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INTRODUCED STOCK IMPACTS ON ALPINE AND SUB-ALPINE FLORA

FLORA: A SHORT REVIEW OF GRAZING EFFECTS

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A Brief History of Stock Grazing in Australian Alpine Areas

From the mid-19th century, large numbers of cattle and sheep with associated stock horses were taken to the Australian Alps each summer, especially during droughts. Stock numbers could be very high, sometimes more than 100,000 head in about 120 km² (Carr and Turner 1959). Sheep and cattle grazing occurred in the Kosciuszko high country and, in the latter half of the 20th century in Victoria, only cattle were permitted to graze. In 1944, with the establishment of Kosciuszko State Park, regulatory limits were placed on grazing numbers and duration in the Snow Leases, and grazing was removed altogether from the Kosciuszko summit area (Costin et al. 2000; Bryant 1973; Taylor 1956). Relief grazing during the worst of historical droughts led to excessive grazing pressures, and this was believed to be the tipping point for the soil erosion in the Carruthers area in the Snowy Mountains (Worboys et al. 2010). Monitoring experiments were instigated by the NSW and Victorian governments to investigate the effects of grazing on soils and vegetation (Carr and Turner 1959; Costin et al. 2000). Domestic grazing stock were removed altogether from government-controlled land in Kosciuszko: first in 1957, where Snow Leases above 1,350 m were withdrawn; and then in 1969, when the NSW Liberal Government advised that all stock grazing with Kosciuszko National Park would be terminated indefinitely. In Victoria, grazing ceased in 2005, after severe fires in 2003 and obvious damage from cattle to alpine landscapes.

General Effects on Alpine Vegetation Composition

Stock were selective grazers in the Alps, with a preference for many inter-tussock forbs, as well as grasses and some low, soft, palatable shrubs. Tall and highly flammable shrubs were not consumed (Van Rees 1984; Van Rees and Holmes 1986; Van Rees and Hutson 1983). Selective grazing caused bare-ground patches in amongst the inter-tussock forbs (Williams and Ashton 1987) and subsequent exposure of fragile soils, which lead to erosion (Worboys et al. 2010). Many graziers recognised the unpalatability of many tussock-forming species and resorted to seasonally burning the alpine and sub-alpine landscapes from the 1860s to the 1940s to facilitate the growth of the 'green-pick', the more

palatable regrowth stage of the tussock grasses. This practice of burning, especially during dry periods, exposed the soil and led to soil erosion (Williams and Ashton 1987). In 1897, in an address to the Royal Geographical Society, the naturalist Richard Helms stated:

Not satisfied with what nature yields, the herdsmen in order to improve the growth of feed and make it sweeter as they say, yearly burn large tracts of the grass and shrub ... what right has one section of the community to rob the other of the full enjoyment of an unsullied landscape ... The husbandman on the farm by the river, the artist and tourist who seek the picturesque, the botanist and zoologist who come in pursuit of plants and animals, are all interfered with. And why? Because some inconsiderate people are allowed to do as they please (quoted in Stanley 1982: 4).

Many studies have occurred investigating the responses of vegetation to stock grazing. These studies demonstrate decreases in the palatable forbs, grasses and low shrubs, and initial sharp increases in non-palatable shrubs and other woody plants (snow gum). They also demonstrate that grazing in alpine and sub-alpine areas has the potential to change the overall composition of vegetation in different communities by way of the creation of bare-ground patches and subsequent colonisation by various forbs and grasses.

Long-term exclusion plots in Victoria in the 1940s clearly showed that, without grazing, the abundance of many palatable species increases substantially (Carr and Turner 1959; Wahren et al. 1994), the cover of which changed little on grazed plots. In contrast, most shrubs in both open and closed heathland are non-palatable and were not affected by grazing (Wahren et al. 1994; Wahren 1997). Similarly, within stock exclosures in sub-alpine Kosciuszko (Bryant 1969), there was a rapid increase in shrub cover of 15–30% in the first three years (but the cover of these species declined thereafter), and also a rapid increase in the number of tree seedlings establishing and persisting. The transects and photoquadrats established in the Kosciuszko area, after the removal of grazing in 1959, showed an initial increase in the cover of palatable species and a decrease in the cover of bare ground (Wimbush and Costin 1979a, 1979b; Scherrer and Pickering 2005). Experimental sheep grazing trials in Kosciuszko National Park, conducted by Alec Costin and Dane Wimbush from 1959 to 1979, showed similar trends (Wimbush and Costin 1979a).

Grazing Effects on Threatened Plant Species and Communities

The selectivity of domestic grazing animals can push some plant species to near extinction. The highly palatable forb *Ranunculus anemoneus* was once widely distributed in the Kosciuszko area, but by the 1960s was becoming difficult to find and was believed to be a species of rock ledges (Costin et al. 2000). Now, in the long absence of grazing, it is found in a wide range of habitats and is reasonably common. The tall grass *Chionochloa frigida* has made a similar return from obscurity in the Kosciuszko area. Many palatable species are restricted by narrow distributions and specific habitat requirements, and may be listed as rare or vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (Venn et al. 2017). Selective grazing of alpine bog and wetland species, and subsequent damage to peat soils, lead to the listing of Alpine Sphagnum Bogs and Associated Fens as a nationally threatened ecological community. Recent activity of feral horses has had a serious impact on this community through trampling and subsequent draining of such wetlands.

Grazing by hard-hoofed stock animals, such as cattle and horses, with no effective control strategy, is an immediate threat to the survival of alpine plant communities and the rare species within them. Scientific enquiries over the last 100 years previously led to governments in Victoria and NSW removing stock animals for the sake of the mountain catchments and the downstream environments they support. The alpine vegetation in some places will never fully recover from cattle grazing. Feral horses in alpine and sub-alpine areas will cause the same amount of damage if left unchecked.

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Ribbony Grass (*Chionochloa frigida*) was a favourite food of stock in the high mountains and has become more common since grazing ceased.

Source: Graeme L. Worboys.



Sphagnum, self-healing, Dicky Cooper Creek tributary, following the removal of stock from Kosciuszko National Park and in the absence of feral horses.

Source: Graeme L. Worboys.