report is contained in Appendix 5. Where no trend was recorded this is because more recent data was not available at the time of writing this report. Change was detected in seven out of the 27 indicators for which there was data. A summary of the results and trends are shown below in Table 1.

Table 1: Summary of changes measured from the indicators used in the 2013 Monitoring Report

Summary of changes measured from the indicators used in the 2013 Monitoring Report		
Number of Indicators (from the 52 indicators in the 2013 Monitoring Report. Refer to Appendix 5 for details on the indicators)	Indicator change 2012 - 2017	Summary of change/reason
25	No data available – (mainly relating to extent of vegetation/habitat loss)	High resolution aerial imagery and Lidar data has recently been obtained for the heritage area, but analysis of this information was not available at the time of preparing this report.
2	No trend data (2017	Data available 2017: proportion of threatened fauna and flora species under active conservation

⁶ Landers, Todd J, Bishop, Craig D, Holland, Kristi R, Lawrence, Grant R and Waipara, Nick W (2018). *Changes in indigenous ecosystems and the environment within the boundary of the Waitākere Ranges Heritage Area Act 2008: 2012-2017 report. Auckland Council technical report, TR2018/002*

	baseline)	management
18	No change	Quality and management of biodiversity has remained static (although indicators measure large-scale rather than small-scale change). Reflects large proportion of high biodiversity areas are within the Waitākere Ranges Regional Park.
4	Positive change	3 indicators relating to percentage increase in total area of ecosystems protected in reserves has increased 1 indicator shows an improvement in pest animal management
3	Negative change	1 indicator relating to weed management shows a downward trend 1 indicator relating to spatial extent of kauri dieback shows a downward trend 1 indicator relating to the ecological quality of lakes shows a downward trend

Further monitoring and data collection, since the 2013 Monitoring Report, has provided better information on the location and condition of threatened species and ecosystems and in identifying sites with high biodiversity values.

2.4 Terrestrial ecosystems

2.4.1 Vegetation changes between 2013 and 2018

The heritage area incorporates approximately 27,000 hectares of land collectively comprising around 21,200 hectares of native habitat. This is one of the largest blocks of continuous indigenous vegetation remaining in Auckland.

Four dominant ecosystems comprise more than 87 per cent of all the native ecosystems within the heritage area, namely;

- 45 per cent kauri-podocarp-broadleaf forest
- 17 per cent mānuka-kānuka scrub
- 13 per cent broadleaf scrub and forest
- 12 per cent kānuka scrub and forest.

Six native ecosystems that include more uncommon forest types, dune land and cliff ecosystems, comprise 1-3 per cent of the total area of native habitat. A mix of rare forest types and wetland ecosystems comprise less than 1 per cent of the total area.



Image on left: Kānuka-mānuka scrub. **Image on right:** Wetland (Whatipu Scientific Reserve).

The regional park (approximately 18,000 hectares) contains 75 per cent of the indigenous vegetation cover within the heritage area, with approximately 6,800 hectares of the park designated for water catchment purposes. The regional park incorporates the Whatipu Scientific Reserve (Gazetted in 2002 under the Reserves Act 1977). The reserve is owned by the Department of Conservation and is vested with the council for its management. Whatipu Scientific Reserve was gazetted for its range of nationally significant values that include:

- geological values from the unique associations of landforms e.g. rock platforms, caves, and sand plains
- ecological values associated with its range of habitats for nationally threatened plants and animals, including the connected wetlands forming the largest wetland system in the region
- ecological values of the sand plains that support native herbs that are unique in the Auckland Region and the only place known in the region for three plant species e.g. *Eleocharis neo-zelandica*⁷, *Schoenus nitens* and *Schoenus concinnus*.

⁷ *Eleocharis neozelandica* was found in 1999 on Great Barrier Island (AK 236524) but has since disappeared.



Whatipu Scientific Reserve.

The vegetation within the heritage area is particularly significant as it retains uninterrupted sequences of indigenous vegetation graduating from the coast (dunes, lagoons and wetlands) to the inland hills (mānuka, kānuka and broad-leaved scrub) up into the kauri and podocarp forest of the ranges. This diverse range of vegetation provides an extensive habitat for a wide range of indigenous plants, birds, reptiles, and insects.

The conclusion of the 2013 Monitoring Report⁸ was that the level of change in terrestrial vegetation was small. It is likely that this level of change has continued and that the biodiversity and environmental effects from vegetation changes between 2012 and 2017 are minimal.

Suggestions for the future: vegetation changes 2018 to 2023

The data used to assess the extent of change in vegetation cover for the 2013 Monitoring Report was based on the digital New Zealand Land-cover Database map of vegetation types derived from remote sensing satellite images. This map shows changes at a minimum scale of approximately one hectare and is suited for showing larger scale changes in vegetation cover, rather than detailed assessments of vegetation change.

High resolution aerial imagery and Lidar data has recently been obtained for the heritage area, but analysis of this information was not available at the time of preparing this report. A new building footprint and impermeable surface layer is also being developed. Once this data is available an interim technical report will be prepared and will be used for measuring vegetation changes between 2018 and 2023.

2.4.2 Ecosystem changes between 2013 and 2018 and Biodiversity Focus Areas

Out of 36 regional ecosystem types, 28 were found within the heritage area, collectively covering approximately 21,200 hectares.

⁸ Pg 37 Waitākere Ranges Heritage Area Monitoring Report Volume 2 June 2013

Fifteen of these ecosystems were assessed as either 'critically endangered' or 'endangered' (refer to Appendix 6). Collectively the endangered ecosystems comprise approximately 53 per cent of the total area of native ecosystems.

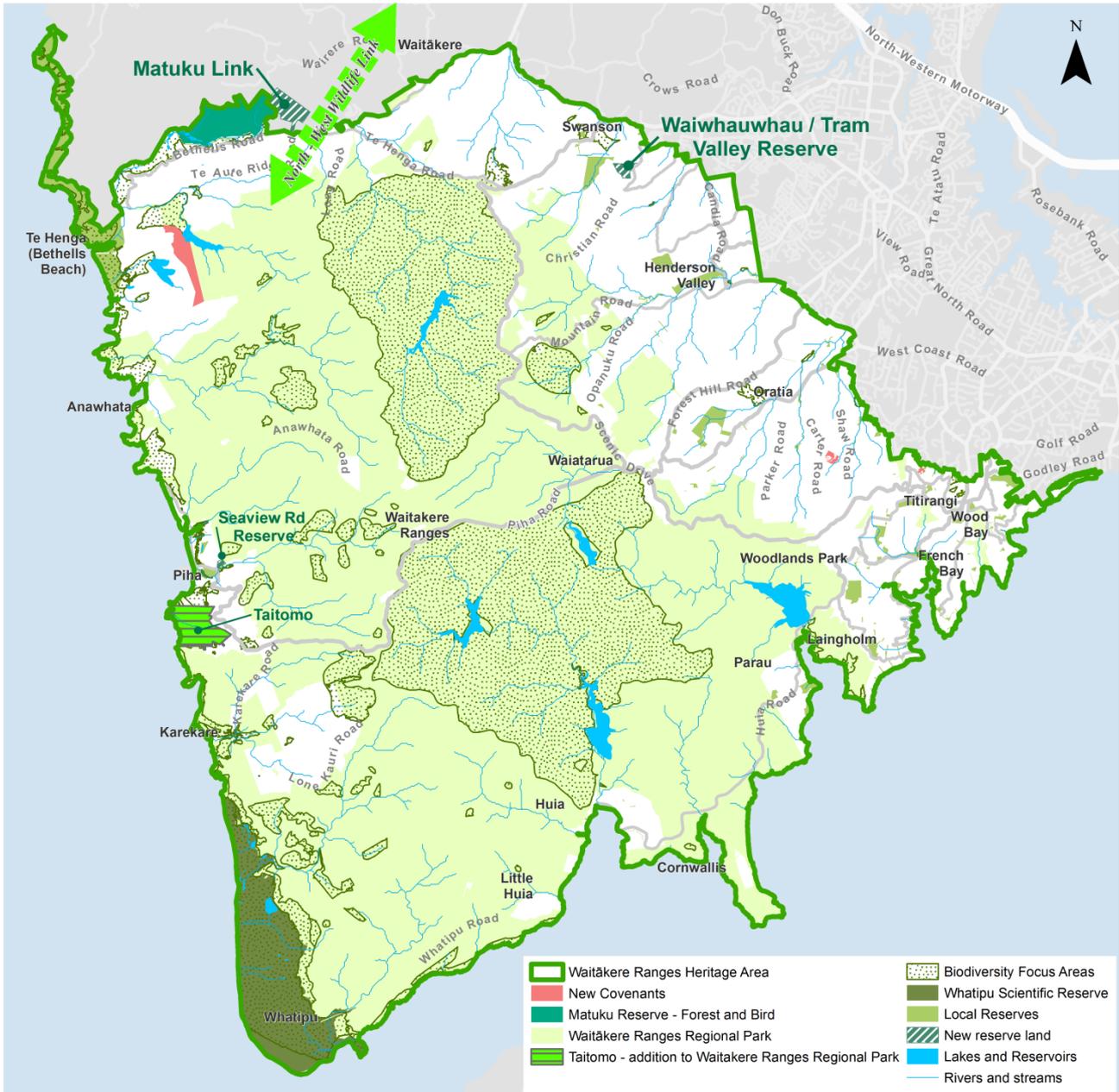
To ensure functioning examples of all of Auckland's original ecosystems in the region are retained over the next 50 years, areas of indigenous vegetation were identified using a methodology developed by the Department of Conservation (Zonation). Using zonation software, areas are ranked by comparison against each other based on their ecosystem type, condition, proximity to other natural areas and land tenure. The map produced through this process identifies priority areas for management known as 'Biodiversity Focus Areas'. Refer to Map 1: New reserves, covenants and Biodiversity Focus Areas.

The identification of Biodiversity Focus Areas will help:

- prioritise restoration work on council-managed land
- support and inform conservation efforts by the council, community groups and landowners to maximise biodiversity benefits
- develop shared conservation priorities with other agencies like Department of Conservation.

Two-thirds of Biodiversity Focus Areas in the heritage area are on public land (regional and local parks plus conservation estate) with the remaining one third occurring on private land. An engagement and funding programme is currently being developed for Biodiversity Focus Areas on private land. The restoration activities undertaken within the Biodiversity Focus Areas identified in the heritage area will be reported in the State of the Waitākere Ranges Heritage Area 2023 report.

Map 1: New reserves, covenants and Biodiversity Focus Areas



2.4.3 Protected area changes between 2013 and 2018

Changes in the extent of protected areas was determined by comparing the 2017 GIS records with the 2012 records of all reserves, parks and covenants within the heritage area. This analysis shows a significant increase in protected areas, namely;

- 78 hectares of land between Karekare and Piha in 2014, known as ‘the Gap’ which now forms part of the regional park (known as Taitomo)
- 10 hectares in Swanson, now the Waiwhauhau / Tram Valley Reserve

- 2 hectares of wetland at 42 Seaview Road, Piha; adjoining the regional park and neighbouring Piha Domain (previously Ministry of Education land).



Looking north towards Taitomo Island and the Gap (with herb field).

Approximately 87 hectares of these new protected areas is dominated by indigenous vegetation. Thirty-four hectares contains indigenous habitat of special significance due to its restricted distribution and threatened status.

The Matuku Reserve Trust purchased 37 hectares of land known as Matuku Link. This links kauri forest, a river valley, wetlands and the sea and connects the predator controlled Matuku Reserve to Ark in the Park, the buffer-zone area, the Forest Ridge Project, Habitat Te Henga and the regional park (refer to Map 1: New reserves, covenants and Biodiversity Focus Areas). This reserve also supports the connection to the North West Wildlink ecological corridor from west Auckland to the Hauraki Gulf.

Twenty-two hectares at the Waitākere quarry site (off Te Henga Road) is no longer used for quarry operations and some restoration planting has been undertaken.

2.4.4 Bird (avifauna) changes between 2013 and 2018

Ten-minute bird counts (based on standard five-minute bird counts) in forest and scrub habitat locations throughout the heritage area are used to measure the representation of birds and as an indicator of ecosystem health. The bird counts taken between 2012 and 2017 showed no significant changes in bird populations. A good ratio of native versus introduced birds was recorded (on average 4.8 native to 2.7 introduced birds) with very similar numbers of endemic, native and introduced birds counted as those in the 2012 survey.

