

NSW Threatened Species Scientific Committee

Notice of and reasons for the Final Determination

The NSW Threatened Species Scientific Committee, established under the *Biodiversity Conservation Act 2016* (the Act), has made a Final Determination to list Snowpatch Feldmark in the Australian Alps bioregion as a CRITICALLY ENDANGERED ECOLOGICAL COMMUNITY in Part 1 of Schedule 2 of the Act. Listing of Critically Endangered Ecological communities is provided for by Part 4 of the Act.

This determination contains the following information:

- Parts 1 & 2:** Section 1.6 of the Act defines an ecological community as “an assemblage of species occupying a particular area”. These features of Snowpatch Feldmark in the Australian Alps bioregion are described in Parts 1 and 2 of this Determination, respectively.
- Part 3:** Part 3 of this Determination describes the eligibility for listing of this ecological community in Part 1 of Schedule 2 of the Act according to criteria prescribed by the *Biodiversity Conservation Regulation 2017*.
- Part 4:** Part 4 of this Determination provides additional information intended to aid recognition of this community in the field.

Part 1. Assemblage of species

- 1.1 Snowpatch Feldmark in the Australian Alps bioregion (hereafter referred to as Snowpatch Feldmark) is characterised by the assemblage of species listed below.

<i>Agrostis muelleriana</i>	<i>Isolepis montivaga</i>
<i>Argyrotegium mackayi</i>	<i>Luzula acutifolia</i> subsp. <i>nana</i>
<i>Carex cephalotes</i>	<i>Luzula australasica</i> subsp. <i>dura</i>
<i>Colobanthus nivicola</i>	<i>Neopaxia australasica</i>
<i>Coprosma niphophila</i>	<i>Poa fawcettiae</i>
<i>Epilobium tasmanicum</i>	<i>Ranunculus anemoneus</i>
<i>Erigeron setosus</i>	<i>Ranunculus muelleri</i>
<i>Euphrasia collina</i> subsp. <i>diversicolor</i>	<i>Senecio pinnatifolius</i> var. <i>alpinus</i>
<i>Ewartia nubigena</i>	

- 1.2 The total species list of the community across all occurrences is likely to be considerably larger than that given above. Due to variation across the range of the community, not all of the above species are present at every site and many sites may also contain species not listed above.

Characteristic species may be abundant or rare and comprise only a subset of the complete list of species recorded in known examples of the community. Some characteristic species show a high fidelity (are relatively restricted) to the community, but may also occur in other communities, while others are more typically found in a range of communities.

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The number and identity of species recorded at a site is a function of sampling scale and effort. In general, the number of species recorded is likely to increase with the size of the site and there is a greater possibility of recording species that are rare in the landscape.

Species presence and relative abundance (dominance) will vary from site to site as a function of environmental factors such as soil properties (chemical composition, texture, depth, drainage), topography, climate and through time as a function of disturbance (e.g. fire, logging, grazing) and weather (e.g. flooding, drought, extreme heat or cold).

At any one time, above ground individuals of some species may be absent but the species may be represented below ground in the soil seed bank or as dormant structures such as bulbs, corms, rhizomes, rootstocks or lignotubers.

The species listed above are vascular plants, however the community also includes micro-organisms, fungi and cryptogamic plants as well as vertebrate and invertebrate fauna. These components of the community are less well documented.

Part 2. Particular area occupied by the ecological community

- 2.1 The assemblage of species listed in Part 1.1 above which characterises Snowpatch Feldmark occurs within the Australian Alps bioregion. This bioregion is defined by SEWPaC (2012) Interim Biogeographic Regionalisation for Australia, Version 7. Department of Sustainability, Environment, Water, Population and Communities.
<http://www.environment.gov.au/parks/nrs/science/bioregion-framework/ibra/maps.html>
- 2.2 It is the intent of the NSW Threatened Species Scientific Committee that all occurrences of the ecological community (both recorded and as yet unrecorded, and independent of their condition) that occur within this bioregion be covered by this Determination.

