

Action Statement

Flora and Fauna Guarantee Act 1988 No. 68 (Revised in 2009)

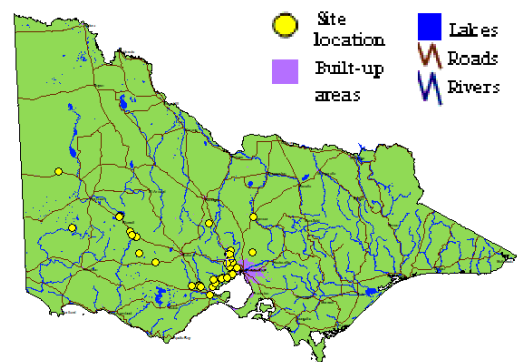
Large-fruit Fireweed *Senecio macrocarpus*

This revised Action Statement is based on the Recovery Plan prepared for this species by DSE under contract to the Commonwealth Department of the Environment, Water, Heritage and the Arts.

Description

Large-fruit Fireweed (or Large-headed/Large-fruit Groundsel; *Senecio macrocarpus* F. Muell. ex Belcher) is a perennial daisy of the Asteraceae family that grows to 40 - 70 cm in height. The leaves are alternate, linear, < 100 mm long and < 5 mm wide. The foliage tends to be crowded towards the base of the plant, and the leaves are covered with cobwebby hairs, particularly on the lower surface. The inflorescence is generally cymose (or corymbose) and bears 2 - 10 capitula (flower heads). Each capitulum supports up to 150 yellowish bisexual and unisexual florets, but lacks ray florets. The florets are normally surrounded by 16 - 21 linear acuminate phyllaries (involucral bracts) with slightly hyaline (transparent) margins. The capitula are relatively large compared to other *Senecio* species: 15 - 18 mm long and 15 - 20 mm wide when pressed. The cypselas (achenes, fruits) are cylindrical, brown, hairy and 4.5 - 6 mm long. Flowering occurs from September to November, and occasionally in March and April. This species is closely related to Leafy Fireweed (*Senecio squarrosus*) and Cotton Fireweed (*Senecio quadridentatus*). *S. macrocarpus* can be most easily distinguished from these species by its relatively large capitula and long cypselas (Belcher, 1983; Walsh, 1999; Hills and Boekel, 1996).

Useful field characteristics for *S. macrocarpus* include its relatively squat form, coarse foliage and robust involucral bracts (even when not in full flower) which are large and rigid, resembling planks on a barrel.



Distribution in Victoria
(Flora Information System DSE 2007)

Distribution

Senecio macrocarpus has been recorded from South Australia, Victoria and Tasmania.

Victoria:

Senecio macrocarpus has been collected extensively from western Victoria and a few other widely dispersed locations. Its current eastern limit is probably Castle Flat at Yan Yean, although one specimen was collected from the Omeo-Hotham area in 1853 (National Herbarium of Victoria 22996).

Most records are located in the eastern reach of the volcanic plain between Digger's Rest, Werribee

and Geelong. *S. macrocarpus* is currently known from railway reserves at Deer Park, Manor, Diggers Rest and Bannockburn, and also Bannockburn cemetery. A single specimen was noted near Castlemaine in 1998, but the species is not known to persist at this site.

Further west, *S. macrocarpus* occurs at a rail-side at Dobie near Ararat, Yalla-Y-Poora Recreation Reserve and Deep Lead Nature Conservation Reserve. It was once distributed more widely in the west of the state from Horsham to Nhill, but is now apparently extinct in these western areas. A 1994 specimen from Goroke State Forest (AD99608208), however, represents an otherwise unknown population and suggests that the species may remain undetected in this region.

South Australia:

In South Australia, *S. macrocarpus* has been collected on the Yorke Peninsula and in the Murray, South Eastern, and Northern- and Southern-Lofty Regions. Natural populations are understood to be currently confined to Messent Conservation Park, Gum Lagoon Conservation Park, Yalkuri Station (private land, near Lake Albert) and private land near Tarcowie.

It is estimated that less than 36 000 plants exist in South Australia, with up to 35 000 of these in Messent Conservation Park.