2.4.5 Seabirds

The council is in the process of developing a regional seabird programme which will include identifying and monitoring some key seabird areas in the heritage area. Recent survey work was undertaken from northern Te Henga / Bethells beach to Muriwai. The information from this programme will be reported in the State of the Waitākere Ranges Heritage Area 2023 report.

Some of the only known grey-faced petrel breeding colonies are located north of the heritage area up to Muriwai, and at Te Henga / Bethells beach, Piha, Karekare, Whatipu and Cornwallis. Community restoration groups are undertaking pest management at many of these nesting areas including at Te Henga / Bethells beach, Piha and Cornwallis.



Grey-faced petrel chick and adult. (Source: James Russell)

2.4.6 Threatened, at-risk and vulnerable species change between 2013 and 2018

Threatened species are plant and animal species whose population has declined to the extent that without some form of intervention or conservation management there is a risk of their becoming extinct at a local, regional or national scale.

There are approximately 231 'threatened' or 'at-risk' species within the heritage area. Overall, at least 57 per cent of the known 'threatened' or 'at risk' fauna species are under some active conservation management through the council's and Department of Conservation's biodiversity operations programmes. The species under active conservation management are summarised below in Table 2: Number of threatened or at risk species under conservation management in 2017, and listed in Appendix 8.

Table 2: Number of threatened or at risk species under conservation management in 2017

Threatened or at risk species in the heritage area 2017	Number and % of species under active conservation management in 2017
176 plant species	12 plant species (7%) Including <i>Lepinella rotundata</i> (thought extinct but discovered in early 2000s and with more areas discovered in the last 5 years)
29 bird species	18 bird species (62%)
8 freshwater fish species	3 freshwater fish species (38%)
5 reptile species	4 reptile species (80%)
1 frog species	Hochstetter's frog (100%)
1 bat species	Long-tailed bat (100%)

There are two areas where threatened species have been successfully reintroduced since 2013 namely:

- Matuku Reserve (and Matuku Link) where 100 pāteke (brown teal) were introduced over the 2014 to 2016 summers
- Ark in the Park where 47 kokako have been introduced between 2009 and 2016, and 653 whitehead were introduced between 2004 and 2016.⁹

In 2014 to 2015 approximately 100 North Island robin were observed in Ark in the Park and Kakariki (New Zealand parakeet) are planned to be released in Ark in the Park in the future. Monitoring of (usually) five or six banded dotterel nests at Whatipu has been undertaken by Friends of Whatipu since 2003, along with pest control. Whatipu supports a number of rare birds.

Monitoring of dotterels at Te Henga / Bethells beach has also undertaken for a number of years, along with pest control. To protect the birds during filming the Waitākere Ranges Local Board has developed a Dotterel Management Framework for Te Henga / Bethells beach.

Population monitoring of the Hochstetter's frog undertaken at Ark in the Park and the Huia catchment in 2016 indicated that the populations studied were stable¹⁰.

⁹ Auckland Council technical report TR2018/002 / *Changes in indigenous ecosystems and the environment within the boundary of the Waitākere Ranges Heritage Area Act 2008: 2012-2017.*

¹⁰ Longson, C. 2016. *Field season report from Waitakere Ranges, for Auckland Council and Ark in the Park.* EcoQuest Education Foundation

Long-tailed bat – nationally vulnerable species

There are two living endemic bat species in New Zealand, the short-tailed and long-tailed bat, which are New Zealand's only native land mammals. The short-tailed bat (*Mystacina tuberculata*) is the more endangered of the two species. The long-tailed bat (*Chalinolobus tuberculatus*) is the more common of New Zealand's bats, but is still classed as nationally vulnerable. The long-tailed bat was found within the heritage area in 2012 during a bat survey near Swanson Reserve and has since been the subject of a number of surveys and studies¹¹.



Image on left: Long-tailed bat. **Image on right:** Automatic bat monitor (Source: Georgia Cummings)

The long-tailed bat:

- is small (weighing between 8-11grams)
- is vulnerable to predation from possums, rats, ferrets, stoats, weasels, and feral cats
- feeds on moths, midges and other flying insects at dawn and dusk
- focuses much of its foraging activity along streams, where any large trees growing along riparian margins may be used for roosting
- uses an echolocation call at a very high frequency for both social interactions and foraging for food (which cannot be heard by the human ear)
- commonly roosts high in tree cavities, epiphytes or loose-bark of large native trees and prefers mature (~1000 year old) kauri trees
- on average 10 bats occupy a roost and move between different roosts on a nightly basis
- can fly at 60km/hr over a very large range.

¹¹ Boffa Miskell Ltd / Auckland Long-tailed Bat Monitoring 2017 / Bat Roost Assessment in Waitākere Ranges Regional Park / 19 June 2017

Surveys found that the heritage area (and surrounds) contains one of the larger long-tailed bat populations recorded in the region and the heritage area is recommended as a priority area for protection.



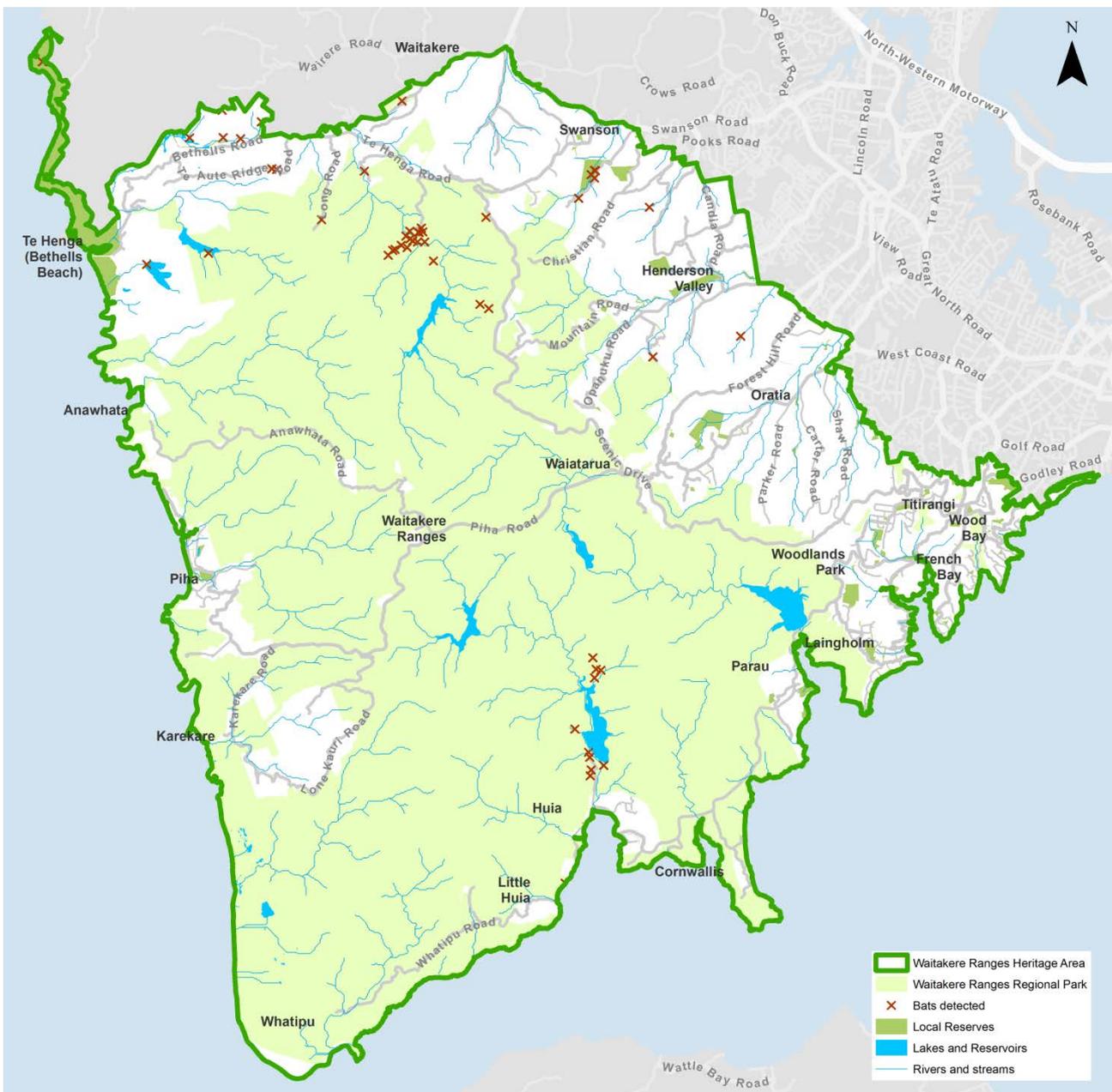
Mature kauri tree where long-tailed bats roost. (Source: Boffa Miskell Ltd)

Over the last five years acoustic survey monitoring, and more recently infrared cameras, have been used to identify the long-tailed bat's roosting habitat to identify where future research and conservation activities should be focused. The research has established that the preferred roosting habitat for the long-tailed bat is mature (not re-generating) kauri forest.

Two sites in the heritage area that have the largest remaining stands of mature kauri have been identified as the key roosting sites for long-tailed bats, and are the focus of ongoing monitoring, namely:

- two areas at Cascade Kauri Park (and an area immediately west of Cascade Kauri park)
- one area north of the Lower Huia reservoir (refer to Map 2: Location of the long-tailed bat roosting sites in the heritage area).

Map 2: Location of the long-tailed bat roosting sites in the heritage area



The risk of kauri dieback affecting these key roosting areas could have implications for population viability of the long-tailed bat within the heritage area. There is presently little understanding of how the advancement of kauri dieback disease will affect the long-tailed bat populations.

Suggestions for the future – long-tailed bats

Ongoing monitoring of the resident long-tailed bat population should be continued to understand their use of the heritage area and to focus conservation efforts to minimise threats to the bat population. The results of research on the long-tailed bat population in the heritage area will be reported on in the State of the Waitākere Ranges Heritage Area 2023 report.

Funding – long-tailed bats 2018 to 2023

Local board funding of \$5000 to continue monitoring the long-tailed bat population in the heritage area has been approved for the 2017-2018 financial year.

Funding should be continued until a complete understanding of the long-tailed bat's use of the heritage area is known and how to best manage threats to the population is determined.

Funding related to managing kauri dieback needs to incorporate protection of the mature kauri forest known to be important for long-tailed bat roosts in the heritage area. In 2017-2018 the council will be:

- re-developing the project scope to focus on advocacy, and community awareness events for summer 2018. This will involve partnering with a community organisation to better engage with the community and target specific audiences about bat conservation
- investigating multi-partner funded research on long-tailed bats in west Auckland through radio tracking to better identify roosting habitats and bat range across peri-urban landscapes each night.

At its meeting on 5 December 2017 the council's Environment and Community Committee approved a grant allocation (from the Regional Environment and Natural Heritage grant programme) of \$53,340 over two years to the Community Waitākere Charitable Trust for long-tailed bat radio tracking in the Waitākere Ranges. The bat radio tracking project aims to help in further understanding the habitats that long-tailed bats are using to feed, move around the landscape and to sleep. The information collected will be used to understand how the local bat population may respond to changes in their environment, including from kauri dieback and urban expansion.

The bat radio tracking project has been granted a warrant from Te Kawerau ā Maki that allows access for research within the rāhui area subject to following strict protocols and procedures around spreading kauri dieback disease.

Future funding may need to be applied to intensive pest control to protect roosts. However, further research is currently required to continue growing knowledge about this species.

2.4.7 Pest plant changes between 2013 and 2018

Pest plants can smother, compete and result in the death of indigenous vegetation with the consequent loss of the ecosystems they support. Over 180 of the 272 declared pest plants in the Auckland Regional Pest Management Strategy¹² are established in the heritage area and are a threat to the areas nationally significant ecosystem values. The threat from invasive pest plant species is ongoing and likely to increase.



Climbing asparagus is a pest plant. (Source: Sirin Brown)

Eradication of all pest plants is not practical or affordable and a strategic targeted pest plant management approach is taken by council based on priorities set annually. A number of pest plant management projects are carried out throughout the heritage area each year based on this strategic approach.

