

Healthy Rivers: Wai Ora – Staging of Lake Catchment Farm Plans

Technical Leaders Group

10 May 2016

Purpose

- i. Provide technical advice to CSG on options for staging the roll-out of property plans across lake catchments
 - a. Provide a list of lakes that are contained within the highest priority river sub-catchments
 - b. Identify lakes (e.g. high quality and/or high vulnerability lakes) that would benefit from being at the front of the queue for lake catchment plans and farm environment plans
- ii. Provide advice on the possible contents of a lake catchment plan to guide restoration

Options for prioritising property plan roll-out

Option 1: Use proposed river sub-catchment prioritisation

A simple approach would be to link lakes to corresponding river sub-catchments they sit within and stage rollouts as per the proposed sub-catchment delivery of property plans (i.e. three tranches over 10 years). That is, deliver property plans to farms in lake catchments at the same time as plans are delivered within the river sub-catchments the lakes fall within. Appendix 1 shows the sub-catchment designation of 48 lakes and the corresponding priority for property plan roll out.

This results in the following arrangement of lakes across the three tranches:

Lake FMU	Low	Medium	High
Peat	14	9	4
Riverine	5	3	4
Volcanic	3	1	1
Dune	2	2	0

NB. There are 48 lakes in total in this table (and in Appendix 1). In previous reports to CSG there have been 59 named lakes mentioned. The reason for the discrepancy is that a number of peat are interconnected and in close proximity (e.g. Lake Serpentine peat lake complex) and have been lumped together for this exercise.

Lakes that fall into the 'High' priority river sub-catchments are:

- Lake Rotokaraka (Peat) – Very little is known of this small (6-7 ha) lake located west of Whitikahu
- Lake Rotokawau (Peat) – Connected to Lake Waikare. Completely surrounded by wetland reserve, but has a dairy/drystock catchment
- Lake Rotokotuku (Peat)- Small lake (1.1 ha) southeast of Te Kuiti
- Lake Rotoroa (Peat) – Urban catchment (Hamilton Lake)
- Lake Kopuera (Riverine) – drains into Lake Waikare

- Lake Ohinewai (Riverine) – drains into Rotokawau and then to Waikare
- Lake Waikare (Riverine)
- Lake Whangape (Riverine)
- Lake Orotu (Volcanic) – South of Waiotapu (geothermal influence?)

A limitation of this approach is that it ignores any specific issues (existing quality/vulnerability) for individual lakes and could be criticised for downplaying the specific management needs of lakes. For example, peat lakes are poorly represented in the ‘High’ priority list. One of the four is in Hamilton City (no farm plans required) and another (Rotokawau) is part of the Waikare catchment. The Waikato and Waipa peat lake complexes are very poorly represented and fall into the ‘Medium’ and ‘Low’ priority tranches.

Many of the peat lakes have been the focus of significant restoration efforts over the last decade or more and this reduces the potential risk of having these lakes sitting outside the first tranche. For example, the table below shows the level of riparian fencing undertaken around lakes that WRC had identified in the Regional Plans as Priority 1 for stock exclusion (Dean-Speirs et al 2014). The riparian margins of 63% of Priority 1 lakes are fully fenced, including most peat lakes.

Table 7 Current extent of fencing in shallow lakes in the Waikato region
 Lakes in italics indicate lakes where there is some uncertainty over extent of fencing. Lakes with a * indicate priority 1 stock exclusion lakes (identified in the WRP). Lake types are indicated by colour in the following way: **riverine**, **peat**, **volcanic**, **dune**, **karst**, unknown.

No fencing required	100% fenced	> 50% fenced	< 50% fenced	No fencing	Not known
Rotoroa (Hamilton)	Kaituna*	Kopuera*	Waitamoumou*	Otamatearoa	Taharoa*
Hakanoa	Komakorau*	Rotokawau*	Whakatangi		Disappear
Kopuatai Burn Pools	Mangahia*	Rotongaro*	Pikopiko*		Numiti
Koraha	Mangakaware*	Waikare*	Te Otamanui		Parkinsons
Rotokaeo	Maratoto*	Whangape*	Harihari		Piopio
Rotopounamu	Ngaroto*	Kimihia	Henderson's Pond		Puketi
Te Koutu	Ngarotoiti*	Posa	Rotopotaka		Rotoiti
Unnamed 9 (Lake Opuatia)	Ohinewai*	Rotongata			Rotokaraka
Waiwhakareke	Okowhao*				Rotoroa (Kawhia)
	Penewaka*				Rototapu
	Rotomanuka*				Te Kapa
	Rotongaraiti*				Te Rotopupu
	Serpentine/ Rotopiko*				Unnamed 3
	Ruatuna*				Waiwhata
	Waahi*				
	Areare				
	Cameron				
	Kainui				
	Koromatua				
	Leasons Pond				
	Millicich				
	Nгахewa				
	Okoroire				
	Pataka				
	Patetonga				
	Rotokauri				
	Rotokotuku				
	Tunawhakaepaka				
	Tutaeinanga				
	Parangi				
	Hotoananga*				

