

SITES FOR WHICH FIELD INSPECTIONS WERE MADE AS PART OF THIS STUDY

Site No.	Site Name	Ecological District	Year of Most Recent Field Survey ¹
<i>Horohoro Geothermal Field</i>			
HHV01	Horohoro	Atiamuri	2003
<i>Waikite Geothermal Field</i>			
WAV01	Waikite Valley	Atiamuri	2011 (part)
WAV02	Northern Paeroa Range	Atiamuri	2010
<i>Waiotapu Geothermal Field</i>			
WTV05	Waiotapu South	Atiamuri	2004
WTV04	Maungakakamea (Rainbow Mountain)	Atiamuri	2004
WTV03	Waiotapu North	Atiamuri	2004
WTV02	Ngapouri	Atiamuri	2004
WTV01	Maungaongaonga	Atiamuri	2004
<i>Mokai Geothermal Field</i>			
MKV04	Paerata Rd	Atiamuri	2011
MKV03	Tirohanga Rd	Atiamuri	2011
MKV02	Waipapa Stream	Atiamuri	2011
MKV01	Whakamaru	Atiamuri	2008
<i>Atiamuri Geothermal Field</i>			
ATV02	Whangapoa Springs	Atiamuri	2011
ATV03	Matapan Rd	Atiamuri	2011
ATV01	Upper Atiamuri West	Atiamuri	2007
<i>Te Kopia Geothermal Field</i>			
TKV06	Mangamingi Station	Atiamuri	2010
TKV02	Murphy's Springs	Atiamuri	2010
TKV03	Te Kopia Northwest	Atiamuri	2010
TKV05	Te Kopia Red Stream	Atiamuri	2010
TKV04	Te Kopia West Mud Pools	Atiamuri	2010
TKV01	Te Kopia	Atiamuri	2004
<i>Orakeikorako Geothermal Field</i>			
OKV05	Akaterewa East	Atiamuri	2011
OKV03	Orakeikorako	Atiamuri	2011
OKV02	Akaterewa Stream	Atiamuri	2007
OKV04	Red Hills	Atiamuri	2007
OKV01	Waihunuhunu	Atiamuri	2007
<i>Ngatamariki Geothermal Field</i>			
NMV02	Ngatamariki	Atiamuri	2011
NMV01	Waikato River Springs	Atiamuri	2011
<i>Whangairoheha Geothermal Field</i>			
WGV01	Whangairoheha	Atiamuri	2011
<i>Reporoa Geothermal Field</i>			
RPV02	Wharepapa Rd	Atiamuri	2010
RPV03	Golden Springs	Atiamuri	2007
RPV01	Longview Rd	Atiamuri	2004
<i>Okaaki Geothermal Field</i>			
OHV02	Ohaaki Steamfield East	Atiamuri	2011

¹ Date of most recent survey given. Some sites have been surveyed multiple times between 2000 and 2011.

Site No.	Site Name	Ecological District	Year of Most Recent Field Survey ¹
OHV01	Ohaaki Steamfield West	Atiamuri	2011
Wairakei-Tauhara Geothermal Field			
THV04	Broadlands Rd	Atiamuri	2011
THV06	Crown Rd	Taupo	2011
WKV01	Te Rautehuia	Atiamuri	2011
WKV02	Te Rautehuia Stream	Atiamuri	2011
WKV03	Upper Wairakei Stream (Geyser Valley)	Atiamuri	2011
WKV05	Te Kiri O Hine Kai Stream Catchment/Wairoa Hill	Atiamuri	2011
WKV09	Waipouwerawera Stream/Tukairangi	Atiamuri	2011
THV01	Otumuheke	Atiamuri	2010
THV07	Waipahihi Valley	Taupo	2009
WKV04	Wairakei Borefield	Atiamuri	2007
WKV06	Lower Wairakei Stream	Atiamuri	2007
THV03	Spa Thermal Park	Atiamuri	2006
THV05	Crown Park	Taupo	2006
WKV07	Karapiti Forest	Atiamuri	2004
WKV10	Craters of the Moon	Atiamuri	2004
WKV08	Hall of Fame Stream	Atiamuri	2003
Rotokawa Geothermal Field			
RKV02	Lake Rotokawa	Atiamuri	2004
RKV01	Rotokawa North	Atiamuri	2004
Tokaanu-Waihi-Hipaua Geothermal Field			
TOV10	Maunganamu East	Taupo	2007
TOV07	Maunganamu West	Taupo	2007
TOV14	Tokaanu Tailrace Canal	Taupo	2007
TOV08	Tokaanu Thermal Park	Taupo	2007
TOV09	Tokaanu Urupa Mud Pools	Taupo	2007
TOV03 to TOV06	Tokaanu Lakeshore Wetland	Taupo	2007
TOV02	Hipaua	Tongariro	1999
Tongariro Geothermal Field			
TGV03	Emerald Lakes	Tongariro	2011
TGV02	Ketetahi	Tongariro	2011
TGV04	Red Crater	Tongariro	2011
TGV01	Te Maari Craters	Tongariro	2011

SITES FOR WHICH FIELD INSPECTIONS WERE NOT UNDERTAKEN AS PART OF THIS STUDY

No field inspection was carried out for the 20 known geothermal sites listed below. This was due to either the site being extremely small, with little to no geothermal vegetation known to be present; or because landowner permission to access the site was withheld.

Site Name	Parekiri Pool
Location	Tirohanga Road
Grid Reference (NZTM)	E1853183 N5734523
Geothermal Field	Mokai
Ecological District	Atiamuri
Vegetation	No geothermal vegetation. Pool enclosed by dirt, concrete and wooden railings.
Notes	A small bathing pool securely fenced off. Wooden shed beside fence.
References	Waikato Regional Council (undated).

Site Name	Atiamuri School Spring
Location	Corner SH30 and Ohakuri Road
Grid Reference (NZTM)	E1867993 N5752733
Geothermal Field	Atiamuri
Ecological District	Atiamuri
Vegetation and Site Description	Highly modified spring surrounded by blackberry, that looks more like a culvert than a natural spring.
References	Waikato Regional Council (undated).

Site Name	Mangatete Stream
Location	Waikite Valley
Grid Reference (NZTM)	E1880300 N5746800
Geothermal Field	Te Kopia
Ecological District	Atiamuri
Vegetation	No geothermal vegetation present.
Notes	Site inspected on 7 May 2004. No geothermal vegetation or activity found within a kilometre upstream or downstream of the grid reference. The general area was also inspected from a vantage point hill on true left of Mangatete Stream. The landowner did not know of any geothermal vegetation in this area.
References	Spring-Rice (unpublished).

Site Name	Lake Ohakuri/Tainui Road
Location	Lake Ohakuri
Grid Reference (NZTM)	E1877700 N5731800
Geothermal Field	Ngatamariki
Ecological District	Atiamuri
Notes	A small hot spring and a number of warm seepages occur along the lake edge. Not located during 2000 survey.
References	Ecroyd 1979b.

Site Name	Butcher's Pool
Location	Broadlands Road, Reporoa
Grid Reference (NZTM)	E1891750 N5738690 (estimate only)
Geothermal Field	Reporoa
Ecological District	Atiamuri
Vegetation	No geothermal vegetation.
Notes	A small spring enclosed by man-made, wooden edges. Recreational use.

Site Name	Mihi
Location	Mangamingi
Grid Reference (NZTM)	Near: E1887950 N5734030
Geothermal Field	Ohaaki
Ecological District	Atiamuri
Vegetation	Tepid spring in pasture behind haybarn.
References	Waikato Regional Council (undated).

Site Name	Kathleen Spring
Location	Taupō
Grid Reference (NZTM)	E1869700 N5714500
Geothermal Field	Tauhara/Taupo
Ecological District	Taupo
Vegetation	Geothermal vegetation comprises less than 1 ha. <i>Lycopodiella cernua</i> present.
Notes	This spring ceased flowing in 1997 and there was no further evidence of flow in 2009 according to Bromley <i>et al.</i> (2010).
References	Beadel & Bill 2000; Given 1989a.

Site Name	Waihi Geothermal site
Location	Waihi Village, Lake Taupo
Grid Reference (NZTM)	E1837824 N5685065 (estimate only)
Geothermal Field	Tokaanu
Ecological District	Taupo
Vegetation	Presence, extent and composition of geothermal vegetation is not known.
Notes	More than a dozen small springs discharging hot water along a c.0.7 km stretch of the Waihi foreshore following the main fracture zone of the Waihi Fault. Some areas of geothermal vegetation is mapped in this report in the Hipaua site (TOV02). It is likely that there are additional areas of geothermal vegetation that are not mapped in the Hipaua site, however permission to access this site was not granted in 2011.
References	Bromley and Mongillo 1991 cited in Hochstein 2005; Hochstein 2005.

Site Name	Southern Stream
Location	Turangi
Grid Reference (NZTM)	E1839428 N5682165 (estimate only)
Geothermal Field	Tokaanu
Ecological District	Tongariro
Vegetation	Presence, extent and composition of geothermal vegetation is not known.
Notes	Permission to access this site was not granted in 2011.
References	Bromley and Mongillo 1991 cited in Hochstein 2005.

Site Name	Toputomatua Stream
Location	Turangi
Grid Reference (NZTM)	E1838631 N5677862 (estimate only)
Geothermal Field	Tokaanu
Ecological District	Tongariro
Vegetation	Presence, extent and composition of geothermal vegetation is not known.
Notes	Permission to access this site was not granted in 2011.
References	Bromley and Mongillo 1991 cited in Hochstein 2005.

Site Name	Ngauruhoe Crater
Location	Tongariro National Park, Mount Ngauruhoe
Grid Reference (NZTM)	E1827400 N5662500
Geothermal Field	Tongaririo
Ecological District	Tongaririo
Vegetation	No geothermal vegetation present.

Site Name	Mokena Geyser
Location	Te Aroha
Grid Reference (NZTM)	Near E1839920 N5841305
Geothermal Field	Te Aroha
Ecological District	Hinuera
Vegetation	Surrounded by concrete. No vegetation present, geothermal or otherwise.
Notes	An artificial geyser located within the grounds of the Mokena private spa baths. Water temperature <i>c.</i> 90°C.
References	Waikato Regional Council (undated).

Site Name	Waitoa Spring
Location	Waitoa
Grid Reference (NZTM)	E1828164 N5845856
Geothermal Field	Waitoa
Ecological District	Hinuera
Vegetation	Spring in pasture. No geothermal vegetation present.
Notes	Located beside a farm drain. Water <i>c.</i> 50°C.
References	Waikato Regional Council (undated).

