Regional Forest Lands

Resource Statement
Volume One – Physical Environment

Quality for Life

greater WELLINGTON
REGIONAL COUNCIL | Parks

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Introduction

This resource document covers the description of the physical environment of Greater Wellington's two **FUTURE WATER COLLECTION AREAS**: Akatarawa and Pakuratahi Forests. A second volume that describes the history and cultural heritage of Akatarawa and Pakuratahi Forests will be published separately.

Akatarawa and Pakuratahi Forests have been primarily held as potential water sources for future generations. As a result of this, the forest ecosystems and ecosystem processes need to be managed in a way that protects and sustains this resource for the future. The maintenance of a healthy vegetated cover is particularly important in water collection areas, because a healthy forest filters out impurities and minimises erosion. This does not mean that these areas cannot be used, but any permitted activities must take into account the purpose of the forests and the significant contribution they make to the region's biodiversity. The status of these lands as future, as opposed to current water collection areas has meant that uses such as recreation and forestry are currently allowed.

The location of the two forests is shown on Map 1. Pakuratahi Forest is in the northern part of the Rimutaka Range and is an important link in a continuous corridor of protected forest along the Wellington region's axial range, that also includes the Hutt and Wainuiomata/Orongorongo Water Catchments and Kaitoke Regional Park, as well as the Rimutaka and Tararua Forest Parks administered by the Department of Conservation. Akatarawa is also continuous with these forests as it adjoins Tararua Forest Park, but it has particular significance because it contains the only large areas of natural vegetation west of the Hutt and Akatarawa Valleys.

In this document, aspects of the Wellington Region's history, physical environment, biota and land usage that have influenced the present-day state of both forests are described in this Introductory Section. Separate sections on the individual forests then deal with the particular resources of Akatarawa and Pakuratahi respectively.

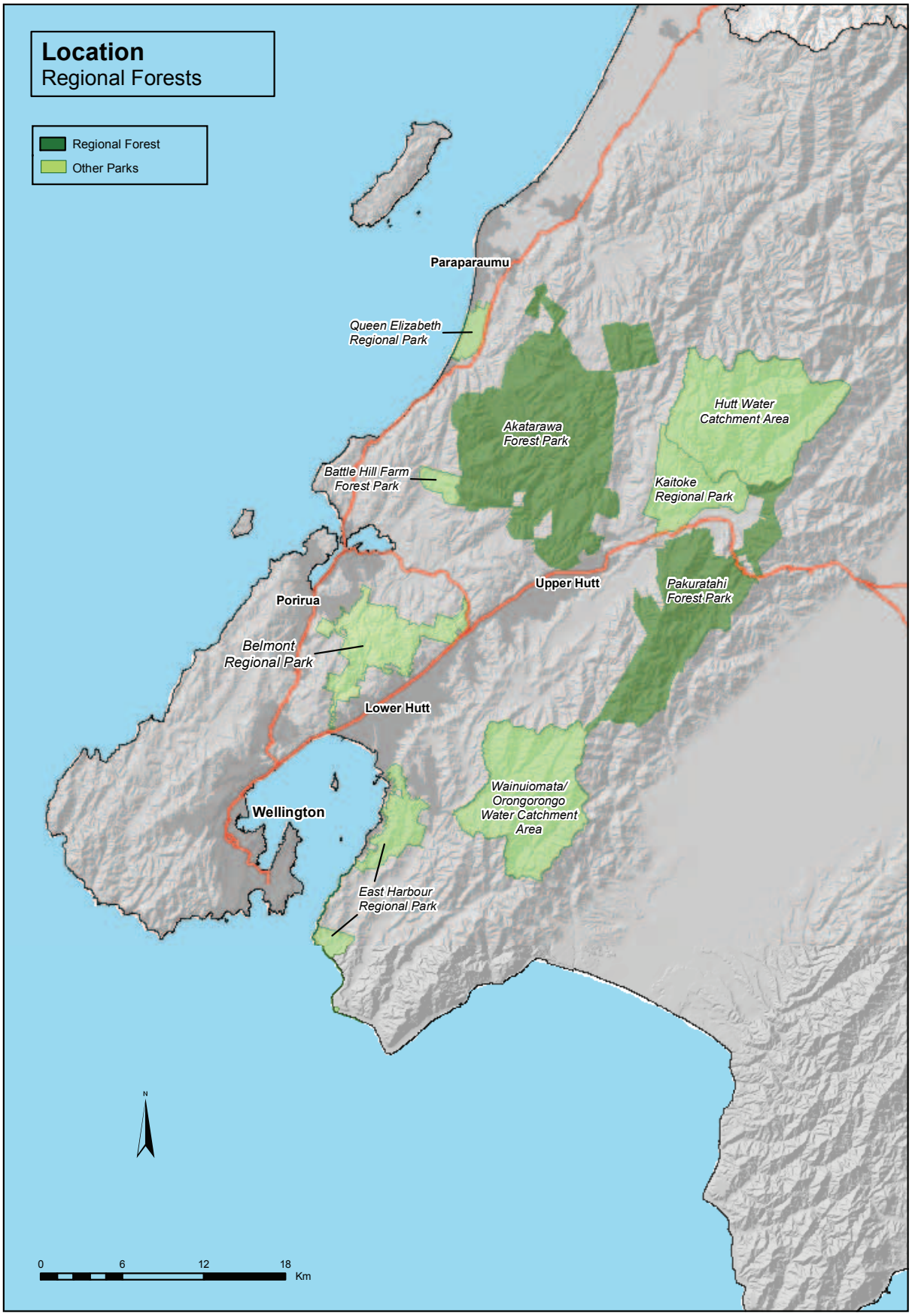
1. Topography, Landforms and Faults

1.1 Geology of the Wellington region

Greywacke rock, a grey sandstone interbedded with mudstone, forms the bedrock under much of the Wellington region. In geological terms, the Wellington greywacke is part of the Torlesse Terrane. Mt Torlesse is the name of the greywacke ranges of Canterbury, which forms much of the mountainous backbone of central and eastern New Zealand and a terrane is the area or surface over which a particular rock or group of rocks is found. The sediments that make up the individual grains in the greywacke were eroded from the eastern part of the ancient continent of Gondwana 240–140 million years ago and deposited in an adjoining trough known as the New Zealand Geosyncline. From 140–100 million years ago, these sediments, now consolidated into rock, progressively rose out of the sea in a major period of tectonic uplift and mountain building (known as the Rangitata Orogeny) to form much of the landmass that was to eventually become New Zealand.

Tectonic uplift slowed around 60 million years ago and most of this mountainous landmass was subsequently eroded away to form an extensive and near flat expanse just above sea level called a peneplain. Over the last 25 million years another period

Map 1 Location of Akatarawa and Pakuratahi Forests



of uplift (known as the Kaikoura Orogeny) affected the region and the part of the peneplain surface in what is now Wellington was raised, tilted and progressively eroded. However, remnants of this peneplain surface, named by Cotton (1957) as the 'K surface' (after the prominent Wellington skyline landmark Mt Kaukau), have survived.

In addition to Mt Kaukau, the best remaining fragments of this gently undulating peneplain are found in Belmont Regional Park and around Quartz Hill near Makara. Support for this uplifted peneplain theory is further provided by the similar heights of the summits of the western hills which extend all the way from Makara to the forested Akatarawa uplands and the Southern Tararua Range.

1.2 Tectonic setting of Wellington

Wellington's proximity to the active margin of the continental Indian/Australian Plate and the oceanic Pacific Plate has generated intense tectonic stresses, causing the greywacke bedrock to fracture along lines known as faults. There are four main fault lines in the Wellington region: the Wairarapa Fault; the Wellington Fault; the Ohariu Fault and the Pukerua Fault (McConchie et al., 2000); each is many tens of kilometres long, and all run roughly parallel to each other with an overall northeast trend. Movements on the faults are mainly lateral and dextral, that is, if viewed from one side of the faultline, the opposite land moves laterally to the right in an earthquake.

The Wellington faults also display vertical displacement of the land. The combined effect of this lateral and vertical movement has produced a series of uplifted blocks tilted to the west, with sharp escarpments just to the west of each fault line and a depression to the east. The topographic effect is steeply rising hills immediately to the west of each fault: the Rimutaka Range adjacent to the Wairarapa Fault reaches up to 900 m within 10 km of the fault, and the Belmont hills west of the Wellington Fault reach 400 m within four km.

Further spectacular evidence of the progressive tectonic uplift of the Wellington landscape is found in the series of old beach ridges, coastal platforms and marine terraces around the coastline. These former wave-cut features are most easily recognised at Pencarrow Head and Baring Head adjacent to East Harbour Regional Park, and in the famous raised beaches of Turakirae Head (where a 6500 year chronology of uplift is preserved). Movement on the Wellington Fault recurs every 500–800 years on average and, for the Ohariu Fault (west of Moonshine), 2000–5000 years (Berryman, 1990; Heron & van Dissen, 1998).

The faults also control Wellington's drainage network, with most of the rivers and streams following the line of easily eroded crushed rock in the fault zone. The Hutt, Wainuiomata and Orongorongo Rivers and major streams like Ohariu Stream, Takapu Stream and Duck Creek all flow along the NE-SW axis of the major faultlines. However, many secondary streams, such as Korokoro, Speedys, and Horokiri Streams, are more aligned along the N–S axis of the less active network of splinter, or subsidiary faults caused by frictional 'drag' as the land slips sideways along the major fault lines. These are thought to have originated during the initial stages of the current period of uplift. Strain was later taken up by the major faults with the smaller faults becoming inactive (Turner, 1985). It is interesting to note that before major uplift began along the Wellington Fault, the Hutt River flowed to the Pauatahanui Inlet, along the route now followed by the Haywards Hill Road. As the Belmont hills rose, the river followed the line of least resistance and turned southwest along the fault, entering the sea where the suburb of Kilbirnie lies today (Stevens, 1991).

1.3 The impact of glaciation on the Wellington region

Throughout geological time the world's climate has fluctuated between cooler periods (known as glacials) and warmer periods such as at present (known as interglacials). During a glacial period more of the Earth's water is locked up in ice caps and glaciers and, as a result, the sea level falls and exposes marine sediments.

The last glacial period (from about 70,000 to 14,000 years ago) had a significant influence on the landforms of the Wellington area. Even though the nearest glaciers were on the upper slopes of the Tararua Range, the Wellington region would have experienced a harsh and extremely cold 'peri-glacial' environment. As the mean annual temperature dropped to as much as 5°C lower than present day, the climate became windier and drier. Large areas became devoid of vegetation and soils were lost through frost-heave and wind erosion. Forests retreated and were replaced by lower stature vegetation – cold-tolerant grasses and scattered shrublands. Rivers such as the Hutt and Orongorongo in Wellington, and the Waikanae and Otaki on the Kapiti Coast, carried sediments down from the bare ranges and spread them as gravels, sands and silts in large outwash plains in the lowlands. In the windier conditions, silt from the outwash plains and exposed seabed was blown landwards, mantling the hills with a cover of fine silty sediment known as loess.

In this last glacial period, most of the subsoils throughout the Wellington landscape are likely to have frozen (a condition called permafrost) and consequently impeded soil drainage. During daytime, however, some thawing would have occurred, allowing a viscous 'porridge' of wet soil and rock particles above the permafrost to slowly slide down even quite gentle slopes under the force of gravity (McConchie, 2000). This mass, called solifluction debris, accumulated in the hollows, filling small gullies and smoothing out the contours of the land. These 'fossil gullies' (technically known as 'colluvium-filled bedrock depressions') are not immediately recognisable on the present day undulating land surface, but they assume enormous importance when lubricated by prolonged rainfall. Because the surface of the underlying greywacke rock was smoothed by the rasping action of the solifluction debris moving over it, the whole mass (when saturated) can slide off this bedrock contact surface if the toe of the gully is destabilised, for example, by road cutting or prolonged or intense wet weather. There is a close correlation between the incidence of landslips during extreme rainstorms and the location of fossil gullies throughout the whole Wellington region.

Each of the processes described above have influenced the physical environment of Akatarawa and Pakuratahi Forests in different ways. The particular geology of Akatarawa and Pakuratahi Forests are described in the individual forest sections.

2. Soils in the Wellington region

Soils in the Wellington Region have formed on greywacke and argillite rock, slope debris (colluvium), river deposits (alluvium), wind blown silt (loess) and sand and peat. They have formed on generally hilly terrain under a climate where temperatures and rainfall vary markedly. These soils have formed during the last 10,000 years, mainly under forest.

'Soil orders'[1] are a technical classification used to describe different types of soils (e.g. brown earth). Within these orders are 'series names' based on where a soil was first described (e.g. Rimutaka series). The largest (and most widespread) soil order in the

[1] (A useful general description of soil orders is currently available from http://www.bush.org.nz/soil/)

region are the brown earths. These form on materials derived from sedimentary rock in a climate where the soil rarely dries out and is not waterlogged in winter (Molloy, 1998). Other orders found in the Wellington region are: organic soils; gley (wet) soils; ultic (leached/illuviated) soils; podzols (leached with an horizon of mineral accumulation); pallic (pale) soils; recent soils; and raw soils (very recent). Thirty three soil series have been described within these orders.

In this document soils are described according to the two soil classification systems in use in New Zealand: the New Zealand Genetic Soil Classification (NZG), which describes soils according to how they were formed (Taylor, 1948) and the present New Zealand Soil Classification (NZSC), which describes soils as they are (Hewitt, 1998). The soil types found in Akatarawa and Pakuratahi Forests are described, and their distribution mapped, in the relevant section later in this document.

3. Climate

Wellington's climate is dictated by the region's proximity to the ocean (in particular Cook Strait) and by the mountain ranges either side of Cook Strait. These ranges funnel westerly winds into the region, creating Wellington's distinctive "windy Wellington" weather.

The area around Cook Strait is noted for its high winds. Wind follows the path of least resistance and rather than pass over the ranges the wind bends and is channelled through the strait. Wind from the west can become a "nor'wester" by the time it has bent around the hills (Dickson, 1986). It will also have increased in speed as a result of being squeezed through the gap. Average wind speed in the narrows of the strait is 33 km/h but maximum gusts of 237 km/h were recorded at Hawkins Hill during the Wahine storm in April 1968 (Goulter, 1984; Reid, 1998).

Anticyclones (high pressure systems) move east across New Zealand every 6–10 days. These are interspersed with troughs of low pressure. A typical pattern of northwesterly winds followed by southwesterlies can become more complex when a wave of depressions or blocking anticyclones occur.

The air mass travels over the ocean before reaching Wellington and can arrive laden with moisture. As the air moves up over the hills, the temperature falls until moisture condenses out as rain. Thus the higher altitude parts of the region receive more rainfall per year than the coastal areas (Salinger et al. 1986). Wellington's west coast generally receives 1000–1200 mm per year, while in the Tararua Ranges annual rainfall varies between 2000 mm at Kaitoke (223 metres above sea level) to 6400 mm above 800m altitude on the main range (see Map 2). Despite this overall pattern the distribution of precipitation in the region on a daily basis is more complex. Intense rainfall can occur at both low and high altitude (Lew & Blackwood, 1995). Rain falls throughout the year with peaks in winter and spring due to the increased frequency of depressions that cross the region at these times.

Wellington's temperature range is smaller than the rest of the country because of the moderating effects of the region's maritime location and its wind. The average winter mean temperature is 8.2°C and the average summer mean temperature is 16.4°C. The night/day temperature difference is also small (Salinger, 2000). Nonetheless, temperatures vary markedly within the region because of its rugged topography (Goulter, 1984), with altitude variations (and therefore cloud cover), local winds and

aspect determining temperatures at different locations. As Akatarawa and Pakuratahi differ in location, altitudinal range and topography, the climates of the two forests are slightly different, and are described in the following separate sections on each of the forests.

4. Flora

4.1 Vegetation in prehistoric Wellington

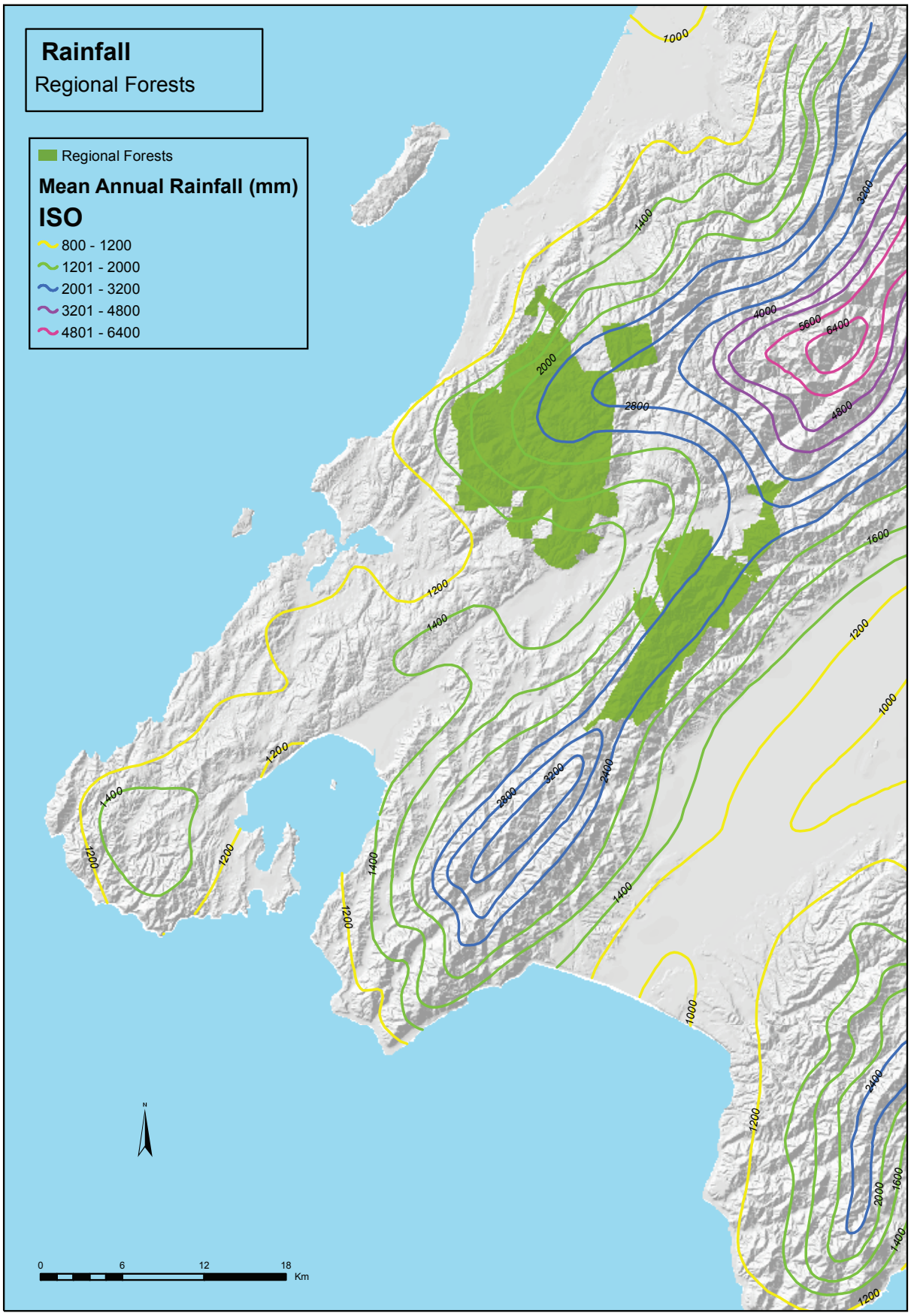
Before humans came to the region, the climate was the main determinant of changing vegetation in the region. The two main forest types currently found here, beech and podocarp/broadleaf forests, have been present in New Zealand for perhaps 100 million years (Dawson, 1993), however past ice ages have caused fluctuations in their distribution throughout this time. There have been many periods when temperatures in Wellington have been both warmer and colder than today, sometimes by as much as 4°C (Mildenhall, 1994). The warmer periods seem to be associated with higher rainfall and the cooler ones with windier weather.

More than 80,000 years ago the climate was warm, rather similar to today. Palynological studies (of ancient pollen grains and wood fragments found at depth in soil cores) show that the forest around Wellington Harbour was dominated by rimu (*Dacrydium cupressinum*) and tree ferns (*Cyathea* spp.). Northern rata (*Metrosideros robusta*) grew at Seaview (Mildenhall, 1994). The forest retreated into sheltered gullies and warm west facing slopes during the last glaciation. During this time much of the Wellington region was covered with grass and low scrub, while silver beech (*Nothofagus menziesii*) and mountain toatoa (*Phyllocladus alpinus*) were the predominant trees. When this cold period ended abruptly ended about 10,000 years ago, the forest flourished again with the gradually rising temperature.

About 7,000 years ago, another cooling phase began and the climate also became drier with more frosts and wind, conditions that led to the development of forests seen in contemporary times. Black beech (*Nothofagus solandri var. solandri*) and hard beech (*N. truncata*) – both species able to withstand cooler temperatures – slowly invaded southwards along the uplands from the Tararua and Rimutaka Ranges. Beech trees have wind dispersed seeds and slowly colonise open sunny sites, surviving on poor soils and spur crests (Druce & Atkinson, 1959; McGlone, 1988). By 2000 years ago, black beech and hard beech were replacing podocarps in forest on the south coast at Pencarrow where Lake Kohangatera lies today (Upston, 2002), but podocarp/broadleaf forest still dominated in the lowlands and in the western parts of the region.

Leaves of silver beech, black beech, hard beech

Map 2 Mean annual regional rainfall



4.2 Human impacts on the vegetation

Human induced changes to New Zealand's natural environment began after Polynesians settled about 1000 years ago. There is evidence of major fires throughout the country, most occurring roughly 750 years ago and leading to extensive deforestation (McGlone, 1989). According to the accounts of early European settlers, however, the hill country and much of the valley floors around Wellington appear to have suffered little of this loss, although Maori did have localised cultivations. The Miramar Peninsula and the hills of Mt Victoria were the only large areas where forest cover was absent. This deforestation is attributable to Maori because it is known that 8000 years ago a dense podocarp forest grew at Miramar (Mildenhall, 1993).

So, at the beginning of the 19th Century the hills of Makara, Karori and Belmont were still covered in podocarp/broadleaf forest whose genera included: *Dacrydium, Metrosideros, Beilschmiedia, Dysoxylum, Prumnopitys, Nestegis, Alectryon, Streblus, Knightia, Pennantia, Elaeocarpus and Weinmannia* (Druce & Atkinson, 1959; Park, 1999). With its dense understorey and many vines, this forest was depicted in photographs and paintings of the era (Angas, 1847). In contrast to the western hills, the Akatarawa uplands and the Tararua and Rimutaka Ranges were dominated by beech forest. The reasons for this pronounced difference in forest type have long been a matter of local scientific speculation. Soil differences are likely to be involved.

