National Recovery Plan for the Large-fruit Groundsel *Senecio macrocarpus*

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Australian Government

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Department for Environment and Heritage

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Department of Sustainability and Environment

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This Recovery Plan has been developed with the involvement and cooperation of a range of stakeholders, but individual stakeholders have not necessarily committed to undertaking specific actions. The attainment of objectives and the provision of funds may be subject to budgetary and other constraints affecting the parties involved. Proposed actions may be subject to modification over the life of the plan due to changes in knowledge.

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Summary

The Large-fruit Groundsel *Senecio macrocarpus* is a small perennial plant endemic to south-eastern Australia, where it occurs in South Australia and Victoria, and formerly occurred in Tasmania. There are about 15 populations containing about 36,000 plants, although almost all plants (about 35,000) occur in just one population. Major threats include habitat disturbance and destruction, weed invasion and competition. The species is listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999, Vulnerable under the South Australian *National Parks and Wildlife Act* 1972, Threatened under the Victorian *Flora and Fauna Guarantee Act* 1988, and as Extinct under the Tasmanian *Threatened Species Protection Act* 1995. This national Recovery Plan for the Large-fruit Groundsel is the first recovery plan for the species, and details its distribution, habitat, threats and recovery objectives and actions necessary to ensure its long-term survival.

Species Information

Description

The Large-fruit Groundsel *Senecio macrocarpus* F. Muell. ex Belcher (family Asteraceae) is a perennial daisy growing to 70 cm high, although usually much shorter. It has alternate, linear leaves to 100 mm x 5 mm and covered with fine hairs on both surfaces. The foliage tends to be crowded towards the base of the plant. The inflorescence bears 2–10 relatively large heads to 18 mm long and 20 mm wide (hence the common name), each supporting up to 150 yellowish florets surrounded by linear, pointed bracts. The fruits are up to 6 mm long, cylindrical, brown and hairy. Plants flower from September to November, and occasionally in March and April. (description from Belcher 1983; Walsh 1999). Useful field characteristics for identifying the Large-fruit Groundsel include its relatively squat form, coarse foliage and large, rigid bracts (resembling planks on a barrel) that are obvious even when the plant is not in full flower. This species is closely related to *Senecio squarrosus* and *Senecio quadridentatus*, and can be best distinguished by its larger flower heads and longer fruits.

The Large-fruit Groundsel is a long-lived perennial species, and plants can live for many years, possibly decades. It may remain green all year round, or die back in dry seasons then re-sprout from rootstock after rain, and can re-sprout after fire (Cutten & Squire 2003). The relatively large seeds are able to secrete a mucilaginous material when moistened, which presumably acts to glue them onto the soil surface (N. Scarlett, pers. comm.). Seed production is apparently highly variable between seasons. In years with sustained spring and summer rainfall, the plant may produce many flushes of flower heads (K. Brewer, pers. comm.), while in dry seasons growth and flowering are substantially reduced. Seeds are capable of germinating in quite dark conditions such as under dense swards of grass, although seedling survival and growth is increased where they establish in gaps between grass clumps, rather than closed swards of grass (Morgan 1998a). Seedlings also establish well in areas with some disturbance such as after fire. Seed longevity is not known, but may be fairly short, as stored seed does not remain viable for long (D. Tonkinson pers. comm.), and the species is unlikely to form a long-lived soil seed bank. Its large seed size suggests limited dispersal ability.

Distribution

The Large-fruit Groundsel is endemic to south-eastern Australia, where it was once widely distributed from the southern Flinders Ranges in South Australia through Victoria to north-eastern Tasmania (Figure 1).

In South Australia, the species has been recorded from the Yorke Peninsula, Flinders and Mount Lofty Ranges and the south-east of the State, in the Eyre Yorke Block, Flinders Lofty Block and Narracorte Coastal Plain bioregions (*sensu* DEH 2000).

In Victoria, the species has been recorded widely across the State, from near Horsham in the west to near Omeo in the east, with most records from western Victoria (Hills & Boekel 1996). Records occur in the Murray Darling Depression, Victorian Volcanic Plain, Victorian Midlands and South Eastern Highlands bioregions.

In Tasmania, the species was recorded in the mid 1800s from the valley of the South Esk River, probably near Perth and Avoca, in the Tasmanian Northern Midlands bioregion, but is now believed to be extinct in that State.