Site Name	Opal Baths
Location	Okauia
Grid Reference (NZTM)	E1850008 N5841305
Geothermal Field	Okauia
Ecological District	Hinuera
Vegetation	Bathing pools. No geothermal vegetation present.
Notes	Pools constructed for commercial, recreational use. Water <i>c.</i> 40°C.
References	Waikato Regional Council (undated).

Site Name	Okoroire Spring
Location	Okoroire
Grid Reference (NZTM)	E1846375 N5795776
Geothermal Field	Okoroire
Ecological District	Hinuera
Vegetation	Bathing pools. No geothermal vegetation present.
Notes	Natural spring around/beside which concrete pools have been constructed for commercial, recreational use (two pools).
References	Waikato Regional Council (undated).

Site Name	Miranda Hot Pools
Location	Waitakaruru
Grid Reference (NZTM)	E1806963 N5879559
Geothermal Field	Miranda
Ecological District	Hauraki
Vegetation	No geothermal vegetation present.
Notes	A spring contained by a metal shaft on a lawn behind the camping ground shop/office. Water <i>c.</i> 50°C.
References	Waikato Regional Council (undated).

Site Name	Kerepehi Spring
Location	Kerepehi
Grid Reference (NZTM)	E1823825 N5873435 (estimate only)
Geothermal Field	Kerepehi
Ecological District	Hauraki
Vegetation	Spring in pasture. No geothermal vegetation present.
Notes	Water is <i>c.</i> 40°C and escapes from pipe with variable pressure. Located on the far side of Paddock 76 from the race (on the boundary with the neighbouring farm).
References	Waikato Regional Council (undated).

Site Name	Waingaro Hot Pools
Location	Waingaro
Grid Reference (NZTM)	E1776332 N5826606
Geothermal Field	Waingaro
Ecological District	Raglan
Vegetation	Bathing pools. No geothermal vegetation present.
Notes	Pools constructed for commercial, recreational use. Fed by a bore opposite the entrance to the hot pools. Water <i>c.</i> 50°C.
References	Waikato Regional Council (undated).

Site Name	Naike (Te Maire) Spring
Location	Naike
Grid Reference (NZTM)	E1771803 N5848022
Geothermal Field	Naike
Ecological District	Raglan
Vegetation	Pool in pasture. Vegetation not assessed.
Notes	Pool bank is a little unstable. Water <i>c.</i> 45°C.
References	Waikato Regional Council (undated).

Site Name	Hot Water Beach
Location	Coromandel
Grid Reference (NZTM)	Near: E1851525 N5913975
Geothermal Field	Not known
Ecological District	Tairua
Vegetation	Hot water seepage on beach. No geothermal vegetation present.
References	Waikato Regional Council (undated).

NOTES ON THE VASCULAR FLORA OF GEOTHERMAL AREAS

Distinctive vegetation types are a characteristic feature of geothermal areas. There are two categories of characteristic geothermal species; those which are restricted to geothermal sites, and those which have dispersed into geothermal sites because the habitat mimics aspects of the usual habitat of the species (Given 1995). Prostrate kanuka is the best known example of a plant restricted to geothermal areas, and the moss *Campylopus capillaceus*, is another example which may be virtually an obligate geothermal species (Given 1995). Plants which occur in geothermal sites because the habitat mimics that of their usual habitat, include plants of warmer climates which occur in regions generally recognised as being outside the climatic range of the species. In these cases, the geothermal heat creates a microclimate warmer than that of adjacent non-geothermal areas. In New Zealand, many tropical and temperate ferns and fern allies fall within this category (Given 1995).

FERNS AND FERN ALLIES

Cheilanthes sieberi: New Zealand, Australia, and New Caledonia. More commonly found in coastal sites, it is currently known from three sites in the Waikato Region: Waikite Valley, Craters of the Moon, and Akatarewa East.

Threatened species ranking¹: Not threatened.



Plate 99: *Cheilanthes sieberi* at Craters of the Moon, August 2007.

***Christella* aff. *dentata* (“thermal”)**: North Island, Kermadec Islands, and probably also in tropics and subtropics of the old world. Apparently distinct from *C. dentata*, which also occurs in New Zealand, by its shorter rhizome and smaller frond but its taxonomic status is not yet determined (Brownsey & Smith-Dodsworth 2000) in the North Island. In the central North Island it only occurs in geothermal areas. These geothermal populations are the southern limit for this taxon in the world. *Christella* aff. *dentata* (“thermal”) is currently known from 14 sites in the Taupo Volcanic Zone, with ten of these sites in the Waikato Region. Several populations have less than ten plants present and are very vulnerable to extinction (e.g. Hall of Fame Stream and Waikato River Springs). Three sites have

¹ From de Lange *et al.* 2009.

a declining population of *Christella* aff. *dentata* (“thermal”) (Akatarewa Stream, Golden Springs and Otumuheke Stream), while the populations at Waikite appear to be immediately threatened by the marked increase of blackberry scrub around stream margins and stock access to drains and waterways. One site, Lower Wairakei Stream, has had a population increase since the survey of Merrett and Burns (1999), although this population is vulnerable to the clearance of stream margins and to any increase in density of blackberry at the site. There are six populations with c.50 or more plants present - Waipapa Stream, Red Hills, Waihunuhunu, Murphys Farm, and Waikite; the largest population in New Zealand occurs at Waimangu-Rotomahana in the Bay of Plenty Region (Bycroft and Beadel 2007). These sites are key sites for the conservation of this taxon in the North Island. There are previous records from a further four sites in the Taupō Volcanic Zone in the Waikato Region (Tokaanu Thermal Park, Te Kiri O Hine Kai Stream Catchment/Wairoa Hill, Upper Wairakei Stream, and Kathleen Springs), but it is presumed to be extinct from these sites. Threatened species ranking¹: At Risk-Declining.



Plate 100: *Christella* aff. *dentata* (“thermal”) alongside Otamakokore Stream, Waikite, May 2007.

***Cyclosorus interruptus*:** Pantropical. This species is found in the North Island in New Zealand; and also in Australia, south-east Asia, and the Pacific. In the North Island it is confined to geothermal areas in the Taupo Volcanic Zone and coastal areas from Kawhia and Tauranga northwards (Brownsey and Smith-Dodsworth 2000). The populations that occur in geothermal areas are the southern limit for this species in the world. Where it occurs in geothermal influenced sites it is present near geothermal hot springs, geothermally heated stream margins, geothermal wetlands, and steam vents.



Plate 101: *Cyclosorus interruptus* at Waihunuhunu, 2007.

In the Waikato Region it is known from eight sites in the following five geothermal fields; Waikite, Waiotapu, Orakeikorako, Ngatamariki, Wairakei-Tauhara. The species is thought have become extinct at four geothermal sites in the last 40 years (Bycroft and Beadel 2007). Threatened species ranking¹: At Risk-Declining.

¹ From de Lange *et al.* 2009.

***Dicranopteris linearis*:** Pantropical. In New Zealand it is confined to geothermal habitats of the Taupo Volcanic Zone, North Island, where it occurs in prostrate kanuka scrub and shrubland, and also other scrub, shrubland and fernland habitats around heated water (hot springs and geothermally-



Plate 102: *Dicranopteris linearis* at Maungaongaonga.

heated streams), and geothermally heated soils. Several populations are present in forest nearby geothermal sites (e.g. Te Kopia and Ngatamariki). These populations in geothermal areas are the southern limit for this species in the world. Elsewhere it is widespread in the tropics and subtropics (Brownsey and Smith-Dodsworth 2000). It is known from c.24 sites in the Waikato Region; however 12 of these populations are very small. It is present in the following geothermal fields; Waikite, Waiotapu, Te Kopia, Orakeikorako, Ngatamariki, Ohaaki, Wairakei-Tauhara and Rotokawa. The most important populations in terms of size for this species at geothermal sites in the Waikato Region occur at Te Kopia, Orakeikorako, Red Hills, Te Kiri O Hine Kai Stream Catchment/Wairoa Hill, and Craters of the Moon.

Threatened species ranking¹: At Risk-Naturally Uncommon.

***Hypolepis dicksonioides*:** In New Zealand it is known from Kermadec Islands, North Island and South Island (Brownsey and Smith-Dodsworth), as well as the Chatham Islands (NZPCN website: accessed 4 May 2007). Outside New Zealand it is known from Norfolk Island, Samoa, Tahiti, and the Marquesas Islands (Brownsey and Smith-Dodsworth 2000). It is occasionally found in coastal areas

of Northland and the Bay of Plenty, and very locally in coastal localities from Wairarapa to Cook Strait and north-west Nelson (Brownsey and Smith-Dodsworth 2000). In New Zealand it is also found in geothermal habitat of the Taupo Volcanic Zone, where it favours light soils or disturbed ground on forest margins, or streams and ditches (Brownsey and Smith-Dodsworth 2000). Known from three geothermal sites in the Waikato Region. *Hypolepis dicksonioides* is probably naturally rare at geothermal sites in the Waikato Region.



Plate 103: *Hypolepis dicksonioides* alongside Otamakokore Stream, downstream of Corbett Road bridge, May 2007.

It is a naturally short-lived, somewhat ephemeral, opportunistic species, which requires disturbance to create fresh habitats to colonise. It also is known from three geothermal sites in the Bay of Plenty Region (Wildland Consultants 2005). However, all populations at geothermal sites are of botanical

interest as they often occur at sites outside its normal altitudinal range. The three Waikato populations in geothermal sites (Otumuheke Stream, Waipahihi Valley, and Waikite) are vulnerable to competition with pest plants (particularly blackberry).

Threatened species ranking: At Risk-Naturally Uncommon.

***Lycopodiella cernua*:** Pantropical and warm temperate. In New Zealand this species usually occurs at coastal sites, or at geothermal sites where it is a characteristic feature. This species is common at geothermal sites throughout the Waikato Region. A new population was found in Te Maari Crater in June 2011.

Threatened species ranking¹: Not threatened.



Plate 104: *Lycopodiella cernua* at Te Maari Craters, June 2011.

