

Priorities for Pest Plant and Animal Control, and Fencing at Geothermal Sites in the Waikato Region

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For:
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ISSN: 1172-4005

March 2006

Document #: 1067359

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Date April 2006

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Date April 2006



PRIORITIES FOR PEST PLANT
AND ANIMAL CONTROL, AND
FENCING AT GEOTHERMAL SITES
IN THE WAIKATO REGION

MARCH 2006

Contract Report No. 1291

Report prepared for

ENVIRONMENT WAIKATO
P O BOX 4010
HAMILTON EAST



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PROJECT TEAM

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1. INTRODUCTION

The Biosecurity Group of Environment, Waikato, wants to identify priorities for pest animal and pest plant control and fencing work at geothermal sites in the Waikato Region. Environment Waikato commissioned Wildland Consultants to rank each geothermal site in the Waikato Region for pest control using existing information, as a desktop exercise.

Environment Waikato had previously contracted Wildland Consultants to develop an inventory of sites of geothermally influenced vegetation in the Waikato Region (Wildland Consultants 2004) and most sites in the Waikato Region were visited and evaluated as part of that project. The data in the 2004 report included information on management needs, including fencing to exclude stock and control of threatening pest plants and pest animals to protect ecological and landscape values. The 2004 report forms the basis of the site rankings carried out in this report, although other reports were also utilised where available.

2. OBJECTIVES

The objective of this project was to undertake a desktop evaluation using existing information on geothermal sites in the Waikato Region (including: Geothermal Vegetation of the Waikato Region: *Wildland Consultants Contract Report No. 896 - Revised 2004*) as the basis for the following:

- Rank sites in order of priority for weed control, fencing needs, and pest animal control (if deemed relevant).
- Provide written advice on the weed species that are of highest priority for control, and any relevant recommendations or considerations regarding their methods in geothermal environments.

Ranking of sites as priority for weed, fencing and animal pest control is likely to take into account:

- The overall value of the site (significance ranking).
- Specific values (e.g. vulnerable threatened species) as risk because of weeds, stock or animal pests.
- Land tenure (sites managed by concessionaires for tourism purposes and sites where restoration is required as mitigation measures funded by geothermal energy companies can be excluded from consideration).
- Potential effectiveness/cost effectiveness of the management effort.

3. METHODS

Relevant information for each geothermal site was collated and summarised from previous reports and updated with in-house knowledge of sites. Most of this information came from the 2003-2004 field survey (Wildland Consultants 2004) and this report can be referred to for further details about each site. Summary information on each site is presented in the form of a table with the following information fields:

- **Site Number:** The number assigned to each site in Wildland Consultants 2004.
- **Site Name:** The name given to each site in Wildland Consultants 2004.
- **Tenure:** Tenure is shown as either protected or non-covenanted private land, or both if applicable. If an area is protected, the type of protection (e.g. reserve, covenant) is shown.
- **Size:** Extent of geothermal vegetation at each site is given in hectares.
- **Significance level:** The significance level assigned to each site in Wildland Consultants (2004) based on the evaluation criteria included in the Waikato Regional Policy Statement.
- **Key values of the site:** An indication of why the site is significant including the presence of 'threatened' and 'at risk' species (listed in de Lange *et al.* 2004) that have been recorded from the site in Wildland Consultants 2004 and other surveys.
- **Threats:** The threats to the ecological values of each geothermal site and geothermal features are listed under three headings: pest plants (weeds), pest animals, and grazing by domestic stock.
- **Vulnerability:** The level of vulnerability of threats at each site is ranked as follows:
 - *High:* The indigenous plant community or geothermal feature is likely to undergo a significant decline in quality within the next five years if no measures are undertaken to control the threat.
 - *Medium:* The indigenous plant community or geothermal feature is likely to undergo a significant decline in quality in the next five to ten years if no measures are undertaken to control the threat.
 - *Low:* The indigenous plant community is likely to undergo minor degradation due to the threat in the next ten years or so, or significant decline in quality over a longer period.
- **Description of threats:** A brief description of what impact each threat may have to the site if the threat is not effectively managed.

- **Action required:** A brief description on what measures may be undertaken to reduce or remove the presence of a threat to the ecological feature or geothermal features at the site, if any.
- **Ecological Benefit:** A simple assessment (high, medium, low, none) of the ecological benefits of controlling the threat(s) at each site, taking into account the value of the site and the scale of the threat to the site:
 - *High:* The site has a high conservation value (Regional Significance Level or greater) and management of the threat is likely to significantly improve the viability of the indigenous geothermal vegetation and geothermal features at the site within the next five years.
 - *Medium:*
 - The site has a high conservation value and management of the threat is likely to significantly improve the viability of the site in the next five to ten years, or
 - The site has a moderate or low conservation value and management of the threat is likely to significantly improve the viability and quality of the site in the next five years.
 - *Low:* Management of the threat in any site category is likely to improve or maintain the viability of the site over a period beyond than the next ten years.
 - *None:* Management of the perceived threat is unlikely to improve or maintain the viability of the site under the current management options.
- **Priority:** The action priority for each threat at each site has been ranked in five categories:
 - *Immediate:* The highest priority sites for active management. These are generally of National Significance (or International), or large Regionally Significant sites. Includes sites where a relatively small investment in the short term may deal cost-effectively with a management problem or threat and avoid potentially more significant problems.
 - *High:* Generally sites of high ecological value (e.g. large Regionally Significant ranked sites, Nationally Significant sites or better) where threats do not immediately threaten the site, but management will significantly improve the viability of key ecological features.
 - *Medium:* Sites of regional value or better where management will significantly improve the long-term viability of ecological features at the site.
 - *Low:* Either sites of Local Significance where management will improve the viability of ecological values or geothermal features, or sites ranked higher where management will improve ecological viability but will require the allocation of significant resources.

- *No action required*: No obvious threats or no perceived gains if management is implemented.
- **Comments**: Any further comments.

4. RESULTS

4.1 Summary

Management recommendations and rankings are presented in Appendix 1 for 40 geothermal sites in the Waikato region. Sites listed include the 36 sites described in detail in the 2004 study (Wildland Consultants 2004) as well as four other sites which are likely to have significant ecological values. A summary of key management priorities for each site is presented in Table 1 below.

Refer to the Methods section above for a description of each field in Appendix 1. This information was used to assign an overall priority for management for each site. Five categories were used - Immediate, High, Moderate, Low, and No Action Required - to indicate a measure of relative overall priority for management of pest plants, pest animals, and fencing at each site. An overall priority rating is not given for the four sites for which field surveys were not undertaken for the 2004 report (Lower Wairakei Stream, Golden Springs, Akatarewa Springs, and Waihunahuna Springs) as further information is required to assess management needs at these sites. There are four sites where no management action is recommended: Horohoro, Waipouwerawera Stream/Tukairangi, Spa Thermal Park, and Hall of Fame Stream. These are sites where there would be little or no benefit from managing pests or stock.

Fifteen sites, and most of one other site, were ranked as being of 'Immediate' priority – being the highest ranked sites for management action. Ten sites are ranked as being of 'High' priority for management action, and five sites were a 'Moderate' priority for action.