Early in 1840 the first European settlers landed on the beach at Petone and, needing wood for building and for fuel, immediately began to fell the forest (Oliver & Williams, 1981). Within a few years much of the floodplain forest was gone, replaced with introduced pasture grasses and plantation trees, although the less accessible hill country retained at least some natural cover.

Both Akatarawa and Pakuratahi Forests contain a mix of vegetative cover which includes areas of little-modified natural vegetation, native forest that have been affected by forestry, fires or other human-induced processes, and areas of exotic vegetation. The distribution of vegetation types, and in particular significant plant communities or species, in each forest is described in the individual sections later in this document.

5. Fauna

5.1 Birds

The diversity of birdlife found in the Wellington region today reflects the extensive changes that have occurred in the area since the arrival of European settlers. A number of forest and wetland bird species have become extinct in the region since that time.

Rifleman

Whitehead

Tomtit

A number of forest and wetland bird species have become extinct in the region since that time. These include: North Island saddleback (*Philesturnus carunculatus rufusater*), New Zealand thrush (*Turnagra capensis tanagra*), robin (*Petroica australis longipes*), North Island kokako (*Callaeas cinerea wilsoni*), North Island weka (*Gallirallus australis greyi*), stitchbird (*Notiomystis cincta*), banded rail (*Rallus philippensis*), little spotted kiwi (*Apteryx owenii*) and huia (*Heteralocha acutirostris*). Native birds that remain are much depleted in number and many are now confined to the large tracts of forest in the ranges in the northern and eastern parts of the region, including Akatarawa and Pakuratahi Forests. These include kaka *(Nestor meridionalis septentrionalis*), rifleman (*Acanthisitta chloris granti*), whitehead (*Mohoua albicilla*), long-tail cuckoo (*Eudynamys taitensis*) and tomtit (*Petroica macrocephala toitoi*). However, these birds are no longer seen or heard in the smaller remnants of bush in farmland or in the urban areas of Wellington.

5.2 Freshwater fish

The Wellington region has 23 native species and 8 introduced species of freshwater fish (Strickland & Quarterman, 2001). The native grayling (*Prototroctes oxyrhynchus*) became extinct after Europeans arrived. With the exception of eels and lamprey, native species are small (most are less than 200 mm long) and they tend to be solitary, nocturnal and secretive (McDowall, 2000). The most common fish are redfin bullies (*Gobiomorphus huttoni*). Records of freshwater fish in the region have been kept for more than 40 years, but until recently sampling has been sporadic and sampling sites have tended to be in the lower and middle reaches of river systems.

Populations of native fish in the region are likely to have been compromised by a number of factors affecting waterways – natural and built barriers, modification and degradation of waterways, and introduction of competitiors and predators.

Natural and built barriers (dams, weirs and culverts) can prevent some species from migrating between fresh and saltwater to complete their lifecycle. Five of these migratory species contribute to the dwindling whitebait fishery. Some, like the koaro (*Galaxias brevipinnis*), are excellent climbers when young and can climb significant barriers to reach well into stream headwaters. Less agile species like banded kokopu (*G. fasciatus*) and inanga (*G. maculatus*) can however be prevented from getting upstream. This limits the amount of habitat available to those species and may limit the potential population size and also therefore, the numbers spawning and migrating. Some landlocked species have adapted to life above a barrier and now complete their lifecycle in lakes and reservoirs.

The modification and degradation of streams and stream margins pose a range of problems for native fish. Many spawn amongst forest litter in podocarp/broadleaf forest along stream margins when these are wetted by high flows (McDowall, 2000). Others spawn in grass along stream margins in estuaries. Today much of this habitat has been degraded by deforestation and urbanisation. Many streams no longer enter the sea through an estuary but have been redirected through pipes. River systems below dams and weirs no longer experience as much flow variation as they used to. River systems that remain unmodified and have their headwaters in native forest have become rare and it is important to protect them.

The brown trout (*Salmo trutta*) is the only exotic fish widespread in the Wellington region's rivers. First successfully introduced to New Zealand in 1867, this moderately sized fish is now found throughout most of the country's freshwater systems. It is thought to both significantly predate and compete with a number of nature fish species (McDowall, 1990).

Forest gecko

Common skink. Photo: Nic Gorman

5.3 Lizards

There are at least 11 species of lizard in the Wellington region (seven skinks and four geckos) (Parrish, 1984). As with bird species, habitat loss and predation by introduced mammals have affected lizard populations, and a number of species are now restricted to offshore islands or small isolated populations while others are regionally extinct. However four skinks and three geckos are still thought to be reasonably widespread in the region. Common (*Oligosoma nigriplantare polychroma*), brown (*O. zelandicum*) and copper (*Cyclodina aenea*) skinks generally prefer open or scrub country with some vegetation cover, but can occur in small patches of such habitat including clearings or river terraces. The ornate skink (*Cyclodina ornata*) and green (*Naultinus elegans punctatus*) and forest (*Hoplodactylus granulatus*) geckos can all occur in extensive forest areas, so are likely to be present at least in parts of the Akatarawa and Pakuratahi Forests. The common gecko (*H. maculatus*) uses a wide range of habitats, but in these forests is most likely to be found around forest margins and river terraces.

5.4 Invertebrates

New Zealand's invertebrates have not been well studied and little is known about species or their distribution. However, because most native invertebrates live in forests they are likely to have suffered from the effects of habitat loss and predation by introduced mammals.

A diverse community of aquatic invertebrates can be found in fast-flowing streams and rivers. These include the nymphs or larvae of insects that develop into terrestrial adults, such as mayflies, stoneflies, caddisflies and midges, as well as worms, snails and others that live their entire life-cycle in water. As each of these invertebrates have different tolerances to pollution levels, a Macro-invertebrate Commuity Index (MCI) has been developed which uses the presence or absence of various species, genera or families to provide a measure of water quality. At stoney riffle sites, only extremely polluted sites score less than 50, while an MCI score greater than 120 indicates pristine water quality (Stark, 1985; 1993).

6. Ecosystems classification and environmental protection

6.1 Ecosystems classification – the LENZ classification

One of the goals of the Wellington Regional Council Forest Lands Management Plan is to protect and enhance native ecosystems within the region's forests. This 'ecosystem' approach reflects the fact everything is interconnected and processes that occur in an ecosystem are as important as the species living within them. Defining an ecosystem

is not simple because ecosystems generally lack concrete boundaries and biological communities are complex, with continuous variation across landscapes. Ecological districts and regions across New Zealand were defined in the late 1980s using landscape and ecological patterns. Forest Parks covered by this document are located within the Tararua ecological district which covers the Akatarawa, Tararua and Rimutaka ranges. It is characterised by the steep, dissected hills of greywacke parent material, gale-force westerlies and severe erosion, particularly in the Rimutaka Range.

A recently developed numerical approach to ecosystem classification – the Land Environments of New Zealand (LENZ) classification (Ministry for the Environment, 2003) – is used to guide management of parks in the Wellington region. Under the LENZ approach, ecosystem patterns are mapped according to 15 environmental drivers, combining climate, landform and soil variables such as temperature, solar radiation, water supply, slope, soil drainage, soil fertility etc. While the environmental drivers in LENZ were chosen primarily because of their importance for tree species growth, they are also useful for depicting the distribution of other organisms. LENZ has defined and mapped these 'environments' at different scales throughout New Zealand. At its most detailed scale of 500 environments, thirteen occur in Wellington's regional forests.

6.2 Impacts of introduced pests

Possums (*Trichosurus vulpecula*), goats (*Capra hircus*), mustelids (*Mustela* spp.) and rats (*Rattus* spp.) have major impacts on the ecological values of the forest. Pigs (*Sus scrofa*), deer (*Cervus* spp.) cats (*Felis catus*), mice (*Mus musculus*), rabbits (*Oryctolagus cuniculus*), hares (*Lepus europaeus occidentalis*), hedgehogs *(Erinaceus europaeus*) and magpies (*Gymnorhina tibicen*) are also contributors to the decline of native flora and fauna. Possums eat leaves, seeds, fruit and seedlings of plants and are also known to predate native birds and insects. Possum damage varies between plant communities as possums often target certain preferred food sources such as kohekohe (*Dysoxylum spectabile*), rata and tawa (*Beilschmiedia tawa*) (Pekelharing, 1995). Possums have been present in the Wellington region since the late 19th century, causing great damage to vegetation as their population rapidly increased in the decades immediately following their introduction. The vegetation change is now more gradual, but ongoing impacts can be seen where possums are not controlled. Goats browse forest and shrubland seedlings. They prefer particular species such as wineberry (*Aristotelia serrata*), pate (*Schefflera digitata*) and fuchsia (*Fuchsia excorticata*), the early colonisers of slips. They are also capable of removing much of the forest understorey. This browsing hastens erosion of steeper slopes, weakens forest structure and inhibits natural regeneration processes. Mustelids and rats prey on birds, invertebrates and lizards.

Pest plants have the potential to significantly change the composition or structure of native habitats. Many climbing pest plants, such as Old Man's Beard (*Clematis vitalba*) and ivy (*Hedera helix*) can smother mature plants, while other plant pests interfere with regeneration and compete with indigenous plants for space and nutrients.

6.3 Pest control and ecological restoration

Greater Wellington undertakes management of animal and plant pests at both Akatarawa and Pakuratahi Forests. Priority species and control methods differ between the forests so are detailed separately in the individual forest sections, along with ecological monitoring and restoration regimes.

Akatarawa Forest

Physical Environment

1. Topography, geology and landforms

1.1 Lower lying topography

Akatarawa Forest (15,423 ha) covers hill country north of the Hutt River between Upper Hutt and Paraparaumu on the Kapiti coast. The forest is the largest of Greater Wellington's forest and water collection areas, though in general it lies lower in altitude and has an easier topography. Wainui No 2 trig (722 m) is the forest's highest point, rising 622 m from the confluence of the Hutt and Akatarawa Rivers, (see Map 3).

Over 70% of the land is classed as moderately steep (21–35°), with around 20% classed as rolling to strongly rolling (8–20°).

Five peaks covered in indigenous forest form a 'dress-circle' on the western, northern and eastern boundaries of the park. Below these peaks, a sequence of rounded summits (all close to 450m in height) contrast with the forest's many deeply incised valleys. The southernmost of these hills has been converted to exotic plantation forests but those in the interior of the forest remain in native cover.

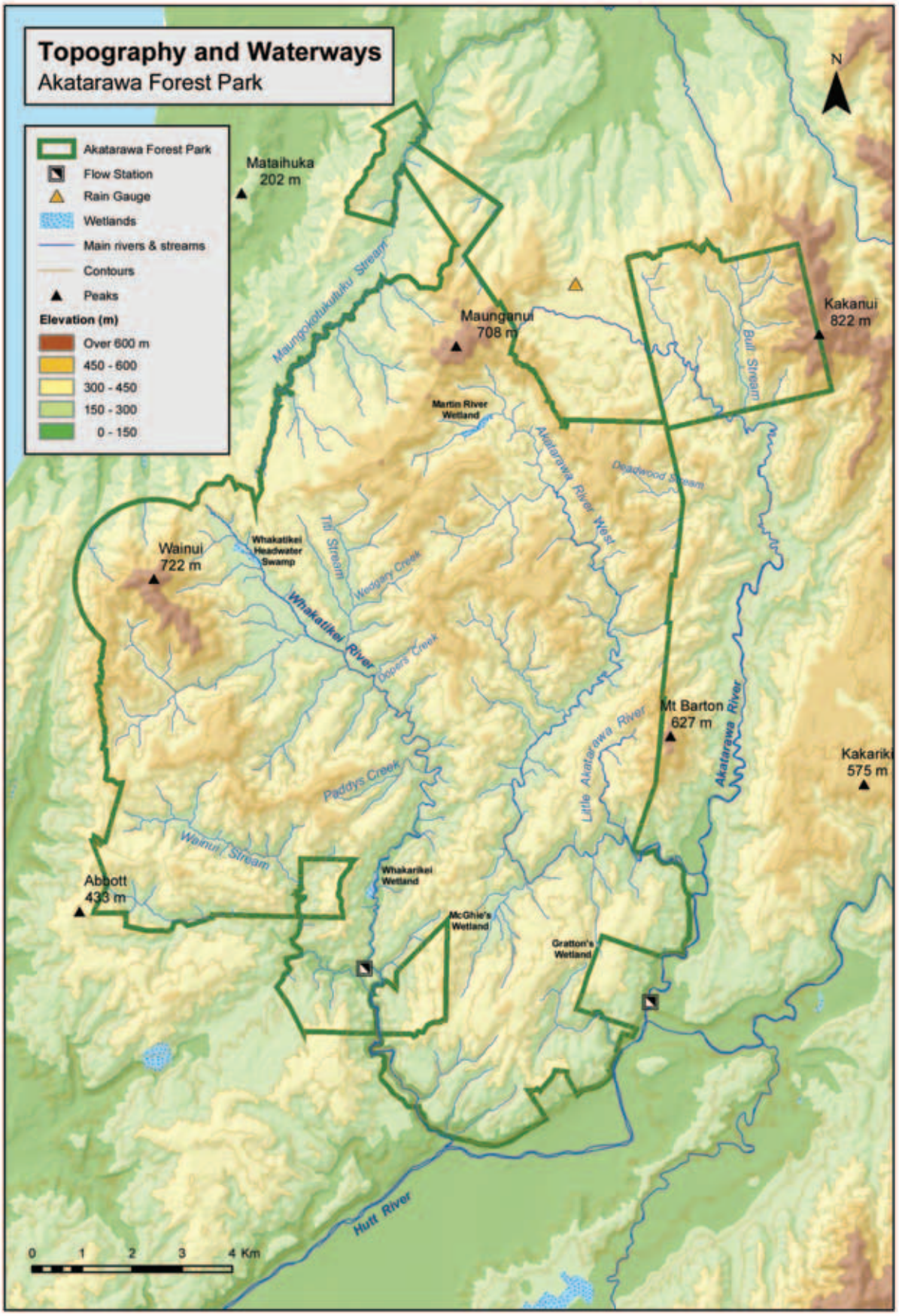
The park has three major catchments formed by the West Akatarawa and Whakatikei rivers, and Maungokotukutuku Stream. The West Akatarawa and Whakatikei are the larger of the three catchments, and both exit the forest to join the Hutt River, which flows a further 30km before reaching Wellington Harbour. Maungokotukutuku Stream, which rises on the northwest slopes of Titi and Maunganui, forms the forest's western boundary. This stream exits the forest to the north, joining the Waikanae River 7km from the west coast.

View across Akatarawa Forest with the more rugged Hutt Water Collection Area in the background. Photo: Robin Blake

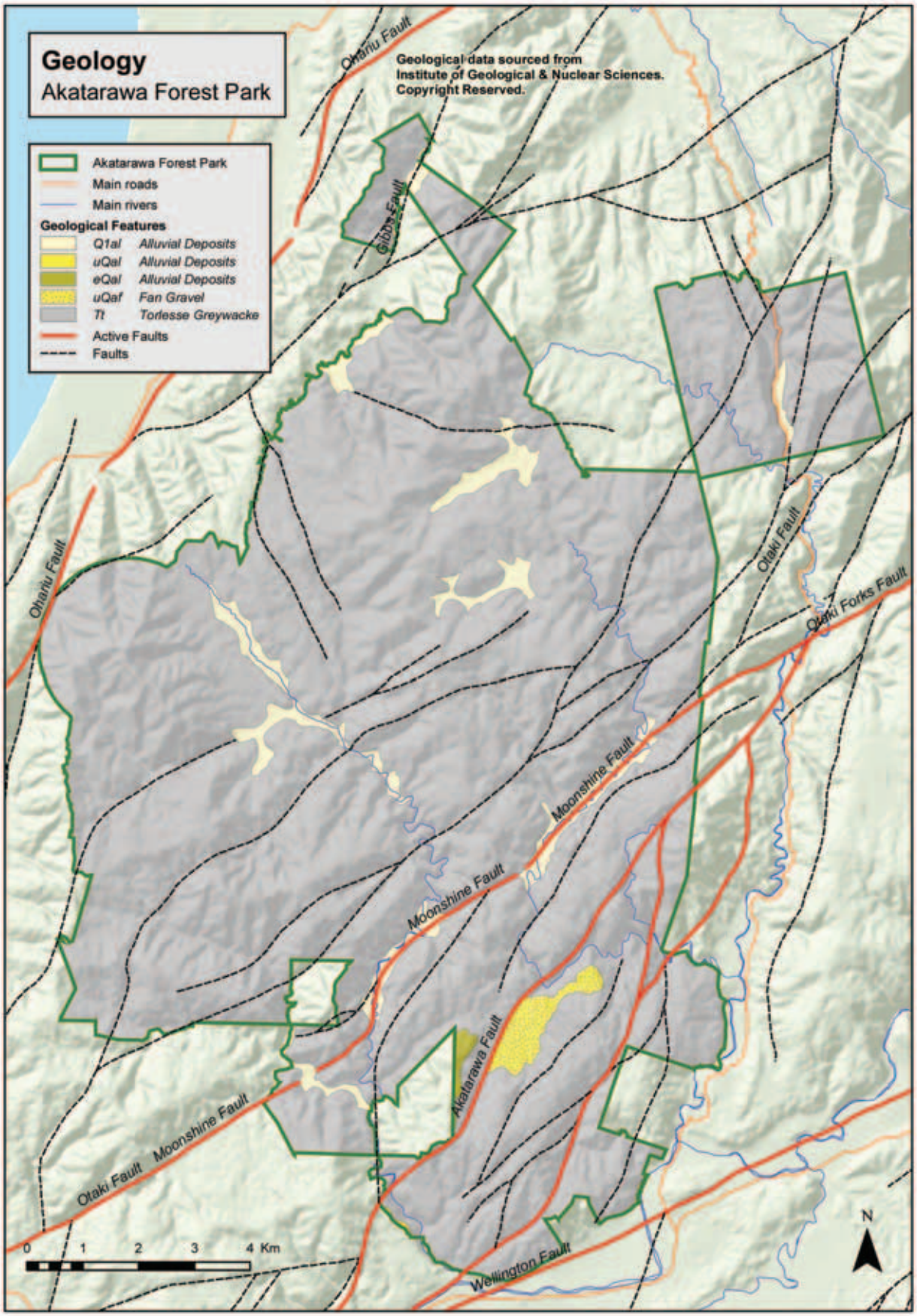
1.2 Ancient greywacke

Torlesse greywackes about 190 million years old lie under the forest (Begg & Mazengarb, 2000). The greywacke was laid down in horizontal layers, then folded and uplifted by tectonic activity so that some strata are now near vertical. Fault lines tend to follow the direction of bedding planes (Henderson, 1929), as shown in Map 4.

Map 3 Akatarawa Forest topography and waterways



Map 4 Akatarawa Forest geology



1.3 Fault-controlled rivers within Akatarawa Forest

Akatarawa Forest lies between two of the Wellington region's four main active fault lines: the Wellington fault to the south, and the Ohariu fault to the north. Like the Wairarapa and Pukerua faults, they are many tens of kilometres long, and all run roughly parallel to each other with an overall northeast trend (McConchie *et al.*, 2000). The active Moonshine Fault runs through the forest under parts of the Whakatikei River and West Akatarawa River. Splinters from the Wellington fault also pass through the forest, joining the Moonshine at the Akatarawa River. Many faults run through the area roughly parallel to these. The valleys are steep sided and generally V-shaped except where well-sorted floodplain gravels (alluvial deposits) fill the riverbeds. The park's drainage pattern closely follows the many fault lines, with many streams aligned northeast–southwest. The remainder cut through at right-angles, possibly following the lines of small splinter faults.

The Whakatikei River bisects the forest from northwest to southeast until it reaches the Moonshine Fault where it turns due south. The Akatarawa River also flows due south just outside the forest boundary. Its west branch flows northwest–southeast until, like the Whakatikei, it changes course to follow the Moonshine fault.

1.4 Peneplain remnants covered in loess

Akatarawa Forest's flat or gently sloping hilltops contrast with its steeply sloping valleys. Akatarawa's hilltops are at roughly the same elevation as other hills in the region. This 'summit accordance' is evidence of the ancient peneplain described above. Known locally as the 'K-surface' (Cotton, 1957), Wellington's peneplain remnants extend from the south coast to the Tararua Range on the western side of the Wellington fault (Begg & Mazengarb, 1996).

Loess deposited during the last glacial periods covers these hilltops. This has been dated using layers of volcanic ash within the loess. Loess is characterised by an even-grained texture and yellow-grey or light grey colouration (Turner, 1985). The free draining nature of the material means that it often develops column-like vertical jointing. Five distinct layers have been named: Ohakea (14,000-24,000 years old); Rata (30,000-60,000 years old); Porewa (65,000-80,000 years old); Marton (140,000 years old); and Burnand (180,000 years old) (Begg & van Dissen, 1998; Berryman, 1990).

1.5 The impact of glacial periods

Climatic conditions during glacial periods caused gravel to be moved down from the upper slopes of the catchments. Some of this debris (known as Kaitoke gravels) was stored in the riverbeds while more filled the basins of the Hutt Valley, Upper Hutt, Te Marua and Pakuratahi catchments. Remnants of river terraces from this time have been preserved near the confluence of the Whakatikei and Hutt Rivers (at Craigs Flat) and the Akatarawa and Hutt Rivers (Emerald Hill). Tectonic movement on the western side of the Wellington Fault has lifted these terraces up to 150 m above the current bed of the Hutt River (Begg & Mazengarb, 1996). The terraces have been dated by identifying the coverbeds of loess above the gravel (Berryman, 1990).

2. Soils of Akatarawa Forest

Akatarawa Forest soils lie on a mixture of rolling hills and steeplands and are derived from both loess and greywacke parent materials. The soils described below and their distribution is shown in Map 5. Soil descriptions below here are from Bruce (2000), while a more general description on the relationship between soils and landscapes in the Wellington region can be found in Molloy (1998).

The dominant soils are the **Ruahine** series. These brown soils occur over roughly 50% of the area, commonly at elevations between 300m and 600m under podocarp/broadleaf forest. These soils have a thin and stony profile developed in greywacke and associated slope deposits. Typically, dark brown silt loam topsoil lies over a subsoil of dark yellowish-brown stony silt loam.
NZSC: *Typic orthic brown soils.*
NZG: *Steepland soil related to yellow brown earths.*

Belmont, Ngaio and **Judgeford** series soils have developed on loess. Of the three, Judgeford soils are the most versatile (have good production values) occurring on the north-west facing slopes above the West Akatarawa River valley where the river runs along the Moonshine fault.