***Nephrolepis flexuosa* (native ladder fern: distinct from *N. cordifolia*):** This indigenous species is known with certainty from New Zealand, Raoul, Norfolk and Lord Howe Islands, and also Fiji and Rarotonga. This species may also be present in Samoa and Sri Lanka, and it is probably wide ranging throughout the Indian and Pacific Oceans. It may also be in Australia. Abundant in coastal forest and scrub on Raoul Island, otherwise in New Zealand confined to the North Island where it is only known from active geothermal fields from Kawerau, Rotorua Lakes District to Lake Taupo. It reaches a world southern limit at Tokaanu near Turangi (NZPCN website: accessed 4 May 2007). Its main habitats within geothermal sites are banks alongside stream margins, steam vents and geothermally heated soils usually in scrub, shrubland, and fernland. It is known from c. 15 sites in the Waikato Region. The most important populations for the conservation of *Nephrolepis*



Plate 105: *Nephrolepis flexuosa* at Waihunuhunu, 2007.

flexuosa in the Waikato Region are Waihunuhunu Geothermal Area (where it is common along the entire length of the unnamed geothermal stream), Upper Wairakei Stream, and Te Kiri O Hine Kai Catchment/Wairoa Hill. There is also a large population of this species at Waimangu-Rotomahana in

the Bay of Plenty Region. Several populations are small (several clumps only) and could be vulnerable to extinction. The population at Otumuheke Stream has declined since the 2004 survey, following restoration works at Otumuheke Stream mouth.
Threatened species ranking¹: At Risk-Declining.

Psilotum nudum: Pantropical. Coastal northern New Zealand, and geothermal sites in the central North Island - Bay of Plenty. It is known from nine geothermal sites in New Zealand, three of these in the Waikato Region.
Threatened species ranking¹: Not threatened.

***Schizaea bifida* (forked comb fern)**: New Zealand (North and South Islands), also Australia and New Caledonia. Local throughout New Zealand, present in geothermal areas in the central North Island, including at least two sites in the Waikato Region.
Threatened species ranking¹: Not threatened.

Schizaea dichotoma: Pantropical. Kauri forests of Northland and South Auckland, and locally at geothermal sites in the central North Island - Bay of Plenty. Known from three sites in the Waikato Region.
Threatened species ranking¹: At Risk-Naturally Uncommon.

Thelypteris confluens: Common names are swamp fern, marsh fern, and swamp lady fern (Brownsey and Smith-Dodsworth). This species is found in the North Island of New Zealand, and it is widely distributed from Africa to Australia. Its North Island distribution is from Te Pahi in the north to the Waitakere in the west, and Bay of Plenty in the east. It is mostly found in coastal wetlands, but extends inland to wetlands near geothermal sites.² It has been recorded from two geothermal sites in the Waikato Region. These are Waikite Wildlife Management Reserve, where two small populations are present (Bycroft and Beadel 2007), and Waihunuhunu. Although it has not been seen at this latter site in recent surveys, it is probably still present.
Threatened species ranking: At Risk-Declining.



Plate 106: *Thelypteris confluens* at Waikite Wildlife Management Reserve.

DICOTYLEDONOUS TREES AND SHRUBS

Korthalsella salicornioides: New Zealand endemic. A semi-parasitic, dwarf mistletoe which grows on a variety of hosts. It is known from Maungaongaonga, Te Kopia, and Tokaanu Thermal Park in the Waikato Region.
Threatened species ranking¹: An „At Risk’ species classed as „Naturally Uncommon’.

¹ From de Lange *et al.* 2009.

² <http://nzpcn.org.nz>: Accessed 19 September 2011.

***Kunzea ericoides* var. *microflora* (prostrate kanuka):** New Zealand endemic. Prostrate kanuka is restricted to geothermal sites in the central North Island, and appears to be a distinct ecotype adapted to shallow warm soils.

Threatened species ranking¹: At Risk-Naturally Uncommon.



Plate 107: Prostrate kanuka scrub at Craters of the Moon, August 2007.

SEDGES

***Fimbristylis velata*:** Pantropical. In New Zealand it occurs occasionally at northern coastal and geothermal sites. Known from one geothermal site in the Waikato Region (also occurs at Lake Whangape in the Waikato Region).

Threatened species ranking¹: At Risk-Naturally Uncommon.

MONOCOTYLEDONOUS HERBS

***Triglochin striata* (arrow grass):** In New Zealand, generally a coastal species which occasionally occurs inland. Known from at least six geothermal sites in the Waikato Region from the following geothermal fields; Waikite, Waiotapu, Ngatamariki, Reporoa, Ohaaki, and Waiarakei-Tauhara.

Threatened species ranking¹: Not threatened.



Plate 108: Arrow grass (*Triglochin striata*) at Waikite Valley, February 2011.

ORCHIDS

***Calochilus paludosus* (brown bearded orchid):** Australia and New Zealand. Currently known from several sites in New Zealand, including areas of geothermally heated ground. Recorded from two geothermal sites in the Waikato Region.

Threatened species ranking¹: At Risk-Naturally Uncommon.

***Calochilus robertsonii* (red bearded orchid):** Australia and New Zealand. Recorded from 15-20 coastal and geothermal sites in New Zealand, including three geothermal sites in the Waikato Region in the Waiotapu, Te Kopia, and Rotokawa Geothermal Fields.

Threatened species ranking¹: At Risk-Naturally Uncommon.

***Prasophyllum pumilum* (leek orchid):** Australia and New Zealand. Recorded from coastal and inland sites in the northern half of the North Island, including one geothermal site in the Waikato Region.

Threatened species ranking¹: Not threatened.

¹ From de Lange *et al.* 2009.

BIOCLIMATIC ZONES (SOURCE: LEATHWICK *ET AL.* 1995)

Refer to the broad distribution of vegetation zones along both altitudinal and coastal to inland gradients where a particular climatic regime dictates the character of the natural ecosystem. Bioclimatic zones used were based on the published definitions of Meurk (1984), but with one further subdivision, and with the addition of a coastal zone to delineate those environments which are typified by frequent windblown salt and a marked reduction in the severity of frost. The zones are described below:

- | | |
|-------------------|---|
| Coastal | Less than 1 km from the coast, and with altitude less than 300 m. |
| Lowland | Extending from the coastal zone up to an altitude of 300 m = the warm-temperate zone of Meurk (1984). |
| Submontane | Extending from 300 m to 800 m altitude = the warmer part of the Cool Temperate zone of Meurk (1984). |
| Montane | Extending from 800 m to 1300 m altitude = the cooler part of the Cool Temperate zone of Meurk (1984). |
| Subalpine | Extending from 1,300 m to 1,800 m = the Subantarctic zone of Meurk (1984). |
| Alpine | Extending upwards from 1,800 m = the Low Antarctic zone of Meurk (1984). |

HABITATS FOR GEOTHERMAL VEGETATION (SOURCE: MERRETT & CLARKSON 1999)

Heated Ground	Geothermally heated soils generally have temperatures above 20°C at 10 cm depth and increasing with depth.
Geothermal Wetlands	Permanently or intermittently wet areas, shallow water, or land water margins that support a natural ecosystem of plants adapted to wet conditions, and in which some or all of the water is geothermally sourced.
Cooled Hydrothermally-Altered Soils	Habitats where geothermal heating has ceased, but the chemically altered soils restrict plant colonization and diversity. These habitats include inactive craters and solfataras, old sinter pavements, and dried mud pools.
Atmospheric Influence	Habitats subject to (a) regular toxic gas emissions to the extent that vegetation growth is negatively influenced (e.g. White Island), or (b) a warm micro-climate created by hot-springs discharge (e.g. the fern <i>Christella</i> aff. <i>dentata</i> (“thermal”) occurs along the margins of hot streams where the atmosphere is influenced by steam).

VEGETATION CLASSES (DEFINITIONS FOR THOSE CLASSES USED IN THIS REPORT) (SOURCE: ATKINSON, 1985)

- Bambooland** Vegetation in which the cover of bamboo in the canopy is 20-100% and in which the bamboo cover exceeds that of any other growth form or bare ground.
- Boulderfield** Land in which the area of unconsolidated bare boulders (>200 mm diameter) exceeds the area covered by any one class of plant growth form. Boulderfields are named from the leading species when plant cover \geq 1%.
- Cushionfield** Vegetation in which the cover of cushion plants in the canopy is 20-100% and in which the cushion plant cover exceeds that of any other growth form or bare ground. Cushion plants include herbaceous, semi-woody and woody plants with short densely packed branches and closely spaced leaves that together form dense hemispherical cushions. The growth form occurs in all species of *Donatia*, *Gaimardia*, *Hectorella*, *Oreobulus*, and *Phyllachne* as well as in some species of *Aciphylla*, *Celmisia*, *Centrolepis*, *Chionohebe*, *Colobanthus*, *Dracophyllum*, *Drapetes*, *Haastia*, *Leucogenes*, *Luzula*, *Myosotis*, *Poa*, *Raoulia* and *Scleranthus*.
- Fernland** Vegetation in which the cover of ferns in the canopy is 20-100% and in which the fern cover exceeds that of any other growth form or bare ground. Tree ferns >10 cm dbh are excluded as trees (cf. forest).
- Flaxland** Vegetation in which the cover of flax in the canopy is 20-100% and in which the flax cover exceeds that of any other growth form or bare ground.
- Forest** Woody vegetation in which the cover of trees and shrubs in the canopy is >80% and in which tree cover exceeds that of shrubs. Trees are woody plants >10 cm dbh. Tree ferns >10 cm dbh are treated as trees.
- Geothermal water¹**
Areas where 100% of the ground is covered by geothermally sourced water where geothermal water means water heated within the earth by natural phenomena to a temperature of 30⁰ C or more; and includes all steam, water, and water vapour, and every mixture of all or any of them that has been heated by natural phenomena.
- Grassland** Vegetation in which the cover of grass in the canopy is 20-100% and in which the grass cover exceeds that of any other growth form or bare ground. Tussock-grasses are excluded from the grass growth-form.
- Herbfield** Vegetation in which the cover of herbs in the canopy is 20-100% and in which the herb cover exceeds that of any other growth form or bare ground. Herbs

¹ Definition from Waikato Regional Council Regional Plan.

include all herbaceous and low-growing semi-woody plants that are not separated as ferns, tussocks, grasses, sedges, rushes, reeds, cushion plants, mosses or lichens.

Loamfield/peatfield

Land in which the area of loam and/or peat exceeds the area covered by any one class of plant growth form. The appropriate name is given depending on whether loam or peat form the greater part of the ground surface. Loamfields and peatfields are named from the leading species when plant cover $\geq 1\%$.

Lichenfield Vegetation in which the cover of lichens in the canopy is 20-100% and in which the lichen cover exceeds that of any other growth form or bare ground.

Mossfield Vegetation in which the cover of mosses in the canopy is 20-100% and in which the moss cover exceeds that of any other growth form or bare ground.

