



SAVING OUR SPECIES

Feldmark Grass

(*Rytidosperma pumilum*)

2018-19 survey



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Cover photo: Feldmark Grass (*Rytidosperma pumilum*) culms emerging from prostrate *Epacris microphylla* s.l. shrub. Genevieve Wright/DPIE

Report prepared by Genevieve Wright and Keith McDougall
Biodiversity and Conservation, Department of Planning, Industry and Environment

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Executive summary

Feldmark Grass (*Rytidosperma pumilum*) is a threatened grass confined to the alpine area of Kosciuszko National Park, NSW. Its leaves grow to about three centimetres high and its flowering stems are about seven centimetres high. It is found in an area 2 km x 1 km between Mount Lee and Mount Clarke in feldmark vegetation, which is characterised by a sparse cover of short vegetation, shallow soils and a high cover of fractured rock.

Prior to this survey, the extent and locations of feldmark grass had not been compiled and comprehensively checked since the 2001 Recovery Plan for the species (NPWS, 2001). As part of the *Saving Our Species* (SoS) program this site-managed species was targeted for an updated survey. New populations were confirmed 700 metres south and one kilometre south-east of the only known population of the species, increasing the area of occupancy from 4 to 8 km². Seed was collected from one site in February 2019 and is now stored at the Australian Plant Bank at Mount Annan, supplementing the 2018 seed collection. Two specimens were collected and are held at the Australian National Herbarium (Table 1, Appendix B).

Based on the results of this survey, it is recommended that additional potential habitat be surveyed in 2019–20 and monitoring be established to investigate the long-term stability of the known populations.



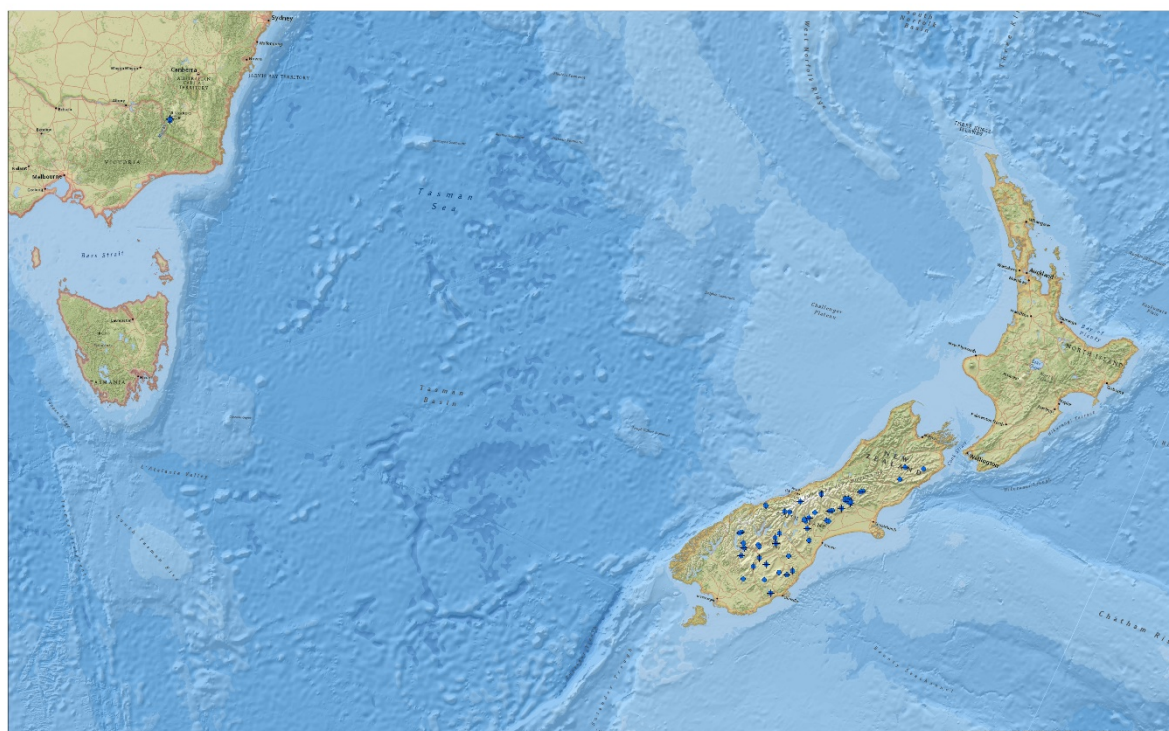
Feldmark Grass (*Rytidosperma pumilum*) culms emerging from prostrate *Epacris microphylla* s.l. shrub. Genevieve Wright/DPIE

1. Background

Feldmark grass (*Rytidosperma pumilum*) is a small, inconspicuous tufted grass. Its leaves grow to about three centimetres high and its flowering stems are about seven centimetres high. The leaves have broad papery sheaths and are often curved or spirally twisted. The flowering stem (inflorescence) is longer than the leaves. The two to four spikelets, which are held against the flowering stem, each contain two to four flowers. Unlike most other grasses, the flowers are completely enclosed by the glumes (small leafy bracts at the base of each spikelet). The lemma (which partly encloses the flower within the glumes) has hairs scattered over the outer surface and a minute central bristle in a notch at the apex. The only other species of grass which is very similar to feldmark grass is snowpatch grass (*Rytidosperma australe*); but snowpatch grass has longer spikelets, lance-shaped glumes and hairy lemmas (NSW NPWS, 2001).

Distribution

Feldmark grass was first collected in Australia at 'Mt Kosciusko, near Lake Albina' in 1949 by Professor Carl Skoltsberg, a visiting Swedish botanist (Table 1, Appendix B). Prior to this collection it was thought that feldmark grass only occurred in New Zealand, where it is more common (NSW NPWS, 2001) (Map 1). All Australian herbarium collections prior to February 2019 were from the ridge crest between Mount Lee and Northcote Pass (Table 1, Appendix A). One exception to this is the 2000 D. Crestani collection located '1km E of Seamans Hut' (Map 2), which remains uncertain because of the habitat type.



