

## **Glacial chronology and Holocene environmental history of Lake Tennyson, North Canterbury, New Zealand**

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Lake Tennyson lies at the boundary between regional climate districts and is sensitive to atmospheric circulation changes. This site can provide evidence to help test hypotheses about what drives glacier activity. However, few detailed studies on the late-glacial and post-glacial history exist there, despite well-defined end moraines marking the southern margin of the basin. We addressed this knowledge gap by establishing the timing of the glacial sequence emplacement at Lake Tennyson. Our work employed geophysical, stratigraphic and geomorphic approaches that included pedology, tephrostratigraphy, cosmogenic analysis and radiocarbon dating. The most recent maximum ice extent was achieved close to ~18.6 ka at Lake Tennyson. However, an older advance of similar extent, limited by local accommodation space, is likely for MIS4 at ~64 ka. Kawakawa/Oruanui Tephra is also inferred as a cryptotephra within a well-developed podzolised soil capping the moraine that marks maximum local ice extent at Lake Tennyson. Inboard recessional moraines mark glacier (and presumably climate) variations during the early part of the last termination through to ~17.1 ka. Replicated cosmogenic ages on the cirque sill of Princess Bath suggest ice had mostly evacuated the catchment by 11.2 ka. Sediment cores change from inorganic to organic sedimentation following small tree and shrub expansion at the expense of herbs prior to 10.5 ka cal BP. Beech (*Fuscospora*) pollen has been present since prior to 10.5 ka, and has been elevated for at least the last 1000 years. Relatively high sedimentation over the last millennium suggests a bi-decadally resolved record could be obtained at this site