Option 2: Address under representation of lakes within river sub-catchment prioritisation

The Waikato peat lakes are concentrated in the Waikato and Waipa Districts and represent the largest collection of this wetland type in New Zealand (Dean-Speirs et al. 2014).

To address the under-representation of peat lakes in the first tranche of farm plan roll outs, TLG suggests including one additional sub-catchment in the 'High' category. Two sub-catchments contain significant clusters of peat lakes – Waikato @ Huntly/Tainui Bridge (sub-catchment 20; 7 lakes) and Waipa @ SH23 bridge/Whatawhata (sub-catchment 34; 7 lakes). It is proposed that sub-catchment 20 be moved from 'Low' to 'High' designation and this would result in the following spread of lakes:

Lake FMU	Low	Medium	High
Peat	7	9	11
Riverine	5	3	4
Volcanic	3	1	1
Dune	2	2	0

The following peat lake catchments would be added to the 'High' tranche:

- Lake A (Whakatangi)
- Lake Areare
- Lake B (Kaituna)
- Lake C (Komakorau)
- Lake D (Kainui)
- Lake Hotoananga
- Lake Pikopiko

It is not known how many farms are affected by this proposal. Note that Lake Areare is already the focus of significant restoration activities

(<http://makearipple.co.nz/Actiongroups/ripples/Restoration-of-Lake-Areare/>). Two of these lakes (Areare and Hotoananga) are high priority under the WRC ranking (see below).

Option 3: Treat lake catchments separately and prioritise by risk

In developing priorities for the staged rollout of farm plans, CSG has based recommendations on the overall gap between current state and desired state across river sub-catchments. It is not possible to use a similar approach to prioritising lake catchments for farm plans due to the paucity of monitoring data for many lakes.

Waikato Regional Council has developed a ranking system for lake ecosystems, based on ecological significance, ecological condition, vulnerability and potential outcomes (Wildlands Consultants 2011). This ranking system could be used to prioritise lake catchments for roll-out of farm plans in a parallel process to the river sub-catchments. For example, a prioritisation scheme could be based on the lake ecosystem ranking in Appendix 1:

Lake FMU	High Rank	Medium Rank	Low Rank & DD
Peat	10	10	7

Riverine	2	4	6
Volcanic	4	0	1
Dune	1	1	2

NB. 'High' rank are those lakes with a rank of 33 or better, 'Medium' ranks is between ranks 37 and 59, and 'Low' ranks are lakes with a rank 62 and above & including data deficient lakes (DD). These cut-offs are arbitrary, but split the lakes into three similar-sized groups.

Under this scheme the following lakes would be added to the first tranche of farm plan rollouts on the basis that they have the highest 'value' and therefore should be protected first. Protecting the best first, rather than improving the worst first, is a recommendation based on the observed water quality decline in a number of lakes (Dean-Speirs et al 2014).

- Lake Maratoto
- Lake Orotu
- Lake Serpentine (Rotopiko)
- Lake Otamatearoa
- Lake Rotomanuka
- Lake Mangakaware
- Lake Ngahewa
- Lake Rotokawau
- Lake Waahi
- Lake Mangahia
- Lake Rotokawa
- Lake Ngapouri/Opouri
- Lake Ruatuna
- Lake Okowhao
- Lake Hotoananga
- Lake Areare
- Lake Ngaroto

The WRC lakes ranking does not follow the pattern of CSG priority catchments (e.g. median WRC ranking is the same (39) for high and low ranked CSG catchments) and only 2 WRC priority lakes are in CSG high priority catchments (i.e., Rotokawau (peat, Waikare subcatchment) and Orotu (volcanic, Waioatapu subcatchment)). Therefore option 3 approach would require giving high priority to an additional 14 lake catchments.

