



Waihunuhunu Geothermal Area

Site Number: SNA565
Ecological District: Atiamuri
Source of Information: Wildland Consultants (2007b) (Site U17/31)
Digital Scale: 1:5,000
Data Source: WRAPS 2007
Regional Council: Waikato
1998 Site Number: Not identified as a site in Shaw and Beadel (1998)
Current Tenure: Unprotected
Site Area: 5.3 ha
Altitude Range: 300-310 m
Bioclimatic Zone: Lowland
Grid Reference: NZTM E1875248, N5738978

VEGETATION		LANDFORM	EXTENT
CODE	TYPE		
1	Geothermal water Geothermally heated waters of Waihunuhunu Arm of Lake Ohakuri. Several hot springs are present as well as inputs from several hot streams.	Open water	2.3 ha
2	<i>Nephrolepis flexuosa</i> fernland The upstream part of the unnamed hot water stream, where the margins of many hot springs and hot water streams are dominated by <i>Nephrolepis flexuosa</i> fernland. Several patches of <i>Dicranopteris linearis</i> are also present. Other species present include <i>Carex virgata</i> , scattered blackberry and mingimingi, <i>Hypolepis ambigua</i> , wheki, fleabane (<i>Conyza albida</i>), buddleia (<i>Buddleja davidii</i>), <i>Christella</i> sp. 'thermal', Spanish heath, Scotch thistle (<i>Cirsium vulgare</i>), bracken, ti kouka, Yorkshire fog, and <i>Cyperus ustulatus</i> .	River margins	<0.1 ha
3	Bracken-mingimingi-blackberry fernland Scattered emergent karamu, kohuhu, mamaku, and wheki are present over an understorey of bracken (<i>Pteridium esculentum</i>), mingimingi, and blackberry. On lake margins patches of <i>Baumea articulata</i> , <i>Schoenoplectus tabernaemontani</i> , <i>Baumea rubiginosa</i> , swamp kiokio, <i>Christella</i> sp. 'thermal', <i>Carex virgata</i> , and kiokio are common. A geothermal stream flows through this vegetation type.	Wetland, terrace	<0.1 ha
4	<i>Christella</i> sp. 'thermal'- <i>Nephrolepis flexuosa</i> -blackberry fernland Narrow band of vegetation on each side of an unnamed hot water stream which flows into the Waihunuhunu Arm of Lake Ohakuri. The stream is fed by hot springs upstream of this vegetation type, but hot water seepages were also present within the stream bed. The banks of the stream are dominated by <i>Christella</i> sp. 'thermal' and <i>Nephrolepis flexuosa</i> . <i>Cyperus ustulatus</i> is also common along stream margins. Upslope of these species is blackberry and bracken shrubland. Indigenous trees form a canopy above this geothermal vegetation type with common karamu, kohuhu, and wheki, as well as planted radiata pine trees. The stream was viewed at several points along its length, although access into the stream is very difficult/ dangerous due to the steep sides and very hot stream temperatures.	Stream margins	<0.1 ha

VEGETATION		LANDFORM	EXTENT
CODE	TYPE		
5	<i>Nephrolepis flexuosa</i> -bracken- <i>Christella</i> sp. 'thermal'-blackberry fernland This type is located on the banks above Lake Ohakuri where hot geothermal water from geothermal stream discharges into the lake. Patches of <i>Nephrolepis flexuosa</i> and bracken are common. Plants of <i>Christella</i> sp. 'thermal', blackberry, and mingimingi are also common. Scattered <i>Dicranopteris linearis</i> , Spanish heath, wheki, karamu, kohuhu, and swamp kiokio are present.	Lake margins	<0.1 ha
6	Mercer grass- <i>Cyclosorus interruptus</i> - <i>Hypolepis ambigua</i> grassland A Mercer grass dominated grassland with common <i>Cyclosorus interruptus</i> and <i>Hypolepis ambigua</i> . Narrow-leaved plantain (<i>Plantago lanceolatum</i>), blackberry, lotus, Spanish heath, Scotch thistle, fleabane, kohuhu, <i>Histiopteris incisa</i> , <i>Cyperus ustulatus</i> , manuka, and bracken are scattered through this area. Several hot springs are present.	Ephemeral wetland	0.1 ha
7	Raupo reedland A raupo reedland with common patches of <i>Carex virgata</i> and <i>Carex secta</i> . Occasional grey willow, <i>Galium aparine</i> , <i>Centella uniflora</i> , <i>Carex māorica</i> , lotus, <i>Carex virgata</i> , spike sedge, wheki, swamp kiokio, <i>Juncus edgariae</i> , and <i>Baumea articulata</i> are present.	Wetland	0.5 ha
8	(Ti kouka)-(manuka)/raupo- <i>Cyperus ustulatus</i> - <i>Schoenoplectus tabernaemontani</i> reedland Scattered ti kouka and manuka are present over a raupo reedland, with other areas dominated by <i>Cyperus ustulatus</i> sedgeland, <i>Schoenoplectus tabernaemontani</i> rushland, with several patches of spike sedge. Some small units of bare soil surrounding hot springs are present. Other common species include <i>Carex virgata</i> , wheki, swamp kiokio, and <i>Baumea articulata</i> .	Wetland	1.8 ha
9	Grey willow/raupo reedland Grey willow is common over raupo.	Wetland	0.4 ha