Six sites and part of one additional site were ranked as having a 'Low' priority for management action, but management would nevertheless provide ecological benefits at these sites if resources were available.

4.2 Pest plants

Most recommended management actions involve the control of pest plants. Wilding pines are the greatest threat at many of the sites. Other common pest trees present in the geothermal vegetation in the Waikato include false acacia (*Robinia pseudacacia*), Tasmanian blackwood (*Acacia melanoxyton*), crack willow (*Salix fragilis*), and grey willow (*Salix cinerea*). If chemicals are being used for control then deciduous trees should be worked on when the trees are in leaf (e.g. the best time of the year to control willow is January/February). When pest plant trees are felled, they should be felled away from geothermal vegetation, where possible. Blackberry (*Rubus fruticosus* agg.), broom (*Cytisus scoparius*), and gorse (*Ulex europaeus*) are common on cooler geothermal soils and site margins, but are difficult to manage in most situations. Pampas (*Cortaderia selloana*) is scattered through geothermal vegetation and is also a high priority for control. Undertaking control when pampas is flowering makes identification easier for weed control operators. One species, *Cyperus involucratus*, was only recorded at one site (Waikite) and could be eradicated from this site.

Generally an ecologist familiar with the ecological values of the site (e.g. location of threatened plants and geothermal vegetation) should be involved with planning weed control operations and be on site to advise contractors (or supervise works) to minimise adverse effects (e.g. advise on the least-damaging method from an ecological perspective to remove individual trees).

4.3 Pest animals and stock control

Pest animal management requirements were not assessed in detail during what was usually a single site visit to map and describe geothermal vegetation. Information in this report is based on in-house knowledge of pest animals in the vicinity of the sites.

Several sites are on private farmland and landowners will need to be consulted with in regards to fencing to exclude stock and pest control on their properties. These sites include Rotokawa North, Crown Road, parts of Broadlands Road, Te Rautehuia, Te Rautehuia Stream, Wharepapa Thermal Areas, Longview Road Thermal Area, Paerata Road, and Horohoro.

4.4 Management priority tables

The following tables outline the management priorities (sorted by immediate, high, moderate, low, and no action required), and a summary of current condition of each site and the action(s) required.

Table 1: Sites of immediate priority for active management and a summary of current condition of each site and the action(s) required.

Site Name/ Number	Action	Current Condition	Action required
Waiotapu South U17/1	Pest plant control	Pest plant tree species dominate large parts of this site, particularly exotic pines (several species including radiata pine (<i>Pinus radiata</i>), black pine (<i>Pinus nigra</i>), and strobus pine (<i>Pinus strobus</i>). Black wattle (<i>Acacia mearnsii</i>) is also scattered in parts of the site.	Remove all exotic pine and wattle species from the site.
	Pest animal control	Deer, pigs and possums are present at the site, although the densities of animals are not known.	Monitor impacts of deer, possum and pigs in the site and manage as necessary.
Orakeikorako U17/11	Pest plant control	Pines cover extensive parts of the geothermal habitats on the eastern shoreline of Lake Ohakuri.	Remove all exotic pine populations on the eastern shoreline of Lake Ohakuri.
Red Hills U17/10	Pest plant control	Exotic pines are scattered throughout this site (less common than at Orakeikorako). Scattered plants of Chinese privet (<i>Ligustrum sinense</i>) are present.	Remove all exotic pines from the geothermal areas. Remove all Chinese privet populations from the site.
Te Kopia U17/13	Pest plant control	Exotic pines are scattered throughout the site.	Requires ongoing monitoring for the extent of pine trees in geothermal areas and control implemented where necessary.
	Pest animal control	Deer, pigs and possums are present at the site, although the densities of animals are not known.	Monitor impacts of deer, possum and pigs in the site and manage as necessary.
Waikite U16/6	Pest plant control	Scattered plants of <i>Cyperus involucratus</i> occurs around bathing facilities. Scattered plants of pampas occur throughout the site.	Remove or poison all <i>C. involucratus</i> and pampas populations from the site.
	Pest plant control	Inappropriate plantings around bathing facilities at Waikite Valley.	Encourage managers of swimming and bathing area to plant locally sourced indigenous species around facilities.
	Fencing	Much of the site is not fenced to exclude domestic stock. Domestic stock cause significant damage to geothermal vegetation by trampling and browse on the vegetation.	Encourage and support landowners to fence areas of geothermal activity and geothermal vegetation, including wetlands down slope from geothermal activity.
Maungakakarama (Rainbow Mountain) U16/2	Pest plant control	Wilding pine populations are scattered in many areas of geothermal activity at this site.	Remove or poison all exotic pine plants from this site. Monitor and control at regular intervals in the future.

Site Name/ Number	Action	Current Condition	Action required
	Pest animal control	Deer, pigs and possums are present at the site, although the densities of animals are not known.	Monitor impacts of deer, possum and pigs in the site and manage as necessary.
Maungaongaonga U16/11	Pest plant control	Pest plants are uncommon at this site. Small populations of radiata pine, Douglas fir (<i>Pseudotsuga menziesii</i>), gorse (<i>Ulex europaeus</i>), blackberry and narrow-leaved carpet grass (<i>Axonopus fissifolius</i>) are present.	Remove or poison all populations of wilding pines, and narrow-leaved carpet grass from the site.
Craters of the Moon U18/4	Pest plant control	Scattered plants of wilding pines are present in the geothermal area at this site.	Remove or poison all wilding pine trees in geothermal areas at Craters of the Moon.
Te Kiriohinekai Stream/ Wairoa Hill U17/5 ¹	Pest plant control	Wilding pines have become the dominant canopy in parts of this site. False acacia (<i>Robinia pseudacacia</i>) is also dominant in places. Pines are also scattered in areas of prostrate kanuka (<i>Kunzea ericoides</i> var. <i>microflora</i>) scrub and shrubland.	Remove or poison all wilding pines and false acacia plants in geothermal areas at this site.
Lake Rotokawa U17/7	Pest plant control	Wilding pines have become the dominant canopy in large parts of this site	Remove or poison wilding pines from all geothermal areas at this site.
Rotokawa North U17/34	Pest plant control	Wilding pines have become the dominant canopy in large parts of this site	Remove or poison wilding pines from all geothermal areas at this site.
	Fencing	Stock have access to geothermal vegetation and features of parts of this site.	Fence all areas of geothermal vegetation at Rotokawa North to exclude stock.
Hipaua T19/1	Survey site	No recent information.	Field survey the site to map extent of vegetation and assess management requirements.
Waihunahuna Springs U17/31	Survey site	No recent information.	Field survey the site to map extent of vegetation and assess management requirements.
Akaterewa Springs U17/30	Survey site	No recent information.	Field survey the site to map extent of vegetation and assess management requirements.
Lower Wairakei Stream U17/2	Survey site	No recent information.	Field survey the site to map extent of vegetation and assess management

¹ This refers to core large unit of geothermal vegetation identified and mapped in Wildland Consultants 2004.

Site Name/ Number	Action	Current Condition	Action required
			requirements.
Golden Springs U17/27	Survey site	No recent information.	Field survey the site to map extent of vegetation and assess management requirements.

