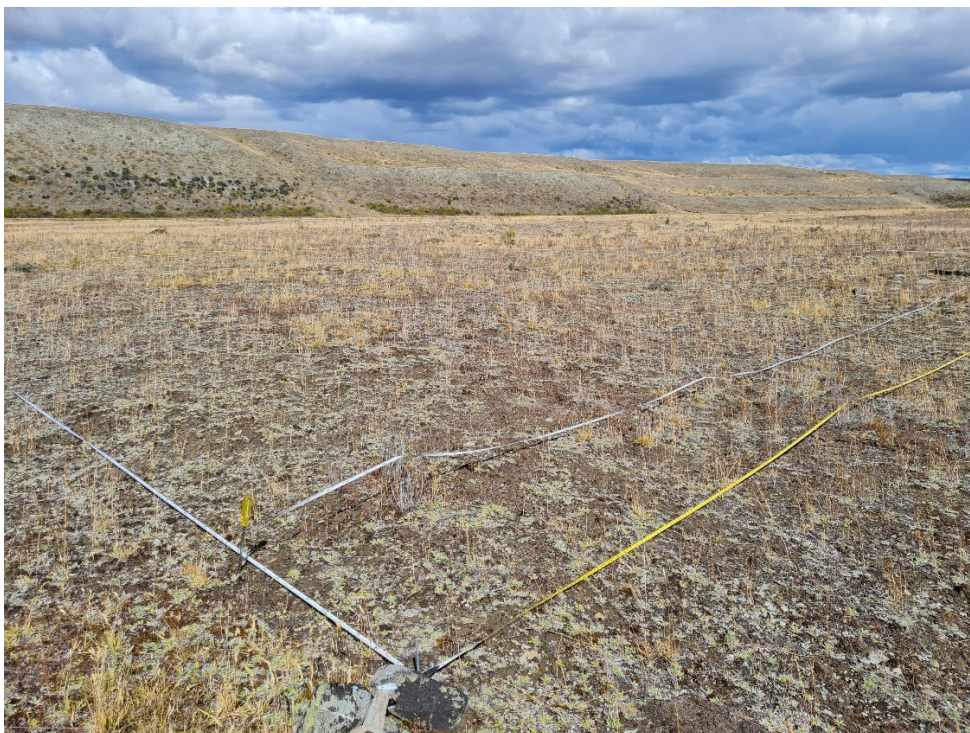


## Mackenzie District Plan Change 18

Espie Presentation Photos.



The Wolds 'Partially Converted' grassland 2021. Oversown and top dressed. Ground cover principally introduced grasses and Hieracium, note that indigenous species remain under this management.



Tekapo Scientific Reserve 2021. Low river terrace with very low moisture retention Larbreck soils by the Tekapo River. Ground cover: Hieracium, introduced sweet vernal grass and bare soil. No tussocks were present in 1992 and no recovery after 29 years.





Tekapo Scientific Reserve 2021. Main outwash surface with Fork Soils. Foreground: shallow stony phase with low moisture retention. Ground cover Hieracium introduced sweet vernal grass, bare soil and stone. Very few tussocks present in 1992 and no appreciable recovery after 29 years. Two percent of tussock on the bare phase, 98% occurrence on the dune phase in 2021. Background: deeper soil phase. Wind accumulation / depletion causes the soil phases from initial post-glacial depositional differences in stone content.



Tekapo Scientific Reserve 2021. Main outwash surface with Fork Soils, dune system in previous photograph. Foreground: shallow stony phase with low moisture retention merging with the dune with deeper soil and increased moisture retention and storage. Tussocks present in 1992 and increased in growth with reduced rabbit grazing.





Tekapo Scientific Reserve 2021. Main outwash surface with Fork Soils similar to previous photograph but with a shallower dune system. Note the decrease in tussocks as the dune flattens and the soil becomes shallower.



Tekapo Scientific Reserve 2021. Permeant location biodiversity assessment quadrat. Shows a typical Hieracium patch and surrounding bare soil halo. Note the hummocky elevation of the bare soil, due to previous winter frost lift, which subsequently exposes it to wind erosion.





Tekapo Scientific Reserve 2021. Moraine fan deep soil plot. Tussocks increased with reduced rabbit grazing, similar to on the deeper soil phase on dunes. Introduced grasses, browntop and sweet vernal, and Hieracium are main understory cover.



Similar tussock recovery under sheep grazing with rabbit control after RCD, Glenmore Station. This is in the same environment and synchronous time period as in the Tekapo Science Reserve.





Maryburn Grazing Trial plots directly adjacent to The Wolds 2021. These large enclosure plots separated the effect of sheep and rabbit grazing. There was a 51% decline in indigenous species biodiversity between 1990 and 2021. Grazing management did not affect this change.