In response to the National Policy Direction of Pest Management 2015 the council is currently developing a new Regional Pest Management Plan to replace the Auckland

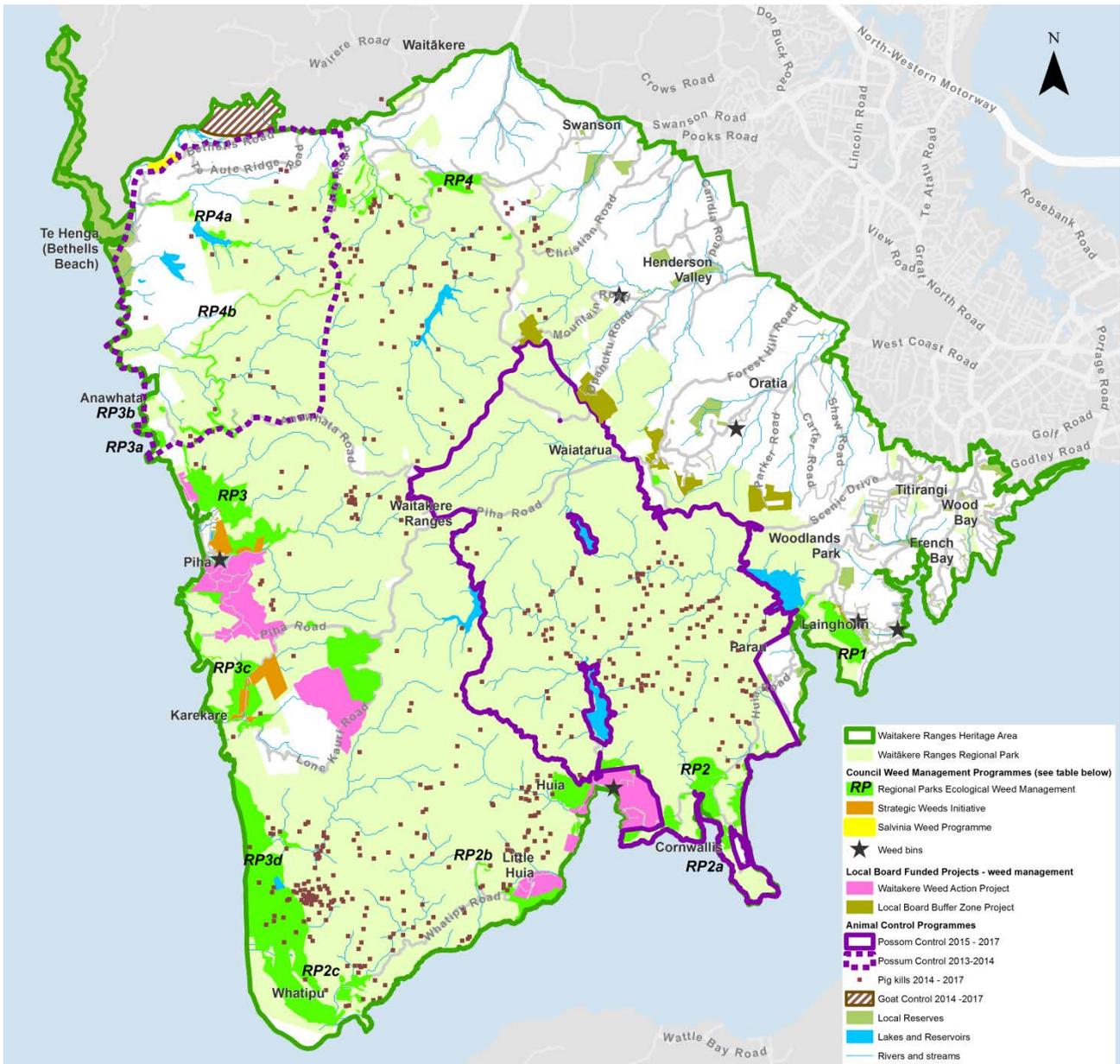
¹² Auckland Regional Pest Management Strategy 2007-2012

Regional Pest Management Strategy 2007-2012. The Auckland Regional Pest Management Plan (presently in development) may include a more site-led approach to pest plants in the heritage area. However, the plan is at an early stage of the process and there may be substantial changes made before an operative plan is adopted. The outcomes also partly depend on the budget decisions made through the Long-term Plan process.

The Waitākere Ranges Local Board commissioned the Waitākere Ranges Strategic Weed Management Plan (June 2015) to specifically address issues of pest plant management in the heritage area. A number of pest plant and animal programmes are undertaken by the council's Biosecurity team and community groups in the heritage area each year. The Waitākere Ranges Local Board funds a programme to control climbing asparagus at Piha, Huia and Karekare (refer to section 6.3.4 Strategic weed projects). Map 3 below shows the location of council's pest plant and animal control programmes between 2013 to 2018 and Table 3 describes the programmes identified.

Map 16 in Section 6: People and communities topic shows the location of the pest plant and animal control programmes that have been undertaken by local communities between 2013 to 2018 and Table 26 describes the programmes identified.

Map 3: Location of council pest plant and animal control programmes 2013-2018



See Table 3 below for explanation of the pest plant programmes identified in this map.

Table 3: Explanation of council pest plant and animal control programmes shown in Map 3 above

Auckland Council / Waitākere Local Board / Ministry for Primary Industries		
Pest plant (weed) programmes 2013 to 2018		
Map 3 legend reference	Pest plant (weed) management programme 2013-2018	Focus of activity
Yellow shading	Salvinia weed programme	Ministry for Primary Industries; removal and surveillance of Salvinia aquatic weed (one of the 100 of the World's Worst)

Auckland Council / Waitākere Local Board / Ministry for Primary Industries Pest plant (weed) programmes 2013 to 2018		
Map 3 legend reference	Pest plant (weed) management programme 2013-2018	Focus of activity
		Invasive Alien Species) at Te Henga / Bethells Beach wetland
Dark green shading	Regional parks ecological weed management	Tactical weed control in key habitats and/or for key weed species
Orange shading	Strategic weeds initiative	Control pest plants on key areas of private land adjoining regional parkland to protect from external weed threats – including areas at Karekare and Huia
Pink shading	Waitākere Ranges Local Board funded project: Waitākere Weed Action project	Working with local community – current focus climbing asparagus at Huia, Piha and Karekare
Olive-green shading	Waitākere Ranges Local Board funded project: Buffer zone project	A local board funded project to manage weeds in response to local area plans where land is close (within 500m) of the boundary of the regional park
Star (symbol) ★	Waitākere Ranges Local Board funded project: Weed bin programme	A local board funded project to provide bins for the local community to dispose of pest plants
RP1	Laingholm area	Focus on climbing asparagus, wild ginger and monkey apple
RP2	Huia area	Focus on climbing asparagus, wild ginger, moth plant and tradescantia
RP2a	Cornwallis fire site	Focus on plants that are competing with native regeneration at the site
RP2b	Mt Donald McLean	Focus on exotic plants interfering with the threatened native plant <i>Hebe bishopiana</i> habitat
RP2c	Whatipu	Focus on moth plant, pampas, Formosan lily, saltwater paspalum, agapanthus and

Auckland Council / Waitākere Local Board / Ministry for Primary Industries		
Pest plant (weed) programmes 2013 to 2018		
Map 3 legend reference	Pest plant (weed) management programme 2013-2018	Focus of activity
		periwinkle
RP3	Piha area	Focus on climbing asparagus, wild ginger, agapanthus, and tradescantia
RP3a	Whites Beach	Focus on climbing asparagus, pampas, Japanese honeysuckle and Montpellier broom
RP3b	Anawhata	Focus on agapanthus, pampas, moth plant, aristeia and African pigs ears
RP3c	Karekare	Focus on climbing asparagus, blue morning glory, mile-a-minute and wild ginger
RP3d	Pararaha	Focus on pampas, marram grass, periwinkle, aristeia and tradescantia
RP4	Cascades area	Focus on moth plant, giant reed, tradescantia, wild ginger, willow species and Japanese honeysuckle
RP4a	Lake Wainamu	Focus on moth plant, pampas, climbing asparagus and climbing dock
RP4b	Tracks	Focus on aristeia

Auckland Transport, in line with recommendations from council's biosecurity team, is currently carrying out a pest plant removal programme in the Waitākere area (including the heritage area). Auckland Transport has made progress in targeting some of the following species:

- moth plant
- woolly nightshade
- Chinese privet (species up to 1.5m in height)
- tree privet (species up to 1.5m in height)
- gorse
- wild ginger.

To date Auckland Transport has not yet produced a management plan which is a requirement under section 18.2 Management Regime of the Regional Pest Management Strategy 2007-2012.

A number of community groups undertake pest plant and animal control and restoration projects and jointly make a significant contribution to protecting and restoring forest habitat and indigenous species within the heritage area. Refer to Map 16 and Table 26 in Section 6: People and communities topic. The council provides financial, administration and practical assistance to these groups.

Progress is being made towards controlling pest plants at a number of intensively managed sites. However, current resourcing is insufficient to achieve comprehensive pest plant control across the heritage area, and this is especially evident in edge habitat such as transport corridors. While monitoring is undertaken at control sites, there is no systematic outcome monitoring framework in place to track changes in pest plant distribution, density and impacts across the heritage area as a whole. Implementing a more comprehensive monitoring framework would support better tracking of overall progress towards the heritage area objectives.

The pest plant plots currently monitored by council are almost all within the regional park. These plots, mostly within dense tracts of native forest, are less susceptible to pest plant establishment or to 'invasion' from pest plants spreading from more open edge areas adjoining the park, or from road corridors. In the long-term highly infected edge sites are likely to lead to more extensive pest plant invasion of core forest habitats. This risk is further exacerbated with the likelihood of increased disturbance events due to climate change and increased canopy openness due to kauri dieback disease.

Additional monitoring sites are required to measure pest plant spread in the park edge 'buffer areas', along road corridors and from road corridors into the native forest.

2.4.8 Pest animal changes between 2013 and 2018

Pest animals are a major threat to the biodiversity of the heritage area. Predators such as rodents (rats), mustelids (stoats and weasels), possums and cats are the greatest threat to native bird, reptile and invertebrate populations in the heritage area.

There are presently no feral deer or goats within the regional park. Retaining this status requires ongoing monitoring by the council's biosecurity team and the Department of Conservation. Contractors continue to cull deer and goats where they are observed and if there is a risk of their entering the regional park (refer to Map 3 above).

Feral pigs are present in a number of areas in the regional park and are subject to an annual programme of contracted hunting and monitoring of kills. Pigs pose a threat to indigenous insects, plants and other organisms and are likely to play a significant role in the spread of kauri dieback disease (refer to Map 3 above).

A number of community groups are actively involved in extensive pest control programmes (refer to Map 16 in Section 6: People and communities topic).

Many pest animals are difficult to eradicate or control and a sustained pest control approach, which aims to keep key pests at levels which allow for the recovery of the ecosystems and indigenous species, is taken.



Image on left: animal pest control sign. Image in middle: rat. Image on right: possum.

Possoms are one of the most devastating pest animals in the heritage area and are the target of the largest pest animal management programmes. Residual Trap Catch (RTC) levels are a useful indicator for monitoring animal pest management in the heritage area. Less comprehensive possum trend monitoring has been carried out in the heritage area over the last five years as the funds available have been used on actual possum control.

Under the Long-term Plan, during this monitoring period, the Residual Trap Catch (RTC) levels for possums across Auckland were set at a 5 per cent or less threshold. To ensure this threshold is met contracts for possum control issued over this monitoring period (and since 2001) have required that a RTC of 3 per cent or less be met.

Efforts have been focused on targeting possum control to larger blocks of land to bring RTC levels back down below the key 3 per cent goal. The latest (partial) survey in 2016-17 of 75 pest lines showed the desired RTC value of 2 per cent.

Possum control areas between 2012 and 2017 are shown on Map 3 above. Table 4 below shows the changes in the RTC of possums within the regional park between 2012 and 2017.

Table 4: Changes in residual trap catch (RTC) of possums within the regional park between 2012 and 2017

Year	RTC value	Description	RCT change from previous year
2012-13	6.6%		
2013-14	5.4%		-1.2%
2014-15	(4.7%)	Partial survey (85 of 150 pest lines)	
2015-16		No monitoring	
2016-17	(2%)	Partial survey (~75 of 150 lines)	

Suggestions for the future – pest plants and animals

Ongoing council support for the pest management work undertaken by local communities and land owners in the heritage area is needed to help retain biodiversity of the heritage area. Council is also seeking increased budget through the Long-term Plan process to enable more comprehensive pest plant and animal programmes to be undertaken in the future. Ongoing pest plant and animal control is required at a level that, at a minimum, retains the biodiversity and ecosystem values of the heritage area.

Additional monitoring sites in the eastern foothills and road corridors are needed to enable robust and accurate reporting on pest plant spread and the effectiveness of control programmes undertaken in these areas.