Belmont series
NZSC: *Allophanic Firm Brown Soils.*
NZG: *Yellow brown earths.*

Ngaio series
NZSC: *Pedal immature pallic soils.*
NZG: *Yellow grey earths.*

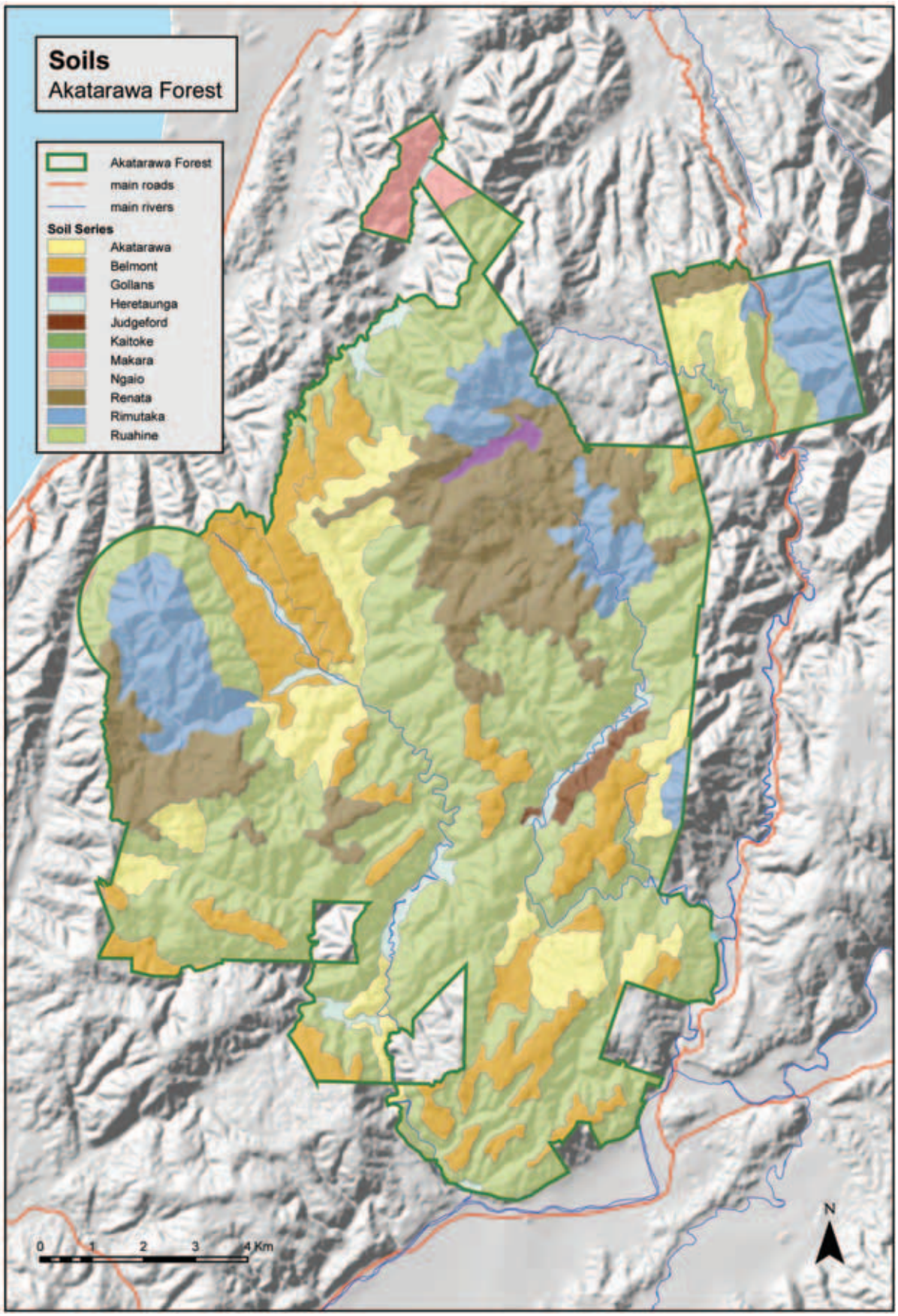
Judgeford series
NZSC: *Acidic-allophanic Firm Brown Soils.*
NZG: *Yellow-brown earths*.

Renata series soils develop in weathered loess over weathered greywacke on the crests of rolling and hilly spurs and ridges on Deep Creek Plateau and to the south of Wainui No 2. These soils have low natural fertility, low pH and an iron pan below the topsoil. They are imperfectly drained and liable to erode should vegetation be removed.
NZSC: *Peaty-silt-mantled Perch-gley Podzol.*
NZG: *Podzol, weakly to moderately gleyed.*

Akatarawa soils occur on rolling hilly land above 300m. They develop in weathered greywacke and related slope deposits. These shallow soils (approximately 25 cm) have a thin dark greyish brown, silt loam surface horizon on a yellowish brown, stony, silt loam subsoil. Structures throughout are only weakly developed.
NZSC: *Typic Orthic Brown Soils.*
NZG: *Steepland soil related to yellow-brown earths.*

The soils of the **Rimutaka** series are imprecisely known. Found on the highest ridges, these brown soils have developed on steep to very steep slopes of greywacke and associated slope deposits. A thin organic horizon covers a dark reddish brown silt loam with 10% or less clay. The stony subsoil is a yellowish brown silt loam.
NZSC: *Humose orthic brown soils.*
NZG: *Yellow brown earths, weakly podzolised.*

Map 5 Soils of Akatarawa Forest



Heretaunga soils are found along much of the river flats. They develop in fine alluvium over rounded gravel on river terraces and fans. The loam may be stony in places with weakly developed surface horizons and subsoil.
NZSG: *Typic Firm Brown Soils.*
NZG: *Yellow-brown earths.*

Gollans soils have developed in the headwaters of the Akatarawa River West in an area known as Martin's River swampland. Here silt or clay loam overlies grey clay loam subsoils and the water table is usually within 35 cm of the surface.
NZSG: *Typic Acid Gley Soils.*
NZG: *Gley Soils.*

3. Climate in the Akatarawa Forest

The climate in Akatarawa Forest is not as extreme as other high country areas managed by Greater Wellington. Nevertheless, it remains a wet and windy place on the hilltops, with sheltered pockets in some valleys.

The forest's hills are the first to be hit by the region's predominant mid-latitude westerly winds as they flow inland from the coast. This airflow is often turned to the south to become a 'nor'wester'. However, when the wind is strong enough it flows up and over the hills, accelerating to gale force on the downslope of the hills (Brenstrum, 1998). Such gales have a marked effect on the ridge and upper slope vegetation of the forest's main western ridge. The area is also exposed to southerly winds, more frequently in the winter. These can dump high concentrations of salt, damaging vegetation and influencing soil nutrient levels (Blakemore, 1953; Claridge, 1975 & Gabites, 2003).

Most rainfall in these catchments occurs when a west/northwest wind arrives from the coast. The duration may vary from a few hours to several days (Dickson, 1986). Annual rainfall in the Akatarawa Valley varies from 1800–2400 mm and in the Whakatikei Valley from 1700–2000 mm. No rainfall figures are available for the upper catchments. Rain falls on average 176 days a year, compared with 125 rain days at Kelburn (Salinger, 2000).

4. Waterways

Akatarawa Forest encompasses the headwaters of three rivers: the West Akatarawa, the Whakatikei and the Maungakotukutuku. The first two drain into the Hutt River and the third into the Waikanae River. They are all gravel-bed rivers that arise in the north of the forest.

Maungakotukutuku Stream, the smallest of the three, has no named tributaries. The Whakatikei drains the higher land to the west of the forest, while tributaries of the West Akatarawa drain the east of the forest. These two catchments are roughly similar in size and shape.

Whakatikei River

Rainfall in these catchments is measured at Warwicks (500 m above mean sea level) near the road on the forest's northern boundary. Rain falls throughout the year and both catchments have a pattern of low rainfall and flow in the summer and autumn with peaks in winter and spring (June–July and October). Flow closely matches rainfall, as can be seen in Figures 1 and 2. Both rivers respond quickly to rain due to the steep nature of the landform.

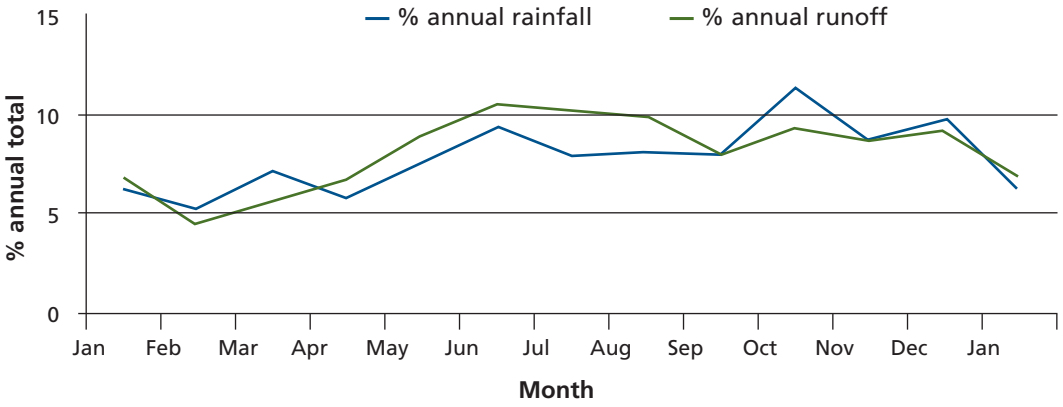


Figure one: A comparison of rainfall at **Warwicks** (mean annual rainfall 2312 mm) with the Akatarawa River regime at Cemetery (mean annual flow 5.04 m3/sec).

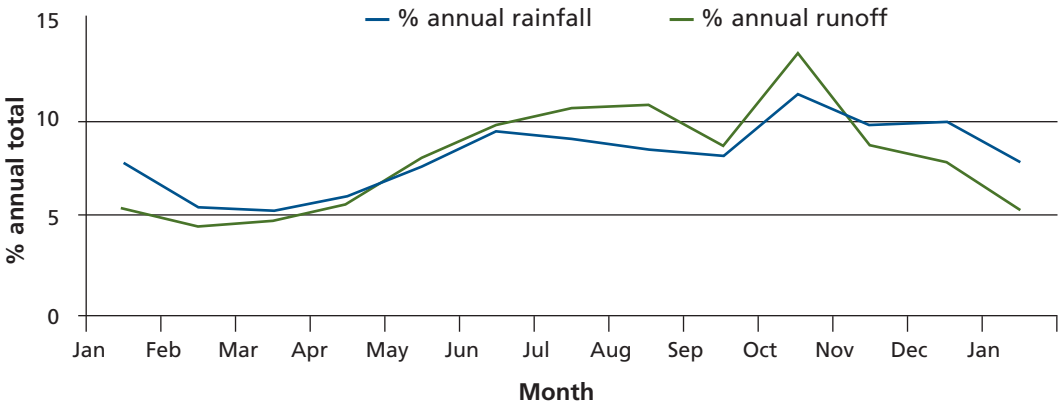


Figure two: A comparison of rainfall at **Blue Gum Spur** (mean annual rainfall 1930 mm) with the Whakatikei River regime at Dude Ranch (mean annual flow 1.82 m3/sec).

West Akatarawa River from McGhie's Bridge. Photo: Robin Blake

At present there is only one permit for water abstraction for horticulture.

Water quality in the Akatarawa River is good, with mean Macroinvertebrate Community Index values ranging from 121 to 140 between 1999 and 2003 (Milne & Perrie, 2005). The stretch of the Akatarawa River tested includes small areas in horticulture and pastoral farming.

Testing of the Whakatikei River's water quality began in September 2003 at a site at Riverstone, near the confluence with the Hutt River. MCI data collected here to date has ranged from 112-151, suggesting water quality is moderately to very good. This catchment has extensive exotic conifer plantation forest, the balance of the catchment being in native vegetation. Erosion from plantation forests may cause pollution as there is a window from harvesting until new trees are eight years old when silt may wash into waterways (Hicks, 1995).

Biodiversity

5. Flora

5.1 Vegetation of the Akatarawa Forest today

Photo Kamahi. Photo: G.Crowcroft

Hinau

Tawa

Ancient rata tree. Photo: Robin Blake

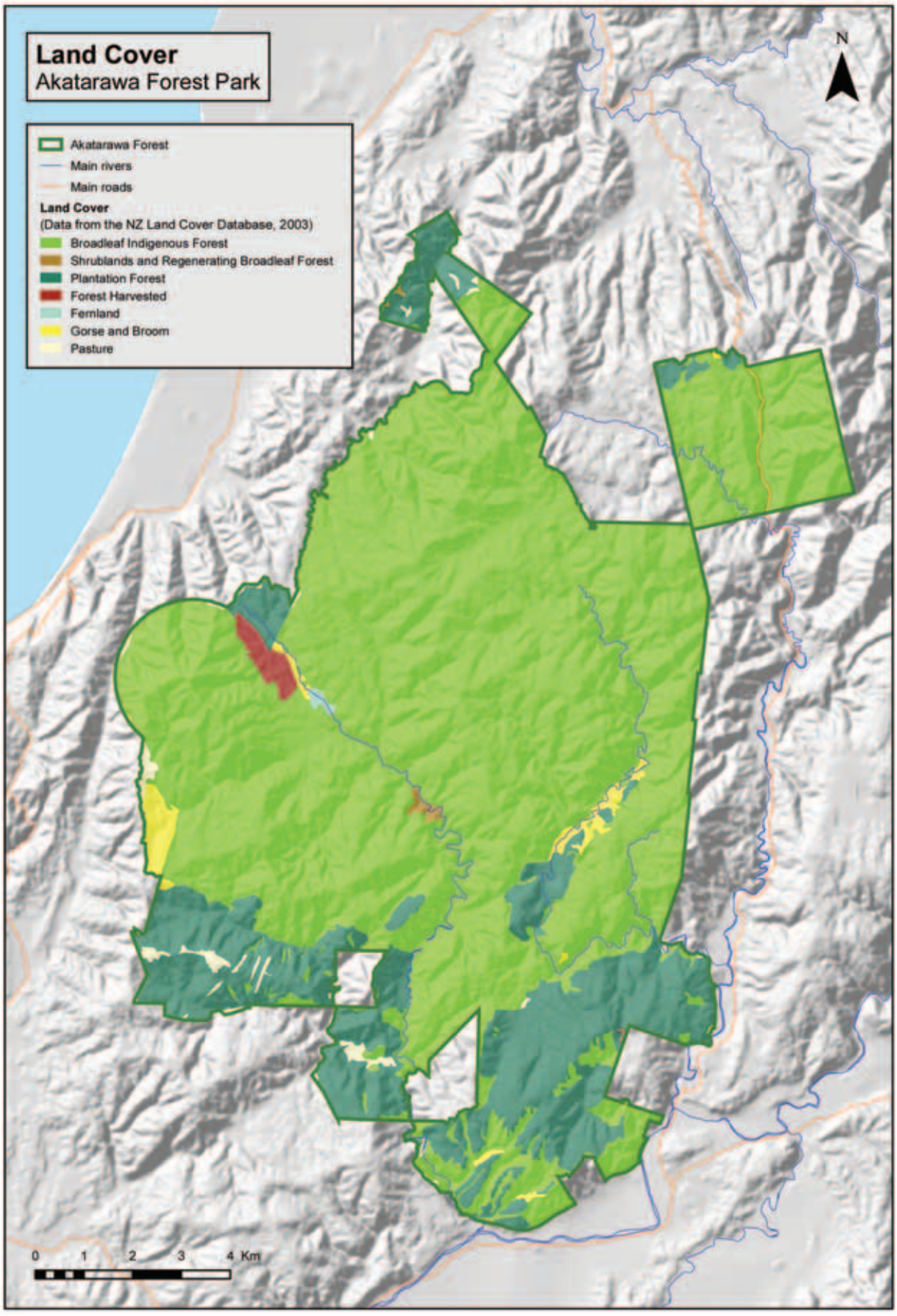
When nineteenth century European settlers arrived in the region, they found the Akatarawa hills covered by a pristine forest that had not been touched by Maori. Much of the area was covered with podocarp and broadleaf forest, while higher up, tree cover graded into beech forest as soil fertility, temperature and other climatic factors changed with altitude.

Tawa (*Beilschmiedia tawa*) would have been the dominant tree species up to 400 m, with rimu (*Dacrydium cuppressinum*) and northern rata (*Metrosideros robusta*) towering above the canopy. Above 400 m, kamahi (*Weinmannia racemosa*) and hinau (*Elaeocarpus dentatus*) made up the bulk of the canopy trees, while above 550 m northern rata, rimu and hinau were replaced by Hall's totara *(Podocarpus hallii*) and miro (*Prumnopitys ferruginea*) above a canopy of kamahi. This wet forest was full of liverworts, ferns and lichens. Hard beech (*Nothofagus truncata*) was present at some sites, usually on poorer soils or interspersed within the rata-rimu hinau kamahi forests.

In today's Akatarawa hills, pockets of this original vegetation remain in places that loggers could not reach, but the remainder was modified by the logging of selected timber trees that occurred throughout the early 1900s.

Of Akatarawa Forest's 15,423 ha, about 3,000 ha is planted in exotic pine forest, while about 290 ha of pasture is also located within the exotic forests. The indigenous forest has regenerated since the end of logging, and according to the latest version of the LENZ Landcover Database (Ministry for the Environment, 2003), around 8,300 ha is in indigenous forest, and a further 4,000 ha is mapped as indigenous scrubland (see Map 6). This mosaic of forest and shrubland has created a variety of habitats and provides for a high diversity of bird and insect life (Parrish, 1983). Importantly, the forest is linked to a larger stretch of forest in the Tararua and Rimutaka ranges. As such it is a valuable example of mature and regenerating forest that demonstrates successional trends for both selectively logged and clear-felled areas.

Map 6 Land cover of Akatarawa Forest



5.2 Indigenous forest

The most readily accessible rimu, matai (*Prumnopitys taxifolia*), totara (*Podocarpus totara*), kahikatea and miro were extracted from the Akatarawa Forest during the late 19th century. Logging began around the Karapoti Gorge in the early 1900s and trams were pushed as far as Hukinga. Various parts of the Akatarawa Forest continued to be logged until the 1960s, and some northern rata was taken for firewood in the 1970s.

The removal of the original canopy species exposed the remaining forest to wind, increased light and frost, changing the species composition of the forest (WRC, 1996). Animal browse, combined with exposure to wind killed many rata trees within the forest. Palatable species, such as broadleaf (*Griselinia littoralis*) and fuchsia (*Fuchsia excorticata*) were much reduced due to the browsing pressure of ungulates and possums. The pockets of remnant vegetation that were left include the tops of Mt Wainui and Mt Maunganui, and an area of untouched rimu/rata/beech forest in the upper gorge of west Akatarawa. The diversity of microclimates and soil types within the Akatarawa Forest reflect the vegetative diversity found within the area. The more fertile soils of the rolling hills and valley floors produce a very productive forest that supports higher densities of flora and fauna than beech forests.

5.3 Significant vegetation

The most significant vegetation is mostly found in the northern half of Akatarawa Forest (in West Akatarawa, Whakatikei, Maungakotukutuku and the Akatarawa Saddle). However, the whole of the indigenous forest has significant values because of its large size and the high diversity of vegetation that provides an excellent food source for birds. The sites of original vegetation include:

Forest Floor

Brachyglottis kirkii

Mt Wainui: tawa, rimu, rata and hinau are found on the lower slopes of Mt Wainui, while kamahi becomes dominant as altitude and moisture increases (Gabites, 1993). The summit of Mt Wainui is high enough for cloud forest, which can be found above 550 m. Here, one of the few regional examples of montane miro-kamahi forest can be seen (Wellington Regional Council *et al*., 1984). The rare *Raukaua edgerleyi* is present, as are numerous filmy ferns (*Hymenophyllum* spp.) and Hall's totara. The association of Hall's totara and kamahi is found on only two peaks in the local Wellington region. Above the treeline is a subalpine association which includes bush tussock and *Astelia* spp.

Mt Maunganui: the summits of Mt Barton and Mt Titi fall just outside Greater Wellington's boundaries, but all three summits have similar associations to those on Mt Wainui. They provide a rich, relatively undisturbed habitat for birds and invertebrates (Wellington Regional Council *et al*., 1984).

Deep Creek Plateau: this highland plateau remained unlogged because it was inaccessible. The emergent tree species here are red beech (*Nothofagus fusca*), rimu and miro, with some rata and kamahi. The rare Kirk's tree daisy (*Brachyglottis kirkii* var. *kirkii*) has also been found here. Deer and goat browse, especially that which occurred between the 1950s and 1970s, has lowered the numbers of palatable species (Blake, 2001).

Akatarawa Saddle: an unlogged portion of rimu/rata forest remains in the Akatarawa River Gorge to the west of Akatarawa Road. This 250 ha piece of lowland forest represents forest communities that were once common in the local Wellington region.

5.4 Wetlands

Akatarawa Forest has several wetlands. The composition of these wetlands is shown in Table 1.

Table 1 Wetlands of Akatarawa forest

Wetland	Floral composition
Martin's River ephemeral wetland	Kahikatea, swamp coprosma, carex species, sedges, small divaricating shrubs
Whakatikei Headwaters marsh	Raupo, carex species, toetoe, kahikatea on fringes
Draper's Flats wetlands	Raupo, carex species, ferns
Valley View ephemeral wetland	Manuka, spaghnum moss

Drapers Flats wetland

5.5 Plantation forestry

In the 1930s, when indigenous logging was still underway, a variety of exotic species were interplanted among regenerating native trees at Hukinga. These species included Lawson's cypress (*Chamaecyparis lawsoniana)*, Monterey cypress or macrocarpa (*Cupressus macrocarpa*), western red cedar (*Thuja plicata*), Japanese cedar (*Cryptomeria japonica*) and Douglas fir (*Pseudotsuga menziesii*). Interplanting trials continued until 1958, when radiata pine (*Pinus radiata)* became the main species planted, with some macrocarpa also used. In the early 1970s, Valley View and Puketiro on the southern and eastern boundaries of the Akatarawa block, were purchased. These lands had been farmed and were used by the regional council to plant exotic forests, mainly in radiata pine. These forests are now the main plantation forestry areas on council land.

6. Fauna

6.1 Birds

All of the native bird species still surviving in the wild in the Wellington region have been recorded in Akatarawa Forest, including kaka (*Nestor meridionalis septentrionalis*) which were still present in the Deep Creek Plateau area in the 1960s. Akatarawa Forest is regarded as a site of special wildlife interest and is ranked as a moderate value forested site (Parrish, 1984).

