

## Lake Sumner Water Storage and Edge Inundation: Ecological Aspect.



*Lake Sumner looking north from just west of Charlie's point*

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**The Hurunui Water Project**

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## 1. Executive Summary

To store water for irrigation use it is proposed to build a low control gate at the outlet of Lake Sumner and use this mechanism to hold the lake level higher than is currently the average. The storage will not exceed the natural range of the lake and will cause an average increase in lake height of between 0.75m and 1.4m (month depending) during the irrigation season. From the ecological perspective the main question raised is:

### **What effect will this change in the lake's height have on the lake edge vegetation and habitat values?**

The following is a summary of the more detailed report attached. This executive summary highlights the salient aspects and conclusions for the reader regarding effects of the proposed additional inundation of Lake Sumner on lake edge vegetation/habitat.

#### 1.1. Types of vegetation

A ground survey method was employed to survey Lake Sumner's vegetated edge in 2010. Eighteen vegetation communities were identified during surveys of the vegetation surrounding the margins of Lake Sumner (Figures 1 to 11).

#### Types and Areas of Vegetation Surrounding the Margins of Lake Sumner

<b>Vegetation Community</b>	<b>Area (ha)</b>
<i>Agrostis</i> grassland	105.2
Gravels	66.3
Mixed beech forest	35.2
Red beech forest	31.2
<i>Juncus</i> rushland	21.7
Divaricating shrubland	16.8
Mountain beech forest	16.6
Kanuka/manuka scrub	16.4
Kanuka/manuka forest	7.8
Manuka/kowhai scrub	6.1
Mixed hardwood scrub	4.5
Matagouri shrubland	2.7
<i>Schoenus</i> sedgeland	2.3
Porcupine shrub shrubland	1.8
Kowhai forest	1.1
<i>Leptinella/Gunnera</i> turfland	1.0
Rata forest	0.4

#### 1.2. Description of margin around the lake (Figure 2)

**Cross sections A to H:** Along the shoreline from the lake inlet to Shoal Bay (sections A,C,E, mountain beech forest is dominant above the shore. This is replaced by mixed hardwood scrub which survives on the more exposed, steep and rocky lake margin in the vicinity of Cape Buttercup (Section H). The hardwood scrub extends almost as far west as Shoal Bay before it is replaced by successional kanuka / manuka scrub (section K). Shoal Bay is dominated by exotic pasture grassland dominated by *Agrostis* grassland, and extensive *Juncus* / *Carex* wetlands (section L).

**Cross section I and Loch Katrine:** The vegetation communities surrounding Loch Katrine are mixed beech forest on the northern side and manuka / kowhai scrub which grows along the gravel shoreline on the southern side. A relatively intact *Schoenus* / *Carex* wetland is present above the western side of the 'canal' between Lake Sumner and Loch Katrine. From Shoal Bay to Home Bay the vegetation is a mosaic of manuka /

kowhai scrub (including numerous riparian kowhai trees), kanuka / manuka scrub, matagouri shrubland and grassland.

**Cross sections B, DL:** *Agrostis* grassland is the most extensive vegetation community at the head of the lake, but small areas of *Gunnera/ Leptinella* turfland grow on some of the more frequently inundated areas of lakeshore and areas of matagouri shrubland, porcupine shrub shrubland and *Juncus* wetlands also grow here. The fans of two northern stream outlets are also dominated by exotic (*Agrostis*) grasslands) with varying abundances of kanuka shrub and mixed grey shrub regeneration.

### 1.3. Dominant Edge (Beach) Species

Kowhai (some large) and *Coprosma propinqua* are the dominant species growing on the lake shore and are the most vulnerable to inundation. Kowhai are common but have a scattered distribution around the margins of the lake.

