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# Ecological Survey and Assessment Natural Values of Owhaoko A1B and A East Blocks, Kaimanawa Ranges

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Prepared for:

Owhaoko A1B and A  
East Blocks Trust

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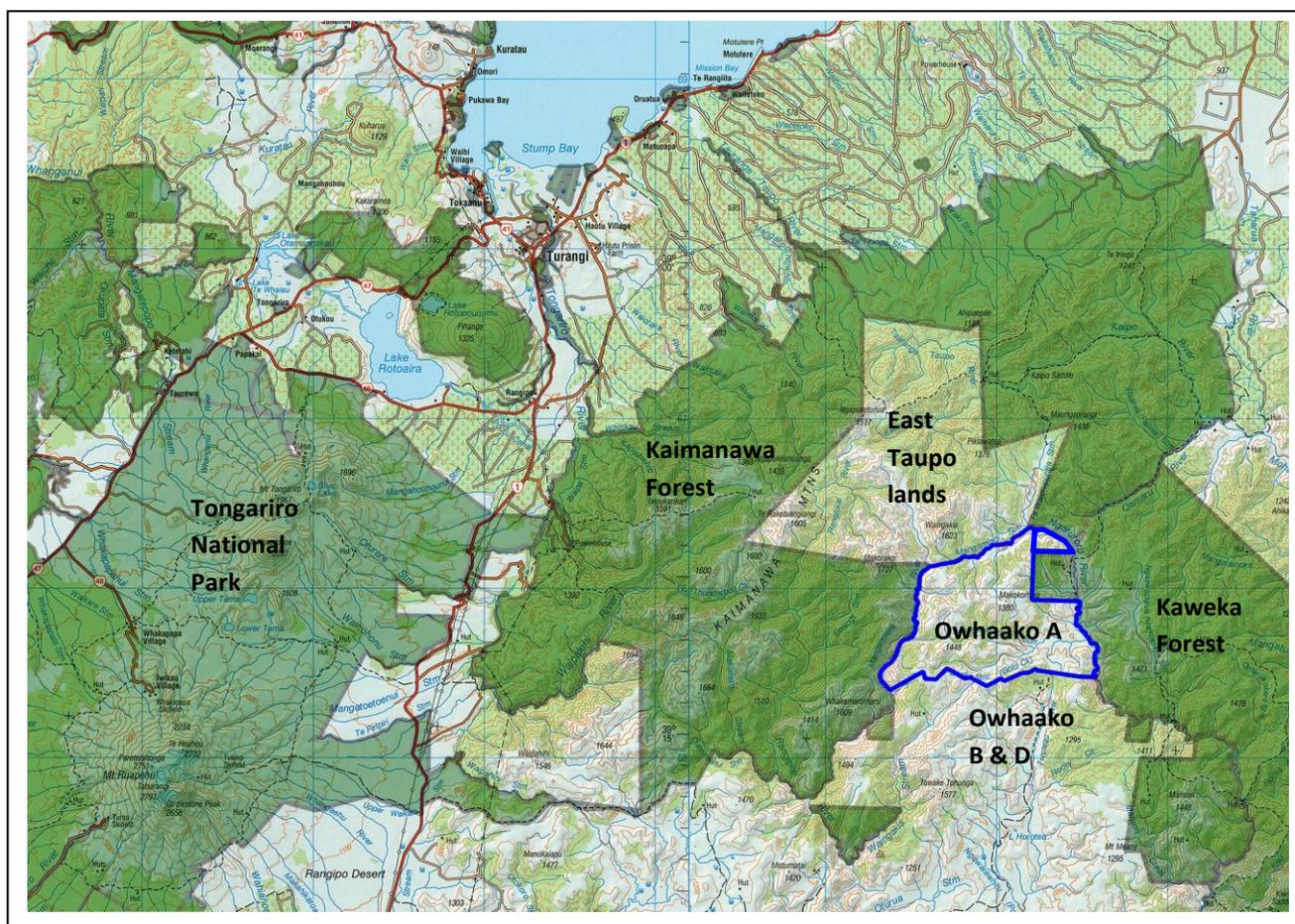
## 1. Introduction

The Owhaoko A East and A1B blocks (hereafter referred to as “Owhaoko A”) are 6743 hectares in size. The blocks are largely mountainous land, with shallow sloping mountain tops, steep hillsides draining into open alluvial terraces alongside the main tributary streams and the Ngaruroro River. The block is situated in the north eastern Kaimanawa Ranges and altitude ranges from 900m a.s.l at the Ngaruroro River which rises to 1454m a.s.l at the highest point, Makokomiko (Figure 1). It is part of a much larger natural area which is dominated by indigenous vegetation which encompasses the Kaweka and Kaimanawa Forest Parks managed by the Department of Conservation to the east and west. In the north a large area of Maori land is managed by the East Taupo Lands Trust and in the south it borders the Owhaoko B&D blocks which are protected Maori land, under Ngawhenua Rahui kawenata.

Further west these lands are connected to Tongariro National Park and being situated within the axial ranges there are connections of indigenous vegetation to the Ruahine, Ahimanawa, Whirinaki and Urewera Ranges.

The trustees of the Owhaoko A block have the desire to see the land protected under Nga Whenua Rahui kawenata. This report is the outcome of a rapid ecological survey undertaken between 18<sup>th</sup>–21<sup>st</sup> January 2015 to assess the ecological values and conservation significance.

Figure 1: Owhaoko A block



## 2. Landscape History and Vegetation Pattern

The landscape and vegetation pattern within the block has been influenced by its geology, especially faulting and erosion, recent volcanic eruptions, historic Maori fires and more recently European burning and livestock grazing and the introduction of invasive species.

The underlying geology is largely greywacke which has been faulted and uplifted by earthquakes and subsequently eroded over time, creating a mountainous landscape. More recently the Taupo 232 AD eruption destroyed much of the vegetation and deposited large amounts of Taupo pumice over thousands of square kilometres across the Central North Island. The eruption's pyroclastic flow of super-heated molten pumice and gases flowed over the western Kaimanawa Mountains and down the Ngaruroro Valley. The eruption would have initially decimated most if not all of the vegetation within the block, though some pockets may have survived in sheltered locations. Post eruption the land would have been covered in white pumice and devoid of vegetation for decades. During this period, erosion would have been rapid and much of the pumice eroded off the steeper hill slopes accumulating in the valleys, raising the bed of streams and rivers. Within a few decades vegetation had colonised much of the land helping to stabilise the fresh pumice soil (Wilmshurst & McGlone 1996). Pumice remains the dominate soil component on gentle slopes flat land, including the shallow ridges above the treeline. In the valley floors erosion over the last 1800 years has formed an intricate pattern of alluvial terraces, deeply incised streams, steep terrace risers and slump landforms. The lowest alluvial terraces, such as those adjacent to the Ngaruroro River, are the most recent landforms and are derived largely from greywacke sediment, typical of similar landforms in mountainous areas of New Zealand. Volcanic eruptions from Mt Ruapehu and Ngauruhoe have periodically deposited ash onto the area and this has contributed to the soil profile and soil fertility. The Taupo pumice landforms on the Owhaako A block and the wider Ngaruroro Valley are some of the most spectacular of their type remaining with indigenous vegetation cover (Figure 2).

Figure 2: Upper Ngaruroro River meandering across an alluvial valley looking towards Boyd Rocks — situated within quintessential Taupo pumice terrace and slump landforms, bordered by steeper greywacke mountains. Following the Taupo eruption the river would have been at a much higher height.