Nonvegetated Raw-soilfield

Areas bare of vegetation that are too hot to support plant life, are cooled but hydrothermally altered, sinter pavements, or are subjected to regular mud ejection or gas emission that prevent colonisation and establishment of plants. These areas are often small scale, and may not be visible on aerial photographs.

- Very hot soils are often associated with steam vents and/or boiling mud craters, and soil temperatures at 10 cm depth are usually $>90^{\circ}\text{C}$.
- Hydrothermally altered soils often occur where geothermal expression has ceased, e.g., dried mud craters, that result in soils with unusual chemical composition.
- Vigorously boiling mud pools and craters that regularly eject hot mud around their margins effectively prevents plant colonisation. In cases where toxic gas is emitted, vegetation is either absent, or if present, killed.

Reedland Vegetation in which the cover of reeds in the canopy is 20-100% and in which the reed cover exceeds that of any other growth form or open water. Reeds are herbaceous plants growing in standing or slowly-running water that have tall, slender, erect, unbranched leaves or culms that are either hollow or have a very spongy pith. Examples include *Typha*, *Bolboschoenus*, *Schoenoplectus tabernaemontani*, *Eleocharis sphacelata*, and *Baumea articulata*.

Rockland Land in which the area of residual bare rock exceeds the area covered by any one class of plant growth-form. They are named from the leading plant species when plant cover $\geq 1\%$ e.g. [koromiko] rockland.

Sandfield Land in which the area of bare sand (0.02-2 mm diameter) exceeds the area covered by any one class of plant growth form. Dune vegetation often includes sandfields which are named from the leading species when plant cover $\geq 1\%$.

Scrub Woody vegetation in which the cover of shrubs and trees in the canopy is $>80\%$ and in which shrub cover exceeds that of trees (cf. forest). Shrubs are woody plants $<10\text{cm dbh}$.

Sedgeland Vegetation in which the cover of sedges in the canopy is 20-100% and in which the sedge cover exceeds that of any other growth form or bare ground. Included in the sedge growth form are many species of *Carex*, *Uncinia*, *Isolepis*, and *Bolboschoenus*. Tussock-sedges and reed-forming sedges (cf. reedland) are excluded.

Shrubland Vegetation in which the cover of shrubs in the canopy is 20-80% and in which the shrub cover exceeds that of any other growth form or bare ground. It is sometimes useful to separate tussock-shrublands as a sub-class for areas where tussocks are >20% but less than shrubs. (Note: the term scrubland is not used in this classification.)

Stonefield/gravelfield

Land in which the area of unconsolidated bare stones (20-200 mm diameter) exceeds the area covered by any one class of plant growth form. The appropriate name is given depending on whether stones or gravel form the greater part of the ground surface. Stonefields are named from the leading species when plant cover $\geq 1\%$.

Vegetation Type

A term which includes the dominant canopy species and structural class of an area of vegetation, e.g. rimu/tawa-kamahi forest, *Isolepis nodosa*/*Muehlenbeckia complexa* sedge-vineland.

In addition, cover values and tiers are included, i.e.

- (tawa) less than 5% cover of the bracketed species
- (rimu)/tawa indicates less than 5% cover of rimu emergent over a canopy of tawa
- tawa-hinau indicates tawa and hinau occur in the same tier
- ↔ mosaic

Vineland Vegetation in which the cover of unsupported (or artificially supported) woody vines in the canopy is 20-100% and in which the cover of these vines exceeds that of any other growth form or bare ground. Vegetation containing woody vines that are supported by trees or shrubs is classified as forest, scrub or shrubland. Examples of woody vines occur in the genera *Actinidia*, *Clematis*, *Lonicera*, *Metrosideros*, *Muehlenbeckia*, *Ripogonum*, *Vitis* and others.

ABBREVIATIONS AND SYMBOLS

<i>c.</i>	approximately; about
DOC	Department of Conservation
ha	hectare
m	metre
/	separates various tiers of the vegetation in the type descriptions
-	links plants in the same tier
()	less than 5% cover of the bracketed species
↔	mosaic
IR	Infra red (used for finding hot spots in the ground that may indicate geothermal activity)

COMMON PLANT NAMES USED IN TEXT

African feather grass	<i>Cenchrus macrourus</i>
agapanthus	<i>Agapanthus praecox</i>
aloe	<i>Aloe</i> sp.
apple	<i>Malus</i> × <i>domestica</i>
annual poa	<i>Poa annua</i>
arrow bamboo	<i>Pseudosasa japonica</i>
arrow grass	<i>Triglochin striata</i>
Australian fireweed	<i>Senecio bipinnatisectus</i>
barberry	<i>Berberis glaucocarpa</i>
beggars' ticks	<i>Bidens frondosa</i>
bishop pine	<i>Pinus muricata</i>
black nightshade	<i>Solanum nigrum</i>
black pine	<i>Pinus nigra</i>
black wattle	<i>Acacia mearnsii</i>
blackberry	<i>Rubus</i> sp. (<i>R. fruticosus</i> agg.)
bracken	rarahū; <i>Pteridium esculentum</i>
broom	<i>Cytisus scoparius</i>
browntop	<i>Agrostis capillaris</i>
buddleia	<i>Buddleja davidii</i>
buffalo grass	<i>Stenotaphrum secundatum</i>
Californian thistle	<i>Cirsium arvense</i>
catsear	<i>Hypochoeris radicata</i>
Chinese privet	<i>Ligustrum sinense</i>
cleavers	<i>Galium aparine</i>
climbing rose	<i>Rosa</i> sp.
cocksfoot	<i>Dactylis glomerata</i>
common alder	<i>Alnus glutinosa</i>
crack willow	<i>Salix fragilis</i>
creeping bent	<i>Agrostis stolonifera</i>
creeping buttercup	<i>Ranunculus repens</i>
Douglas fir	<i>Pseudotsuga menziesii</i>
dwarf mistletoe	<i>Korthalsella salicornioides</i>
eucalyptus	<i>Eucalyptus</i> sp.
European larch	<i>Larix decidua</i>
false acacia	robinia; black locust; <i>Robinia pseudoacacia</i>
feijoa	<i>Feijoa sellowiana</i>
fleabane	<i>Conyza sumatrensis</i>
foxglove	<i>Digitalis purpurea</i>
gorse	<i>Ulex europaeus</i>
grape	<i>Vitis vinifera</i>
greater bindweed	<i>Calystegia silvatica</i>
grey willow	<i>Salix cinerea</i>
harakeke	flax, <i>Phormium tenax</i>
heather	<i>Calluna vulgaris</i>

Himalayan honeysuckle	<i>Leycesteria formosa</i>
horoeaka	lancewood, <i>Pseudopanax crassifolius</i>
hound's tongue fern	kowaowao; <i>Microsorium pustulatum</i>
Indian doab	<i>Cynodon dactylon</i>
inkweed	<i>Phytolacca octandra</i>
ivy	<i>Hedera helix</i>
Japanese cedar	<i>Cryptomeria japonica</i>
Japanese honeysuckle	<i>Lonicera japonica</i>
kahikatea	<i>Dacrycarpus dacrydioides</i>
kamaha	<i>Weinmannia racemosa</i>
kanuka	<i>Kunzea ericoides</i>
karamu	<i>Coprosma robusta</i>
kiokio	<i>Blechnum novae-zelandiae</i>
kohuhu	<i>Pittosporum tenuifolium</i>
koromiko	<i>Hebe stricta</i> var. <i>stricta</i>
Lawson's cypress	<i>Chamaecyparis lawsoniana</i>
lodgepole pine	contorta pine; <i>Pinus contorta</i>
lotus	<i>Lotus pedunculatus</i>
lupin	<i>Lupinus arboreus</i>
macrocarpa	<i>Cupressus macrocarpa</i>
mahoe	<i>Melicetyus ramiflorus</i> subsp. <i>ramiflorus</i>
makomako	wineberry, <i>Aristotelia serrata</i>
mamaku	<i>Cyathea medullaris</i>
manuka	<i>Leptospermum scoparium</i> agg.
mapou	<i>Myrsine australis</i>
maritime pine	<i>Pinus pinaster</i>
Mercer grass	<i>Paspalum distichum</i>
mingimingi	<i>Leucopogon fasciculatus</i>
mint	<i>Mentha</i> sp.
monoao	<i>Dracophyllum subulatum</i>
montbretia	<i>Crocasmia ×crocosmiiflora</i>
Montpellier broom	<i>Teline monspessulana</i>
narrow-leaved carpet grass	<i>Axonopus fissifolius</i>
narrow-leaved plantain	<i>Plantago lanceolatum</i>
oak	<i>Quercus</i> sp.
oioi	<i>Apodasmia similis</i>
ornamental cherry	<i>Prunus</i> sp.
olive	<i>Olea</i> sp.
ovens wattle	<i>Acacia pravissima</i>
pampas	<i>Cortaderia selloana</i>
paspalum	<i>Paspalum dilatatum</i>
patotara	<i>Leucopogon fraseri</i>
plum	<i>Prunus ×domestica</i>
pohue	<i>Calystegia sepium</i> subsp. <i>roseata</i>
ponga	silver fern; <i>Cyathea dealbata</i>
poplar	<i>Populus</i> sp.
prairie grass	<i>Bromus willdenowii</i>
prickly mingimingi	<i>Leptecophylla juniperina</i> subsp. <i>juniperina</i>
prostrate kanuka	<i>Kunzea ericoides</i> var. <i>microflora</i>
radiata pine	<i>Pinus radiata</i>

ragwort	<i>Jacobaea vulgaris</i>
raupo	<i>Typha orientalis</i>
reed sweetgrass	<i>Glyceria maxima</i>
rewarewa	<i>Knightia excelsa</i>
rhododendron	<i>Rhododendron</i> sp.
rimu	<i>Dacrydium cupressinum</i>
Scotch thistle	<i>Cirsium vulgare</i>
sea rush	<i>Juncus kraussii</i> var. <i>australiensis</i>
sheep's sorrel	<i>Rumex acetosella</i>
shaking brake	turawera, <i>Pteris tremula</i>
silver birch	<i>Betula pendula</i>
Spanish heath	<i>Erica lusitanica</i>
strawberry tree	<i>Arbutus unedo</i>
strobilus pine	<i>Pinus strobus</i>
swamp kiokio	<i>Blechnum minus</i>
swamp millet	<i>Isachne globosa</i>
sweet vernal	<i>Anthoxanthum odoratum</i>
tall fescue	<i>Schedonorus arundinaceus</i>
tall willow herb	<i>Epilobium ciliatum</i>
Tasmanian blackwood	<i>Acacia melanoxylon</i>
tawiniwini	<i>Gaultheria antipoda</i>
ti kouka	cabbage tree; <i>Cordyline australis</i>
toatoa	<i>Phyllocladus toatoa</i>
toru	<i>Toronia toru</i>
totara	<i>Podocarpus totara</i> var. <i>totara</i>
tradescantia	<i>Tradescantia fluminensis</i>
tree lucerne	<i>Chamaecytisus palmensis</i>
tree privet	<i>Ligustrum lucidum</i>
turutu	<i>Dianella nigra</i>
tutu	<i>Coriaria arborea</i> var. <i>arborea</i>
umbrella sedge	<i>Cyperus eragrostis</i>
water purslane	<i>Ludwigia palustris</i>
water lily	<i>Nymphaea alba</i>
whauwhaupaku	fivefinger; <i>Pseudopanax arboreus</i>
wheki-ponga	<i>Dicksonia fibrosa</i>
wheki	<i>Dicksonia squarrosa</i>
white clover	<i>Trifolium repens</i>
wild portulaca	<i>Portulaca oleracea</i>
wild seradella	<i>Ornithopus perpusillus</i>
yarrow	<i>Achillea millefolium</i>
Yorkshire fog	<i>Holcus lanatus</i>
yucca	<i>Yucca</i> sp.