Maps showing the distribution of the Large-fruit Groundsel are available from the Department of Sustainability and Environment (for Victoria), and the Department for Environment and Heritage (for South Australia).

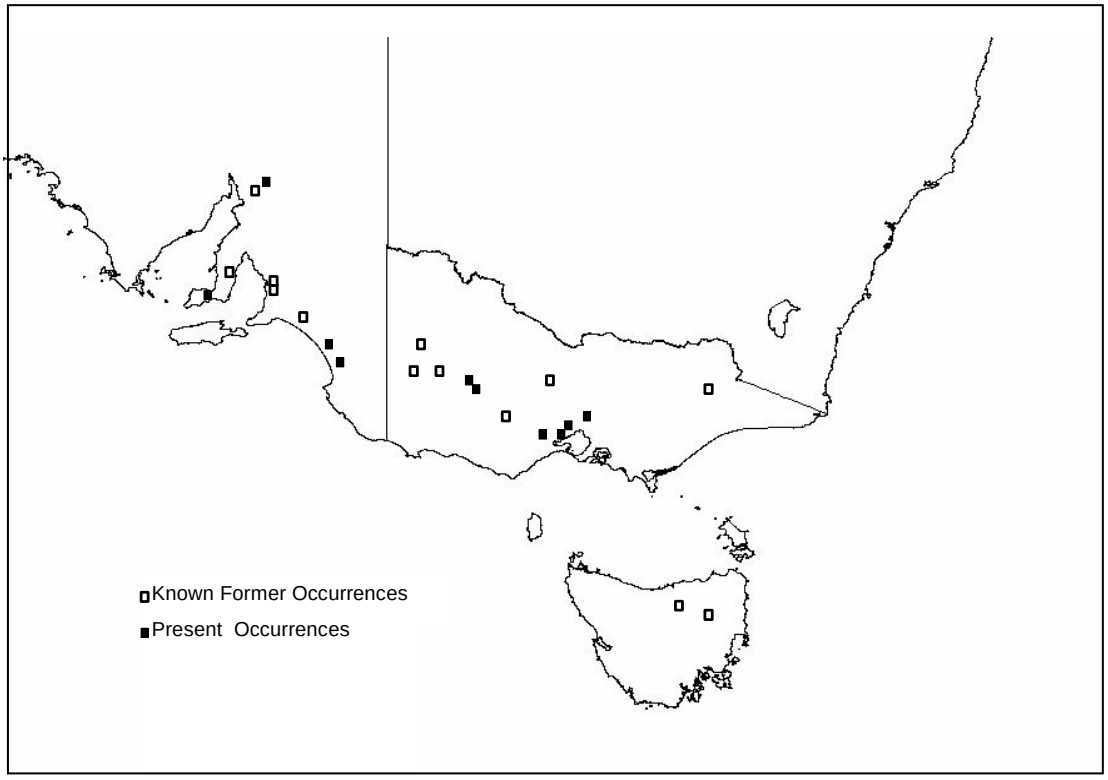

Figure 1. Former and current distribution of the Large-fruit Groundsel

Population Information

Currently there are thought to be 14 populations of Large-fruit Groundsel containing an estimated 36,000 plants (Table 1), although almost all of these (35,000) occur in a single population, in Messent Conservation Park near Salt Creek in South Australia. There are another three populations in South Australia: Gum Lagoon Conservation Park (near Messent CP), Yalkuri Station (private land, near Lake Albert), and private land near Tarcowie in the southern Flinders Ranges, all with only a few plants. The species may still exist on the Yorke Peninsula, with a herbarium record from 1994 being the most recent collection.

In Victoria, there are perhaps 10 populations containing less than 1,000 plants. The largest populations occur in the Deep Lead Nature Conservation Reserve and adjoining land near Stawell in western Victoria, on private land at Laverton and along a rail line near Werribee, to the south-west of Melbourne. The remaining populations are largely on rail reserves or private land and all contain only a few plants.