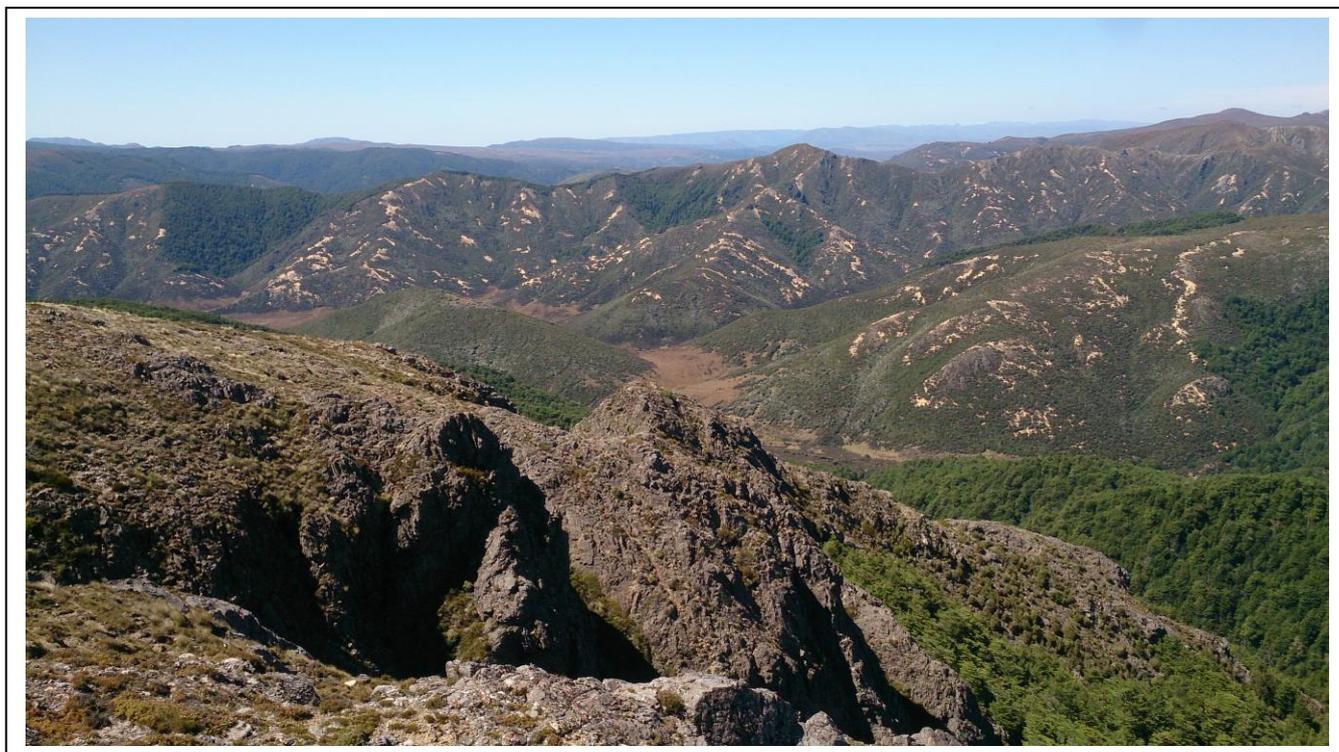


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Tall forest vegetation returned to suitable locations across the Central Volcanic Plateau within 200–300 years after the Taupo 232AD eruption (Wilmshurst & McGlone 1996). Mountain beech would have recolonized from refugia, potentially from the seedbank and invasion from eastern forests that survived the eruption. Prior to Maori arrival mountain beech would have dominated all suitable hill slopes, while the valley floors and above the tree line would have been a mosaic of tussock, shrubland and low scrub. Wetlands also occurred where water ponded.

Human induced fires altered this natural vegetation pattern, especially in the southern portion of the block and within the valley floors which contained fire prone vegetation. The first human induced fire which likely occurred here was probably the massive fire approximately 450 years ago. This fire burnt most of the Ngamatea Plateau from the northern Ruahine Ranges in the south to the Kaimanawa and Kaweka Ranges in the north (Rogers 1994). Subsequent fires have mostly burnt over the same fire affected area rather than destroying additional areas of beech forest (Figure 3).

Figure 3: The southern part of Owhaoko A block showing the upper Panoko (Gold) and Mangataramea Streams, looking south east towards the Mt Meany tops, Ngamatea Plateau and the northern Ruahine Ranges in the rear. Soil erosion and secondary vegetation is apparent resulting from historic fires. Small areas of original mountain beech forest remain in gully refugia, unaffected by fire. The valley floor would have always been dominated by red tussock and frost tolerant scrub, and probably more closely resembles its pre-human state.



Fire resulted in loss of some of the original vegetation which developed following the Taupo eruption, especially in the southern parts of the block, alongside the Panoko (Gold) Stream, Mangamingi Stream and alongside of the Ngaruroro River. Much of the stream side vegetation such as red tussock was naturally fire

adapted and re-sprouted afterwards recovering rapidly, but woody vegetation would have taken considerably longer to recover. It is likely that very limited areas of mountain beech forest have regenerated since the first large fire and the subsequent repeat burning. Most of the remaining mountain beech forest within the block occurs is restricted to steep landforms and gullies which are sheltered from the impacts of wild fire.

In the southern portion of the block characteristic fire induced erosion patterns are present. These are typified by areas of bare rock and exposed subsoil, especially on ridges, some of which remain un-vegetated today. In these areas fires were so hot that soil organic matter was burnt and the top soil was subsequently eroded (Figure 3). Much of the land which was burnt is now regenerating into manuka, monoao scrub or red tussock, depending on how severe the micro-site is to cold air ponding.

Much of the alpine tops would have been burnt at some point, probably by both Maori, and early European graziers. This would have reduced the abundance and extent of the woody component of the vegetation and locally appears to have lowered the treeline where mountain beech was removed (Figure 4). Subalpine scrub appears to have been especially reduced in extent which typically includes a high component of flammable species such as turpentine scrub and mountain celery pine. Only a few areas of this vegetation type remain now almost exclusively restricted to steeper gully areas.

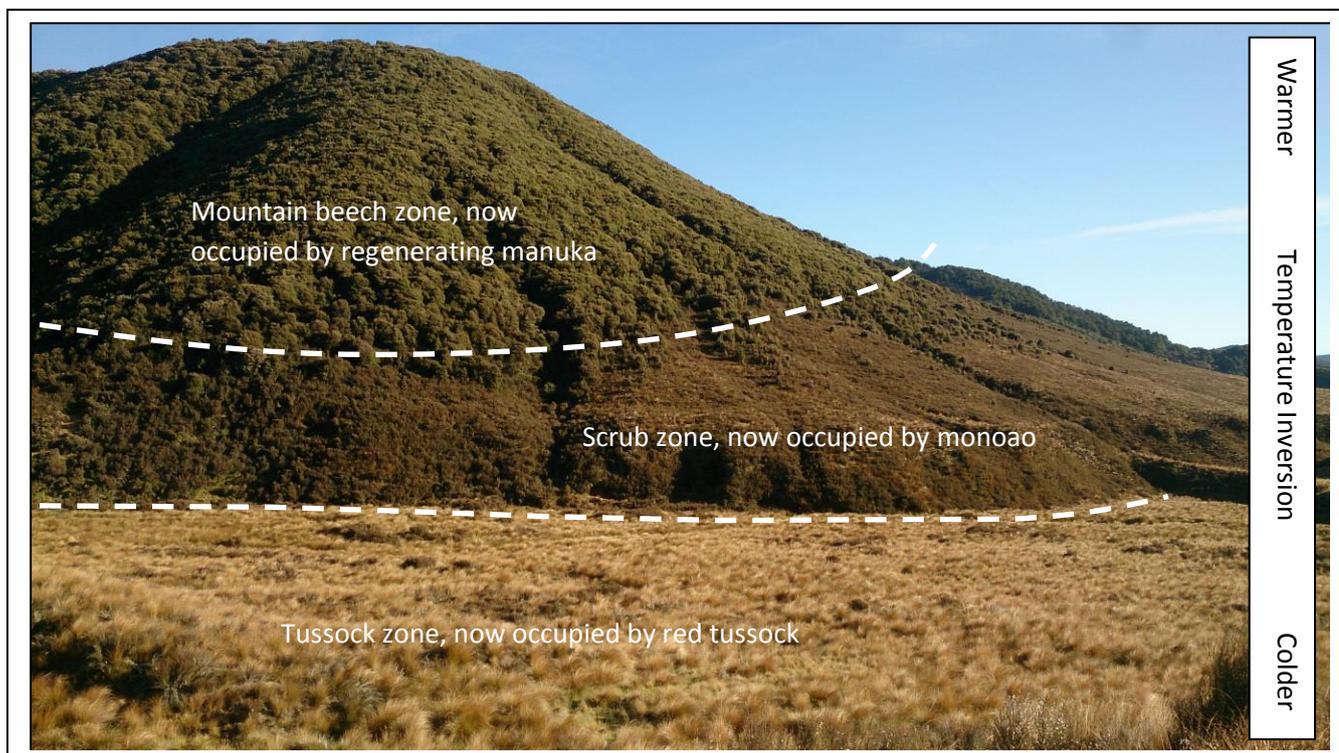
Figure 4: Headwaters of the Waiherowhero Stream showing relict stands of mountain beech which survived fire. This valley is regenerating to scrub, especially manuka, snow totara and mountain celery pine.



The general climate is cool with frequent snowfalls in the winter and a short growing season from late spring to early autumn. Frost can occur in any month of the year, especially within the valley floors, which experience cold air ponding which is a significant environmental factor that determines the vegetation pattern. Known as a cold air temperature inversion (or a “frost-flat”) the coldest air ponds in the lowest valley floors, especially if restricted by landscape features, while further up-slope frost is less severe. The tolerance

of plant species to frost is variable with grasses such as red tussock having a greater tolerance than scrub e.g. monoao and manuka, which in turn has a greater tolerance than mountain beech (Figure 5).

Figure 5: Upper Panoko Stream near Mangataramea Hut. Cold air ponding in the valley is the most significant environmental factor that determines vegetation pattern in these areas. Manuka on the upper hillslope has regenerated where mountain beech would have previously dominated prior to fire. Manuka is less tolerant to frost with a maximum tolerance of approximately  $-9^{\circ}\text{C}$ , while below this monoao has a much greater frost tolerance. Red tussock is more tolerant to frost than monoao.