Tasmania:

Senecio macrocarpus was collected in the mid-nineteenth century from the valley of the South Esk River. It has not been collected recently from Tasmania, and is now considered extinct in this state (*Threatened Species Protection Act (Tas) 1995*).

Abundance

It is estimated that less than one thousand plants exist in Victoria.

Important Victorian populations

Conservation Reserves

Deep Lead Nature Conservation Reserve

This site supports a population of several hundred plants. It is a large reserve managed for conservation purposes and contains other significant flora including Purple Eyebright (*Euphrasia collina* subsp. *muelleri*).

Laverton

This site is situated on the former RAAF base, which was managed by the Department of Defence until 1998. It is now the site of a future industrial development. In 1998, Bosis Research surveyed the site and recorded approximately 200 *S. macrocarpus* plants. These plants are within one of three small reserves which will be included in the development. The surrounding grassland is of high quality, and supports a number of threatened

species including Spiny Rice-flower (*Pimelea spinescens* subsp. *spinescens*) and Basalt Podolepis (*Podolepis* sp. 1).

Rail reserves

Manor Rd-Bulban Rd, Werribee

This site is a small, linear fragment of grassland located beside the Melbourne-Geelong railway line. It supports about 160 *S. macrocarpus* plants and a small population of the threatened species Button Wrinklewort (*Rutidosis leptorrhynchoides*).

Dobie (near Ararat)

This site supports a diverse woodland community dominated by Yellow Box (*Eucalyptus melliodora*). The understorey contains diverse herb- and grass-like species, including approximately 60 *S. macrocarpus* plants. The soil is of sedimentary origin, but many of the species more commonly occur as grassland species (e.g. Button Wrinklewort) and the edge of the basalt plain is only a few hundred metres from the site.

Other populations

Yan Yean Reservoir

The population at Yan Yean Reservoir occurs in an unusually secure and intact location. Due to the very small population size, however, the population is not considered to be important and is unlikely to be viable in the longer term. Given its secure tenure, this site may be a suitable site for future re-introductions.

Habitat

S. macrocarpus occurs in grassland, sedgeland, woodland and shrubland, generally on relatively heavy soils. Competition from other understorey plants is relatively subdued in all of these communities, either as a result of the physical and floristic characteristics of the site or due to regular burning.

Life history and ecology

Senecio macrocarpus is a long-lived perennial species that may remain green all year round, or die off in dry seasons and re-sprout from a sturdy rootstock. Flowering occurs in spring and may continue over summer in suitable conditions. It is likely that *S. macrocarpus* is self-compatible (Lawrence, 1985). At many sites on the Victorian Basalt Plain, *S. macrocarpus* occurs with other herb species in Kangaroo Grass (*Themeda triandra*)-dominated grassland on heavy clays derived from relatively recent lava flows (Morgan 1998a, b; Mueck, 2000). In western Victoria and South Australia, it occurs in Yellow Gum (*Eucalyptus leucoxylon* (Vic) or Southern Blue Gum (*E. globulus*) (SA) woodland in low, flat areas, generally where there are few other understorey species. At Yan Yean Reservoir in Victoria, *S. macrocarpus* occurs on heavy soil on a broad flat along the upper edge

of the water level (S. Sinclair, pers. obs.; D. Tonkinson, pers. comm.).

S. macrocarpus appears to occupy a rather broad ecological niche. Sites are generally characterised by relatively heavy soils which may be susceptible to water-logging and/or summer drought. Inter-specific competition also appears to be a significant determinant of *S. macrocarpus* distribution and persistence in grasslands.

Seeds of *S. macrocarpus* germinate readily without treatment. Successful germination occurs in both light and dark conditions, including beneath dense swards of grass (Morgan 1998a). Seedlings, however, survive better and grow faster in large gaps (18 cm) than in small gaps (6 cm) or closed swards of grass. Large gaps created by fire in *Themeda*-dominated grasslands contract rapidly (to 1 % after three years) (Morgan 1998b). In this closed environment, recruitment opportunities for herbs such as *S. macrocarpus* are clearly limited. Davies (1995) considers that a sparse fire regime is placing *S. macrocarpus* populations in Victorian grassland under immediate threat of extinction.