Table 1. Population and threat information for the Large-fruit Groundsel

Location/Site	Pop size (year)	Manager	Threats (H = high, M = medium, L = low)	Comments
South Australia				
Messent Conservation Park, Salt Creek	~35,000 plants (1992)	DEH	wetland restoration/site flooding (H) weed invasion (L)	the most important site for conservation of this species; contains most plants; occurs on land managed for conservation purposes; proposed wetland restoration poses major threat to population.
Gum Lagoon Conservation Park, Salt Creek	10 plants (2000)	DEH	threats not known	
Yalkiri Station, Narrung Peninsula	'small population' (1988)	private	threats not known	
Private land ca. 15km SSW of Corny Pt, Yorke Peninsula	'sparsely present' (1994)	private	threats not known	weeds present (*Trifolium scabrum, Dittrichia graveolens*)
Victoria				
Deep Lead – reserve, rail reserve, private land	~375 plants (1998)	Parks Victoria, ARTC, private	vehicle disturbance (L) weed invasion (L)	population occurs across three land tenures; most plants occur in Deep Lead Nature Conservation Reserve, with some plants on adjoining rail reserve and private land; threats mostly a problem for these plants
private land, Laverton	~200 plants (2000)	private	urban development (H) weed invasion (H)	site is on land destined for residential development; although most plants occur in fenced 'reserves' these areas may still be developed
rail reserve, Manor Road, Werribee	~160 plants (2001)	V/line	weed invasion (H) vehicle disturbance (M)	
rail reserve, Diggers Rest	94 plants (2001)	V/line	weed invasion (H)	
rail reserve, Dobie	~60 plants (2003)	V/line	Vehicle disturbance (H)	
Bannockburn Cemetery	20 plants (2003)	Bannockburn Cemetery Trust	weed invasion (H)	
rail reserve, Deer Park	2 plants	V/line	weed invasion (H)	
recreation reserve, Yalla Y Poora	6 plants (2003)	Ballarat Environment Network	weed invasion (H)	
quarry site, Werribee	3 plants (2001)	private	weed invasion (H)	
Yan Yean Reservoir	200+ plants (1998) 2 plants (2003)	Melbourne Water	vegetation succession/weed invasion (H) grazing by kangaroos (M)	site has developed a thick sward of both native vegetation and weeds, causing population decline

Habitat

The Large-fruit Groundsel occurs in a variety of habitats, including grasslands, sedgelands, shrublands and woodlands, generally on sparsely vegetated sites on sandy loam to heavy clay soils, often in depressions that are waterlogged in winter.

In South Australia, at Messent CP, the species occurs in shallow depressions on loamy sand with numerous sedge and herb species including *Baumea juncea*, *Lepidosperma concavum*, *Apodasmia brownii*, *Schoenus nitens*, *Wilsonia rotundifolia*, *Wilsonia backhousei*, *Podolepis canescens* and *Gahnia filum*. Some areas have an overstorey of Moonah *Melaleuca lanceolata* and Salt Paperbark *Melaleuca halmaturorum*, and Desert Banksia *Banksia ornata* is becoming a dominant shrub on these depressions as they get progressively drier. It has been suggested that this is a largely artificial habitat (Owens *et al*. 1995; Cutten & Squire 2002). The best documented population in this area is at Alf Flat (Davies 1995, 2003; Cutten & Squire 2002, 2003). At Gum Lagoon CP, the species occurs in depressions on heavy clay soils in Mallee Honey-myrtle *Melaleuca brevifolia* shrubland (Davies 2000). At Yalkuri Station, the Large-fruit Groundsel grows on bare ground in loamy sand in solution holes in limestone in shrubland dominated by *Lasiopetalum behrii* and *Correa alba* var. *pannosa* (Davies 1995, 2003). On the Yorke Peninsula, it was recorded in *Gahnia filum* sedgeland with scattered shrubs including *M. lanceolata* and *M. halmaturorum* (Davies 2000).

At many sites in western Victoria, the Large-fruit Groundsel occurs with many other herb species in grassland dominated by Kangaroo Grass *Themeda triandra* on heavy basalt clay soils (Morgan 1998a, b; Mueck, 2000). There are also several records from Yellow Gum *Eucalyptus leucoxylon* woodland, generally in low, flat areas where there are few other understorey species. At Yan Yean, *S. macrocarpus* occurs on heavy soil on a broad flat along the upper edge of the water level. The population at Dobie occurs in Yellow Box *Eucalyptus melliodora* woodland with a herbaceous and grassy understorey on sedimentary soils.

