

# Action statement No.102

Flora and Fauna Guarantee Act 1988

Southern Shepherd's Purse *Ballantinia antipoda*



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# Southern Shepherd's Purse *Ballantinia antipoda*

### Description

Southern Shepherd's Purse (*Ballantinia antipoda*) is a small, cool-season annual of the Cress family (Brassicaceae). The sparsely haired, prostrate stems up to 5 cm high arise from a rosette of stalked, spoon-shaped leaves which are often divided into three parts. Small, stalked white flowers, 4mm in diameter occur along the upper stems, developing into small elliptical fruits (siliculae) 3-5 mm long (Shaw 1974, Hewson 1982).

### Distribution

Southern Shepherd's Purse is endemic to south-eastern Australia, but has disappeared from almost all known locations across its historic range in Victoria and Tasmania. The species is now believed to be restricted to Mount Alexander in central Victoria, with almost all known patches occurring within the Mount Alexander Regional Park. A small patch was also found on adjacent private land in 2013 (Foreman 2014). In the period 2011 to 2014 the metapopulation varied between 70 and 120 discrete patches; the number of patches in a given year is largely dependent on environmental conditions, particularly winter rainfall.

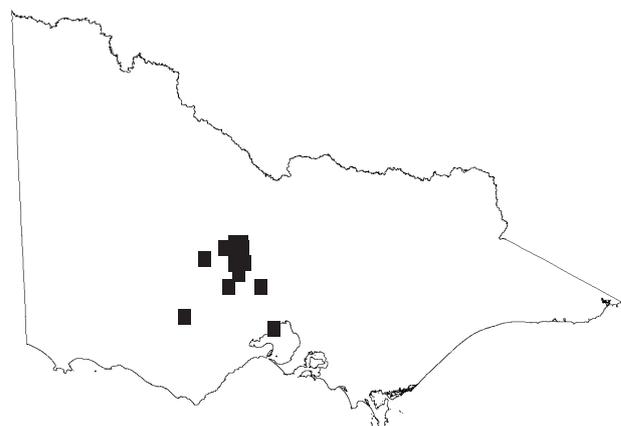
### Habitat

Southern Shepherd's Purse grows in a very specific and probably finely balanced habitat - moss mats on seepage areas in open situations. Populations are usually discrete, in areas with a light canopy of Manna Gum (*Eucalyptus viminalis*) and more rarely Messmate (*E. obliqua*). Southern Shepherd's Purse is rare or absent from moss mats on deeper soils in depressions and cracks in the rocks where other vascular annuals are common, but has been found in soil and leaf litter at the bottom of some granite boulders. Unlike many other annuals of the Cress Family, both native and introduced, Southern Shepherd's Purse does not occur on recently disturbed mineral soils (Alexander 1999).

Southern Shepherd's Purse predominantly occurs on sheltered easterly aspects, with some occurring on slightly sheltered west to south-west aspects. The species mostly occurs at elevations greater than 525 m above sea level (ASL), with greater population densities at higher elevations, and on gentle slopes less than 40 degrees (Foreman 2014a).

Southern Shepherd's Purse shares its moss mat habitat with a diverse range of other indigenous annual and geophytic vascular plants typical of seasonally moist or rocky sites in central and northern Victoria. The dominant species of moss in this habitat is *Breutelia affinis*, with other common species including *Bartramia papillata*, *Grimmia pulvinata*, *Polytrichum juniperinum*, *Campylopus introflexus* and *Bryum billardieri*. *Leptodon smithii*, a rare moss, has been recorded in this habitat on Mount Alexander (Cook 1998). Invasive weed species of moss mats include Bulbous Meadow-grass (*Poa bulbosa* var. *bulbosa*), Elegant Hair-grass (*Aira elegans*), Chickweed (*Cerastium glomeratum*), Small Quaking-grass (*Briza minor*), Smooth Cat's-ear (*Hypochaeris glabra*), Five-anthered Corn Spurrey (*Spergularia pentandra*), Whitlow Grass (*Erophila verna*) and St John's Wort (*Hypericum perforatum*) (Alexander 1999; Foreman 2014c).