◆ Rytidosperma pumilum records (AVH, 2019)

Map 1 *Rytidosperma pumilum* global distribution
Map: G. Wright/DPIE

In Australia, feldmark grass has only been observed in the alpine area of Kosciuszko National Park, where it is confined to a restricted alpine vegetation community called feldmark (Costin et al., 2000, NSW NPWS 2001). This community, listed as 'Windswept Feldmark', a Critically Endangered Ecological Community on the NSW *Biodiversity Conservation Act 2016* occurs on exposed ridges and summits, and plants in the community are subject to freezing abrasive winds and low temperatures (Costin et al. 2000). The current known extent of this community is 24 hectares (NSW Scientific Committee, 2015).

Prior to the current survey there were four unconfirmed locations of the feldmark grass: one near Seaman's Hut, another at Charlotte Pass (NSW NPWS, 2001), one 250 metres south east of Carruthers Peak and one at Mount Clark. No herbarium collections had been made at these sites to verify the locations. It is thought that the Seaman's Hut and Charlotte Pass records were most likely *Rytidosperma australe* a very similar species (NSW NPWS, 2001). The Carruthers Peak 2016 record is possibly valid, located 850 metres north of the area of windswept feldmark, where *Rytidosperma pumilum* currently occurs (Pickering 2017). The Mount Clarke site is associated with a long-term monitoring project of high alpine summits (GLORIA GLObal Observation Research Initiative in Alpine environments) and *Rytidosperma pumilum* was first recorded here in February 2004 (Pickering, pers.comm., 23 June 2019).

Seed collection

Seed of the feldmark grass has been collected from the population between Mount Lee and Mount Northcote. There are collections held in both the National Seedbank in Canberra and the Australian Plantbank at Mount Annan in New South Wales (Table 2, Appendix B). A germination test was completed on the 2018 collection and results indicate seeds of *Rytidosperma pumilum* have a physiological dormancy. The final germination rate was 50% (Graeme Errington pers. comm. 26 June 2019).

Previous research

The 'Windswept' feldmark community, may be the only vegetation community in which *Rytidosperma pumilum* is found in Australia. Research relevant to the conservation of feldmark grass, therefore, includes work done on this vegetation community. The following is a chronology of work completed on the feldmark grass and the community it occurs in.

Early work by Barrow et al. (1968) documented the cyclical changes that occur in the feldmark plant community in Kosciuszko National Park. They found the prevailing westerly winds would damage and kill the windward facing parts of the dominant *Epacris* shrubs and fine material gathering on the sheltered side of shrubs, was facilitating their spread to the lee side at a rate estimated of one centimetre per year.

In 1998, a survey to determine the distribution of feldmark grass was completed. This was done prior to the development of the Recovery Plan for the threatened Alpine Flora, in which the feldmark grass is included (NSW NPWS, 2001). The 1998 survey included areas where feldmark grass had been reported to occur and all areas mapped as feldmark vegetation by Costin et al. (1979). Survey results only found feldmark grass growing in the Northcote Pass area as a single population extending along the ridge top from Northcote Pass to the summit of Mount Lee. No plants were found in any of the other areas surveyed.

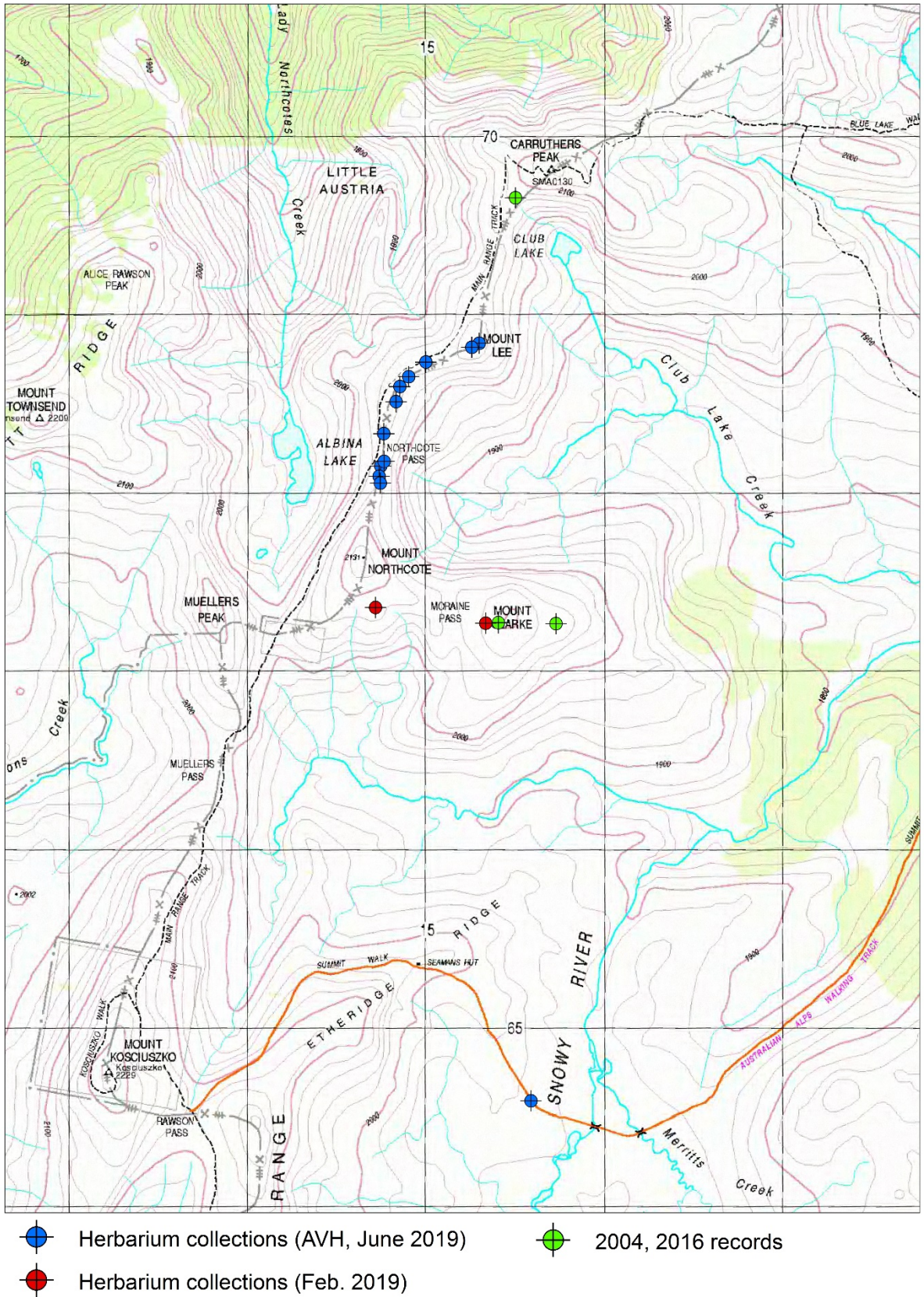
In 2003 a study was conducted to assess the impact of trampling on feldmark vegetation, focussing on the existing walking track (McDougall and Wright 2004). The Main Range walking track traverses one of the largest and most continuous patches of windswept feldmark which, until recently was the only known location of the *Rytidosperma pumilum*. This work found a number of species were less abundant on the leeward side of the track, including the dominant shrub *Epacris microphylla* s.l., suggesting the track was interfering with the feldmark processes. In 2013, this area was surveyed to assess the impact of the

