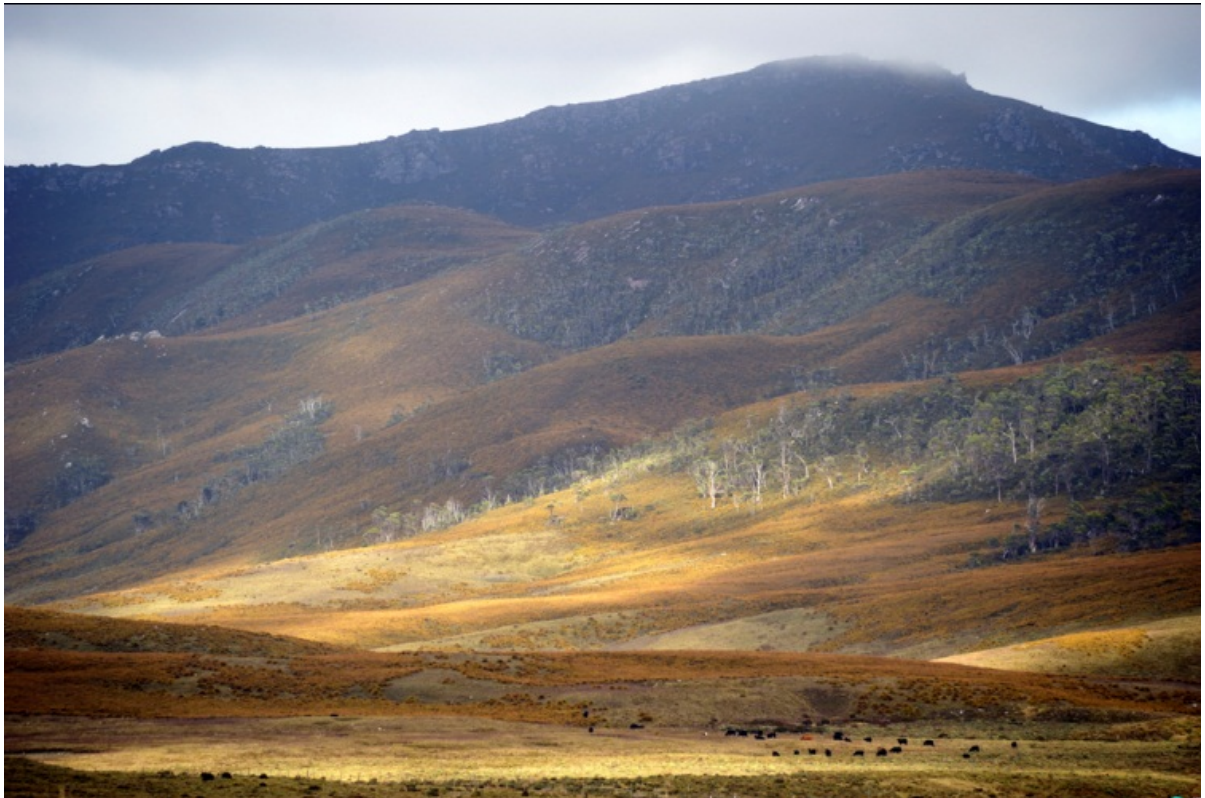




Vale of Belvoir Reserve Management Plan



2013 - 2018

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Acronyms

DPIPWE	Tasmanian Government Department of Primary Industries, Parks, Water and Environment
EPBC Act	Australian <i>Environment Protection and Biodiversity Conservation Act 1999</i>
IUCN	International Union for Conservation of Nature
NC Act	Tasmanian <i>Nature Conservation Act 2002</i>
NVA	Natural Values Atlas database (DPIPWE)
PWS	Tasmania Parks and Wildlife Service
TASVEG	Tasmanian Vegetation Monitoring and Mapping Program (TASVEG 2.0, 19 February 2009)
TFS	Tasmania Fire Service
TLC	Tasmanian Land Conservancy
TSP Act	Tasmanian <i>Threatened Species Protection Act 1995</i>
UTAS	University of Tasmania

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The TLC greatly appreciates the assistance of its supporters, who have provided overwhelming support through donations towards the purchase of the Vale of Belvoir Reserve. TLC supporters continue to assist with management of the reserve, as volunteers and through financial donations. In addition, the Australian Government's Maintaining Australia's Biodiversity Hotspots Programme provided significant financial support for the purchase of the Vale of Belvoir Reserve.

1. Background

1.1 The Tasmanian Land Conservancy

The Tasmanian Land Conservancy (TLC) works towards achieving sustainability and biodiversity conservation in Tasmania, in partnership with other organisations, communities, individuals and governments. The TLC is a non-profit, non-political and non-governmental organisation that began in 2001 and has grown to be a respected leader in private land conservation in Tasmania, nationally and internationally.

TLC 2050 Mission

The mission of the Tasmanian Land Conservancy (TLC) is:

In partnership with other organisations, communities, individuals and governments, the TLC will:

- 1. Take a lead role in building a landscape scale approach to conservation including a world-class system of reserves complemented by sustainable development.*
- 2. Demonstrate excellence in management for biodiversity conservation.*
- 3. Contribute to Tasmania becoming a centre for knowledge and expertise for nature conservation and planning.*
- 4. Develop and implement innovative mechanisms for achieving sustainability and biodiversity conservation.*
- 5. Provide opportunities and mechanisms for communities and individuals to achieve conservation.*
- 6. Demonstrate organisational leadership through exceptional governance, a positive working environment and financial sustainability.*

This management plan and the implementation of the strategies and actions within it, including monitoring and reporting, contribute to the TLC meeting Point 2 of the Mission.

1.2 Management Plan Status

This Vale of Belvoir Reserve draft Management Plan expands on an Interim Management Plan that was prepared immediately following the purchase of the Vale of Belvoir Reserve.

This Management Plan has been developed through consultation with key stakeholders and the public. Comments on the draft Management Plan were received from fourteen individuals or organisations. Many comments recommended the inclusion of additional information regarding monitoring and proposed actions. Where appropriate, these comments were addressed in the final Management Plan. With the aim of keeping the Management Plan as an overview document, a Monitoring Strategy and Annual Action Plan will be available as appendices to the Management Plan once they are finalised.

This Management Plan was finalised on 26 February 2013 when it was approved by the TLC Board of Directors. In meeting obligations under a funding contract for the purchase of the Vale of Belvoir Reserve, this Management Plan was submitted to the Australian Government's National Reserve System on 12 March 2013.

2. Introduction

The Vale of Belvoir Reserve was purchased by the TLC in 2008 and protects 476 ha of highland grassland, woodland and rainforest vegetation. The reserve contains five vegetation communities of conservation significance and thirteen threatened species have been recorded since 2008. In addition, the highland grassland ecosystem at the Vale of Belvoir is one of the most extensive and intact remaining in Tasmania and has exceptional floristic diversity compared to other Tasmanian highland grassland sites.

The Vale of Belvoir has a rich, diverse and unique geology and is a key site for demonstrating geological and geomorphological processes in western Tasmania. It has been partly infilled with basalt and was glaciated in the early part of the last Ice Age. The limestone on the valley floor forms an active karst system, with numerous sinkholes and caves and, at 800 m altitude, is the largest subalpine limestone valley in Tasmania.

Nationally threatened species recorded at the Vale of Belvoir Reserve include the Tasmanian devil (*Sarcophilus harrisii*), spotted-tailed quoll (*Dasyurus maculatus*), wedge-tailed eagle (*Aquila audax fleayi*) and grassland paperdaisy (*Leucochrysum albicans* var. *tricolor*).

The property was owned by the same family from the 1890s to 2008, during which time the grasslands were burnt regularly in a mosaic pattern and grazed by cattle during the summer months. Some grazing infrastructure remains in the Vale, including a cattleman's hut (known as Charleston's Hut), stables and stockyards. It is believed by some grassland ecologists that this historical pattern of disturbance may have promoted the high levels of floristic diversity that is found in the grasslands of the Vale of Belvoir today (Jamie Kirkpatrick, pers. comm.).

The Vale of Belvoir Reserve is surrounded by the Vale of Belvoir Conservation Area, and has been a site of conservation biology research for at least 15 years.

3. Management Plan Goal

To identify, conserve, assist people to appreciate and, where necessary, restore the Vale of Belvoir Reserve's natural and cultural heritage values, and to ensure these values are passed on to future generations in as good or better condition than at present.

4. Management Plan Objectives

Objective 1: Maintain or improve the extent and diversity of the highland grasslands at known levels into the future, ensuring the maintenance and viability of important populations of grassland-dependent species.

Objective 2: Determine baseline levels of wetland condition and maintain or improve these into the future.

Objective 3: Determine baseline condition of karst and maintain or improve this into the future.

Objective 4: Determine baseline levels of the extent and condition of the subalpine eucalypt woodland, and maintain or improve these into the future.

Objective 5: Determine baseline levels of the extent and condition of the rainforest, and maintain or improve these into the future.

Objective 6: Develop and maintain clear tangible opportunities for the community to benefit from the TLC's reserves through visitation, volunteering, education and other activities.

5. Location and tenure

The Vale of Belvoir is located in the northwest of Tasmania, in the municipality of Kentish, and is situated approximately 12 km northwest of Cradle Mountain. The valley is oriented north-south, bounded by Black Bluff Range to the west and Bonds Range to the east.

The TLC's Vale of Belvoir Reserve is privately-owned, freehold land. This private land accounts for a large proportion of the grassy valley (Figure 1). The remaining portion of the valley is public land protected within the Vale of Belvoir Conservation Area, managed by the Tasmania Parks and Wildlife Service (PWS).

In 2009, the PWS transferred to the TLC an existing license to graze cattle within the Vale of Belvoir Conservation Area. This grazing license incorporates grassland areas adjacent to the Vale of Belvoir Reserve (Figure 1). The grazing license continues historical grazing rights granted to the previous landowners of the Vale of Belvoir since the 1890s. The TLC is required to protect the natural values of the grazing license area from impacts related to grazing.

This draft Management Plan does not cover the area of the grazing license, although the strategies and actions included in this plan will be implemented by the TLC within the grazing license area, following approval from PWS.

6. Access

The Vale of Belvoir is accessed via roads of varying standards (see Figure 1). The south of the property can be accessed on foot from Belvoir Road (Cradle Mountain Link Road) which is a major highway dissecting the southern part of the property. The northern part of the property can be accessed on foot from the Lake Lea Track, which is a rough dirt track that is usually accessible by 2WD. A rough cattleman's hut, known as Charleston's Hut, can be accessed via a very steep, rough dirt track that is 4WD drive access only. This track is subject to erosion and is currently in poor condition. To minimise deterioration of this track, visitors are requested not to use vehicles on this track.

7. IUCN Protected Area Management Category status

IUCN protected area management categories classify protected areas according to their management objectives. The IUCN states that the six categories are not viewed as a hierarchy in terms of quality, importance or naturalness, as all are important in their contribution to the system of protected areas (Dudley 2008).