Table 2: Sites of high priority for active management and a summary of current condition of each site and the action(s) required.

Site Name/ Number	Action	Current Condition	Action required
Ohaaki Steamfield West U17/25	Pest plant control	Wilding pines, pampas (<i>Cortaderia jubata</i> and <i>Cortaderia selloana</i>), blackberry (<i>Rubus fruticosus</i> agg.) and gorse dominate parts of this site. Some geothermal areas currently have a dominant cover of wilding pines.	Remove wilding pines and pampas from the site.
Ohaaki Steamfield East U17/14	Pest plant control	Wilding pines, blackberry, broom (<i>Cytisus scoparius</i>) and gorse dominate parts of this site. Some geothermal areas currently have a dominant cover of wilding pines.	Remove wilding pines from the site.
	Dumping of rubbish/ effluent.	Rubbish and effluent has been dumped into geothermal vegetation and features at Ohaaki Steamfield East	Adjacent landowners should be encouraged not to dump rubbish into this geothermal site.
Broadlands Road U18/7	Pest plant control	Scattered wilding pines are present at this site. Large areas are dominated by blackberry, gorse and broom, particularly on margins.	Remove wilding pines from the site.
Otumuheke Stream U18/3	Pest plant control	Scattered pampas and wilding pines are present in geothermal areas at this site. Blackberry is common on margins.	Remove or poison wilding pines and pampas. Control other pest tree species alongside stream margins below main geothermal site.
Crown Road U18/2	Fencing	Stock have access to large areas of geothermal vegetation and habitat at this site.	Discuss with landowner options for fencing geothermal vegetation and habitat at Crown Road.
	Pest plant control	Scattered wilding pines are present throughout this site. Blackberry, broom and pasture grasses are abundant on cooler soils.	Remove or poison all wilding pines at this site.
	Miscellaneous	<ul style="list-style-type: none"> • Proposed Eastern Arterial Road • Fire • Motocross course • Subdivision development 	

Site Name/ Number	Action	Current Condition	Action required
Waiotapu North U16/1	Pest plant control	Pest plants are common in geothermal areas at this site including exotic pines, Douglas fir, Lawson's cypress (<i>Chamaecyparis lawsoniana</i>), macrocarpa (<i>Cupressus macrocarpa</i>), redwood, poplar (<i>Populus sp.</i>), grey willow (<i>Salix cinerea</i>), silver birch (<i>Betula pendula</i>), cotoneaster (<i>Cotoneaster sp.</i>), broom and blackberry.	Remove or poison all exotic trees in geothermal sites.
Te Rautehuia U17/22	Pest plant control	A pine plantation is present on margins of geothermal activity, with scattered wildings pines in geothermal area.	Remove all wilding pines from geothermal areas.
	Fencing	Stock, including deer have access to major areas of geothermal vegetation and geothermal features.	Discuss management options with landowner in conjunction with the Te Rautehuia Stream site, including the fencing of all major areas of geothermal activity to exclude stock.
Te Rautehuia Stream U17/22	Pest plant control	Wilding pine trees occur occasionally in areas of geothermal vegetation.	Remove wilding pines from areas of geothermal activity, particularly prostrate kanuka scrub and shrubland.
	Fencing	Stock, including deer have access to some areas of geothermal vegetation and geothermal features.	Discuss management options with landowner in conjunction with the Te Rautehuia site, including the fencing of all major areas of geothermal activity to exclude stock.
Upper Wairakei Stream (Geysers Valley) U17/3	Pest plant control	Exotic pest plants are common in large parts of the geothermal vegetation at this site including grape vine (<i>Vitis vinifera</i>), Tasmanian blackwood (<i>Acacia melanoxylon</i>), Chinese privet, false acacia, pampas, Spanish heath (<i>Erica lusitanica</i>), broom and heather (<i>Calluna vulgaris</i>).	Remove or poison grape vine, Tasmanian blackwood, wilding pines, Chinese privet, false acacia and pampas from this site.
Tokaanu Thermal Park T19/3	Pest plant control	Planted and adventive exotic plants are common around geothermal features.	Remove or poison the following species from the site – ivy (<i>Hedera helix</i>), arrow bamboo (<i>Pseudosasa japonica</i>), grey willow and exotic planted species around geothermal features.

Table 3: Sites of moderate priority for active management and a summary of current condition of each site and the action(s) required.

Site Name/ Number	Action	Current Condition	Action required
Broadlands Road U18/7	Fencing	Stock have access to some small areas of geothermal activity that are not fenced.	Discuss with landowner options on fencing geothermal vegetation, that stock have access to.
Waipapa Stream T17/1	Pest plant control	Wilding pines were scattered around hot springs.	These wilding pines have recently been managed by the land managers (Carter Holt Harvey Forests). Monitor vegetation and manage when necessary.
Ngatamariki U17/15	Drainage system	Wilding and planted pines are scattered around hot springs, prostrate kanuka and <i>Cyclosorus interruptus</i>	All pine trees should be removed that have the potential to damage threatened fern populations and all areas of geothermal vegetation indicated in Wildland Consultants 2004.
Longview Road Thermal Area U17/18	Drainage system	Drainage on the margins of the site appears to have lowered the water table in parts of the site allowing pest plants such as blackberry to expand its range at the site.	Discuss with landowner options for managing drains in a manner that will either maintain the water table at this site, or allow it to return to previous levels.
Wharepapa Road Thermal Areas U17/32	Pest plant control	Planted trees and exotic pines (<i>radiata</i> pine, maritime pine (<i>Pinus pinaster</i>) and lodgepole pine (<i>Pinus contorta</i>) are common on margins of geothermal areas. Scattered exotic pine are also present in geothermal areas.	Remove exotic trees from all geothermal sites (private land site).
	Fencing	Stock have access to some geothermal areas, and some fences are poorly maintained around some geothermal sites.	Improve the quality of fencing around geothermal features where necessary, and establish new fences around new geothermal features.

Table 4: Sites of low priority for active management and a summary of current condition of each site and the action(s) required.

Site Name/ Number	Action	Current Condition	Action required
Crown Park U18/12	Pest plant control	Wilding pines are common at this site. Scattered flowering cherry (<i>Prunus</i> sp.), eucalyptus (<i>Eucalyptus</i> sp.), and pampas are also present.	Remove all wilding pines, planted ornamental trees, flowering cherry, eucalyptus and pampas from this site.
Paerata Road T17/3	Fencing	Domestic stock have access to some of the geothermal vegetation and features at this site. The best areas are fenced.	Fence all significant areas of geothermal activity to exclude stock.
Ngapouri	Pest plant	Scattered exotic trees are present at	Remove all exotic trees from

Site Name/ Number	Action	Current Condition	Action required
U16/7	control	this site including crack willow, Tasmanian blackwood and wilding pines. Blackberry is common on site margins.	geothermal areas. The extensive area of blackberry would be difficult to control at this site.
Karapiti Forest U18/19	Pest plant control	Scattered wilding pines and pampas are present.	Remove or poison all wilding pines and pampas from the site.
Te Kiriohinekai Stream/ Wairoa Hill U17/5 ¹	Pest plant control	Wilding pines are common in geothermal areas.	Remove wilding pine trees from all areas of prostrate kanuka.
Upper Atiamuri U16/8	Pest plant control	Blackberry and broom dominate the margins of geothermal vegetation.	Control blackberry and broom.
Horohero U16/9	Fencing	Stock have access to hot spring and its margins.	Discuss with landowner options for fencing the hot spring and its margins.