Although still present in isolated areas, characteristic scrub and small trees such as bog pine, mountain celery pine, mingimingi (*Coprosma* spp.) and koromiko (*Hebe* spp.) would have been a dominant vegetation type of the valley floor vegetation pattern (Figure 6). These species would have dominated on the higher frost prone pumice terraces, terrace risers and on the transitional margin between mountain beech forest and red tussock grasslands. Monoao (*Dracophyllum subulatum*) is filling the void where celery pine and bog pine would have once been common, and although recovery is occurring it will likely take several centuries to fully recover. Red tussock would have been dominant on the young alluvial terraces adjacent to streams and in the most frost prone depressions.

European graziers arrived relatively early onto the Ngamatea Plateau because the land was largely covered in grassland and required very limited modification to farm. The first lease for the land was granted to John Studholme in 1878 and he grazed sheep north to the Ngaruroro River. There are no known written accounts of the vegetation composition before grazing. There is little doubt that much of the land was already fire induced red tussock grassland with abundant palatable inter-tussock grasses and herbs. Sheep could freely graze without restriction across vast acreages and proliferated in the early years with abundant food. Sheep numbers rapidly grew on the virgin ungrazed land and by 1894, 60,400 sheep were shorn (Riseborough, 2006). It is highly likely that within only a few decades, the land was over-grazed. Combined with repeated use of fire

to encourage fresh growth on the tussocks (as was the normal management practise at that time), many palatable native grasses and herbs would have been eliminated. Sheep would have also grazed within the beech forest areas and it is likely that they would have removed much of the palatable under-storey (especially ferns and small seedlings) from the smaller patches of forest, well before deer arrived into the area.

Figure 6: Alluvial terrace of the Ngaruroro River with *Hebe parviflora* (light green) and bog pine (centre and brown) invading into red tussock grassland. On the hill slope behind several remnant river terraces are present.



This history of “fire stick farming”, combined with over-grazing, opened up the vegetation which facilitated the spread of rabbits, further deteriorating the vegetation cover, although this would have been restricted to lower altitudes. There are numerous photos (most taken in the 1950s-60s) within the book “Ngamatea – the land and the people” (Riseborough, 2006) that show a very low and sparse vegetation cover of unpalatable shrubs and short tussock with very little tall red tussock present.

The first red deer to be seen on Ngamatea were in 1903, and by 1930, deer were abundant with large mobs of 40-50 seen browsing in the open, near forest margins. Red deer were so abundant in 1938, that Ngamatea was forced to close its back country (e.g. Owahaoko Blocks) because of competition with deer for feed (Elder, 1962). One of the recorded impacts of deer within these beech forests is that the most common under-storey species, such as mountain five-finger and other large-leaved shrubs were almost entirely removed through browsing and bark stripping. Sika deer have replaced red deer as the dominant species and continue to prevent the regeneration of these large-leaved shrub and tree species, even at the lower densities they occur in today. Sika deer (unlike red deer) also browse mountain beech seedlings which progressively can lead to lack of forest regeneration after windfall events, the development of browse resistant scrub and open “deer lawns” — turf vegetation of browse resistant native herbs.

Annual grazing of the area likely ceased in the late 1960's to early 1970's, around the time of the formation of the Kaimanawa Forest Park. Grazing had however been formally prohibited in the Harkness Valley in neighbouring Kaweka Forest Park in 1962 after the New Zealand Forest Service were forced to extinguish a large fire there. With the retirement of grazing vegetation has substantially recovered and the natural vegetation pattern is now re-establishing itself in many areas.

### 3. Vegetation

The current vegetation can be broken down into the following types, which have been mapped and quantified (Table 1 & Figure 13):

Table 1: Summary of vegetation types and the hectares of each type within Owhaoko A Block

Vegetation Type	Hectares
Bare soil or rock	18
Low alpine scrub	111
Manuka scrub	1941
Monoao scrub	75
Mountain beech	2326
Red tussock & monoao	1065
River	31
Snow tussock & shrubland	2035
Wetland	33

#### 3.1 Low alpine mid-ribbed snow tussock grasslands and shrublands

The most common vegetation type above the tree line occurs on the flat to moderately sloping mountain tops which have a top soil largely formed from Taupo pumice and other volcanic ash. Here the vegetation is composed of tussock grassland and alpine shrubs (Figure 7) with mid ribbed snow tussock (*Chionochloa pallens*), mountain neinei (*Dracophyllum recurvum*) most abundant, and whipcord hebe (*Hebe tetragonia*), Mt Ruapehu hebe (*Hebe venustula*), and mountain daisy (*Celmisia spectabilis*) common. This vegetation includes a number of other species of lower abundance than the above mentioned species.

In steeper areas and on sharp ridgelines above the tree line there are areas with very limited soil dominated by rock and gravel. In these areas snow tussock is largely absent and the vegetation is almost entirely dominated by two shrubs; mountain neinei and locally snow totara (*Podocarpus nivalis*). Other species are also present though in a much lower abundance including *Epacris alpina*, mountain daisy, Volcanic plateau foxglove and woolly moss (Figure 8). Prior to grazing these areas may have had a component of palatable grasses such as snow tussock and blue tussock which were eliminated by overgrazing.

Figure 7: Mid ribbed snow tussock grassland on gently rolling ridges, near Mt Makokomiko, looking south west to Mt Ruapehu and Mt Makorako, the highest peak in the Kaimanawa Range.



Figure 8: Exposed greywacke rock and gravel with a sparse cover of mountain neinei and locally snow totara



### 3.2 Mountain Beech Forest

Mountain beech forest occurs on hillslopes in the zone between the low-alpine vegetation on the mountain tops and the valley floors where cold air ponding occurs. Mountain beech is dominant with no other tall forest tree being present. Beneath the understory two small leaved shrubs, *Coprosma macrocarpa* and *C. pseudocunneata* are common. Throughout the forest old broadleaved trees are present and within the gullies bush lawyer or taramea is common. Very limited fern or forest floor vegetation is present. Mountain beech regeneration is patchy with pockets of regenerating saplings generally restricted to steeper topography while the majority of the forest on more shallow slopes has few seedlings or saplings in the browse tier (Figure 9).

Figure 9: A closed canopy stand of even aged mountain beech forest with limited understory. In areas without sika deer, such as in the South Island, this aged stand would likely have a dense understory of mountain beech seedlings and saplings.



### 3.3 Valley floor scrub and red tussock grasslands

Red tussock grasslands and scrub occurs within valley floors which experience periods of cold air ponding. The lowest stream and river terraces are dominated by tall red tussock grassland. Red tussock grasslands occupy many of the higher terraces and adjoining hill slopes, however in these areas monoao is rapidly regenerating and will likely replace the tussock. In association with the red tussock are a wide range of other native grasses (especially blue tussock) and native herbaceous species. Lichen is also locally abundant growing between the tussocks. In comparison to the Taruarau Valley on Owhaako B & D blocks, the red tussock grasslands here are taller, denser and considerable more natural with few exotic grasses and other introduced plants present. Pre-human colonisation even the most frost prone alluvial terraces would have contained a wide range of typically alpine shrub species and locally regeneration of a few species is now occurring (Figure 6).

Monoao and manuka scrub are the most common scrubland vegetation types found occurring in areas which have been burnt. In the Panoko, Mangataramea and Mangamingi Streams and in the main Ngaruroro River

large areas of monoao “frost-flat” scrub is present on the higher river terraces and hillslopes in areas of cold air inversion. In pre-human times, these areas of monoao would likely have been dominated by a low forest of bog pine and mountain celery pine, though monoao would have also been abundant. In the coming decades monoao will increase in dominance and will likely persist for a century or more. In the absence of fire these areas could eventually develop into a low forest of mountain celery pine, bog pine and monoao. Where relict stands remain, other scrub species are regenerating including mountain celery pine, mingimingi, twiggy tree daisy, tree koromiko and native broom. Locally, small stands of coprosma scrub occur alongside stream margins and this will likely increase over time.

Manuka scrub replaces monoao on higher hill slopes (Figures 5 & 10) and pre-human colonisation these areas would likely have been mountain beech forest. Manuka is also present in areas near the tree line which likely were also previously mountain beech forest.