Areas where Southern Shepherd's Purse was previously known to exist and places listed as potentially suitable habitat including Mount Cole, Mount Buangor and Mount Langi Ghiran are composed of a different type of granite than that found at Mount Alexander (LCC 1978). These mountains seem to support different moss mat habitats than those found on Mount Alexander, the most similar being found on Mount Langi Ghiran. The flora of the more westerly granite outcrops is quite distinct, with *Cardamine lilacina* seeming to fill a similar ecological niche to *Ballantinia antipoda* (Cook 1998).



Distribution in Victoria (DELWP, 2015)

Some 19th century collection localities (Shaw, 1974) suggest that Southern Shepherd's Purse may also have occurred on basaltic rocks, e.g. 'plains near Carisbrook', Whan (MEL 18236), 'Werribee', Fullagar (MEL 18228). The evidence from Mount Alexander suggests it would have occurred on 'stony rise' sites particularly where there was water seepage.

## Life History and Ecology

Southern Shepherd's Purse is an annual species, thus the maintenance of populations through time is completely dependent on seed stored in the soil from the seed-crop of previous years. While there is currently no specific data on the longevity of Southern Shepherd's Purse seed, the 2013 emergence of plants on moss mats where it had not previously been detected suggest that it is likely to remain viable for several years, as do many other genera of Brassicaceae (Alexander 1999; Foreman 2014c).

Southern Shepherd's Purse germinates in winter and is in full flower by mid to late September. Seed set generally occurs as the moss mats begin to dry out in mid to late spring, but can occur rapidly if drying winds are experienced in early spring. The conspicuous white flowers attract a variety of insects including native ants and introduced honeybees (Alexander 1999).

Southern Shepherd's Purse is not always detected at known locations, which suggests that the species may not germinate every year. Germination, growth and flowering of the species appears to be dependent on factors such as the timing and intensity of the seasonal 'break' in autumn or early winter, the maintenance of seepage flow of water beneath the moss mats and the severity of desiccation of the moss mats during the months of September and October. The temperature and rainfall patterns of those months are believed to be important in determining such desiccation effects (Nevill and Camilleri 2010).

Little is known about the effect of fire on Southern Shepherd's Purse or its moss mat habitat. Bryophytes are usually early colonisers following fire (Askey-Doran 1990) however it may take many years for the moss mats to regrow. While Mount Alexander has been completely burnt over in the past (Forest Commission of Victoria) it is possible that small pockets of moss have remained unburnt.

## Conservation status

### National conservation status

Southern Shepherd's Purse (*Ballantinia antipoda*) has been listed as endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

### Victorian conservation status

Southern Shepherd's Purse (*Ballantinia antipoda*) has been listed as threatened under the Victorian *Flora and Fauna Guarantee Act 1988*.

Southern Shepherd's Purse (*Ballantinia antipoda*) is considered endangered in Victoria according to the Department of Environment, Land, Water and Planning (DELWP)'s *Advisory List of Rare or Threatened Plants in Victoria - 2014* (DEPI 2014).

## Threats

Most Victorian records and the sole Tasmanian record of Southern Shepherd's Purse date from the 19th century - the species was presumed extinct until it was rediscovered at Mount Alexander in 1983. While the decline of Southern Shepherd's Purse was not well documented, loss of habitat through clearing of native vegetation for agriculture is believed to have played a major role, along with grazing by sheep (*Ovis aries*) and European Rabbits (*Oryctolagus cuniculus*) (Neville and Camilleri 2010).

Current threats to Southern Shepherd's Purse include weed invasion, changes to micro-hydrology, human recreational activities, construction and maintenance of roads and tracks, and disturbance by introduced and native animals.