The conservation objectives of this management plan are consistent with the objectives of Category IV, as follows:

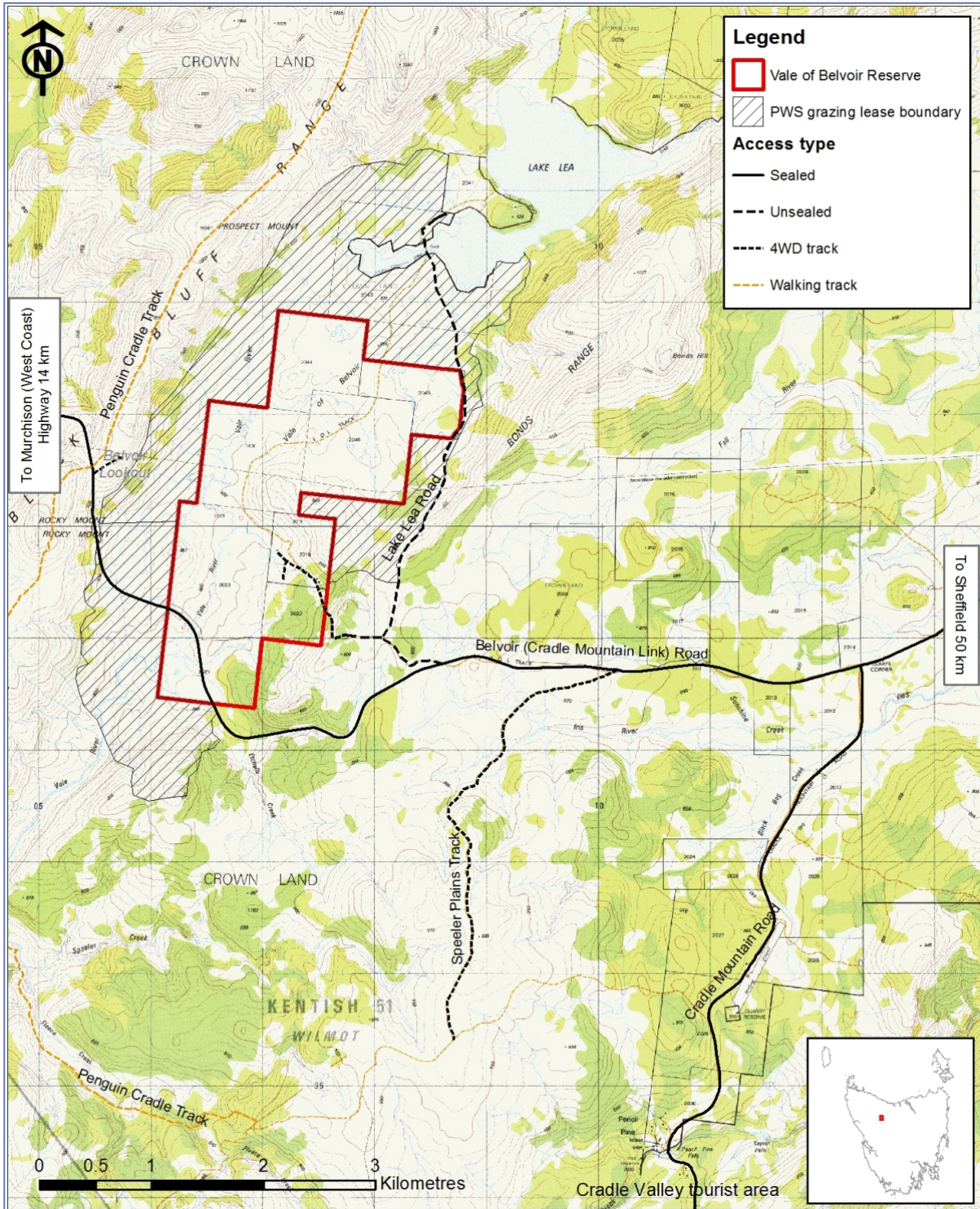
Category IV (Habitat/species management area)

Primary objective: To maintain, conserve and restore species and habitats.

Other objectives:

- To protect vegetation patterns or other biological features through traditional management approaches;
- To protect fragments of habitats as components of landscape or seascape-scale conservation strategies;
- To develop public education and appreciation of the species and/or habitats concerned;
- To provide a means by which the urban residents may obtain regular contact with nature.

Figure 1: Location of the Vale of Belvoir, including access routes and grazing lease area



Continuing the historical cattle grazing and mosaic burning regime at the Vale of Belvoir fits within IUCN Category IV, as the primary objective of this management regime is to maintain the condition of the highland grasslands, rather than the sustainable use of resources. This is reflected in the *Deed Granting Limited Grazing Rights* to the Charleston family, which was developed with the intention of adjusting or phasing out cattle grazing if the results of scientific research indicate that the cattle do not have a positive effect on the maintenance of the grassland diversity or condition.

8. Legal Status

A conservation covenant has been registered on the Vale of Belvoir Reserve land title under the Tasmanian *Nature Conservation Act 2002* (NC Act). The covenant is aimed at ensuring the protection of the conservation values of the Vale of Belvoir Reserve and has the force of a statutory document that binds the TLC to its provisions.

In addition to the conservation covenant, the TLC is applying to the Tasmanian Government to have this land declared a Private Nature Reserve under the NC Act. This will assist in ensuring that conservation management is consistent across the multiple tenures that exist in the area.

The *Kentish Planning Scheme 2005* is the local government planning instrument. Any developments planned for the land may need to be approved by the local government.

Several species and vegetation communities listed as threatened under Australian and Tasmanian legislation are present on the property. These are identified in Section 10: Natural Values. Constraints may apply to activities which could adversely affect these species and communities.

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's key piece of legislation to protect threatened species and ecological communities. Four species and one ecological community listed under the EPBC Act have been identified on the property.

The Tasmanian *Threatened Species Protection Act 1995* (TSP Act) lists species considered to be threatened in Tasmania. It is an offence to knowingly disturb or destroy a listed species without a permit. Schedule 3A of the NC Act lists threatened native vegetation communities in Tasmania. Disturbance to listed communities is regulated through revisions to Tasmania's *Forest Practices Act 1985*. Fifteen species and four ecological communities listed under Tasmanian legislation have been identified on the property.

9. Stakeholders

The major stakeholders to this plan include the neighbouring land manager (PWS), the Charleston family (whom TLC have granted a grazing lease and a deed of rights to use the hut and stables area) and the Private Land Conservation Program, who monitor conservation covenants on behalf of the Tasmanian Government. These major stakeholders have been consulted regarding the development of this Management Plan and will continue to be consulted about the practical implementation of the Management Plan.

Additional stakeholders include the Australian Government, through their Maintaining Australia's Biodiversity Hotspots Programme (which provided 2/3 funding towards the purchase of the Vale of Belvoir Reserve), TLC supporters and the general public. Stakeholders were provided the opportunity to comment on the draft Management Plan and will be informed of any significant changes to the plan.

10. Natural values

10.1 Vegetation

The Vale of Belvoir is one of the most extensive and intact highland grassland ecosystems in Tasmania. It is intersected by wetlands, which support *Sphagnum* bogs and karst ecosystems, and is surrounded by myrtle rainforest and eucalypt woodlands.

Five vegetation communities present at the Vale of Belvoir Reserve are listed as threatened under Australian or Tasmanian legislation. The types, extent and conservation status of the vegetation communities that have been mapped at the Vale of Belvoir Reserve are listed in Table 1.

Table 1: Vegetation communities mapped at the Vale of Belvoir Reserve (TASVEG)

Vegetation community	TASVEG code	Approx. Area (ha)	Conservation status (NC Act)
Highland <i>Poa</i> grassland	GPH	107	Rare, Endangered
Highland sedgy grassland	MGH	199	Rare
Wetland (undifferentiated)	AWU	1	Vulnerable
Subalpine <i>Diplarrena latifolia</i> rushland	MDS	89	Rare
Dry <i>Eucalyptus gunnii</i> woodland	DGW	19	
Eastern alpine sedgeland	HSE	32	
Eastern alpine heathland	HHE	2	
Eastern buttongrass moorland	MBE	9	
<i>Nothofagus-Atherosperma</i> rainforest	RMT	29	
Alpine <i>Sphagnum</i> Bog and Associated Fens	n/a	*	Endangered (EPBC Act)

* While *Alpine Sphagnum Bog and Associated Fens* occur at the Vale of Belvoir, they are not extensive enough to be mapped using TASVEG protocols. Estimates of extent will be determined in the future.

Grassy ecosystems are one of the most endangered vegetation types in Australia, and extensive highland grassland occurs rarely in Australia. Highland grasslands, whilst better protected in Tasmania than lowland grasslands, have often been converted to pastures and tree plantations, and many are degraded and fragmented. Highland *Poa* grassland in Tasmania is listed under the NC Act as rare and endangered. Other treeless vegetation communities are scattered throughout the *Poa* grasslands at the Vale of Belvoir Reserve, including Eastern buttongrass moorland, Highland sedgy grassland and Subalpine *Diplarrena latifolia* rushland, with the latter two vegetation communities being listed as rare in Tasmania (Table 1).

The highland grasslands within the entire Vale of Belvoir have been summer grazed by cattle since the 1890s by the Charleston family and their forebears. Around 100 – 300 cattle were brought in to graze the area between November and June each year, with a mosaic fire regime implemented to improve ‘green pick’ for stock during this time. The maintenance of high levels of floristic diversity in the grasslands at the Vale of Belvoir has been attributed to this grazing and burning regime. More information on the historical grazing and burning regimes are provided in Section 12: Current Management and Links to the Past.

Extensive rainforest and subalpine eucalypt woodland occur on the slopes of the Vale of Belvoir Reserve, with a very sharp boundary delineating the forests from the grasslands. Analysis of historical aerial photographs and satellite imagery indicate that the location of these boundaries remained almost unchanged between 1953 and 2011 (Fixico and Weingart, 2012). However, this analysis also found that rainforest vegetation appears to have become dominant in some previously eucalypt woodland areas over this period.

At the Vale of Belvoir Reserve there are numerous examples of *Sphagnum*-dominated peatlands that occur predominantly in narrow linear strips along drainage lines. In Tasmania, vegetation dominated by *Sphagnum* is classed as *Sphagnum* peatland, which is listed as rare under the NC Act. However, there are no *Sphagnum* peatlands mapped under TASVEG at the Vale of Belvoir Reserve, as they are not extensive enough to be mapped as an individual vegetation unit (minimum size is 10 m x 10 m in TASVEG mapping protocols). However, *Sphagnum* dominated vegetation occurring above 800 m in Tasmania is classified under the EPBC Act to be the ecological community *Alpine Sphagnum Bog and Associated Fens*, and is listed as endangered under this Act. As such, *Sphagnum* is considered to be a vegetation community of conservation importance in the Vale of Belvoir.

10.2 Flora species of conservation significance

The diverse vegetation communities at the Vale of Belvoir have sites of high plant species richness, including grasslands on limestone and basalt, which are unusual in Tasmania. The Vale of Belvoir also has significant populations of rare and threatened plant species. Extensive surveys between 2010 and 2012 have recorded eight threatened plant species at the Vale of Belvoir (Table 2). An additional species has been recorded in the previous decades but was not detected during the recent surveys.

The mat-forming perennial herb, alpine candles (*Stackhousia pulvinaris*), is only known in Tasmania from the Vale of Belvoir and the adjacent Speeler Plains. Surveys in 2010 by TLC staff, volunteers and botanists found in excess of 10,000 individuals within the Vale of Belvoir, being a 10-fold increase on previous estimates of the population size (Threatened Species Section, 2010). Maintenance of this occurrence in the Vale of Belvoir is necessary for the continued existence of the species in Tasmania.

The grassland paperdaisy (*Leucochrysum albicans* var. *tricolor*) has several disjunct populations in Tasmania, occurring primarily in the Midlands and Central Plateau areas. Studies from the Tasmanian Midlands have shown that it responds well to disturbance, including grazing and burning (Gilfedder and Kirkpatrick, 1994). This species is endangered due to increasing pressure occurring from the clearance and conversion of its grassland habitat. The Vale of Belvoir has one of the most significant populations of this species in Tasmania (Sinclair, 2010).

The Vale of Belvoir also supports populations of threatened sub-alpine plants that include the showy herb chamomile sunray (*Rhodanthe anthemoides*), Tadgells leek orchid (*Prasophyllum tadgellianum*) and the prostrate shrub, matted lignum (*Muehlenbeckia axillaris*).

10.3 Fauna species of conservation significance

The Vale of Belvoir supports known populations of five threatened animal species (Table 2). It has a rich fauna assemblage, with past records and surveys indicating relatively high densities of marsupial carnivores including Tasmanian devils, eastern and spotted-tailed quolls and, in the past, the thylacine. There is also a large and significant population of the vulnerable ptunarra brown butterfly throughout the grasslands.