Figure 10: Red tussock grassland and regenerating monoao within the Panoko (Gold) Stream, looking downstream from Mangataramea Hut

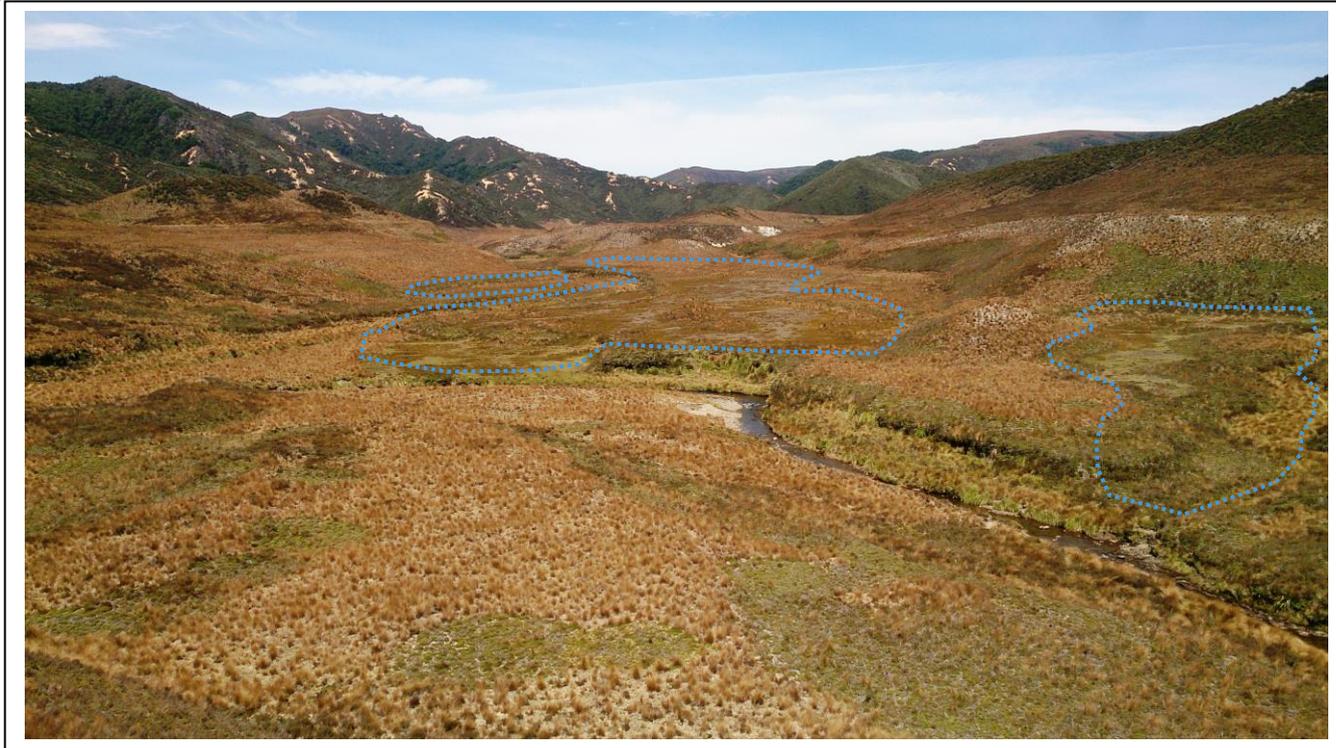


### 3.4 Wetlands

The Panoko (Gold) Stream catchment has numerous wetlands which are associated with former stream courses, depressions on alluvial terraces, or where springs and seepages appear. Small wetlands are also present near the Ngaruroro River and Mangamingi Stream. Most of the wetland habitat can be classified as “fen” which is moderately fertile, however “swamp”, “marsh” and fen which is developing towards “bog” are also present. Swamp and marsh wetlands occur in areas where flooding is more common and these wetlands are more fertile and have taller and denser vegetation. Several wetlands in the upper Panoko Stream have been colonised by wire rush (*Empodisma minus*) which is a peat forming species. With time wire rush will dominate, slowly transforming the wetlands into low fertility bog wetlands (Figures 11 & 12).

The fen wetlands are dominated by a few species species; four square (*Lepidosperma australe*), bog rush (*Schoenus pauciflorus*), wire rush and tangle fern (*Gleichenia dicarpa*) (Figures 11 & 12). Red tussock is also abundant on the wet margins. Swamp wetlands are dominated by sedge species, particularly purei (*Carex secta*), cutty grass (*Carex coriacea*) with bog rush and locally twiggly tree daisy. Small marsh wetlands occur in areas which are regularly flooded and were only seen on alluvial terraces of the Ngaruroro River. In one small area a population of the acutely threatened sedge (*Carex rubicunda*) was found in a small ephemeral wetland.

Figure 11: Fen wetland areas (highlighted in blue) in the upper Panoko Stream dominated by four square, wire rush and tangle fern.



Like the adjoining tussock grasslands most wetlands have been burnt and woody vegetation is likely to be less abundant compared to pre-human times. Some shrubs are present and twiggly tree daisy is particularly common along-side the Panoko Stream. It is expected that with time shrubs will increase in abundance especially in the swamp wetlands.

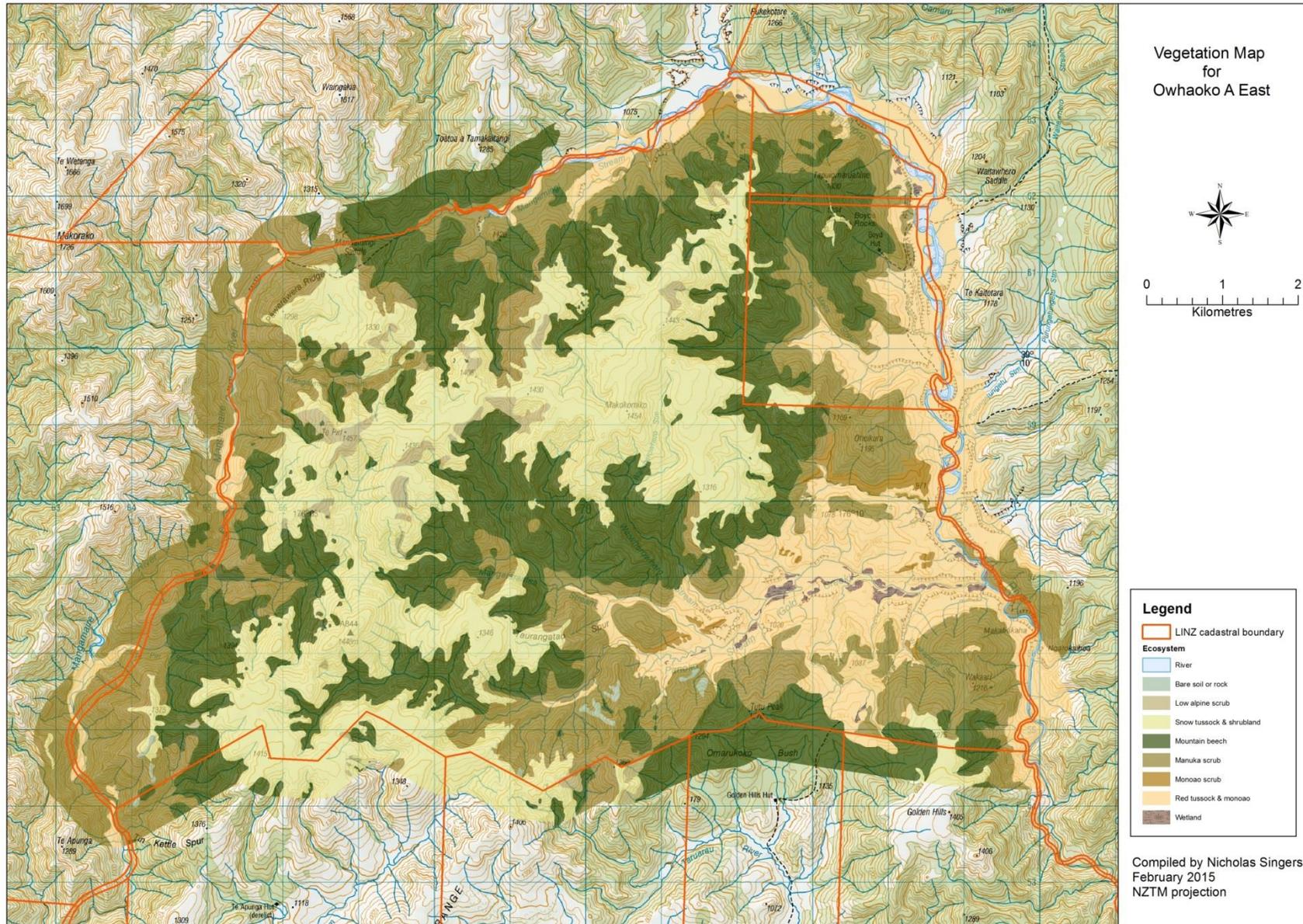
The wetlands on Owhaoko A are relatively low in species diversity, which is not surprising given that they have formed post the Taupo 232AD eruption and are relatively isolated from other wetlands. Despite this they are some of the most intact examples remaining in the entire Central North Island with few introduced plant species. Several threatened plant species were found within the wetlands and with further survey others would likely be discovered.

Locally there are smaller areas of more specific vegetation types related to geological features. These include small areas of pumice bluffs and greywacke rock cliffs, small mobile scree above the treeline, braided river gravels alongside the Ngaruroro River and Panoko (Gold) Stream.

Figure 12: Wetland habitat in a former course of the Panoko Stream. The arrow indicates the direction of water flow. Upper (right) areas are fen though three circular patches of the peat forming wire rush are clearing viable. Further downstream (left) this wetland develops into fertile swamp with purei abundant. A small area of twiggy tree daisy (grey shrubs) can be seen beneath the steep slope.



Figure 13: Vegetation Map for Owhaoko A Block



## 4. Threatened species

Several threatened or at risk species were found including five birds, three wetland plants and two plant species associated with riparian gravel and sandy areas. They are listed below in hierarchical order of their threat status.