Table 5: Sites where no action is required at this stage for active management and a summary of current condition of each site and the action(s) required.

Site Name/ Number	Action	Current Condition	Action required
Hall of Fame Stream U17/6	None		None
Spa Thermal Park U18/11	None		None
Waipouwerawera Stream/Tukairangi U18/10 and U17/19	None		None
Waipapahi Valley U18/5	None		None

ACKNOWLEDGEMENTS

This project was undertaken for Environment Waikato and we would like to thank Karen Denyer for initiating this project and providing project liaison and useful feedback.

¹ Several small isolated patches of geothermal vegetation mapped and identified in Wildland Consultants 2004.

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**THREATS TO GEOTHERMAL SITES
IN WAIKATO REGION – PEST
PLANTS, PEST ANIMALS, AND
GRAZING (STOCK)**

(A description of each field in the table is
provided in the Methods section of this
report.)

Threats to Geothermal Sites in Waikato Region - Pest Plants, Pest Animals, and Grazing (Stock)

Site #	Site Name	Tenure	Size	Significance Level	Key values of the site	Threats	Vulnerability of site to threat	Description of threats	Action required	Ecological benefit	Priority	Comments
T17/1	Waipapa Stream	Non-covenanted private land	c.0.7 ha	National	Contains the third largest population of <i>Christella</i> sp. "thermal" known in New Zealand. <i>Christella</i> sp. "thermal" is a 'Chronically Threatened' species listed as 'Gradual Decline' in de Lange et al. 2004.	Pest plants	High	Without management pest plants, particularly exotic pines will change the natural character of the geothermal vegetation and features. Pines falling into geothermal vegetation are likely to threaten populations of the threatened <i>Christella</i> sp "thermal" and other geothermal vegetation and features.	None - landowner is doing this	High	Immediate	Wilding pines are being managed by the land managers. Careful management of surrounding pine plantation is required to ensure the ecological values of the site are maintained or enhanced. Logging on steep slopes could increase sedimentation into geothermal areas. Wildland Consultants have been involved with management of this area with Carter Holt Harvey Forests (Wildland Consultants 2005c)
						Pest animals	Low			Low	Low	
						Grazing by domestic stock	No threat		No action necessary	None	No action required	
T17/3	Paerata Road	Non-covenanted private land	c.1.3 ha	Part regional/ part local	Contains the best population of prostrate kanuka scrub and shrubland in the Mokai Geothermal Field. Prostrate kanuka is endemic to geothermal sites in New Zealand and is an "At Risk" species listed as "Range Restricted " in de Lange 2004.	Pest plants	Medium	Extensive parts of blackberry occur around all geothermal areas where stock have been excluded.	Monitor spread of blackberry and control if it invading into geothermal vegetation.	Medium	Low	
						Pest animals	Rabbits	Rabbit are present in geothermal areas with some burrows present.	Rabbit control should be undertaken in geothermal sites and adjacent pasture.	Medium	Low	
						Grazing by domestic stock	High	Stock trample geothermal vegetation, changing the indigenous character of these areas.	Fence all areas of geothermal vegetation and geothermal features not currently fenced to exclude stock.	Medium	Medium	Areas mapped as Area B in report no. 896 (Wildland Consultants 2004) are heavily grazed by cattle.
U17/15	Ngatamariki	Protected (Ngatamariki Hot Springs Scenic Reserve)	c.0.7 ha	Part national/ part regional	The site contains a small area of geothermal vegetation including a good population of <i>Cyclosorus interruptus</i> . <i>C. interruptus</i> is a "Chronically Threatened" species listed as 'Gradual Decline' in de Lange (2004). It is also the best quality area of geothermal vegetation in the Ngatamariki Geothermal Field.	Pest plants	Medium	Wilding pines threaten to alter the indigenous character of the site and are likely to damage indigenous geothermal vegetation following tree fall.	Control all wilding pines in geothermal vegetation.	High	High	The Department of Conservation has initiated some pine control at this site.
						Pest animals	Low			Medium	Low	
						Grazing by domestic stock	No threat			None	No action required	
U17/25	Ohaaki Steamfield West	Non-covenanted private land	c.11.0 ha	Regional	This site contains a good population of the "At Risk" prostrate kanuka. The "At Risk" <i>Dicranopteris linearis</i> has also been recorded from this site. Both of these species are listed as being "Range Restricted" in de Lange <i>et al.</i> 2004. The site comprises a relatively large example of a nationally uncommon vegetation type (geothermal).	Pest plants	High	The continued spread of pest plants, particularly exotic pines, will alter the indigenous character of the site.	Remove wilding pines and pampas. Monitor spread of blackberry, broom and gorse at this site.	High	Immediate	Contact energy requirements for their resource Consents need to be assessed for this site.
						Pest animals	Low			Low	Low	
						Grazing by domestic stock	No threat			None	No action required	
U17/25	Ohaaki Steamfield East	Non-covenanted private land	c.6.0 ha	Regional	This site contains a good population of the "At Risk" prostrate kanuka.	Pest plants	High	The continued spread of pest plants, particularly exotic pines, will alter the indigenous character of	Remove wilding pines. Monitor spread of blackberry, broom and gorse at this site.	Medium	Medium	Consideration should be given as to who is responsible for management work at this site (landowner/leasee?)