Recruitment of *S. macrocarpus* is further limited by large seasonal variations in seed production. In years with sustained spring and summer rainfall, plants may produce many flushes of flower heads (K. Brewer, pers. comm.). Growth, however, is limited in dry seasons. Furthermore, in some seasons the flower heads are invaded by insect species which entirely prevent seeding (K. Brewer, A. Arnold pers. comm.).

Although recruitment generally appears to follow fire events, numerous *S. macrocarpus* seedlings have been observed growing in unburnt *Themeda*-grassland at Manor Rail Reserve. These seedlings were growing in gaps created by micro-topology and non-fire disturbance (S. Sinclair, D. Burns, pers. obs.). It is unknown how well seedlings which have not yet developed a woody root system, are able to survive extreme environmental conditions. Seedlings at Manor, however, survived well over the dry, but cool, summer/autumn of 2003 - 2004 (D. Burns, pers. comm.).

Mature *S. macrocarpus* plants can persist for years in closed swards of grass (D. Burns, A. Arnold, pers. comm.). Therefore populations may persist for relatively long periods in grassland habitat without disturbance events. The continued survival of established plants is, however, not guaranteed in absence of fire for decades. At Castle Flat (Yan Yean Reservoir, Vic), several hundred *S. macrocarpus* plants were noted in 1988 (D. Tonkinson, pers. comm.), but by December 2003, only two plants could be found at the same location. The reasons for this decline are difficult to establish but were probably related to increased inter-specific competition. The abundance of grasses and Drooping Cassinia (*Cassinia arcuata*)

had increased substantially in the intervening 15 years. Altered water levels in the reservoir may also have influenced the ecology of the site detrimentally for *S. macrocarpus* persistence.

Mature *S. macrocarpus* plants will re-sprout after fire (Cutten and Squires, 2003). Conversely, fire may 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.). Fire regimes clearly must be managed sensitively to ensure the long-term survival of *S. macrocarpus* in grasslands. Other observations suggest *S. macrocarpus* is capable of surviving regular disturbance (e.g. mowing) by continually resprouting from the rootstock (S. Hadden, pers. comm.). More research is required to determine the most suitable disturbance regimes to protect *S. macrocarpus* populations.

Competition from neighbouring plants is likely to be less aggressive in woodland, shrubland and sedgeland communities than grassland. At Deep Lead, for example, the site remains almost entirely free from other understorey vegetation, and the population of *S. macrocarpus* seems to be regenerating despite not being burnt for many decades (John Harris, pers. comm.). Davies (1995) notes that the small population at Yulkiri Station occurs in low, sparse shrubland with an absent ground layer. Similarly, Owens *et al.* (1995) suggest that *S. macrocarpus* survives at Messent Conservation Park in sedgeland depressions because of the open spaces associated with taller sedges and because it can overtop the shorter, finer sedges that grow in dense mats. This large population persists both in recently burnt areas (2002) and in areas of sedgeland that have not been burnt since 1977 (Davies, 1995; 2003; Cutten and Squire, 2002; 2003). The management of *S. macrocarpus* is therefore likely to require less intervention (e.g., burning) in non-grassland communities.

Grazing also limits the survival of some *S. macrocarpus* populations. Sheep preferentially feed on *S. macrocarpus* (N. Scarlett pers. comm.). The introduction of sheep to native pastures may have led to rapid declines soon after European settlement in this species, once common in grassy environments (J. Morgan pers. comm.).

It is unknown whether *S. macrocarpus* maintains a soil seed bank. Ragwort (*S. jacobea*) seeds retain high levels of viability after five years, but viability then decreases sharply and after 16 years few seeds remain viable (James and Rahman, 2000). The native species Fleshy Groundsel (*S. gregorii*) also appears to have a soil seed-bank which allows it to rapidly establish populations after fire (D. Cheal, pers. comm.). When stored in envelopes, *S. macrocarpus* seeds do not remain viable for long

periods (years) (D. Tonkinson, pers. comm.). This, together with the fact that many other grassland daisies have short-lived seeds, suggests that *S. macrocarpus* is unlikely to form a long-lived seed bank. Further investigation is needed. The long-term viability of seed banks will influence site management, particularly at sites where the population is very small (e.g. Yan Yean) or has recently become locally extinct.