UPDATED* WAIKATO REGIONAL COUNCIL CRITERIA FOR THE EVALUATION OF INDIGENOUS VEGETATION AND HABITATS OF INDIGENOUS FAUNA

* Criterion 3 is updated to reflect the revised threat classification system of Townsend *et al.* (2008).

Complete Column E only if you need to determine level of significance.

A. Criteria	B. Definitions and Further Information	C. Likely Information ¹ Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to assist with determining level of significance
<p><u>SITE PROTECTED OR ASSESSED PREVIOUSLY</u></p> <p>1 It is indigenous vegetation or habitat that has been specially set aside by statute or covenant for protection and preservation, unless the site can be shown to meet none of Criteria 3-11.</p>	<p>This may include sites protected under the Conservation Act, Resource Management Act, or with QEII or NWR.</p> <p>The assumption inherent in this criterion is that legally protected areas have been assessed and deemed worthy of protection. Therefore such sites are assumed to be significant unless challenged, in which case the challenger would have to show that the site does not meet criteria 3-11.</p>	<p>DOC, EW, NWR, QEII, TLA.</p>	<p>Y / N / NS</p>	<p>What type of legally protected area is it? E.g. Scenic Reserve, National Park, QEII Covenant.</p> <hr/> <hr/>

¹ CE = Consultant Ecologist, CRI= Crown Research Institute e.g. Landcare Research or National Institute of Water and Atmospheric Research (NIWA), DOC = Department of Conservation, EW = Environment Waikato, NHF = Nature Heritage Fund, NWR = Nga Whenua Rahui, P = Published reports or maps, QEII = QEII National Trust, TLA = Territorial Local Authority (district or city council), UW = University of Waikato..

A. Criteria	B. Definitions and Further Information	C. Likely Information ¹ Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to assist with determining level of significance
2 It is indigenous vegetation or habitat recommended for protection by the Nature Heritage Fund or Nga Whenua Rahui committees, or the Queen Elizabeth the Second National Trust Board of Directors, unless the site can be shown to meet none of Criteria 3-11.	Assumption is as above.	NHF, NWR, QEII	Y / N / NS	What type of legal protection has been recommended? <hr/>
<p><u>RARE / DISTINCTIVE FEATURES</u></p> 3 It is vegetation or habitat that is currently habitat for indigenous species or associations of indigenous species that are; <ul style="list-style-type: none"> • Classed as „Threatened’ or „At Risk’ in the New Zealand Threat Classification System, or • Classed as „Data Deficient’ in the New Zealand Threat Classification System, or • endemic to the Waikato Region, or • it is a habitat of importance for the 	<p>Species that are Threatened’, „At Risk’ or „Data Deficient’ are indigenous species that have been evaluated and placed within categories under the New Zealand Threat Classification System.</p> <p>Endemic to the Waikato Region, means currently only occurs naturally within the Waikato Region.</p>	CE, CRI, DOC, EW	Y / N / NS	<p>List the „Threatened’, „At Risk’ or „Data Deficient’ species and their classification</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <p>List any „Threatened’, „At Risk’ or „Data Deficient’ species that use the site which are international migrants.</p> <hr/> <hr/> <hr/> <hr/> <p>List any regionally endemic species</p> <hr/> <hr/> <hr/> <hr/>

A. Criteria	B. Definitions and Further Information	C. Likely Information ¹ Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to assist with determining level of significance
conservation of regionally threatened or regionally at risk species (or genetically distinct population) in the Waikato Region.				
4 It is indigenous vegetation or habitat type that is under-represented (10% or less of its known or likely original extent remaining) in an Ecological District, or Ecological Region, or nationally.	<p>Maps of ecological districts and regions (McEwen 1987) are available from DOC and EW.</p> <p>A “type” of indigenous vegetation or habitat could refer to a broad unit such as podocarp/tawa-dominant forest, or a more detailed classification and mapping unit such as harakeke flaxland.</p> <p>Definitions (and examples) of vegetation/habitat structural classes and vegetation types are provided in Atkinson (1985) and, for wetlands, Clarkson <i>et al.</i> (2002). Vegetation types for non-wetland vegetation in the Waikato Region are described in Leathwick <i>et al.</i> 1995.</p> <p>Comparison with known or likely original extent may require analysis (for example, using a Geographic Information System) of current extent and previous extent.</p> <p>Leathwick <i>et al.</i> 1995 mapped and described the extent of indigenous vegetation types in 1840 and 1995.</p>	CE, CRI, DOC, EW, P	Y / N / NS	<p>List under-represented vegetation/habitat type(s) and state whether rare at the national, regional, or ecological district scale?</p> <hr/> <hr/> <hr/> <hr/>

A. Criteria	B. Definitions and Further Information	C. Likely Information ¹ Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to assist with determining level of significance
	<p>Vegetation types are not directly comparable and many vegetation types need to be grouped for comparison with the estimated 1840 extent. Future analysis using frameworks such as Land Environments may enable comparison with vegetation prior to human occupation. In the meantime comparison with the 1840 datum will provide useful information for most vegetation classes.</p>			
<p>5 It is indigenous vegetation or habitat that is, and prior to human settlement was, nationally uncommon, such as geothermal, Chenier plain, or karst ecosystems.</p>	<p>Geothermal habitats can include geysers, springs, sinter terraces, and hydro-thermally altered soils. They provide habitat for geothermally-influenced vegetation, and heat-tolerant bacteria.</p> <p>Chenier plain is a plain comprising shell ridges with infilled muds and other sediment between the ridges. An extensive area at Miranda provides habitat for international wader migrants.</p> <p>Karst ecosystems are limestone systems, providing habitat for specialist limestone plants (e.g. <i>Asplenium cimmeriorum</i>, <i>Gymnostomum calcereum</i>) and fauna (e.g. cave weta).</p> <p>Note that these three examples are not a comprehensive list of nationally uncommon vegetation or habitat types.</p>	<p>CE, CRI, DOC, EW</p>	<p>Y / N / NS</p>	<p>Type of feature: _____ _____</p> <p>Area: _____ _____</p> <p>Condition: _____ _____</p>

A. Criteria	B. Definitions and Further Information	C. Likely Information ¹ Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to assist with determining level of significance
<p>6 It is wetland habitat for indigenous plant communities and/or indigenous fauna communities¹ that has not been created and subsequently maintained for or in connection with:</p> <p>(a) waste treatment; or</p> <p>(b) wastewater renovation; or</p> <p>(c) hydro electric power lakes²; or</p> <p>(d) water storage for irrigation; or</p> <p>(e) water supply storage;</p> <p>unless in those instances they meet the criteria in Whaley <i>et al.</i> (1995).</p>	<p>Wetlands have been severely depleted nation-wide, and are recognised as a rare habitat type. The RMA definition of a wetland is: "Wetland" includes permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions.</p> <p>Wetlands may have fluctuating water levels and the edge of a wetland may be difficult to define but will generally be where wetland plant species (e.g. raupo) are replaced with dryland species (e.g. kanuka). Note that manuka can occur in wetland and dryland habitats.</p> <p>All artificially-created wetlands listed in Criterion 6a-e should also be evaluated using the criteria in Whaley <i>et al.</i> (1995), as well as criteria 1-5 and 7-11 in Table 1.</p>	<p>CE, CRI, DOC, EW, P</p> <p>Copies of Whaley <i>et al.</i> (1995) can be obtained from EW.</p>	<p>Y / N / NS</p>	<p>Type of wetland habitats/indigenous communities present:</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>Origins of wetland (natural, artificial):</p> <p>_____</p> <p>_____</p> <p>Area (ha): _____</p>

¹ Does not include exotic rush/pasture communities.
² Does not include Lake Taupo.

A. Criteria	B. Definitions and Further Information	C. Likely Information ¹ Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to assist with determining level of significance
<p>7. It is an area of indigenous vegetation or naturally occurring habitat that is large relative to other examples in the Waikato Region of similar habitat types, and which contains all or almost all indigenous species typical of that habitat type.</p>	<p>This criterion is not intended to select the largest single example of a habitat type in the Waikato Region.</p> <p>Refer to vegetation maps (e.g. Leathwick <i>et al.</i> 1995), to determine which other parts of the Region have similar habitat, and the size of those examples. Refer to natural area inventories (e.g. report by Wildland Consultants Ltd and EPRO Ltd 1999), DOC compilations of Sites of Special Wildlife Importance (SSWI), DOC Conservation Management Strategies for Waikato, Bay of Plenty, Wanganui, Auckland, and Tongariro/Taupo Conservancies, Protected Natural Area Programme reports (e.g. Coromandel PNAP) to help determine the species that are typical of each habitat type.</p>	<p>CE, CRI, DOC, EW</p>	<p>Y / N / NS</p>	<p>Broad habitat types present:</p> <p>_____</p> <p>_____</p> <p>Area (ha)</p> <p>Notable flora or fauna:</p> <p>_____</p> <p>_____</p> <p>How does the size compare with other similar habitat types in the Region? <i>e.g. the site is part of one of the largest example of similar habitat types in the Region.</i></p> <p>_____</p> <p>_____</p>