walking trail over time. The research found that the trail continued to adversely affect the community and was also having an impact on the *Rytidosperma pumilum* population. Fewer *Rytidosperma pumilum* plants were recorded on the track surface and lee side of the track edge compared with areas further away from the walking track (Ballantyne et al. 2014).

Humphreys et. al. (2010) conducted a large genetic study of Danthonioid grass species worldwide, which included Australian and New Zealand (NZ) collections of *Rytidosperma pumilum* and *Rytidosperma australe*. Collections of *Rytidosperma australe* clustered closely in their analyses suggesting close genetic affinity amongst populations despite large geographic separation. An Australian collection of *Rytidosperma pumilum*, on the other hand, appeared more closely related to collections of two other NZ *Rytidosperma* species than to a NZ collection of *Rytidosperma pumilum*. The sample size is far too small to be confident that such differences are representative of taxonomic distance. Further genetic and taxonomic work involving multiple collections of *Rytidosperma pumilum* and its related species in NZ is warranted to determine whether the Australian taxon is separable. If the Australian taxon is distinct it will require a new name.

In 2013, additional studies were conducted to assess the role *Epacris microphylla* in providing habitat for other species within the windswept feldmark in Australia (Ballantyne and Pickering 2015a, Ballantyne and Pickering 2015b). Clear differences in the composition and functional traits of plants were found between plants growing within the *Epacris* canopy compared to areas of bare rock outside the shrubs canopy, indicating that *Epacris* may facilitate other species to occur within the windswept feldmark. Other studies at that time focused on the recovery of this community after the impact of the 2003 fires in Kosciuszko National Park. This work found that the floristic composition had changed and the recovery of the dominant *Epacris* shrubs took several years (Pickering, 2013).

In 2017, further research on the windswept feldmark community included work on *Rytidosperma pumilum*. Results of this work indicated a strong positive association between the feldmark grass and the canopy of the dominant *Epacris* shrub (Pickering, 2017).



Map 2 *Rytidosperma pumilum* records, Kosciuszko National Park.
Map: G. Wright/DPIE

2. Purpose

Rytidosperma pumilum is listed as Vulnerable on the NSW *Biodiversity Conservation Act 2016*. The species is currently assigned to the site-managed stream in the *Saving our Species (SoS)* program. Priority actions in the SoS Conservation Project for *Rytidosperma pumilum* include regular monitoring and survey of potential habitat to locate additional populations.

2018–19 project objectives:

- establish a trial of a monitoring method for the species
- survey of un-vouchered distribution records
- collect herbarium specimens to substantiate un-vouchered distribution
- record details of habitat
- identify current or potential threats
- record other ecological observations
- ensure seed collection from the Northcote Pass – Mount Lee populations of *Rytidosperma pumilum*.

This document reports on work conducted in the 2018–19 field season.