Tasmanian devil densities were very high in the area throughout the 1980s and 1990s but decreased from about 2000 (Nick Mooney, pers. comm.), more rapidly after 2006 with Devil Facial Tumour Disease. The local eastern quoll population in particular was extremely high through the 1980s and 1990s with many denning in sinkholes but they decreased past 2000; the species is known to be prone to cyclical fluctuations in most of its range. Spotted-tailed quoll seem to have maintained their densities and may have even increased slightly though the area, especially the forested fringes of the Vale. In the early 1900s several thylacine were captured alive (Peter Carter pers. comm.) near Lake Lea and a number of apparently credible sighting reports were made from the Vale and environs through the 1990s (DPIPWE records).

The grassland-dependent ptunarra brown butterfly (*Oreixenica ptunarra*) has been recorded at the Vale of Belvoir. Monitoring and surveys of this species from 2010 to 2012 have demonstrated that this species is abundant throughout the grasslands and grassy-sedgeland at the Vale of Belvoir (TLC, unpublished data). The extent and condition of these grasslands may be critical for the long-term survival of this species (Phil Bell, pers. comm.).

Another grassland-dependent threatened species, the tussock skink, was first identified at the Vale of Belvoir in 2010 (Bush Blitz Species Discovery Program, 2010). This record represents a major range extension for the species, being the first known record occurring in subalpine or alpine grasslands in Tasmania (Michael Driessen, pers. comm.).

The forested vegetation communities provide habitat for populations of marsupial herbivores and, subsequently, extensive populations of marsupial carnivores. A field survey of the bat population conducted in March 2010 also recorded three microbat species, including unusually high densities of the lesser long-eared bat (*Nyctophilus geoffroyi*) (Lisa Cawthen, pers. comm.).

Little is known about the aquatic fauna of the Vale of Belvoir. Samples have been collected from the Vale River in the past, although no data has been found or publications known from these collections (Peter Davies, pers. comm.).

Table 2: Threatened species recorded at the Vale of Belvoir Reserve

Species	Common name	Conservation Status*	Status/significance at the Vale	Comments
FLORA				
<i>Argyrotegium poliochlorum</i>	Greycotton leaf	-/r	Majority of known plants in Tasmania	Multiple recent records. This species appears to favour disturbed and/or damp situations.
<i>Australopyrum velutinum</i>	Mountain wheat grass	-/r	Poorly known	Records from 1997 within stock enclosure monitoring plots. No individuals were found during threatened flora surveys in 2010.
<i>Leucochrysum albicans</i> var. <i>tricolor</i>	Grassland paperdaisy, hoary sunray	EN/e	Large population	Apparently restricted to basalt geology at Vale of Belvoir; mostly known from the Midlands in Tasmania
<i>Muehlenbeckia axillaris</i>	Matted lignum	-/r	Scattered plants	Multiple recent records. Often associated with rocky places, some subject to seasonal flooding.
<i>Prasophyllum tadgellianum</i>	Tadgells leek orchid	-/r	Poorly known, probably not present	Single recent record in the NVA, with no confirmed herbarium records. Recent field studies at the Vale and taxonomical research has cast doubt on the identification of this species (Phil Collier, pers. comm.).
<i>Rhodanthe anthemoides</i>	Chamomile sunray	-/r	Large population	Widespread throughout the valley and in the north-western subalpine grasslands, scattered elsewhere. Favours well-drained sites.
<i>Scleranthus brockieii</i>	Mountain knawel	-/r	Poorly known	Single recent record. This species is very similar to <i>Scleranthus biflorus</i> . More work is required to confirm the extent and status of the Vale population.
<i>Stackhousia pulvinaris</i>	Alpine candles	-/r	Vast majority of known plants in Tasmania	Widespread throughout the valley especially in well-drained open situations. Known only from the Vale of Belvoir and a few recently confirmed records from nearby Speeler Plain.
<i>Viola cunninghamii</i>	Cunninghams violet, alpine violet	-/r	Poorly known	Single recent record. This species is very similar to <i>Viola hederacea</i> when not in flower. More work is required to confirm the extent and status of the Vale population.
FAUNA				
<i>Aquila audax fleayi</i>	Wedge-tailed eagle	EN/e		Regular sightings, but no suitable nest sites on the property. Useful reference habitat due to lack of disturbance in long-term. Endemic to Tasmania.
<i>Dasyurus maculatus</i>	Spotted-tailed quoll	VU/r		
<i>Pseudemoia pagenstecheri</i>	Tussock skink	-/v		First known record of the species in subalpine grasslands in Mar 2010, extensive potential habitat.
<i>Sarcophilus harrisi</i>	Tasmanian devil	EN/e		Endemic to Tasmania.
<i>Thylacinus cynocephalus</i>	Thylacine	EX/x		Long-term monitoring site in 1990s, many sightings and trapping records in Lake Lea area up to early-1900s. Endemic to Tasmania.
<i>Oreixenica ptunarra</i>	Ptunarra brown butterfly	-/v	Large population	Monitoring between 2010 and 2012 confirmed large populations at the Vale, likely to be a stronghold for the species. Endemic to Tasmania.

*r = rare; VU/v = vulnerable; EN/e = endangered; EX/x = extinct. Capitals denote listing under the EPBC Act. Non-capitals denote listing under the TSP Act.

10.4 Geomorphology and geoconservation values

The Vale of Belvoir lies at an average altitude of 800 m, giving it a subalpine character. It is underlain by Ordovician limestone (about 450 million years old) and is the largest subalpine limestone valley in the state. The limestone is underlain by a formation of siliceous sandstone, quartzite and conglomerate – the same unit which forms the West Coast Range - and both have been folded to form a broad syncline or elongate basin, which forms the valley, with anticlines of the siliceous rocks rising up on either side to form the Black Bluff Range to the west and the Bonds Range to the east.

About one third of the valley has been infilled with basalt flows, of Tertiary age (about 20 million years), and these form a 100m-high dome-shaped hill in the middle part of the valley (known as Daisy Hill), a smaller hill on the western side of the valley, and several large hills at the northern end. The basalt has spread around the valley floor during the third phase of the geological history, when a small ice sheet, spreading out from the Cradle Mountain area in the early part of the Pleistocene Ice Age (1-2 million years ago), picked up and redistributed many basalt boulders. This ice sheet also carried and deposited many boulders, or erratics, of dolerite from Cradle Mountain, as it ground its way across the valley and up the western flank, where it finally melted. As a result, the valley floor now has a semi-continuous cover of glacial moraine, rich in basalt boulders in many places, in between the outcrops of limestone bedrock. The basalt has improved the soil fertility and limestone also favours grasses, which partly explain the extensive grass cover.

As is typical of limestone valleys, there are numerous sinkholes and caves across the floor of the Vale of Belvoir. The sinkholes are typically 10-20 m across, with grassy to muddy walls and floor where the surface soil has collapsed into the top of the cave beneath. Some of the sinkholes have exposed limestone sides, and some have permanent ponds or small lakes in them. Several have water bubbling up and flowing out one side, with impressive aquatic plants in some cases

This valley is unusual and unique in that the rivers have a bi-directional drainage pattern, which is probably a result of the basalt flows. At the northern end is the picturesque Lake Lea, which flows out northwards via the Lea River into the Iris-Wilmot river system and eventually into the Bass Strait. The south-flowing Vale River drains the rest of the valley, eventually flowing into the Pieman River on the West Coast.

The Tasmanian Geoconservation Database (DPIPWE) lists three Geoconservation sites at the Vale of Belvoir. These include the nationally significant Vale of Belvoir Sub-alpine Karstland and Central Highlands Cainozoic Glacial Area, and the globally significant Central Plateau Terrain.

11. Cultural history

11.1 Indigenous history

Before European occupation of the area, Aboriginal people, likely to be from the Parlingermairhetohe band of the Tommeginner tribe of the northwest, are known to have passed through the area regularly. Haygarth (1998) described the route of the current Cradle Mountain Link Road as follows an indigenous travelling route, which was subsequently used by early Europeans. No Aboriginal artefacts are known at the Vale of Belvoir, but many artefacts, including domed bark huts, have been recorded in the surrounding area.

There was much conflict reported between the indigenous people and early Europeans in the region and the last remaining Aboriginals in the area were relocated to the Furneaux Islands by the end of the 1830s (Plomley, 1966).

11.2 European history

The freehold land at the Vale of Belvoir has been in the continuous use and ownership by the Charleston family and their forebears, the Williams family, since the 1890s. The following European history is a summary of a history of the area prepared by Lisa Charleston in 2004.

The natural grasslands at the Vale of Belvoir appealed to early settlers for summer stock grazing, with winters being too harsh for stock. The Williams family brought cattle up to the Vale of Belvoir annually from their main landholdings at Wilmot, some 50 km away. During the early 1900s, a dairy and small cheese 'factory' were established and a hut built to support the workers. This operation continued until the mid- to late 1930s and some evidence of the dairy and cheese factory still remain, close to the site of the existing hut.

During the winter months, members of the Williams family would return to the Vale of Belvoir to snare possum and wallaby for the lucrative European and U.S. fur trade, establishing small snarer's huts to survive the extreme weather conditions.

The Charleston brothers, Jim and Kevin, began running cattle at the Vale around the early 1960's alongside the Williams family. Kevin married Wendy Williams, and he and Jim gradually took over the long-term public land leases and purchased the freehold blocks. The Charleston brothers worked closely with the Williams family, passing down family knowledge of the area, its habitats, and the lessons learnt of managing the stock and mosaic burning to maintain the grasslands in good condition.

The original hut burnt down at some time during 1960s and another two-room hut was built by the Charleston brothers and the local community around 1975. Over the following several years, they also built the traditional split-timber stables and timber stockyards, and extended the hut.

Until the mid-1980s, the Vale of Belvoir was particularly isolated and remote and, as such, few people visited the valley. Vehicle access to the area was via a notoriously boggy track from Leary's Corner that was often impassable, with the Charleston family riding horses or walking the remaining distance in to their hut.

The process of taking cattle into the Vale of Belvoir was often a community-oriented one, with 100 – 300 cattle being walked in over two days from Erriba using stock horses, usually late in December or early January. The cattle were mustered up again over a period of about a week in May/June and returned home again.

Developments in the Vale of Belvoir began in the mid-1980s, with the construction of the West Coast electricity transmission line in around 1983 and the Cradle Mountain Link Road in 1985, both of which dissect the valley from east to west. Whilst these developments greatly improved access into the area and to the west coast, the aesthetic and environmental values of the Vale of Belvoir were severely impacted.

An intention by the Tasmanian Government to end the grazing leases over public lands in the Vale of Belvoir in the 1980s resulted in strong community opposition. This led to extensive public consultation and the establishment of scientific monitoring plots in the grasslands. The Vale of Belvoir Conservation Area, which surrounds the freehold land, was declared in 2000 and cattle grazing permitted to continue under grazing leases.

12. Current management and links to the past

The TLC manages the Vale of Belvoir Reserve primarily for the purpose of biodiversity conservation. However, the exceptional conservation values of the Vale were maintained under a historic management regime of patch burning and seasonal cattle grazing. The TLC has therefore adopted a precautionary to the ongoing management of cattle grazing at the Vale. Before making any significant changes to a long-running management regime that appears to have maintained the biodiversity, it is important to determine the effect of historic management practices on the conservation values that we see today.

Patch burning

Details of the historical fire regime were reported to the TLC in an interview in 2011 with the former landowners, Kevin and Wendy Charleston. The Charleston's noted that their personal memories of the area dated back to around the 1960s, although specific details were hazy beyond the 1990s, and they also contributed historical family knowledge told to them by Wendy's father. The fire regime was sporadic, with fires being lit in September – October in years when weather and vegetation conditions were appropriate for the white grass, or *Poa* tussocks, to carry a fire. As such, the fire interval has ranged from 10 – 40 years on the eastern side of the Vale River. With exception of the basalt knoll in the south of the valley, Kevin and Wendy Charleston had no memories of any fires burning on the western side of the Vale River.