A. Criteria	B. Definitions and Further Information	C. Likely Information ¹ Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to assist with determining level of significance
<p>8 It is aquatic habitat that is a portion of a stream, river, lake, wetland, intertidal mudflat or estuary, and their margins, that is critical to the self sustainability of an indigenous species within a catchment of the Waikato Region and which contains healthy, representative populations of that species.</p>	<p>Excluding artificial water bodies, except those created for the maintenance and enhancement of biodiversity or as mitigation for a consented activity.</p> <p>Critical means essential for a specific component of the life cycle and includes breeding and spawning grounds, juvenile nursery areas, important feeding areas, and migratory pathways.</p> <p>It is likely that sound technical advice will need to be obtained from an appropriately qualified and experienced aquatic ecologist.</p>	<p>CE, CRI, DOC, EW, UW</p>	<p>Y / N / NS</p>	<p>Catchment:</p> <p>_____</p> <p>_____</p> <p>Area (ha) or length of habitat:</p> <p>_____</p> <p>Breeding species present:</p> <p>_____</p> <p>_____</p> <p>_____</p>
REPRESENTATIVE EXAMPLES				
<p>9 It is an area of indigenous vegetation or habitat that is a healthy, representative example of its type because:</p> <p>its structure, composition, and ecological processes are largely intact, and if protected from the adverse effects of plant and animal pests and of adjacent landuse (e.g. stock, discharges, erosion), can maintain its ecological sustainability over time.</p>	<p>Fencing and pest control would be required for most mainland sites in the Region (irrespective of habitat type).</p> <p>Ecological sustainability means a site's ability to continue to exist as an area of indigenous vegetation or habitat for indigenous fauna when taking into account its size, shape, buffering from external effects, connection to other natural areas, and likely threats. It may change naturally into a different habitat but indigenous species are probably prominent or dominant and it will retain a natural character.</p> <p>Ecologists assessing this criterion should take into account the site's size,</p>	<p>CE, CRI, DOC, EW, P</p> <p>This criterion will require the input of an experienced and qualified ecologist.</p> <p>Good information is probably required, and, in most instances, a field visit is probably</p>	<p>Y / N / NS</p>	<p>Rank the following factors High (H), Medium (M) or Low (L):</p> <p>structural intactness _____</p> <p>ratio of indigenous: exotic species _____</p> <p>connectivity to other natural areas _____</p> <p>size of the area in the context of the relevant ecological district _____</p> <p>degree of protection from likely threats (e.g., fenced, buffered) _____</p> <p>species diversity _____</p>

A. Criteria	B. Definitions and Further Information	C. Likely Information ¹ Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to assist with determining level of significance
	<p>shape, buffering from external effects, and connection to other natural areas. Other factors to be considered include indigenous regeneration (presence of fruit, seedlings, nests, juvenile animals etc), structural tiers (layers), hydrological processes in wetlands, invasive weeds, pest animals, domestic stock, threat management, and management history.</p> <p>Representative areas are sites that are the best examples of sites that form a network covering the full range of landforms, soil sequences, vegetation and fauna communities within an ecological district (c.f. Shaw 1994). The reality for many landscapes, particularly throughout much of the Waikato, is that a 'representative example' is probably the larger and most diverse remaining examples of indigenous vegetation and habitats.</p>	<p>necessary.</p>		<p>List no. of responses to the above questions:</p> <p>H _____</p> <p>M _____</p> <p>L _____</p> <p>Indicate overall ecological quality of the site.</p> <p>_____</p> <p>Would you consider this to be among the best examples of its type nationally (Y/N), in the Waikato Region (Y/N), or in a particular ecological region/ district (Y/N)? Provide justification.</p> <p>_____</p> <p>_____</p> <p>_____</p>
<p>10 Is it an area of indigenous vegetation or habitat that forms part of an ecological sequence that is either not common in the Waikato Region or an ecological district, or is an exceptional, representative example of its type.</p>	<p>Ecological sequence means a series of two or more connected ecosystems or vegetation types that retain natural transition zones along an environmental gradient.</p> <p>Ecological sequences that are not common in the Waikato Region include, but are not restricted to, indigenous dune vegetation through to</p>	<p>CE, CRI, DOC, EW, P</p>	<p>Y / N / NS</p>	<p>Does the site include or is it part of one of the best or only examples of this type of ecological sequence nationally (Y/N), regionally (Y/N), or in the relevant ecological district (Y/N)?</p> <p>Location:</p> <p>_____</p>

A. Criteria	B. Definitions and Further Information	C. Likely Information ¹ Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to assist with determining level of significance
	<p>coastal scrub or forest, lake margins or geothermal systems to indigenous forest, coastal to montane or alpine vegetation.</p> <p>Such sequences should be largely intact (e.g. perhaps bisected by roads but not by large tracts of non-indigenous land cover), such that they can be traversed by the majority of indigenous species that are reliant on such sequences for the completion of part or all of their life-cycles (e.g. by movement of key fauna or dispersal of propagules such as seed).</p> <p>It will probably be necessary to provide or obtain a map(s) of the sequence and the main vegetation types and habitats that it comprises.</p> <p>An exceptional, representative sequence is probably one of the best examples of its type, taking into account its intactness, composition, and ecological processes.</p> <p>GIS analysis using a vegetation map and an appropriate evaluation framework (e.g. ecological district boundaries) may demonstrate if a sequence is uncommon or one of the better examples.</p>			<p>Key elements of sequence:</p> <hr/> <hr/> <hr/> <hr/> <hr/> <p>Justification:</p> <hr/> <hr/> <hr/> <hr/>

A. Criteria	B. Definitions and Further Information	C. Likely Information ¹ Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to assist with determining level of significance
<p><u>ROLE IN PROTECTION OF ECOLOGICALLY SIGNIFICANT AREA</u></p> <p>11 It is an area of indigenous vegetation or habitat for indigenous species (which habitat is either naturally occurring or has been established as a mitigation measure) that forms, either on its own or in combination with other similar areas, an ecological buffer, linkage or corridor, and which is necessary to protect any site identified as significant under Criteria 1-10 from external adverse effects.</p>	<p>This also includes riparian vegetation that protects a freshwater fishery.</p>	<p>CE, CRI, DOC, EW, P</p>	<p>Y / N / NS</p>	<p>Key ecological function(s) of site (buffer, ecological linkage, other):</p> <hr/> <hr/> <p>Which site(s) does this area provide a buffer or linkage for?</p> <hr/> <hr/> <p>How significant is the site(s) listed above? i.e. which of criteria 1-10 does the buffered or linked site comply with?</p> <hr/> <hr/> <p>Justification:</p> <hr/> <hr/> <hr/>

UPDATED* WAIKATO REGIONAL COUNCIL CRITERIA FOR THE ASSESSMENT OF RELATIVE ECOLOGICAL SIGNIFICANCE OF INDIGENOUS VEGETATION AND HABITATS OF INDIGENOUS FAUNA

* Factors 7 and 12 are updated to reflect the revised threat classification system of Townsend *et al.* (2008).

In Column A, circle the criteria numbers for which you scored a „Yes’ in Table 1. Then consider the factors to be assessed, and complete Column D, using your answers in Table 1 Column E to justify your response.

A. RPS Criteria met (see Table 1 above)	B. FACTORS TO BE ASSESSED	C. NOTES	D. RESPONSE (Yes / No / Not Sure)
	<p><u>INTERNATIONALLY SIGNIFICANT</u></p> <p>A site is Internationally Significant if you respond „YES’ to any of the questions in this section:</p>	<p>Internationally significant natural areas have usually been identified in previous assessments. These sites are so important that some of them are already protected by international conventions. For example, the Tongariro National Park is a World Heritage Area, and there are three wetlands in the Waikato listed as Wetlands of International Importance under the international RAMSAR Convention (Whangamarino Swamp, Kopouatai Peat Dome, and the Firth of Thames estuary).</p> <p>Other natural areas may be internationally significant if they contain high quality vegetation or habitat that is unique in the world - for example, geothermal systems at Waitapu and Orakeikorako.</p> <p>Internationally significant sites are likely to attract the interest of overseas and NZ scientists, and be a primary attraction for international and national tourists, e.g. Miranda bird sanctuary, Tongariro National Park.</p>	

A. RPS Criteria met (see Table 1 above)	B. FACTORS TO BE ASSESSED	C. NOTES	D. RESPONSE (Yes / No / Not Sure)
1	1. Has it been recognised under international legislation or convention as an internationally significant area (e.g. as a World Heritage Site or a RAMSAR site)?		Y / N / NS
2	2. Has it been recommended for protection as a World Heritage Site or Wetland of International Importance (RAMSAR site) by QEII or NWH, or NHF?		Y / N / NS
3	3. Is it currently habitat for an indigenous species which is threatened with extinction (in the categories Nationally Critical, or Nationally Endangered or Nationally Vulnerable) and endemic to the Waikato Region?		Y / N / NS
3	4. Is it a key habitat for the completion of the life cycle of species that migrate internationally and that would be threatened if these habitats weren't sustained?	An example of key habitat for international migrants is the Firth of Thames.	Y / N / NS

A. RPS Criteria met (see Table 1 above)	B. FACTORS TO BE ASSESSED	C. NOTES	D. RESPONSE (Yes / No / Not Sure)
If meets several of 4 & 9 or 5 & 9 or 6 & 9 or 7 & 9 or 8 & 9 or 10 & 9	5. Is the site the best or only remaining large representative example in New Zealand of a suite of relatively intact indigenous ecosystems and ecological sequences e.g. a wetland/forest complex with altitudinal sequences?	This would need to be justified by several well-qualified and experienced ecologists.	Y / N / NS

A. RPS Criteria (see Table 1 above)	B. FACTORS TO BE ASSESSED	C. NOTES	D. RESPONSE (Yes / No / Not Sure)
	<p><u>NATIONALLY SIGNIFICANT</u></p> <p>The site is at least Nationally Significant if you can answer „YES‘ to any of the questions in this section.</p>	<p>Nationally Significant natural areas includes sites that contain healthy populations of threatened species (such as kokako and kaka habitat at Pureora), or are very good examples of nationally rare habitat or vegetation (such as the large wetlands in the northern Waikato). They also include sites that are the only location where certain species occur, such as the hooded orchid at Whangamarino, or the Mercury Islands tusked weta.</p> <p>Nationally significant sites tend to attract the interest of scientists, technical specialists, and/or tourists from other parts of New Zealand.</p>	