Little is known about the dispersal ability of *S. macrocarpus*. Although other *Senecio* species, particularly Cotton Fireweed (*S. quadridentatus*), are able to readily colonise distant areas of wasteland, *S. macrocarpus* has not been known to behave as a true ruderal. Its large seeds may not be capable of long-distance wind dispersal. Alternatively, the species may no longer be abundant enough to make long distance germination probable. Given the species' limited dispersal ability, habitat fragmentation is probably an ongoing impediment to the recovery of *S. macrocarpus*.

Senecio macrocarpus will invade newly formed areas of suitable habitat if disturbance occurs directly adjacent to a population. It has been suggested that the largest known *S. macrocarpus* population, Messent Conservation Park, occurs in a mainly artificial habitat (Owens *et al.*, 1995; Cutten and Squires, 2002). The sedgeland in this area have probably dried out considerably since European settlement due to the diversion of watercourses and increased drainage (Cutten and Squire 2002), allowing *S. macrocarpus* to invade new areas. Further hydrological changes such as the proposed diversion of water into Messent Conservation Park may jeopardise the population (Cutten and Squires, 2002) as *S. macrocarpus* is unlikely to be able to withstand substantial or prolonged inundation by fresh or saline water (Davies, 2003). Managing this area will require a trade-off between the preservation of wetland habitat and the persistence of an artificial, but highly significant, *S. macrocarpus* population (Cutten and Squires 2002). Alterations in hydrology are likely to be a major potential threat to the largest population of *S. macrocarpus*.

Conservation status

Senecio macrocarpus is listed as vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Senecio macrocarpus is listed as threatened under the Victorian *Flora and Fauna Guarantee Act 1988*.

It is listed as vulnerable under the South Australian *National Parks and Wildlife Act 1972*.

It has not been recorded recently in Tasmania, and is listed as extinct under the Tasmanian *Threatened Species Protection Act 1995*.

It is considered endangered in Victoria, according to the Department of Sustainability and Environment's *Advisory List of Rare or Threatened Vascular Plants in Victoria - 2005* (DSE 2005).

Potentially threatening processes

The processes listed below are considered to have the potential to threaten populations or habitat. They may or may not be listed as potentially threatening processes under the *Flora and Fauna Guarantee Act 1988*. An indication of the degree of threat is also provided.

Inappropriate disturbance (fire) regimes

High (grassy sites). If burnt at the beginning of the growing season, *S. macrocarpus* plants may be killed. If fires occur too infrequently, recruitment is likely to be reduced.

Moderate (non-grassy sites). The relatively low biomass of understorey species in non-grassy sites probably allows *S. macrocarpus* to actively recruit under a fire regime with longer intervals between fires (i.e. decades).

Weed invasion

High. A number of highly invasive weed species are actively spreading in or around *S. macrocarpus* populations. These include African Love-grass (*Eragrostis curvula*) at Manor Rail Reserve, Blue Periwinkle (*Vinca major*) at Bannockburn Cemetery, and Bridal Creeper (*Asparagus asparagoides*) and Montpellier Broom (*Genista monspessulana*) at Dobies Bridge Rail Reserve.

Grazing

Low to high (potentially). As grazing was probably the major factor in the historical decline of *S. macrocarpus*, the ultimate recovery of this species is likely to be successful only in landscapes that are not grazed. Fortunately, all extant populations are located in areas unlikely to be grazed in the future, such as rail reserves and conservation reserves.

Clearing / Removal

Moderate. Although the largest populations are in reserves dedicated to conservation, a number of smaller populations are located in areas of less secure tenure from a conservation perspective (e.g. rail reserves).

At present the Melbourne-Geelong rail link passes through or near several groups of *S. macrocarpus* plants, some of which have had to be translocated.

Previous Management Action

General

- Plants have been propagated from targeted wild populations and trial reintroductions commenced 2005 - 2007.
- Seed has been collected and germination trials conducted.