Cattle grazing

The TLC has granted the Charleston family a *Deed Granting Limited Grazing Rights* over the entire Vale of Belvoir Reserve so that the historical management regime is maintained in the short to medium term, and to ensure that knowledge of this regime can be passed on to the TLC to inform future management of the property. The Deed provides limited grazing rights for five years, with three further five year options. The Charleston family is responsible for maintaining stock-proof fences under the Deed. Under the Deed, the TLC has the right to alter the grazing regime at any time if the conservation values of the property are being negatively impacted by the stock grazing regime.

The TLC is currently investigating the impact of cattle on floristic diversity and populations of threatened plants at the Vale. Enclosures have been constructed to determine the effect that destocking would have on vegetation values if applied across the entire property. The monitoring program is being guided by the expert advice of scientists from the University of Tasmania and DPIPW. If the outcome of this investigation shows that cattle are having a negative impact upon the conservation values of the property then the TLC may reduce cattle numbers, alter the timing of grazing and the locations where grazing may occur, or cease grazing at the Vale.

Recreational use

The Vale of Belvoir has been the subject of recreational pursuits, particularly since the development of the Cradle Mountain Link Road. Many of these pursuits have been undertaken by the Charleston family and their friends, including hunting, horse riding, walking, camping and fishing. The recreational use of 4WD vehicles in the Vale of Belvoir has never been permitted by the Charleston family. However, occasional unauthorised attempts by drivers to access Lake Lea have resulted in physical damage to the valley floor.

The development of the Lake Lea Road in the late 1990s, which gave all-weather vehicle access to Lake Lea, reduced the incidence of recreational 4WD use. In 2012, the PWS reported continued, although infrequent unauthorised 4WD activities in the Vale of Belvoir Conservation Area off the Lake Lea Road, focused on the margins of Lake Lea. These unauthorised activities may also impact upon the Vale of Belvoir Reserve.

In addition to recreational use by the general public, the former owners of the Vale of Belvoir, the Charleston family, sold the property to the TLC, on agreement that they could continue their long familial association with the area. To this end, the TLC granted the Charleston family a *Deed Granting Right to Use Buildings and Access Land* and a time-limited *Deed Granting Limited Grazing Rights*.

Deed Granting Right to Use Buildings and Access Land is a 99 year non-commercial agreement that provides the Charleston family an exclusive right to use, repair, renovate or replace the buildings on Certificate of Title 209013/1, which comprise Charleston's Hut, the stables and stockyards. Under the conditions of this Deed, the Charleston family are also permitted non-exclusive access to the Vale of Belvoir Reserve, to walk and ride horses over the land and to fish in the rivers.

Any use of the Vale of Belvoir Reserve by the public or the Charleston family, is limited to use that does not adversely impact upon the conservation values of the land, as determined by the TLC and the Conservation Covenant.

13. Scientific research summary

The Vale of Belvoir has been a site of interest to scientists since the early 1980s, due to its unique geology and geomorphology and the presence of threatened flora, fauna and vegetation communities. The TLC is aware of numerous research projects being undertaken at, or near, the Vale of Belvoir and wherever possible aims to utilise the results of this research to inform decisions on reserve management. A selection of research activities at the Vale is provided below:

- Monitoring the impact of cattle on grassland diversity through the establishment of six plots excluding cattle but allowing native herbivores. This research was undertaken between 1992 and 1997 by State Government botanists Jenny Dyring and Louise Gilfedder. The exclusion fences are still standing and in good condition and will be utilised in ongoing research into the effect of cattle on the grasslands. No publications resulted from this research.
- A PhD thesis using the Vale of Belvoir as one case study site in an investigation into the relationship between grazing and burning in Tasmanian native grasslands (Leonard, 2008).
- Numerous threatened flora surveys, particularly focussed on alpine candles (*Stackhousia pulvinaris*), grassland paperdaisy (*Leucochrysum albicans* var. *tricolor*) and Tadgells leek orchid (*Prasophyllum tadgellianum*) conducted by TLC staff and volunteers, and botanists from the Tasmanian Government, Tasmanian Herbarium and Royal Tasmanian Botanical Gardens. No publications have resulted from this research at this time. Data from these surveys has been included within the Natural Values Atlas (DPIPWE).
- Mapping of the caves present at the Vale of Belvoir was undertaken by Stephen Blanden and other speleologists over 10 years from the late 1990s. No publication has resulted from this work.
- Sampling of the litter invertebrate fauna was undertaken by Bob Mesibov, University of Tasmania throughout the 1990s and 2000s (unpublished).
- Long-term monitoring site for thylacine throughout the 1980s and 1990s, with surveys conducted by Tasmanian Government biologists – including Nick Mooney and others.
- Fauna and flora surveys conducted as part of an Australia-wide species discovery program in 2010 (Bush Blitz Species Discovery Program, 2010). Data from these surveys has been included within the Natural Values Atlas (DPIPWE).

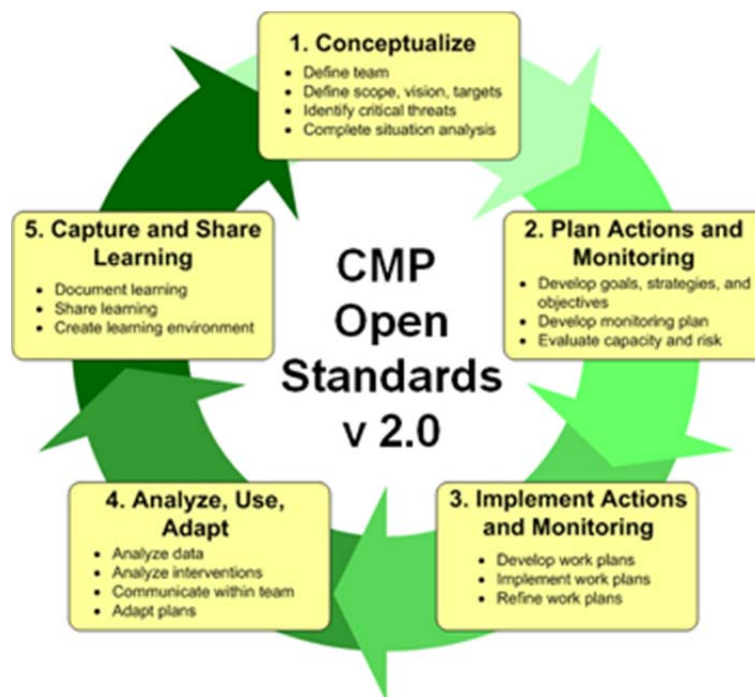
14. Reserve management framework

Adaptive Management

The TLC protects important natural areas as permanent reserves. A mission of the TLC is to demonstrate excellence in management for biodiversity conservation. To achieve this mission the TLC has adopted the *Open Standards for the Practice of Conservation*, which is an international system of adaptive management developed by the Conservation Measures Partnership for use in conservation projects (<http://www.conservationmeasures.org>). The *Open Standards* provide a guide to planning and implementing conservation actions. The model of adaptive management used by the *Open Standards* is shown in Figure 2.

The TLC uses Miradi project management software for reserve management planning, monitoring, evaluation and reporting. The software was developed by the Conservation Measures Partnership for use in conservation and land management. Miradi provides the TLC with a tool to prioritize threats, develop objectives and actions, and select monitoring indicators to assess the effectiveness of our management strategies. Miradi also provides a toolkit for storing and using monitoring data and links monitoring data to specific reserve management objectives. The integration of a planning process and a monitoring database makes Miradi a powerful adaptive management tool.

Figure 2: Open Standards adaptive management model, developed by the Conservation Measures Partnership (CMP) and adopted for use by the TLC



Conservation Action Planning

This Management Plan for the Vale of Belvoir Reserve represents the outcomes of the first and second stages of Conservation Action Planning, using the *Open Standards* adaptive management model. Conservation targets have been selected that describe broad ecosystem classes or habitat types, often with nested targets that are dependent upon the protection of the primary target (e.g. critical populations of a grassland dependent species are notable as a target, yet are wholly dependent upon the primary target and so are not selected as an independent target). Consistent ecological indicators are selected for each target to monitor changes in the condition of the targets. Threats to each of the targets are then identified, along with the factors that contribute to the threats, and these are prioritised depending on the extent, likelihood and severity of the impact of these

threats to the conservation targets. Strategies to manage these threats are developed, with consideration given to their environmental, social and economic feasibility of each strategy.

Implementation of Management Strategies

Strategies to mitigate the threats to conservation targets are assessed for their feasibility and prioritised based on a combination of factors. These include likelihood and extent of mitigating the threat or the viability of the target, the resources required and the resources available to implement the strategy.

Five-year work plans are subsequently developed for each property to implement the management strategies. These work plans identify specific activities to be undertaken and their priority, the timing of these and the resources required. Work plans also allocate budgets, allowing the TLC to plan ahead to ensure appropriate capacity to deliver reserve management activities.

Ecological parameters are also considered when scheduling works, to ensure that projects are undertaken when they are most likely to succeed. Progress against activities in the work plan is reviewed annually, along with the activity success and priority relative to other activities.

Monitoring and Evaluation

The TLC implements a monitoring and evaluation strategy across all of its permanent reserves. Monitoring methods will be described in detail in the TLC Monitoring Manual, which is currently being developed and will be critiqued by the TLC's independent Conservation Science and Advisory Council.

Monitoring of specific ecological indicators enables the collection of scientifically credible information on the status and trends of the conservation targets. Measuring the success of management actions is also critical for ensuring successful long-term management of the targets. This involves four types of monitoring – long-term ecological monitoring, annual reserve assessments, management effectiveness evaluation, and change detection analysis. A monitoring and evaluation plan is prepared for each reserve, and describes how each of these monitoring streams is delivered at the reserve. The Vale of Belvoir Reserve Monitoring Plan will be appended to this Management Plan upon completion.

Long-term ecological monitoring will be undertaken regularly and will establish baseline measures of ecological indicators and subsequently provides early warning of deleterious changes in the conservation targets. The results of this monitoring allow reserve managers to develop mitigation measures and reduce future costs of remedial management. This monitoring program is currently being trialled with data collected every two years.

Annual reserve assessments are undertaken by TLC reserve management staff across all permanent reserves to identify any new or emerging threatening processes that have the potential to reduce the viability of the targets. Early identification of threats allows early management interventions to mitigate a threat.

Management effectiveness evaluation provides land managers with information that is essential for them to determine the adequacy of their efforts. Data are collected on management inputs and biodiversity outputs, with indicators selected that are specific to measuring the success of management strategies. This information is then used by TLC reserve managers to make better-informed decisions on land management, measure progress towards performance objectives and determine the effectiveness of management strategies.

Change detection analysis of remote sensing data using GIS, is undertaken on TLC reserves every 5 years to assess the impact of management strategies on vegetation cover. The surrounding region is also assessed to identify changes in land cover that could indicate threatening processes that have the potential to impact on a reserve. Analysis of surrounding lands also provides an indication of any "leakage" – shifting of threatening process from a reserve to surrounding areas. Where this is identified, the TLC works with neighbouring landholders to develop local or regional mitigation strategies.

Reporting

The results of the monitoring program are communicated to TLC reserve management staff in regular progress reports. This information is used to adapt and direct on-ground works programs and update annual work plans and reserve management plans.

The status of conservation targets, trends in ecological indicators and outcomes of reserve management activities are communicated to the TLC board, stakeholders and the community through a range of regular communication channels including an annual report.