*Raoulia* (a) (CHR 79537; "K"). Nationally critical. This is a very small mat forming plant which remains taxonomically undescribed. It grows in the flood zone alongside upland braided rivers and until this discovery it was only known adjacent to the upper Taruarau and Moawhango Rivers in the North Island. In the South Island it has only been found at a single site in the upper Waimakiriri River. Approximately 500 plants were found growing on the edge of braided gravels and tussock grassland, near the junction of Boyd, Kaimanawa Forest Park boundary. This is potentially the largest currently known population in New Zealand and strongly suggests that the upper Ngaruroro River has the largest population nationally as abundant suitable habitat occurs upstream.

*Carex rubicunda*; Nationally vulnerable. This is a small red-leaved sedge which grows in ephemeral wetlands, an uncommon type of wetland which is seasonally dry. It was found at one small site near the Ngaruroro River where 38 plants were counted.

Karearea/ New Zealand falcon (*Falco novaeseelandiae*). Nationally vulnerable. A single female falcon was observed hunting above the bush-line. Like elsewhere in the Kaimanawa Ranges falcon are present though at low abundance.

*Isolepis fluitans* var. *fluitans*. Nationally vulnerable. This is an aquatic sedge which grows in stream channels often those flowing from wetlands. It was seen at a single site in the upper Panoko Stream.

Hoiho/ native mint (*Mentha cunninghamii*). At risk – declining. This plant was observed at several locations generally near water amongst red tussock grassland and wetland margins.

Rifleman (*Acanthisitta chloris*). At risk – declining. Riflemen were heard on several occasions while surveying areas of mountain beech forest. It is likely that, as ship rats are absent or extremely uncommon at this altitude, the population here is probably stable.

New Zealand pipit (*Anthus novaeseelandiae*). At risk – declining. New Zealand pipit is numerous in the red tussock grassland and was also observed above the tree line. The introduced skylark, a close relative is also abundant.

North Island fernbird (*Bowdleria punctata* subsp. *vealeae*). At risk – declining. Fernbird were numerous in areas of monoao and manuka scrub and were regularly heard throughout the block wherever suitable habitat existed. At dusk near Mangataramea Hut at least half a dozen birds could be heard calling to one another. It is likely that, as ship rats are likely to be absent or extremely uncommon at this altitude, the population here is probably stable.

*Schoenus fluitans*. At risk – Naturally uncommon. This is a wetland sedge which is restricted to the Central North Island on the mainland and is also found on the Chatham Islands. It was observed growing in two separate wetlands, one in Panoko Stream and the other in the Ngaruroro River.

Longtailed cuckoo (*Eudynamys taitensis*). At risk – Naturally uncommon. Several long tailed cuckoo were heard in the mountain beech forest. They appeared to be reasonably numerous along with their foster parent bird the whitehead.

Other threatened species highly likely be present on the Owhaoko block, though likely at a low abundance, include two species of beech mistletoe (*Alepis flavida* and *Peraxilla tetrapetala*) which are declining nationally

because of possum browse. The small scaled skink (*Oligosoma microlepis*) has been recorded from near Boyd Lodge (Whitaker 1997) and is likely to occupy suitable areas of rocky habitat. However no skink observations were made during the survey, which was carried out in hot and sunny weather, ideal conditions for skink spotting. This result is indicative that any species present will be at a very low abundance. Whio are also potentially resident on the Mangamingi Stream as a pair of whio duck were observed in spring 2014 in the “Blue Duck Stream” approximately 1.7km up from the confluence with the Mangamingi Stream.

A relict population of the eastern North Island brown kiwi still remain in some areas in the adjoining Kaweka and Kaimanawa Forest Parks. Resident birds may still be present in suitable forest and scrub areas, though like elsewhere without management will be declining due to predation.

## 5. Conservation values and ecological significance

The ecological values of the Owhaoko A block are similar to adjoining protected areas with the Kaimanawa Ecological District (Kaimanawa Forest, Kaweka Forest and Owhaoko B&D blocks). The forest is a natural monoculture of mountain beech which is also the dominant forest type within the southern Kaimanawa Ranges and through much of the Kaweka Range. Additionally, the snow tussock grasslands above the treeline are very similar to the Taweke Tohunga Range on Owhaoko B&D block and the Umukarikari Range in Kaimanawa Forest Park.

Owhaoko A block however contains some outstanding landscape and ecological features which are under-represented or are the best examples of their type. Of greatest significance is the landscape and associated vegetation types of the valley floors of the Ngaruroro catchment, including the Panoko and Mangamingi Stream. Cold air temperature inversion is of equal importance shaping these areas and the natural vegetation would be red tussock grassland, scrub and low frost tolerant forest with sporadic wetlands in suitable areas. In my opinion the upper Ngaruroro Valley is the best preserved example remaining of an alluvial river landform and associated indigenous vegetation types, associated with the Taupo 232AD eruption. Similar landforms occur in the upper Taruarua and Taharua valleys however the vegetation of both of these areas have been modified to a much greater extent. Owhaoko A block is a core area of these values and contains the largest area of valley floor red tussock grassland and wetlands within the catchment.

The wetlands deserve special mention because of their near pristine condition and because together they make up the most significant area of wetland habitat within the entire Kaimanawa Ecological District. Thirty-four of the largest wetlands were mapped within the Panoko Stream and the upper Ngaruroro River and combined occupy approximately 30 Ha. Many smaller wetlands were too small to map including areas above the treeline.

Most wetlands are of low to moderately fertile “fen” wetlands dominated by four square, tangle fern, bog rush and locally wire rush. In general they are species poor, though some unusual plants such as sundews and orchids are abundant. An ecologically outstanding swamp occurs within a former channel of the Panoko Stream. This swamp contains some pristine purei (*Carex secta*) and bog rush sedgeland, which is a highly threatened wetland type throughout North Island. Twiggy tree daisy (*Olearia virgata*) shrubland with an understorey of cutty grass is also a swamp wetland type which is well represented adjacent to the Panoko Stream in several areas. This woody wetland type is likely to be recovering from fire and will increase over time. The abundance of wire rush (a bog forming plant) is also note-worthy. This peat forming plant appears to have only recently arrived and as yet is still uncommon. Near the Ngaruroro River a small ephemeral

wetland was found which had a population of a threatened plant, *Carex rubicunda* and locally areas of riverine marsh occur. Two other threatened plants were found though the wetlands likely will have many more — in the Central North Island wetlands have the greatest diversity of threatened plants compared to any other ecosystem type.

Despite the land use history of fire and grazing, of additional significance is that the condition of the vegetation is extremely intact and vegetation succession is almost entirely of native species. Only one ecologically significant invasive plant was observed within the wetlands, jointed rush (*Juncus articulatus*). Despite being relatively species poor, as a complex the wetlands of the upper Ngaruroro catchment are some of the most pristine and ecologically significant examples remaining in the North Island. Likewise, in general braided river or riparian ecosystems have been severely degraded (especially by weeds) throughout the North and South Islands (Wiser & Williams 2004). The naturally occurring non-forest vegetation of the upper Ngaruroro River is likely to be some of the most intact of remaining in the North Island. Further there is a very low diversity and abundance of introduced plants, with few significant environmental weeds present.

Associated with these valley floor vegetation types are at least six threatened plant species, though with further survey it is highly likely that more species would be found.

## Threats

In general the ecological condition of most of the block is outstanding. Weeds are the greatest ecological threat long-term, though currently very few invasive ecological weeds are present. Common woody environmental weeds threats which are almost ubiquitous on the central North Island, such as lodge-pole pine (*Pinus contorta*), broom (*Cytisus scoparius*), gorse (*Ulex europaeus*), tree lupin (*Lupinus arboreus*) and heather (*Calluna vulgaris*) appear to be absent. One small grey willow (*Salix cinerea*) seedling was pulled-out from the Ngaruroro River though in comparison to other rivers nearby the abundance of this weed is extremely low. Grey willow is spreading throughout the Central North Island, invading river margins and wetlands and is probably the greatest threat to riverine and wetland habitats. Heather potentially could be present as it has previously been controlled by the Department of Conservation land down-stream of Boyd Lodge.

Compared to the Oamaru Valley to the north and the Taruarau Valley to the south, introduced pasture grasses and herbaceous weeds are also relatively uncommon. The two commonest herbaceous weed threats are mouse-eared hawkweed and jointed rush, which are most common in more fertile habitat alongside the Ngaruroro River. Mouse-eared hawkweed is locally abundant growing amongst red tussock, while jointed rush is dominant in several marsh wetlands which are likely to be periodically flooded. Both of these species however are now too widespread to be able to undertake direct control. Insect biological agents have been introduced to control mouse-eared hawkweed and may be an option, though how successful these are is still unknown.

The priority for weed control is ongoing surveillance and removal if species of threat arrive. *Pinus contorta* and heather are the most likely species to arrive as they occur on surrounding land.

Of the many introduced animal species present, sika deer (*Cervus nippon*) are having the greatest ecological impact, principally threatening the regeneration of forest species such as mountain beech. Compared to parts of the Rangitikei catchment in Kaimanawa Forest Park the sika deer population is much lower and the overall ecological impact is less. Localised mountain beech regeneration is occurring and there is a sub-canopy of

small leaved Coprosma shrubs, whereas in the Rangitikei very limited vegetation remains beneath the mountain beech canopy. Improvement in forest regeneration will only occur with a reduction in sika deer abundance, specifically targeting hinds.