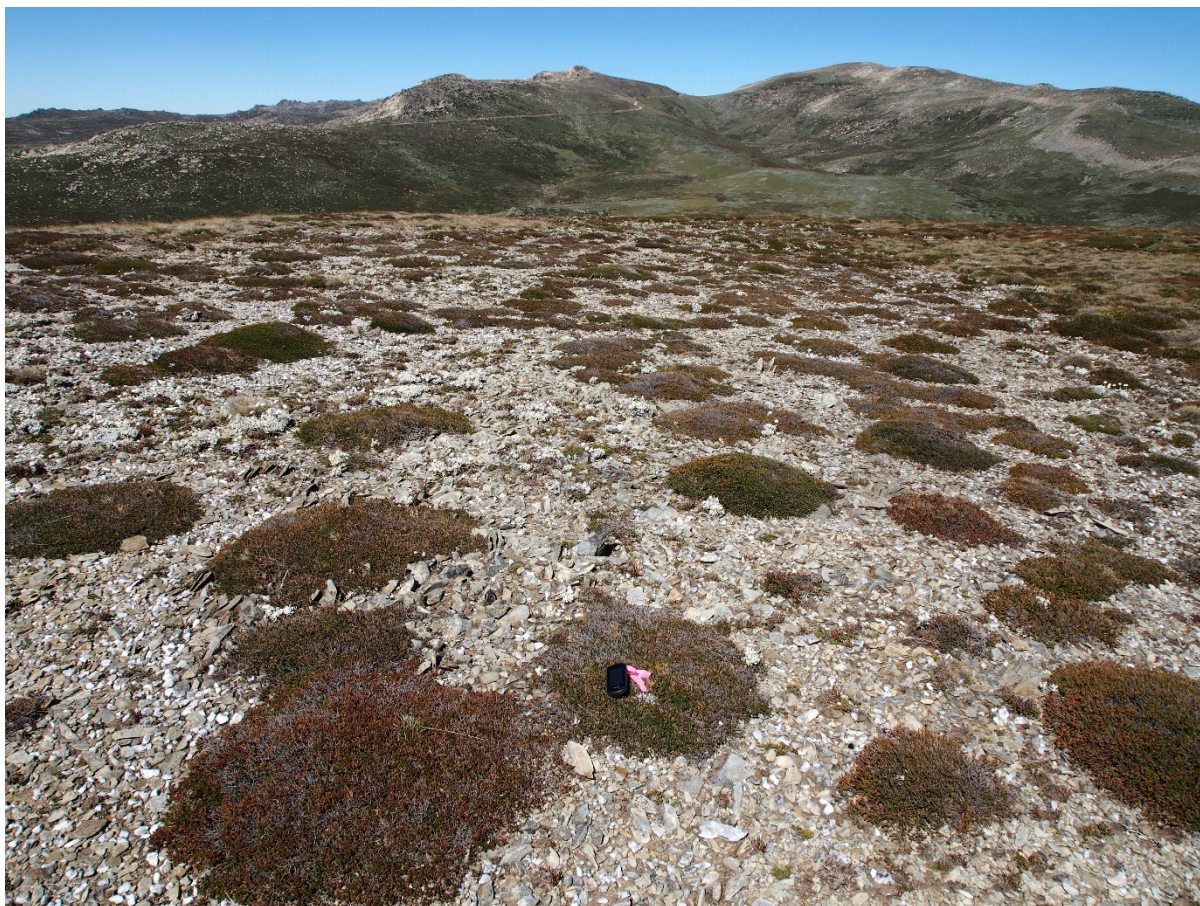


Photo 1 *Rytidosperma pumilum* habitat on Mount Clark, Kosciuszko National Park, 22 February 2019

Photo: G. Wright/DPIE

3. Methods

Transects

The area in which *Rytidosperma pumilum* occurs between Mount Lee and Mount Northcote was surveyed in 2018 and mapped. The location of 30 transects within this area for the purposes of monitoring were randomly generated and run from west to east.

As a trial, five transects at Northcote Pass on the southern edge of the *Rytidosperma pumilum* population were established. On each transect three quadrats ($\frac{1}{4} \text{ m}^2$) were measured and photographed; one on the western side of the transect, another on the eastern side and one either in the centre of the transect or on the track surface. The location of the quadrat on the tape was recorded and a photograph was taken of the start of each transect. Steel pins mark the start and end of the transect. These transects will be re-surveyed in 2019–20. If this technique is repeatable the rest of the transects will be established.



Photo 2 *Rytidosperma pumilum* quadrat, Northcote Pass area.