A. RPS Criteria (see Table 1 above)	B. FACTORS TO BE ASSESSED	C. NOTES	D. RESPONSE (Yes / No / Not Sure)
1 or 2	6. Is it protected, or recommended for protection, under the Conservation Act 1987 (as an Ecological Area, or Forest Sanctuary), National Parks Act 1980, Marine Reserves Act 1971, or Reserves Act 1977 (as a Nature Reserve or Scientific Reserve).	In the Waikato Region these include: Tongariro National Park, Waihaha Ecological Area, Waipapa Ecological Area, Mangatutu Ecological Area, Rapurapu Ecological Area.	Y / N / NS
3	<p>7. Is it habitat for an indigenous species (or genetically distinct population) threatened with extinction in the categories „Nationally Critical’, „Nationally Endangered’, or „Nationally Vulnerable’,</p> <p>OR</p> <p>It is one of the best quality examples, on a national basis, of habitats used on an ongoing basis by a species (or genetically distinct population) in the „At Risk’ category,</p> <p>OR</p> <p>It is a key habitat for the completion of the lifecycle of a species (or genetically distinct population) in one of the threat categories above, that migrate nationally and that would be threatened if these habitats were not sustained.</p>	<p>Sites where low numbers are present on only a few occasions (and are unlikely to be important for the long-term viability of the species) do not meet this factor. Sites that meet this factor will be used on an on-going basis, or be important for sustaining a population on a seasonal basis for key components of its lifecycle (e.g. feeding site), or be an important migratory site, breeding site, or over-wintering site.</p>	<p>Y / N / NS</p> <p>Species:</p> <p>_____</p> <p>_____</p> <p>Threat Status:</p> <p>_____</p> <p>_____</p>
4 & 9 or 5 & 9 or 6 & 9	8. Is it indigenous vegetation or habitat for indigenous species that is under-represented nationally (10% or less remains), or nationally uncommon (including wetland) that is a good quality example that is representative of its type?	<p>Good quality examples would receive mostly highs or mediums for Criterion 9 in Table 1(taking into account size, presence of plant and animal pests, stock damage, and other damaging effects).</p> <p>For the definition of vegetation types refer to Criterion 4 in Table 1 above - Column B, Definitions and Further Information.</p>	<p>List no. of responses to criterion 9 in Table 1:</p> <p>H _____</p> <p>M _____</p> <p>L _____</p>

A. RPS Criteria (see Table 1 above)	B. FACTORS TO BE ASSESSED	C. NOTES	D. RESPONSE (Yes / No / Not Sure)
			Y / N / NS
	<p><u>REGIONALLY SIGNIFICANT</u></p> <p>The site is at least Regionally Significant if you can respond „YES’ to any of the questions in this section:</p>	<p>Regionally significant natural areas include the best examples in the Waikato Region of habitats that may be common elsewhere in New Zealand - for example, our best dune systems or largest mangrove-filled estuaries, or large examples of more common vegetation types. They may also include examples of nationally rare features that are not in good condition.</p>	
1	9. Is it protected under the Reserves Act 1977, as a Wildlife Management Reserve, Wildlife Refuge, Scenic Reserve, Nga Whenua Rahui Kawenata, or for any conservation purpose under the Conservation Act such as a Conservation Area or Conservation Park, with significant fauna and/or flora values.		Y / N / NS Status: _____ Recommended Status: _____ _____
1	10. Is it protected under the Queen Elizabeth the Second National Trust Act 1977 as an Open Space Covenant for any purpose other than those outlined for sites of international or national significance?		Y / N / NS
2	11. Is it a site that has been recommended for protection by NHF, NWR, or QEII?		Y / N / NS

A. RPS Criteria (see Table 1 above)	B. FACTORS TO BE ASSESSED	C. NOTES	D. RESPONSE (Yes / No / Not Sure)
3	<p>12. Is it habitat of considerable importance for the conservation of an indigenous species (or genetically distinct population) in the 'At Risk' category or it is an important habitat for a species that is endemic to the Waikato Region,</p> <p>OR</p> <p>It is habitat of importance for the conservation of regionally threatened or regionally at risk species (or genetically distinct population) within the Waikato Region, although the species is secure elsewhere,</p> <p>OR</p> <p>Habitat considered, by several qualified and experienced ecologists to be of importance for the sustainability of a 'Data Deficient' species on a regional basis.</p>	<p>Species currently known to be endemic to the Waikato Region (defined as currently only occurs naturally within the Waikato Region) include: <i>Sporadanthus ferrugineus</i>, Mercury Is. Tusked weta, Te Aroha stag beetle, Moehau stag beetle, <i>Hebe 'Awaroa'</i>, <i>Corybas carsei</i>.</p> <p>Assessment of whether a species is classified as at risk or threatened in the Waikato Region would have to be justified by several well-qualified and experienced ecologists familiar with the species and ecology of the Waikato Region.</p>	<p>Y / N / NS</p> <p>Species:</p> <p>_____</p> <p>_____</p> <p>Threat Status:</p> <p>_____</p> <p>_____</p>
4 & 9	<p>13. Is it indigenous vegetation or habitat for indigenous species that is under-represented regionally (i.e. within relevant ecological regions and districts) and which is a good quality example that is representative of its type (taking into account size, plant and animal pests, stock damage, other damaging effects)?</p>	<p>Good quality examples would receive highs or mediums for Criterion 9 in Table 1.</p> <p>Assessment must be justified by a well qualified and experienced ecologist.</p>	<p>List no. of responses to question 9 in Table 1:</p> <p>H _____</p> <p>M _____</p> <p>L _____</p> <p>Y / N / NS</p>

A. RPS Criteria (see Table 1 above)	B. FACTORS TO BE ASSESSED	C. NOTES	D. RESPONSE (Yes / No / Not Sure)
4, 5, or 6	14. Is it a relatively large example of indigenous vegetation or habitat for indigenous species that is under-represented nationally, or nationally uncommon (including wetlands), but which is degraded in quality (taking into account presence of plant and animal pests, stock damage, other damaging effects)?	Assessment must be justified by a well qualified and experienced ecologist. Use the results from Criterion 9 in Table 1 to determine the relative quality of the site.	Y / N / NS
4	15. Is it the Region's only remaining representative example (irrespective of its size) of a particular indigenous vegetation type or indigenous species habitat that is degraded in quality?	<p>Representative areas are the best examples of indigenous vegetation and habitats that comprise a network covering the full range of landforms, soil sequences, vegetation and fauna communities within an ecological district (c.f. Shaw 1994). The reality for many landscapes, particularly throughout much of the Waikato, is that a 'representative example' is probably the largest and most diverse remaining examples of indigenous vegetation and habitats.</p> <p>Degraded sites would receive mostly Low scores for the factors listed in Criterion 9.</p>	<p>List no. of responses to question 9 in Table 1:</p> <p>H _____</p> <p>M _____</p> <p>L _____</p> <p>Y / N / NS</p>
9 or 8 & 9 or 10 & 9	16. Is it one of the best representative examples in the Waikato Region of indigenous vegetation or habitat for indigenous fauna or an ecological sequence?	Assessment must be justified by a well qualified and experienced ecologist.	Y / N / NS
7 & 9	17. Is it a good quality example of indigenous vegetation or habitat for indigenous species representative of the ecological character typical of the Waikato Region?	This may include examples of indigenous vegetation that are large or moderately large relative to other similar habitats in the Region or within the relevant ecological district. They should be relatively intact and retain the main elements of their original composition structure. Examples would include relatively large tracts of indigenous forest and habitats on the Hakarimata Range and Kaimai Range.	Y / N / NS
11	18. Is it a buffer (or a key part of a buffer) to a site that is of international or national significance?	The site buffered must have first been shown to be of national or international significance using relevant sections above in Table 2.	Y / N / NS

A. RPS Criteria (see Table 1 above)	B. FACTORS TO BE ASSESSED	C. NOTES	D. RESPONSE (Yes / No / Not Sure)
All	<p><u>LOCALLY SIGNIFICANT</u></p> <p>19. The site is at least of Local Significance if you answered “Yes” to at least one criterion in Table 1 but did not answer “Yes” to any of the questions above in Table 2.</p>	<p>Locally significant natural areas are healthy examples of relatively common vegetation and habitat types. They are often small areas, but large enough to enable key ecological processes to occur, such as regeneration of seedlings or reproduction of indigenous fauna. These sites may not be particularly significant in their own right, but nevertheless play an important part in a network of natural areas. For example, a locally significant site might be important as a seasonal feeding or breeding area. It might also act as a stepping stone between other natural areas, allowing indigenous fauna to move in search of food or mates.</p> <p>Such sites are likely to provide representative examples of common or typical vegetation types or habitat for common indigenous species. They will not be among the best examples in the Region but will meet Criterion 9 as healthy, functioning, and ecologically viable sites.</p>	Y / N
HOW SIGNIFICANT IS THE SITE?		Circle the highest level for which you allocated at least one “Yes” response in Table 2. This indicates the relative importance of the site.	International, National, Regional, Local

THREAT CLASSIFICATIONS SYSTEM
(from Townsend *et al.* 2008) followed in de Lange *et al.* (2009).

NATIONALLY CRITICAL

A. Very small population (natural or unnatural)

A taxon is „Nationally Critical’, regardless of population trend and regardless of whether the population size is natural or unnatural, when evidence¹ indicates that:

1. There are fewer than 250 mature individuals; or
2. There are ≤ 2 sub-populations and ≤ 200 mature individuals in the largest sub-population; or
3. The total area of occupancy is ≤ 1 ha (0.01 km²).

B. Small population (natural or unnatural) with a high ongoing or predicted decline

A taxon is „Nationally Critical’ when evidence indicates that it fits at least one Status criterion and the Trend criterion as follows:

Status

1. The population comprises 250-1,000 mature individuals; or
2. There are ≤ 5 sub-populations and ≤ 300 mature individuals in the largest sub-population; or
3. The total area of occupancy is ≤ 10 ha (0.1 km²).

Trend

There is an ongoing or predicted decline of 50-70% in the total population due to existing threats, taken over the next 10 years or three generations, whichever is longer.

C. Population (irrespective of size or number of sub-populations) with a very high ongoing or predicted decline (>70%)

A taxon is „Nationally Critical’ when the population has an ongoing trend or predicted decline of >70% in the total population due to existing threats taken over the next 10 years or three generations, whichever is longer.

¹ Evidence in this context is defined as quantitative data and supporting information about the status of a candidate taxon.

NATIONALLY ENDANGERED

A. Small population (natural or unnatural) that has a low to high ongoing or predicted decline

A taxon is „Nationally Endangered’ when evidence indicates that it fits at least one Status criterion and the Trend criterion as follows:

Status

1. The total population size is 250-1000 mature individuals; or
2. There are ≤ 5 sub-populations and ≤ 300 mature individuals in the largest sub-population; or
3. The total area of occupancy is ≤ 10 ha (0.1 km^2).