Indigenous Flora: *Christella* sp. 'thermal' and *Nephrolepis flexuosa* (both 'At Risk - Declining' in de Lange *et al.* 2009) are scattered alongside stream margins throughout this site, and alongside lake margins.

One relatively large population of *Cyclosorus interruptus* ('At Risk - Declining' in de Lange *et al.* 2009) is present. In 2007, this population comprised c.5,500 fronds in 52 major clumps over a 60 m² area.

Two small populations of *Dicranopteris linearis* ('At Risk - Naturally Uncommon') were present towards the hot springs along the unnamed hot water stream, as well as at its outlet into Lake Ohakuri.

Other species present that are typical of geothermal habitat include *Cyperus ustulatus*, turutu, *Histiopteris incisa*, raupo, mingimingi, and manuka.

Thelypteris confluens ('At Risk - Declining' in de Lange *et al.* 2009) has been recorded from this site in the past (E. Miller pers. comm. in Hobbs 2002a), but was not recorded during this survey or by Hobbs.

Fauna: North Island fernbird ('At Risk - Declining' in Miskelly *et al.* 2008), spotless crane ('At Risk - Relict'), grey warbler, bellbird, spur-winged plover, tui, pukeko, and little shag ('At Risk - Naturally Uncommon') have been recorded from this site. Other common indigenous and introduced bird species typical of the habitat are likely to be present.

Notes on Overall Condition:	This site is mostly in good ecological condition providing habitat for threatened fern species. However, exotic pest plants (e.g. grey willow and crack willow (<i>Salix fragilis</i>)) are common in the wetland. Blackberry scrub and exotic plantation trees are common around geothermal stream.
Change Relative to 1998:	Not identified as a site in Shaw and Beadel (1998) - probably little change.
Threats/Modification/Vulnerability:	<p><i>Invasive Exotic Plants:</i> Blackberry (5-25% cover), grey willow (1-5% cover), crack willow (1-5% cover), and buddleia (<1% cover).</p> <p><i>Human Impacts:</i> Litter is common near hot springs by the road entrance. Exotic plantations are near the hot geothermal stream at this site. Part of the site was probably flooded when Lake Ohakuri was formed following the damming of the Waikato River for electricity generation.</p> <p><i>Grazing:</i> The site is not farmed. Some feral pig sign was evident.</p>
Risk Assessment:	<p>Pigs: Risk to site - low; Timeframes - low.</p> <p>Pest plants: Risk to site - high. Timeframes - high.</p>
Significance Level:	National (Table 1, Criteria 3, 5, 6, 7, 9, Table 2, Factors H).
Significance Justification:	This site is of national significance as it contains relatively large populations of three uncommon species, <i>Cyclosorus interruptus</i> , <i>Christella</i> sp. 'thermal' and <i>Nephrolepis flexuosa</i> (all 'At Risk- Declining'). The population of <i>N. flexuosa</i> and <i>Cyclosorus interruptus</i> is one of the largest in New Zealand. The site is also a good quality example of geothermal vegetation that is a nationally uncommon habitat type.
Fieldwork Required:	No fieldwork is required. Site was most recently surveyed in 2007.
Notes:	<p>Given (1996) assessed the botanical value of many of the geothermal sites in the Waikato Region. This site was classed as Category B - the second highest category.</p> <p>This site has great potential for ecological restoration through management of pest plants (e.g. controlling willow trees in wetland).</p>
References:	Beadel and Bill (2000); Given (1989 & 1995); Merrett and Burns (1999); Smith-Dodsworth (1993); Hobbs (2002a); Wildland Consultants (2007a & 2007b).