6.1.1 Surveys of bird species

Annual bird monitoring has not been undertaken in the Akatarawa Forest. Some distance sampling of bellbird (*Anthornis melanura*) and whitehead (*Mohoua albicilla*) has been trialed, but most bird data has been collected during other monitoring activities, such as vegetation plot re-measurements. Yellow-crowned parakeet (*Cyanoramphus auriceps*), kereru (*Hemiphaga novaeseelandiae*), fantail (*Rhipidura fuliginosa placabilis*), bellbird, grey warbler (*Gerygone igata*), long-tailed cuckoo (*Eudynamus taitensis*), tui (*Prosthemadera novaeseelandiae*), tomtit (*Petroica macrocephala toitoi*), silvereye (*Zosterops lateralis*), morepork (*Ninox novaeseelandiae*), whitehead, black shag (*Phalacrocorax carbo*), falcon (*Falco novaeseelandiae*), kingfisher (*Halcyon sancta vagans*) and gulls (*Larus* spp.) have been recorded. Exotic bird species include chaffinch (*Fringilla coelebs*), blackbird (*Turdus merula*), spur-wing plover (*Vanellus miles novaehollandiae*) and magpie (*Gymnorhina tibicen*). The large variety of indigenous vegetation types found within the Akatarawa Forest create a mosaic of food sources for bird species and the variety and abundance of bird species seen reflects this.

Bellbird

Falcon

Kereru. Photo: Department of Conservation

Kakariki

Tui. Photo: Department of Conservation

Giant kokopu

Banded kokopu

6.2 Freshwater fish

Most fish surveys completed in Akatarawa Forest rivers and streams have been completed outside the boundaries of the Akatarawa Forest. However, given that suitable habitat for these species exists upstream from the survey sites and that there are few barriers to fish passage in these catchments, it can be assumed that species found at survey sites are also present in forest waterways. Surveys have been completed in the Akatarawa and Whakatikei rivers, Bull Stream, and some streams inside the Akatarawa Forest (NIWA fish database, Blake, 2000). Eleven species of fish have been identified in Akatarawa waterways, including dwarf galaxias (*Galaxias divergens*) (Strickland & Quarterman, 2001). Banded (*G. fasciatus*) and giant kokopu (*G. argenteus*) are also present (both of these species have declined nationally in range and abundance as a result of habitat degradation). Koaro (*G. brevipinnis*), another galaxid species, has been observed taking an insect from the surface of the water (Blake 2001).

Four species of bully (Gobiidae) family have been found. These are the common (*Gobiomorphus cotidianus*), bluegill (*G. hubbsi*), redfin (G. huttoni) and Cran's bullies (G. basalis). All but the Cran's bully are diadromous (fish that migrate between fresh and saltwater). Torrentfish (*Cheimarrichthys fosteri*) and lamprey (*Geotria australis*), as well as fresh water crayfish (*Paranephrops planifrons*) are also present. Eels (both long-finned, *Anguilla dieffenbachii*, and short-finned, *A. australis*) were once common in Akatarawa Forest, but their numbers were depleted by commercial fishing in the 1970s and 1980s. Brown trout (*Salmo trutta*) are the only exotic fish known to be in the Akatarawa forest waterways.

6.3 Lizards

No recordings of lizard species have been made in Akatarawa Forest, but it is likely that the three gecko species and both *Cyclodina* skinks described in the introduction are present at least in scattered populations. The two *Oligosoma* skinks may occur in clearings, riverbeds or historically modified areas.

6.4 Invertebrates

No studies of invertebrates have been completed in Akatarawa Forest, but common insects such as cicada and stick insects have been noted. The presence of the predatory snail *Wainui urnula* has also been recorded.

Environmental Management & Land Uses

7. Ecosystems classification and environmental protection

7.1 Akatarawa's ecosystems

Akatarawa Forest is part of the Tararua Ecological District, which covers the Akatarawa, Tararua and Rimutaka Ranges. It is characterised by the steep, dissected greywacke and argillite hills, high rainfall and strong westerlies winds (McEwen, 1987).

At the most detailed LENZ classification level, one environment of conservation concern is found in the Akatarawa Forest. Two of the Akatarawa wetlands (Martin River and Whakatikei Headwaters) fall within this environmental classification. Seventy percent of this environment occurs in the Wellington region and only 12% is left under native cover. The bulk of the Akatarawa Forest falls into the central hill country and central mountains classifications.

7.2 Control of introduced mammalian pests and weeds

7.2.1 Possum control

Cyanide poisoning and trapping by fur hunters was the main method of possum (*Trichosurus vulpecula*) control in the Akatarawa Forest during the 1960s and 1970s. The first 1080 control operation on council land was completed in Puketiro in the exotic pine forest in 1995. Two operations within Akatarawa Forest were completed in subsequent years. These operations were in the Whakatikei and Akatarawa West sections of the forest, but encompassed different blocks to those currently used as management units. Akatarawa Forest is now part of a Council-land possum control program, where the large forested blocks are treated using 1080 on a five-yearly rotational basis. The current programme includes the blocks shown in Table 2.

Table 2 Possum control blocks in Akatarawa Forest

Block Name	Area (ha)	Year last controlled	Possum numbers prior to control (RTC)	Possum numbers after control (RTC)
Akatarawa Forest	14,000	2007	10.4%	0.4%
Whakatikei	8,000	2001	19.1%	0.9%
Akatarawa West	6,380	2002	20.3%	2.3%
Akatarawa Saddle	470	2000	36.2%	1.5%

Note: RTC stands for 'residual trap catch', which indicates the number of possums caught per 100 raps laid over a set time period.

7.2.2 Goats, deer and pigs

Ungulate populations in Akatarawa Forest were not greatly affected by recreational hunting pressure until 1980, as public access was tightly controlled by a permit system until 1980. Reports show that goat (*Capra hircus*) damage in the 1930s in the Akatarawa Forest was severe (Blake, 2000) and hunters were paid to shoot goats at that time.

Judas goat with collar

Old Mans Beard

Permits were issued from the 1950s, but red deer (*Cervus elaphus*) were plentiful and goats were not a target animal. Pig (*Sus scrofa*) numbers fluctuated over time, and rose when bans were placed on pig dogs because lost dogs were attacking stock on neighbouring farms. In the 1960s, Akatarawa Forest was again closed to public hunting and staff were given hunting rights. Ungulate numbers rose until the mid-1980s, when the public were allowed to hunt again. Between 1986 and 1991, around 2,831 hunting permits were issued by the regional council on council land. Most of these permits were issued for the Akatarawa Forest and animal numbers fell. Ranger staff hunted the area when possible.

A culling programme using professional hunters was begun in Akatarawa Forest in 2003. In that year, a major goat control operation in the Mt Wainui area netted 142 goats and 2 pigs. The forest is now part of an ongoing goat control operation using 'Judas' goats in selected sites after intensive ground hunting has been completed. Judas goats wear collars fitted with transmitters, which makes them easy to locate. Because goats are social animals and tend to mob up with others, the Judas goat unwittingly 'betrays' its companions.

Deer and pigs are primarily controlled by recreational hunters through a six-monthly permit system. They are also culled by Greater Wellington rangers and during goat control operations. Sika deer *(Cervus nippon)* have been relased in the nearby Hutt Water Catchment Area, but have not yet been reported in the Akatarawa Forest.

7.2.3 Other pest animals

No other pest animals are targeted for control in Akatarawa Forest. Rat numbers are lowered every five years as a further beneficial consequence of 1080 possum control operations. This gives native birds and other fauna a chance to raise their young without predators for one breeding season.

7.2.4 Pest plants

Akatarawa Forest has the worst pest plant problem of the four forests managed by Greater Wellington. Disturbance during past and present plantation forestry activities, and recreational access, have contributed to this invasion.

Old and current house sites (and their associated gardens) harbour a number of pest plant species able to move into indigenous forest areas. For example, at the old mill site, buddleia (*Buddleja davidii*), cotoneaster (*Cotoneaster* sp.), Darwin's barberry (*Berberis darwinii*) and sycamore (*Acer pseudoplatanus*) are present. Some plantation forestry species are also spreading into the indigenous forest – western red cedar, Douglas fir and Lawson's cypress are currently invading open beech forest.

Pest plant infestations in the Akatarawa forest were listed and assessed in 2001. Twenty-nine environmental pest plants were identified and all infestations were prioritised using criteria related to the urgency and practicality of control.

Fifteen pest plant species were selected for control. These were old man's beard (*Clematis vitalba*), Japanese honeysuckle (*Lonicera japonica*), Montpellier broom (*Teline monspessulana*), dogwood (*Cornus* sp.), buddleia, tradescantia (*Tradescantia fluminensis*), selaginella (*Selaginella kraussiana*), cotoneaster, holly (*Ilex aquifolium*), hops (*Humulus lupulus*), montbretia (*Crocosmia x crocosmiiflora*), hydrangea (*Hydrangea macrophylla*), aluminium plant (*Galeobdolon luteum*), sycamore and Darwin's barberry. Old man's beard, a major problem in the area for many years, is required to be controlled under the Regional Pest Management Strategy. Ongoing control has been programmed. Many roadside dump sites are also being targeted as these are ideal sites from which weeds can spread.

7.3 Ecosystem monitoring and rehabilitation

Six permanent 20 m by 20 m vegetation plots were established in Akatarawa Forest in 1996/97. These plots measure changes in the forest structure over time. They have been placed in a variety of vegetation types, from podocarp/tawa/hinau/rata to red beech/kamahi forest. These plots were re-measured in 2000/01. Basal area (a measure of tree growth) remained constant over that time, as did the number of stems per hectare.

Other monitoring in the Akatarawa Forest includes digital photography of rata, tawa fruitfall plots and fruiting/flowering recording. An aerial survey for introduced fungi and insects is completed every two years. Pest control, the major focus of restoration in this forest, is aiding forest regeneration.

In 2003, a major restoration project in the Whakatikei area resulted in the removal of a ford that was acting as a barrier to fish passage. There may be opportunities for forest restoration in areas where plantation forestry managers no longer wish to replant a site. Greater Wellington staff also work with the Akatarawa Recreational Access Committee to minimise the impacts of recreational use.

Ford after lowering – removal of barrier to fish passage

Ford before lowering

8. Landscape character

Topographically, the Akatarawa Forest Block comprises a complex system of deep valleys. The ridges between these valleys are roughly concordant in height generally between 500 and 550 metres. A crest of higher hills along the northwestern boundary rises above the general level of hilltops in the block – Wainui (722 metres), Titi (613 metres) and Maunganui (708 metres). On the eastern side of the block, Mt Barton (627 metres) also stands above the general level of surrounding hills. Away from these high points the many deep valleys and the absence of skyline reference points gives the block considerable complexity. This complexity gives the Akatarawa Forest Block a high capacity to absorb land use change. Because of the visual isolation between valleys, land use developments in one valley have little impact on the landscape character of neighbouring valleys. In terms of land cover the block can be divided into three separate landscape zones, reflecting the different land use history of these areas.

8.1 Southern landscape

The southern end of the Akatarawa Block contains the greatest landscape diversity. Large areas of this retired farmland have been planted in exotic forest. The remainder possesses a variety of land covers including areas of open grassland, exotic forest of various ages, exotic shrubland (gorse, *Ulex europaeus*), native shrubland (tauhinu, *Ozothamnus leptophyllus*), regenerating native forest (kamahi) and remnants of the native forest that formerly covered this area. In a number of places, valleys widen and form attractive basins that have potential for development as recreational foci. An area of native forest on the eastern side of the Whakatikei River separates Hukinga and Puketiro forests.

View from Cannon Point Walkway over Upper Hutt.
Photo: Jessica Dewsnap

Whakatikei Valley

8.2 Central landscape

The central landscape zone is forested, largely in native vegetation (logged and unlogged), interspersed with compartments of exotic trees of various species. Much of this area was logged for native timber and contains an extensive network of forest roads. The character of the native vegetation reflects this history. The different exotic forest plantings and the evidence of previous activities in this area provide local character to the valleys and points of interest that enliven the landscape of this zone.

View from Pram Track

Karapoti Gorge

8.3 Northern landscape

The northern end of the block, between the Akatarawa River West and the Maungakotukutuku Stream, is relatively homogenous in character and the land cover entirely native forest. Although some of this zone was logged there are few tracks relative to the central zone, and it is the most remote part of the Akatarawa block, having the character of remote natural hill country.

9. Recreation

9.1 Recreational opportunities

Akatarawa Forest is a unique and very important regional resource for open space recreation. It is easily accessible, has a large area of unbroken forest, an extensive track network (see Map 7) and a wide range of opportunities in a variety of settings (Cosslett, 1999). These opportunities range from relatively accessible passive recreation to technically demanding activities.

The main recreational opportunities are walking (including tramping), horse-riding, running, mountain biking, picnicking, trail bike riding, four wheel driving and quad biking, hunting, fishing and nature study. The track and road network provides generally very good access to many parts of the forest. The importance of the area for mountain biking is underscored by its use as a venue for the Karapoti Classic, Australasia's premier mountain bike event, held in the park since 1985. The forest is also known throughout New Zealand as an important site for trail biking and four-wheel drive adventures as it is one of a few areas of public land in the region available for this purpose. A wide range of sport and recreation clubs use the forest for competitions or other activities – on average 2–3 club events are held there every week. The forest is not recognised for its value as an educational resource, with schools mainly using the regional parks instead.

A 4x4 adventure company holds a licence to operate tours in the Akatarawa Forest.

Four-wheel drive tour group

9.2 Recreational zones and permitted activities

Restrictions and zones are used to control hunting and motorised recreation so that environmental damage and user conflicts are avoided and public safety is optimised.

All motorised recreational users must comply with the Motorised Recreational User Code, developed by ARAC and Greater Wellington in 1997. The code explains the restrictions and behaviour standards necessary to meet Greater Wellington's statutory obligations to protect the environment, other recreational users and adjoining landowners. Motorised recreational use is restricted to agreed tracks within the Regional Forest Lands Plan.

Mountain bikers in the Karapoti Classic

Main roads through the forest are open to the public for quad and trail biking, and a trail bike zone has also been designated through the forest. Trail bikes are not allowed beyond these areas. A 30 km/h speed limit operates in the forest. Casual two- and four-wheel drive off-road racing, scrambling, motocross, and competitive riding or driving is not permitted. Nor is trail biking permitted in ecologically sensitive zones such as the summits of Mounts Barton, Maunganui, Titi and Wainui, the upper Akatarawa Valley and rivers and stream margins, stream beds, swamps and wetlands.

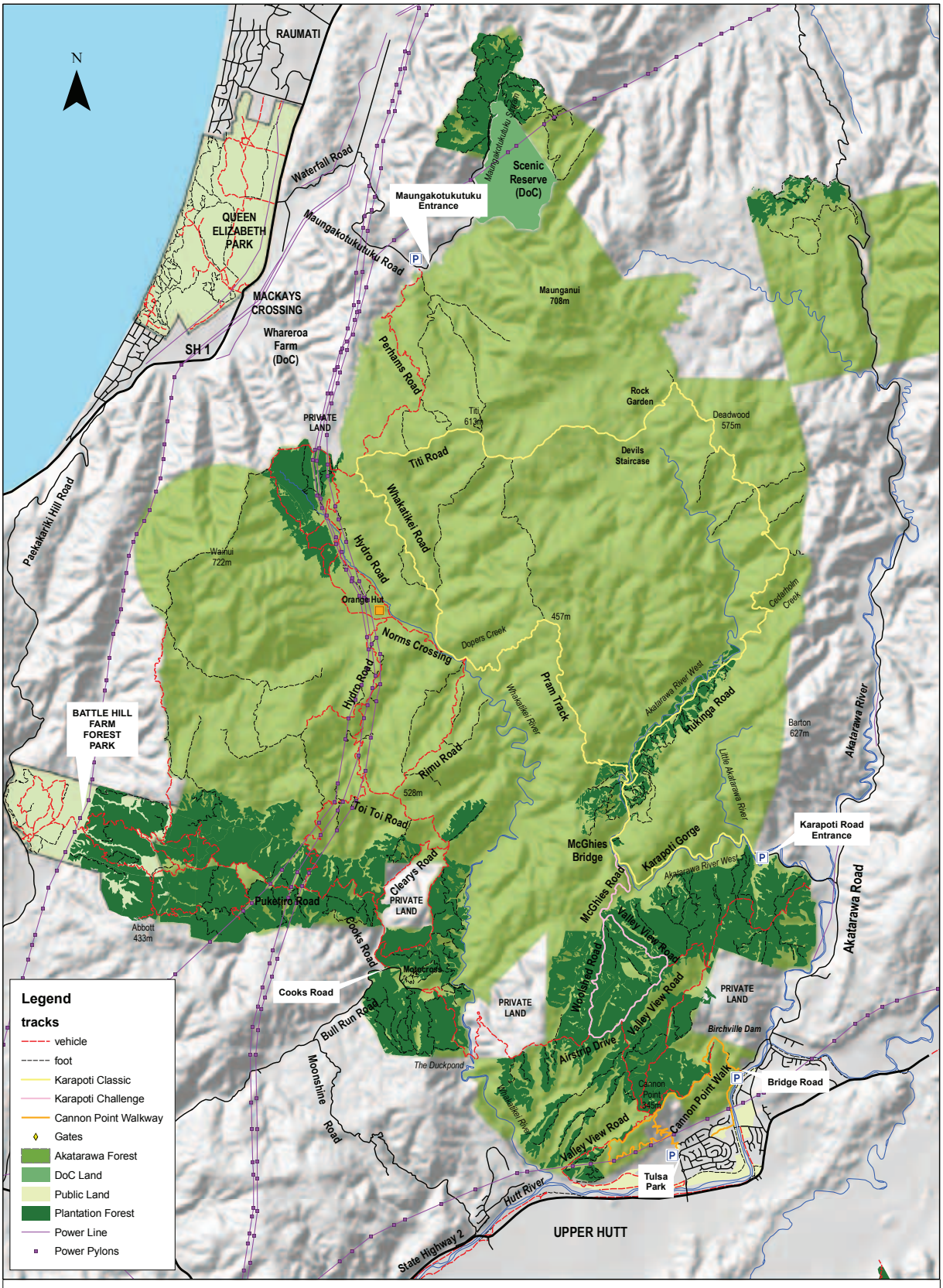
Casual trail bikers are required to have individual permits.

Access to the forest by four-wheel drive enthusiasts is restricted to club trips only. Clubs must have a permit to enter the forest and keep to designated tracks.

Dogs are permitted in the forest, and hunting for deer, goats and pigs is permitted in designated hunting areas. Hunters must obtain a permit prior to entering the block. Parts of the forest may be closed for time to time for commercial forestry activities.

Akatarawa Forest trail bikers.
Photo: Jessica Dewsnap

Map 7 Akatarawa Forest recreational tracks



9.3 Visitor preferences and patterns of recreational use

Compared with other regional parks and recreation areas, Akatarawa Forest has a much lower proportion of walkers and a much higher proportion of mountain bikers, and is unique as venue for casual motorised recreational use (Cosslett, 1999). Proximity to Upper Hutt results in a high level of use of the forest's southwestern fringe by residents of that city for picnics, walks or swimming (Cosslett, 1999). Greater Wellington has only recently begun estimating how many numbers visit Akatarawa Forest. Vehicle counts taken at the Karapoti entrance for the year to June 2004 recorded just under 40,000 visits, while at the Maungakotukutuku entrance the figure was approximately 43,000.

Cosslett's research found that mountain biking is the park's dominant recreational activity, while trail- and quad-bike riding were the next most common activities. Running, tramping, horse riding and hunting were progressively less common, followed by four wheel driving. 'Other' activities included blackberry picking, bird watching and tubing the Akatarawa River.

Most recreational activity takes place along tracks and roads. Swimming, picnicking and hunting are exceptions, though these still rely on roads for access. Recreation patterns are strongly linked to the location of forest entry points, while use is heaviest on well-formed, easy graded tracks within a short radius of each road end.

According to the 1999 research, the Valley View block is the most frequently visited exotic forest in the area (26.4%), reflecting proximity to Upper Hutt. Of these, 44% were walkers, 39% mountain bikers and 10% runners. Puketiro Forest block is heavily used due to its proximity to Battle Hill Forest Park and the popular Battle Hill mountain bike loop. Despite good numbers saying that they had been to Hukinga Forest block, an overall picture is hard to calculate because of the spike in figures created by the Karapoti Classic. Low numbers visited the upper Whakatikei River, although users noted the area's importance for expert trail-bike riders and four-wheel drivers because of the technically demanding tracks.

A 2007 survey found that – 6% of respondents from the region had visited the Akatarawa Forest in the previous 12 months (Cox, 2007). Most visitors were from Upper Hutt (14%), followed by Lower Hutt (8%) and Kapiti (6%). Porirua, Wellington and Wairarapa recorded less than 5%.

Sixty percent of Akatarawa Forest visitors were very satisfied with their experience, with over half of these appreciating the native bush and thought that it was a peaceful place to go. Other qualities of the area noted by users was the scenery and the easy access.

10. Forestry

Akatarawa Forest has approximately 3,000ha of exotic forest species, mainly mixed age pine and macrocarpa forest, which are part of Greater Wellington's plantation forests. When the Wellington Regional Council came into existence in 1980, it took over the responsibilities of the Water Board. The land within the Akatarawa Forest Block has been maintained for water conservation purposes but there has also been milling of the exotic forestry established within the block.

The plantation forests in the Akatarawa Forest are divided into five locations: Valley View, Hukinga, Puketiro, Akatarawa Saddle and Maungakotukutuku. The bulk of the trees were planted in the late 1970s and the 1980s. Puketiro is the largest of these forests (1,272ha) and it extends into Battle Hill Farm Forest Park. Valley View has 1,120ha in exotic forest, which is predominately radiata pine, with small blocks of macrocarpa and eucalypt. Hukinga Forest has 138ha in exotic trees, including a 12ha stand of Douglas fir. The Akatarawa Saddle block was planted in 1990 and is 184ha in area, while Maungakotukutuku Forest has 181ha in radiata pine, which was planted in the mid 1980s.