Standard threat	Source of threat	Explanation
Competition	Invasion by environmental weeds	Of the various weed species which invade moss mat habitat, Bulbous Meadow-grass ( <i>Poa bulbosa</i> var. <i>bulbosa</i> ) is believed to represent the most significant threat. Bulbous Meadow-grass is an aggressive coloniser of areas with shallow soils and seasonal drying patterns; there is evidence to suggest that it is encroaching into a number of moss mats containing Southern Shepherd's Purse (Foreman 2014c).
Habitat damage or loss	Animals - introduced herbivores	<p>Grazing and disturbance by introduced herbivores has been known to cause significant damage to the moss mats which support Southern Shepherd's Purse. Digging by European Rabbits can severely degrade moss mats - while rabbit numbers are low at present, they may increase rapidly if not continuously controlled. Feral Pigs (<i>Sus scrofa</i>) remain a potential threat, having been deliberately introduced to Mount Alexander in the 1990s and remaining there in low numbers. Goats (<i>Capra aegagrus hircus</i>) may represent an emerging threat if escapees from small-scale goat farms in the surrounding district are able to establish a feral population in the park (Nevill and Camilleri 2010). Deer (<i>Cervus</i> sp.) have been observed on the west side of Mt Alexander; their impacts are not known.</p> <p>The findings of the 2014 population census suggest that the current impact of introduced animals is negligible (Foreman 2014c).</p>
	Animals - native species	Swamp Wallabies ( <i>Wallabia bicolor</i> ) and Eastern Grey Kangaroos ( <i>Macropus giganteus</i> ) trample populations of Southern Shepherd's Purse although it is unclear whether this has a detrimental effect (Foreman 2014a). The net impact of White-winged Choughs ( <i>Corcorax melanoramphos</i> ), which are known to upturn moss mats while foraging for invertebrates, is also uncertain (Seidel <i>et al.</i> 2005; Foreman 2011). The findings of the 2014 population census do however suggest that the current impact of native animals is negligible (Foreman 2014c).
Surface water - quantity/regime	Water - level/ flow changes	Inappropriately placed vehicle tracks, walking tracks and firebreaks have been shown to result in hydrological changes and increased siltation, the effects of which may be seen some distance from the site of the original disturbance. Moss mats may become sufficiently degraded that they are no longer able to support Southern Shepherd's Purse (Nevill and Camilleri 2010). Upslope weed infestations have also been shown to adversely impact on the micro-hydrology of Southern Shepherd's Purse habitat by utilising water that would normally flow over moss mats (Foreman 2014c).

Standard threat	Source of threat	Explanation
Human disturbance	Recreational activities - motorised (4wds, trail bikes, boats etc.)	Illegal trail bike riding and four-wheel driving across rock faces strips away moss mat cover. This can disrupt local seepage patterns leading to further removal of moss mats by water flow after heavy rain (Nevill and Camilleri 2010) and leave damaged areas susceptible to weed invasion.
	Recreational activities - non-motorised	Disturbance associated with unauthorised or inappropriately located walking and cycling tracks has been shown to have a significant impact on Southern Shepherd's Purse. The likely mechanism by which populations are impacted is through trampling, which leads to weed invasion, micro-hydrological changes and other indirect effects. Where this disturbance is sufficiently severe or persistent, habitat condition deteriorates and patches of Southern Shepherd's Purse may become extinct (Foreman 2014c). In the past, moss mats have also been deliberately removed by fishermen (to keep scrub worms moist) and plant growers (for bonsai pots) (Nevill & Camilleri 2010).
Weather	Weather - climate change	Loss of habitat due to climate change is listed as a Key Threatening Process for Southern Shepherd's Purse under the Commonwealth EPBC Act. This species mostly occurs above 525m ASL, so it is highly likely that climate change will result in an overall contraction of suitable habitat as the shallow moss mats on lower slopes become increasingly warm and dry (Foreman 2014b). Lower rainfall is also likely to result in reduced seed germination and increased loss of seedlings.

## Important locations

Catchment	Location name	Land manager	Bioregion
NORTH CENTRAL	Mount Alexander R.P.	Parks Victoria	Goldfields

## Past management actions

Action	Result explanation
Involve community groups and volunteers in recovery activities	Local Landcare groups and Bendigo TAFE have been involved in monitoring, field days and weed control activities throughout the past decade.  In the past, conservation of Southern Shepherd's Purse has also been promoted through the Land for Wildlife program, fact sheets, displays at community events and interpretive signage.
Manage environmental weeds	Weed spraying has been carried out annually, primarily targeting woody weeds (e.g. Blackberry) and St John's Wort.  A weed control trial was undertaken in 2009 using a combination of hand weeding and herbicide application to manage weeds in moss mats. It is unclear whether the methods were effective as the results of the trial were not well documented.