Together, these observations imply that the niche occupied by this species is rather broad. From a physical perspective, it is generally characterised by relatively heavy soils that may be susceptible to waterlogging and/or summer drought. In addition to this, observations and specific studies of *S. macrocarpus* in native grasslands suggest that competition from other plant species is important in determining the distribution and persistence of *S. macrocarpus*. In almost all areas where the species currently occurs, competition from other understorey plants is relatively light, either as a result of the physical and floristic characteristics of the site, or due to regular burning. This relative lack of competition may be an important component of habitat critical to the survival of *S. macrocarpus*. An action in the Recovery Plan is aimed at identifying and mapping habitat critical to the survival of the Large-fruit Groundsel.

Decline and Threats

There has been a substantial decline in range and abundance of the Large-fruit Groundsel. The species was last recorded from Tasmania in the 1850s, and is now considered extinct there. In Victoria, there has been a major contraction in distribution. The last record from near Omeo in eastern Victoria was in 1853, and the species has not been seen there since, so the easterly distribution limit is now probably Yan Yean, north of Melbourne. It was once distributed more widely in western Victoria, but has disappeared from many sites, and is now apparently extinct from sites west of Horsham. It is estimated that less than 1,000 plants exist in Victoria. In South Australia the species may have disappeared from some areas including near Adelaide and some sites on the Yorke Peninsula.

The initial cause of decline of *S. macrocarpus* was almost certainly the spread of agriculture across the grassy plains of south-eastern Australia. The species is highly palatable to and readily eaten by sheep (N. Scarlett pers. comm.), so grazing probably led to a rapid decline soon after settlement, especially in grassy habitats of western Victoria where it was once common (J. Morgan pers. comm.). Further declines probably occurred through conversion of native vegetation communities to pasture and crops. This has resulted in the loss of the species from virtually all of the agricultural areas of western Victoria, with remaining populations surviving in remnant habitat along rail lines and in several small reserves. Given this lack of long-distance dispersal, habitat fragmentation is probably an ongoing impediment to the

recovery of *S. macrocarpus*. Remaining populations exist in areas unlikely to be grazed at present, such as along rail lines and conservation reserves, although grazing from pest animals such as European Rabbit may be a localised problem (Hills & Boekel 1996).

Current major threats include ongoing disturbance to and destruction of habitat, competition, weed invasion and possibly climate change. These are discussed further below:

Habitat disturbance/destruction

Although the largest and most important population of *S. macrocarpus* occurs in Messent Conservation Park (SA), it may not be secure. The 'Wetlands Waterlink' component of the 'Upper South East Dryland Salinity and Flood Management Plan' suggests introducing flooding to Messent CP as part of an attempt to restore wetlands in the area (detailed in Cutten & Squire 2002). This could alter the habitat, probably kill individual plants, and depending on the extent of flooding, may seriously threaten this key population (Cutten & Squire 2002; Davies 2003). However, the situation at Messent is complex. It has been suggested that the species occurs in a largely artificial habitat resulting from substantial changes to the original habitat at the site (Owens *et al*. 1995; Cutten & Squire 2002). After European settlement it is likely that this area received reduced flooding due to the diversion of water from the Marcollat and Bakers Range Watercourses, then increased drainage, predominantly from the Blackford Drain and Drain M in the 1950s and 1960s (Cutten & Squire 2002). Thus, since European settlement, the site has probably dried out substantially, allowing *S. macrocarpus* to establish in new bare habitat. However, the diversion of water into Messent CP could threaten the species as it is unlikely that *S. macrocarpus* could withstand substantial or prolonged inundation by fresh or saline water (Davies 2003). While the proposal seeks to improve the value of the wetlands by partially restoring them to their former condition, it risks damaging the new value attained by the degraded system in the form of the *S. macrocarpus* population. Managing this area will require a trade-off between restoring wetland habitat and maintaining the most important *S. macrocarpus* population (Cutten & Squire 2002).

The second-largest population in Victoria, at Laverton, occurs on private land destined for residential development. Although most plants occur in small fenced 'reserves' within the larger development site, these areas may still be developed. Several populations along rail lines are also at risk from disturbance and destruction due to rail maintenance activities, especially heavy machinery movement. The recent upgrade of rail facilities between Melbourne and Geelong necessitated some plants being transplanted away from the line to avoid loss.