Residual trap catch monitoring will continue to be used to monitor possum densities. Effort will continue to focus on retaining the less than 3 per cent residual trap catch levels.

Funding – pest plants and animals 2018 to 2023

The management and funding for pest plant and animal control is a matter of key interest to local communities and landowners within the heritage area. Initiatives by the local board, such as buffer zone weed programmes and community weed bins are well-subscribed.

This report highlights the need to fund monitoring at a level sufficient to assess overall trends in ecosystem health across a range of ecosystems and land tenure types. This includes monitoring of transport corridors in other edge habitats in addition to the forest.

Through the Long-term Plan 2018-2028 process council is consulting with the public on whether additional money should be allocated to protection of the natural environment

through a targeted rate. One the targeted rate options (Option A) would provide for a substantial additional investment in kauri dieback management, but would see little if any additional funding for pest plant or animal management within the heritage area.

The other targeted rate option (Option B) would see a substantial increase in funding allocated to pest plant and animal control in addition to enhanced kauri dieback management. This option would provide for most of the programmes proposed Regional Pest Management Plan in its current form. Neither of the options present in the Long-term Plan (2018-2028) would provide for the full implementation of the Regional Pest Management Plan in its current form.

Public consultation on the proposed Regional Pest Management Plan, as well as budget decisions arising from the Long-term Plan process, will combine to inform the final plan. The approved Regional Pest Management Plan and the amount of funding allocated through the Long-term Plan will have a significant influence on meeting the heritage area objectives over the next 10 years and will be of key interest to the local board and communities within the heritage area.

2.4.9 Biosecurity changes 2013 to 2018 - kauri dieback disease

Kauri dieback disease is caused by a soil and water borne microscopic fungus-like plant pathogen (now formally named *Phytophthora agathidicida*(PTA)) that was discovered in 2008. Infection by PTA results in the eventual death of kauri trees of all ages. At present there is no known way to combat the pathogen and no proven treatment for infected trees. The disease can be spread with just a pinhead of soil and the highest risk of spreading the disease is from soil disturbance associated with human activity. Contaminated soil from vehicles and animals, such as feral pigs, can also spread the disease.

In late 2008 MAF Biosecurity New Zealand declared PTA an 'Unwanted Organism' under the Biosecurity Act 1993 and its movement is restricted under this legislation. In response a multi-agency long term management programme involving Tangata Whenua, Department of Conservation, Northland, Waikato and Bay of Plenty Regional Councils, Ministry for Primary Industries and Auckland Council has been underway since late 2008.

Kauri is a key 'ecosystem driver' in that it has a significant influence on soil chemistry and local plant diversity. As most of the indigenous vegetation in the heritage area is primarily kauri or mixed kauri forest, kauri dieback disease presents a major threat to the kauri forest ecosystem of the heritage area; far greater than 'traditional' threats such as possums, and invasive weeds.

A surveillance programme was initiated in 2008 to determine the distribution of kauri dieback disease across Auckland, with a particular focus on the regional park. In 2009, a targeted ground survey identified five significant disease zones along the regional park track network. This was followed by an aerial survey in 2010 to assess the extent of kauri dieback off-track. The aerial survey identified numerous unhealthy trees and groups of

trees that had not previously been recorded by ground surveying. It also increased the known extent of unhealthy trees at several locations where kauri dieback had previously been identified. All unhealthy trees identified in the aerial survey were inspected.



Image on left: thinning canopy of a kauri tree affected by kauri dieback disease. **Image on right:** Dead kauri tree.

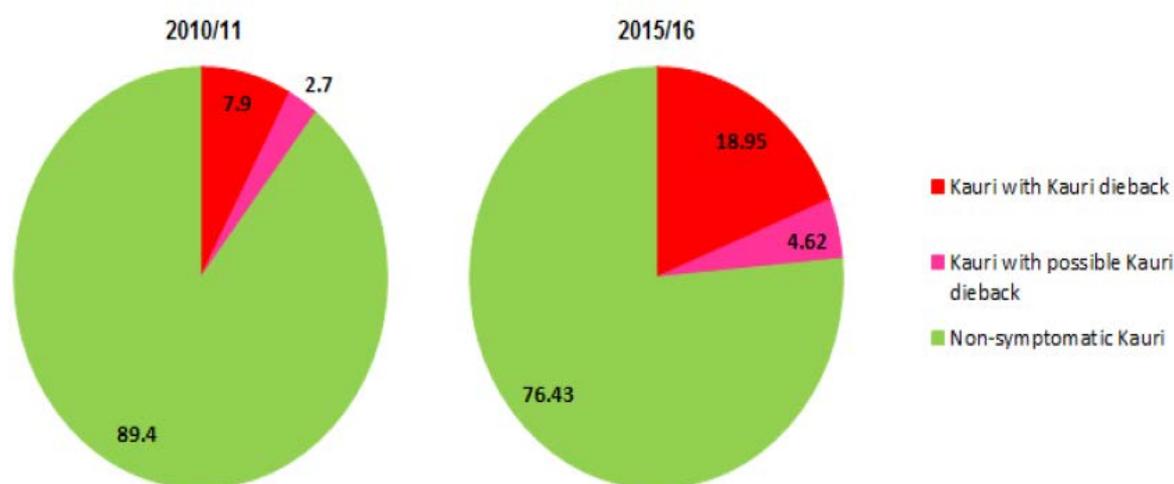
The council monitors the health of kauri trees in all of its regional parks every five years and the aerial and ground survey monitoring undertaken in 2009 and 2010 was repeated in 2016 and included:

- a survey of kauri health within 10 metres of the track network of the regional park
- an evaluation of current phytosanitary measures (cleaning stations)
- an evaluation of track conditions
- an aerial evaluation of the canopy health of kauri (summer of 2015-2016)
- a ground-truthing programme to assess symptoms (22,477 kauri trees were surveyed for symptoms of kauri dieback disease)
- collection of diagnostic samples where necessary (230 soil samples were taken for laboratory based diagnostics).

The investigation and findings were reported in 'Kauri Dieback Report 2017'¹³. The conclusions from this report are included in the discussion below.

The 2013 Monitoring Report estimated that eight per cent of areas of dense kauri forest were infected by kauri dieback and an additional 3 per cent showed signs of infection and were concluded as likely to be infected¹⁴. Following monitoring in 2016 it was calculated that 18.95 per cent of areas of dense kauri forest were infected with kauri dieback, and that a further 4.62 per cent showed signs of infection and were likely to be infected (refer to Figure 2 below).

Figure 2: Percentage of kauri areas affected by kauri dieback in the regional park between 2010/2011 and 2015/16



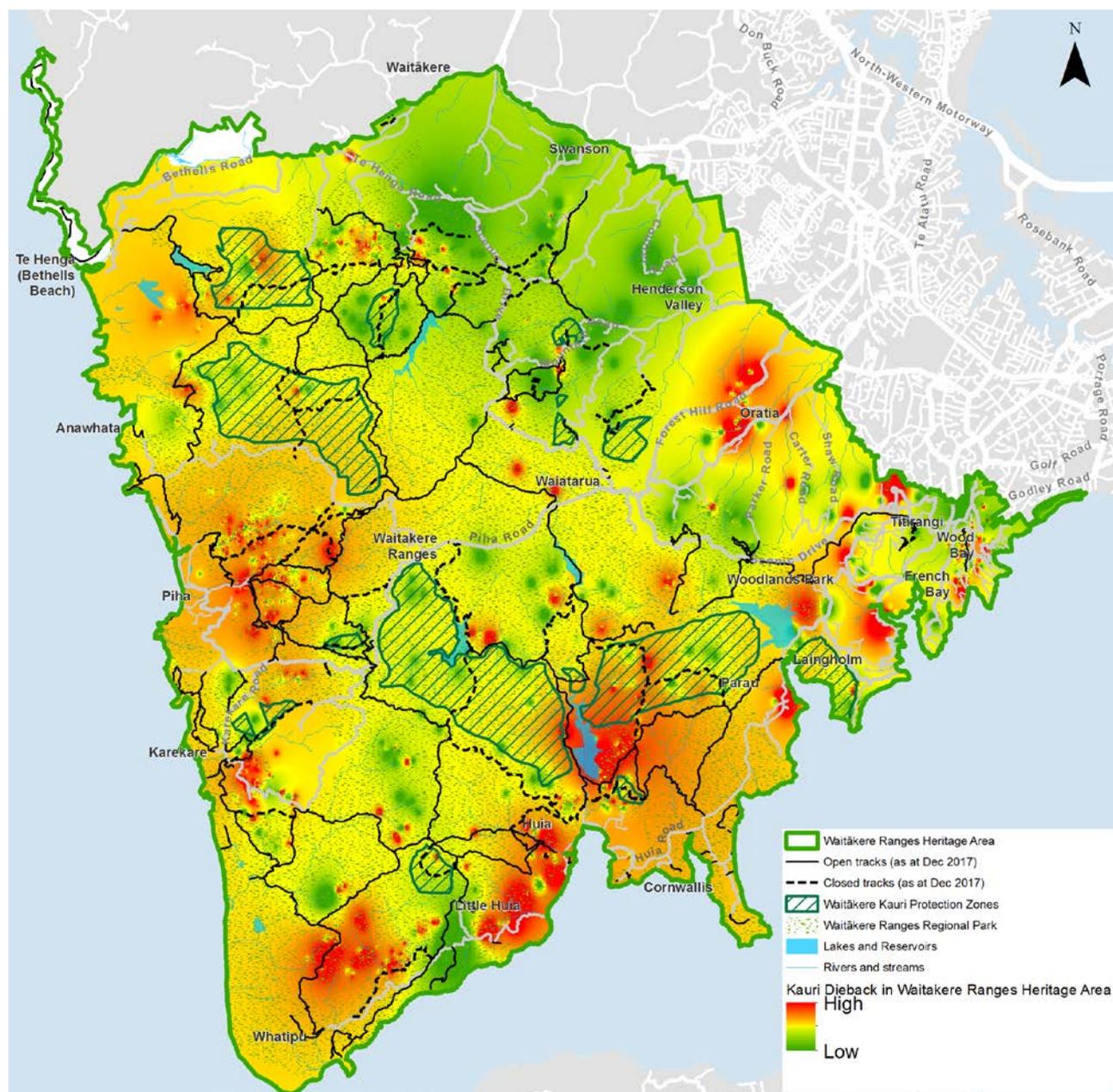
Kauri is a keystone species and the size of kauri forest areas is important to the integrity of a kauri ecosystem. Areas of kauri forest above five hectares in size have been defined as having key ecological values. Out of the 91 distinct areas of kauri forest above five hectares in size within the regional park, 58.3 per cent were observed to be exhibiting symptoms of kauri dieback infection.

Monitoring, including passive surveillance (public reports), shows some of the highest levels of kauri dieback infection on private land in the Auckland region are in areas surrounding the regional park, particularly privately-owned trees and stands of trees in the residential areas of Titirangi, Huia and Laingholm (refer to Map 4 above). As of October 2017, there were 414 private properties affected by kauri dieback disease. This equates to an area of 1039.59 hectares of private land being affected by kauri dieback disease within the heritage area. Map 4 below identifies the locations within the heritage area affected by kauri dieback disease in 2017.

¹³ Auckland Council / Kauri Dieback Report 2017: An investigation into the distribution of kauri dieback, and implications for its future management, within the Waitakere Ranges Regional Park / Version 2: Update June 2017

¹⁴ 2013 Monitoring Report pg 41

Map 4: Locations within the heritage area affected by kauri dieback disease in 2017



Analysis of the likely causes of the spread of kauri dieback disease concluded that:

- 71 per cent of kauri dieback zones and 56 per cent of possible kauri dieback zones were within 50 metres of a track
- 59 per cent of kauri dieback zones and 47 per cent of possible kauri dieback zones were within 50 metres of a waterway
- 48 per cent of kauri dieback zones and 28 per cent of possible kauri dieback zones are within 50 metres of a bait-line (however analysis of bait-lines was limited and incomplete).

The highest risk of spreading kauri dieback disease into new locations is considered to be from soil disturbance associated with human activity.

There is presently no known treatment to halt the spread of the disease or to treat infected trees. Phosphite injections have been trialled on trees in the regional park and by property owners within the heritage area. While there have been some positive signs, there are still some unknowns and limitations to the use of phosphite. Phosphite manages symptoms, but is not a cure and cannot eradicate the disease from an infected tree. Further research is also required to understand the application and effectiveness of this treatment across different size classes of trees over the long-term.

