The effects of tahr in alpine and subalpine ecosystems

A summary of potential and alternative monitoring networks to assess the ecological integrity of subalpine and alpine vegetation exposed to tahr grazing

Department of Conservation
Te Papa Atawhai

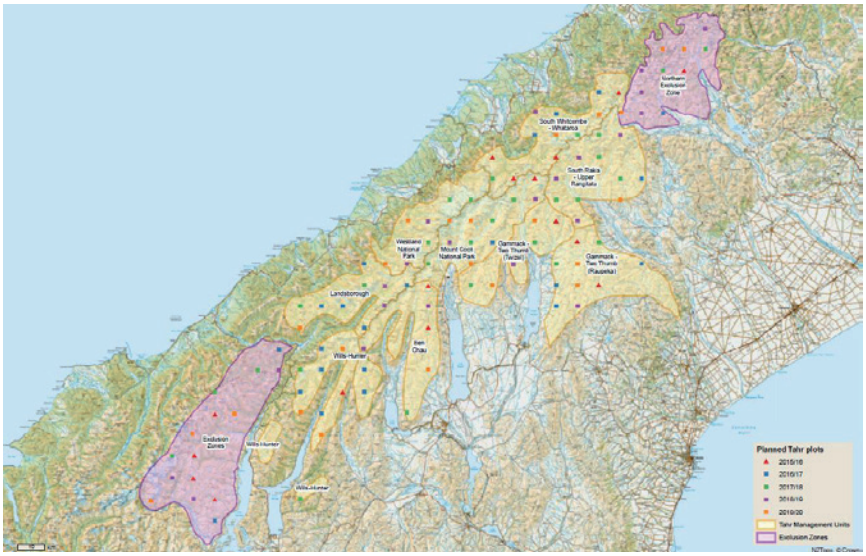
Manaaki Whenua
Landcare Research

What we know about the effects of tahr in alpine and subalpine ecosystems:

- **Alpine and subalpine ecosystems in New Zealand are naïve to mammalian herbivores, so it's likely that these ecosystems will not be resilient to some of their effects [Forsyth et al. 2010]**
- **Tahr are social animals that affect ecosystems differently in space and time: alpine ecosystems in summer and subalpine ecosystems (especially shrublands) in winter [Forsyth & Tustin 2005]**
- **Tahr diet in alpine and subalpine ecosystems consists mostly of tussocks and shrubs but also alpine herbs (buttercups and others) that are naturally uncommon and patchy in distribution [Tustin & Parkes 1988; Parkes & Forsyth 2008]**
- **Tahr can have highly concentrated effects in alpine and subalpine ecosystems, transforming tall tussocks and subalpine shrublands to turfs at local (<300 m2) scales [Wilson 1976; Wardle 1977, 1979]**
- **As tahr abundance increases, the heights of dominant tussocks decline at wider scales [Cruz et al 2017]**

Infrastructure available to report on the effects of tahr on alpine and subalpine ecosystems:

- Plots in alpine grasslands (n = 117) in 8 catchments in the management zone, established in the 1990s, remeasured several times, most recently 2013; remeasurement begins 2020.
- Plots in alpine grasslands are environmentally and compositionally biased, adequate for reporting change in dominant tussocks but not other less dominant species.
- Plots in alpine grasslands are only in 8 catchments in the management zone and cannot be used to make inference about the whole management zone.
- Systematically-located plots on an 8-km grid across alpine and subalpine ecosystems across the management and exclusion zones, established 2011–2017; remeasurement began in 2018.
- Systematically-located plots are adequate to report on change in structural dominant species (tussocks, shrubs) but not for other less dominant species (e.g., small herbs eaten by tahr).
- Legacy datasets of transects in some alpine and subalpine ecosystems on public conservation land (established 1970s/80s), not remeasured since.
- Legacy datasets of transects in subalpine grasslands on public leasehold land, established in 1960s/70s, measured most recently 2000s [Day & Buckley 2013].