15. Conservation Targets for the Vale of Belvoir Reserve



Photo: Denna Kingdom

Target 1: Highland Grassland

Conservation Priority: Very high

Objective 1.0: Maintain or improve the extent and diversity of the highland grasslands at known levels into the future, ensuring the maintenance and viability of important populations of grassland-dependent species.

Native grasslands occupy the valley floor where there are deep organic soils. Three vegetation types occur in this area under the TASVEG classification. These are *Highland Poa grassland*, *Highland grassy sedgeland* and *Subalpine Diplarrena latifolia rushland*.

All three vegetation communities are listed as threatened under the NC Act. The vegetation in this area is floristically diverse and forms a complex mosaic of grassland and grassy sedgeland.

Highland grassland extends across 391.2 ha of the Vale of Belvoir Reserve covering 82% of the total area of the reserve (see Figure 4). The grasslands also extend beyond the Vale of Belvoir Reserve, forming a contiguous area

of approximately 1000 ha throughout the entire valley, making it one of the largest areas of highland grassland in Tasmania.

The diversity of herbaceous taxa in this area is of particular conservation significance and important populations of several threatened plant species occur in this vegetation complex, including *Stackhousia pulvinaris*, *Argyrotegium poliochlorum*, *Leucochrysum albicans* var. *tricolor* and *Rhodanthe anthemoides*. The grasslands support a high abundance of marsupial herbivores and this in turn supports high populations of Tasmania's threatened marsupial carnivores. Areas that contain greater than 30% cover of *Poa* grassland support extensive populations of the vulnerable, Tasmanian endemic, ptunarra brown butterfly. Vulnerable tussock skinks have also been recorded in the grasslands at the Vale of Belvoir. Three of these threatened species have been selected specifically as Nested Targets as the Vale of Belvoir is a stronghold for these species and is critical to the long-term survival of the species.

The decision to group highland grassland and grassy sedgeland as a single conservation target is based on the assumption that the grassland and sedgeland communities form a mosaic that is determined by a combination of soil characteristics and disturbance history. In the absence of fire or other disturbance, grasslands become increasingly dominated by sedge species (Jamie Kirkpatrick, pers. comm.). Also, many of the threatened flora species that occur in the Vale of Belvoir, which are typically associated with grasslands are equally abundant in areas of *Highland grassy sedgeland* and *Diplarrena latifolia rushland*. The area occupied by these vegetation types will therefore be managed as a single unit, with the aim of maximising floristic diversity and maintaining a mosaic of quality habitat for a variety of fauna.

The highland grasslands are thought to be in good to excellent condition. The aim of management is for the grasslands to be maintained in excellent condition. Monitoring to be undertaken by the TLC will establish a baseline condition using appropriate ecological indicators and assess the success of management regimes in meeting this aim. The monitoring program will be developed in partnership with relevant experts and, on completion, will be included as an Appendix to this Management Plan.

Nested targets

Several species that are dependent upon the maintenance of the highland grasslands are also of particular importance at the Vale, and have been specifically identified as Nested Targets. Other threatened plant species also occur at the Vale, but the species listed below have been selected as the Vale of Belvoir is a stronghold for these species and the property is critical to their long-term survival.



Target 1.1 Alpine candles (*Stackhousia pulvinaris*)

In Tasmania, alpine candles is only known to occur in the Vale of Belvoir and the nearby Speeler Plains. This mat-forming herb occupies approximately 240 ha across both the Vale of Belvoir Reserve and Vale of Belvoir Conservation Area. Observations indicate that it prefers well-drained open situations, often on the edges of sinkholes or along animal pads in grassland or sedgeland.

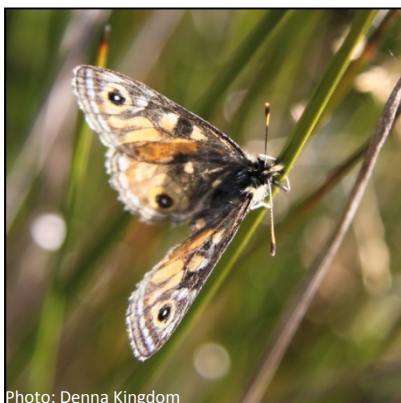
Objective 1.1: Working in partnership with the Tasmanian Government and the community, maintain or improve the habitat for *Stackhousia pulvinaris* and implement, monitor and adapt management actions to ensure the species' ongoing viability at the Vale of Belvoir



Target 1.2 Grassland paperdaisy (*Leucochrysum albicans* var. *tricolor*)

The Vale of Belvoir has one of the largest known populations of this species (Sinclair, 2010), with 72,000 individuals estimated in the main population, extending over 1 ha, in 2011 (TLC, 2011). The species primarily occurs at the top of a basalt outcrop known as Daisy Hill, which features shallow, rocky soils. Studies show that the species responds favourably to disturbance, including grazing and burning (Gilfedder and Kirkpatrick, 1994).

Objective 1.2: Working in partnership with the Tasmanian Government and the community, maintain or improve the habitat for *Leucochrysum albicans* var. *tricolor* and implement, monitor and adapt management actions to ensure the species' ongoing viability at the Vale of Belvoir.



Target 1.3 Ptunarra brown butterfly (*Oreixenica ptunarra*)

An extensive population of the grassland-dependent ptunarra brown butterfly has been recorded at the Vale of Belvoir. Monitoring and surveys of this species from 2010 to 2012 have demonstrated that the species is abundant throughout the grasslands and grassy-sedgelands at the Vale of Belvoir (TLC, unpublished data). The extent and condition of these grasslands may be critical for the long-term survival of this species (Phil Bell, pers. comm.).

Objective 1.3: Working in partnership with the Tasmanian Government and the community, maintain or improve the habitat for *Oreixenica ptunarra* and implement, monitor and adapt management actions to ensure the species' ongoing viability at the Vale of Belvoir.

Threats to the values

The primary threats to highland grasslands are an inappropriate disturbance regime, competition or predation by invasive species and climate change. These threats may affect the floristic diversity of the grasslands and the quality of habitat provided by the grasslands for native fauna.

An inappropriate disturbance regime (i.e. inappropriate frequency or intensity of fire or grazing) is the most significant threat to the diversity in flora species and quality animal habitat in the highland grasslands. A lack of disturbance can result in the replacement of grasslands by shrubs and forest species, as part of the natural successional cycles. However, some grasslands and grassy sedgelands may persist in the absence of fire with factors such as soil type, geology, or climate limiting shrub and tree encroachment. In the absence of disturbance, herbs are outcompeted by grasses, including the grassland paperdaisy (Gilfedder and Kirkpatrick, 1994) and alpine candles (Threatened Species Section, 2010). An inappropriate disturbance regime that allows for natural succession may also result in a loss of suitable habitat for the ptunarra brown butterfly, which is completely dependent upon *Poa* species throughout its lifecycle.

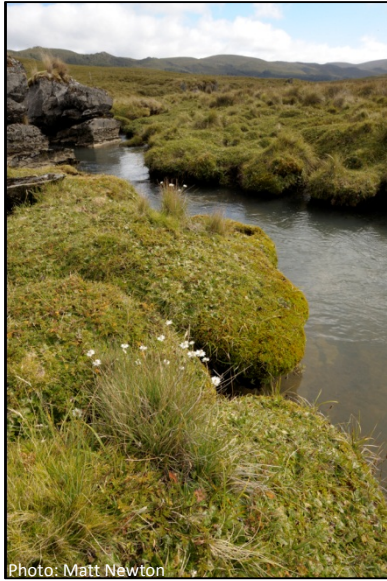
The establishment of exotic pest species can also impact on biodiversity of the grasslands. European wasps have also been observed preying on ptunarra brown butterflies in areas where butterfly populations have subsequently crashed. Postgraduate research is currently being undertaken by Josephine Potter at the University of Tasmania to quantify the link between European wasps and ptunarra brown butterfly populations, and to determine how well wasp control measures limit the impact of the wasps on ptunarra brown butterfly populations. Cats are also known within the area and foxes may become established. Both of these pest species will impact heavily on critical weight range mammals at the Vale of Belvoir.

The introduction of weeds is a broad threat to the grasslands. Several exotic species already occur within the Vale of Belvoir, however only two species have been recorded. Spear thistles (*Cirsium* spp.) are present in some areas that are frequented by cattle and a single blackberry plant (*Rubus fruticosus* agg.) has been recorded previously growing from a black limestone outcrop alongside the Vale River. Yorkshire fog grass (*Holcus lanatus*) is naturalised in the grasslands, although occurs in very low frequencies. Other weed species are present in the region and may be carried in to the Vale of Belvoir by people, vehicles, cattle or the wind.

Medium-term climate change projections of warming and drying around the Vale of Belvoir (Climate Futures Tasmania, 2012) are also likely to impact on the species diversity of the highland grasslands, in particular through the introduction of species that are currently restricted from the area due to the cold climate.

Summary of threats directly affecting this target and the strategies that TLC will implement to control the threats (strategies discussed in Section 17).

Threatening process	Source of threat	Current threat rating	Management strategy	Priority
Loss of biological diversity and habitats	Inappropriate disturbance regime	High	Disturbance management regime	Very high
	Establishment or increase in competition or predation by invasive fauna species (i.e. European wasps, cats, foxes)	Moderate	Exotic fauna species control	High
			Annual reserve assessment	High
	Competition from establishment or increase of invasive flora species (including native shrubs)	Moderate	Weed management	Moderate
			Disturbance management regime	Very high
			Access control	Moderate
			Visitation and hygiene policy	High
	Climate change	Moderate	Annual reserve assessment	High
			Resilience to climate change	Moderate
		Long-term ecological monitoring	High	



Target 2 Streams and wetlands

Conservation priority: High

Objective 2.0: Determine baseline levels of wetland condition and maintain or improve these into the future.

Streams and wetlands are extensive across the Vale of Belvoir Reserve in proximity to drainage lines and areas of poor drainage and sinkhole depressions. All areas mapped as *Eastern alpine sedgeland* (TASVEG) have also been included in this target, as this vegetation community primarily occurs almost exclusively alongside the Vale River and drainage lines.

Many of the surface streams and wetlands are the surface expression of an extensive underlying karst aquifer. The surface and sub-surface hydrological systems are intimately connected and cannot be managed in isolation of each other.

The vegetation of streams and wetlands is dominated by *Baloskion australe*, *Juncus* species, *Carex* species and *Schoenus* species. A variety of herbaceous taxa are also present, including two threatened species chamomile sunray (*Rhodanthe anthemoides*) and alpine violet (*Viola cunninghamii*). *Sphagnum* occurs as the dominant genus in the upper sections of many drainage lines. Vegetation dominated by *Sphagnum* is part of the nationally endangered vegetation community *Alpine Sphagnum Bogs and Associated Fens*.

Little detail is known about the aquatic fauna of the wetlands, although surveys are known to have been completed in the area in the past (Peter Davies, pers. comm.).

The wetlands and streams occupy approximately 47 ha of the Vale of Belvoir Reserve (see Figure 4). The condition of the streams and wetlands varies from poor to good, with the variation primarily due to the presence or absence of cattle over the summer months. The aim of management is for the streams and wetlands to be predominantly in good condition by 2018. Monitoring to be undertaken by the TLC will establish a baseline condition using appropriate ecological indicators and assess the success of management regimes in meeting this aim. The monitoring program will be developed in partnership with relevant experts and, on completion, will be included as an Appendix to this Management Plan.

Threats

The primary threats to the streams and wetlands are physical disturbance from cattle (pugging), inappropriate vehicle use and sedimentation resulting from erosion due to an inappropriate disturbance regime. These threats may cause the loss of structural integrity and the loss of species diversity. Loss of species diversity may occur through nutrient loading from cattle defecating in streams and wetlands or from untreated waste water from Charleston's Hut. Medium-term climate change projections of warming and drying around the Vale of Belvoir (Climate Futures Tasmania, 2012) are also likely to impact on both the structural integrity and species diversity of the streams and wetlands.