Site #	Site Name	Tenure	Size	Significance Level	Key values of the site	Threats	Vulnerability of site to threat	Description of threats	Action required	Ecological benefit	Priority	Comments
								the site.				
						Pest animals	Low			Low	Low	The other major threat to this site is the continued dumping of effluent into the geothermal area and surrounding vegetation.
						Grazing by domestic stock	Medium	Stock trample through geothermal vegetation changing the indigenous character of the site.	Some small areas of raw-soilfield are grazed to the north of the site.	Low	Medium	
U17/11	Orakeikorako	Part protected and part non-covenanted private land	c.31.1 ha	National	This site is one of the best examples of geothermal vegetation and features in the Waikato Region. It contains a population of the 'Chronically Threatened' <i>Christella</i> sp. "thermal". It also contains one of the largest populations of the "At Risk" <i>Dicranopteris linearis</i> in New Zealand. It also supports a number of other notable geothermal plant species as well as high diversity of geothermal features.	Pest plants	Immediate	Exotic pines threaten to extensively alter the indigenous character of the site, and are likely to reduce the area of habitat available to indigenous geothermal plant species.	Exotic pines should be removed from all geothermal areas. If pines are not removed then many of the ecological values present at this site will be markedly reduced.	High	Immediate	Total control of wilding pines should be implemented in the geothermal area at Orakeikorako.
						Pest animals	Medium			Unknown	Low	
						Grazing by domestic stock	No threat			None	No action required	
U17/10	Red Hills	Protected (Lake Ohakuri Conservation Area administered by DOC).	c.11.1 ha	National	This site together with Orakeikorako comprises one of the best areas of geothermal vegetation in Waikato Region. The vegetation at this site is currently in better condition than that at Orakeikorako because of wilding pine control works that have recently been undertaken at the site. Much of the Red Hills is dominated by extensive areas of the 'At Risk' prostrate kanuka, as well as good populations of the 'Chronically Threatened' <i>Christella</i> sp. 'thermal' and the 'At Risk' <i>Dicranopteris linearis</i> .	Pest plants	High	Wilding pines threaten the indigenous character of the site and are likely to damage indigenous geothermal vegetation following tree fall.	Control populations of exotic pines (maritime pine and radiata pine) and Chinese privet.	High	High	Control of exotic pines has been undertaken by DOC. Total control of wilding pines should be implemented in the geothermal areas of the Red Hills. Ongoing monitoring of pine control is required.
						Pest animals	Medium			Unknown	Unknown	
						Grazing by domestic stock	No threat			None	No action required	
U17/18	Longview Road Thermal Area	Protected (Molloy Conservation Covenant)	c.3.3 ha	Regional	This is the best example of geothermal vegetation associated with the Reporoa Geothermal Field. Prostrate kanuka, an 'At Risk' species has been recorded from this site in the past.	Pest plants	Medium	Blackberry, if left uncontrolled is likely to spread into surrounding manuka and mingimingi dominated shrubland. Drainage (by adjacent farm drains) may be a key issue for managing blackberry at this site.	Monitor spread of blackberry and control if it invading into geothermal vegetation.	Medium	Medium	
						Pest animals	Low			Low	Low	
						Grazing by domestic stock	Low			Low	Low	Some grazing occurs around streams and manmade drains that contain geothermal water outside of the main geothermal area.
U17/18	Wharepapa Road Geothermal Area	Non-covenanted private land	c.3.9 ha	Regional	This site contains several small populations of the 'At Risk' prostrate kanuka.	Pest plants	High	Exotic planted and wilding trees have altered the natural character of the site, and may damage geothermal vegetation and geothermal features following tree fall.	Wilding trees should be controlled. Blackberry should be monitored and controlled if spreading into geothermal areas.	Medium	Medium	
						Pest	Low			Low	Low	

Site #	Site Name	Tenure	Size	Significance Level	Key values of the site	Threats	Vulnerability of site to threat	Description of threats	Action required	Ecological benefit	Priority	Comments
						animals						
						Grazing by domestic stock	Medium	Stock trampling geothermal vegetation damage the vegetation and alter the character of the site.	All areas of geothermal vegetation and features should be fenced.	Medium	Medium	Most areas are fenced, but are in a poor state of repair in places. Some, possibly new geothermal features are not fenced.
U17/7	Lake Rotokawa	Lake Rotokawa Conservation Area (administered by DOC).	c.68.7 ha	Regional	The "At Risk" prostrate kanuka covers extensive parts of this site. While the vegetation is degraded in quality it comprises a large area of geothermal habitat - a nationally uncommon habitat type.	Pest plants	High	The continued spread of pest plants, particularly exotic pines, will alter the indigenous character of the site.	Exotic pines are visually dominant and should be controlled	High	High	Some control of exotic pines has been undertaken by DOC.
						Pest animals	Unknown			Unknown	Unknown	
						Grazing by domestic stock	No threat			None	No action required	
U17/34	Rotokawa North	Non-covenanted private land	c.33.7 ha	Regional	An "At Risk" species (prostrate kanuka) covers extensive parts of this site. A small population of a "Chronically Threatened" species <i>Nephrolepis flexuosa</i> and an "At Risk" species <i>Dicranopteris linearis</i> are also present. With the Lake Rotokawa site it comprises a large area of geothermal vegetation - a nationally uncommon vegetation type.	Pest plants	High	The continued spread of pest plants, particularly exotic pines, will alter the indigenous character of the site.	Exotic pines are visually dominant and should be controlled	High	High	
						Pest animals	Unknown			Unknown	Unknown	
						Grazing by domestic stock	Medium	Stock trampling causes the character of the site. Significant damage to geothermal vegetation.	Stock have access to some smaller areas of geothermal vegetation. These areas should be fenced.	High	Medium	
U18/7	Broadlands Road	Protected (Broadlands Road Scenic Reserve) and unprotected	c.32.3 ha	Regional	This site contains a large area of good quality prostrate kanuka (an "At Risk" species) scrub and shrubland. It also comprises a relatively large area of geothermal habitat - a nationally uncommon vegetation type.	Pest plants	High	The continued spread of pest plants will alter the indigenous character of the site.	Wilding pines should be controlled. Blackberry, gorse, and broom should be monitored and controlled if spreading into geothermal areas.	Medium	Medium	
						Pest animals	Unknown			Unknown	Unknown	
						Grazing by domestic stock	low	Stock trampling causes the character of the site. Significant damage to geothermal vegetation.	Most of the site has been fenced to exclude stock. However small areas to the east of the reserve are accessible to stock. These areas should be fenced.	Medium	Medium	
U18/3	Otumuheke Stream	Non-covenanted private land (Taupo District Council and Privately owned)	c.2 ha	National	This site contains good populations of several threatened fern species, most notably, <i>Cyclosorus interruptus</i> , <i>Nephrolepis flexuosa</i> , and <i>Christella</i> sp. thermal. This site is the best quality example of geothermal wetland surrounding Taupo township and restoration of ecological values at the site would be valuable for educational purposes.	Pest plants	High	Exotic pest plants threaten populations of 'Threatened' and 'At Risk' fern species and the quality of the geothermal vegetation present.	Pampas and wilding pines should be controlled. Blackberry should be monitored and controlled if spreading into geothermal areas.	High	Immediate	Care should be taken with any removal of pest plants to protect populations of threatened geothermal species in this area including <i>Nephrolepis flexuosa</i> , <i>Christella</i> sp. "thermal", <i>Hypolepis dicksonioides</i> and <i>Cyclosorus interruptus</i> .
						Pest animals	Low			Low	Low	
						Grazing by domestic stock	No threat		No action necessary	None	Low	
U17/13	Te Kopia	Protected (Te Kopia Scenic Reserve)	c.56.4 ha	International	This site has the best quality relatively large area of geothermal vegetation that	Pest plants	High	Pest plants, particularly exotic pines will change the natural character of	Control wilding pines. Blackberry and gorse should be monitored	High	High	Some control of wilding pines has been undertaken by the Department of Conservation. Requires ongoing