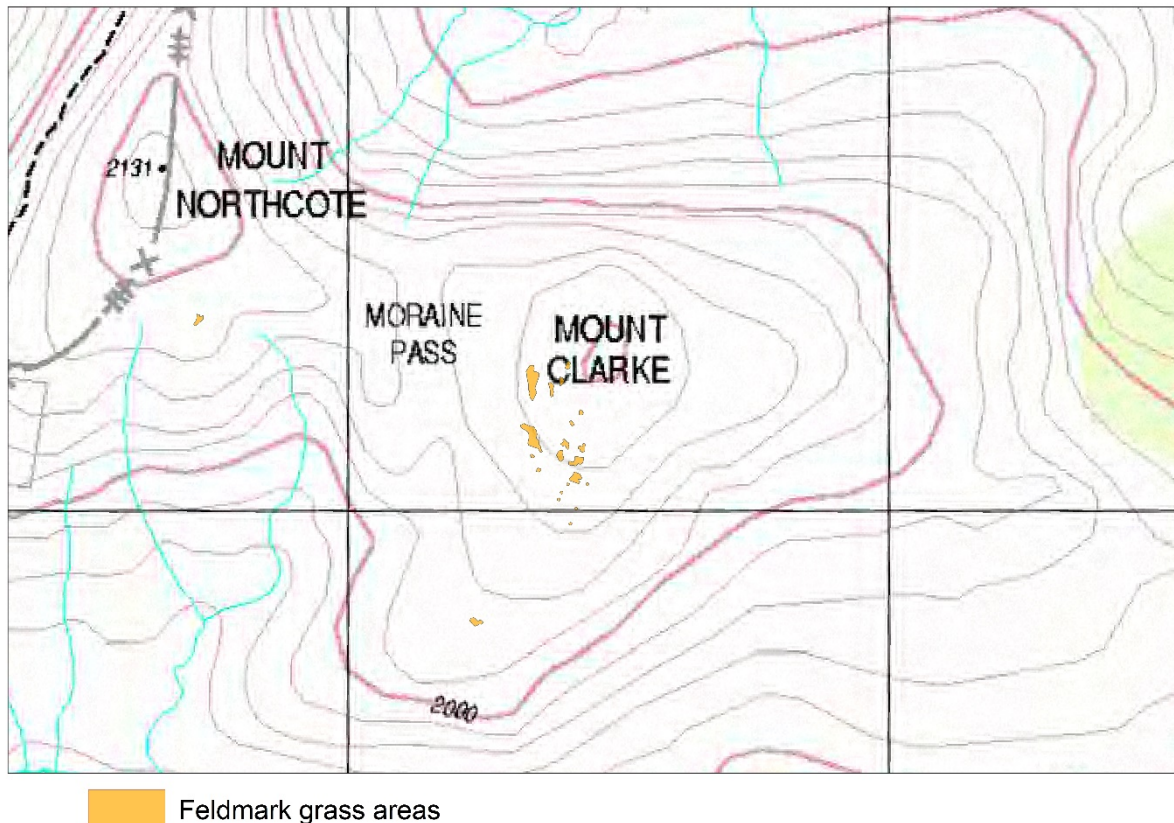
Photo: G. Wright/DPIE

Survey

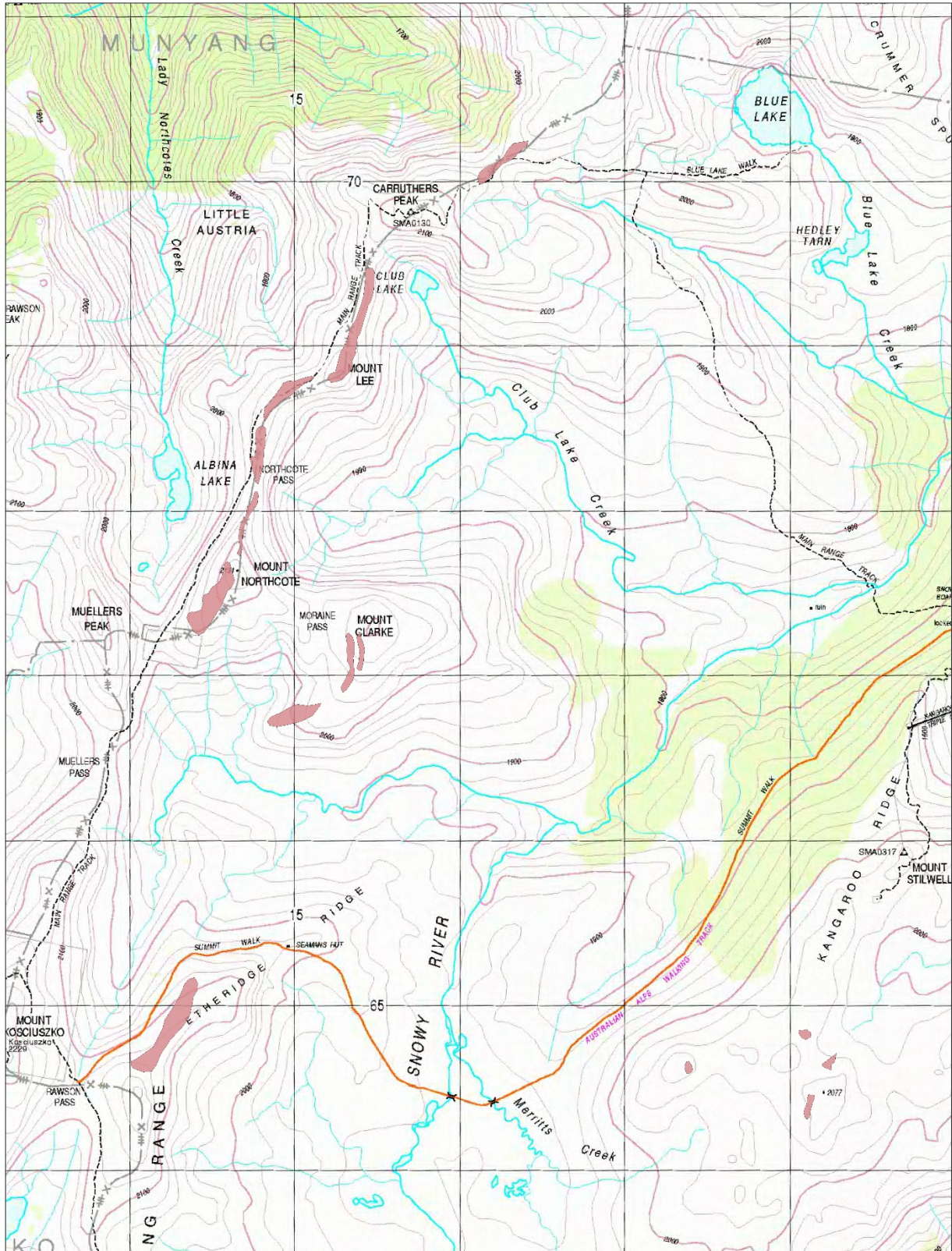
Surveys were completed in February and March 2019. An initial survey on the 22 February targeted one of the Mount Clarke 2004 records. This survey started at the saddle between Muellers Peak and Mount Northcote and continued to Mount Clarke. Areas of feldmark vegetation were surveyed on route. A new, single small population was found 280 metres south of Mount Northcote Summit and the population on Mount Clarke was confirmed. Herbarium specimens were collected from these sites and have been confirmed to be *Rytidosperma pumilum* (Appendix A, Table 1).

The March surveys, conducted over four days, searched all mapped areas of 'Windswept Feldmark' (Costin, 2000) (Map 4). A day's survey was completed on the feldmark areas between Mount Northcote and the saddle north-east of Carruthers Peak. Two days of detailed surveys were completed on the Mount Clarke feldmark areas and one day was spent surveying Etheridge Ridge and the four patches of feldmark mapped on the southern end of Kangaroo Ridge. The area of the 2016 record (Pickering 2017) was not thoroughly searched and areas to the west of Mount Clarke were not surveyed, these areas should be included in future survey work.

The 2019 survey found feldmark grass in the known locality between Mount Northcote and Mount Lee, one small site south of Mount Northcote Summit and on the south-western slopes of Mount Clarke within an area 500 by 200 metres (Map 3). Survey of the Etheridge Ridge and Kangaroo Ridge sites were unsuccessful with no feldmark grass found. Three of the Kangaroo Ridge sites supported feldmark vegetation, the northern mapped patch did not and was grassland vegetation (Map 4) (Appendix A, patch 2).



