

# Investigation of geomorphic response to major catchment disturbance using optically-stimulated luminescence dating, Wairarapa valley, New Zealand

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## Project Summary

A series of large sand dune ridges are preserved adjacent to Lake Wairarapa, North Island, New Zealand (Fig. 1). Pilot work mapping the dunes using LiDAR and aerial photography produced two potentially concordant hypotheses for dune formation: (a) the dunes were built from sediment pulses delivered to the lake following large-magnitude earthquakes on proximal active faults; (b) dune-building-phases were initiated by climatically- or tectonically-driven changes in the water-level of Wairarapa Bay. The BSG Early Career Researcher grant was used to fund 11 optically stimulated luminescence (OSL) ages from the dunes (Fig. 2) in order to establish a chronology of dune formation.

## Results and discussion

The luminescence ages from the dune ridges range in age from  $3870 \pm 260$  years BP to  $1190 \pm 80$  years BP. Spatially, the luminescence ages show a trend of increasingly younger dunes towards the west (i.e. dunes closer to the lake). Where multiple ages have been obtained from the same ridge, there is also a trend for the ages to decrease from north to south.

The eastern-most ridge is commonly believed to mark the position of the early Holocene shoreline around Lake Wairarapa. The age of this ridge, c. 3,900 years BP, coincides with sea-level beginning to fall following the end of the mid-Holocene sea-level highstand.

Work is ongoing to elucidate whether a fault rupture on the Wairarapa Fault c. 2,700-3,000 years BP may be the source of sediment delivered to the lake for the formation of the next dune to the west, which has OSL ages ranging from 2900 to 1800 years BP.

Cores from the inter-dune coastal plain show contain alluvial gravels and sands, as well as estuarine silts and clays. Pilot ground penetrating radar surveys suggest that these sediments onlap onto dunes. Further ground penetrating radar surveys across the dunes and the inter-dune plain, will hopefully provide further data to tie together the core and OSL dates to produce a coherent theory of the process of formation of the dunes surrounding Lake Wairarapa.

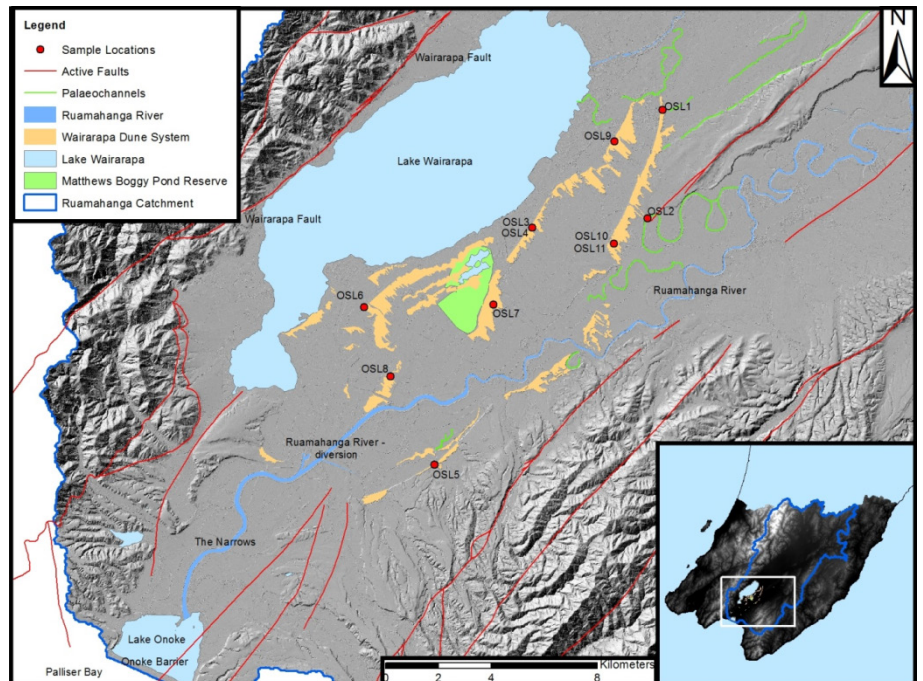


Figure 1: The Wairarapa dune system (yellow) and retrieved OSL samples (red dots).



Figure 2: (left) Eastern-most dune ridge, with a recently excavated section, with OSL sample being recovered from the crest; (right) a section of the next youngest ridge, with OSL sample recovered from the base of the dune.