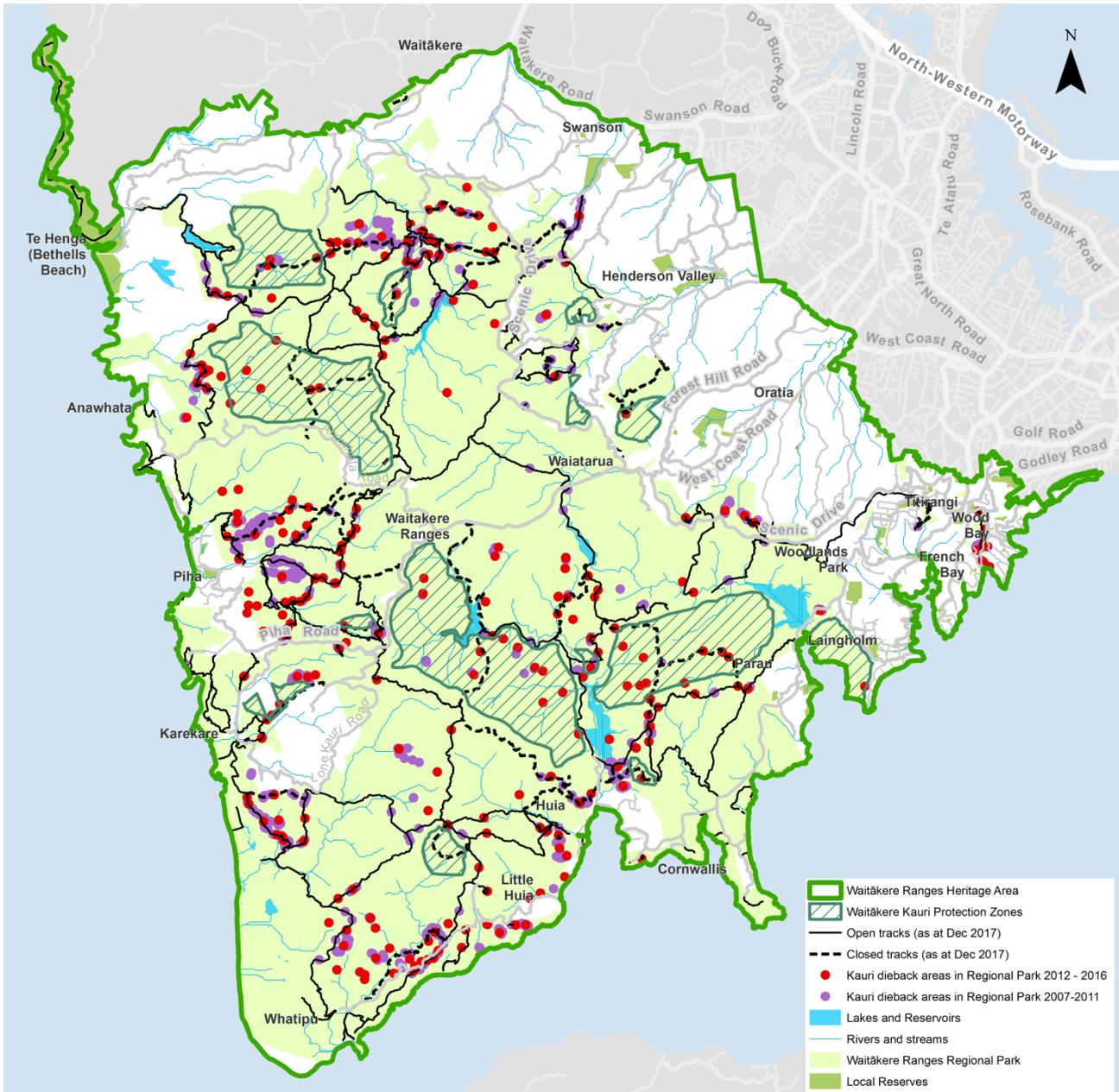


Image on left: Bleeding lesion on kauri tree affected by kauri dieback disease. **Image on right:** Kauri Greenhood Native Orchid .

All kauri forest within the heritage area is now considered to be at very high risk of infection by kauri dieback disease. The kauri is the backbone of the forest ecosystem and at least 17 other species rely on the kauri to survive. The loss of the kauri would have a cascade effect on the plants and animals that depend upon the kauri forest, including orchids and ferns that only grow under kauri and on the long-tailed bat (discussed above) whose preferred roosts are mature kauri trees.

Map 5 below shows the extent of the spread of kauri dieback disease within the regional park between 2012 and 2017.

Map 5: Extent of spread of kauri dieback disease in the regional park 2012-2017



The kauri forest of the heritage area is a taonga (treasure) that has significant and cultural and spiritual values for mana whenua. The increasing number of iconic trees, such as ‘Aunt Agatha’, being confirmed with kauri dieback has a major cultural impact. For Te Kawerau ā Maki the death of the forest is an existential threat. Kauri are tupuna (ancestors) and the rangatira (chiefs) of the forest. Their health is linked to the health of numerous other plants and animals within the ecosystem, and to the health of the iwi.

In response to the findings on the spread of kauri dieback disease Te Kawerau ā Maki placed a rāhui over people using the forests of the heritage area in December 2017. This action was taken to try and avoid further spread from people and to allow the forest to heal.

Findings – kauri dieback disease management

Phytosanitary stations (boot scrub and disinfectant stations)

Phytosanitary stations, (brush and a spray bottle of disinfectant with instructions for users to clean their footwear), were installed at a number of tracks within the regional park in 2008. The 2016 study concluded that these stations have failed to ensure a high level of effective disinfection, hygiene and track user compliance. Monitoring showed that while 78 per cent of regional park visitors were aware of kauri dieback and 89 per cent understood the importance of cleaning footwear, the average compliance with some form of cleaning was approximately 56 per cent. Ongoing work to improve the design and efficacy of these stations is underway.



Image on left: Cleaning boots with disinfectant. Image on right: Phytosanitary station.

Kauri protection zones – closed tracks and park activities

Following the 2012 kauri dieback survey 13 Kauri Protection zones were created to try and prevent the disease being introduced to approximately 400 hectares of kauri forest within the regional park (refer to Map 5 above).

The implementation of the Kauri Protection zones led to the closure of approximately 27km of tracks to public use and extra requirements or exclusions of other activities in these zones. The 2016 survey showed that there was no change in the status of kauri dieback in nine out of the 13 Kauri Protection zones and that the disease has spread within the protection zones as elsewhere within the heritage area.

It is difficult to assess the effectiveness of Kauri Protection zones as a management tool due to the lack of certainty over the period of time between the disease arriving at a site and the trees showing symptoms of kauri dieback. As a consequence it is not known whether the increase in trees showing symptoms of kauri dieback disease in the most

recent survey reflect disease spread that occurred before or after implementation of the Kauri Protection zones.

The closure of tracks has had limited success as a protection measure as monitoring data shows people's use of Kauri Protection zones has remained high in spite of track closures. This suggests there is an ongoing risk of people spreading the disease within protection zones and that further resourcing is required to implement effective track closures.



Kauri protection - closed track sign .

In addition a number of off-track and unmanaged activities were noted during the process of undertaking kauri dieback monitoring. There are also two canyoning concessions granted by council that authorise activities off-track. Off-track activities are a potential source of spread of kauri dieback disease (refer to Map 11 in Section 4: Recreational use of the heritage area topic).

Feral pigs

Feral pigs, which disturb soil through rooting, are suspected to be a factor in introducing the disease in some areas. Ongoing analysis of feral pig activity is required to determine the risk of the disease being spread through feral pig activity and how pig control might best be implemented to reduce the risk of disease spread.

Pest control bait-lines

Pest bait-lines are considered to be another pathway of human-assisted spread of kauri dieback disease. This is evident along the Ark in the Park bait-lines within the Cascades area of the regional park. Monitoring supports the hypothesis that historic activity (prior to kauri dieback being confirmed in the area) along these bait-lines has led to disease distribution and this can be seen in the size and shape of kauri dieback zones.

Waterways

A higher than average percentage of kauri dieback infection was detected in the 2016 survey along waterways and a high proportion of kauri dieback sites are within 50 metres of a waterway. Further analysis of this potential connection is required to quantify the risk of spread via waterways taking into account the extent of kauri forest that contains a high number and network of streams.

Local board and community initiatives – kauri dieback disease

In addition to the council and Ministry for Primary Industries initiatives a number of local board, community group and landowner actions have been undertaken to try and manage the spread of kauri dieback disease, raise awareness of the disease with the public and in trialling possible treatments (injecting affected trees with phosphite).

Since 2014 the Waitākere Ranges Local Board (with council's Infrastructure and Environmental Services team) have funded a community coordinator to provide advocacy, support and information about kauri dieback disease. This has resulted in a range of activities and events with stakeholders, schools, community groups and the public to raise awareness of kauri dieback disease.

The coordinator also supported the regionally funded summer ambassador programme and carried out track hygiene advocacy and compliance monitoring. This involved direct engagement with visitors at high-use track entrances and engagement with over 25,000 park visitors between January and April 2017. This position was continued in the 2016/2017 financial year.



Kauri dieback disease community coordinator .

Future considerations – kauri dieback disease

All kauri forest in the heritage area is at very high risk of infection by kauri dieback disease. There is now an extreme risk of continued spread of the disease locally, regionally and nationally, unless mitigation management and compliance levels are significantly improved (Parks Recreation and Heritage Forum 2011). The expansion of kauri dieback may have unknown future consequences for indigenous biodiversity within the heritage area.

On 2 December 2017 a rāhui (customary prohibition) was laid over the forest of the heritage area by Te Kawerau ā Maki as a matter of tikanga to stop human access (and spread of the disease), protect the forest for future generations and to enable the forest to recuperate. Te Kawerau ā Maki also asked the Government and council to implement a Controlled Area Notice under the Biosecurity Act (1993) over the forest to support the rāhui. In implementing the rāhui 'rolling opening' of areas for public use was to occur where the risk of spread was determined to be neutral or controlled.



Rāhui sign at the corner of Scenic Drive and Huia Road.

At its meeting on 5 December 2017 the council’s Environment and Community Committee resolved to support the rāhui in principle but considered it that it was not practicable, or able, to close the forests of the regional or local parks to public use. To support the rāhui 42 tracks within the regional park have been closed for public use (refer to Map 5 above). Phytosanitary stations (hygiene and shoe cleaning) and tracks are being upgraded and people are being advised to only use the upgraded open tracks. Ambassadors advising people of the threat of spreading kauri dieback are also to be stationed at a number of entrances and cleaning stations, and people are being encouraged to not use other locations for recreation.

On 20 December the Biosecurity Minister and Conservation Minister announced the development of a National Pest Management Plan to strengthen efforts to protect kauri trees from kauri dieback disease. An interim Controlled Area Notice under the Biosecurity Act applying to kauri forests is also under consideration.

This report covers the period up to 2018 (information up to the end of December 2017). Kauri dieback management initiatives are ongoing and changing. The State of the Waitākere Ranges Heritage Area 2023 report will update changes relating to kauri dieback from 2018 to 2023.

Funding – kauri dieback monitoring and management (2018 to 2023)

Council’s funding for the management of kauri dieback spread will be determined through the Long-term Plan process. Both options being consulted on through the Long-term Plan process provide for a substantial increase in investment in kauri dieback management.

The recommendation of the Kauri Dieback Report 2017 is that funding is needed for the preparation of a ‘Waitākere Ranges Regional Park Kauri Dieback Management Plan’ that would address:

- reviewing access and management of human vectoring
- considering options for feral pig control
- using knowledge of kauri dieback distribution to plan more effectively
- supporting and using research.

2.4.10 Emerging biosecurity threat – myrtle rust

Myrtle rust (*Austropuccinia psidii*) is an exotic fungal disease that attacks plants in the myrtle family including pōhutukawa, mānuka and rātā as well as some garden plants such as ramarama. Myrtle rust was found in mainland New Zealand in May 2017 and, in addition to losses of kauri from kauri dieback, could be devastating for the heritage area.

The heritage area contains many native and exotic cultivated trees that will be susceptible to the disease. The risk of the loss of iconic trees such as pōhutukawa and the potential threat to revegetation projects which use mānuka and kānuka as primary replanting species to re-establish forest ecosystems are huge. The Department of Conservation has initiated the collection of seeds for seed banking of vulnerable species within the heritage area.



Pōhutukawa in the heritage area 2017.