Most land in the Owhaoko block is situated above 900m a.s.l. which is around the upper altitude that ship rats sustain permanent populations (Kelly *et al.* 2005). As a result, the predator population is less diverse than lowland areas with stoats and possums being the primary predators of indigenous fauna. Both of these species could be efficiently and effectively managed using currently available tools. Given the size and available habitat, both of these pests could be effectively managed to increase the abundance of forest and grassland birds.

## Recommendations

### 1. Legal Protection

The Owhaoko A block thoroughly warrants legal protection for its large size, landscape, ecological and scenic values. Further the ecological condition of the land is high and limited threats are present, which long term means that maintenance of these values is highly feasible.

The landscape values of the upper Ngaruroro River and tributaries are geologically and scenically spectacular. They include some of the best remaining landforms associated with the Taupo 232AD eruption in indigenous vegetation. Ecologically the wetlands, cold air temperature inversion tussock grasslands and monoao scrub, and natural riparian vegetation are nationally significant and are habitat for several threatened species. Protection of these areas is in accordance with several national priorities (MFE 2007).

- National Protection Priority 2 “To protect indigenous vegetation associated with sand dunes and wetlands; ecosystem types that have become uncommon due to human activity”.
- National Protection Priority 3 “To protect indigenous vegetation associated with ‘originally rare’ terrestrial ecosystem types not already covered by priorities 1 and 2”. This includes the valley floor red tussock and monoao, braided river and ephemeral wetland habitats.
- National Protection Priority 4 “To protect habitats of acutely and chronically threatened indigenous species”.

In addition to the more unusual ecological values, the land contains large areas of more common vegetation types such as snow tussock grassland and shrubland and mountain beech, with approximately 2000 hectares each.

### 2. Ecological Management

Maintenance of the ecological values of the land will require ongoing active management. Invasive weeds pose the greatest long term threat, although currently the weed species of greatest threat appear to be absent. Successful management will require trustees and concessionaires involved firstly being cognisant of potential threats (especially weeds) and locating weed threats at an early stage of invasion to enable timely control to occur. Active surveillance through regular searching in high risk areas will provide the greatest chance of intercepting these threats. Long term maintenance of ecological values will only be successful if adjoining landowners similarly recognise the importance of the land, the ecology and the values they contain and potential threats to them.

Enhancement of ecological values is a realistic goal to aim for. Priority management could include periodically reducing sika deer abundance (especially of the resident hind population) to allow mountain beech forest regeneration to proliferate. Similar management has occurred in the adjoining Kaweka Forest Park and learning from this should be applied if sika deer management is undertaken. Specifically targeting hinds would likely allow stags to thrive and reach trophy size, potentially enabling greater revenue from hunting during the rut, while still achieving forest regeneration goals.

Enhancing indigenous fauna such as forest birds through possum and predator control is entirely technically possible with current methods. Stoat control alone is often sufficient management to drastically increase small forest bird abundance, such as bellbird as ship rats will be rare or absent. If predator control is implemented it should initially focus around luxury accommodation areas to increase bird populations and enhance the visitor experience — such as the dawn chorus.

This survey was rapid and is by no means comprehensive of the ecological values of the land. It is highly likely that other ecological values such as significant populations of threatened species occur.

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## Appendix

### Plant Species of the Owhaoko A blocks, Eastern Kaimanawa Ranges

This list was compiled by Nicholas Singers from field work that occurred between 18<sup>th</sup> – 20<sup>th</sup> January 2015.

The plant species list is a compilation of lists for relatively distinct habitat types;

- i.) Alluvial terraces of red tussock, monoao and riparian margins of Gold Creek and the Ngaruroro River
- ii.) Mountain beech forest
- iii.) Low alpine snow tussock grassland — shrubland on the Makokomiko Range
- iv.) Wetlands adjacent to Gold Creek and the Ngaruroro River

Several species were vouchered for identification purposes followed by their individual voucher number.

#### Abundance Key

Species abundance was quantified subjectively using the following abundance key.

r = rare

u = uncommon

l = local

o = occasional

c = common, also lc = locally common

a = abundant, also la = locally abundant

p = present

? = present in Owhaoko B/D but not recorded in A block

\* = exotic/adventive species

Scientific name	Common name	Abundance within habitat types			
		i	ii	iii	iv

<u>Gymnosperm Trees and Shrubs</u>					
Scientific name	Common name	i	ii	iii	iv
<i>Halocarpus bidwillii</i>	mountain pine, bog pine	u		u	r
<i>Lepidothamnus laxifolius</i>	pygmy pine	lc		c	
<i>Phyllocladus alpinus</i>	celery-top pine	l	c	u	
<i>Podocarpus nivalis</i>	snow totara	u		a	
<i>Podocarpus hallii</i> x <i>nivalis</i>			p		
<u>Monocot Trees</u>					

<i>Cordyline indivisa</i>	mounatin cabbage tree		?		
<b><u>Dicot Trees and Shrubs</u></b>					
<i>Acrothamnus colensoi</i>		u			
<i>Androstoma empetrifolium</i>	bog mingimingi	u			
<i>Aristotelia fruticosa</i>	montain wineberry	r			
<i>Aristotelia serrata</i>	wineberry, makomako		?		
<i>Brachyglottis bidwillii</i>				c	
<i>Carmichaelia australis</i>	NZ broom	u			
<i>Carpodetus serratus</i>	marble leaf, putaputaweta		u		
<i>Coprosma acerosa</i> var. <i>brunnea</i>	pepperwood, sand coprosma	l			
<i>Coprosma cheesemanii</i>		c		c	
<i>Coprosma</i> aff. <i>cheesemanii</i>					
<i>Coprosma depressa</i>				o	
<i>Coprosma decurva</i>		r			
<i>Coprosma foetidissima</i>	stinkwood		c		
<i>Coprosma lineariifolia</i>	yellow wood, mikimiki				
<i>Coprosma microcarpa</i>	small seeded coprosma	u	c		
<i>Coprosma perpusilla</i>				c	
<i>Coprosma propinqua</i> subsp. <i>propinqua</i>	mingimingi	u			u
<i>Coprosma propinqua</i> x <i>robusta</i>			u		
<i>Coprosma pseudocuneata</i>			c		
<i>Coprosma rigida</i>					
<i>Coprosma robusta</i>	karamu, glossy karamu	r			
<i>Coprosma rugosa</i>		u			
<i>Coprosma tayloriae</i>	divaricating coprosma	u	l		

<i>Coprosma tenuifolia</i>	wavy-leaved karamu		o		
<i>Coriaria arborea</i>	tree tutu				
<i>Coriaria kingiana</i>		l			
<i>Coriaria plumosa</i>	feathery tutu, mountain tutu	l			
<i>Coriaria pteridoides</i>	small-leaved tutu	l			
<i>Dracophyllum longifolium</i>				u	
<i>Dracophyllum recurvum</i>	curved leaved neinei	u		a	
<i>Dracophyllum strictum</i>					
<i>Dracophyllum subulatum</i>	monoao	c			u
<i>Epacris alpina</i>				a	
<i>Fuchsia excorticata</i>	tree fuchsia, kotukutuku		r		
<i>Fuscopora cliffortioides</i>	mountain beech		a		
<i>Gaultheria colensoi</i>	mountain snowberry		l	o	
<i>Gaultheria depressa</i>		u			
<i>Gaultheria macrostigma</i>	prostrate snowberry	u			
<i>Griselinia littoralis</i>	broadleaf, papauma		o		
<i>Hebe odora</i>				u	
<i>Hebe parviflora</i>		la			
<i>Hebe stricta</i> var. <i>stricta</i>	koromiko	l			l
<i>Hebe stricta</i> var. <i>lata</i>	shining koromiko		u		
<i>Hebe tetragona</i>	whipcord hebe			a	
<i>Hebe venustula</i>		u		a	
<i>Kunzea ericoides</i>	kanuka, white tea tree	a			
<i>Leptospermum scoparium</i>	manuka, red tea tree	a		o	u
<i>Leucopogon colensoi</i>		u			

<i>Leucopogon fasciculatus</i>	tall mingimingi		o		
<i>Leucopogon fraseri</i>	dwarf mingimingi, patotara	a			
<i>Meliccytus alpinus</i>	porcupine shrub	r			
<i>Myrsine divaricata</i>	weeping mapou / matipo		c		
<i>Myrsine nummularia</i>	creeping mapou / matipo			p	
<i>Olearia arborescens</i>	common / glossy tree daisy				
<i>Olearia furfuracea</i>		r			
<i>Olearia nummulariifolia</i>		r			
<i>Olearia virgata</i>	twiggy tree daisy	lc			la
<i>Ozothamnus vauvilliersii</i>	mountain tauhinu	a		c	u
<i>Pentachondra pumila</i>		o		o	
<i>Peraxilla tetrapetala</i>	scarlet mistletoe		?		
<i>Pimelea prostrata</i>	NZ daphne, Strathmore weed	u			
<i>Pittosporum tenuifolium</i> var. <i>colensoi</i>	kohuhu				
<i>Pseudopanax colensoi</i>	orihou		r		
<i>Pseudopanax crassifolius</i>	lancewood, horoeka		r		
<i>Raukaua anomalus</i>			u		
<i>Raukaua simplex</i>	three-finger		o		
<b><u>Dicot lianes</u></b>					
<i>Clematis forsteri</i>	clematis	l			
<i>Clematis paniculata</i>	white clematis		r		
<i>Clematis quadribracteolata</i>		o			o
<i>Muehlenbeckia australis</i>	pohuehue		u		
<i>Muehlenbeckia axillaris</i>	creeping pohuehue	o		o	
<i>Rubus cissoides</i>	bush lawyer		c		
<i>Rubus schmidelioides</i>	white-leaved lawyer		lc		