Erect/maintain structures to restrict or control access	Several significant populations protected through walking track closures, deviations and vehicle barrier fencing. In the mid-2000s protective caging and visual deterrents were erected over some patches to prevent White-winged Choughs causing physical disturbance to the moss mats. The cages were removed in early 2012 when it was observed that Southern Shepherd's Purse had declined in caged sites, likely as the result of abundant growth of robust moss species in the absence of disturbance.
Identify potential sites for reintroduction/translocation	At least 25 potential recipient sites for future reintroduction have been identified at Mount Alexander, with a further three sites identified at Tallarook State Forest.
Establish and maintain a reintroduced/translocated population	Since 1999 at least five attempts have been made to establish new populations of Southern Shepherd's Purse: at Mount Tarrengower in 1999, in unoccupied habitat at Mount Alexander in 2003, 2013 and 2014, and at Tallarook State Forest in 2014. The 2014 reintroduction at Tallarook is considered to be a limited success, with a small number of reintroduced seeds germinating and flowering in both 2014 and 2015. The ecology of the species does however mean that it won't be known for several years whether a self-sustaining population has been established at Tallarook.
Control introduced animals	Rabbit control and active entrance warren monitoring have been carried out regularly at Mt Alexander.
Map habitat	All 235 known moss mats on public and private land at Mount Alexander were visited and assessed for the presence and extent of Southern Shepherd's Purse in 2013 and/or 2014. In 2013, 120 patches of Southern Shepherd's Purse were detected across 57 moss mats; this is the maximum number of discrete patches that have been detected in any one year. Of the remaining moss mats which did not support Southern Shepherd's Purse in 2013, at least 81 are considered to be too degraded to support it in the future.  GPS coordinates have been collected for all 235 moss mats
Undertake research to identify key biological functions	In 2014 the Royal Botanic Gardens Melbourne undertook an experiment to determine temperature requirements and thresholds for germination of Southern Shepherd's Purse seed. Maximum germination was found to occur at 14°C, supporting previous assumptions that the best time to sow seed is in April or May after the mid-autumn break. The study also found that pre-soaking the seeds in gibberellic acid for 24 hours prior to sowing both increases total germination and broadens the temperature range over which the seed will germinate (Hirst 2014).  In 2004 the University of Ballarat (now Federation University) undertook a study into the ecology of Southern Shepherd's Purse and its associated moss mat community. Low field condition of Southern Shepherd's Purse was found to be associated with denser stands of robust moss species such as <i>Breutelia affinis</i> , <i>Polytrichum juniperinum</i> , <i>Campylopus bicolor</i> and <i>C. introflexus</i> , while higher field condition was associated with <i>Triquetrella papillata</i> and <i>C. clavatus</i> . Seed drop in Southern Shepherd's Purse was found to coincide with the period when mosses are dry and have furled leaves, facilitating seed penetration into the soil. The report also suggested that the disturbance caused by foraging White-winged Choughs might assist in the creation and maintenance of suitable habitat for Southern Shepherd's Purse (Seidel <i>et al.</i> 2005).

Acquire baseline population data	Southern Shepherd's Purse is monitored regularly at flowering time, with the 2011, 2013 and 2014 censuses being the most comprehensive to date. Data from these censuses has been uploaded to the Victorian Biodiversity Atlas (VBA).  Metapopulation estimates have been modelled for each habitat precinct.
Prepare a plan for reintroduction/reinforcement/translocation	A reintroduction/translocation plan has been established to guide future attempts.

## Conservation objectives

### Long term objective

To ensure that the Southern Shepherd's Purse can survive, flourish and retain its potential for evolutionary development in the wild.

### Objectives of this Action Statement

- To increase knowledge of biology, ecology or management requirements
- To maintain or increase community awareness and support
- To secure populations or habitat from potentially incompatible land use or catastrophic loss
- To increase the number of populations or individuals
- To maintain or improve condition of habitat

### Intended management actions

The actions in this action statement have been developed taking into consideration relevant social and economic matters, as required under the FFG Act.

These actions are designed to support the conservation, management or control of flora and fauna and the management of potentially threatening processes, which will assist in mitigating any impact of climate change on Southern Shepherd's Purse, and will have no impact on greenhouse gas emissions.

The intended management actions listed below are further elaborated in DELWP's Actions for Biodiversity Conservation (ABC) system. Detailed information about the actions and locations, including priorities, is held in this system and will be updated annually for land managers and other authorities.