Map 3 Mapped areas of Windswept Feldmark, Mount Clarke and South of Mount Northcote Summit.
Map: G. Wright/DPIE



 Windswept Feldmark (Costin, 2000)

Map 4 Mapped areas of Windswept Feldmark, Kosciuszko National Park (Costin, 2000)
Map: G. Wright/DPIE

5. Discussion

The purpose of the 2018–19 work was to trial a monitoring method for the feldmark grass, survey un-substantiated distribution records, and re-survey a number of areas of feldmark vegetation that had not been surveyed since 1998. This work was done to update the current knowledge of the species distribution in the alpine area of Kosciuszko National Park. Prior to this survey the distribution of the species was thought to be confined to the area of feldmark vegetation between Mount Lee and Mount Northcote, although a number of recent records indicated a larger distribution. Results of this survey have confirmed two new sites for the species, one on Mount Clarke and the other south of Mount Northcote. These sites are 700 metres and one kilometre respectively from the southern end of the Northcote population (Map 2) and increase the area of occupancy from 4 km² to 8 km².

Surveys conducted in 1998, prior to the development of the Threatened Alpine Flora Recovery plan (NSW NPWS, 2001), did not find feldmark grass on Mount Clarke despite thorough searches of the feldmark vegetation that occurs there. The extent of the current distribution and the density of plants found at this site suggest that the 1998 surveys would have found this population, although if only a few plants had been present it is possible that these were overlooked. This observation suggests that the species is currently expanding its range. Not all unconfirmed records were surveyed in the 2018–19 surveys and future work will target these sites and may increase the known distribution of the species further.

Seed was collected at the Northcote area population of feldmark grass in February 2019, for the second consecutive year, by staff from the Australian PlantBank, Mount Annan (G. Phillips per. comm. 19 June 2019). These collections supplement the earlier 2008 collection by staff from the Australian National Botanic Gardens, Canberra (Table 2). A germination trial was run on the 2018 collection of *Rytidosperma pumilum* seed (50 seeds). The results of this trial indicate that the seeds have a physiological dormancy. The spike in germination after the exposure to gibberellic acid indicates that some of the seeds have a non-deep physiological dormancy but the limited response suggests the remaining seeds may have a deeper level of physiological dormancy (G. Errington pers. comm. 27 June 2019). The final germination rate was 50%. This result indicates the Northcote population of feldmark grass is currently producing viable seed which can germinate under certain conditions.

Threats to this species at the sites surveyed currently appear to be minimal. The impacts associated with trampling on the walking track have been greatly reduced by the construction of a new track along an alignment which avoids both the windswept feldmark community and the feldmark grass habitat. The impact of fire and climate change on this species is unknown, although compositional change to the community in which it occurs has been documented after wildfire (Pickering, 2017).

5. Recommendations

The following recommendations are made in response to the survey findings:

- Undertake surveys in suitable habitat within the known distribution to locate any additional populations.
- Continue seed collection program to increase seed bank collections of the species to safeguard the species in the longer term.

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Appendix A – Survey details

Site 1



Grid ref: (GDA94, Z55): Easting: 614719; Northing: 5967364 **Date:** 22 February 2019

Elevation: 2080 m **Slope:** 10° **Aspect:** 150 ° SSE

Location: Kosciuszko National Park, saddle near Moraine Pass, between Mount Northcote and Mount Clarke. Approx. 290m south of Mount Northcote Summit.

Habitat: Feldmark

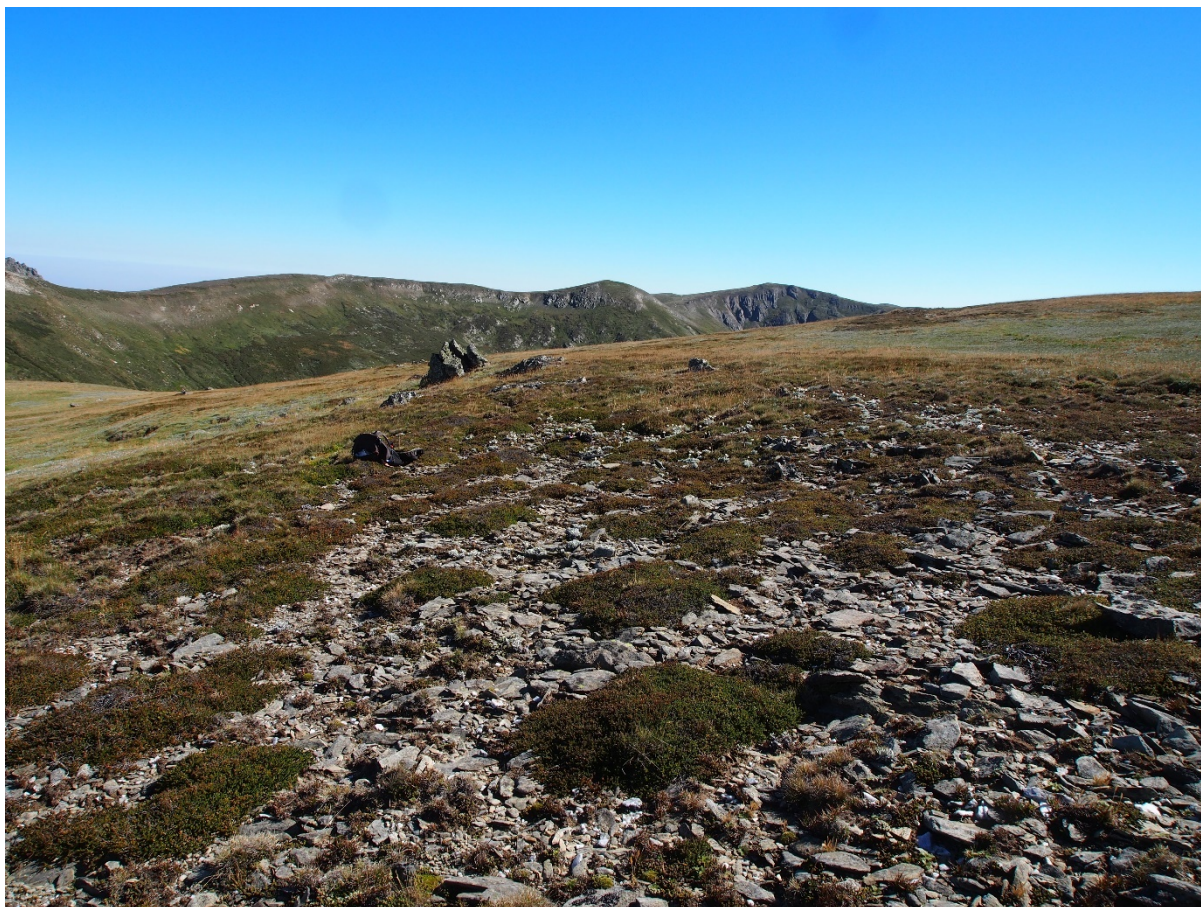
Geology: Granite **Landform:** Upper slope.