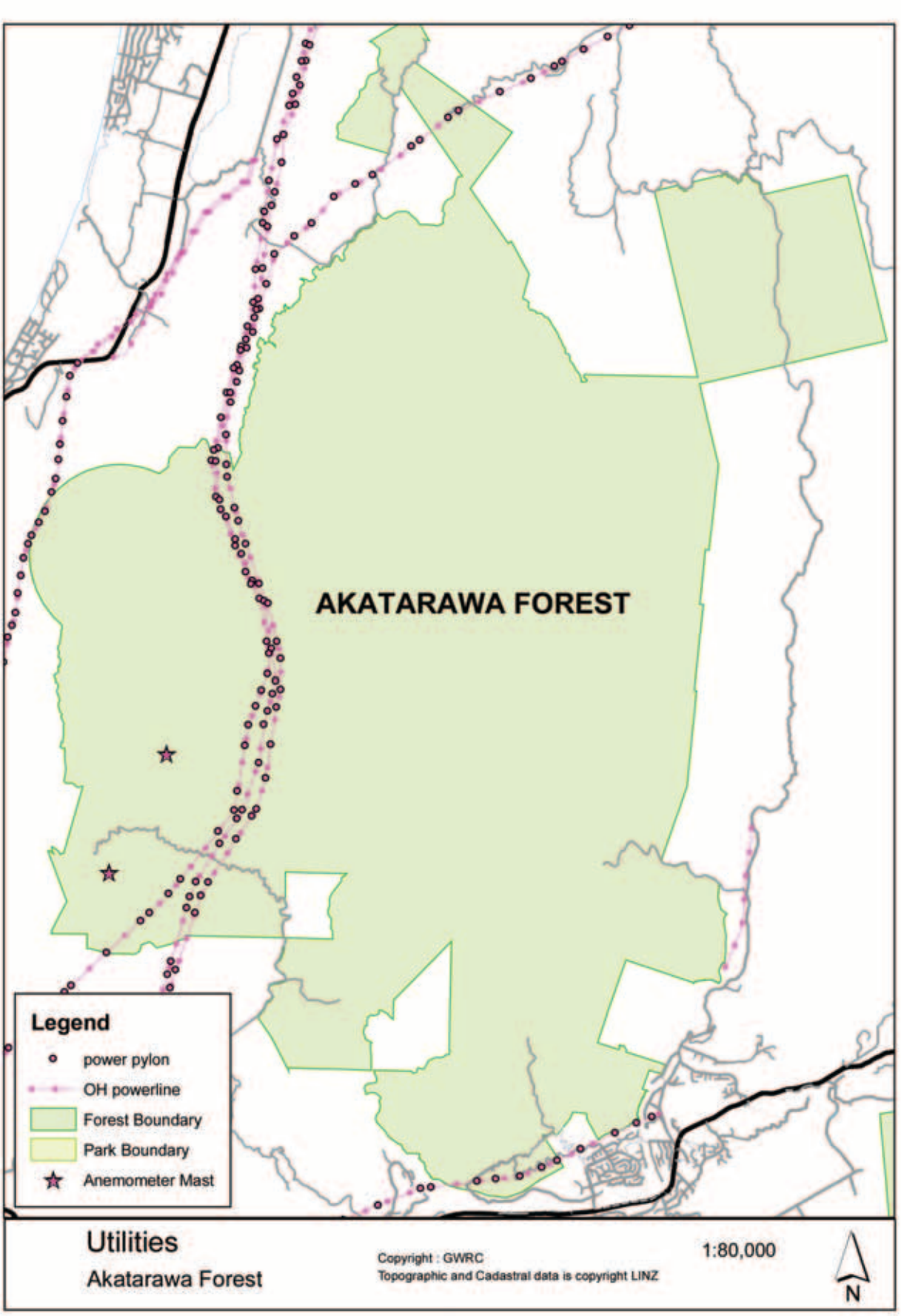
11. Utilities

A number of high voltage AC electricity transmission pylon lines owned by Transpower New Zealand pass through Akatarawa Forest. Three 220 kV lines (two lines between Haywards and Bunnythorpe, and one from Wilton to Bunnythorpe) run roughly north/south in a corridor crossing the forest boundaries north-west of Moonshine Road, and at the Maungakotukutuku Valley. Two other high voltage lines skirt the forest boundary between Cannon Point and Birchville, and on the western flank of Mount Wainui, (see Map 8).

Two anemometer masts have been erected in the south-west part of Akatarawa Forest, to assess the potential of Puketiro and surrounding high country for wind power generation.

Pylons crossing Akatarawa Forest

Map 8 Utilities in Akatarawa Forest



Pakuratahi Forest

Physical Environment

1. Topography, geology and landforms

1.1 Topography

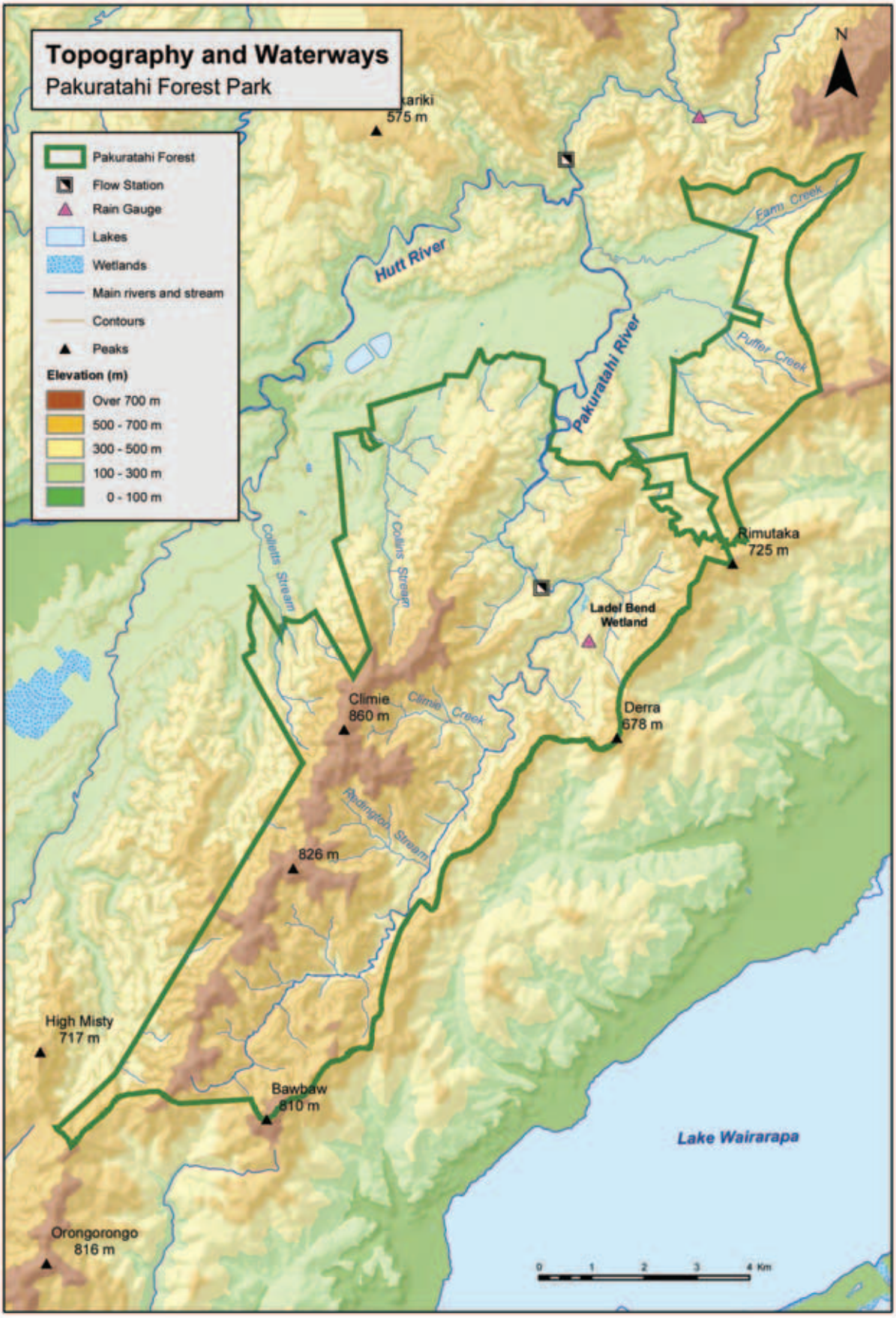
Pakuratahi Forest (8,000ha) is a long and narrow area of forest and regenerating scrub encompassing virtually the entire Pakuratahi River catchment and land in the Kaitoke Basin. The area covers the western side of the Rimutaka Range north of Upper Hutt and is bounded by the Rimutaka Forest Park in the east.

Pakuratahi forest is predominantly steep hill country (rising to 860m at Mt Climie), with more accessible foothills (see Map 9). Much of the area is covered in mature forest, with areas of regenerating vegetation along its western flanks recovering from past fires and clearance. Snow tussock occurs at 826m – the only such area in the entire Rimutaka Range. North of State Highway 2, a narrow band of rugged terrain covered with regenerating native forest links Pakuratahi Forest with the Hutt Water Collection Area. The forest also contains some 775ha of exotic forest in its northern and western parts, just south of SH2.

Eighty percent of Pakuratahi Forest is classed as either steep or very steep (26–35° or greater than 35°). Most of this steep country is in the southern part of the forest and remains covered in native forest.

View from Mt Climie towards Rimutaka Rail Trail

Map 9 Pakuratahi Forest topography and waterways



1.2 Predominance of greywacke rocks

Given its long and narrow catchment, the Pakuratahi Forest contains fewer examples of the geological process that shaped the region than Akatarawa Forest. A belt of sheared Torlesse greywackes known as the 'Esk Head Melange' underlies the Pakuratahi area (Begg & Mazengarb, 2000). This belt forms a 10km wide contact zone between the Rakaia Terrane to the west, which is about 190 million years old, and the Pahau Terrane to the east, which is about 136 million years old. As elsewhere, greywacke in the Pakuratahi area has been folded and lifted by tectonic forces. Volcanic and other ocean floor material has been incorporated into the rock during these processes, with geological surveys revealing small basalt, chert and limestone outcrops (*ibid*.). After this mixture of rock, known as mélange, reached the surface it was crushed and broken in places by faults. As a result, the rocks of the Rimutaka Range are a mix of relatively intact blocks (up to a kilometre in area) and intensely deformed broken rock (Begg & Mazengarb, 1996).

The Wellington Fault lies north of the forest, and the Wairarapa Fault to the south, (see Map 10). The rate of tectonic uplift in these ranges averages 4m every 1,000 years. Consequently the rock is intensely shattered and prone to erosion. Faults pass through the Pakuratahi Forest but none are recognised as being active. They follow the northeast/southwest trend of other faults in the region with secondary faults cutting them at an oblique angle. Traces of these faults were seen during construction of the Rimutaka Railway Tunnel where it runs under the Forest (Reed, 1957).

1.3 Impact of glacial periods

Hilltops suffered severe erosion during past glacial periods, during which time the Pakuratahi Basin, north of the forest and before Kaitoke, was buried under 400m of gravel and sand (Stevens, 1974). Evidence of this is preserved in a river terrace sequence in the Pakuratahi Basin (Berryman, 1990). Many streams and rivers converge in this basin to become the Hutt River.

2. Soils of Pakuratahi Forest

Roughly 80% of Pakuratahi Forest's soils are classified as steepland soils (soils on slopes of 26° or more) that have developed on greywacke and associated slope deposits. Different types of soil have developed on rolling ridge crests in gravel deposits and weathered loess (wind blown silt), while rare instances occur of soils that have developed in river deposits (alluvium). The most widespread soil order in the park are the brown earths. These form on materials derived from sedimentary rocks in a climate where the soil rarely dries out and is not waterlogged in winter (Molloy, 1998).

The soils described below and their distribution is shown in Map 11: Soils of Pakuratahi Forest, (see Introductory Soils Section for a guide to the soil classifications used below). Soil descriptions given here are from Bruce (2000), while a more general description on the relationship between soils and landscapes in the Wellington region can be found in Molloy (1998).

Soils of the **Rimutaka** series occur over 64% of the area. These highly variable soils have not been well studied. They are found high on the flanks and summits of the range, having developed on steep to very steep slopes of greywacke and associated slope deposits. A thin layer, or horizon, of organic material covers a dark reddish brown silt loam with 10% or less clay. The stony subsoil is a yellowish brown silt loam.

NZSC: *Humose orthic brown soils.*
NZG: *yellow brown earths, weakly podzolised.*

Ruahine and Kaitoke series soils are found on lower west-facing slopes. **Ruahine** soils have a thin and stony profile developed in greywacke and associated slope deposits. Typically, dark brown silt loam topsoil overlies subsoil of dark yellowish brown stony silt loam.
NZSC: *Typic orthic brown soils.*
NZG: *Steepland soil related to yellow brown earths.*

Kaitoke series soils develop in glacial and interglacial deposits. A thin silt loam topsoil overlies a stony clay loam. Usually well drained, these soils are low to moderate fertility. The risk of erosion is high on steeper slopes.
NZSC: *acidic firm brown soils.*
NZG: *yellow-brown earths, strongly leached.*

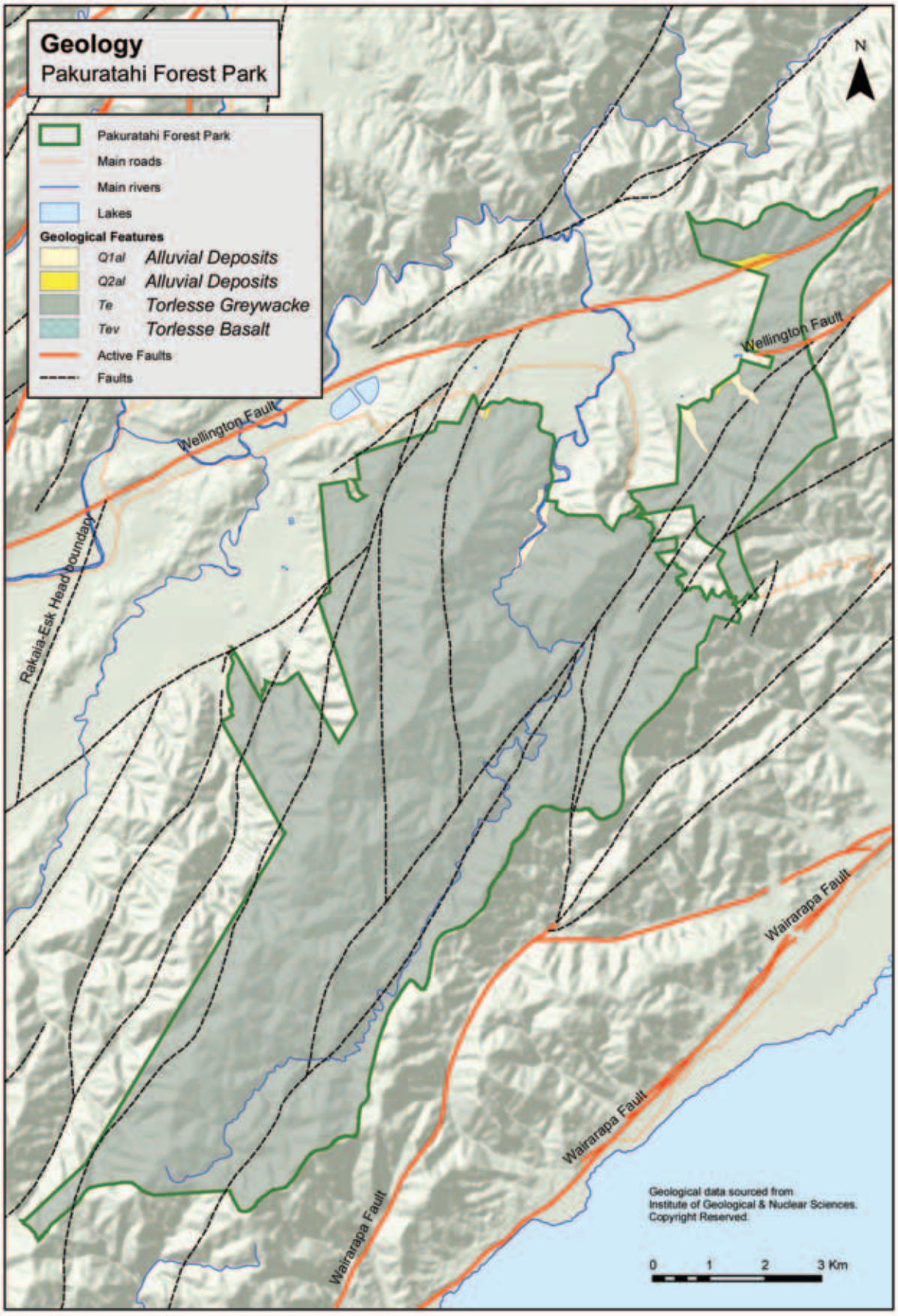
Renata series soils have developed in weathered loess over weathered greywacke on the west-facing flanks of the main divide of the Rimutaka Range. These soils have low natural fertility, low pH and an iron pan below the topsoil. They are imperfectly drained and liable to erode should vegetation be removed.
NZSC: *Peaty-silt-mangled Perch-gley podsol.*
NZG: *Podzol, weakly to moderately gleyed.*

Waikanae and **Heretaunga** series soils develop in alluvial silt, sand and gravel in rivers and streambeds. They are fertile and well drained. Waikanae soils develop on the better-drained areas of riverflats in silty or sandy alluvium. They are young soils with little structural development.

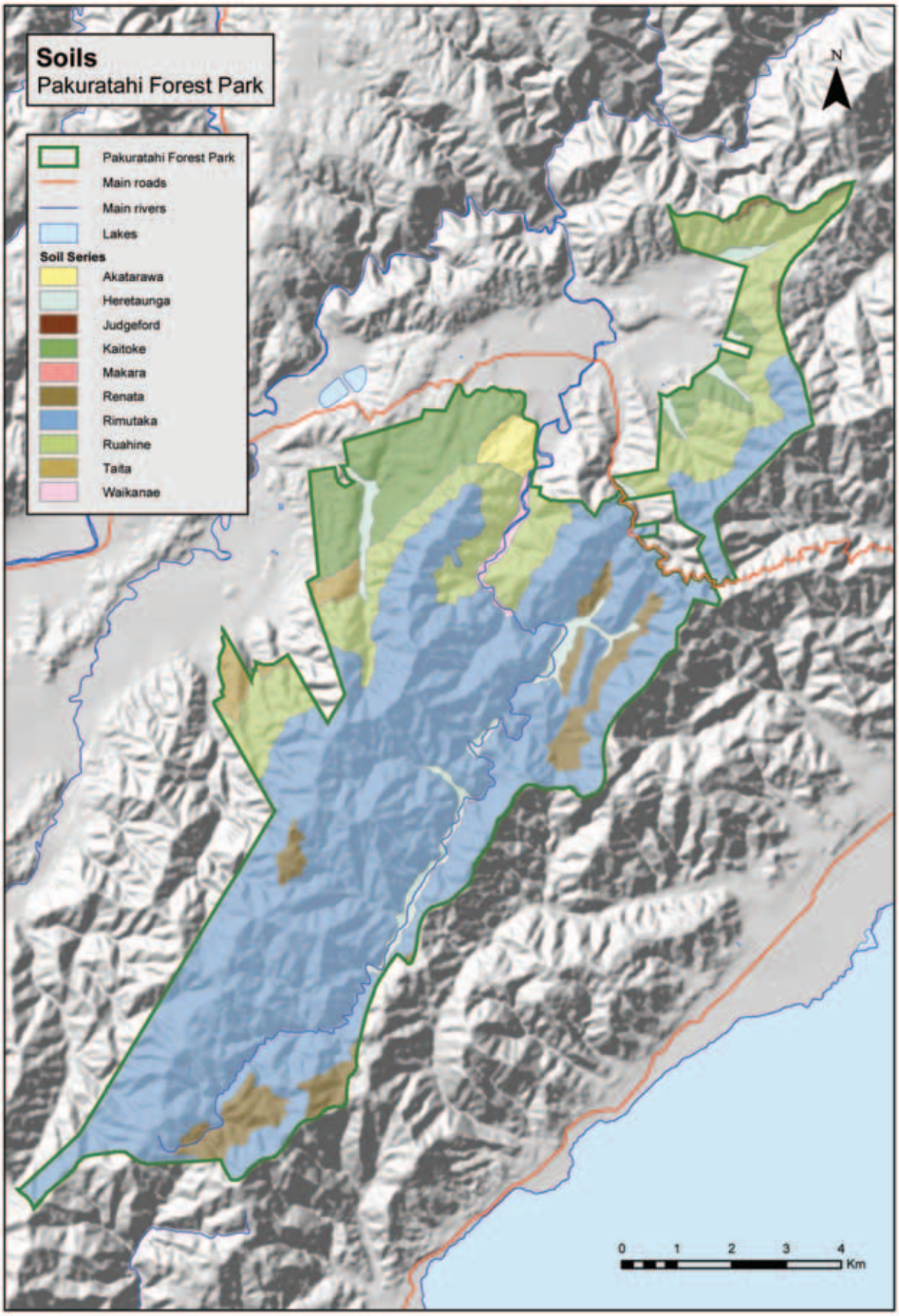
Waikanae
NZSC: *Weathered fluvial recent soil.*
NZG: *yellow-brown earths.*

Heretaunga
NZSC: *Acidic firm brown soil*
NZG: *yellow-brown earths.*

Map 10 Pakuratahi Forest geology



Map 11 Soils of Pakuratahi Forest



3. Climate in the Pakuratahi Forest

Pakuratahi Forest has a sheltered north-easterly aspect. The forest receives reasonably uniform rainfall, with most rain arriving from the south. Mean annual rainfall in the Pakuratahi Valley is about 2200mm. No figures are available for the upper catchment. Rain falls on average 192 days a year at the Centre Ridge Weather Station (compared with 125 rain days at Kelburn in Wellington city). Snowfall occurs intermittently on Mt Climie.

Although most of the catchment is sheltered from the predominant northwesterly and southeasterly winds, vegetation on the exposed faces of Mt Climie and Mt Rimutaka still suffer wind damage (WRC, 1996). Damage occurs as wind-thrown trees, flag-formed trees and protracted recovery of vegetation after disturbance.

4. Waterways

Snowfall on Mt Climie

Pakuratahi River

Pakuratahi Forest encompasses the headwaters of the Pakuratahi River. The river has a gravel bed and flows northeast from the heart of the Rimutaka Range down a narrow, steep-sided drainage basin. Numerous steep tributaries flow into the river before it joins the Hutt River at Kaitoke.

Water quality is monitored in the Pakuratahi River in Kaitoke Regional Park. Although the river passes through developed farmland between Pakuratahi Forest and the Regional Park, water quality remains high with MCI between 124 and 139 in the 1999-2003 period (Milne & Perrie, 2005).

Rainfall is highest in winter and spring, with peaks in July and October. Water flows closely match rainfall (see Figure 3). The steep nature of the surrounding land means the river responds quickly when it rains.