Site #	Site Name	Tenure	Size	Significance Level	Key values of the site	Threats	Vulnerability of site to threat	Description of threats	Action required	Ecological benefit	Priority	Comments
		administered by DOC) and small areas of private land			forms part of an indigenous ecological sequence including geothermal vegetation (prostrate kanuka, geothermal wetland and nonvegetated raw-soilfield) through to tall indigenous forest remaining in New Zealand. It also has one of the largest populations of the 'At Risk' <i>Dicranopteris linearis</i> and prostrate kanuka in New Zealand. It also contains populations of four other 'At Risk' species including <i>Nephrolepis flexuosa</i> , <i>Calochilus paludosus</i> , <i>C. robertsonii</i> , <i>Korthasella salicornioides</i> and <i>Schizaea dichotoma</i> .			the geothermal vegetation and features.	and controlled if spreading into geothermal areas.			monitoring and pine control.
U16/6	Waikite Valley	Protected (Waikite Stewardship Area; Otamakokore Steam Marginal Strip.; Waikite Wildlife Management Reserve - all administered by DOC. Part of the site non-covenanted private land.	c.13.5 ha	National	This site contains the second largest population of <i>Christella</i> sp. 'thermal in New Zealand, and the largest in the Waikato Region. It also contains populations of the 'Chronically Threatened' <i>Nephrolepis flexuosa</i> and the 'At Risk' <i>Dicranopteris linearis</i> and <i>Hypolepis dicksonioides</i> . The site is highly significant in terms of its flora, but overall the vegetation is of low quality due to the high density of exotic species present. Many margins of geothermal activity are surrounded by blackberry and the vegetation is accessible by stock.	Pest plants	High	Exotic pest plants threaten populations of 'Threatened' and 'At Risk' fern species and the quality of the geothermal vegetation present.	Control grey willow, pampas and <i>Cyperus involucratus</i> .	High	High	
						Pest animals	Low			Low	Low	
						Grazing by domestic stock	High	Domestic stock damage geothermal vegetation and reduce the ability of geothermal vegetation to establish around geothermal features.	The northeast area is not fenced and threatened by grazing stock. The hot streams and geothermal areas alongside Otamakokore Stream are particularly threatened by trampling, pugging and grazing damage by stock. It is recommended that these areas should be fenced.	High	High	
U16/2	Maungakakamea (Rainbow Mountain)	Protected (Rainbow Mountain Scenic Reserve)	c.41.7 ha	National	This site is a good quality example of an ecological sequence grading from geothermal vegetation (prostrate kanuka shrubland and geothermal wetland) to tall indigenous forest. It contains populations of one 'Chronically threatened' species, <i>Nephrolepis flexuosa</i> and six 'At Risk' species including prostrate kanuka, <i>Dicranopteris linearis</i> , <i>Schizaea dichotoma</i> , <i>Calochilus paludosus</i> , <i>C. robertsonii</i> , and <i>Caladenia atradenia</i> .	Pest plants	High	Continued wilding pine invasions is a threat to some areas of prostrate kanuka scrub and other geothermal habitats of the site. The invasions of pest plants at the site reduces the quality and character of the geothermal vegetation present.	Control exotic pines.	High	High	Some control of wilding pines has been undertaken by the Department of Conservation.
						Pest animals	Medium	Pigs and deer are likely to damage and have negative effects on the regeneration of the geothermal vegetation present.	Wild pest animals should be monitored and controlled where necessary at this site.	Medium	Medium	
						Grazing by domestic stock	No threat			None	Low	

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U16/7	Ngapouri	Protected (Ngapouri Covenant) and non-covenanted private land	c.3.1 ha	Part regional/ part local	Although large parts of this site are dominated by exotic pest plants, it provides a moderate-sized area of geothermal habitat- a rare vegetation type nationally. It also is in a prominent location on State Highway 5.	Pest plants	High	Much of this site is dominated by pest plants, which has reduced the indigenous character of the site.	Control of invasive exotic plants trees including crack willow, Tasmanian blackwood, and exotic pines.	Medium	Medium	
						Pest animals	Low			Low	Low	
						Grazing by domestic stock	Medium	Domestic stock damage geothermal vegetation and reduce the ability of geothermal vegetation to establish around geothermal features.	Domestic stock have access to some of the geothermal areas, these areas should be fenced.	Medium	Medium	
U16/11	Maungaongaonga	Protected (Ngapouri Covenant) and non-covenanted private land	c.9.1 ha	National	This site is one of the best quality remaining examples of geothermal vegetation remaining in New Zealand. It forms part of an ecological sequence from geothermal vegetation (prostrate kanuka scrub and nonvegetated raw-soilfield) through to tall forest. The vegetation is of good quality and pest plants are relatively uncommon at the site. It also provides habitat for one 'Chronically Threatened' species (<i>Nephrolepis flexuosa</i>) and two 'At Risk' species (Prostrate kanuka and <i>Dicranopteris linearis</i>).	Pest plants	Medium	If pest plants are not controlled and spread into this site - this will cause a reduction in the indigenous character of the site.	The uncommon pest plants at the site should be controlled including wilding pines (Douglas fir and radiata pine), gorse and blackberry. Narrow-leaved carpet grass should be considered for control at this site.	High	Medium	
						Pest animals	Medium	Pigs and deer are likely to damage and have negative effects on the regeneration of the geothermal vegetation present.	This site should be monitored for pest animals and control of these species should be undertaken when necessary.	Unknown	Unknown	
						Grazing by domestic stock	No threat			None	Low	
U17/1	Waiotapu South	Protected (Waiotapu Stewardship Area and Waiotapu Scenic Reserve)	c.69.4 ha	Part international/ part regional	This site contains one of the best representative examples of geothermal wetland and terrestrial vegetation remaining in New Zealand. However, pest plants are dominant surrounding many areas of geothermal vegetation. The wetland to the south contains a large population of the 'Chronically Threatened' <i>Cyclosorus interruptus</i> .	Pest plants	High	Parts of this site are dominated by pest plants, which have reduced the indigenous character of this high profile site.	Pest plants at the site should be controlled, particularly the extensive parts covered with exotic pines (maritime pine, radiata pine, black pine, and strobus pine). Other pest plants that should be controlled include blackberry, black wattle, broom, gorse and Spanish heath.	High	Immediate	
						Pest animals	Medium	Pigs and deer are likely to damage and have negative effects on the regeneration of the geothermal vegetation present.	This site should be monitored for pest animals and control of these species should be undertaken when necessary	Unknown	Medium	
						Grazing by domestic stock	No threat			None	Low	
U16/1	Waiotapu North	Mostly non-covenanted private land with three small protected areas.	c.40.7 ha	Regional	This site contains a relatively large area of a nationally uncommon vegetation/habitat type - geothermal. It also contains populations of two 'At Risk' species - prostrate kanuka	Pest plants	High	Much of this site is dominated by pest plants, which has reduced the indigenous character of the site.	Pest plant species including exotic pines, Douglas fir, Lawson's cypress, macrocarpa, redwood, poplar, grey willow, silver birch,	High	Immediate	Kaingaroa Timberlands initiated control work of some of these species in the areas of highest significance at Waiotapu North in autumn 2005 (Wildland Consultants 2005). This work is not complete.