Lake Catchment Management Plans

A number of organisations have developed lake management plans. These range from individual lake catchment plans (e.g. catchment action plan for lake Ngaroto developed by NZ Landcare Trust), to plans for specific lake types (e.g. peat lake management plan developed by Waipa District Council), to a regional shallow lakes management plan (Waikato Regional Council). Links to these plans are given below:

- Catchment Action Plan for Lake Ngaroto (<http://www.landcare.org.nz/Regional-Focus/Hamilton-Office/Lake-Ngaroto>)

- Peat lake catchment guidelines (<http://www.landcare.org.nz/Regional-Focus/Hamilton-Office/Guidelines-for-Landowners-in-Peat-Lake-Catchments>)
- Waikato region shallow lakes management plan (<http://www.waikatoregion.govt.nz/tr201459/>)
- Waikato Regional Council - Peat lakes (<http://www.waikatoregion.govt.nz/Environment/Natural-resources/Water/Lakes/Shallow-lakes-of-the-Waikato-region/Peat-lakes/>)
- Waipa District Council – Peat lake management plan (<http://www.waipadc.govt.nz>)

The ‘Waikato Region Shallow Lakes Management Plan’ (Dean-Spiers et al. 2014) provides the most comprehensive overview of current lake state, pressures and restoration priorities that is currently available for the region’s shallow lakes. Improving management of lake water level, internal and external nutrient and sediment loads, pest fish and weeds, riparian margins and public access are identified as the main restoration priorities for shallow lakes. However, a comprehensive overview of shallow lakes cannot hope to identify the specific actions that will lead to lake improvement.

In previous advice to CSG the TLG has recommended that individual lake catchment management plans would be a valuable tool in managing the very complex issues and solutions that will be needed to protect and restore fresh water values in Waikato’s shallow lakes. The Catchment Action Plan for Lake Ngaroto (Berry & Dresser 2014) provides a very good example of a targeted and integrated plan to improve fresh water values including recreation and biodiversity. It includes actions on farm, delivered through tailored farm plans, as well as catchment scale mitigations (e.g. wetlands, silt traps) and management of pest fish, lake margins and lake level. As such it is an integrated catchment management plan to address significant water quality problems in this highly valued peat lake.

The map below shows some of the specific actions proposed in the management plan and highlights that farm plans alone are not the whole picture:

