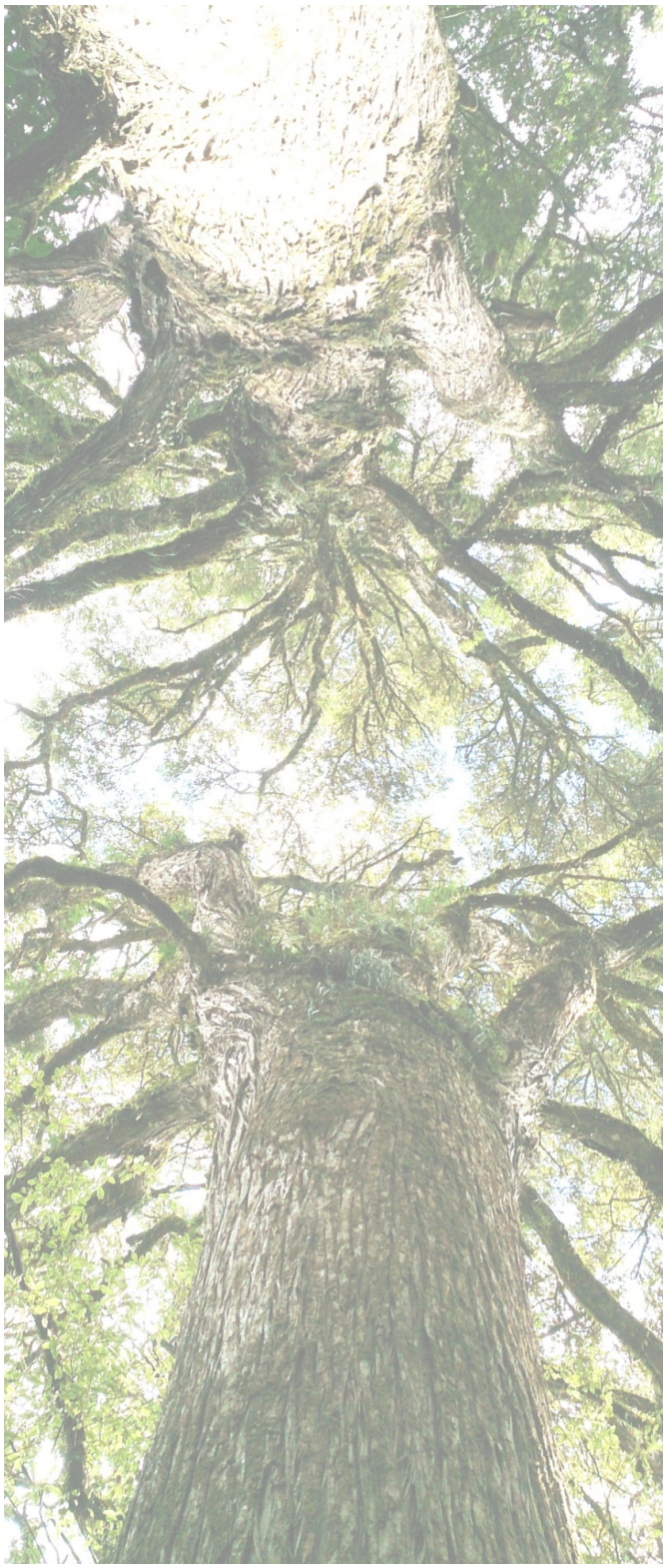

Ecological advice for Lake Te Rotokare

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1) What is the local, regional and/or national significance of the ecological wetland communities that you have identified at Lake Te Rotokare?

Two wetland vegetation types are present at Lake Te Rotokare; raupo reedland and a low-lying herbfield or turf. Raupo reedland is a common wetland type found throughout lowland fertile wetlands and is especially common on the margins of shallow lakes.

The herbfield community occurs primarily in shallow sloping areas which are ephemerally or intermittently wet and is best described as "ephemeral wetland" (Johnson & Rogers 2003). Within this zone there are two broad vegetation communities; the upper zone is dominated by the introduced plants especially Mercer grass (*Paspalum distichum*), creeping bent (*Agrostis stolonifera*), water speedwell (*Veronica anagallis-aquatica*), water celery (*Ranunculus sceleratus*) and introduced rushes; while the wetter lower zone is dominated by indigenous species, of which common milfoil (*Myriophyllum propinquum*), mudwort (*Limosella lineata*) and purple wind grass (*Lachnagrostis striata*) are most common. Ephemeral wetland habitat provides significant foraging opportunities for a wide range and high abundance of wetland birds.

Nationally ephemeral wetlands occur in a variety of situations such as on the margins of lakes, tephra basins, riparian depressions, kettle holes, limestone pavements and dune slacks. Ephemeral wetlands are a nationally rare ecosystem (Williams et al 2007) which was classified as Nationally Critical by Holdaway et.al (2012) — using an Internal Union for Conservation of Nature (IUCN) ecosystem threat ranking system to assess rarity and threat status. This is the highest threat rank possible and highlights that all extant examples, especially examples that are native dominant are biologically significant and are a priority for conservation.

Ephemeral wetland habitat is very uncommon in the North Island. In the Hawkes Bay Region nationally significant ephemeral wetland communities occur on the margins of more intact lakes including Kaweka Lakes, Lake Waikaremoana and neighbouring small wetlands. A very small ephemeral wetland also occurred on limestone pavement on the Te Waka Range.