Competition

Populations of *S. macrocarpus* growing in native grassland habitats are at risk of decline or extinction if dense grassy swards develop in the absence of periodic disturbance such as fire. The species needs open ground for seed germination and seedling establishment. In one study of a *Themeda*-dominated grassland (Morgan 1998b), the large gaps created by fires contracted to 40% after a year, to 26% after two years, and to 1% after three years. In this habitat, the window of opportunity for regeneration of herbs such as *S. macrocarpus* is clearly limited. While adult plants can persist for years in closed swards of grass (D. Burns, A. Arnold DSE pers. comm.), seedlings cannot establish, and local populations without disturbance to open the sward may eventually die out. The large decline in the Yan Yean population between 1988 and 2003 is almost due to the increased abundance of grasses and *Cassinia arcuata* at the site.

Adult plants can re-sprout from rootstock after fire (Cutten & Squire 2003). While fire is an important disturbance factor for maintenance of populations in native grasslands, fire may also kill adult plants if it occurs at inopportune times in the growing season, particularly when the first shoots are emerging from the rootstock (A. Arnold; J. Morgan, pers. comm.). Therefore, while periodic fires are required in grassy habitats, fire timing and frequency will be an important aspect of management of grassy habitats for *S. macrocarpus*.

In woodlands, shrublands and sedgelands, competition from neighbouring plants is likely to be less severe than in grassland communities. At Deep Lead (Vic), the population of *S. macrocarpus* is surviving and reproducing in a vegetation community that has very little understorey vegetation and has not been burnt for many decades (John Harris DSE pers. comm.). The small population at Yalkuri Station (SA) occurs in low-sparse shrubland with little or no ground layer (Davies 1995). The large population at Messent CP is able to survive in the sedgeland depressions because of the open spaces between the taller sedges (Owens *et al*. 1995). This population persists in both recently burnt areas (2002) and in areas that have not

been burnt for over 30 years (1977) (Davies 1995, 2003; Cutten & Squire 2002, 2003). The management of *S. macrocarpus* is thus likely to require less intervention (e.g. by burning) in non-grassland sites than in grassland sites.

Weed invasion

Competition from weed invasion is a problem at many sites, especially those in disturbed situations such as along roadsides and rail lines and in small reserves. Major weeds include African Love-grass *Eragrostis curvula*, Perennial Veldt-grass *Ehrharta calycina*, Sweet Vernal Grass *Anthoxanthum odoratum*, Chilean Needle-grass *Nassella neesiana*, Serrated Tussock *Nassella trichotoma*, Blue Periwinkle *Vinca major*, Bridal Creeper *Asparagus asparagoides*, Montpellier Broom *Genista monspessulana* and Paterson's Curse *Echium plantagineum*.

Climate change

As *S. macrocarpus* appears to rely on seasonally damp sites on which to grow, climate change may be a threat to the species. Predicted decreasing rainfall and increasing temperatures forecast for south-eastern Australia could lead to a long-term drying of sites, and hence reducing suitable habitat area for the species.

Recovery Information

Recovery Objectives

The Overall Objective of recovery is to minimise the probability of extinction of the Large-fruit Groundsel in the wild and to increase the probability of populations becoming self-sustaining in the long term. Within the duration of this Recovery Plan, the Specific Objectives for the recovery of the Large-fruit Groundsel are to:

1. Determine distribution, abundance and population structure
2. Determine habitat requirements
3. Manage threats to populations
4. Identify key biological characteristics
5. Determine life history and viability of populations
6. Establish an *ex situ* collection
7. Build community support for its conservation

Program Implementation and Evaluation

This Recovery Plan guides recovery actions for the Large-fruit Groundsel and will be implemented and managed by the Victorian Department of Sustainability and Environment and the South Australian Department for Environment and Heritage, supported by other agencies, educational institutions, regional natural resource management authorities and community groups as appropriate. Technical, scientific, habitat management or education components of the Recovery Plan will be referred to specialist groups on research, *in situ* management, community education and cultivation as required. Contact will be maintained between the State agencies on recovery issues concerning conservation of the Large-fruit Groundsel. The Recovery Plan will run for five years from the date of its adoption under the EPBC Act, and will be reviewed and revised within five years of the date of its adoption.