Associated species: Silver ewartia (*Ewartia nubigena*); alpine stackhousia (*Stackhousia pulvinaris*); feldmark woodrush (*Luzula australasica* subsp. *dura*), feldmark cushion-plant (*Colobanthus pulvinatus*), Mueller's bent (*Agrostis muelleriana*), felted buttercup (*Ranunculus muelleri*), bristle grass (*Trisetum spicatum*).

Threats: None apparent.

Notes: This is a new site found in the 2018/19 surveys. It is unusual in that the dominant species in the feldmark vegetation are silver ewartia (*Ewartia nubigena*) and alpine stackhousia (*Stackhousia pulvinaris*) rather than *Epacris microphylla* s.l. A herbarium collection was made at this site and has been verified (GTW591).

Site 2



Grid ref: (GDA94, Z55): Easting: 615333; Northing: 5967273 **Date:** 22 February 2019
Elevation: 2080 m Slope: 5° Aspect: 260 °W

Location: Kosciuszko National Park, Mount Clarke. Western side of Mount Clarke approx. 150 m from the summit.

Habitat: Feldmark

Geology: Granite **Landform:** Upper slope.

Associated species: *Epacris* (*Epacris microphylla* s.l.), silver ewartia (*Ewartia nubigena*); alpine sunray (*Leucochrysum alpinum*), feldmark snow-hebe (*Veronica densifolia*), feldmark cushion-plant (*Colobanthus pulvinatus*), smooth blue snowgrass (*Poa fawcettiae*)

Threats: None apparent.

Notes: This site falls within one of the GLORIA sites and feldmark grass was first recorded in the 2004 surveys. The dominant species in the feldmark vegetation at this site is *Epacris* (*Epacris microphylla* s.l.). A herbarium collection was made at this site and has been verified (GTW592).

Ethridge Ridge



Grid ref: (GDA94, Z55): Easting: 614142; Northing: 5964838 **Date:** 8 April 2019

Elevation: 2120 m Slope: 5° Aspect: NW

Location: Kosciuszko National Park, Etheridge Ridge.

Habitat: Feldmark

Geology: Granite **Landform:** ridge crest.

Threats: None apparent.

Notes: This site was surveyed on 8 April 2019, no plants were found.

Kangaroo Ridge

Patch 1



Grid ref: (GDA94, Z55): Easting: 617414; Northing: 5964650 **Date:** 8 April 2019

Elevation: 2060 metres Slope: 5° Aspect: SE

Location: Kosciuszko National Park, Kangaroo Ridge.

Habitat: Feldmark

Geology: Granite **Landform:** Ridge crest.

Threats: None apparent.

Notes: This site was surveyed on 8 April 2019, no feldmark grass plants were found.

Patch 2



Grid ref: (GDA94, Z55): Easting: 618091; Northing: 5964830 **Date:** 8 April 2019

Elevation: 2060 m Slope: 5° Aspect: SE

Location: Kosciuszko National Park, Kangaroo Ridge.

Habitat: Grassland

Geology: Granite **Landform:** Ridge crest.

Threats: None apparent.

Notes: This site was surveyed on 8 April 2019, and habitat was found not to be feldmark. Survey was done in the vicinity to find the mapped feldmark vegetation patch but it could not be found.

Patch 3

Grid ref: (GDA94, Z55): Easting: 618288; Northing: 5964619 **Date:** 8 April 2019