In November 2017 myrtle rust was found in west Auckland (affecting cultivated ramarama (*Lophomyrtus bullata*)) and subsequently in several other locations. If it cannot be

eradicated this outbreak presents a very high disease risk to myrtle species within the heritage area and in wider Auckland.

The impacts of myrtle rust on the heritage area will be reported in the State of the Waitākere Ranges Heritage Area 2023 report.

2.5 Indigenous aquatic ecosystems

2.5.1 River, stream and riparian changes between 2013 and 2018

Riparian vegetation is important because structurally diverse vegetation such as forest, scrub, reeds and rushes surrounding rivers, lakes or streams provide a range of benefits including:

- filtering and reducing surface water flows
- allowing sediment to be trapped and reducing the sediment entering streams
- shading and lowering water temperature
- preventing algae growth and supporting stream life
- providing organic matter that contributes to freshwater food webs
- providing habitat for spawning and shelter for fish and invertebrates
- providing habitat for native plants and animals.

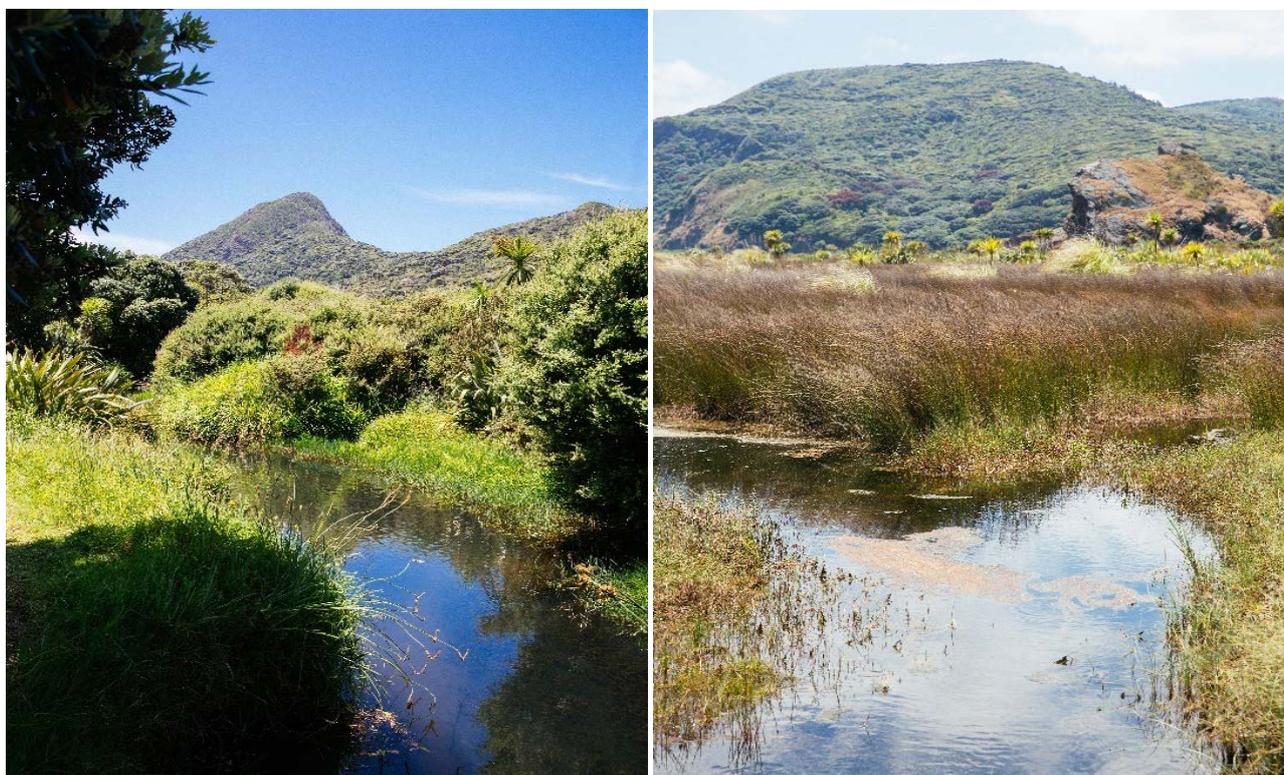


Image on left: Riparian margins along a stream. **Image on right:** Riparian margins in the Whatipu wetland.

Riparian vegetation adjoining rivers and streams was used as an indicator in the 2013 Monitoring Report and they were divided into two zones:

- **Zone I:** watercourses generally within the regional park and draining west ('pristine' watercourses)
- **Zone II:** watercourses generally within the eastern foothills and draining east (watercourses subject to greater land-use impacts).

High resolution aerial imagery and Lidar data has recently been obtained for the heritage area. Analysis of this information about riparian vegetation was not available at the time of preparing this report. A new building footprint and impermeable surface layer is also being developed. Once this data is available it will be used for measuring vegetation changes between 2018 and 2023.

For the purposes of this report an assessment was made on the likely change in riparian vegetation based on past information. The extent of change was concluded to most likely be minor. Table 5 below shows the assessed likely change in riparian vegetation cover 2012 to 2017.

Table 5: Assessment of likely change in riparian vegetation 2012 to 2017

2008 value	2012 value	Estimated change 2012-2017
Zone I: 91%	Zone I: 91%	Zone 1: -0.01% (c.0.12 ha loss)
Zone II: 66%	Zone II: 66%	Zone II: -0.07% (c.0.24 ha loss)

2.5.2 Wetland changes between 2013 and 2018

Wetlands are important for the range of different environmental, economic, biodiversity and cultural benefits they provide. Only around four per cent of Auckland's original freshwater wetland ecosystems remain. The heritage area includes two significant regional wetland complexes; at Te Henga / Bethells Beach and at Whatipu. Several important dune lake wetlands and smaller and more fertile/modified wetlands exist surrounded by farmland. The coastal lagoons are discussed separately below.



Wetlands at Te Henga / Bethells beach

There was no change in the extent of wetland habitat between 2001 and 2012. While data was not collected between 2013 and 2017 it was concluded the extent of change from human activity is likely to have been negligible. Some changes in extent may have occurred through natural processes such as sediment accumulation.

Both the Te Henga / Bethells Beach and Whatipu wetlands are vulnerable to invasion by weeds; particularly pampas and blackberry at Whatipu, and grey willow and crack willow at Te Henga / Bethells Beach. The extent of weeds in these wetlands was used as the indicator to measure change and it was concluded that the extent of change was minor.

Changes in avifauna (birds) within the wetlands are monitored through ten-minute bird counts. The bird counts in 2011 and 2013 were undertaken at six wetland plots, with nine plots being measured between 2015 and 2017. The wetlands surveyed had, on average, slightly more native and endemic birds compared to introduced species. Overall no significant changes were detected.



The New Zealand Fernbird. (Source: Jacqui Geux)

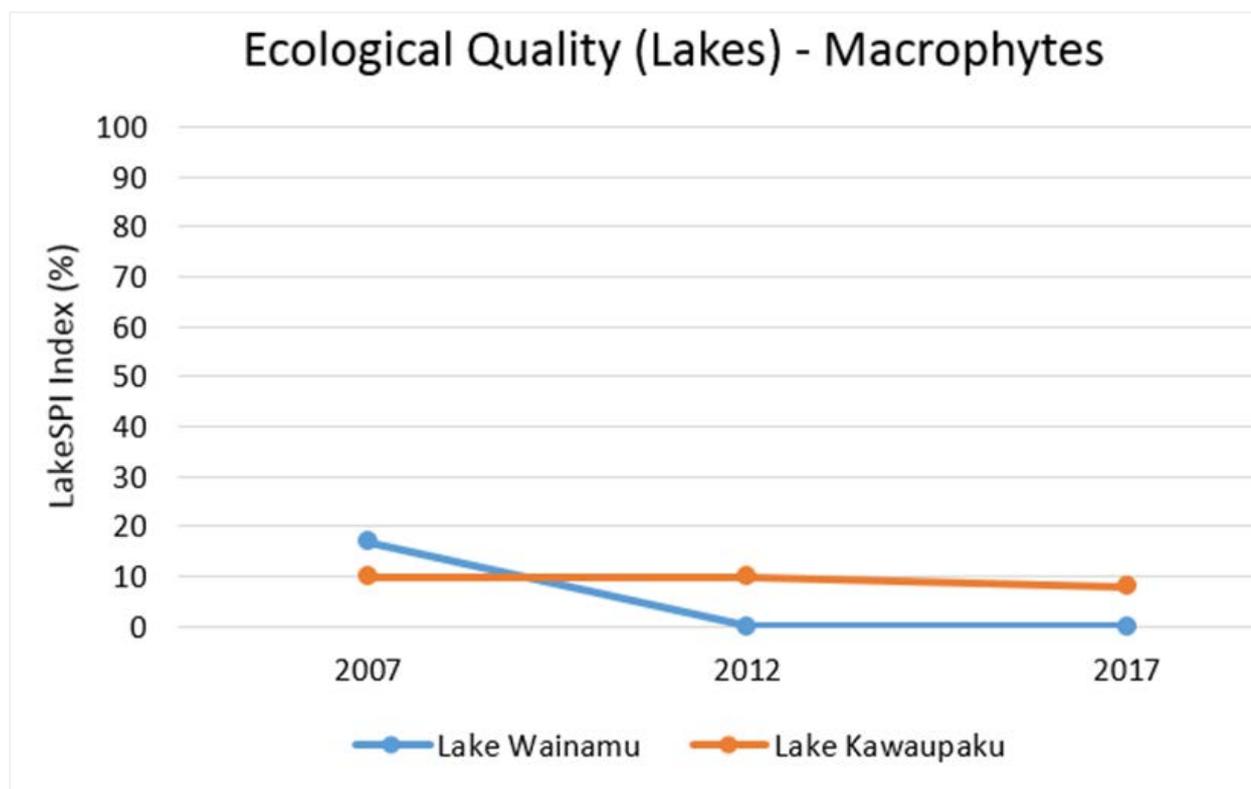
2.5.3 Dune-lake changes between 2013 and 2018

There are two large dune lakes in the heritage area; Lake Kawaupaku and Lake Wainamu at Te Henga / Bethells Beach. Both lakes have gone from a pristine state (in the 1970s), to being degraded by the invasion of the weed *Egeria*. Grass carp were introduced into Lake Wainamu in 2009 and have successfully addressed the weed invasion.

Indigenous macrophytes (submerged plant species) and rotifers (natural components of lake zooplankton communities) are used as indicators to measure the ecological health of lakes. The general trend noted from the 2008 to 2013 monitoring was that the ecological condition of both lakes was in the 'poor' range.

Data collected in 2017 and shown in Figure 3 below indicates that Lake Kawaupaku is still in decline. Lake Wainamu was not part of the 2017 survey as the grass carp used as part of the bio-control for pest macrophytes are still present and the lake is likely to still be non-vegetated.

Figure 3: Ecological condition of Lake Wainamu and Kawaupakau 2007-2017



2.5.4 Dune system changes between 2013 and 2018

Dune systems are dynamic and fragile ecosystems that provide critical buffering of adjoining land from heavy seas and wind and help mitigate coastal erosion. In the heritage area dune systems also provide important breeding habitat for a range of threatened bird species (including the northern New Zealand dotterel, the variable oystercatcher, the New Zealand pipit and the little blue penguin) and threatened plant species (such as shore spurge (*Euphorbia glauca*) and sand tussock (*Poa billardierei*)).