Part 3. Eligibility for listing

- 3.1 Reasons for determining eligibility for listing
 - 3.1.1 The geographic distribution of Snowpatch Feldmark is very highly restricted. The extent of occurrence of Snowpatch Feldmark is 104 km² based on a minimum convex polygon enclosing known occurrences of the community and using the method of assessment recommended by IUCN (Bland *et al.* 2016). The estimated area of occupancy (AOO) is one 10 x 10 km grid cell, the scale recommended for assessing AOO by IUCN and applying a minimum occupancy threshold of 1% (Bland *et al.* 2016). The distribution of Snowpatch Feldmark was estimated using Costin *et al.*'s (2000) map of native vegetation of the Snowy Mountains Main Range and from an unconfirmed record (Wimbush & Costin 1979) of the community from the Gungahran area. Costin *et al.* (2000) noted that the mapped distribution of this community includes bare areas associated with late-lying snow and therefore its extent has likely been overestimated.
 - 3.1.2 The assemblage of species which characterises Snowpatch Feldmark is restricted to areas with late-lying snowpatches, the area of which is in decline. Davis (2013) demonstrated that snow depth and cover duration have declined in the Snowy Mountains since the late 19th century, with the greatest decline in the most recent years. Edmonds *et al.* (2006) have shown that the area of late-lying snowpatches is correlated with snow depth as measured

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at several locations within Kosciuszko National Park. Modelling of future snow conditions in the Australian alpine regions has projected continuing declines in both the area and the length of time those areas are covered by snow (Hennessy *et al.* 2003). Pickering *et al.* (2014) have linked earlier thaw of snowpatches to changes in floristic composition caused by the invasion from surrounding communities of species which presently rarely occur in areas of late-lying snow cover. While weeds have rarely been recorded in Snowpatch Feldmark in the past (McDougall and Walsh 2007), possible increases in temperature due to climate change may facilitate the invasion of weed species (Pickering 2007). 'Anthropogenic climate change' is listed as a Key Threatening Process under the Act.

3.2 Criteria for listing

Snowpatch Feldmark in the Australian Alps bioregion is eligible to be listed as a Critically Endangered Ecological Community in accordance with Part 4 of the Act as, in the opinion of the NSW Threatened Species Scientific Committee, it is facing an extremely high risk of extinction in Australia in the immediate future, as determined in accordance with the following criteria as prescribed by the *Biodiversity Conservation Regulation 2017*:

Clause 4.10 – Restricted geographic distribution of ecological community
(Equivalent to IUCN criterion B)

The ecological community's geographic distribution is:			
	(a)	for critically endangered ecological communities	very highly restricted.
and the following conditions apply:			
	(e)	There are threatening processes that are likely to cause continuing decline in either geographic distribution, environmental quality or biotic interactions within the near future,	
	(f)	The ecological community exists at:	
	(i)	for critically endangered ecological communities	an extremely low number of locations

Clause 4.12 – Disruption of biotic processes or interactions in ecological community
(Equivalent to IUCN criterion D)

The ecological community has undergone or is likely to undergo within a time span appropriate to the life cycle and habitat characteristics of its component species:			
	(a)	for critically endangered ecological communities	a very large disruption of biotic processes or interactions.

Dr Marco Duretto
Chairperson
NSW Threatened Species Scientific Committee

Exhibition period: 27/04/18 – 22/06/18

Proposed Listing date: 27/04/18

Part 4. Additional information about the ecological community

The following information is additional to that required to meet the definition of an ecological community under the Act, but is provided to assist in the recognition of Snowpatch Feldmark in the Australian Alps bioregion in the field. Given natural variability, along with disturbance history, Snowpatch Feldmark may sometimes occur outside the typical range of variation in the features described below.