- DSE has produced guidelines for management of biodiversity on rail lines (including *S. macrocarpus*).

Bannockburn Cemetery

- Surveys were completed in 2007 & 2008.
- Fences have been erected and are checked periodically.
- Ecological burns have been conducted with one hectare of grassland burnt in 2006 and other areas in late autumn 2007.
- Weeds are being targeted and controlled through funding from a Conserving Our Biodiversity grant. The Ballarat Environment Network is monitoring success of weed control.
- Threats have been assessed and a Bayesian Network Analysis completed for this site.
- DSE is liaising with the cemetery trust, local government authorities and community groups over the management of grasslands at this site.
- A draft management plan has been completed by the Ballarat Environment Network and consultations are continuing (2009).

Bannockburn Rail Reserve

- Population is monitored annually and the data entered onto VROTPop database.
- Population has been mapped.
- Threats to the population were assessed 2008/09.
- Ecological burns were conducted by the Country Fire Authority in autumn 2006 and 2008.
- Signs have been erected to deter accidental damage and are checked periodically.
- Fences have been erected and are monitored regularly.
- Ballarat Environment Network conducts weed control works annually.

Bulban Road Rail Reserve

- DSE conducted ecological burns in autumn 1996, 2001, 2003 and 2005.
- Site was fenced as part of the Regional Fast Rail Project. Fences are maintained as necessary.
- Signs have been erected and are monitored regularly.
- DSE has liaised with relevant stakeholders to maintain their awareness of the species.

Deep Lead Nature Conservation Reserve

- DSE and the Field Naturalists Club of Victoria have collected seed in 2006/07 and 2008/09 from more than 100 plants.
- Site was inspected in 2008 and the *S. macrocarpus* population was mapped.

Deer Park Rail Reserve

- An ecological burn was conducted across 3.7 ha in April 2007.
- Weeds have been controlled.
- Fences have been erected and are maintained as necessary.
- Signs have been erected and are monitored regularly.
- Rail managers have been given a list of current biosites.

Derrimut Grassland Reserve

- DSE conducted a 26 ha ecological burn in April 2007.

Diggers Rest (Calder Park) Rail Reserve

- DSE conducted ecological burns in April 2007.
- Fences were erected as part of the Regional Fast Rail Project and are monitored as necessary.
- Signs have been erected and are monitored regularly.

Dobies Bridge Rail Reserve

- Detailed map of population was prepared in 2001.
- Periodic surveillance monitoring is undertaken using VROTPop system.
- Detailed ecological burn plan was developed in 2002. This was superseded in 2006 by a management plan which includes ecological burning and weeds control strategies.
- DSE conducted ecological burns in autumn 2004 and 2006.
- The need for burning was assessed in 2008/09 and deemed unnecessary for this season.
- Fence to exclude introduced herbivores was completed in 1999 and is checked regularly.
- Annual weed control has been undertaken by Ballarat Environment Network, VicRoads contractors and the Glenelg-Hopkins Catchment Management Authority.
- Seed has been collected for viability analysis.

Goroke

- Suitable habitat was located in 2008/09.
- Threatened Flora Recovery Meeting held for the species in March 2009.

Lake Terangapom Wildlife Reserve

- Survey for *S. macrocarpus* was completed in 2007/08 to confirm existing records but no plants were found.

Laverton RAAF Base

- Liaison undertaken with private landholders.
- Annual weed control report received and burn nominations in Fire Plan for the site.

- Environmental weed control targeting Serrated Tussock and Chilean Needle undertaken by Practical Ecology. Serrated Tussock and Chilean Needle Grass have been spot-sprayed.
- Site was surveyed in 2006/07 as part of wider development management.

Little River South Rail Reserve

- Threats and management requirements assessed for these populations.
- Liaison has been undertaken with all relevant management bodies.
- Fences have been erected and are monitored as necessary.
- Detailed population monitoring has been undertaken and demographic information collected.
- Population has been monitored to determine extent and density.