<b><u>Fern allies and mosses</u></b>					
<i>Lycopodium fastigiatum</i>	alpine / mountain clubmoss	u		o	
<i>Lycopodium scariosum</i>	creeping clubmoss	p		p	
<i>Racomitrium lanuginosum</i>	woolly moss	la			
<i>Sphagnum cristatum</i>	sphagnum moss				u
<b><u>Ferns</u></b>					
<i>Asplenium hookerianum</i>	Hooker's spleenwort				
<i>Asplenium flabellifolium</i>	butterfly fern	u			
<i>Asplenium flaccidum</i>	hanging spleenwort		u		
<i>Asplenium terrestre</i>		u			
<i>Blechnum fluviatile</i>	kiwakiwa		u		
<i>Blechnum montanum</i>	mountain kiokio	u			
<i>Blechnum nigrum</i>					
<i>Blechnum novae-zelandiae</i>	kiokio	u			
<i>Blechnum pennamarina</i>		o	o	p	u
<i>Blechnum procerum</i>	small kiokio				
<i>Cheilanthes seiberi</i> subsp. <i>seiberi</i>	rock fern	r			
<i>Gleichenia alpina</i>				o	
<i>Gleichenia dicarpa</i>	tangle fern	a			la
<i>Grammitis billardierii</i>			c		
<i>Histiopteris incisa</i>	water fern, mata		c		
<i>Hymenophyllum multifidum</i>	filmy fern				
<i>Hymenophyllum sanguinolentum</i>					
<i>Hypolepis millefolium</i>	thousand-leaved fern				

<i>Hypolepis rufobarbata</i>			u		
<i>Leptopteris superba</i>	Prince of Wales Feathers				
<i>Lindsaea trichomanoides</i>					
<i>Microsorium pustulatum</i>	hounds tongue, kowaowao				
<i>Polystichum sylvaticum</i>			u		
<i>Polystichum vestitum</i>	prickly shield fern		u		
<i>Pteridium esculentum</i>	bracken, rahurahu	u			
<i>Pyrrosia eleaganifolia</i>	leather-leaf fern	r			
<i>Sticherus cunninghamii</i>	umbrella fern		u		
<b><u>Orchids</u></b>					
<i>Aporostylis bifolia</i>	orchid			o	
<i>Caladenia chlorostylis</i>			c		
<i>Chiloglottis cornuta</i>	green bird orchid		o		
<i>Corybas oblongus</i>		l			
<i>Corybas orbiculatus</i>					
<i>Corybas trilobus</i>			c		
<i>Earina mucronata</i>	bamboo orchid				
<i>Gastrodia sesamoides</i>	potato orchid				
<i>Gastrodia cunninghamii</i>	black orchid				
<i>Microtis oligantha</i>	onion orchid				c
<i>Microtis unifolia</i>	onion orchid	o			
<i>Prasophyllum colensoi</i>	leek orchid	u		c	u
<i>Pterostylis humilis</i>			u	r	
<i>Pterostylis patens</i>	tutukiwi	u	c		
<i>Thelymitra cyanea</i>	short-leaved thelymitra				o
<i>Thelymitra longifolia</i>	long-leaved thelymitra	p			

<i>Thelymitra "Whakapapa"</i>	Ruapehu sun orchid			p	
<b>Grasses</b>					
* <i>Agrostis capillaris</i>	brown top, bent grass	u			
* <i>Anthosachne scabra</i>	Australian blue wheatgrass	c			
<i>Anthosachne solandri</i>	native blue wheatgrass	u			
* <i>Anthoxanthum odoratum</i>	sweet vernal	a			
<i>Chinochloa pallens</i>	mid-ribbed snow tussock			a	
<i>Chinochloa rubra</i>	red tussock	a		l	l
<i>Cortaderia fulvida</i>	toetoe	u			
<i>Deyeuxia avenoides</i>	mountain oat grass	o		o	
<i>Deyeuxia</i> aff. <i>quadriseta</i>	bog oat grass				u
<i>Dichelachne crinata</i>	long-hair plume grass	u			
<i>Festuca novae-zelandiae</i>	hard tussock	a			
* <i>Festuca rubra</i> subsp. <i>communtata</i>	chewings fescue	l			
<i>Hierocloe recurvata</i>	holy grass			p	
<i>Hierocloe redolens</i>	holy grass, karetu				u
* <i>Holcus lanatus</i>	Yorkshire fog	l			u
<i>Lachnagrostis filiformis</i>	NZ wind grass	u			
<i>Lachnagrostis striata</i>		p			u
* <i>Lolium perenne</i>	perennial ryegrass	r			
<i>Microlaena stipoides</i>	meadow / slender rice grass	u	p		
<i>Poa anceps</i>	broad-leaved poa	lc			
<i>Poa breviglumis</i>			c		
<i>Poa cita</i>	silver tussock	u			
<i>Poa colensoi</i>	blue tussock	c		c	
* <i>Poa pratensis</i>	Kentucky bluegrass				

<i>Rytidosperma clavatum</i>		l			
<i>Rytidosperma gracile</i>		o			u
<i>Rytidosperma setifolium</i>	bristle tussock	o		o	
* <i>Schedonorus arundinaceus</i>	tall fescue	u			
<i>Stenostachys gracilis</i>		u	p		
<b><u>Sedges and rushes</u></b>					
<i>Carex breviculmus</i>		u			
<i>Carex comans</i>		u			
<i>Carex coriacea</i>	cutty grass, rautahi	c		l	c
<i>Carex dissita</i>		u			l
<i>Carex echinata</i>	starsedge				o
<i>Carex forsteri</i>			u		
* <i>Carex ovalis</i>		u			
<i>Carex rubicunda</i>					r
<i>Carex rubicunda</i> X <i>C. tahoata</i>					r
<i>Carex secta</i>	pukio, makura	u			la
<i>Carex tahoata</i>		u			o
<i>Carpha alpina</i>				l	c
<i>Centrolepis ciliata</i>					lc
<i>Eleocharis acuta</i>	sharp spike sedge				la
<i>Eleocharis gracilis</i>					o
<i>Empodisma minus</i>	wire rush				la
<i>Isolepis crassiuscula</i>		l			lc
<i>Isolepis fluitans</i>					u
<i>Isolepis subtilissima</i>		o			u
* <i>Juncus articulatus</i>		u			o

<i>*Juncus effusus</i>		u			
<i>Juncus edgariae</i>	Edgar's rush	u			u
<i>Juncus novae-zelandiae</i>		u			u
<i>Lepidosperma australe</i>	square sedge	o			a
<i>Luzula banksiana</i>	coastal woodrush				
<i>Luzula colensoi</i>	dwarf alpine woodrush	u			
<i>Luzula picta</i> var. <i>picta</i>		u			
<i>Luzula subclavata</i>		r			
<i>Machaerina rubiginosa</i>	baumea				r
<i>Machaerina tenax</i>	baumea				r
<i>Oreobolus pectinatus</i>	comb sedge, cushion sedge	c		o	o
<i>Schoenus fluitans</i>	floating schoenus				r
<i>Schoenus maschalinus</i>	dwarf bog rush				o
<i>Schoenus pauciflorus</i>	bog rush, sedge tussock	l		o	la
<i>Triglochin striata</i>	arrow grass				u
<i>Uncinia clavata</i>			u		
<i>Uncinia divaricata</i>				u	
<i>Uncinia filiformis</i>				o	
<i>Uncinia fuscovaginata</i>					
<i>Uncinia rubra</i>		c			a
<i>Uncinia rupestris</i>			o		
<b><u>Monocot herbs other than grasses, sedges, rushes</u></b>					
<i>Astelia</i> aff. <i>nervosa</i>	mountain astelia		u		
<i>Bulbinella hookeri</i>	Maori onion	u			u
<i>Herpolirion novae-zelandiae</i>	grasslily, skylily, creeping lily	c			
<i>Lilaeopsis ruthiana</i>				p	