While intermittently wet or ephemeral wetland habitat exists elsewhere in lowland Hawkes Bay such as at Lake Poukawa and Lake Hatuma, they are dominated by introduced plants and no longer are representative of the indigenous ephemeral wetland habitat identified at Lake Te Rotokare (Singers 2015). Several lakes and wetlands occur within close proximity to Lake Te Rotokare, though ephemeral wetland habitat is probably absent from the margins of Lake Oingo and Lake Runanga, the two largest areas (Lamason 2007a & 2007b; Cameron 2008). Ecological information could not be found whether it occurs any of the smaller lakes such as Kautuku Swamp, Lake Potaka or Hurimoana Swamp. Examination of aerial photos from Google Earth taken in drought conditions (22-3-2013) suggests it may occur on the margins of these areas, though if present is of much smaller extent than LakeTe Rotokare.

Without ecological information from these wetlands, Lake Te Rotokare is likely to be the best example of indigenous dominant ephemeral wetland in lowland Hawkes Bay and as such is at least regionally significant.

2) What is the optimal hydrological and grazing regime to ensure the restoration and ongoing preservation of these existing wetland communities?

Ephemeral wetlands occur in wetlands which experience large fluctuations in water table height resulting in extended periods of submergence and emergence (Singers 1997). Typically, the wetland profile has a very shallow gradient to it and flooding is typically less than 0.5m in height. Submergence usually occurs in winter–spring, though heavy rainfall events at any time of the year will result in out of season submergence. Periods of

emergence may last many months and upper parts of the wetland may even experience droughts conditions, resulting in plant death. Plant species that inhabit ephemeral wetlands are well adapted to these conditions and most species only flower and reproduce during periods of emergence. Consequently having a water table that fluctuates with seasonal rainfall and evaporation is a fundamental abiotic ecosystem driver to maintain this habitat. Based on the pattern of vegetation zonation, the areas which were lower (therefore wetter) more frequently submerged had a much higher abundance of indigenous species, while higher (therefore drier) were dominated more by introduced species. This suggests that the period of submergence is an important factor for controlling the spread and growth of some introduced plant species, especially Mercer grass which is highly invasive — when Lake Te Rotokare was visited on the 2nd February 2016 Mercer grass was much more abundant indicating that compositional change had occurred since the initial visit on the 25th August 2015.

Grazing may potentially be beneficial or detrimental depending on the species of grazing animal and when grazing occurs. Ephemeral wetlands are often grazed by water fowl including black swan, geese and paradise shell duck and this grazing likely assists with maintaining a short and dense turf. Grazing by ruminants is more generally damaging because of the pugging impact which occurs to soils and plants especially on moist soils such as near the lake margin. Intermittent light grazing by sheep may if managed with care result in little impact if undertaken in dry periods when soils are firm. Light and careful grazing could potentially be used to manage invasive weeds such as Mercer grass, creeping bent and water speedwell to maintain native dominant wetland herbfield.

3) Is the proposed level of 22.75 of the proposed control weir optimal to protect the identified ecological values of the ephemeral wetland communities?

This height is not optimal for protecting the ecological values of the ephemeral wetland communities as observed in August 2015.

Based on the delineation of the wetland (Singers 2015) this water table height is a drop in height compared to pre 2013, before recent drainage works occurred. If this is the maximum water table height that the lake can attain, this modification will result in a reduction of ephemeral wetland habitat by approximately 2.4 hectares as this area will no longer be flooded. While of most of this wetland habitat is dominated by Mercer grass and other introduced species, it does provide habitat for a range of wetland birds and consequently represents a loss of habitat for these species.

4) If not, what are the long-term consequences of getting it wrong?

Capping the maximum lake height at this level, will probably result in a shorter period of submergence in the upper ephemeral wetland zone on the wetland margin (c.f. pre 2013), especially in below average rainfall years. The period of submergence is probably the greatest environmental factor responsible for the maintenance of a native dominant ephemeral wetland turf.

In addition to a loss of 2.4 hectares of wetland habitat another potential ecological impact will likely be that the edge vegetation which is dominated by introduced plants will shift down the hydrological gradient, displacing native dominant ephemeral wetland turf. These introduced plants including Mercer grass and creeping bent are highly competitively and have displaced native species where they occur. Further down the hydrological gradient native species are much more abundant. Currently extended periods of submergence is likely the main environmental factor that limits the extent of these introduced species.
If the level is fixed at 22.75 and maintaining the area of extent of native dominant ephemeral wetland is an objective of the hydrological management of this wetland, active weed control, especially controlling Mercer grass, celery leaved buttercup and water speedwell with a combination of potential well-timed selective herbicide application or

possibly grazing will probably be required. Any management undertaken to improve the condition of native dominant ephemeral wetland herbfield should be monitored to determine whether it achieves the desired outcomes.

5) **If the proposed level of 22.75 of the proposed control weir is not optimal to protect the existing identified ecological values of the ephemeral wetland communities can you advise on what should be the optimal retained winter water maximum level? Should it be the effective outlet level prior to the 2013 drainage works or should it be set at some other level?**

The main environmental factor maintaining the high condition of the native dominant ephemeral wetland turf is probably the period of submergence. As the hydrology of the lake is primarily fed by rainfall and runoff, how long this habitat is flooded for is entirely dependent on the outlet height and seasonal rainfall and evapotranspiration.

Maintaining the outlet height at the level prior to the 2013 drainage works will give the greatest probability of maintaining the extent of indigenous dominant ephemeral wetland herbfield.

6) If you cannot advise on what the optimal retained winter water maximum level should be can you advise on the steps that would be required to determine this?

The most important ecological values of Lake Te Rotokare wetland is the ephemeral wetland, especially the area dominated by native herbfield community and the habitat that the larger area of ephemeral wetland provides for wetland birds.

I recommend that monitoring of plant communities along the hydrological scale from the edge of the wetland to permanent water be undertaken to describe composition in combination with measuring the wetland profile and the seasonal change in the water table. This information over time should provide sufficient information to determine how to best manage the water table at Lake Lake Te Rotokare to protect the ecological values of the wetland.

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