Animal disease and the introduction of exotic fauna may also alter the composition of species in the streams and wetlands. Brown and rainbow trout are naturalised in the area, with the Vale River being one of only two self-maintaining populations of rainbow trout in Tasmania's rivers. Brown trout occur in Lake Lea and also occasionally populate the Vale River. Trout are voracious consumers and can rapidly alter the ecosystems of their habitat.

The introduction of the highly invasive freshwater alga, didymo (*Didymosphenia geminata*), is a possibility. Information from the Inland Fisheries website (IFS, 2012) states that this freshwater alga is widespread in the Northern Hemisphere and has recently been discovered in New Zealand, although is currently not present in

Australia. Didymo rapidly forms massive blooms that completely smother streams and lake beds, adversely affecting water quality, aquatic invertebrates and fish stocks. It poses a significant threat in Tasmania because of the potential transfer from New Zealand via used fishing and other equipment. Wet or damp fishing gear, particularly felt-soled boots, has been identified as a primary vector for transferring the alga.

Several diseases are present in Tasmania that threaten native animals and their spread may be facilitated by humans. These include mucormycosis, which affects platypus, and chytrid fungus, which affects some frog species. Both of these diseases have been recorded in Tasmania and can be transported in contaminated water or soil on vehicles, boots and equipment. It is not known if mucor or chytrid are present at the Vale.

Summary of threats directly affecting this target and the strategies that TLC will implement to control the threats (strategies discussed in Section 17).

Threatening process	Source of threat	Current threat rating	Management strategy	Priority
Loss of structural integrity	Cattle (pugging)	Moderate	Disturbance management regime	Very high
	Inappropriate vehicle use	Low	Access control	Moderate
	Inappropriate fire regime	Moderate	Disturbance management regime	High
	Climate change	Low	Resilience to climate change	Moderate
Loss of biological diversity and habitats	Inappropriate fire regime	Moderate	Disturbance management regime	High
	Cattle (nutrient loading)	Moderate	Disturbance management regime	Very high
	Untreated waste water from Charleston's Hut	Low	Waste water	Low
	Establishment or increase in predation by invasive fauna species (e.g. trout)	Low	Exotic fauna species control	Low
	Competition from establishment of invasive flora species	Moderate	Visitation and hygiene policy	Moderate
			Weed management	Moderate
			Annual reserve assessment	High
	Introduction of fauna disease	Low	Visitation and hygiene policy	Moderate
	Climate change	Low	Resilience to climate change	Moderate
Long-term ecological monitoring			High	



Photo: Grant Dixon

Target 3 Karst

Conservation priority: High

The Vale of Belvoir is the one of the largest subalpine limestone, or karst, valleys in Tasmania. The limestone on the valley floor forms an active karst system, with numerous, constantly changing sinkholes (dolines) and caves. The presence of the karst results in very alkaline soils that are usually well drained, producing extensive mineral and organic alpine humus soils that are well developed. This limestone geology also results in numerous springs that flow on occasion throughout the year, including at least one mound spring, which is believed to be the only subalpine mound spring recorded in Tasmania.

Karst extends throughout most of the lower-lying areas of valley and often co-occurs with highland grassland and wetland vegetation communities.

The condition of the karst is thought to be moderate to good. Monitoring to be undertaken by the TLC will establish a baseline condition using appropriate indicators and assess the success of management regimes in meeting this aim. The monitoring program will be developed in partnership with relevant experts and, on completion, will be included as an Appendix to this Management Plan.

Objective 3.0: Determine baseline condition of karst and maintain or improve this into the future.

Threats

Threats to the karst primarily relate to physical impacts, e.g. by stock grazing, wombat burrowing, off-road vehicle use and cave visitation. Wombats use the caves extensively for burrowing (Stephen Blanden, pers. comm.) and it is likely that other wildlife species also use the caves for shelter. Cattle occasionally shelter in the lee of karst outcrops, although this appears to be infrequent based on the amount of cattle dung observed around the outcrops. It is also possible that cattle and wildlife activity in and around the caves increases the rates of sedimentation and nutrient loading, although no information is known in this regard. Off-road vehicle use in the past has not focussed on karst areas, however these activities may hasten the collapse of dolines.

Fire is usually considered to be a threat to the integrity of karst, due to spalling during high-intensity fires (e.g. forestry burns) and ash and sediment deposition on karst formations. At the Vale of Belvoir, however, fire is considered to be a low risk due to the low-intensity of grassland fires, and the lack of formations within the caves (Rolan Eberhard, pers. comm).

Cave visitation at the Vale of Belvoir is very unusual, as the caves contain no features and are frequently water-filled. Cave visitation has only been undertaken by experienced cavers with an interest in exploring and mapping the caves.

Summary of threats directly affecting this target and the strategies that TLC will implement to control the threats (strategies discussed in Section 17).

Threatening process	Source of threat	Current threat rating	Management strategy	Priority
Physical disturbance	Cattle	Low	Disturbance management regime	Moderate
	Off-road vehicle use	Low	Access control	Low
	Cave visitation	Low	Visitation and hygiene policy	Low
Sedimentation and nutrient loading	Cattle and wildlife activity	Unknown	Long-term ecological monitoring	Moderate



Target 4 Subalpine eucalypt forest

Conservation priority: Low

Subalpine eucalypt forest occupies lower slopes on the margins of grasslands and sedgeland. One vegetation type is recognised in this area under the TASVEG 2.0 classification, being *Eucalyptus gunnii* woodland. Understorey trees include *Nothofagus cunninghamii* and *Phyllocladus aspleniifolius*. Shrub species include *Cyathodes parviflora*, *Tasmannia lanceolata*, *Pittosporum bicolor*, *Orites revoluta* and *Persoonia gunnii*. The ground layer is dominated by ferns and sedges including *Polystichum proliferum*, *Gleichenia alpina*, *Restio australis* and *Diplarrena latifolia*.

The subalpine eucalypt forest also provides habitat for marsupial herbivores, which in turn supports large populations of Tasmania's threatened marsupial carnivores. Old-growth trees also provide essential roosting habitat for at least three species of bats.

The subalpine eucalypt forest extends across 19 ha of the Vale of Belvoir Reserve, accounting for 4% of the reserve (see Figure 4). Subalpine eucalypt woodlands are common in the area and usually occur in a mosaic with highland grasslands and rainforest vegetation communities.

The condition of the subalpine eucalypt forest is thought to be good. The aim of management is for this vegetation community to be maintained in good condition. Monitoring to be undertaken by the TLC will establish a baseline condition using appropriate ecological indicators and assess the success of management regimes in meeting this aim. The monitoring program will be developed in partnership with relevant experts and, on completion, will be included as an Appendix to this Management Plan.

Objective 4.0: Determine baseline levels of the extent and condition of the subalpine eucalypt woodland, and maintain or improve these into the future.

Threats

Threats to the subalpine eucalypt forest and the species dependent upon it include inappropriate disturbance regime (e.g. overgrazing or too high fire frequency or intensity), invasion by weeds and animal disease. These threats can cause the loss of structural and biological diversity.

A high fire frequency or intensity and overgrazing can result in removal of understorey species and halt recruitment of seedlings. Alternately, lack of disturbance can result in the replacement of eucalypt woodland with rainforest, as can be recognised from photos in the Waldheim area. Evidence of this is also present at the Vale of Belvoir (Weingart and Fixico, 2012).

No weeds are currently present in the subalpine eucalypt forest at the Vale of Belvoir, although weeds are present in similar vegetation communities in the broader area. These include ragwort (*Senecio jacobaea*), foxglove (*Digitalis purpurea*), gorse (*Ulex europaeus*) and Montpellier broom (*Genista monspessulana*).

Cattle grazing can also be a threat to subalpine eucalypt forest due to trampling, browsing and nutrient loading, however there are no indications of this at the Vale of Belvoir, most likely because of the extensive food source available in the grasslands.

Climate change may impact on the eucalypt woodlands, possibly stressing eucalypts as a result of warming and drying, and resulting in increased insect attack.

Tasmanian devils frequent the eucalypt woodlands at the Vale of Belvoir and the Devil Facial Tumour Disease was first noticed in the area in 2006. It is unknown what specific impact this disease has had locally on Tasmanian devils, although it is highly likely that it has resulted in a steep population decline.

Summary of threats directly affecting this target and the strategies that TLC will implement to control the threats (strategies discussed in Section 17).

Threatening process	Source of threat	Current threat rating	Management strategy	Priority
Loss of structural and biological diversity	Inappropriate disturbance regime	Moderate	Disturbance management regime	Moderate
	Competition from establishment of invasive flora species	Low	Weed management	Moderate
			Annual reserve assessment	Moderate
	Natural successional change	Moderate	Disturbance management regime	Moderate
	Animal disease	Low	Visitation and hygiene policy	Moderate
Climate change	Moderate	Long-term ecological monitoring	Moderate	

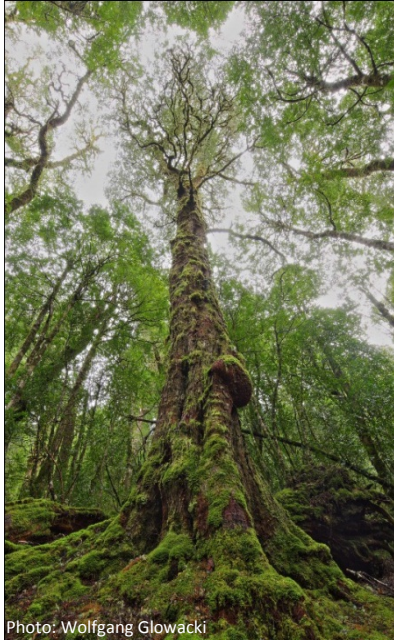


Photo: Wolfgang Glowacki

Target 5 Rainforest

Conservation priority: Low

Rainforest occupies the slopes of the Vale of Belvoir. One vegetation type is recognised in this area under the TASVEG classification – *Nothofagus - Atherosperma rainforest*. The dominant canopy species in areas of rainforest is *Nothofagus cunninghamii*. Subdominant canopy species include *Atherosperma moschatum* and *Phyllocladus aspleniifolius*. Understorey shrubs are relatively sparse and include *Tasmannia lanceolata*, *Monotoca glauca*. The ground layer is dominated by ferns and sedges such as *Polystichum proliferum*, *Blechnum watsii* and *Gahnia grandis*.

The rainforest extends across 29 ha of the Vale of Belvoir Reserve, accounting for 6% of the area of the reserve (see Figure 4). However, rainforest continues beyond the reserve, extending broadly to the east and north.

The rainforest at the Vale of Belvoir is unusual in that support few understorey species, with the exception of ferns and bryophytes. Many large myrtle trees are senescent, possibly a result of recent drought conditions, which has resulted in a decreased canopy cover. A return to wetter climate conditions may see the active recruitment of canopy species.

The rainforest are thought to be in fair condition, possibly as a result of climatic conditions and soil fertility (Jamie Kirkpatrick, pers. comm.), although surveillance monitoring will establish and monitor ecological indicators to determine the condition. The aim of management is for the rainforest to be in good condition, although the causes for its current poor condition may be unfeasible to manage (i.e. drought and soil fertility).

Objective 5.0: Determine baseline levels of the extent and condition of the rainforest, and maintain or improve these into the future.

Threats

Threats to the rainforest and its dependent species include an inappropriate fire regime, plant disease (i.e. myrtle wilt) and climate change. These threats can result in a loss of vegetation structure and floristic diversity.

In contrast to the fire-tolerance of grasslands, rainforest is fire-sensitive and likely to be severely degraded by fire. Fire may result in the conversion of rainforest to forest dominated by eucalypt species, or even convert them to grasslands, as has been seen in the Surrey Hills area along historic railway lines (Robert Onfray, Gunns Ltd, pers. comm.).