<i>Phormium cookianum</i>	mountain flax, wharariki	l			
<i>Potamogeton cheesemanii</i>	Cheeseman's pondweed				u
<i>Potamogeton suboblongus</i>	mud pondweed, rerewai	l			o
<b><u>Composite herbs</u></b>					
* <i>Achillea millefolium</i>	yarrow				
<i>Anaphalioides bellidioides</i>	Hell's bells	l		p	
<i>Anaphalioides trinervis</i>		l			
<i>Brachyglottis lagopus</i>	yellow rock daisy			u	
<i>Brachycome sinclarii</i>					
<i>Celmisia glandulosa</i>	downy daisy	u			o
<i>Celmisia gracilentia</i>	mountain daisy, pekepeka	o		u	
<i>Celmisia graminifolia</i>	grassy-leaved mountain daisy	p		o	o
<i>Celmisia spectabilis</i>	common mountain daisy	o		a	
* <i>Cirsium arvense</i>	Californian thistle	l			
* <i>Cirsium palustre</i>	marsh thistle	l			
* <i>Cirsium vulgare</i>	Scotch thistle	u			
<i>Craspedia uniflora</i> "wetland"	woolly head	u			o
<i>Craspedia uniflora</i> "stream banks"	woollyhead	l			
<i>Euchiton audax</i>		u			
<i>Euchiton delicatus</i>	creeping cudweed	l			
<i>Euchiton limosus</i>		u			u
<i>Euchiton ruahenicus</i>	creeping cudweed	u			
<i>Euchiton sphaericus</i>		u			
<i>Euchiton traversii</i>	Travers cudweed	o			
<i>Helichrysum filicaule</i>		o			
* <i>Hieracium pilosella</i>	mouse-ear hawkweed	a		u	

<i>*Hypochoeris radicata</i>	catsear	c		o	
<i>Lagenifera cuneata</i>	slender N Z daisy		p		
<i>Lagenifera pumila</i>	papataniwhaniwha	o			
<i>Lagenifera strangulata</i>	parani		c		
<i>Leptinella squalida</i>	fern-leaf pincushion				
<i>Leptostigma setulosa</i>		u			
<i>*Leucathemum vulgare</i>	oxeye daisy	u			
<i>Microseris scapigera</i>	yam daisy	o			u
<i>*Mycelis muralis</i>	wall lettuce	u	o		
<i>Pseudognaphalium luteoalbum</i>	Jersey cudweed	u			
<i>Raoulia albosericea</i>	Volcanic Plateau raoulia	la		l	
<i>Raoulia australis</i>	golden scabweed	u			
<i>Raoulia grandiflora</i>	large-flowered mat daisy				
<i>Raoulia tenuicaulis</i>	mat daisy, tutahuna	la			
<i>Raoulia</i> ( sp.K)	scabweed	u			
<i>Senecio glaucophyllus</i> subsp. <i>toa</i>		u			
<i>*Senecio jacobaea</i>	ragwort, Saint James wort	o			
<i>Senecio rufigliandulosus</i>		u			
<i>Senecio wairauensis</i>		u			
<i>*Sonchus asper</i>	prickly sowthistle				
<i>Taraxacum magellanicum</i>	native dandelion	o			
<i>*Taraxacum officinale</i>	dandelion	u			
<i>Vittadinia australis</i>	white fuzz weed	lc			
<b><u>Dicot herbs other than composites</u></b>					
<i>*Acaena agnifera</i>		u			
<i>Acaena anserinifolia</i>	bidibid, pipiri, hutiwai	u	l		

<i>Acaena emittens</i>		u	c		
<i>Acaena inermis</i>	mountain bidibid	u			
<i>Acaena microphylla</i>	scarlet bidibid	o			
<i>Acaena novae-zelandiae</i>	red bidibid	o			
<i>Aciphylla squarrosa</i>	speargrass, karamea	u		u	
<i>Anisotome aromatica</i>	native carrot, aniseed, kopoti			a	
* <i>Callitriche stagnalis</i>	starwort	l			
<i>Cardamine debilis</i> agg.	NZ bittercress, panapana		p		
* <i>Centaurium erythraea</i>	centaury	r			
* <i>Cerastium glomeratum</i>	mouse-eared chickweed	u			
<i>Dichondra repens</i>	Mercury Bay weed	u			
<i>Drosera arcturi</i>	alpine sundew				u
<i>Drosera binata</i>	forked sundew, scented sundew	lc			la
<i>Drosera spathula</i>					
<i>Epilobium alsinioides</i>		o			
<i>Epilobium brunnescens</i>	creeping willowherb	u			
<i>Epilobium chionanthum</i>	marsh willowherb				l
* <i>Epilobium ciliatum</i>	willowherb				r
<i>Epilobium glabellum</i>	glossy willowherb			p	
<i>Epilobium melanocaulon</i>		u			
<i>Epilobium microphyllum</i>		u			
<i>Epilobium macropus</i>					
<i>Epilobium nerterioides</i>		p			
<i>Epilobium pallidiflorum</i>	tarawera				u
<i>Epilobium pedunculare</i>	long-stalked willowherb	p			
<i>Epilobium pubens</i>	hairy willowherb	u			
<i>Epilobium pychnostachyum</i>	scree epilobium				

<i>Epilobium rotundifolium</i>	round-leaved willowherb		p		
<i>Euphrasia cuneata</i>	North Island eyebright	u		a	
<i>Euphrasia zelandica</i>	lesser NZ eyebright				
<i>Forstera bidwillii</i>	leafy forstera			p	
<i>Galium perpusillum</i>	dwarf bedstraw	u		u	
<i>Gentiana bellidifolia</i>	mountain/ common NZ gentian			p	
<i>Gentianella grisebachii</i>	marsh gentian, small NZ gentian	u			
<i>Geranium microphyllum</i>	small-leaved cransbill				
<i>Geranium potentilloides</i> var. <i>potentillodes</i>		o			
<i>Geranium sessiliflorum</i>	short-flowered cranesbill	o		c	
<i>Gonocarpus aggregatus</i>		o		o	
<i>Gunnera dentata</i>		lc			
<i>Hydrocotyle heteromeria</i>	waxweed pennywort	u	p		u
<i>Hydrocotyle moschata</i>	hairy pennywort		o		
<i>Hydrocotyle novaezelandiae</i>	NZ pennywort	u	o		
<i>Hydrocotyle sulcata</i>	pennywort				u
<i>Hypericum pusillum</i>	swamp hypericum	p			u
<i>Kelleria dieffenbachii</i>	NZ thyme				
<i>Leptostigma setulosa</i>		p	p		
* <i>Linum catharticum</i>	purging / fairy flax	o			
<i>Lobelia angulata</i>	panakenake	l	u		u
* <i>Lotus pedunculatus</i>	lotus	u			
<i>Mentha cunninghamii</i>	native mint	r			u
<i>Montia campylostigma</i>					
<i>Montia fontana</i>	blinks				l
<i>Myosotis forsteri</i>	forget-me-not	u	p		

<i>*Myosotis laxa</i>	water forget-me-not	l			
<i>Myriophyllum pedunculatum</i> subsp. <i>novaezealandiae</i>	NZ milfoil				u
<i>Myriophyllum propinquum</i>	common water milfoil				r
<i>Nertera depressa</i>		u			
<i>Nertera villosa</i>			o		
<i>Oreomyrrhis colensoi</i>	mountain myrrh	o	o		
<i>*Ornithopus perpusillus</i>	wild seradella				
<i>Ourisia caespitosa</i>					
<i>Ourisia macrophylla</i>	mountain foxglove				
<i>Ourisia vulcanica</i>	matted ourisia			o	
<i>Oxalis exilis</i>	creeping / yellow oxalis	u	u		
<i>Oxalis magellanica</i>	white oxalis, tutae-kahu		c		
<i>Parahebe lanceolata</i>		l			
<i>Plantago lanigera</i>		u			
<i>*Prunella vulgaris</i>	selfheal	u			
<i>Ranunculus amphitrichus</i>	swamp buttercup	u			o
<i>*Ranunculus flammula</i>	spearwort	r			
<i>Ranunculus multicapus</i>	common tussock buttercup	u			
<i>Ranunculus reflexus</i>	bush / hairy buttercup, maruru	l	o		u
<i>*Ranunculus repens</i>	creeping buttercup, crowfoot				
<i>*Rumex acetosella</i>	sheep's sorrel	l			
<i>*Sagina procumbens</i>	pearlwort	u			
<i>Schizeilema colensoi</i>		u			
<i>Schizeilema trifoliolatum</i>			c		
<i>Scleranthus biflorus</i>	Irish moss	o			
<i>Scleranthus uniflorus</i>		r			

<i>Selleria microphylla</i>	selliera, remuremu				lc
<i>Stellaria gracilentia</i>	slender chickweed		u		
* <i>Stellaria media</i>	chickweed				
<i>Stellaria parviflora</i>	NZ chickweed		u		
* <i>Trifolium dubium</i>	suckling clover	u			
* <i>Trifolium repens</i>	white clover	u			
<i>Urtica incisa</i>	bush / scrub nettle		lc		
<i>Utricularia dichotoma</i>	bladderwort				o
* <i>Verbascum thapsus</i>	great / woolly mullein	r			
* <i>Veronica serpyllifolia</i>	Turf speedwell	r			
<i>Viola cunninghamii</i>	mountain / white violet	u		l	u
<i>Viola filicaulis</i>	forest violet		c		
<i>Wahlenbergia pygmaea</i> subsp. <i>pygmaea</i>	maori bluebell	o		c	o
<i>Wahlenbergia violacea</i>	violet harebell	u			