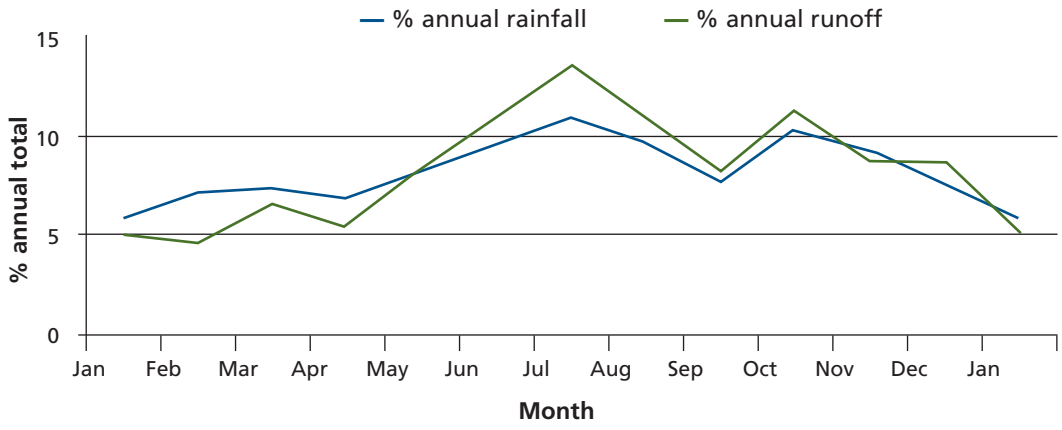


Figure three: A comparison of rainfall at Centre Ridge, Pakuratahi Forest (mean annual rainfall 2080 mm) with the Pakuratahi River regime at Truss Bridge

Biodiversity

5. Flora

5.1 Prehistoric vegetation of Pakuratahi Forest

The vegetation of the Pakuratahi Forest would have reflected general vegetation patterns that developed throughout much of the Wellington region after the end of the last glacial period, with podocarp/broadleaved forests being found at low altitudes and hard, black, red and silver beech forest clothing the uplands.

5.2 Human impacts on the vegetation

After 1840, early European settlers cleared much of the forest in the Pakuratahi Basin (also known as Kaitoke Basin) and in some of the lower altitude area below Mt Climie ridge for farming. Much of the vegetation around the Rimutaka Incline was burned off by large fires ignited by sparks from passing steam trains between 1878 and 1955 (Blake, 2002). Most of the forest around the railway that wasn't burned was selectively logged during the late 1800s. Pine trees were planted in the 1960s to provide regional employment opportunities, to suppress gorse and for soil conservation purposes. The summit of Mt Climie was forested until the 1920s when fire spread up from Whiteman's and Mangaroa valleys, destroying the silver beech forest.

5.3 Vegetation of the Pakuratahi Forest today

Pakuratahi Forest is now comprised of a large area of unmodified indigenous forest in the Pakuratahi headwaters to the south, and a mosaic of original and regenerating podocarp remnants and exotic forest in the north. Of the total 8,050 ha area, over half of the vegetative cover (4,850 ha) is classified as indigenous forest under the 2003 Land Cover Database classification. Another quarter (2,000 ha) is classed as scrub, with around 800ha of exotic planted forest, 280 ha of grassland and 120 ha of tussockland (on Mt Climie ridge). A map of the land cover of the forest is shown in Map 12. The forest is earmarked as a future water collection area and as such, the protection and enhancement of the indigenous vegetation is a key management objective. Pakuratahi Forest forms the central section of a contiguous stretch of forest managed by Greater Wellington. To the north and west, are Akatarawa Forest, the Hutt Water Collection Area and Kaitoke Regional Park while the Wainuiomata/Orongorongo Water Collection Area adjoins Pakuratahi Forest to the south. All of these forests are contiguous with the Tararua and Rimutaka Forest Parks, which are managed by the Department of Conservation.

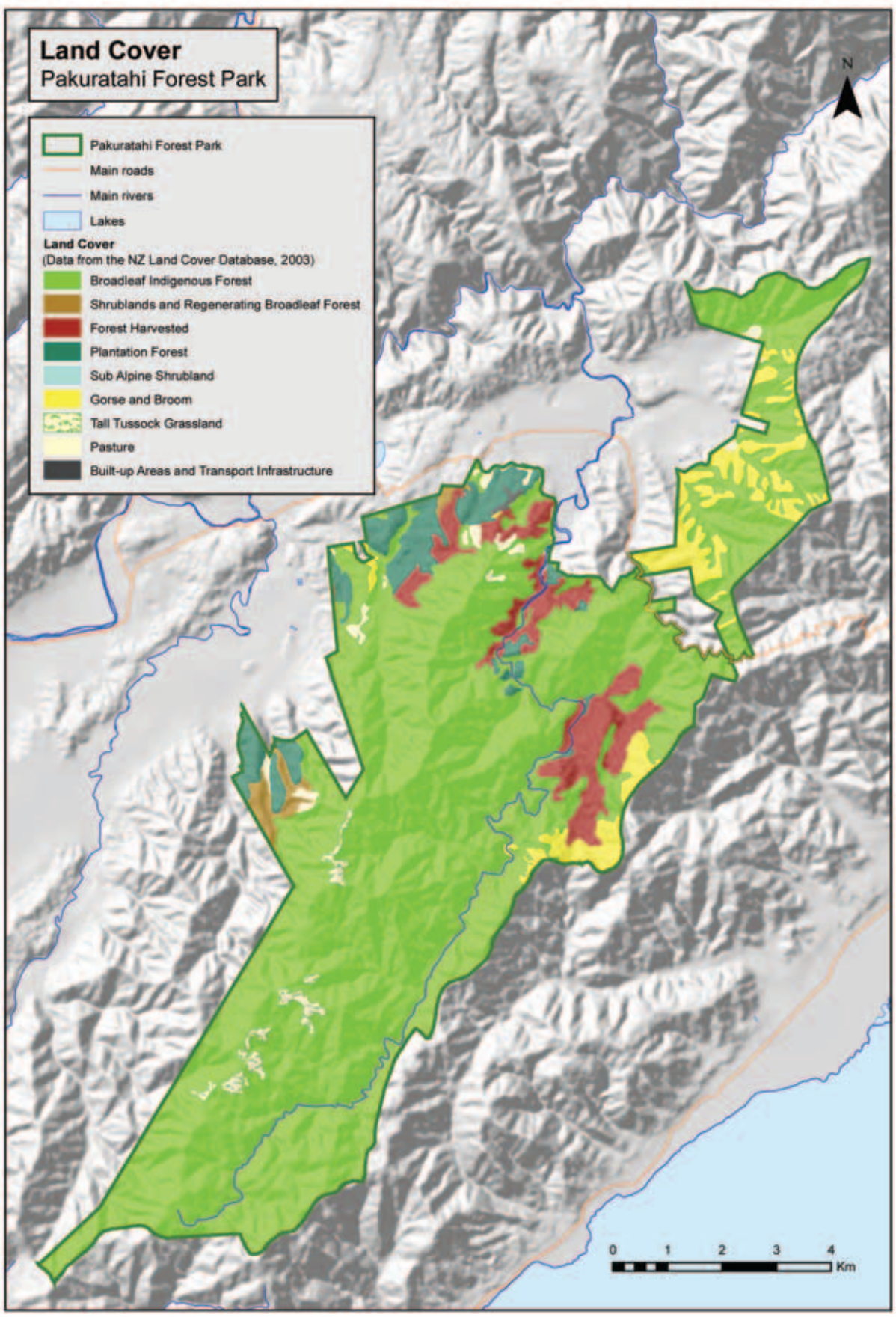
5.3.1 Composition of the indigenous forests/shrublands

The composition of the indigenous forest, shrubland vegetation and alpine communities is described below.

Pakuratahi North

This northern-most section of forest is largely regenerating forest and scrub on a rolling to steep, amphitheatre-shaped piece of land on the eastern side of the Pakuratahi Basin. Some areas that have suffered fire damage in more recent years are good examples of successional sequences. A small area of original bush remains between Farm Creek and the northern boundary, though recent GIS landcover

Map 12 Land cover of Pakuratahi Forest



analysis (Ministry for the Environment, 2003) now registers at least half of the 1,060 ha Pakuratahi North block as indigenous forest. Emergent tree species present include hard beech (*Nothofagus truncata*), rimu (*Dacrydium cupressinum*), kahikatea (*Dacrycarpus dacrydioides*) and rewarewa (*Knightia excelsa*), while silver beech (*N. menziesii*) is found on the ridgetops. Other plant species commonly found in the area are pate (*Schefflera digitata*), putaputaweta (*Carpodetus serratus*), manuka (*Leptospermum scoparium*), kamahi (*Weinmannia racemosa*) and rangiora (*Brachyglottis repanda*), with many small leaved coprosmas and crown fern (*Blechnum discolor*) in the understorey. The regionally rare southern rata (*Metrosideros umbellata*) is also found here.

The area known as the "Puffer" (around 400 ha), located at the north-eastern end of Pakuratahi North, is a nationally recognised ground orchid site (Clelland, 1984a; BRWR, 1984; Blake, 1999). Though the area has been extensively modified by fire, the large expanse of low scrub that has resulted is ideal for native orchids. Over 30 orchid species have been recorded near the popular Puffer Track, an entrance to Tararua Forest Park.

A 70 ha area of land owned by Forest and Bird was gifted to Greater Wellington in 2000. This area of largely regenerating forest is located west of the Rimutaka Hill summit.

Easter orchid (Earina autumnalis)

Rimutaka Rail Trail

The vegetation surrounding the popular Rimutaka Rail Trail is now a mosaic of planted exotic forest, regenerating scrubland, regenerating forest and small pockets of original forest. Four areas of significant vegetation and a wetland are located within the Rimutaka Rail Trail zone: Rifle Range Bush, Pakuratahi Terrace Bush, Rimutaka Bush A and B, and Ladle Bend wetland.

Rifle Range Bush is a remnant of podocarp/broadleaf/hard beech forest located on the true left of the creek running into Pakuratahi River and the New Zealand Deerstalkers Association rifle range (Blake, 1999). It contains a significant area of swamp maire (*Syzygium maire*), a once common, but now rare plant in the Kaitoke/Upper Hutt region. Emergent canopy trees found here are kahikatea, hard beech, rewarewa, rimu and hinau (*Elaeocarpus dentatus*), while the canopy trees include swamp maire, mamaku (*Cyathea medullaris*), totara (*Podocarpus totara*), lacebark (*Hoheria populnea var. populnea*), lancewood (*Pseudopanax crassifolius*) and five-finger (*P. arboreus*) The lower layers contain a large variety of species, including miro (*Prumnopitys ferruginea*), pate, hangehange (*Geniostoma rupestre* var. *ligustrifolium*), wineberry (*Aristotelia serrata*), cabbage tree (*Cordyline australis*), hebe species, as well as many ferns and orchids.

Vegetation on the Rimuataka Rail Trail

Pakuratahi Terrace Bush is very small in size (only 1.5 ha), but contains kahikatea, hard beech, black maire (*Nestegis cunninghamii*), rata, rewarewa and swamp maire as canopy emergents (Blake, 1999). The understorey is diverse and this small remnant provides a seed source for the area. Rimutaka Bush A and B total around 170 ha and are described in Clelland (1984b) and Wellington Regional Council et al. (1984). They contain excellent stands of red beech (*Nothofagus fusca*), but silver, hard and black beech (*N. solandri* var. *solandri*) are also present. It has been recorded as a good to moderate site of special wildlife interest.

The Ladle Bend wetland is a 1.5 ha rain-fed wetland dominated by manuka. Construction of the incline railway cut off the lower edge of this wetland and overland runoff from the railway was diverted elsewhere. There is no open water but the area is probably subject to occasional flooding (McIntyre, 2000). Two distinct communities make up the wetland: a less boggy region with dense manuka and a wetter region with grass, sedge and sphagnum where the manuka is less dense.

Ladle Bend wetland

Tunnel Gully

A large pocket of original bush remains at Tunnel Gully, while the rest of the area is a mosaic of planted pine forest (around 300 ha), mixed scrub and regenerating bush. Tunnel Gully contains the only example of podocarp-tawa forest on alluvial terrace left in the region. Large terrestrial rata and both swamp and black maire can be seen on Tane's Track. Further up the access road to Mt Climie, predominately broadleaf forest is found. These areas have been classified as significant vegetation (Wellington Regional Council *et al.*, 1984; Blake, 1997).

The road to Mt Climie is regularly used to demonstrate the altitudinal vegetation sequence for the Hutt Valley. It is one of the only places in the region that this sequence can be easily accessed. At Tunnel Gully (altitude 200 m) northern rata, rimu, matai (*Prumnopitys taxifolia*), kahikatea and pukatea (*Laurelia novae-zealandiae*) emerge above a canopy of tawa (*Beilschmiedia tawa*) hinau, rewarewa and kamahi. Below the canopy are tree ferns and, in warmer, north-west facing gullies, nikau palms (*Rhopalostylis sapida*). Above the lowland forest a mixed podocarp/ broadleaf with beech mixture forms an intermediate band before the beech forest proper. Initially miro and Hall's totara (*Podocarpus hallii*) become more abundant and rimu and rata, the dominant emergent species in the lowland forest, become less common. Beech trees appear, not as components of the podocarp/broadleaf forest, but on the shallow soil of ridge crests and spurs within the forest (Dawson, 1988). This forest type covers the lower slopes and fertile valley floors of the Pakuratahi River between 400–500 m.

With increasing altitude the podocarp/broadleaf forest gradually gives way to beech forest. The canopy is less complex and moisture loving kamahi become abundant but smaller, and more shrubby (Gabites, 1993). Tawa, rewarewa and hinau gradually drop out to be replaced by more cold hardy species such as horopito (*Pseudowintera colorata*), stinkwood (*Coprosma foetidissima*) and tree fuchsia (*Fuchsia excorticata*). Black and hard beech are restricted to dry, infertile sites. Red beech is found on slightly more fertile and moist sites (Wardle, 1991). The Pakuratahi Forest contains the southern limit for red beech in the Wellington Region. To the south of this catchment where red beech is absent, its role is filled by silver beech.

Above 550 m, as soils become less fertile, temperature falls and rainfall increases, silver beech increasingly predominates. Mountain cabbage tree *(Cordyline indivisa)* appears and kamahi drops out. Astelia spp. become more common on the forest floor.

Lowland forest at Tane's Track, Tunnel Gully

Beech forest

By 700 m the canopy is almost entirely silver beech. Moss covers the ground and the many tree trunks, which by now are gnarled and stunted. Haumakaroa (*Raukaua simplex*), kohurangi (*Brachyglottis kirkii* var. *kirkii*) and horopito form the shrubby understorey. Mountain five finger (Pseudopanax colensoi) is found here – a plant now rare in the region, as it is a preferred food of browsing animals, such as deer and possums.

Montane silver beech forest, Mt Climie

Subalpine vegetation on Mt Climie, dominated by Astelia

Pakuratahi Headwaters

The sequence described in the previous section makes up the bulk of this large area of largely unmodified indigenous forest. The whole of Pakuratahi headwaters is regarded as significant (Wellington Regional Council *et al.*, 1984), because of its value as habitat and its largely unmodified nature. Although a few scattered silver beech trees have returned to the summit of Mt Climie since the 1920s fire, sub alpine and bog communities now predominate. Beech seedlings also failed to re-establish after a fire on the Quoin Ridge in the Hutt Water Collection Area and it has been suggested that this is due to loss of peat and soil during and after the fire (Blake, 2002a). The plants now growing on the tops are well adapted to the cold, wet, windy conditions. A dense sward of Astelia sp. aff. nervosa spreads over boggy ground and grasses such as mountain toetoe (*Cortaderia fulvida*) and *Chionochloa conspicua,* wave in the wind. Areas of *Oreobolus* cushionfield are found with low emergent shrubs. To the south at spot height 826 m is the only snow tussock (*Chionochloa flavescens*) on the Rimutaka Range.

The regionally sparse Pittosporum rigidum and regionally critical kohurangi are present in the area, as is the threatened shrub, *Pimelea gnidea* and the uncommon *Hymenophyllum pulcherrimum* and *Viola filicaulis*. The wet nature of the forest means that there is a thick carpet of filmy ferns and mosses over much of the ground and the tree trunks, giving a goblin forest appearance. This high diversity of filmy ferns was noted in a survey of the Pakuratahi headwaters, completed in 2004 (Spearpoint and Hopkins, 2004). An ecological assessment of the Mt Climie ridges was also completed in 2004 (Froude, 2004). Splendid examples of Prince of Wales fern (*Leptopteris superba*) were noted in this survey. Considerable damage from animal browse was also recorded. The harsh climate has created a very fragile ecosystem, and wind-throw can result in degraded sites, especially on west-facing upper slopes.

Two permanent 20 m by 20 m plots have been established in the Pakuratahi Forest to record changes in the growth and mortality of forest species.

5.4 Exotic vegetation

There are now around 700 ha of planted pine forest in the Pakuratahi, mainly *Pinus radiata*. Small areas of *P. nigra* and *P. contorta* were also planted. Many of the initial pine plantations, established in the 1960s and 1970s have now been harvested and were re-planted between 1999 and 2001.

6. Fauna

6.1 Birds

6.1.1 Pakuratahi as bird habitat within the wider Wellington ecological region

The whole of the Rimutaka Range, including Pakuratahi Forest, is regarded as a site of special wildlife interest and is ranked as a high value forested site (Parrish, 1984).

Tomtit

6.1.2 Surveys of bird species

Unlike other parks and water collection areas in the region, annual bird monitoring has not been undertaken in Pakuratahi Forest. However, bird species have been recorded during ecological surveys and monitoring activities such as vegetation plot re-measurements. Yellow-crowned kakariki (*Cyanoramphus auriceps*) were recorded near Mt Climie in 1997 (Blake, 1997). In lowland bush remnants, very active populations of kereru (*Hemiphaga novaeseelandiae*), tui (*Prosthemadera novaeseelandiae*) and fantail (*Rhipidura fuliginosa placabilis*) (Blake, 1999) have been noted, while silvereye (*Zosterops lateralis*), morepork (*Ninox novaeseelandiae*), tomtit (*Petroica macrocephala toitoi*), New Zealand pipit (*Anthus novaeseelandiae*) and exotic birds, such as chaffinch (*Fringilla coelebs*), magpie (*Gymnorhina tibicen*) and rosellas (*Platycercus eximius*) were also seen. In higher altitude beech forest, falcon (*Falco novaeseelandiae*), kaka (*Nestor meridionalis septentrionalis*), grey warbler (*Gerygone igata*), fantail, *rifleman* (*Acanthisitta chloris granti*), kereru, tui, bellbird (*Anthornis melanura*), tomtit, silvereye, kingfisher (*Halcyon sancta vagans*), skylark (*Alauda arvensis*) and chaffinch have been recorded (Spearpoint and Hopkins, 2004; Froude, 2004). A species list from these surveys is shown in Appendix 3.

Kaka

6.2 Freshwater fish

A survey of the Pakuratahi River in 2002 recorded dwarf galaxias (*Galaxias divergens*), Crans bully (*Gobiomorphus basalis*), redfin bully (*G. huttoni*) and brown trout (*Salmo trutta*). Koaro (*Galaxias brevipinnis*) were also found in a nearby tributary (Joy and Hewitt, 2002). Comprehensive surveys of the Pakuratahi River outside the forest's boundaries and at the confluence with the Hutt River have also been carried out. Given that suitable habitat for these species exists upstream from the survey sites, and that there are few barriers to fish passage, the same species noted above can be expected further up the catchment within Pakuratahi Forest.

Rifleman

Surveys within the Forest boundaries and in surrounding areas have been carried out by a number of organisations including Greater Wellington (NIWA; Wellington Fish & Game, 1996; Joy & Death, 2002). Ten species of fish have been identified including dwarf galaxias (Strickland & Quarterman, 2001). The Department of Conservation has recently reclassified threatened species in New Zealand (DoC, 2002) and dwarf galaxias are classified as being in gradual decline. These solitary fish may be found in riffley margins of rivers and streams in foothills and little is known about their spawning habits.

Upland bully. Photo: Alton Perrie

Five species of bully (Gobiidae family) occur in the Pakuratahi River system, these are: common (*Gobiomorphus cotidianus*), bluegill (*G. hubbsi*), redfin, Cran's, and upland bullies (*G. breviceps*). The common, bluegill and redfin bullies are 'diadromous' fish that migrate between fresh and saltwater. Bullies mature at one year and live for 2-4 years. They live in a variety of habitats, from swiftly flowing streams and rivers to small streams with gentle flows and also lakes and ponds. Chance sightings of all but the common bully are rare.

A fish passage was installed on a tributary of the Pakuratahi River where it crosses the former railway in December 2002. This will allow dwarf galaxias, bullies and trout to get past a ford that acted as a barrier to these fish. Opening up further habitat to these fish will increase their spawning populations and the ecosystem diversity of such tributaries.

6.3 Lizards

There are no known records of lizard species from Pakuratahi Forest, however undetected populations of a number of relatively common species are likely to be present. The common (*Oligosoma nigriplantare polychroma*) and copper skink (Cyclodina aenea) are likely to be present in the open country of the park. The ornate skink (*Cyclodina ornata*) prefers forest habitat so may occur in at least the lower areas of Pakuratahi. Of the geckos, common (*Hoplodactylus maculatus*), forest (*Hoplodactylus granulatus*) and green gecko (*Naultinus elegans punctatus*) are likely to be present in the forest.

6.4 Invertebrates

Wainuia snails

New Zealand's invertebrates have not been well studied and little is known about species or their distribution. Because most native invertebrates live in forests they are likely to have suffered from the effects of habitat loss and predation by introduced mammals. Few studies have been completed on invertebrates in Pakuratahi Forest, though 12 species of indigenous snail were recorded in the leaf litter in Ladle Bend wetland (McIntyre, 2000). *Wainuia urnula* snails have also been recorded on Mt Climie.

Environmental Management & Land Uses

7. Ecosystems classification and environmental protection

7.1 Pakuratahi's ecosystems

Pakuratahi Forest is part of the Tararua Ecological District, which covers the Akatarawa, Tararua and Rimutaka ranges. It is characterised by the steep, dissected hills of greywacke parent material, gale-force westerlies and severe erosion, particularly in the Rimutaka Range.

Under the most detailed scale of the LENZ classification of 500 environments nationally, eight occur in Pakuratahi Forest, including two of conservation importance.
Only very small remnants of broadleaf lowland forest are left among pine forest in one environment which is only found in the Wellington region. This environment is found along the Pakuratahi River in the Rimutaka Rail Trail area. The broadleaf forest in Tunnel Gully falls into the other important environment, 70% of which is found in the Wellington region, but only 12% of that environment is left under native cover.
The bulk of the Pakuratahi Forest falls into the P8.2 category, of which the majority is still under natural cover.

7.2 Impacts of introduced pests

The greatest damage to Pakuratahi Forest has been caused by possums (*Trichosurus vulpecula*), goats (*Capra hircus*) and pigs (*Sus scrofa*) which have been present in high numbers in the past.