### 1.4. Threatened plant species

With regard to threatened plant species a single specimen of *Alepis flavida* was found growing in a large *Coprosma propinqua* shrub in gravels on the lake margin. *Carex tenuiculmis* has been recorded in the *Schoenus/ Carex* wetland above the western side of the 'canal' between Lake Sumner and Loch Katrine; and *Traversia baccharoides* was once found on the northern side of the river bank at the outlet to Lake Sumner.

### 1.5. Birds

In regard to the lake birds a preliminary list of the birds recorded during vegetation survey work has been compiled. The existing knowledge of the birds of the Lake Sumner area is comprehensive (Armstrong 2006). Of the species recorded, one, the New Zealand pipit is considered to be 'At Risk' (Miskelly *et al.* 2008) but not affected. Australasian crested Grebe have been previously considered to be present on the lake however, recent distribution studies (Jensen & Snoyink 2005) state that the lakes north of the Pearson group (that includes the Hurunui group) now have only a few stragglers rather than viable breeding populations.

### 1.6. Inundation

Under the current proposal the area that would be inundated is typically (on average) gravel or cobble or boulder "beaches" or vertical rock slopes with limited upper edge vegetation (see results). The inundation will be for at least 1 but perhaps 2-3 months of each year, irrigation need dependant.

Pattle Delamore Partners (PDP) have calculated the frequency of occurrence that the lake will rise to its historic maximum level because of the control gate as well as what the raised average level will be. They suggest that the maximum range would be attained (exceeded) 0.1% of the time as opposed to 0.008% (pre control gate) and raised partway (above half way to the historic mean maxima) 0.3% of the time as opposed to 0.03%. The proposed lake situation therefore increases the chance of the lake being at its maxima by around 10 fold, but the chance is still less than half a percent –it remains a rare occurrence.

PDP also show that on a monthly basis the actual lake rise (despite the quotation of a typical 1.4m) is actually less than 1m.

Existing inundation effects of lake edges have been studied (Burrows *et al.* 2006). Burrows concluded that: "Comparison of shore vegetation and substrates over time, from analysed transect data and from the photographic record, suggest that the minor observed changes are to be expected as part of the natural dynamic process in the lake-shore environments, and that the controlled management of lake-level fluctuation regimes is not having any adverse or significant measurable impacts on the shore vegetation". We expect this conclusion to also be valid for the Lake Sumner proposed levels and variations.

Of the 33 ha of vegetation to be inundated 27 ha are primarily exotic grasslands on the head delta. Only four hectares relate to Beech and broadleaf (mixed hardwood) vegetation around the lake margin. Two further hectares relate to the Loch Katrine edge and manuka/gorse/kowhai/Carex.

Figures 2-7 show aerial extent of the inundation and then cross sections showing various lake heights against vegetation present.

The extent of vegetation change in relation to the lake edge and the wider forest is quite small.

The main potential adverse effect is related to the loss of some or all of the lower-beach kowhai-*Coprosma* communities. Even with tolerances of over 90 days inundation (Johnston 1972) it is likely that most in the current typical beach vegetation fragments will eventually die. However, our current estimate is that of the 3ha of kowhai edge that exist, less than a quarter of a hectare (2500m<sup>2</sup>) will be significantly adversely affected.

The majority of the lower beach community lies on the northern edges of the lake and particularly at the north-western and north-eastern corners. Other kowhai are scattered along the northern and southern sections and are also often on the forest edge along the upper beach. These upper bands are more likely to remain given their tolerance to partial inundation.

### **1.7. Conclusion**

We conclude that the lake margin increase under the proposed storage regime will affect the beach growing herbaceous vegetation (a narrow band up to 2m wide in some locations), kowhai and broadleaf raised margins, brown top dominated grasslands, a small area of *Schoenus* wetland in the Loch, but very little beech forest. The margin will still present as a native intact riparian vegetated margin, if with less frequently evident beaches.

**Figure 1: Cross Sections Location Plan of Lake Sumner**  
**Figures 2 to 11 : Cross Sections showing Lake Levels**