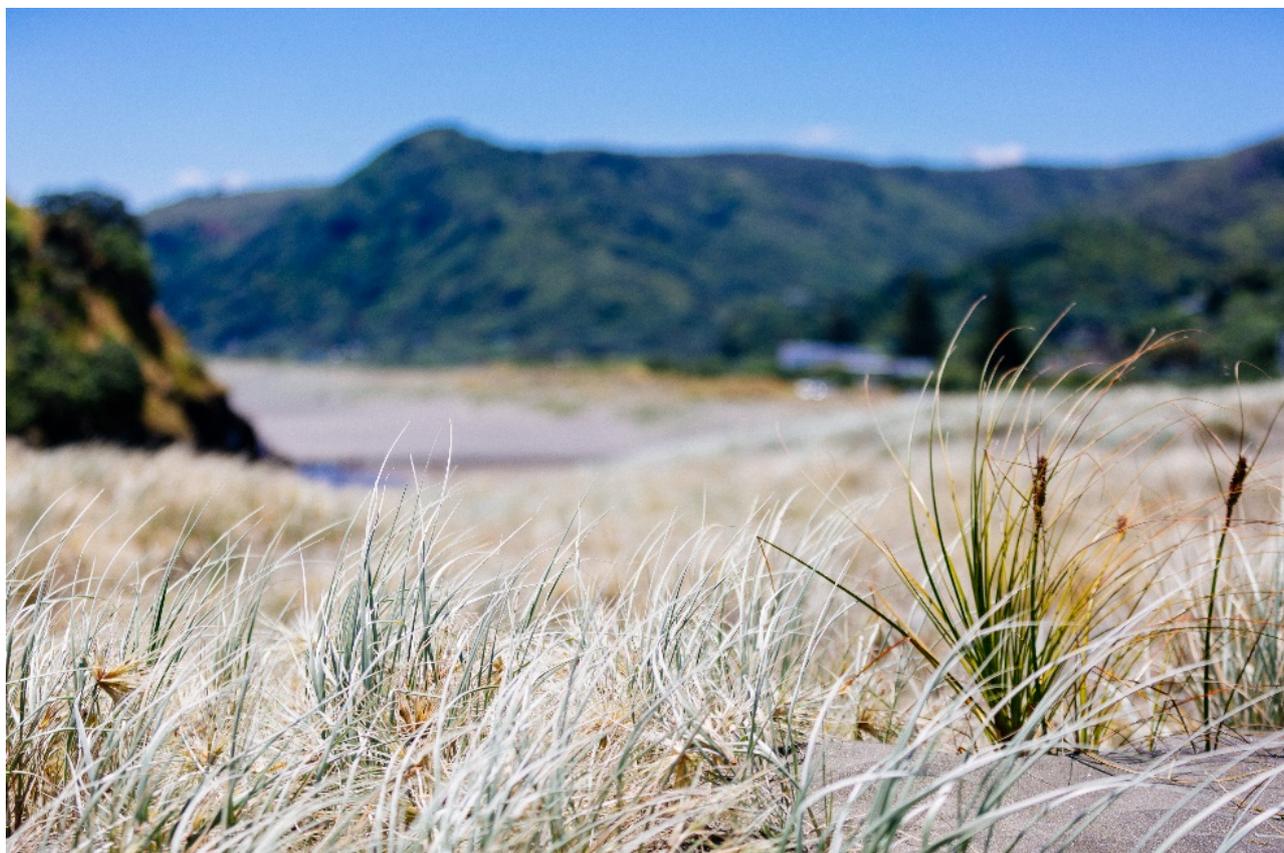
There are approximately 925 hectares of dune systems in the heritage area comprising (approximately):

- 80 per cent at Whatipu
- 15 per cent at Te Henga / Bethells Beach
- 5 per cent smaller patches of dune systems along the Tasman Sea coast.

Refer to Appendix 7 for description of the dune habitat in the heritage area. Exotic and other 'non-indigenous' dune vegetation has lower biodiversity values than indigenous vegetation but still provides habitat for indigenous animals and some plants, and often protects the natural physical structure of the dunes.

The construction of buildings, roads and other impervious structures result in substantial modification of dune morphology (e.g. cut and fill, removal of topsoil, paving over with concrete etc.) and the loss of natural values. The indicator used to assess change to dune

systems is the proportion of dunes covered by impervious surfaces. Buildings, roads and carparks and other impervious surfaces and structures are concentrated in the coastal settlements at Piha and Te Henga / Bethells Beach.



Dune system.

No data on changes to impervious surfaces affecting dune systems was collected for the period 2012 and 2017. However, the boundaries of all dune systems have recently been digitised and the council now has an accurate map of the extent of buildings from which to measure future change. The impermeable surface layer in council's GIS will become the main tool for calculating this indicator for the 2023 report. The council is presently investigating a regional dune system monitoring programme in addition to identifying future management actions for conserving and restoring dunes in Auckland.

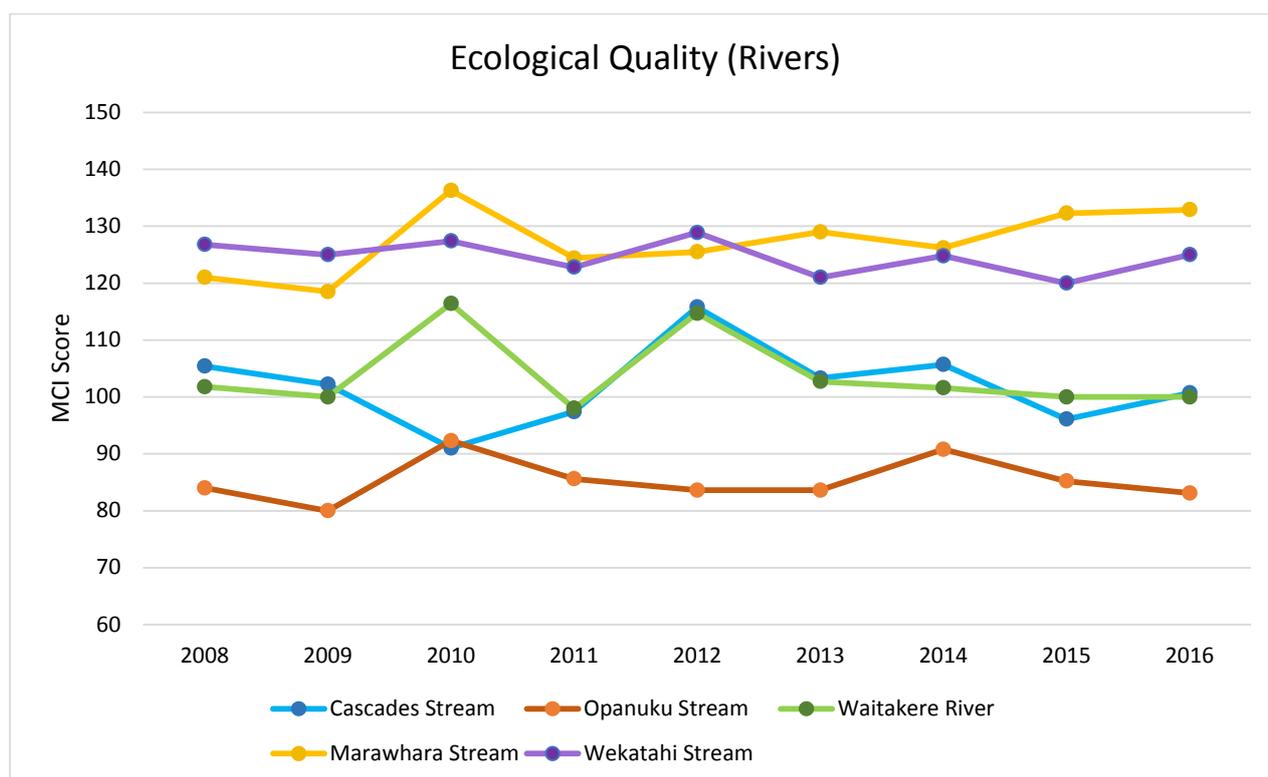
2.5.5 Stream ecology changes between 2013 and 2018

The macroinvertebrate communities of streams (for example the insects, bugs and worms) are frequently sampled to provide an assessment of the ecological condition of the stream. This is because they are found in all streams, are relatively easy to sample and identify, and are sensitive to a wide range of disturbances. Each of the commonly found species

are assigned a macroinvertebrate (MCI) “score” between 1 (least sensitive) and 10 (most sensitive) based on their tolerance to a range of environmental stressors.

Five sites in the heritage area that are monitored for ecological quality on a regular basis: Cascades Stream, Opanuku Stream, Waitākere River, Marawhara Stream, and Wekatahi Stream. The MCI scores and quality classes for these five sites are shown below in Figure 4.

Figure 4: Macroinvertebrate scores/ecological quality of streams

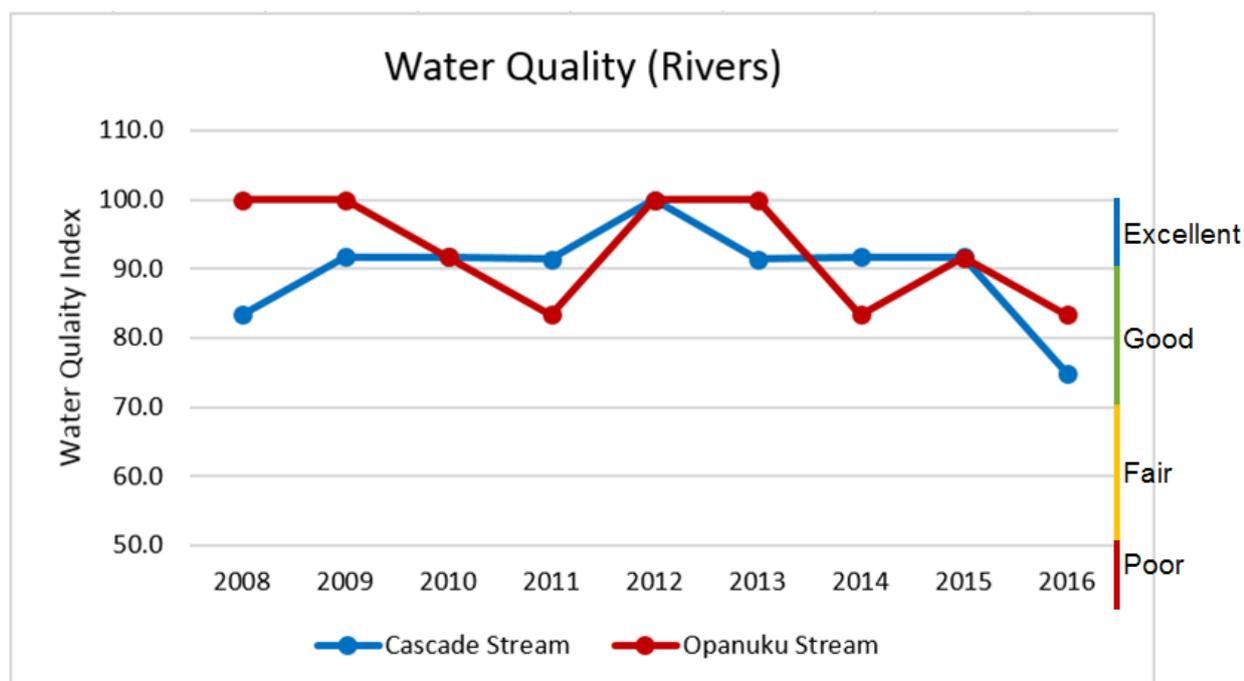


Monitoring between 2012 and 2017 showed stream ecological quality to be fairly constant, with excellent scores being maintained for Marawhara and Wekatahi streams. Cascade Stream and Waitākere River have continued to dip in and out of the Fair quality class, with Opanuku stream remaining towards the lower end of the Fair class. The recent River Ecology State and Trends report indicated that Wekatahi Stream has seen a statistically significant decline in MCI score, over the time period 2003 to 2013, but the minor nature of this change is such that it is likely not to be ecologically significant. The other four sites have not shown a significant trend.

2.5.6 Stream water quality changes between 2013 and 2018

There are two water quality monitoring sites within the heritage area; Cascades Stream and Opanuku Stream. The results from water quality monitoring of these two streams is shown below in Figure 5.

Figure 5: Water Quality Index data from river sites in the heritage area



Although changes over a short period of time cannot be accurately assessed, monitoring indicates that the water quality for Opanuku and Cascades stream may be in decline. However, both streams have remained within the “Good” to ‘Excellent’ class within this time frame. Trend analysis indicates that nutrient levels in both these streams are improving.

Some targeted monitoring of specific fish species was undertaken between 2016 and 2017 and results indicate that three of the four known Auckland populations of shortjawed kokopu are living within streams in the heritage area. The results of the 2016 and 2017 monitoring are shown below in Table 6.

Table 6: Rare fish populations in the heritage area

Fish Species	Location of population	Survey Date
Shortjawed Kokopu (<i>Galaxis postvectis</i>)	Marawhara Stream	2016
	Glen Esk/Piha Stream	2017

	Karamatura Stream	2016
Giant Kokopu (<i>Galaxis argenteus</i>)	Piha Stream	2017

2.5.7 Coastal lagoons and beach water quality

Coastal lagoons form part of the dune systems and aquatic ecosystems that are heritage features under the Act and the adjoining beaches contribute to the recreational opportunities of the heritage area. While the water at the beaches monitored may be outside of the legally defined heritage area they have been included in this report as it is the use of the land within the heritage area that is affecting the water quality of the adjoining beaches.

