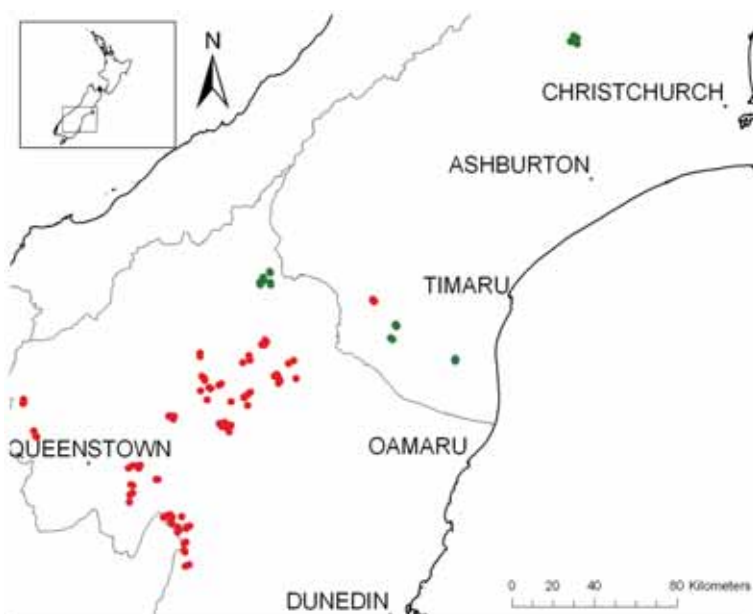


# *Two decades of vegetation change in tussock grasslands across New Zealand's South Island*



Vegetation data were collected from 125, 100 m permanently-marked vegetation transects in New Zealand's South Island tussock grasslands between 1982 and 2007. Transects were in both conservation and pastoral tenure (including leasehold and freehold).



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Six plant species communities were identified on these transects, which are characterised by their species composition (the identities of species that coexist on a transect) (photos accompany these):

1. Alpine vegetation dominated by low-growing and mat-forming species
2. Tall-tussock grasslands with herbaceous inter-tussock species,
3. Short-tussock grasslands dominated by native species,
4. Tall-tussock grasslands with woody inter-tussock species,
5. Short-tussock grasslands dominated by exotic species, and
6. Weedy, highly-modified grasslands.

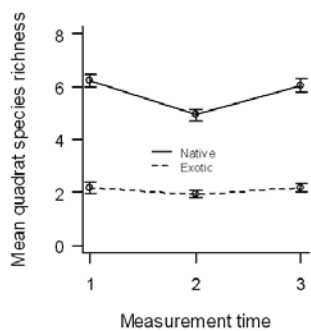


Figure 1: Mean quadrat species richness at each measurement on transects in pastoral and conservation tenure.

These changes in species richness were not driven by exotic species.

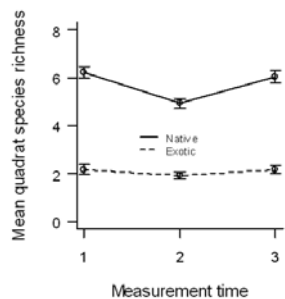
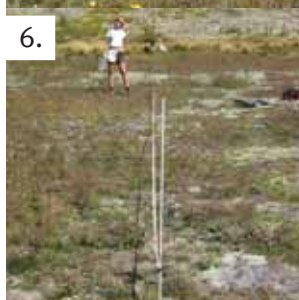
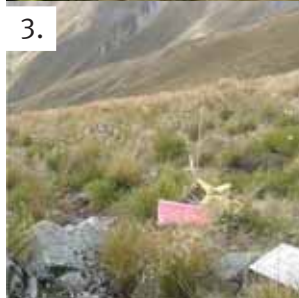
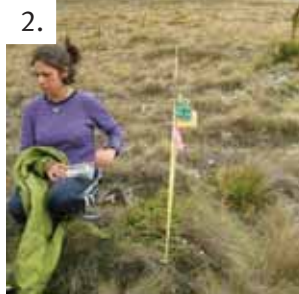
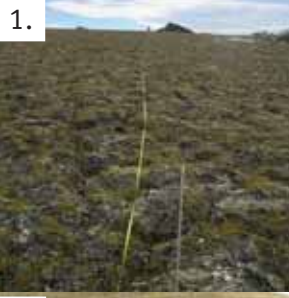


Figure 2: Mean quadrat species richness at each measurement for native and exotic species.

Hieracium (hawkweed) species richness increased over time.

Change in Chionochloa (snow-tussock) abundance was negligible.

Although the changes in mean quadrat species richness differed for each time period, soil alkalinity and rock type were significant predictors of these changes for both periods. Soil alkalinity was correlated with elevation.



## Changes over time

*We investigated changes in species composition that occurred in short- and tall-tussock grasslands over time (groups 2, 3, 4, 5: 103 transects).*

There was no relationship between how composition changed over time and the tenure of the land.

Property was related to how transects changed in species composition over time:

- Transects on some properties changed more in composition than others.
- Transects on some properties were more likely to become more dominated by native species than others.

Other factors were also important:

- Transects in short-tussock grasslands dominated by exotic species changed more in composition.
- Over time, exotic species increased in short-tussock grasslands dominated by exotic species.
- Transects on greywacke rock changed more in composition than transects on schist rock.

*We also investigated how all 125 transects changed in species richness over time (the mean number of species within an area of 0.25 m<sup>2</sup>).*

Species richness declined between the 1980s and 1990s, but then increased between the 1990s and 2000s.

Transects in both conservation and pastoral tenure showed this decline and then increase (figure).





## Implications

This research indicates that removing grazing alone does not necessarily enhance native biodiversity. However, considering that plants in tussock grasslands are slow growing, and that these areas have been grazed and burned for more than a century, we may expect it to take some time for vegetation dynamics in conservation tenure to differ from pastoral tenure.

The changes in the community structure of these tussock grasslands are related to a combination of environmental factors, such as soil chemistry and climate, and management factors.

The inconsistent changes that have occurred on these transects, and the nature and complexity of the variables that explain those changes, make it difficult for us to be able to make any clear predictions about future changes that may occur.

However, we can conclude from this research that the conversion of pastoral lease land to conservation tenure has not, so far, had a large impact on changes in plant species composition or species richness in these tussock grasslands.

This highlights the importance of continued monitoring of these permanent transects and a range of other High Country sites for many years into the future if we are to obtain a good understanding of the effects of land



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