INVESTIGATION OF LAKE/WETLAND INTERACTION AT LAKE COLERIDGE

Sanson, J,[1] Lough, H[1]
[1] Pattle Delamore Partners Ltd

Aims

Lake Coleridge, in the mid-Canterbury high country, has a number of wetlands located around the lake edges. This paper will identify these wetlands and discuss their significance under the RMA. It will also discuss the hydraulic connection between the lake and wetlands, including the results from a monitoring programme to investigate the lake-wetland interaction. Finally this paper will consider one method of modelling the observed lake-wetland interaction.

Methods

The Resource Management Act 1991 (RMA) defines a wetland as including: "Permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions". Boffa Miskell (2011) identified 13 wetlands around the edge of Lake Coleridge. Of these, five were considered to be of greater ecological (biodiversity) value.

Four key indicator wetlands were chosen for the hydraulic connection study and their water levels were monitored during mid-winter to early spring 2011 to enable comparison with lake levels. These wetlands were chosen based on their classified significance under the RMA and their representativeness of other wetlands around the lake.

To enable remote measurement of the wetland water levels, pressure transducers that electronically log pressure at pre-programmed intervals were installed in each of the four wetlands in July 2011. The relative levels of the water surfaces at all transducers and the lake were surveyed in and converted to reduced levels based on the lake levels recorded by TrustPower on the day.

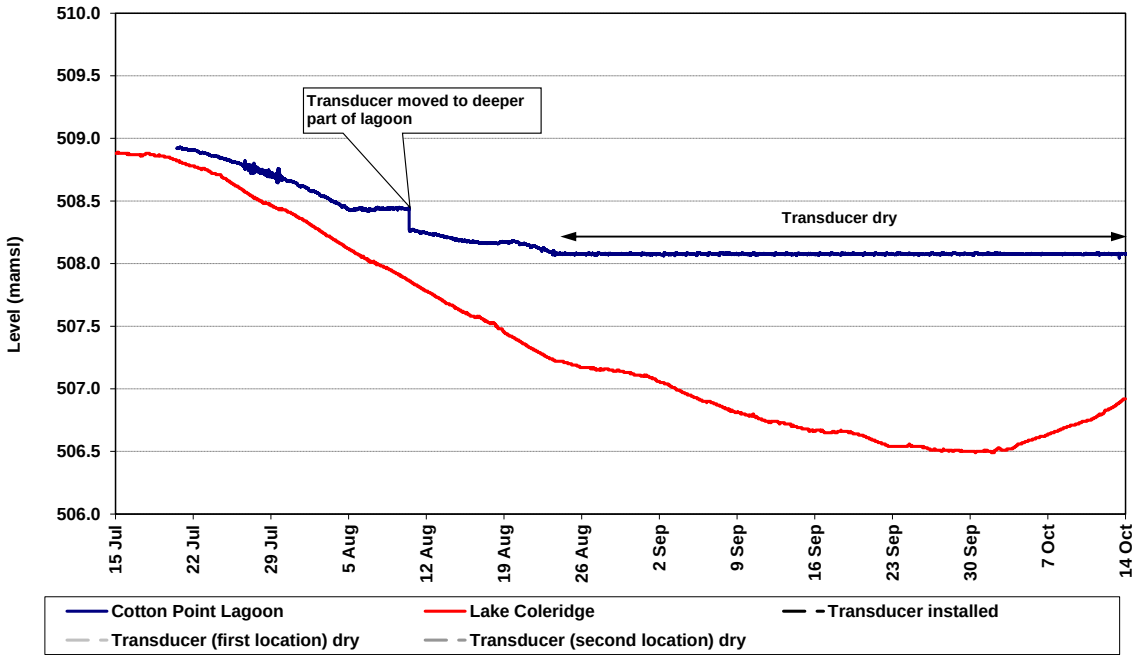
Due to unexpectedly low lake levels and a high hydraulic connection, some of the transducers had to be moved in August because they were no longer submerged. A final site visit was undertaken to remove the transducers in October.

Results and Conclusions

Review of the water level data from the transducers showed that they all experienced a decline in water levels following their installation, in response to a decline in lake levels.

Review of the lake level data showed that the lake declined steadily by around 2 m over the monitoring period. Lake levels typically decline during the winter months which is due to a combination of an increase in electricity demand and because precipitation in the catchments is falling, and being accumulated, as snow. Some of the wetlands experienced a decline in water levels that was similar to the lake level decline. Figure 1 shows water levels in Lake Coleridge and one of the wetlands monitored (Cotton Point Lagoon).

Figure 1: Water Levels in Lake Coleridge and Cotton Point Lagoon



The wetlands immediately bordering Lake Coleridge had a strong hydraulic connection to lake level changes, while wetlands further from the lake had less or little connection. The relationship was also dependent on the permeability of the substrate and whether the wetlands receive surface inflow from other sources.

An analytical equation developed by Bruce Hunt was used to model the lake/wetland interaction. The equation models changes in water levels in response to instantaneous head changes in a constant head boundary, such as a river or lake. A good fit could be achieved between the observed and modelled data; however, there were a range of possible combinations of transmissivity and specific yield that could be used to achieve a good fit.

Overall, the investigation provided an interesting insight into lake-wetland interactions and was useful for assessing changes that may occur under future lake level operating regimes.

References

Boffa Miskell, 2011. Lake Coleridge Project: River terrace and Lake Coleridge wetlands report. Prepared by Boffa Miskell Ltd for TrustPower Ltd.