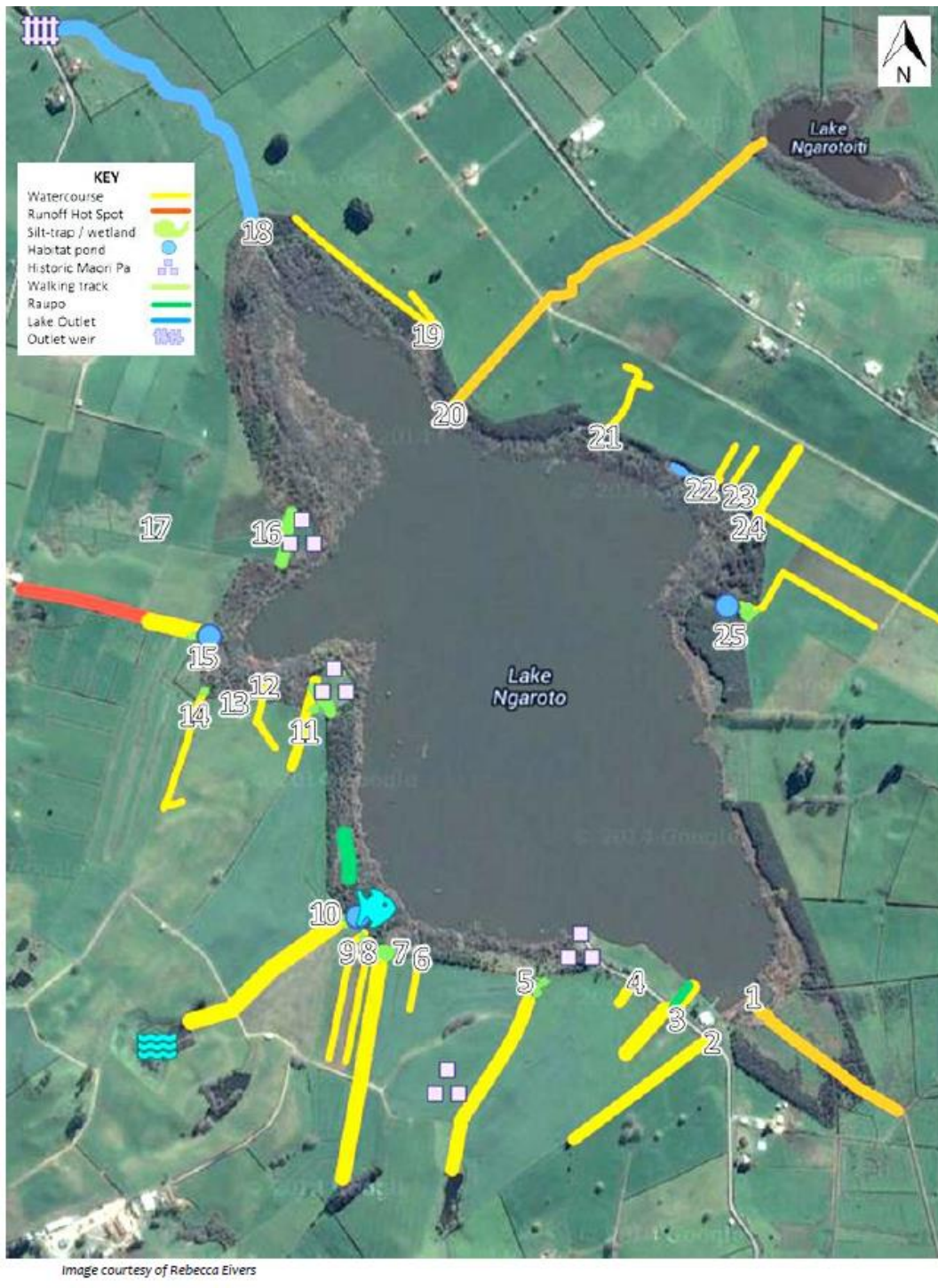


Figure 1. Map of riparian management actions around Lake Ngaroto. Reproduced with permission from Berry & Dresser (2014).

The map below shows the extent of farm plans delivered in the Lake Ngaroto catchment to date (Berry & Dresser 2014). The map highlights the challenge of bringing all property owners on board and also suggests that within a single catchment it is likely that a further prioritisation of farm plan delivery may be required. For example, farm plans for those properties bordering the lake will be a

high priority, whereas properties that do not have a direct connection with the lake may be a lower priority.