Recovery Actions and Performance Criteria

Action	Description	Performance Criteria
Specific Objective 1: Determine distribution, abundance and population structure		
1.1	Undertake surveys to determine the area, extent, number, size & structure of populations, and inference or estimation of population change. **Responsibility: DSE, DEH**	• All populations mapped, plants counted and land tenure identified where this is in doubt.
Specific Objective 2: Determine habitat requirements		
2.1	Survey known habitat and collect floristic & environmental information relevant to community ecology and condition. **Responsibility: DSE, DEH**	• Species/habitat specific survey design prepared. • Habitat critical to survival mapped for extant populations.
2.2	Identify and survey potential habitat, using ecological & bioclimatic information to indicate habitat preference. **Responsibility: DSE, DEH**	• Predictive model for potential habitat developed & tested at five sites. • Suitable habitat near Goroke, Daly Head and in Gum Lagoon searched.
Specific Objective 3: Manage threats to populations		
3.1	Control threats from pest plants. **Responsibility: PV, DEH**	• Measurable decline in invasive species at five sites.
3.2	Protect populations on public land. **Responsibility: PV, DSE, DEH**	• Successful negotiation with land managers for protection of all railside and cemetery sites. • Protection of population at Messent CP if wetland restoration work proceeds.
3.3	Protect populations on private land. **Responsibility: DSE, DEH**	• Private land owners approached to enter into voluntary conservation agreements for populations on private land at Laverton, Deep Lead, Tarcowie.
3.4	Control the threat of direct damage by human activities. **Responsibility: DSE, DEH**	• Five sites fenced & signposted to prevent damage.
Specific Objective 4: Identify key biological characteristics		
4.1	Evaluate current reproductive status, seed bank status, longevity, fecundity and recruitment levels. **Responsibility: DSE, DEH**	• Reproductive ecology and regenerative potential quantified for five representative sites. • Seed bank potential quantified for five sites.
4.2	Identify key stimuli for seed germination requirements. **Responsibility: DSE, DEH**	• Stimuli for recruitment identified. • Management strategies identified to maintain, enhance or restore processes fundamental to reproduction and survival.
4.3	Identify and implement disturbance regimes to maintain habitat at grassland sites. **Responsibility: PV, DSE**	• Management prescriptions for ecological burning at three specific sites prepared
Specific Objective 5: Determine life history, population trends and viability of populations		
5.1	Measure population trends and responses against recovery actions by collecting demographic information including recruitment and mortality, timing of life history stages and morphological data. **Responsibility: DSE, DEH**	• Techniques for monitoring developed and implemented. • Population growth rates determined and Population Viability Analysis completed for five populations.
Specific Objective 6: Establish an *ex situ* collection		
6.1	Establish plants in cultivation to provide a research population and potentially for reintroductions. **Responsibility: RBG**	• Effective propagation and cultivation techniques developed. • At least 200 mature plants in cultivation.
6.2	Establish a seed bank and determine seed viability. **Responsibility: RBG**	• Seed from important/representative populations in storage.
Specific Objective 7: Build community support for its conservation		
7.1	Identify opportunities for community involvement in the conservation of the Large-fruit Groundsel and implement them. **Responsibility: PV, DSE, DEH**	Community nature conservation and Landcare groups aware of the species and support its conservation.

Abbreviations: DEH – Department for Environment and Heritage (SA); DSE – Department of Sustainability and Environment (Vic); PV – Parks Victoria; RBG – Royal Botanic Gardens, Melbourne

Management Practices

Management practices required to conserve the Large-fruit Groundsel include:

- Protection of existing populations threatened by habitat disturbance/destruction.
- Surveys and publicity to locate new populations.
- Weed control.
- Research into the ecology and management of the species and its habitat, especially fire and other disturbance regimes required to maintain populations.

Affected Interests

Senecio macrocarpus populations occur on land owned or managed by Parks Victoria, Australian Rail Track Corporation, V/line, Bannockburn Cemetery Trust, Ballarat Environment Network, Melbourne Water, Department of Environment and Heritage (SA), and at least three private landowners. Private land-holders are yet to be identified and will be contacted during implementation of this plan.

Role and Interests of Indigenous People

Indigenous communities on whose traditional lands *S. macrocarpus* occurs are being advised, through the relevant regional Indigenous facilitator in Victoria, and through the Aboriginal Partnerships branch of DEH in South Australia, of the preparation of this Recovery Plan and will be invited to be involved in implementation of the plan.