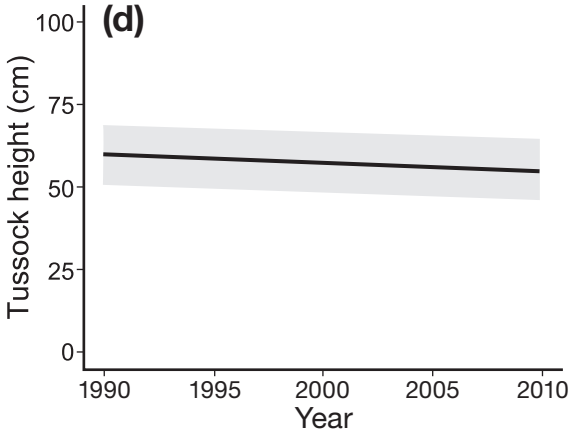
▲ Tier 1 20 x 20 plots within the tahr management units and exclusion zones as defined in the Tahr Control Plan.

▲ Vegetation in one of the 117 subjectively located plots (in Zora Creek, Westland) at two points in time showing a reduction in tussock cover and height. Left image in 1999; right image in 2012. *Photos: Ingrid Grüner, DOC*

Cover image: Juvenile males. *Photo: Dylan Higgison*

Here's the state of our capacity to report on the effects of tahr:

- We can report on change in alpine tussock grasslands from plots established between 1990 and 1999. These plots showed a small but significant decline in tussock grass height over time [Cruz et al 2017]
- New systematically-located plots (established since 2011) provide a baseline against which changes in alpine and subalpine ecological integrity can be determined. These plots have established that there is lower shrub cover in the tahr management zone than the exclusion zone [Bellingham et al 2018]
- So far, reporting of effects of tahr on ecosystems is from public conservation land only.



▲ Image of figure from *Cruz et al* showing change in tussock height.

We cannot report on:

- Resilience of alpine and subalpine species and ecosystems to grazing by tahr.
- Whether tahr are impoverishing vegetation widely or transforming ecosystems widely because we lack time-series data.
- Effects on herbaceous species eaten by tahr. We need more information to inform what groups of plants to monitor and why. Our capacity to select other species to measure is currently statistically poor and hampered by a lack of knowledge about tahr's dietary preference (we know that herbaceous plants like Ranunuculus species comprise up to a quarter of their diet by dry weight [Parkes & Forsyth 2008], but we are unable to determine whether this affects their populations).
- Catchment-scale impacts of tahr and ecosystem resilience that integrate tahr behaviour and movements with vegetation changes in alpine and subalpine ecosystems.

▲ Herbaceous species.

Things that could better inform decisions about the ecological impacts of tahr and how to set thresholds for intervention that are scientifically defensible for both alpine and subalpine ecosystems:

- Continue measurement of existing plots in alpine tussock grasslands in the management zone and of systematically-located plots across the management and exclusion zones.
- Establish new networks of plots (or reinstate old plot networks) in alpine and subalpine ecosystems to increase statistical power to detect tahr browsing effects.
- Instigate long-term research sites that collect coupled data on tahr and other mammalian herbivores with vegetation data in alpine grasslands and subalpine grasslands that are heavily browsed by tahr east and west of the Divide.
- Maintain current methods used on plots to determine effects of tahr (to ensure continuity and ability to maximise time-series data) and evaluate suitability of other methods to determine effects.
- Determine the effectiveness of multiple remote sensing techniques to determine tahr habitats and their impacts on them.
- Determine dietary preference of tahr (i.e., ascertain biomass of plant species in the wild in proportion to their mass in tahr rumens), including throughout seasons.
- Improve the evidence base for attributing impacts on vegetation to tahr, in the context of other herbivores. This would include determining hare diets in alpine or subalpine ecosystems .
- Determine targets (optimum ecological integrity) to which to management of alpine and subalpine ecosystems could be aimed.

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Photo: Scott Theobald (DOC)

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