- 4.1 Snowpatch Feldmark is characterised by a sparse cover of small prostrate shrubs and low herbs amongst an exposed rocky substrate. Mats of *Coprosma niphophila* may be locally dominant with compact tufts of *Colobanthus nivicola* also frequent. Other common species include *Epilobium tasmanicum*, *Neopaxia australasica*, *Poa fawcettiae*, *Agrostis muelleriana*, *Luzula acutifolia* subsp. *nana*, *Luzula australasica* subsp. *dura* and *Senecio pinnatifolius* var. *alpinus* (McDougall and Walsh 2007). Snowpatch Feldmark falls within the Alpine Fjaeldmarks vegetation class of Keith (2004).
- 4.2 Snowpatch Feldmark has been recorded from the alpine area of Kosciuszko National Park on the Great Dividing Range and nearby spurs and peaks (Costin 1954; McDougall and Walsh 2007). The community occurs on the well-drained upper slopes of areas occupied by late-lying snowpatches, that is, snowdrifts that persist into summer after the surrounding snow has melted (Edmonds *et al.* 2006; Costin *et al.* 2000). McDougall and Walsh (2007) recorded the *Coprosma-Colobanthus* alliance (Snowpatch Feldmark) between 2,050 and 2,200 m a.s.l. Snowpatch Feldmark has been mapped by Costin *et al.* (2000) as scattered slender patches on east to south facing slopes, generally above approximately 1,800m a.s.l. Costin *et al.* (2000) noted that the mapped distribution of this community includes bare areas associated with late-lying snow and therefore its extent has likely been overestimated. Costin *et al.* (2000) have mapped Snowpatch Feldmark between Mount Kosciuszko in the south west and Mount Tate in the north east, Mount Townsend in the north west and Mount Stilwell in the south east. They recorded 107 patches with a mean area of 1.5 ha and a north – south range of 14 km (Costin *et al.* 2000).
- 4.3 Wimbush and Costin (1979) noted the presence of feldmark (although they didn't identify Snowpatch Feldmark specifically) and late-lying snow patches near Gungartan, a mountain 2,068 m high situated 9 km north east of Mount Tate. Twelve of the 17 species McDougall and Walsh (2007) identified as characterising Snowpatch Feldmark have been recorded within 5 km of Gungartan: *Colobanthus nivicola*, *Agrostis muelleriana*, *Argyrotegium mackayi*, *Epilobium tasmanicum*, *Euphrasia collina* subsp. *diversicolor*, *Ewartia nubigena*, *Isolepis montivaga*, *Luzula australasica* subsp. *dura*, *Poa fawcettiae*, *Ranunculus anemoneus*, *Ranunculus muelleri*, *Senecio pinnatifolius* var. *alpinus* (ALA 2017). It is not known if Snowpatch Feldmark exists in this area at present. Gungartan is further north than the other known locations of Snowpatch Feldmark and has only a small area of habitat typical of Snowpatch Feldmark (south to east facing slopes above 1,800m a.s.l.). Hence late-lying snowpatches in this area are rarer and potentially more vulnerable to climate warming.
- 4.4 The component species of Snowpatch Feldmark survive on steep, skeletal soils and are subject to a short period of insolation due to snow cover and aspect (McDougall and Walsh 2007). These physical constraints are probably responsible for a lack of competition from species of adjacent communities (Pickering *et al.* 2014).

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- 4.5 Dry, wind-exposed areas above Snowpatch Feldmark typically support the Endangered Ecological Community Windswept Feldmark listed under the Act (Community 40, *Epacris gunnii* - *Chionohebe pulvinatus* Feldmark of McDougall and Walsh (2007)). Wet, sparsely vegetated areas below Snowpatch Feldmark often support Snowpatch Herbfield, Community 13 of McDougall and Walsh (2007). Snowpatch Herbfield in the Australian Alps bioregion is listed as a Critically Endangered Ecological Community in Part 1 of Schedule 2 of the Act. Well-drained areas near Snowpatch Feldmark, but away from the influence of late-lying snowpatches, support the grassland communities of Tall Alpine Herbfield (sensu Costin 1954); communities 18, 19 and 22 of McDougall and Walsh (2007).
- 4.7 Snowpatch Feldmark is likely to contain several threatened plant species including those listed in the table below:

Species	BC Act*	EPBC+
<i>Ranunculus anemoneus</i>	Vulnerable	Vulnerable
<i>Rytidosperma pumilum</i>	Vulnerable	Vulnerable
<i>Argyrotegium nitidulum</i>	Vulnerable	Vulnerable

*Biodiversity Conservation Act 2016

+ Environment Protection and Biodiversity Conservation Act 1999

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