Manor Rail Reserve South

- Ecological burns were conducted in autumn 2005.
- Weed invasion has been mapped in 2005-2007.
- Weeds have been controlled.
- Signs have been erected as part of the Regional Fast Rail Project and are monitored regularly.
- Fences have been erected as part of the Regional Fast Rail project.
- Conservation presentations have been provided to the major rail authorities (RRL, TAJV, Freight, V/Line Pty).

Organ Pipes National Park

- Rabbit control has been conducted as part of park management.
- Weed control is undertaken annually.

Peak School Road Rail Reserve

- Threats to populations, including extent and expansion of weeds, were assessed in 2008/09. Management actions have been implemented as required.
- Fences have been erected and are checked periodically.
- Periodic surveillance monitoring is undertaken using VROTPop system.

Quarry Sites South Rail Reserve

- Survey was conducted in 2005/06 and additional plants were located and fenced.
- Site is nominated in Bacchus Marsh Fire District and is to be burnt every 3 - 4 years.
- Signs have been erected and are checked regularly.
- Fences have been erected and are checked periodically.
- DSE maintains contact with major stakeholders.

Yalla-y-poora Recreation Reserve

- Detailed map of population has been prepared.
- Detailed ecological burn plan was developed in July 2002 and entered onto FireWeb.
- A new burn plan was developed in 2004/05.
- DSE conducted ecological burns in March 2003 and February 2008.
- Ballarat Environment Network has completed a rabbit-proof fence on the southern side of the reserve and has a grant to replace other fences.
- Environmental weeds are controlled annually.
- Botanic Guardians had a project to remove weeds and conduct VROTPop assessments (five visits per annum). Data has been entered into VROTPop database.

Conservation Objectives and Intended Management Actions

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

Long term objective

To ensure that Large-fruit Fireweed (*Senecio macrocarpus*) can survive, flourish and retain its potential for evolutionary development in the wild.

Specific Objectives, Actions and Targets

Objective I To improve knowledge of biology, ecology and management requirements

<i>Action</i>	<i>Targets</i>	<i>Responsible</i>
1. Acquire baseline population data by conducting detailed field and desk-top surveys including identification of the area and extent of populations.	<ul style="list-style-type: none"> ▪ Baseline data collected. ▪ Conservation status reassessed. ▪ Populations accurately mapped. 	DSE Statewide Services – South West & Port Phillip

2. Assess habitat characteristics and/or condition. Collect floristic and environmental information required to describe critical habitat, and relevant to community ecology and condition.	<ul style="list-style-type: none"> Habitat data collected and analysed. Important habitat mapped. 	DSE Statewide Services – South West & Port Phillip
3. Assess threats to populations regularly, including weed invasion, human impacts and herbivory.	<ul style="list-style-type: none"> Threats assessed regularly. Extent and rate of spread of significant weeds assessed at target sites. Suitable recovery actions developed and implemented (see Objective III). 	DSE Statewide Services – South West & Port Phillip
4. Conduct survey to identify and search suitable habitat. Identify and survey potential <i>S. macrocarpus</i> habitat, using ecological and bioclimatic information that may indicate habitat preference	<ul style="list-style-type: none"> Predictive model for potential habitat developed and tested. Potential habitat searched, especially in the Goroke area. 	DSE Statewide Services – South West & Port Phillip
5. Undertake and facilitate research to identify key biological functions.	<ul style="list-style-type: none"> Critical life history stages identified. Recruitment and dispersal identified at known sites. Age at reproductive maturity determined. Seed bank/regenerative potential quantified for each/target population. Stimuli for recruitment/regeneration identified. 	DSE Biodiversity and Ecosystem Services DSE Statewide Services – South West
6. Undertake detailed population monitoring and collect demographic information.	<ul style="list-style-type: none"> Techniques for monitoring developed and established. Census data for target populations collected. Target populations monitored after ecological burns. 	DSE Statewide Services – South West
7. Analyse population trends. Collate, analyse and report on census data and compare with management histories.	<ul style="list-style-type: none"> Population growth rates determined and Population Viability Analysis completed for target populations. 	DSE

Objective II To secure populations or habitat from potentially incompatible land use or catastrophic loss.