Social and Economic Impacts

The implementation of this Recovery Plan is unlikely to cause significant adverse social and economic impacts. Several important populations occur on public land managed for conservation purposes. Populations on other public land and private land will be conserved through negotiation and voluntary agreement with landowners and managers, assisted where possible by incentives available through regional natural resource management programs.

Biodiversity Benefits

The Recovery Plan includes a number of potential biodiversity benefits for other species and vegetation communities in Victoria. Principally, this will be through the protection and management of habitat. The adoption of broad-scale management techniques and collection of baseline data will also benefit a number of other plant species growing in association with *S. macrocarpus*, particularly those species with similar life forms and/or flowering responses.

In Victoria, *S. macrocarpus* occurs at several sites also containing other threatened flora. The Laverton site in particular has high-quality Western (Basalt) Plains Grassland community (a listed threatened community in Victoria) containing *Pimelea spinescens* subsp. *spinescens* (Vulnerable). The rail reserve site at Werribee also has Button Wrinklewort *Rutidosis leptorrhynchoides* (Endangered) and Spiny Riceflower *Pimelea spinescens* subsp. *spinescens* (Vulnerable). In South Australia, the species occurs at sites supporting Metallic Sun Orchid *Thelymitra epipactoides* (Endangered) and Spiral Sun Orchid *Thelymitra matthewsii* (Vulnerable). Management actions for the conservation of *S. macrocarpus* will also benefit these species.

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Priority, Feasibility and Estimated Costs of Recovery Actions

Action	*Description*	*Priority*	*Feasibility*	*Responsibility*	*Cost estimate*					
					Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	**Distribution, abundance**									
1.1	Surveys	1	100%	DSE, DEH	**$10,000**	**$10,000**	**$10,000**	**$0**	**$0**	**$30,000**
2	**Habitat requirements**									
2.1	Known habitat	1	100%	DSE, DEH	**$10,000**	**$10,000**	**$0**	**$0**	**$0**	**$20,000**
2.2	Potential habitat	1	75%	DSE, DEH	**$0**	**$10,000**	**$10,000**	**$0**	**$0**	**$20,000**
3	**Threat management**									
3.1	Pest plants	1	75%	PV, DEH	**$5,000**	**$5,000**	**$5,000**	**$5,000**	**$5,000**	**$25,000**
3.2	Public land	1	75%	PV, DSE, DEH	**$5,000**	**$5,000**	**$0**	**$0**	**$0**	**$10,000**
3.3	Private land	1	50%	DSE, DEH	**$10,000**	**$10,000**	**$10,000**	**$5,000**	**$5,000**	**$40,000**
3.4	Human damage	1	100%	DSE, DEH	**$5,000**	**$5,000**	**$5,000**	**$0**	**$0**	**$15,000**
4	**Biological characteristics**									
4.1	Reproductive status	2	75%	DSE, DEH	**$0**	**$0**	**$8,000**	**$8,000**	**$0**	**$16,000**
4.2	Seed germination	2	75%	DSE, DEH	**$0**	**$0**	**$5,000**	**$5,000**	**$0**	**$10,000**
4.3	Disturbance regimes	2	75%	DSE, PV	**$15,000**	**$10,000**	**$10,000**	**$10,000**	**$10,000**	**$55,000**
5	**Life History and pop. viability**									
5.1	Censusing	2	100%	DSE, DEH, PV	**$5,000**	**$5,000**	**$5,000**	**$5,000**	**$5,000**	**$25,000**
6	***Ex situ* Cultivation**									
6.1	Cultivated plants	3	50%	RBG	**$10,000**	**$5,000**	**$5,000**	**$5,000**	**$5,000**	**$30,000**
6.2	Seed bank	3	50%	RBG	**$5,000**	**$2,000**	**$2,000**	**$2,000**	**$2,000**	**$13,000**
7	**Community support**									
7.2	Community extension	3	100%	DSE, DEH, PV	**$2,000**	**$2,000**	**$2,000**	**$2,000**	**$2,000**	**$10,000**
				TOTALS	**$84,000**	**$81,000**	**$79,000**	**$49,000**	**$36,000**	**$329,000**