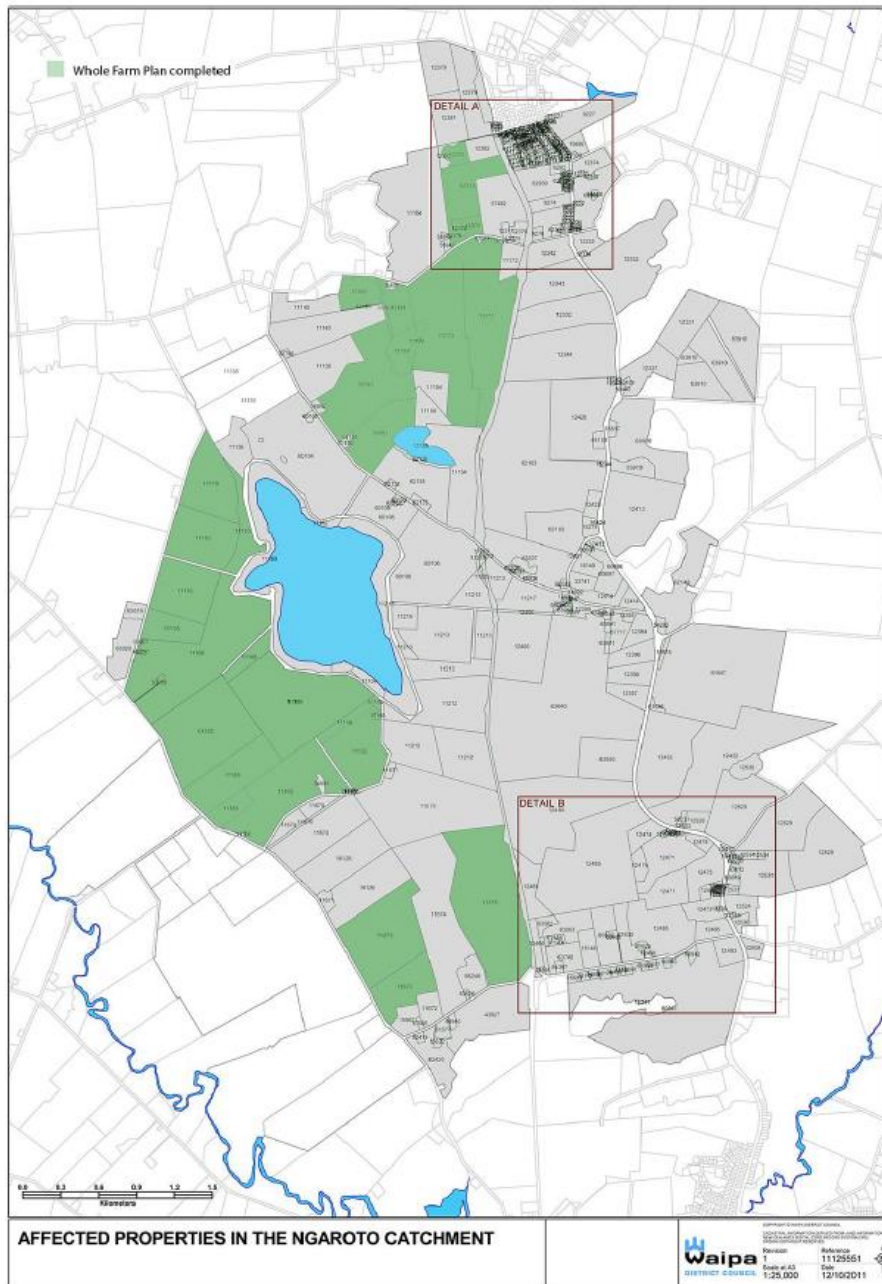


Figure 2. Map of Farm plans completed within Lake Ngaroto catchment. Reproduced with permission from Berry & Dresser (2014).

All lake management plans will have the following elements:

- A vision for the lake and community acceptance of that vision
- Description of the desired state of lake and recognition of the challenges (e.g. costs) in achieving it
- Evidence-based description of the problem (i.e. what is the gap between current state and desired state) that recognises the presence of multiple stressors and uncertainty in responses and time frames

- Community engagement in defining actions that will move the lake towards its desired state
- Responsibility for achieving the agreed actions and expected timeframes is clear to everyone and accepted by those who will be undertaking work
- A monitoring regime that will provide evidence of progress towards the plan's actions and evidence of changes in the state of the values in the lake catchment

In summary, the process of developing and implementing a lake catchment management plan is very similar to the Healthy Rivers process, with the main difference being the scope of stressors – an integrated lake management plan will need to look beyond N, P, sediment & *E. coli* to consider pest fish, hydrology and biodiversity.

TLG recommendation to CSG

We see efficiency and communication benefits in coordinating the roll-out of farm property plans for lake catchments with those for the broader sub-catchments within which lakes are located. We are also mindful of the capacity limits for the farm property plan development and that lake restoration is a long-term and ongoing process. Taking account of these factors, we recommend Option 2 as an appropriate compromise for incorporating a more representative range of lake types in the first tranche of property plans.

References

- Berry, N., Dresser, M. (2014) Catchment action plan for Lake Ngaroto. NZ Landcare Trust, 49 p.
http://www.landcare.org.nz/files/file/1321/Catchment%20Action%20Plan%20for%20Lake%20Ngaroto_Final.pdf.
- Dean-Speirs, T., Neilson, K., Reeves, P., Kelly, J. (2014). Waikato region shallow lakes management plan: Volume 2. Waikato Regional Council Technical Report 2014/59.
- Wildland Consultants Ltd (2011). Significant natural areas of the Waikato region: Lake ecosystems. Waikato Regional Council Technical Report 2011/5. Hamilton, Waikato Regional Council.

APPENDIX 1: Waikato-Waipā lakes and the river sub-catchments they fall within. ‘CSG priority’ relates to the proposed property plan rollout for river sub-catchments. The ‘WRC Lake Rank’ is the ranking of lake ecosystems across the Region by Wildlands Consultants (2011). ‘DD’ = data deficient.