Site #	Site Name	Tenure	Size	Significance Level	Key values of the site	Threats	Vulnerability of site to threat	Description of threats	Action required	Ecological benefit	Priority	Comments
					and <i>Dicranopteris linearis</i> .				and cotoneaster, broom and blackberry.			
						Pest animals	Medium	Pigs and deer are likely to damage and have negative effects on the regeneration of the geothermal vegetation present.		Unknown	Medium	
						Grazing by domestic stock	No threat			None	Low	
U18/4	Craters of the Moon	Protected (Karapiti Scenic Reserve, pending gazettal)	c.45.6 ha	National	This site contains a good quality example of geothermal habitat - a nationally uncommon vegetation type. One 'Chronically Threatened' species (<i>Nephrolepis flexuosa</i>) and three 'At Risk' species are present (prostrate kanuka, <i>Dicranopteris linearis</i> , and <i>Hypolepis dicksonioides</i>).	Pest plants	High	The spread of pest plants, particularly exotic pine species, threaten to alter the indigenous character of the site.	Control of the low cover wilding pines (mostly radiata pines and maritime pines) and blackberry, pampas and Spanish heath. Control should be undertaken in a manner that minimises damage to populations of threatened and at risk plant species at the site.	High	High	Some control of pine species has been undertaken at the site.
						Pest animals	Low	Pigs and deer are likely to damage and have negative effects on the regeneration of the geothermal vegetation present.		Low	Low	
						Grazing by domestic stock	No threat			None	Low	
U17/19	Karapiti Forest	Non-covenanted private land	c.0.4 ha	Regional	This small site contains populations of two 'At Risk' species, prostrate kanuka and <i>Dicranopteris linearis</i> .	Pest plants	High	The spread of pest plants, particularly exotic pine species, threaten to alter the indigenous character of the site.	Control wilding pine and pampas populations in geothermal vegetation.	Medium	Medium	
						Pest animals	Low				Low	
						Grazing by domestic stock	No threat			None	Low	
U17/5	Te Kiriohinekai Stream Catchment/Wairoa Hill	Non-covenanted private land	c.38.0 ha	Regional (Parts of this site would now be ranked National due to the good populations of <i>Nephrolepis flexuosa</i> .)	Although somewhat degraded in quality, this site comprises a relatively large area of geothermal vegetation - a nationally uncommon vegetation type. It contains good populations of the 'Chronically Threatened' <i>Nephrolepis flexuosa</i> and the 'At Risk' prostrate kanuka and <i>Dicranopteris linearis</i> . Some areas of prostrate kanuka have relatively few pest plants present.	Pest plants	High	The dominance of pest plants, particularly exotic pines, has caused a major reduction in the indigenous character of the site. The continued spread of wilding pines threatens populations of 'Threatened' and 'At Risk' species at the site.	Control of wilding pines, which are a major threat to large parts of this site.	High	Immediate	
						Pest animals	Medium			Unknown	Unknown	
						Grazing by domestic stock	No threat			None	Low	
U17/22	Te Rautehuia	Non-covenanted private land	c.6.6 ha	Regional	This site contains a small population of one chronically threatened species <i>Nephrolepis flexuosa</i> . It contains a good-	Pest plants	High	The spread of pest plants, particularly exotic pine species, threaten to alter the indigenous character	Removal of wilding pines which are a key threat to the site.	High	High	Discuss management issues of geothermal features at this site with the landowner in conjunction with site U17/20 (Te Rautehuia Stream).

Site #	Site Name	Tenure	Size	Significance Level	Key values of the site	Threats	Vulnerability of site to threat	Description of threats	Action required	Ecological benefit	Priority	Comments
					sized population of the 'At Risk' prostrate kanuka and small population of <i>Dicranopteris linearis</i> .			of the site.				
						Pest animals	Low			Low	Low	
						Grazing by domestic stock	Medium	Domestic stock damage geothermal vegetation and reduce the ability of geothermal vegetation to establish around geothermal features.	Site is mostly fenced, although it appears stock have access to site at times (Wildland Consultants Ltd 2004). Discussions should occur with landowner to exclude stock from geothermal areas.	High	High	
U17/3	Upper Wairakei Stream (Geyser Valley)	Protected (Wairakei Tourist Park)	c.4.6 ha	Regional	This site contains small population of the 'Chronically Threatened' <i>Nephrolepis flexuosa</i> . It contains good-sized populations of the 'At Risk' prostrate kanuka and <i>Dicranopteris linearis</i> .	Pest plants	High	The spread of pest plants, particularly exotic pine species, threaten to alter the indigenous character of the parts of the site where indigenous vegetation is still intact.	Removal of exotic pest plants which have highly modified the site. Species that should be controlled include Tasmanian blackwood, wilding pines, false acacia, grape vine, pampas, tradescantia, heather, and Spanish heath.	High	High	
						Pest animals	Low			Low	Low	
						Grazing by domestic stock	No threat			None	Low	
U16/9	Horohoro	Non-covenanted private land (Waipupumahana C-Maori freehold land)	<1 ha	Local	This site contains a small example of a nationally rare habitat type - geothermal.	Pest plants	Low			Low	Low	The site is surrounded by pasture with few indigenous geothermal species present
						Pest animals	Low			Low	Low	
						Grazing by domestic stock	Medium	Fencing is likely to enable indigenous vegetation to establish around the hot spring if pest plants are controlled.	Fencing is likely to improve the cover of geothermal species surrounding the large hot spring at this site.	Low	Low	
U16/8	Upper Atiamuri	Protected (administered by DOC)	c.0.1 ha	National	Two geothermal pools with one small population of the 'Chronically Threatened' <i>Nephrolepis flexuosa</i> and the 'At Risk' prostrate kanuka.	Pest plants	High	The continued spread of blackberry may have an impact of the quality of geothermal vegetation surrounding the hot pools.	Control of blackberry and broom surrounding the geothermal hot springs	Medium	Medium	
						Pest animals	Low			Low	Low	
						Grazing by domestic stock	No threat			None	Low	
U18/10 and U17/9	Waipouwerawera Stream/Tukairangi	Waipouwerawera Steam Stewardship Area (Administered by DOC)	c.0.1 ha	Local	A small area of geothermal vegetation in a degraded state – however geothermal vegetation is a rare vegetation type nationally. Contains a small population of the 'At Risk' prostrate kanuka.	Pest plants	High	As this site appears to have cooled, exotic pest plants have spread into the site.	Wilding pines, blackberry and broom should be controlled as they are expanding their range as soils appear to be cooling at this site.	Low	Low	
						Pest animals	Low			Low	Low	
						Grazing by domestic stock	Low			None	Low	