One plant disease is known that may impact on the rainforest, being myrtle wilt. Myrtle wilt is the main cause of death of myrtle, *Nothofagus cunninghamii*, with tree death resulting from infection from a pathogenic fungus (Packham et al, 2008). Recent work has suggested that myrtle wilt may be endemic and that rates of spread are generally low enough to allow replacement of dying individuals. It is not known if myrtle wilt is present at the Vale of Belvoir, although it is known to be present in the broader region.

Medium-term climate change projections of warming and drying around the Vale of Belvoir (Climate Futures Tasmania, 2012) are also likely to negatively impact on the structure and diversity of the rainforest.

Summary of threats directly affecting this target and the strategies that TLC will implement to control the threats (strategies discussed in Section 17).

Threatening process	Source of threat	Current threat rating	Management strategy	Priority
Loss of structural and biological diversity	Inappropriate fire regime	Moderate	Disturbance management regime	Moderate
	Plant disease	Moderate	Visitation and hygiene policy	Moderate
			Annual reserve assessment	Moderate
	Climate change	Moderate	Resilience to climate change	Moderate
			Long-term ecological monitoring	Moderate

16. Social Targets for the Vale of Belvoir Reserve



Target 6 Community knowledge, understanding and appreciation of conservation

Members of the community hold valuable knowledge about conservation values and management strategies. Seeking out and engaging with these members of the community provides opportunities for the TLC to focus our efforts on developing and implementing conservation strategies that work, by learning from the community knowledge. In the case of the Vale of Belvoir, TLC has committed to learn from the Charleston family to ensure that their knowledge of the landscape was recorded and passed on. Other people, such as speleologist Stephen Blanden, scientists Jamie Kirkpatrick, Louise Gilfedder, Jennie Whinam and others, and PWS staff from Cradle Mountain have also shared their knowledge of the Vale and its values with the TLC.

Many members of the community also have valuable skills that can be offered voluntarily to the TLC to assist with management and monitoring of our properties, substantially increasing the capacity of the TLC to undertake our work.

Working alongside and sharing conservation knowledge with the broader community can also improve community understanding and appreciation of conservation, and result in improved attitudes and behaviours.

Objective 6: Develop and maintain clear tangible opportunities for the community to benefit from the TLC's reserves through visitation, volunteering, education and other activities.

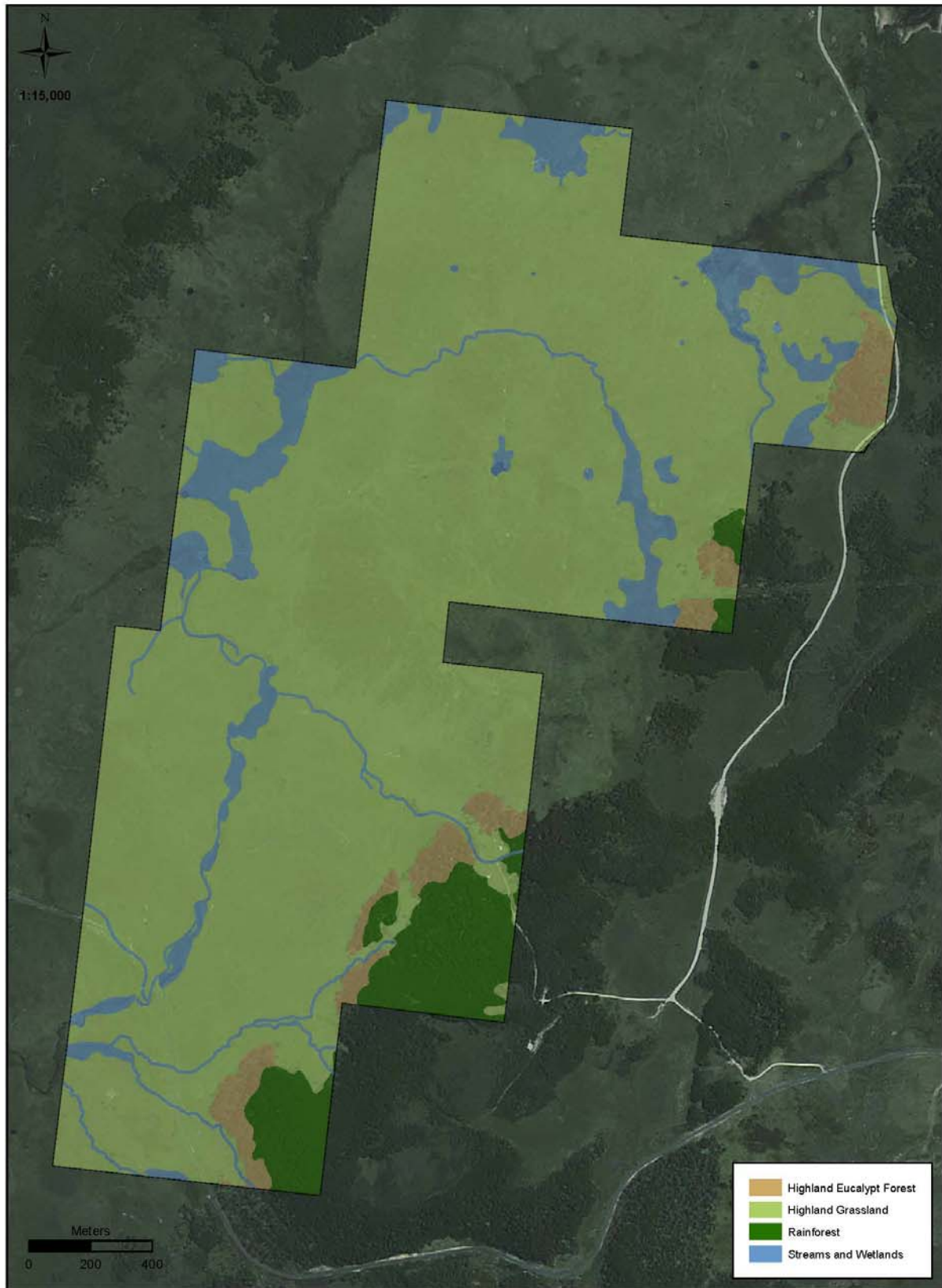
Threats

The loss of knowledge, understanding and appreciation is the primary threat to achieving this objective. This may arise from lack of, or poor, communication or the lack of opportunities to become, or remain, engaged with the TLC.

Summary of threats directly affecting this target and the strategies that TLC will implement to control the threats (strategies discussed in Section 17).

Threatening process	Source of threat	Current threat rating	Management strategy	Priority
Loss of conservation knowledge, understanding and appreciation	Lack of appropriate communication	Moderate	Communication and volunteering strategy	High
	Lack of opportunities to engage with the TLC	Moderate		

Figure 2: Conservation targets at the Vale of Belvoir



Vale of Belvoir Reserve - Conservation Targets



Map produced by the Tasmanian Land Conservancy

Karst is not shown in this map, as it occurs extensively throughout the entire valley, underlying most areas of grassland.

17. Strategies to manage threats

The following pages describe the strategies we will pursue to reduce threats and protect the targets. Each strategy is described. Execution of the key actions should lead to a reduction of the threat, which in turn will improve the condition of our targets. Outcomes of the strategies will be monitored, and will be used to adjust the strategy if the expected outcomes are not being achieved.

Strategy 1: Disturbance management

Priority: Very high

Fire and grazing are the primary forms of disturbance that are likely to maintain highland *Poa* grasslands in good condition with high levels of biodiversity. This is demonstrated by the Vale of Belvoir, which is recognised by its large expanse of natural grasslands that are relatively free of shrub invasion, in comparison to other highland grasslands, such as Waldheim and the area of Lee's Paddocks within the World Heritage Area. Highland grasslands that are characterised by shrub invasion have been free of burning and stock grazing for several decades, and also exhibit low levels of floral diversity (Jennie Whinam, pers. comm.). This disturbance creates and maintains gaps that act as recruitment niches and reduce competition for the less competitive herb species. There is some strong evidence that many of the highland grasslands were maintained and extended by burning by Aboriginals (Kirkpatrick, 1999), and highland graziers state that their forebears mimicked the burning practices of the Aboriginal people (Kevin Charleston, pers. comm.).

The PWS Draft Montane Grassland Fire Management Strategy 2012-2016 states:

“Highland grasslands will not burn if the *Poa* tussocks consist of less than 60% dead material or have more than 24% moisture content (Leonard 2009). High percentages of dead material are not available in summer, when managers can often use montane grasslands as fire boundaries. Native animal grazing increases the percentage of dead grass in tussocks (Leonard et al. 2010; Kirkpatrick et al. 2011). Dead grass reaches its peak in *Poa* tussocks in late winter after severe frosts (Cubit 1996, Leonard et al. 2010).

The mountain cattlemen of northwest Tasmania take advantage of this late winter peak in dead material to burn off their pastures. The need for burning is judged on the basis of the cover of the *Poa* tussocks. When the leaves of the adjacent *Poa* tussocks meet there is judged to be a need for burning and a high probability of fire spread. Burning takes place after a run of days without rain. In late winter and early spring the adjacent scrub and forest vegetation is too wet to burn, so boundaries are secure.”

However, some grasslands and grassy sedgelands may persist in the absence of fire with factors such as soil type, geology, or climate limiting shrub and tree encroachment. It is not currently clear which, if any, areas at the Vale of Belvoir fall within this category.

A fire management strategy and burn plans will be developed in partnership with the PWS to ensure optimum use of fire in the *Poa* grasslands and the exclusion of fire in wetlands and rainforest. Post-fire water quality monitoring should be considered, to assess impacts of fire on karst and wetlands. Consideration will be given to the tolerance of all primary and nested targets during the development of the fire management strategy and burn plans. Cooperation with PWS is also required to prevent wildfires from threatening the nearby Cradle Valley tourist area.

Historically, cattle have been grazed at the Vale of Belvoir during summer months. While it is possible that stock grazing at the traditional low intensity may have assisted in maintaining the high level of diversity in the grasslands, cattle also impact negatively on the environment, in particular on wetlands. A grazing management plan will be implemented to ensure that cattle grazing does not reduce the viability of any of the targets. The grazing management plan will be consistent with the current grazing lease.

As defined by the conservation covenant, managing grazing includes:

- limiting maximum cattle numbers to 300 at any time (the estimated historic average number of cattle present at any one time) and only allow cattle from 30 November to 30 June each year;
- limiting cattle access to sensitive wetland and karst areas through construction and maintenance of fences;
- monitoring the specific effects of cattle in the grasslands;
- ensuring that the areas that cattle graze in the weeks before being moved into the Vale are free of weeds, or cattle are 'quarantined' for several days in a specific location at the Vale prior to being moved into wider spaces.

The stock grazing regime needs to be considered in conjunction with the intensity of the native grazing regime and the fire regime, to ensure that the total disturbance regime is balanced and able to meet the conservation targets of this plan. If research indicates that grazing is not required for conservation purposes, then grazing will cease.