Pest plants have the potential to significantly change the composition or structure of native habitats. Many climbing pest plants such as old man's beard (*Clematis vitalba*) and ivy (*Hedera helix*) can smother mature plants, while other plant pests interfere with regeneration and compete with native plants for space and soil nutrients.
The disturbance events, such as exotic forestry and the presence of the historic Rimutaka railway have assisted the entry of exotic weed species.

7.3 Control of introduced mammalian pests and weeds

Possums

Possums were first liberated in the 1880s by acclimatisation societies to establish a fur trade. Restrictions on killing possums were not lifted until 1947 (Kerr, 1997). During the 1960s and 70s trappers were allocated blocks for possum skin recovery by Wellington City Council and the Suburban Water Supply Board. Permits for fur recovery are now issued by Wellington Regional Council, which became the regulatory authority for the area in 1981. Regional council rangers continue to carry out regular night shootings of possums.

An Animal Health Board-funded bovine tuberculosis (Tb) possum control operation was carried out in the lower Pakuratahi, Maymorn/Mangaroa and Kaitoke basin area in 1997/98.The upper Pakuratahi was not included at that time because possums were less of a problem in the predominately beech forest environment. Possums were controlled by using aerial and ground applications of 1080, with some trapping and brodifacoum use. Possum numbers fell from 25.9% to 1.9% residual trap catch (RTC). A second Tb control operation completed in 2002/03 included the upper Pakuratahi after additional funding was provided by WRC. Possum numbers were lowered from 8% to 0.7% RTC. In 2007, a control operation resulted in an RTC of 0%. Tb control operations will continue in Pakuratahi Forest until infected herd numbers fall to zero. The normal rotation time for 1080 control for Tb purposes is around four years, but possum levels are monitored more regularly to see if they have increased beyond the trigger level of 5% RTC.

Goats

Goats have been a major pest in the Pakuratahi Forest for many decades. It is thought that most of the population originated from animals liberated by Maori and whalers who lived along the coast in the 19th century. In the 1960s, large mobs of goats (up to 30–50 goats) could be seen in the lower Pakuratahi area. Bounties were paid for goats and NZFS hunters started to reduce these numbers in the late 1960s. However, goats in the rough country were not culled to any great degree as there were also plenty of deer and pigs to shoot. During the 1980s, annual hunting parties from the New Zealand Forest Service hunted deer, goats and pigs in the Rimutaka Range, work that was continued by DoC in the 1990s. The highest populations of goats in recent years have been found at the northern end of Pakuratahi Forest and on the west side of Mt Climie Ridge especially where the block borders private properties. Tunnel Gully regularly holds moderate goat numbers. These populations have been controlled by Greater Wellington rangers, and by a contractor working over short time periods. A 'Judas goat' control programme[57] has been used since 2005/2006 to reduce goat populations in the forest.

Pigs and deer

Pigs and red deer (*Cervus elaphus*) are culled by recreational hunters who obtain six-monthly permits from Greater Wellington. The deer population in Pakuratahi is thought to be generally quite light, but numbers are greatest in the scrub/regenerating hardwoods in the vicinity of the pine plantations. Very few deer live in the upper catchment, but some may colonise from the vicinity of Narrow Neck.

Other pest animals

Rats (*Rattus* spp.) are controlled as a by-product of possum control operations, as they also eat bait (e.g. brodifacoum or cholecalciferol, but not cyanide) laid out for possums. Rabbits (*Oryctolagus cuniculus*) and hares (*Lepus europaeus occidentalis*) are regularly shot by the forest ranger, especially near planted sites.

Pest plants

Land disturbance caused by plantation forestry activities and recreational access have contributed to pest plant invasions in the lower Pakuratahi area, especially around the Rimutaka Incline. In 2001, a major pest plant survey was completed around the Rimutaka Rail Trail and in Tunnel Gully. Thirty-one environmental pest plants were

[57] Judas goats wear collars fitted with transmitters, which makes them easy to relocate and are released after intensive grid searching and culling has reduced goat populations to small isolated pockets. Because goats are social animals and tend to mob up with others, the Judas goat unwittingly brings about the 'betrayal' of its companions.

identified and all infestations were prioritised using criteria related to the urgency and practicality of control. Fifteen pest plant species were selected for control. These were: ivy, sycamore (*Acer pseudoplatanus*), pampas (*Cortaderia* spp.), holly (*Ilex aquifolium*), tradescantia (*Tradescantia fluminensis*) and buddleia (*Buddleja davidii*) at Tunnel Gully, as well as old man's beard, pampas, eleagnus (*Eleagnus* sp.), privet (*Ligustrum* spp.), boxthorn (*Lycium ferrocissimum*), elder (*Sambucus nigra*), holly, Mexican daisy (*Erigeron karvinskianus*), barberry (*Berberis darwinii*) and tradescantia around the Rimutaka Rail Trail. Old man's beard is required to be controlled under the Regional Pest Management Strategy. Ongoing control has been programmed.

7.4 Ecosystem rehabilitation and restoration

Apart from the pest control activities detailed above, little other ecosystem rehabilitation work is required in undisturbed and regenerating forest. There are, however, opportunities to restore retired plantation forestry areas, the Ladle Bend wetland and pockets of native bush around the Rimutaka Rail Trail. In 2000, funding was obtained through a regional biodiversity funding package for restoration work after exotic logging had taken place. The purpose of this project was to develop buffer strips of riparian vegetation along the edges of the streams and rivers to reduce sediment runoff and to enhance environmental and landscape values. Planning and design work was carried out in 2000/01 to assess different types of vegetation management techniques. It was noticed that since logging had been completed, natural regeneration was generally abundant, especially in more sheltered sites at lower altitudes. A trial was conducted around the Ladle Bend wetland, which had been affected by the removal of pine trees surrounding it in 2000. Nearby faces were replanted with native species in 2001, and five plots were established to research the differences in survival and growth rates between planted seedlings and natural regeneration. This trial was conducted over three years, but the results have not been analysed as yet. However, it appears that "managed" natural regeneration, (i.e. removal of weed species) is more effective than planting at a site where adequate seed sources exist.

During 2002 and 2003, emphasis was placed on restoration at the summit yards site on the Rimutaka Incline. Riparian plantings were initiated in the area and a contaminated site was discovered. The contaminated site was subsequently capped and sealed. One of the greatest threats to biodiversity is the invasion of wilding pine into the native bush and into the riparian corridors. This is currently being dealt with by using work teams from Rimutaka Prison to pull out smaller pine trees that had been planted in inappropriate areas.

Tree planting at the Summit

Mid-Pakuratahi Valley

Northern end of Mt Climie

Rimutaka Hill Road

View from Mount Climie, west across Mangaroa and Hutt Valleys. Photo: Jessica Dewsnap

Upper Pakuratahi River

Mt Climie

8. Landscape character

The Pakuratahi block comprises two broad landscape zones distinguished on the basis of land use and complexity – the Goat Rock/Rimutaka zone and the Upper Pakuratahi zone.

8.1 Goat Rock/Rimutaka landscape

The Goat Rock/Rimutaka landscape zone comprises the catchments at the northern end of the Mt Climie ridge, the mid-Pakuratahi valley up to the Summit Tunnel and the west-facing slopes to the north of Rimutaka summit. The zone adjoins settled farmland in the Mangaroa valley and Kaitoke basin and is generally accessible by vehicle.
Its present landscape character reflects its varied land use and history. On lower slopes of the northern end of the Climie Range small exotic forests planted on retired farmland are interspersed with areas of native forest of varying age. In Tunnel Gully a small area of mature podocarp forest remains, flanked on either side by exotic forest compartments. Above Tunnel Gully the western flanks of Climie are clad in a native vegetation mosaic of different age classes, reflecting the history of bush fires that swept across the range following settlement of the Hutt Valley. In the mid-Pakuratahi Valley the native forest is interspersed with exotic forest compartments planted on the scars of fires caused by sparks from steam engines on the old Rimutaka railway.

The dissected topography and the variety of indigenous and exotic forest types on the lower slopes of the Climie Range and the mid-Pakuratahi valley create an interesting and diverse landscape capable of absorbing a range of activities and uses. The higher slopes and ridges add to the drama and interest of this zone but their greater visibility and more even cover of native vegetation give them high visual sensitivity.

On the slopes north of Rimutaka Summit, extending to the Puffer track and beyond, the native forest regeneration process is well advanced. Manuka shrubland is supplanting gorse over extensive areas. In the damper gullies regeneration of hard beech forest is well advanced. These slopes are part of the scenic corridor of the Rimutaka Hill Road. As a result they are very sensitive visually with a very low capacity to absorb changes in land use without loss of amenity value.

8.2 Upper Pakuratahi landscape

The upper Pakuratahi landscape zone, comprising the upper catchment of the Pakuratahi River, is perhaps the least visible of the forest land areas, hidden between the two northern branches of the Rimutaka Range. It is isolated visually from the Kaitoke basin, into which it flows, by the complex course of the mid-Pakuratahi valley. The zone's western boundary, the Mt Climie Ridge and the western branch of the Rimutaka Range, forms the eastern skyline seen from Upper Hutt. Mt Climie is just visible from Wellington where it is seen as a distant crest above the Eastern Hutt hills. Otherwise, the upper Pakuratahi zone cannot be seen from outside its own boundaries.

Internally the upper Pakuratahi valley is complex. The river bed is deeply cut and follows a sinuous course. The valley is clad in largely unmodified podocarp/hardwood and beech forest and is part of the natural landscape tract of the Rimutaka Range. Its landscape character is that of a remote wilderness area. Its seclusion and its natural forest cover give it especial charm.

The internal complexity and the visual isolation of the upper Pakuratahi valley give the interior of this zone a low visual sensitivity rating, corresponding to a high visual absorbance capacity. However, the Mt Climie ridge on the zone's western boundary has very high visual sensitivity because of its prominence on the Hutt Valley skyline.

9. Recreation

9.1 Recreational opportunities

Pakuratahi Forest is a significant location for open space recreation, with activity centering on the Tunnel Gully Recreation Area, the Rimutaka Rail Trail and Rimutaka Summit – all in the forest's northern reaches. Both the Rimutaka Rail Trail and Tunnel Gully are very popular venues for events, including group picnics, school and club fun runs and/or walks, and mountain biking. Recreational access is shown in Map 13.

The main activities are walking, mountain-biking and hunting. Picnicking, dog walking, swimming and camping, which is allowed at two sites on the Rail Trail are other important activities. Go-kart, rifle and gliding clubs operate in the northern area, subject to lease/licence agreements.

No motorised recreation is permitted in the forest, setting it apart from nearby Akatarawa Forest as a location for passive recreation. Ease of access from SH2 (including bus and rail links to near Tunnel Gully), proximity to Upper Hutt city and the suitability of Tunnel Gully and the Rail Trail for activities that don't require a high degree of back country skill are other important characteristics of the area.

Tunnel Gully Recreation Area is an important educational resource. Easy walks through mature forest and paddocks are used for school nature study and recreational activities. As part of Greater Wellington's "Take Action" environmental education programme, school students use the stream there to learn about water quality.

9.2 Recreational zones and permitted activities

Hunters with permits may hunt for deer, pigs and goats in two zoned areas: between SH2 and the Hutt Water Collection Area; and south of Mt Climie and the Rail Trail in a zone that encompasses the headwaters and tributaries of the Pakuratahi River. Walking tracks next to the Rimutaka Rail Trail can only be accessed from the trail entrance at Kaitoke or from Wairarapa. No access to these tracks is allowed from SH2.

Tane's Track in the Tunnel Gully Recreation Area is the only walking-only track in the Forest. All other tracks are open to mountain-bikers. Access may be restricted during periods of high fire risk or forestry operations.

Dogs are permitted in the forest.

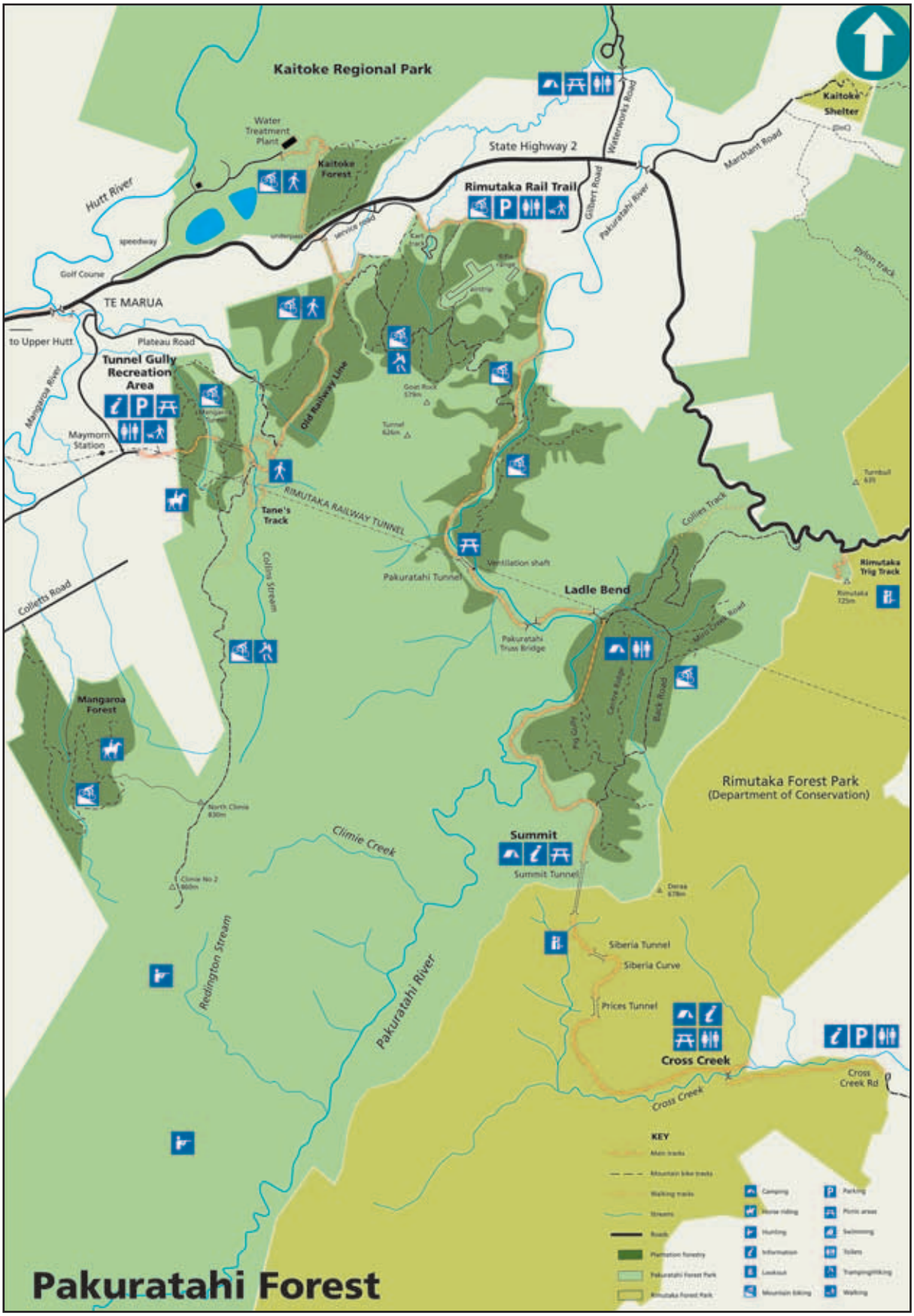
Rimutaka Rifle Range

Mountain biking on the Rimutaka Rail Trail

Mangaroa Tunnel, Tunnel Gully. Photo: Jessica Dewsnap

Tunnel Gully Picnic Area

Map 13 Pakuratahi recreation access and facilities



9.3 Visitor preferences and patterns of recreational use

The most visitors to Pakuratahi Forest come from Upper Hutt (21%), followed by Lower Hutt (13%) and Wellington (12%). Seventy-four percent of the visitors indicated that they were very satisified with the forest. The most valued aspects according to those surveyed were the well-maintained tracks and easy access, followed by the history, scenery and relaxing effect of the area. Pakuratahi Forest was the fourth-most visited of the major parks and forests managed by Greater Wellington, according to a recent survey (Cox, 2007). Tunnel Gully is the most popular area in the forest, with an estimated 45,000 visitors annually (WRC, 2004). The Rimutaka Rail Trail has an estimated 30,000 visitors a year.

10. Forestry

The lower (northern) parts of the Pakuratahi Forest were modified by frequent fires, caused by sparks from the steam engines which used to travel the Rimutaka Incline.

Plantation forests in Pakuratahi Forest are managed in three blocks; Pakuratahi West, Pakuratahi East and Mangaroa. These stands total over 700ha and are harvested at around 30 years of age, depending on the tree growth, quality and market opportunities. The bulk of the forests are in Pinus radiata, but there are some small areas of Pinus nigra. The majority of the plantation forest in Pakuratahi East was planted in the 1960s, while the stands in Pakuratahi West were started in the late 1970s and 1980s. Sustained harvesting of these forests began in 1995. After logging, the areas are replanted in radiata pine the following winter. The Mangaroa stands were planted in the 1980s.

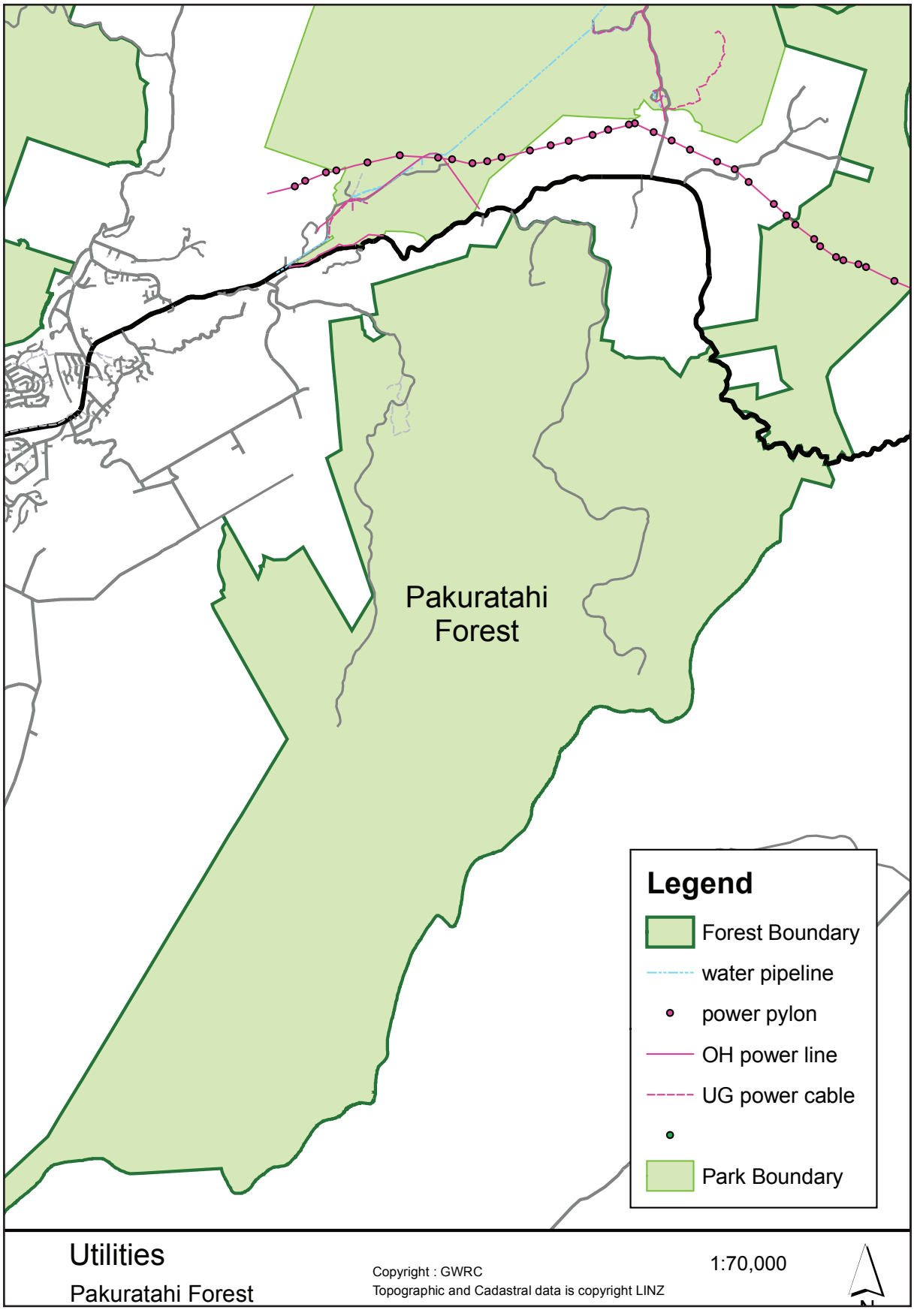
Plantation forestry stands in mid-Pakuratahi Valley

11. Utilities

The only significant public utility passing through Pakuratahi Forest is the high voltage AC electricity transmission pylon line owned by Transpower New Zealand. This line runs from Haywards Substation to the Wairarapa, and crosses the northern block of the forest in a roughly east-west direction, (see Map 14).

State Highway Two bisects the forest as it climbs from Kaitoke to the Rimutaka Road Summit, separating the main and northern blocks of Pakuratahi.