LAKE NAME	Lake FMU	Catchment	Catchment FMU	WRC Subcatchment #	CSG Priority	WRC Lake Rank
Lake Otamatearua	Dune	Waikato at Port Waikato	Lower Waikato	6	med	16=
Lake Puketi	Dune	Awaroa (Waiuku)	Lower Waikato	19	low	DD
Lake Rotoiti	Dune	Awaroa (Waiuku)	Lower Waikato	19	low	DD
Parkinsons Lake	Dune	Waikato at Port Waikato	Lower Waikato	6	med	40=
Horseshoe Lake (Waiwhakareke)	Peat	Ohote	Waipa	26	low	55=
Lake A (Whakatangi)	Peat	Waikato at Huntly-Tainui Br	Lower Waikato	20	low	59=
Lake Areare	Peat	Waikato at Huntly-Tainui Br	Lower Waikato	20	low	33=
Lake B (Kaituna)	Peat	Waikato at Huntly-Tainui Br	Lower Waikato	20	low	41=
Lake C (Komakorau)	Peat	Waikato at Huntly-Tainui Br	Lower Waikato	20	low	66
Lake Cameron	Peat	Waikato at Narrows	Central Waikato	33	low	54
Lake D (Kainui)	Peat	Waikato at Huntly-Tainui Br	Lower Waikato	20	low	47=
Lake E (Tunawhakaheke)	Peat	Komakorau	Lower Waikato	22	med	70
Lake Hotoananga	Peat	Waikato at Huntly-Tainui Br	Lower Waikato	20	low	31=
Lake Koromatua	Peat	Waipa at SH23 Br Whatawhata	Waipa	34	med	47=
Lake Mangahia	Peat	Waipa at SH23 Br Whatawhata	Waipa	34	med	24=
Lake Mangakaware	Peat	Waipa at SH23 Br Whatawhata	Waipa	34	med	19=
Lake Maratoto	Peat	Waikato at Narrows	Central Waikato	33	low	6=
Lake Ngaroto	Peat	Waipa at SH23 Br Whatawhata	Waipa	34	med	33=
Lake Ngarotoiti	Peat	Waipa at SH23 Br Whatawhata	Waipa	34	med	72
Lake Pataka	Peat	Waipa at SH23 Br Whatawhata	Waipa	34	med	46
Lake Pikopiko	Peat	Waikato at Huntly-Tainui Br	Lower Waikato	20	low	59=
Lake Rotokaraka	Peat	Mangawara	Lower Waikato	17	high	DD
Lake Rotokauri	Peat	Ohote	Waipa	26	low	41=
Lake Rotokawau	Peat	Waikare	Lower Waikato	13	high	22=

Lake Rotokotuku	Peat	Mangaokewa	Waipa	63	high	DD
Lake Rotomanuka	Peat	Waikato at Narrows	Central Waikato	33	low	18
Lake Rotongata	Peat	Waikato at Karapiro	Upper Waikato	41	low	67
Lake Rotopotaka	Peat	Mangapiko	Waipa	38	med	57=
Lake Rotoroa	Peat	Waitawhiriwhiri	Central Waikato	28	high	62
Lake Ruatuna	Peat	Waipa at SH23 Br Whatawhata	Waipa	34	med	28
Lake Serpentine (Rotopiko)	Peat	Waikato at Narrows	Central Waikato	33	low	15
Lake Hakanoa	Riverine	Waikato at Rangiriri	Lower Waikato	15	med	63
Lake Kimihia	Riverine	Waikato at Rangiriri	Lower Waikato	15	med	68=
Lake Kopuera	Riverine	Waikare	Lower Waikato	13	high	57=
Lake Ohinewai	Riverine	Waikare	Lower Waikato	13	high	63=
Lake Okowhao	Riverine	Waikato at Rangiriri	Lower Waikato	15	med	29
Lake Rotongaro	Riverine	Waikato at Mercer Br	Lower Waikato	9	low	37
Lake Rotongaroiti	Riverine	Waikato at Mercer Br	Lower Waikato	9	low	71
Lake Te Kapa	Riverine	Waikato at Mercer Br	Lower Waikato	9	low	DD
Lake Waahi	Riverine	Awaroa (Rotowaro) at Harris/Te Ohaki Br	Lower Waikato	18	low	23
Lake Waikare	Riverine	Waikare	Lower Waikato	13	high	39
Lake Waiwhata	Riverine	Waikato at Mercer Br	Lower Waikato	9	low	DD
Lake Whangape	Riverine	Whangape	Lower Waikato	16	high	38
Lake Ngahewa	Volcanic	Waiotapu at Campbell	Upper Waikato	58	low	19=
Lake Ngapouri/Opouri	Volcanic	Waiotapu at Campbell	Upper Waikato	58	low	27
Lake Orotu	Volcanic	Waiotapu at Homestead	Upper Waikato	65	high	14
Lake Rotokawa	Volcanic	Waikato at Ohaaki	Upper Waikato	73	low	24=
Lake Tutaeinanga	Volcanic	Kawaunui	Upper Waikato	62	med	65