Key actions:	Details
Develop fire management strategy, including an ecological burn schedule to optimise the outcomes of the fire regime.	Work with PWS, TFS and DPIPW to develop a fire management strategy for the Vale of Belvoir. This should follow as closely as possible the historical grassland burning regime, but also recommend appropriate fire regimes for other vegetation types, including consideration to natural succession in grasslands and woodlands. Consideration should also be given to the probability of unplanned fires, e.g. from lightning strike or spread from adjacent properties. The strategy should identify the desired outcomes of planned fires in different vegetation types (including absence of fire in wetlands and rainforest) and methods to measure the outcomes of the strategy.
Implement ecological burn schedule, in partnership with PWS.	Including monitoring results of burns.
Develop an Fire Management Agreement with PWS to agree on appropriate actions to be taken with regards to managing planned and unplanned fires.	This document was drafted in September 2012 and is being finalised by TLC and PWS.
Develop and implement a grazing strategy to determine the influence of summer cattle grazing on maintaining the condition of the grasslands and ensure that cattle grazing does not reduce the viability of the conservation targets.	The grazing strategy will be based upon historical levels of grazing, as identified in the grazing lease, but be informed by the results of monitoring to alter the grazing lease in favour of the protection of conservation values. Areas that are particularly vulnerable to cattle impacts were identified and stock-proof fences installed in 2010 around 25 ha of wetland and karst. These stock enclosures, as well as experimental enclosures installed in the 1990s, will be utilised for monitoring the differences between areas grazed by cattle with those un-grazed by cattle. A grazing lease over the grasslands area in the Vale of Belvoir Conservation Area was obtained in 2010 and should be maintained while any stock grazing is permitted at the Vale of Belvoir Reserve.
Adjust grazing regime if research indicates this is necessary to achieve the conservation objectives of the Management Plan.	Cattle-proof fencing, reducing cattle numbers, or excluding cattle for a season are some options that will be considered for adjusting the grazing regime. Cattle-proof fencing was installed in 2010 around two sensitive karst and wetland areas and will be maintained.
Implement good neighbours policy.	This policy ensures that TLC liaises with neighbours to best manage cross-boundary values and threats. For the Vale of Belvoir, this includes working with PWS to manage cattle grazing, fire management, unauthorised access, weed management and wasp control.

Strategy 2: Visitation and hygiene

Priority: High

Visitation to the Vale of Belvoir is seasonal, with most occurring during the summer months. Most visitation in the valley is focussed on Lake Lea, however visitation to the Vale of Belvoir Reserve is focussed on Charleston's Hut and Daisy Hill.

Inappropriate activities may be undertaken by visitors to the Vale of Belvoir, including off-road driving, lighting of fires and hunting. These activities may result in physical disturbance to wetlands and karst, unplanned and escaped fires, and the introduction or spread of weeds and diseases.

A visitation policy will ensure that visitors are encouraged to undertake appropriate activities and are aware of the prohibition of certain activities. Any visitor facilities and signage should encourage appropriate behaviours and inform of activities that are not permitted, including off-road driving, firearms, domestic animals and lighting of fires.

The caves are not considered suitable for general public access. All cave-based activities should comply with accepted minimal impact caving practices (eg. http://www.caves.org.au/s_minimal.htm).

Key actions:	Details
Implement the TLC weed and soil-borne pathogen hygiene policy.	The TLC weed and soil-borne pathogen hygiene policy identifies procedures to prevent the introduction and spread of weeds and water- and soil-borne pathogens.
Install and maintain signs at the Vale of Belvoir that encourages appropriate behaviours and informs of activities that are not permitted	Signs were installed at the Vale of Belvoir in 2011.

Strategy 3: Exotic fauna species control

Priority: Moderate

Exotic fauna species, including European wasps, cats, foxes and trout, may all have an impact on conservation targets. This strategy aims to ensure that the impact of exotic pest species is minimised.

European wasps have been recorded preying on endangered ptunarra brown butterflies in areas where butterfly populations have subsequently crashed. Postgraduate research is currently being undertaken by Josephine Potter to quantify the specific impact that European wasps have on ptunarra brown butterfly populations, and to determine how well wasp control measures limit the impact of the wasps. It is likely that undertaking active wasp control during March, when adult ptunarra brown butterflies are emergent, will restrict the impact that wasps have on this species.

Rainbow trout have established a self-maintaining population in the Vale River, and brown trout are common in Lake Lea. Neither of these waterways are stocked by the Inland Fisheries Service, but are both regularly fished by anglers during the trout season. Trout may have a significant impact on aquatic invertebrate populations, although it is unclear yet the full extent of the impact at the Vale of Belvoir and whether the impacts may be reversed or ameliorated with control of the trout populations.

Cats are likely to already occur at the Vale of Belvoir, although no evidence has been seen of this species. Should foxes become established in the state, they would have a significant impact on critical weight range mammals, including at the Vale of Belvoir.

Key actions:	Details
Work with neighbours, scientists, governments and the community to control exotic fauna species.	
Identify and kill wasp nests annually prior to and during the ptunarra brown butterfly flying season (March).	Methodology for this action has been established as part of current postgraduate research.
Consider options for controlling the trout populations.	
Implement good neighbours policy.	This policy ensures that TLC liaises with neighbours to best manage cross-boundary values and threats. For the Vale of Belvoir, this includes working with PWS to manage cattle grazing, fire management, unauthorised access, weed management and wasp control.

Strategy 4: Access control

Priority: Moderate

Unauthorised vehicle access has been recorded on several occasions at the Vale of Belvoir. These activities may result in physical disturbance to wetlands and karst and the introduction or spread of weeds and diseases. The Parks and Wildlife Service are aware of unauthorised vehicle activity in the Lake Lea area and are in the process of installing signs and physical barriers to discourage these activities.

The TLC infrequently uses vehicles off-road for land management activities requiring heavy materials or equipment to be carried long distances, however this is not undertaken in wetlands, watercourses or areas containing karst outcrops, and is avoided during wet conditions.

Key actions:	Details
Ensure signage is maintained at all access points to inform visitors of appropriate behaviours.	Ensure that visitor information encourages appropriate behaviours and informs of inappropriate behaviours
Maintain fences where required.	Fences have been constructed along either side of the Belvoir (Link) Road to prevent unauthorised vehicle access and prevent stock access to the road.
Implement good neighbours policy.	This policy ensures that TLC liaises with neighbours to best manage cross-boundary values and threats. For the Vale of Belvoir, this includes working with PWS to manage cattle grazing, fire management, unauthorised access, weed management and wasp control.

Strategy 5: Weed management

Priority: Moderate

The introduction of weeds may threaten the conservation targets of the Vale of Belvoir, in particular weeds may outcompete native herbs in the highland grasslands and sedgeland. Spear thistles are present in some areas that are frequented by cattle and a single blackberry plant has been recorded previously.

Ragwort (*Senecio jacobaea*), foxglove (*Digitalis purpurea*), gorse (*Ulex europaeus*) and Montpellier broom (*Genista monspessulana*) are present in the broader region and this, and other weed species, may be accidentally introduced by un-quarantined cattle, unauthorised vehicle access, road maintenance works, wind, unclean vehicles and walkers. Change in climate may also favour the establishment of exotic species or encourage invasion of shrub and woodland plant species into the grasslands.

Key actions:	Details
Develop and implement a weed management strategy.	The weed management strategy will map any weeds recorded and identify primary control and follow-up control methods. Control of spear thistles has been undertaken in Jan 2011 and 2012.
Implement the TLC weed and soil-borne pathogen hygiene policy.	The TLC weed and soil-borne pathogen hygiene policy identifies procedures to prevent the introduction and spread of weeds and soil-borne pathogens.
Implement good neighbours policy.	This policy ensures that TLC liaises with neighbours to best manage cross-boundary values and threats. For the Vale of Belvoir, this includes working with PWS to manage cattle grazing, fire management, unauthorised access, weed management and wasp control.

Strategy 7: Resilience to climate change

Priority: High

Medium-term (2040 – 2069) climate change projections for the Vale of Belvoir under higher- and lower-emissions include warming (+1.43 C and +1.05 C respectively) and drying (-76 mm and -53 mm respectively) (Climate Futures Tasmania, 2012). Changes in climate will affect most conservation targets, but particularly wetlands and rainforest. In addition, warming and drying may result in grassland burns extending into woodlands and rainforest, due to the decreased rainfall and increased evaporation.

While there is little direct action that can be undertaken to prevent the impact of climate change on the conservation targets at the Vale of Belvoir, improving the resilience of the conservation targets will help to limit the impacts.

Key actions:	Details
Encourage and support research into effects of climate change on conservation targets, and collection of seed banks for indicator, foundation and iconic plant species found at the Vale of Belvoir	
Implement the TLC weed and soil-borne pathogen hygiene policy.	The TLC weed and soil-borne pathogen hygiene policy identifies procedures to prevent the introduction and spread of weeds and soil-borne pathogens.

Strategy 8: Waste water treatment

Priority: Low

Charleston's Hut, within the Vale of Belvoir Reserve, includes a pit-toilet, located in proximity to a creek that flows through karst and into the wetlands. The current usage of the hut is unlikely to result in any significant impacts to the karst or wetlands, however increased use of this toilet may result in localised, unacceptable levels of nitrification to these conservation targets. In negotiating the lease of this area to the Charleston family, it was agreed that an alternate toilet would be installed to prevent impact to the conservation values.

Key actions:	Details
Liaise with Charleston family to ensure an appropriate waste water treatment system is installed.	

Strategy 9: Communication and volunteering strategy

Priority: High

The TLC aims to provide opportunities for the community to engage with their natural environment. These activities include communication, volunteering, and opportunities for learning and recreation. Where possible the TLC develops partnerships with other organisations to assist in the delivery of the strategy.

At the Vale of Belvoir, the TLC has partnered with the voluntary community group Threatened Plants Tasmania to assist in the monitoring of threatened plants and has also engaged with the international research group WildFire PiRE, providing interns with an individual research project. Other such partnerships are actively being sought.

The TLC also has a strong partnership with the former landowners, the Charleston family, whose family history is strongly associated with the Vale of Belvoir. The Charleston family have an exceptional knowledge of the area and continue to assist the TLC in the management of the property.

Key actions:	Details
Effective communication	Communicate in a timely and appropriate manner with stakeholders and the community.
Maintain relationships with community partners.	Community partners include the Charleston family and Threatened Plants Tasmania
Prepare visitor information and provide to visitors.	Ensure that visitor information encourages appropriate behaviours and informs of inappropriate behaviours

Strategy 10: Surveillance monitoring

Priority: Very high

Surveillance monitoring will be undertaken regularly and will establish baseline measures of ecological indicators and subsequently provides early warning of deleterious changes in the conservation targets. The results of this monitoring will allow reserve managers to develop mitigation measures and reduce future costs of remedial management. This monitoring program is currently being trialled with data collected every two years.

Key actions:	Details
Identify indicators; develop surveillance monitoring program, including methodology; and implement.	
Share data collected with relevant organisations (e.g. UTAS) and submit to relevant databases (e.g. NVA)	

Strategy 11: Annual reserve assessment

Priority: Very high

Annual reserve assessments are undertaken by TLC reserve management staff across all permanent reserves to identify any new or emerging threatening processes that have the potential to reduce the viability of the targets. At the Vale of Belvoir, these potential threats may include the establishment of feral predators, weeds, invasion of shrubs into the grasslands.

Key actions:	Details
Annually assess potential threats to the reserve, report results and adapt management program	
Share collected data with relevant organisations (e.g. UTAS) and submit to relevant databases (e.g. NVA)	

18. Management Responsibilities

TLC staff are responsible for undertaking the management of the Reserve. This includes the co-ordination of contractors, consultants and volunteers where they are required to implement the management requirements outlined in this Management Plan. Relevant experts from the TLC Board and Conservation Science Advisory Council will also be requested to assist with management wherever an individual's expertise is relevant to management.

Wherever possible, the TLC works with neighbours to manage cross-tenure threats.

The TLC will endeavour to act as a good neighbour to all parties and, where possible, undertake co-operative or complementary management where both parties seek a similar outcome (e.g. weed control and fire management). As far as is practical, the TLC will ensure that management of the Reserve does not have a detrimental impact on adjoining land or marine areas.

Long-term management costs will be met through the TLC Foundation, an endowment fund that seeks to use compounding interest to pay for the costs of the organisation, and by ongoing fundraising or through relevant grant opportunities as they become available.

19. Management Plan Review

In implementing the adaptive management process identified by the TLC's Reserve Management Policy, progress towards meeting the objectives of this plan will be reviewed at regular intervals not exceeding every two years. Such reviews may lead to minor amendments to the plan.

A full review of the plan will occur at a time no earlier than five years and no later than ten years from the date of publication of this plan. This full review will involve public input prior to the intended publication of a new management plan.

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