Standard objective	Objective explanation	
<b>To increase knowledge of biology, ecology or management requirements</b>	To increase knowledge of the biology, ecology and conservation status of Southern Shepherd's Purse results in targeted management strategies which maintain, enhance or restore regenerative processes fundamental to the species' reproduction and survival in perpetuity.	
Standard action	Details	Responsible agents
Assess habitat characteristics and/or condition	Monitor and report on the condition and suitability of habitat to better inform and target management priorities.  Conduct research into the impacts of trampling by macropods on Southern Shepherd's Purse.	DELWP

Undertake habitat monitoring	Undertake detailed population monitoring and collect demographic information annually.  Submit all records of Southern Shepherd's Purse to the VBA within six months of data collection.	DELWP
Undertake research to identify key biological functions	Investigate the longevity of Southern Shepherd's Purse seeds in the soil seed bank.  Further investigate the relationship between rainfall and temporal population dynamics of Southern Shepherd's Purse.  Investigate the effects of fire on Southern Shepherd's Purse and its moss mat habitat. Use opportunities presented from any planned burns.	DELWP

Standard objective	Objective explanation	
<b>To maintain or increase community awareness and support</b>	To increase participation in programs and activities such as Land for Wildlife, field days and periodic monitoring builds community understanding and support for conserving Southern Shepherd's Purse.	
Standard action	Details	Responsible agents
Involve community groups and volunteers in recovery activities	Continue to promote the conservation of Southern Shepherd's Purse through partnerships with community-based natural resource management groups (including Landcare, Conservation Management Networks and 'Friends Of') and recreational user groups.  Conduct community field days. Investigate engagement scope with mountain bike (MTB) users through track development at plantation site.	DELWP

Standard objective	Objective explanation	
<b>To secure populations or habitat from potentially incompatible land use or catastrophic loss</b>	To minimise damage to Southern Shepherd's Purse and its moss mat habitat by planned burn activities, timber harvesting, recreational activities and construction of new roads, tracks and firebreaks.  Review current track locations (vehicle, walking and cycling tracks) and realign where necessary.	
Standard action	Details	Responsible agents
Provide input into regional fire management and operations plans	Highlight all proposed burns and forest utilisation works with records of Southern Shepherd's Purse, including reintroduced/translocated populations, and provide advice and mitigation measures to land management agencies and proponents of the works.	DELWP

Erect/maintain structures to restrict or control access	<p>Maintain existing track closures to restrict vehicle access to known and potential Southern Shepherd's Purse habitat. Regularly maintain the fence erected near the East of Track population to exclude vehicles; enforce closure of Ballantinia Track and rehabilitate the site under the guidance of an ecological consultant.</p> <p>Avoid the creation of new roads, tracks and firebreaks within 100 metres of moss mats known to support Southern Shepherd's Purse.</p> <p>Ensure adjacent MTB track development does not impact on Southern Shepherd's Purse.</p>	Parks Victoria
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Standard objective	Objective explanation	
<b>To increase the number of populations or individuals</b>	Reduce the vulnerability of Southern Shepherd's Purse to extinction through the establishment of new populations in the wild.	
Standard action	Details	Responsible agents
Establish and maintain a reintroduced/translocated population	Implement the Southern Shepherd's Purse reintroduction plan, with a particular focus on establishing self-sustaining populations in suitable habitat beyond Mount Alexander.	DELWP
Identify potential sites for reintroduction/translocation	Identify suitable recipient sites for future reintroductions across the historic range of Southern Shepherd's Purse. Key priorities for more intensive investigation include Mount Langi Ghiran, Mount Cole, Mount Buangor and the Cobaw Ranges.	DELWP

Standard objective	Objective explanation	
<b>To maintain or improve condition of habitat</b>	Reduce the impacts of invasive weeds, herbivory and disturbance by introduced and native animals on populations of Southern Shepherd's Purse.	
Standard action	Details	Responsible agents
Control introduced animals	<p>Depending on monitoring data engage qualified personnel to regularly control rabbits through baiting, warren destruction and/or shooting.</p> <p>Monitor impacts of other potentially threatening species (e.g. pigs, goats) and implement control measures as required as per guidelines established under Department codes of practice for animal welfare.</p>	Parks Victoria

<p>Manage environmental weeds</p>	<p>Achieve a measurable reduction in weed cover around all affected populations of Southern Shepherd's Purse.</p> <p>Research and trial management practices for removing weeds (e.g. Bulbous Meadow-grass) from moss mats without causing adverse impacts. Control trials could include manual; selective chemical; wick wand application of non-selective herbicide.</p>	<p>Parks Victoria</p>
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