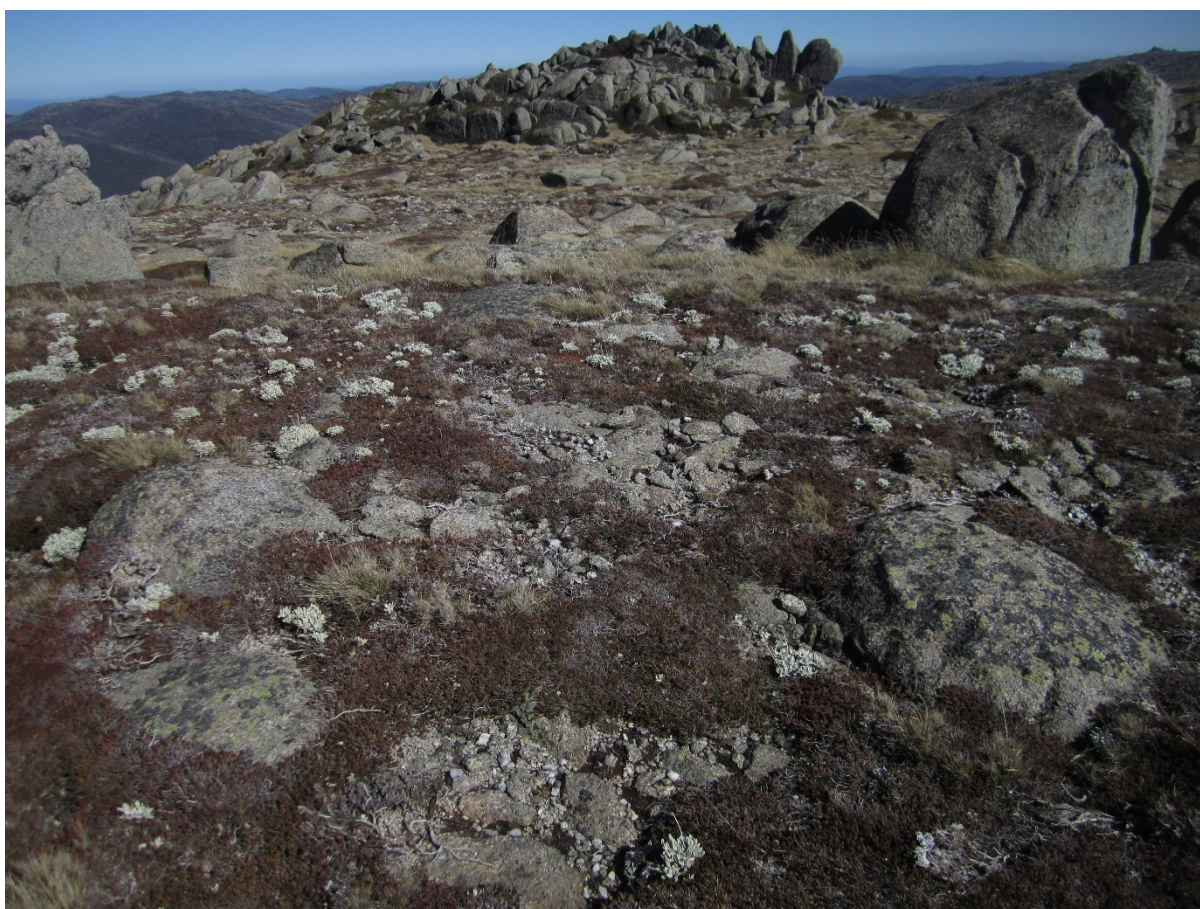
Elevation: 2060 m **Slope:** 5° **Aspect:** NE

Location: Kosciuszko National Park, Kangaroo Ridge. **Habitat:** Feldmark

Geology: Granite **Landform:** Ridge crest. **Threats:** None apparent.

Notes: No image taken, but similar to patch 1. A small patch of feldmark vegetation surrounded by larger boulders on the crest of Kangaroo Ridge. This site was surveyed on 8 April 2019, no feldmark grass plants were found.

Patch 4



Grid ref: (GDA94, Z55): Easting: 618288; Northing: 5964619

Date: 8 April 2019 **Elevation:** 2060 m **Slope:** 5° **Aspect:** NE

Location: Kosciuszko National Park, Kangaroo Ridge. **Habitat:** Feldmark

Geology: Granite **Landform:** Ridge crest. **Threats:** None apparent.

Notes: A large conglomeration of patches separated by low and high boulders, and step-ups. Two grid references identify the core of the larger patches (618198/ 596435 to 618196/5964409). The sites were mostly centred on the crest or along the western edge of the crest of Kangaroo Ridge (windward side).

Appendix B – Herbarium collections

Table 1 Herbarium collections (AVH 2019) and recent

Collection number/s	Collector	Collection date	Location
NSW 9371	Skoltsberg C	11/03/1949	Mt Kosciusko, near Lake Albina
CANB 236388.1	McVean DN	1/01/1965	Northcote feldmark, Kosciusko area
CANB 452182.1	Unknown	11/04/1966	Mt Lee
NSW 317828 / CANB 236390.1	McVean DN	28/01/1967	Northcote Pass, Mt Kosciusko
CANB 236389.1	Totterdell C	12/02/1970	Mt Northcote – Mt Lee saddle, Kosciusko area
CANB 463534.1	Totterdell C	24/02/1972	Mt Northcote – Mt Lee, Kosciusko area
NSW 369553 / NSW 369552	Harden GJ	2/02/1994	Northcote Pass, between Mount Northcote and Mount Lee
NSW 448115	Crestani D	2/02/2000	1 km E of Seamans Hut
MEL 2275945A	Walsh NG.	10/02/2004	Top of Main Range on saddle SW of Carruthers Peak, between Mount Lee and Northcote Pass
CANB 770497.1	McAuliffe J	13/03/2008	Kosciuszko National Park, Main Range at the summit of Mt Lee
NSW 1003799	Phillips GP	22/02/2018	Main Range Track, approx 280m SW of Mt Lee summi.
CANB number not allocated yet	Wright GT; Blyth A	22/02/2019	Kosciuszko National Park, saddle near Moraine Pass, between Mount Northcote and Mount Clark
CANB number not allocated yet	Wright GT; Blyth A	22/02/2019	Kosciuszko National Park, western side of Mount Clark, approx. 150m from summit

Table 2 Feldmark Grass Seed Collections

Accession number	Collector/s	Collection date	Location	No. seeds
CANB 770497.2	McAuliffe J; Sweet H; Phillips A	13/03/2008	Main Range at the summit of Mt Lee	2490
NSW P2018-0163	Phillips GP, Willis K	22/02/2018	Main Range Track, approx. 280m SW of Mt Lee summit	640*
NSW P2019-0228	Phillips GP, Cuneo PV	01/02/2019	Northcote Pass	896

* – half of this seed collection was sent to the Millennium Seed Bank, Kew Gardens.