<i>Action</i>	<i>Targets</i>	<i>Responsible</i>
8. Negotiate management agreement with public land manager(s).	<ul style="list-style-type: none"> All known public land sites identified and protected by agreement. Fencing and signposting completed as required to prevent damage from vehicles and machinery. 	DSE Statewide Services – South West & Port Phillip V/Line Pty. Ltd.
9. Negotiate a voluntary management agreement with private landholder(s).	<ul style="list-style-type: none"> Negotiations undertaken with all landholders. All known private land sites protected through planning processes and/or agreements. 	DSE Statewide Services – South West DSE Biodiversity & Ecosystem Services
10. Provide information and advice to local	<ul style="list-style-type: none"> All known sites identified and protected 	DSE

government authorities for inclusion in planning processes.	through planning processes. ▪ Fencing and signposting completed.	Statewide Services - South West & Port Phillip V/Line Pty. Ltd.
11. Liaise with stakeholder groups and government agencies to provide advice on grassland management.	▪ Stakeholder groups and government agencies aware of presence and importance of species. ▪ Advice on management requirements provided to stakeholder groups as appropriate.	DSE Statewide Services - South West
12. Collect and store reproductive material as a safeguard against catastrophic loss. Establish cultivated plants <i>ex situ</i> for inclusion in living collections to safeguard against any unforeseen destruction of wild populations.	▪ Reproductive material securely stored. ▪ Seed viability tested. ▪ Development of effective propagation and cultivation techniques. ▪ At least 200 mature plants in cultivation.	Royal Botanic Gardens DSE Statewide Services - South West
13. Propagate seedlings and/or cuttings for reintroduction or reinforcement.	▪ Seedlings propagated for reintroduction or reinforcement of wild populations. ▪ Database of threatened plants in cultivation developed and maintained.	DSE Statewide Services - South West
14. Establish and maintain reintroduced population(s).	▪ <i>S. macrocarpus</i> reintroduced to suitable sites such as sections of Bannockburn Cemetery and Deep Lead Nature Conservation Reserve.	DSE Statewide Services - South West Parks Victoria

Objective III To improve the extent and/or condition of habitat

<i>Action</i>	<i>Targets</i>	<i>Responsible</i>
15. Identify disturbance regimes to maintain habitat. Particular emphasis should be placed on fire regimes. This research work should be undertaken in co-ordination with regular management burns, and will probably involve pre-burn discussion, experimental design and data collection, followed by post-burn data collection, monitoring and reporting.	▪ Fire regimes identified to maintain, enhance or restore habitat. ▪ Information on fire regimes incorporated into ecological burning plans and /or fire protection plans, as required.	DSE Statewide Services - South West & Port Phillip DSE Biodiversity & Ecosystem Services
16. Implement disturbance regimes as required.	▪ Ecological fire management implemented where necessary. Burns conducted in autumn every 2 - 4 years at grassland sites. Yan-Yean Reservoir site burnt or slashed every three years as appropriate. ▪ Habitat condition maintained or improved.	Parks Victoria Local Country Fire Authorities Melbourne Water
17. Manage environmental weeds. Control threats from pest plants, using application of herbicide or hand removal of weeds.	▪ Measurable reduction in cover and abundance of weeds at significant population sites.	DSE Statewide Services - South West & Port Phillip Parks Victoria,

		V/Line Pty. Ltd.
18. Implement recovery actions to manage other threats as required such as fencing to prevent grazing, erecting signage to alert public to presence of species and prevent trampling, and control of feral animals.	<ul style="list-style-type: none"> Management actions implemented as required. Measurable decrease in threats and loss of cover or abundance of <i>S. macrocarpus</i> at significant population sites. 	DSE Statewide Services - South West & Port Phillip Parks Victoria

Objective IV To increase community awareness and support

Action	Targets	Responsible
19. Involve community groups and volunteers such as Field Naturalists Club of Victoria, Botanic Guardians and Ballarat Environment Network in monitoring and recovery activities.	<ul style="list-style-type: none"> Opportunities for involvement identified, promoted and supported. 	DSE Statewide Services - South West & Port Phillip

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