The 2013 Monitoring Report did not include a section relating to the water quality of the coastal lagoons or beaches. However, since 2013 the water quality at coastal lagoons and beaches has affected aquatic ecosystems and recreational use of the heritage area. For these reasons they are included as a matter to be monitored as part of this report.

Indicators used to measure water quality

Beaches and lagoons are the receiving environments for contaminants that originate from upstream and from nearby sources. As a result they often have higher levels of contamination, including from faecal sources. This contamination can pose a health risk to people swimming in the lagoons and beaches.

The criteria levels which determine if a beach or lagoon exceeds the allowable levels is based on the levels set out in the Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas, 2003. Two parameters are used to measure water quality:

- *Escherichia coli* (*E.coli*) which is a microbiological indicator of pathogens in freshwater from animal or human faeces
- Enterococci which is a microbiological indicator of pathogens in saline environments, such as lagoons.

The Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Area (2003) is used to assign a beach or lagoon a Microbiological Assessment Category grade (MAC) which determines if a beach or lagoon is issued with long-term signage warning people of the health risks. The MAC grade is based on a minimum of three years of continuous data and long-term signage may be placed if the grade is C or D. If a beach is graded a D the beach is monitored under the council's faecal source contamination investigations that aim to identify and fix the source of contamination.

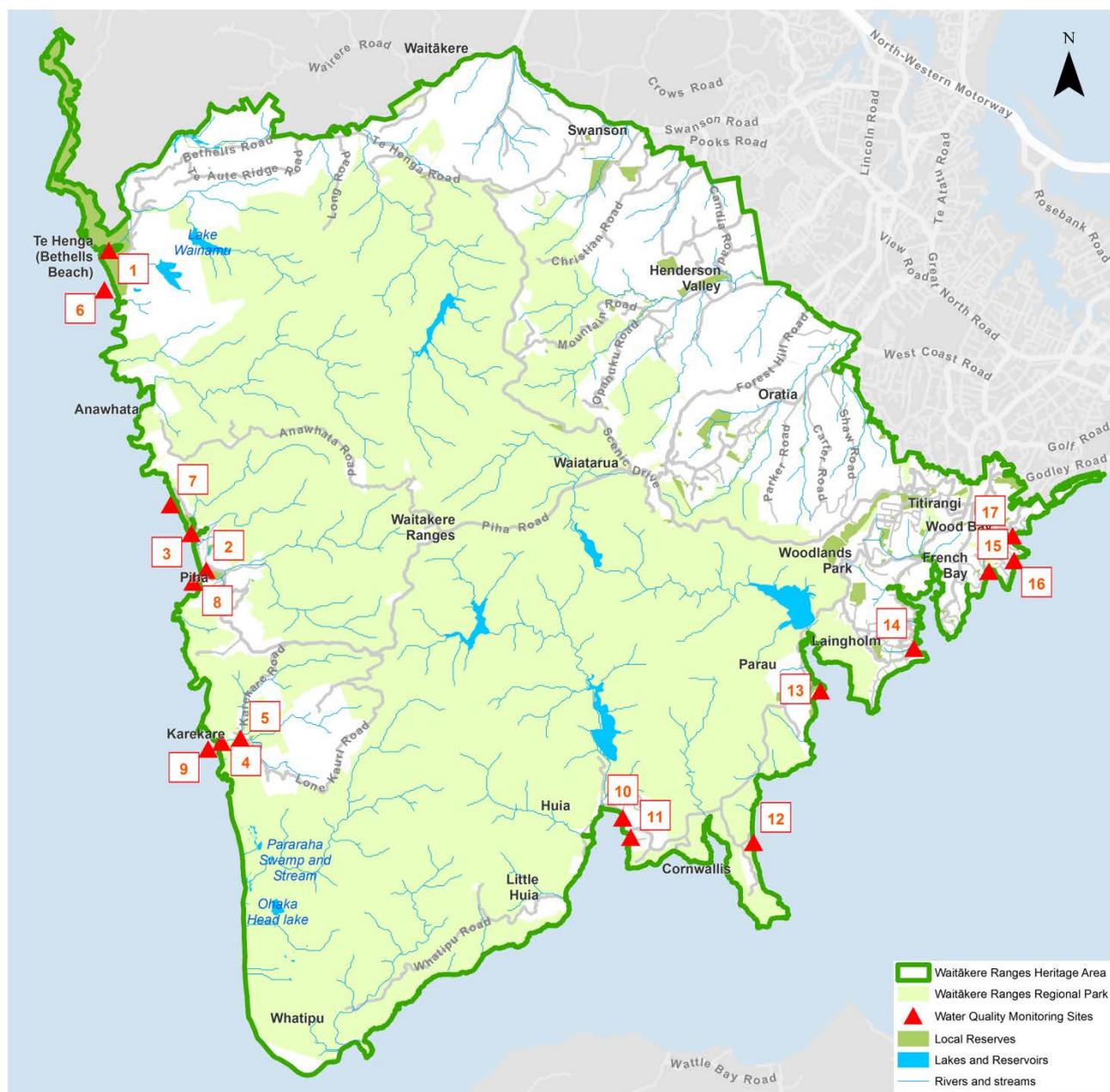
Water quality at five coastal lagoons and 12 beaches within, or adjoining the heritage area, are tested weekly over summer from November to March for levels of faecal indicator bacteria (FIB) (*E.coli* or enterococci) to determine if they are safe for swimming (refer to Map 6 below). If monitoring shows that a lagoon or beach has levels of faecal indicator bacteria that exceed the allowable levels of *E.coli* or enterococci, then signs are erected advising that the site is temporarily closed for swimming until faecal bacteria levels are safe for swimming. The closed beaches are referred to as 'long term signage sites'.



Public health warning sign at Foster Bay, Huia 2017.

Some sites within the heritage area have a D grade but are still suitable for swimming. These sites have had key issues assessed. Some sites have rapid dilution and dispersion by currents and large volumes of water where health risks can be managed by issuing health warnings through the Safeswim programme. Map 6 below shows the location of the water quality monitoring sites and Table 7 lists the MAC results for each of the sites.

Map 6: Location of water quality monitoring sites



Refer to Table 7 below for the water quality monitoring sites results.

Table 7: 2016/2017 results of water quality at the monitoring sites shown in Map 6 above. MAC grades are calculated from five summer seasons proceeding the most current summer season, namely 2016/2017.

Map 6 No.	Lagoons	MAC Grade	Status
1	Te Henga / Bethells Beach lagoon	D	Long-term signage
2	Piha lagoon	D	Long-term signage
3	North Piha lagoon	D	Long-term signage
4	Karekare lagoon	D	Open

5	Karekare lagoon carpark	D	Open
	Beaches		
6	Te Henga/Bethells Beach	B	Open
7	North Piha beach	A	Open
8	South Piha beach	B	Open
9	Karekare beach	A	Open
10	Huia Bay	D	Open
11	Fosters beach	D	Long-term signage
12	Cornwallis beach	C	Open
13	Armour Bay	D	Long-term signage
14	Laingholm beach	D	Long-term signage
15	Titirangi beach	D	Long-term signage
16	French Bay	D	Open
17	Wood Bay	D	Long-term signage

Physical sampling at the beaches with long term signage was stopped from the 2017/2018 summer season. The physical sampling has been replaced with the development of a model that predicts, with very little error of margin, the level of enterococci and whether it is safe for swimming. Stopping the physical sampling will allow funds and effort to be directed at identifying the contamination sources and improving the water quality at the beaches.

Identifying the sources of faecal contamination

Auckland Council uses DNA techniques to identify the species from which the faecal bacteria contamination originates. In summary the sources of faecal bacteria contamination were identified as:

- **Te Henga / Bethells Beach lagoon** - The highest occurrence of faecal bacteria contamination originates from livestock (ruminant) reflecting the catchment's use for rural livestock activities. Dog and bird sources were also common.

- **Piha lagoon** - Occurrence of faecal bacteria contamination originates from humans, reflecting that the catchment has the most densely populated beach settlement using on-site waste water systems (septic tanks).
- **North Piha lagoon** – Strong evidence of human contamination. However the exact source is unclear. Overall the lagoon had moderate levels of *E.coli*.
- **Karekare lagoons** – Moderate levels of *E.coli* are found at this site with the stream being a contributing source of *E.coli*. Good evidence of overwhelmed on-site wastewater systems caused by rain events.
- **Most beaches and lagoons** are affected by faecal bacteria from dogs, reflecting the popularity of dog walking in these locations.
- **Most beaches and lagoons** are affected by faecal bacteria from birds, reflecting the large amount of natural bird habitat that surrounds lagoons and beaches in the heritage area.

Actions taken to address degraded water

The council has ongoing investigations that look at the cause of elevated levels of faecal sources at a number of beaches. These include Huia Bay, Fosters Beach, Armour Bay, Laingholm Beach, Titirangi Beach, French Bay and Wood Bay.

The local board and community groups have been working towards improving the water quality at the lagoons and beaches in the heritage area. 'Love our Lagoons' was an education initiative and part of the West Coast Lagoons Action Plan¹⁵. This was initiated in 2014/15 and identified a number of other cross-council and community initiatives to improve water quality in the lagoons including:

- behaviour change initiatives
- community information events
- riparian planting and stock exclusion fencing subsidies for properties in the Te Henga / Bethells Beach catchment
- onsite waste water tank upgrade grants.

¹⁵ West Coast Lagoons Action Plan (5 February 2016) Auckland Council



Piha lagoon with health warning sign.

The West Coast Lagoons Action Plan will be reviewed in 2017/18 and will remain a focus area for a further three years. The outcomes of the West Coast Lagoons Action Plan will be reported in the State of the Waitākere Ranges Heritage Area 2023 report.

The local board provided a \$50,000 fund (for the 2015/16 and 2016/17 years) to provide up to \$5,000 per homeowner to assist with the costs of upgrading on-site wastewater systems to a higher level of treatment and reduce the human impact on the beaches and lagoons. In 2015/2016 six grants were awarded by the local board and three were taken up. In 2016/2017 eleven grants awarded and one was taken up, although the final numbers at the date of reporting are not confirmed. The local board has not continued this into the 2018 calendar year. Other initiatives include the council providing reduced building and resource consent fees for on-site wastewater system upgrades.



Septic tank pump out truck at Piha Domain 2017.

Suggestions for the future

Funds and effort are being directed towards identifying contamination sources and improving the water quality at the beaches. The council will progressively assess contributing sources of contaminants using the latest DNA methods that identify the species that the *E.coli* or enterococci originates from. Where they are shown to be having a negative impact on water quality the council will address these in future scenario planning and initiatives to achieve improved water quality.

Integrated Watershed Plans and are being prepared by the council as part of its Freshwater Management Plan. The West Coast and Manukau Watershed Plans will provide the basis for overall water improvements in the heritage area.

Funding of activities 2018 to 2023

The funding of the activities are covered within the operating budgets of the local board and council's Regulatory Services, Healthy Waters and Community Facilities budgets. All water quality monitoring and investigations are covered under the council's Healthy Waters department budget. The funding for monitoring and initiatives relating to water quality improvements may be encompassed within the Auckland-wide budget. These programmes and actions are aimed at addressing water quality in, or adjoining, the heritage area. They give effect to achieving the objectives of the Act relating to aquatic ecosystem health and enabling safe recreational use of the heritage area and adjoining beaches.

The council has applied targeted rates to home-owners in the heritage area who have septic tanks to fund septic tank pump-out every three years by a council approved contractor to ensure septic tank maintenance.

2.6 Public feedback – terrestrial and aquatic ecosystems

As discussed in the sections above, the health of the ecosystems of the heritage area are a key concern to the council, public and communities living in the heritage area. The feedback received from members of the public at the meeting held on 15 June 2017 reflected concern about a number of the matters discussed in this section. Refer to Appendix 4 for a record of feedback from the meeting.

Key themes relating to ecosystems was that maintaining the health of the natural environment of the heritage area was fundamental to achieving the objectives of the Act and in this regard, there are concerns that:

Pest plant and animal control

- better roadside weed control and practises are needed by Auckland Transport
- invasive weeds are not being adequately controlled in a number of areas
- possum numbers have escalated in recent years
- Pest Free Auckland needs to be implemented in the heritage area
- local community groups are implementing a number of pest plant and animal control programmes in their local areas.

Biosecurity – kauri dieback

- kauri dieback prevention measures are not working
- use of the Hillary trail should be stopped
- a range of measures should be undertaken, and prevention promoted through social media
- myrtle rust is an added threat to other pressures and threats to the area.

Water quality

- there are sewage overflows around the coast
- action is needed to improve the water quality of streams and lagoons