Trend

There is an ongoing or predicted decline of 10-50% in the total population due to existing threats, taken over the next 10 years or three generations, whichever is longer.

B. Small stable population (unnatural)

To trigger this pathway to „Nationally Endangered’, taxa must have current population sizes that result from unnatural causes. Such taxa are defined as „Nationally Endangered’ when evidence indicates that they fit at least one Status criterion and the Trend criterion as follows:

Status

1. The total population size is 250-1,000 mature individuals; or
2. There are ≤ 5 sub-populations and ≤ 300 mature individuals in the largest sub-population; or
3. The total area of occupancy is ≤ 10 ha (0.1 km^2).

Trend

The population is stable ($\pm 10\%$) and is predicted to remain stable over the next 10 years or three generations, whichever is longer.

C. Moderate population and high ongoing or predicted decline

A taxon is „Nationally Endangered’ when evidence indicates that it fits at least one Status criterion and the Trend criterion as follows:

Status

1. The total population size is 1,000-5,000 mature individuals; or
2. There are ≤ 15 sub-populations and ≤ 500 mature individuals in the largest sub-population; or
3. The total area of occupancy is ≤ 100 ha (1 km^2).

Trend

There is an ongoing or predicted decline of 50-70% in the total population due to existing threats, taken over the next 10 years or three generations, whichever is longer.

NATIONALLY VULNERABLE

A. Small, increasing population (unnatural)

To trigger „Nationally Vulnerable’, taxa must have current population sizes that result from unnatural causes. Such taxa are defined as „Nationally Vulnerable’ when evidence indicates that they fit at least one Status criterion and the Trend criterion as follows:

Status

1. The total population size is 250-1,000 mature individuals; or
2. There are ≤ 5 sub-populations and ≤ 300 mature individuals in the largest sub-population; or
3. The total area of occupancy is ≤ 10 ha (0.1 km^2).

Trend

The population is increasing ($>10\%$) and is predicted to continue to increase over the next 10 years or three generations, whichever is longer.

B. Moderate, stable population (unnatural)

To trigger „Nationally Vulnerable’, taxa must have current population sizes that result from unnatural causes. Such taxa are defined as „Nationally Vulnerable’ when evidence indicates that they fit at least one Status criterion and the Trend criterion as follows:

Status

1. The total population size is 1,000-5,000 mature individuals; or
2. There are ≤ 15 sub-populations and ≤ 500 mature individuals in the largest sub-population; or
3. The total area of occupancy is ≤ 100 ha (1 km^2).

Trend

The population is stable ($\pm 10\%$) and is predicted to remain stable over the next 10 years or three generations, whichever is longer.

C. Moderate population, with population trend that is declining

A taxon is „Nationally Vulnerable’ when evidence indicates that it fits at least one Status criterion and the Trend criterion as follows:

Status

1. The total population size is 1,000-5,000 mature individuals; or
2. There are ≤ 15 sub-populations and ≤ 500 mature individuals in the largest sub-population; or
3. The total area of occupancy is ≤ 100 ha (1 km^2).

Trend

There is an ongoing or predicted decline of 10-50% in the total population due to existing threats, taken over the next 10 years or three generations, whichever is longer.

D. Moderate to large population and moderate to high ongoing or predicted decline

A taxon is „Nationally Vulnerable’ when evidence indicates that it fits at least one Status criterion and the Trend criteria as follows:

Status

1. The total population size is 5,000-20,000 mature individuals; or
2. There are ≤ 15 sub-populations and $\leq 1,000$ mature individuals in the largest sub-population; or
3. The total area of occupancy is $\leq 1,000$ ha (10 km^2).

Trend

There is an ongoing or predicted decline of 30-70% in the total population due to existing threats, taken over the next 10 years or three generations, whichever is longer.

E. Large population and high ongoing or predicted decline

A taxon is „Nationally Vulnerable’ when evidence indicates that it fits at least one Status criterion and the Trend criterion as follows:

Status

1. The total population size is 20,000-100,000 mature individuals; or
2. The total area of occupancy is $\leq 10,000$ ha (100 km^2).

Trend

There is an ongoing or predicted decline of 50-70% in the total population or area of occupancy due to existing threats, taken over the next 10 years or three generations, whichever is longer.

CRITERIA FOR ‘AT RISK’ TAXA

Taxa that qualify as „At Risk’ do not meet the criteria for any of the „Threatened’ categories. However, they are declining (though buffered by a large total population size and/or a slow decline rate), biologically scarce, recovering from a previously threatened status, or survive only in relictual populations.

Four „At Risk’ categories exist: „Declining’, „Recovering’, „Relict’ and „Naturally Uncommon’. Definitions for each are provided below.

Declining

„Declining’ taxa do not qualify as „Threatened’ because they are buffered by a large total population size and/or a slower decline rate. However, if the declining trends continue, these taxa may be listed as „Threatened’ in the future.

A. Moderate to large population and low ongoing or predicted decline

A taxon is „Declining’ when evidence indicates that it fits at least one Status criterion and the Trend criterion as follows:

Status

1. The total population size is 5,000-20,000 mature individuals; or
2. The total area of occupancy is ≤ 1000 ha (10 km²).

Trend

There is an ongoing or predicted decline of 10-30% in the total population or area of occupancy due to existing threats, taken over the next 10 years or three generations, whichever is longer.

B. Large population and low to moderate ongoing or predicted decline

A taxon is „Declining’ when evidence indicates that it fits at least one Status criterion and the Trend criterion as follows:

Status

1. The total population size is 20,000-100,000 mature individuals; or
2. The total area of occupancy is $\leq 10,000$ ha (100 km²).

Trend

There is an ongoing or predicted decline of 10-50% in the total population or area of occupancy due to existing threats, taken over the next 10 years or three generations, whichever is longer.

C. Very large population and low to high ongoing or predicted decline

A taxon is „Declining’ when evidence indicates that it fits at least one Status criterion and the Trend criterion as follows:

Status

1. The total population size is $> 100,000$ mature individuals; or
2. The total area of occupancy is $> 10,000$ ha (100 km²).

Trend

There is an ongoing or predicted decline of 10-70% in the total population or area of occupancy due to existing threats, taken over the next 10 years or three generations, whichever is longer.

Recovering

Taxa that have undergone a documented decline within the last 1,000 years and now have an ongoing or predicted increase of >10% in the total population or area of occupancy, taken over the next 10 years or three generations, whichever is longer. Note that such taxa that are increasing but have a population size of <1,000 mature individuals (or total area of occupancy of <10 ha) are listed in one of the 'Threatened' categories, depending on their population size.

A. Moderate population

A taxon is eligible for listing as 'Recovering (A)'³ if its total population size is between 1000 and 5000 mature individuals or its area of occupancy is ≤ 100 ha (1 km²).

B. Moderate to large population

A taxon is eligible for listing as 'Recovering (B)'¹ if its total population size is between 5,000 and 20,000 mature individuals or its area of occupancy is $\leq 1,000$ ha (10 km²).

Relict

Taxa that have undergone a documented decline within the last 1,000 years, and now occupy less than 10% of their former range and meet one of the following criteria:

- A. Have 5,000-20,000 mature individuals and are stable ($\pm 10\%$)
- B. Have more than 20,000 mature individuals and are stable or increasing at >10%

The range of a relictual taxon takes into account the area currently occupied as a ratio of its former extent. 'Relict' can also include taxa that exist as reintroduced and self-sustaining populations within or outside their former known range.

Naturally Uncommon

Taxa whose distribution is naturally confined to specific substrates (e.g. ultramafic rock), habitats (e.g. high alpine fellfield, hydrothermal vents), or geographic areas (e.g. subantarctic islands, sea-mounts), or taxa that occur within naturally small and widely scattered populations. This distribution is not the result of past or recent human disturbance. Populations may be stable or increasing. Note that a naturally uncommon taxon that has fewer than 250 mature individuals qualifies for 'Nationally Critical'. Taxa that have more than 20,000 mature individuals are not considered 'Naturally Uncommon', unless they occupy an area of less than 100,000 ha (1,000 km²).

¹ Recovering (A) and Recovering (B) are two different categories, rather than two pathways to the same category, and hence it is necessary to add '(A)' or '(B)' when classifying taxa, unlike for other categories.

INDEX

Akatarewa East	263	Red Hills	259
Akatarewa Stream	240	Rotokawa North	405
Broadlands Road	338	Spa Thermal Park	333
Craters of the Moon	397	Te Kiri O Hine Kai Stream Catchment/Wairoa Hill	374
Crown Park	342	Te Kopia	194
Crown Road	347	Te Kopia Northwest	204
Emerald Lakes	462	Te Kopia Red Stream	218
Golden Springs	309	Te Kopia West Mud Pools	210
Hall of Fame Stream	388	Te Maari Craters	454
Hipaua	416	Te Rautehuia	355
Horohoro	76	Te Rautehuia Stream	359
Karapiti Forest	384	Tirohanga Road	168
Ketetahi	458	Tokaanu Lake Shore Wetland	420
Lake Rotokawa	410	Tokaanu Tailrace Canal	448
Longview Road	281	Tokaanu Thermal Park	428
Lower Wairakei Stream	380	Tokaanu Urupa Mudpools	436
Mangamingi Station	224	Upper Atiamuri West	181
Matapan Road	189	Upper Wairakei Stream (Geyser Valley)	363
Maungakakamea (Rainbow Mountain)	129	Waihunahuna Geothermal Area	234
Maunganamu East	440	Waikato River Springs	267
Maunganamu North Wetland	444	Waikite Valley	81
Maunganamu West	424	Waiotapu North	114
Maungaongaonga	105	Waiotapu South	141
Murphy's Springs	200	Waipahihi Valley	351
Ngapouri	109	Waipapa Stream	163
Ngatamariki	271	Waipouwerawera Stream/ Tukairangi	392
Northern Paeroa Range	89	Wairakei Borefield	369
Ohaaki Steamfield East	321	Whakamaru	159
Ohaaki Steamfield West	315	Whangairorohea	277
Orakeikorako	245	Whangapoa Springs	185
Otumuheke	327	Wharepapa Road	285
Paerata Road	175		
Red Crater	466		



Call Free 0508 WILDNZ
Ph: +64 7 343 9017
Fax: +64 7 3439018
ecology@wildlands.co.nz

99 Sala Street
PO Box 7137, Te Ngae
Rotorua 3042,
New Zealand

Regional Offices located in
Auckland, Hamilton, Tauranga,
Whakatane, Wellington,
Christchurch and Dunedin

ECOLOGY RESTORATION BIODIVERSITY SUSTAINABILITY

www.wildlands.co.nz