Site #	Site Name	Tenure	Size	Significance Level	Key values of the site	Threats	Vulnerability of site to threat	Description of threats	Action required	Ecological benefit	Priority	Comments
U18/11	Spa Thermal Park	Unknown	c.0.1 ha	Local	A small area of geothermal vegetation in a degraded state - a rare vegetation type nationally. Contains a small population of the 'At Risk' prostrate kanuka.	Pest plants	High	As this site appears to have cooled, exotic pest plants have spread into the site.	Control broom, blackberry and gorse which are expanding their range in geothermal vegetation – although probably of limited ecological value.	Low	Low	This is a very small site of limited ecological value.
						Pest animals	Low			Low	Low	
						Grazing by domestic stock	No threat			None	Low	
U17/20	Te Rautehuia Stream	Wairakei Tourist Park, private freehold land and riparian marginal strip.	c.2.3 ha	Regional	This site comprises of several geothermal areas surrounded by riparian margins, farmland and plantation forest. Contains several populations of the 'Chronically Threatened' <i>Nephrolepis flexuosa</i> . It also contains a moderate-sized population of prostrate kanuka.	Pest plants	High	The continued spread of wilding pines and blackberry into geothermal vegetation and features reduces the indigenous character of the site. It will reduce the cover of indigenous geothermal vegetation and threaten populations of 'At Risk' and 'Threatened' species at the site.	Control of wilding pines which occur locally within the geothermal vegetation.	High	High	Consult management issues of geothermal features at this site with the landowner in conjunction with site U17/22 (Te Rautehuia).
						Pest animals	Low			Low	Low	
						Grazing by domestic stock	High	Domestic stock damage geothermal vegetation and reduce the ability of geothermal vegetation to establish around geothermal features. The western portion of the site is grazed, with regular trampling by deer, which have caused major damage to geothermal vegetation and features at this site (Wildland Consultants Ltd 2004)	Fence significant areas of geothermal vegetation and features at this site to exclude domestic stock.	High	Immediate	
U17/6	Hall of Fame Stream	Protected (administered by DOC)	c.0.1 ha	Regional	This small geothermal site contains a small population of the 'Chronically Threatened' <i>Christella</i> sp. 'thermal'.	Pest plants	Medium	The blackberry around stream margins probably reduces the extent of habitat available to <i>Christella</i> sp. 'thermal' at this site.	Control blackberry downstream from the hot springs.	Low	Low	
						Pest animals	Low			Low	Low	
						Grazing by domestic stock	No threat			None	Low	
U18/2	Crown Road	Non-covenanted private land	c.19.0 ha	Regional	This site contains a good quality example of extensive shrublands of the 'At Risk' prostrate kanuka. It also contains a small population of the 'At Risk' <i>Dicranopteris linearis</i> . Although degraded in habitat by the spread of pest plants and ongoing grazing by stock the site comprises of a	Pest plants	High	The continued spread of broom, blackberry and wilding pines are reducing the quality of the indigenous character of the site.	If the site was to be fenced to exclude stock with control measures undertaken to reduce the pest plants, particularly wilding pines, Chinese privet, blackberry and broom the ecological values	High	High	See Table 1 for other management issues at this site.

Site #	Site Name	Tenure	Size	Significance Level	Key values of the site	Threats	Vulnerability of site to threat	Description of threats	Action required	Ecological benefit	Priority	Comments
					relatively large area of vegetation influenced by geothermal activity - a nationally uncommon habitat.				of the site are likely to improve markedly.			
						Pest animals	Low			Low	Low	
						Grazing by domestic stock	High	Domestic stock have caused significant damage to the indigenous geothermal vegetation by trampling.	Fencing of the site to exclude domestic stock would greatly improve the ecological values of the site.	High	High	
U18/12	Crown Park	Unknown	c.0.6 ha	Regional	This small geothermal site contains a small sized area of prostate kanuka shrubland.	Pest plants	High	The site is threatened by the continued spread of exotic pest plants into the site.	Control of pest plants present would greatly enhance the viability of this site. Species to control include maritime pines, flowering cherry, eucalyptus, and pampas.	Medium	High	Removal of litter from the site would increase the value of the site.
						Pest animals	Low			Low	Low	
						Grazing by domestic stock	No threat			None	Low	
U18/5	Waipahihi Valley	Protected (Waipahihi Stream Conservation Area administered by DOC).	c.0.2 ha	Regional	This small degraded site contains small populations of the 'Chronically Threatened' <i>Cyclosorus interruptus</i> and the 'At Risk' <i>Hypolepis dicksonioides</i> .	Pest plants	High	Most of the site currently has an exotic character due to the high cover of exotic pest plants at the site.	Control blackberry.	Low	Low	Control of these plants should be carried out in a manner that does not threaten the small populations of the threatened fern species present.
						Pest animals	Low			Low	Low	
						Grazing by domestic stock	No threat			None	Low	
T19/3	Tokaanu Thermal Park	Protected (Tokaanu Thermal Park Recreation Reserve administered by DOC).	c.5.5 ha	Regional	Two 'Chronically Threatened' species have been recorded from this site in the past (<i>Nephrolepis flexuosa</i> and <i>Christella</i> sp 'thermal'. It contains two small populations of two 'At Risk' species - <i>Korthasella salicornioides</i> and <i>Schizaea dichotoma</i> . This site forms part of an interesting ecological sequence ranging from geothermal wetland, geothermal shrubland to tall forest.	Pest plants	High	Pest plants threaten the indigenous character of this high profile geothermal site.	Control of the pest plant species at the site including grey willow, arrow bamboo, and ivy. Exotic ornamental species planted around geothermal features should also be removed.	High	Immediate	
						Pest animals	Low			Low	Low	
						Grazing by domestic stock	No threat			None	Low	
T19/1	Hipaua	Non-covenanted private land	c.8.7 ha	Regional	This site has not been recently assessed but contains a moderate sized area of geothermal vegetation that is probably relatively unmodified.	Pest plants	Unknown			Unknown	Unknown	
						Pest animals	Unknown			Unknown	Unknown	
						Grazing by domestic stock	Unknown			None	Unknown	
						Pest animals	Unknown			Unknown	Unknown	
						Grazing by domestic stock	None			None	Unknown	
U17/31	Waihunahuna Springs	Non-covenanted private land	Unknown	This site was not ranked in Wildland Consultants	This site has not been recently assessed. This site is known to contain good populations of <i>Christella</i> sp. 'thermal' and	Pest plants	Unknown	It is likely that there will be significant pest plant management issues that need to be addressed at	Collect information on pest plant abundance at this site and implement pest plant	Unknown	High	

Site #	Site Name	Tenure	Size	Significance Level	Key values of the site	Threats	Vulnerability of site to threat	Description of threats	Action required	Ecological benefit	Priority	Comments
				(2004) but would be of National Significance because it contains good populations of several "Chronically Threatened species.	<i>Cyclosorus interruptus</i> as well as a small population of <i>Nephrolepis flexuosa</i> . It also contains good quality example of geothermal wetland habitat.			this site.	management as necessary.			
						Pest animals	Unknown			Unknown	Unknown	
						Grazing by domestic stock	None			None	Unknown	
U17/30	Akaterewa Springs	Non-covenanted private land	Unknown	Not ranked	Unknown	Pest plants	Unknown		Survey site and implement management if required.	Unknown	Unknown	
						Pest animals	Unknown		Survey site and implement management if required.	Unknown	Unknown	
						Grazing by domestic stock	None		Survey site and implement management if required.	Unknown	Unknown	
U17/27	Golden Springs	Unknown		Not ranked	Unknown	Pest plants	Unknown		Survey site and implement management if required.	Unknown	Unknown	
						Pest animals	Unknown		Survey site and implement management if required.	Unknown	Unknown	
						Grazing by domestic stock	Unknown		Survey site and implement management if required.	Unknown	Unknown	
U17/2	Lower Wairakei Stream	Unknown		Not ranked	Unknown	Pest plants	Unknown		Survey site and implement management if required.	Unknown	Unknown	
						Pest animals	Unknown		Survey site and implement management if required.	Unknown	Unknown	
						Grazing by domestic stock	Unknown		Survey site and implement management if required.	Unknown	Unknown	