Map 14 Pakuaratahi Utilities



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Appendix One

Akatarawa and Pakuratahi Forests plant species list

Nomenclature follows "Ngaa Tipu o Aotearoa – New Zealand Plants, Manaaki Whenua – Landcare Research database (http://nzflora.landcareresearch.co.nz)

Presence: AKT = Akatarawa, PAK = Pakuratahi

Species name	Common name	Maori name	Presence	
Gymnosperm Trees				
Dacrydium cupressinum	red pine	rimu	AKT	PAK
Dacrycarpus dacrydioides	white pine	kahikitea	AKT	PAK
Podocarpus hallii	Hall's or mountain totara	totara	AKT	PAK
Podocarpus totara	totara	totara	AKT	PAK
Prumnopitys ferruginea	brown pine	miro	AKT	PAK
Prumnopitys taxifolia	matai	matai	AKT	PAK
Monocot Trees				
Cordyline australis	cabbage tree	ti kouka	AKT	PAK
Cordyline banksii	forest cabbage tree	ti ngahere	AKT	PAK
Cordyline indivisa	mountain cabbage tree	toi	AKT	PAK
Rhopalostylis sapida	nikau palm	nikau	AKT	PAK
Dicot Trees/Shrubs				
Alectryon excelsus	titoki	titoki	AKT	PAK
Alseuosmia pusilla	mountain alseuosmia	karapapa	AKT	PAK
Aristotelia serrata	wineberry	makomako	AKT	PAK
Ascarina lucida	hutu	hutu	AKT	PAK
Beilschmiedia tawa	tawa	tawa	AKT	PAK
Brachyglottis repanda	rangiora	rangiora	AKT	PAK
Brachyglottis eleagnifolia			AKT	PAK
Brachyglottis kirkii var. kirkii	Kirk's daisy	kohurangi	AKT	PAK
Brachyglottis rotundifolia	muttonbird scrub	puwharetaiko, puheretaiko makaka, maukoro, tainoka, tawao	AKT	PAK
Carmichaelia australis	broom		AKT	PAK
Carpodetus serratus	marble leaf	putaputaweta	AKT	PAK
Coprosma areolata	thin-leaved coprosma		AKT	PAK
Coprosma colensoi	springy coprosma		AKT	PAK
Coprosma crassifolia	hairy coprosma		AKT	PAK
Coprosma foetidissima	stinkwood	hupiro		PAK
Coprosma grandifolia		kanono, manono, raurekau		PAK
Coprosma lucida	shining karamu	karamu		PAK
Coprosma propinqua			AKT	PAK
Coprosma pseudocuneata			AKT	PAK
Coprosma rhamnoides			AKT	PAK
Coprosma robusta	karamu	karamu	AKT	
Coprosma rotundifolia	round-leaved coprosma		AKT	PAK
Coprosma rubra				PAK
Coprosma tenuicaulis	swamp coprosma	hukihuki	AKT	PAK
Corynocarpus laevigatus		karaka	AKT	

Species name	Common name	Maori name	Presence	
Dicot Trees/Shrubs continued				
Leptecotheca juniperina	prickly mingimingi	mingimingi		PAK
Dracophyllum longifolium		inanga or inaka	AKT	PAK
Dysoxylum spectabile	kohehohe	kohehohe	AKT	
Elaeocarpus dentatus	hinau	hinau	AKT	PAK
Species name	Common name	Maori name	Presence	
Elaeocarpus hookerianus	pokaka	pokaka	AKT	PAK
Fuchsia excorticata	tree fuchsia	kotukutuku	AKT	PAK
Gaultheria antipoda	bush snowberry	tawiniwini	AKT	PAK
Gaultheria depressa				PAK
Gaultheria rupestris				PAK
Geniostoma rupestre var. ligustrifolium	hangehange	hangehange	AKT	PAK
Griselinia littoralis	broadleaf	kapuka, papauma, maihihi	AKT	PAK
Griselinia lucida	puka	puka	AKT	PAK
Hebe stricta var. atkinsonii	koromiko	koromiko	AKT	PAK
Hedycarya arborea	pigeonwood	porokaiwhiri	AKT	PAK
Helichrysum lanceolatum	everlasting daisy	niniao		PAK
Hoheria aff. sexstylosa	hoheria	houhere		PAK
Hoheria sexstylosa	lacebark, hoheria	houhere	AKT	PAK
Ileostylus micranthus	small-flowered mistletoe	pirinoa	AKT	PAK
Knightia excelsa	rewarewa	rewarewa	AKT	PAK
Korthalsella lindsayi	dwarf mistletoe		AKT	PAK
Kunzea ericoides	kanuka	kanuka	AKT	PAK
Laurelia novae-zelandiae	pukatea	pukatea	AKT	PAK
Leptospermum scoparium	tea tree	manuka	AKT	PAK
Leucopogon fasciculatus	soft mingimingi	mingimingi		PAK
Lophomyrtus bullata	ramarama	ramarama	AKT	PAK
Lophomyrtus obcordata	rohutu	rohutu, routu, tuhuhi	AKT	PAK
Macropiper excelsum	pepper tree, kawakawa	kawakawa	AKT	PAK
Melicope simplex		poataniwha	AKT	PAK
Melicope ternata	wharangi	wharangi	AKT	
Melicytus lanceolatus	narrow-leaved mahoe	mahoe wao	AKT	PAK
Melicytus ramiflorus	whiteywood	mahoe		PAK
Metrosideros robusta	northern rata	rata	AKT	PAK
Metrosideros umbellata	southern rata	rata		PAK
Mida salicifolia	willow-leaved maire	maire-taiki		PAK
Myoporum laetum	ngaio	ngaio	AKT	
Myrsine australis	mapou	mapou	AKT	PAK
Myrsine divaricata	weeping matipo			PAK
Myrsine salicina	toro	toro	AKT	PAK
Neomyrtus pedunculata	rohutu	rohutu, routu, tuhuhi	AKT	PAK
Nestegis cunninghamii	black maire	maire	AKT	PAK
Nestegis lanceolata	white maire	maire	AKT	PAK
Nestegis montana	narrow-leaved maire	maire rororo, maire rauriki	AKT	PAK
Nothofagus fusca	red beech	tawhai	AKT	PAK
Nothofagus menziesii	silver beech	tawhai	AKT	PAK
Nothofagus solandri var. solandri	black beech	tawhai	AKT	PAK
Nothofagus truncata	hard beech	tawhai	AKT	PAK
Olearia aff. lacunosa	tree daisy		AKT	

Species name	Common name	Maori name	Presence	
Dicot Trees/Shrubs continued				
Olearia arborescens	common tree daisy		AKT	PAK
Olearia paniculata		akiraho	AKT	
Olearia rani	tree daisy	heketara	AKT	PAK
Olearia solandri	coastal tree daisy		AKT	
Olearia virgata	twiggy tree daisy			PAK
Pennantia corymbosa	kaikomako	kaikomako	AKT	PAK
Peraxilla colensoi	red mistletoe		AKT	PAK
Peraxilla tetrapetala	red mistletoe	pirirangi	AKT	PAK
Species name	Common name	Maori name	Presence	
Dicot Trees/ Shrubs continued				
Pimelea gnidea				PAK
Pittosporum cornifolium	perching kohukohu	tawhirikaro, wharewhareatua	AKT	PAK
Pittosporum eugenioides	lemon wood	tarata	AKT	PAK
Pittosporum rigidum				PAK
Pittosporum tenuifolium	kohukohu, kohuhu	kohukohu, kohuhu	AKT	PAK
Plagianthus regius	ribbonwood	manatu		PAK
Pseudopanax anomalus		whauwhaupaku,		PAK
Pseudopanax arboreus	five-finger	whauwhaupaku	AKT	PAK
Pseudopanax colensoi	mountain five-finger, three-finger	orihou	AKT	PAK
Pseudopanax crassifolius	lancewood	horoeka	AKT	PAK
Pseudowintera axillaris	lowland pepper tree	horopito	AKT	PAK
Pseudowintera colorata	alpine pepper tree	horopito	AKT	PAK
Raukaua anomalus			AKT	PAK
Raukaua edgerleyi	raukawa	raukaua, haumangaroa	AKT	PAK
Raukaua simplex	mountain three-finger	haumakaroa	AKT	PAK
Schefflera digitata	seven-finger	pate	AKT	PAK
Sophora microphylla	kowhai	kowhai		PAK
Streblus banksii	large-leaved milk tree	ewekuri, turepo, tawari	AKT	
Streblus heterophyllus	small-leaved milk tree	turepo	AKT	PAK
Syzygium maire	swamp maire	maire tawake	AKT	PAK
Teucridium parvifolium				PAK
Weinmannia racemosa	kamahi	kamahi	AKT	PAK
Monoct Lianes				
Freycinetia banksii	kiekie	kiekie	AKT	
Dicot Lianes				
Clematis foetida	clematis		AKT	
Clematis forsteri	small white clematis	poanga, pohue, puawananga	AKT	
Clematis paniculata	white clematis	puawananga	AKT	PAK
Metrosideros colensoi		rata	AKT	PAK
Metrosideros diffusa	white climbing rata		AKT	PAK
Metrosideros fulgens	scarlet rata	rata, akatawhiwhi	AKT	PAK
Metrosideros perforata	clinging rata	aka, akatea, akatorotoro	AKT	PAK
Parsonsia heterophylla	NZ jasmine	kaihua	AKT	PAK
Passiflora tetrandra	NZ passionfruit, kohia	kohia		PAK
Rubus australis	swamp lawyer	tataramoa	AKT	PAK

Species name	Common name	Maori name	Presence	
Lycopods and Psilopsids				
Huperzia varia	hanging club moss	whiri o Raukatauri	AKT	PAK
Lycopodium scariosum	creeping club moss		AKT	PAK
Lycopodium volubile	climbing club moss	waewae kokou	AKT	PAK
Tmesipteris elongata	fork fern		AKT	
Tmesipteris tannensis	fork fern		AKT	PAK
Ferns				
Adiantum cunninghamii	common maidenhair	huruhuru tapairu	AKT	
Adiantum diaphanum	small maidenhair	huruhuru tapairu	AKT	
Adiantum fulvum	NZ maidenhair	huruhuru tapairu	AKT	
Adiantum viridescens	NZ maidenhair	huruhuru tapairu	AKT	
Asplenium bulbiferum	hen and chickens fern	manamana	AKT	PAK
Species name	Common name	Maori name	Presence	
Asplenium flaccidum	hanging spleenwort	makawe o Raukatauri	AKT	PAK
Asplenium bulbiferum subsp. gracillium			AKT	
Asplenium hookerianum	perching spleenwort		AKT	
Asplenium oblongifolium	shining spleenwort	huruhuru whenua	AKT	PAK
Asplenium polyodon	sickle spleenwort	petako	AKT	PAK
Blechnum chambersii	lance fern	nini	AKT	PAK
Blechnum discolor	crown fern	piupiu	AKT	PAK
Blechnum filiforme	thread fern	panako	AKT	PAK
Blechnum fluviatile	ray water fern	kiwakiwa, kiwikiwi	AKT	PAK
Blechnum membranaceum			AKT	
Blechnum minus	swamp kiokio			PAK
Blechnum nigrum	black hard fern		AKT	
Blechnum novae-zelandiae	kiokio	kiokio	AKT	PAK
Blechnum penna-marina	little hard fern			PAK
Blechnum procerum	small kiokio		AKT	PAK
Ctenopteris heterophylla	comb fern		AKT	PAK
Cyathea colensoi	mountain tree fern			PAK
Cyathea cunninghamii	gully tree fren	punui		PAK
Cyathea dealbata	silver tree fern	ponga	AKT	PAK
Cyathea medullaris	black tree fern, mamaku	mamaku	AKT	PAK
Cyathea smithii	soft tree fern	katote	AKT	PAK
Dicksonia fibrosa	golden tree fern	wheki ponga, kuripaka	AKT	PAK
Dicksonia squarrosa	rough tree fern	wheki	AKT	PAK
Grammitis billardierei	strap fern		AKT	PAK
Histiopteris incisa	water fern	matata	AKT	PAK
Hymenophyllum armstrongii	filmy fern	mauku	AKT	
Hymenophyllum atrovirens	filmy fern	mauku	AKT	
Hymenophyllum bivalve	filmy fern	mauku	AKT	PAK
Hymenophyllum demissum	drooping filmy fern	irirangi	AKT	PAK
Hymenophyllum dilatatum	filmy fern	matua mauku, irirangi	AKT	PAK
Hymenophyllum ferrugineum	rusty filmy fern	mauku	AKT	PAK
Hymenophyllum flabellatum	fan like filmy fern	mauku	AKT	PAK
Hymenophyllum multifidum	much divided filmy fern	mauku	AKT	PAK
Hymenophyllum peltatum	one sided filmy fern	mauku	AKT	PAK

Species name	Common name	Maori name	Presence	
Ferns continued				
Hymenophyllum rarum	filmy fern	mauku	AKT	PAK
Hymenophyllum revolutum	filmy fern	mauku	AKT	PAK
Hymenophyllum sanguinolentum	filmy fern	piripiri	AKT	
Hymenophyllum scabrum	hairy filmy fern	mauku	AKT	PAK
Hypolepis rufobarbata	sticky pig fern		AKT	PAK
Lastreopsis glabella	smooth shield fern		AKT	PAK
Lastreopsis hispida	hairy fern		AKT	PAK
Lastreopsis velutina	velvet fern		AKT	PAK
Leptolepia novae-zelandiae	lace fern		AKT	PAK
Leptopteris hymenophylloides	single crepe fern	heruheru	AKT	PAK
Leptopteris superba	Prince of Wales feather	heruheru	AKT	
Lindsaea linearis				PAK
Lindsaea trichomanoides			AKT	PAK
Microsorum pustulatum	hounds tongue	kowaowao	AKT	PAK
Microsorum scandens	fragrant fern	mokimoki	AKT	
Paesia scaberula	ring fern	matata	AKT	PAK
Pellaea rotundifolia	round-leaved fern	tarawera	AKT	
Pneumatopteris pennigera	gully fern	pakau roharoha	AKT	PAK
Species name	Common name	Maori name	Presence	
Polystichum vestitum	prickly shield fern	puniu	AKT	PAK
Pteridium esculentum	bracken	rahurahu		PAK
Pteris macilenta	brake	titipo	AKT	PAK
Pyrrosia eleagnifolia	leather-leaf fern	ota	AKT	PAK
Rumohra adiantiformis	leathery shield fern	karawhiu	AKT	PAK
Sticherus cunninghamii	umbrella fern	waekura	AKT	PAK
Trichomanes endlicherianum	bristle fern		AKT	
Trichomanes reniforme	kidney fern	raurenga, kopakopa, konehu	AKT	PAK
Trichomanes venosum	veined bristle fern		AKT	PAK
Orchids				
Aporostylis bifolia	odd leaved orchid			PAK
Stegostyla lyallii	white orchid			PAK
Acianthus oblongus				PAK
Acianthus reniformis	gnat orchid			PAK
Drymoanthus adversus			AKT	
Earina autumnalis	Easter orchid	raupeka	AKT	PAK
Earina mucronata	Spring or bamboo orchid	peka-a-waka	AKT	PAK
Gastrodia cunninghamii	black orchid	huperei		PAK
Orthoceras novae-zeelandiae		Ikaika, Maika, Maikaika		PAK
Prasophyllum colensoi	leek orchid			PAK
Pterostylis banksii	greenhood orchid	tutukiwi	AKT	
Pterostylis cardiostigma	greenhood			PAK
Pterostylis foliata	greenhood			PAK
Pterostylis graminea	greenhood	tutukiwi		PAK
Pterostylis irsoniana	greenhood			PAK
Pterostylis tasmanica	greenhood			PAK
Pterostylis venosa			AKT	
Thelymitra longifolia	white sun orchid	maikuku	AKT	
Thelymitra pulchella		maikaika		PAK
Winika cunninghamii			AKT	PAK

Species name	Common name	Maori name	Presence	
Grasses				
Chionochloa cheesemanii	narrow leaved bush tussock			PAK
Chionochloa conspicua	broad leaved bush tussock	hunangamoho	AKT	PAK
Chionochloa flavescens	broad leaved snow tussock	haumata		PAK
Cortaderia fulvida	toetoe	toetoe	AKT	PAK
Cortaderia toetoe	toetoe	toetoe	AKT	PAK
Hierochloe redolens	holy grass	karetu		PAK
Microlaena avenacea	bush rice grass		AKT	PAK
Poa anceps	broad leaved poa		AKT	PAK
Sedges				
Baumea tenax				PAK
Carex dissita			AKT	PAK
Carex flaviformis				PAK
Carex geminata				PAK
Carex lessoniana		rautahi	AKT	PAK
Carex secta	purei	purei, purkireki, pukio, mata	AKT	PAK
Carex virgata	swamp sedge		AKT	PAK
Cyperus ustulatus	giant umbrella sedge	toetoe upokotangata, whatu manu	AKT	PAK
Gahnia pauciflora	cutting sedge		AKT	PAK
Gahnia setifolia		mapere		PAK
Gahnia xanthocarpa	giant sedge	tupari-maunga		PAK
Isolepis fluitans				PAK
Lepidosperma australe				PAK
Oreobolus pectinatus	comb or cushion sedge			PAK
Oreobolus strictus				PAK
Uncinia angustifolia	hooked sedge			PAK
Uncinia gracilenta	hooked sedge	watu, matau, matau ririki		PAK
Uncinia uncinata	hooked sedge	kamu, matau-a-Maui		PAK
Uncinia zotovii	hooked sedge			PAK
Rushes				
Juncus australis	rush	wi	AKT	
Juncus gregiflorus	leafless rush	wi, kopupungawha	AKT	PAK
Juncus pallidus	giant rush	wi, kopupungawha	AKT	PAK
Juncus planifolius		wi		PAK
Juncus sarophorus	leafless rush	wi	AKT	PAK
Luzula picta	wood rush	wi		PAK
Other Monocot Herbs				
Arthropodium candidum	small rengarenga	repehina-papa	AKT	
Astelia fragrans	bush lily	kahaha	AKT	PAK
Astelia linearis				PAK
Astelia solandri	perching astelia	kowharawhara	AKT	PAK
Astelia sp. aff. nervosa		kakaha		PAK
Collospermum hastatum	collospermum	kahakaha	AKT	PAK
Collospermum microspermum			AKT	
Dianella nigra	blueberry	turutu	AKT	PAK
Libertia grandiflora	NZ iris	mikoikoi, manga a huripapa, tukauki		PAK

Species name	Common name	Maori name	Presence	
Other Monocot Herbs continued				
Libertia ixioides	NZ iris	mikoikoi	AKT	
Luzuriaga parviflora	lantern berry	nohi	AKT	PAK
Phormium cookianum	mountain flax	whararikí	AKT	PAK
Phormium tenax	swamp flax	harakeke	AKT	PAK
Typha orientalis	bulrush	raupo	AKT	
Dicot Herbaceous Plants				
Abrotanella caespitosa				PAK
Acaena anserinifolia	bidibid	hutiwai, piripiri		PAK
Celmisia sp.				PAK
Centella uniflora	centella			PAK
Dactylanthus taylorii	wood rose	pua o te Reinga	AKT	
Drosera binata	scented or forked sundew	wahu		PAK
Euphrasia cuneata	North Island eyebright	tutae kiore	AKT	PAK
Gentianella grisebachii	marsh gentian			PAK
Gratiola sexdentata			AKT	PAK
Gunnera monoica	gunnera		AKT	PAK
Hydrocotyle moschata	hydrocotyle			PAK
Jovellana repens			AKT	PAK
Lagenifera pumila	papataniwhaniwha			PAK
Mazus novaezeelandiae	dwarf musk, dwarf false musk		AKT	PAK
Nertera depressa	fruiting duckweed			PAK
Nertera scapanioides				PAK
Senecio minimus				PAK
Stellaria decipiens	chickweed	kohukohu		PAK
Stellaria parviflora	chickweed	kohukohu		PAK
Vittadinia australis			AKT	
Mosses	**NB: No mosses or adventive plants listed for Akatarawa**			
Ptychomnion aciculare				PAK
Sphagnum cristatum	sphagnum			PAK
Some Adventive Plants				
Rubus fruticosus	blackberry			PAK
Senecio jacobaea	ragwort			PAK
Taraxacum officinale	dandelion			PAK
Ulex europaeus	gorse			PAK
Viola filicaulis				PAK

Appendix Two

Akatarawa and Pakuratahi Forests freshwater fish species list

Species	Common name	Maori name	Presence	
Anguilla australis	Shortfin eel	Tuna	AKT	PAK
Anguilla dieffenbachii	Longfin eel	Tuna	AKT	PAK
Galaxias brevipinnis	Koaro	Koaro		PAK
Galaxias fasciatus	Banded kokopu	Kokopu	AKT	
Galxias divergens	Dwarf galaxias		AKT	PAK
Geotria australis	Lamprey	Piharau, kanakana	AKT	
Gobiomorphus basalis	Cran's bully		AKT	PAK
Gobiomorphus breviceps	Upland bully			PAK
Gobiomorphus cotidianus	Common bully			PAK
Gobiomorphus hubbsi	Bluegill bully		AKT	PAK
Gobiomorphus huttoni	Redfin bully		AKT	PAK
Salmo trutta	Brown trout		AKT	PAK
Paranephrops planifrons	Freshwater crayfish	Koura	AKT	PAK

This list is compiled from data in the Greater Wellington freshwater fish database at June 2003, NIWA freshwater fish database at June 2003 and Wellington Fish and Game Council Report, 1996.

Appendix Three

Akatarawa and Pakuratahi Forests bird species list

Species name	Common name	Maori name	Presence	
Acanthisitta chloris granti	rifleman	titipounamu	AKT	PAK
Anas platyrhynchos	mallard		AKT	PAK
Anthornis melanura	bellbird	korimako, makomako	AKT	PAK
Carduelis carduelis	goldfinch		AKT	PAK
Carduelis chloris	greenfinch		AKT	PAK
Chrysococcyx lucidus	shining cuckoo	pipiwharauroa	AKT	PAK
Circus approximans	Australasian harrier	kahu	AKT	PAK
Cyanoramphus auriceps	yellow-crowned parakeet		AKT	
Emberiza citrinella	yellowhammer		AKT	PAK
Eudynamys taitensis	long-tailed cuckoo	koekoea	AKT	PAK
Falco novaeseelandiae	New Zealand falcon	karearea	AKT	PAK
Fringilla coelebs	chaffinch		AKT	PAK
Gerygone igata	grey warbler	riroriro	AKT	PAK
Gymnorhina tibicen	Australian magpie		AKT	PAK
Halcyon sancta vagans	New Zealand kingfisher	kotare	AKT	PAK
Hemiphaga novaeseelandiae	New Zealand pigeon	kereru	AKT	PAK
Hirundo tahitica neoxena	welcome swallow		AKT	PAK
Larus dominicanus	black-backed gull	karoro	AKT	PAK
Mohoua albicilla	whitehead	popokatea	AKT	PAK
Ninox novaeseelandiae	morepork	ruru	AKT	
Passer domesticus	house sparrow		AKT	PAK
Pavo cristatus	peafowl		AKT	
Petroica macrocephala toitoi	North Island tomtit	miromiro	AKT	PAK
Phalacrocorax carbo novaehollandiae	black shag	kawau	AKT	PAK
Platycerus eximius	eastern rosella		AKT	PAK
Porphyrio porphyrio melanotus	pukeko	pukeko	AKT	PAK
Prosthemadera novaeseelandiae	tui	tui	AKT	PAK
Rhipidura fuliginosa placabilis	North Island fantail	piwakawaka	AKT	PAK
Tadorna variegata	paradise shelduck	putangitangi	AKT	PAK
Turdus merula	blackbird		AKT	PAK
Turdus philomelos	song thrush		AKT	PAK
Vanellus miles novaehollandiae	spur-winged plover			PAK
Zosterops lateralis	silvereye	tauhou	AKT	PAK

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Stream in Akatarawa Forest.
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