National Recovery Plan for the

Clover Glycine

Glycine latrobeana

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Australian Government

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Tasmania DEPARTMENT *of* PRIMARY INDUSTRIES, WATER *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 Clover Glycine (*Glycine latrobeana)* is small perennial herb endemic to south-eastern Australia, where it is occurs in Tasmania, Victoria and South Australia, growing mostly in grasslands and grassy woodlands. The species has suffered an extensive decline in distribution and abundance due to widespread degradation and destruction of habitat. About 140 populations containing about 7,000 plants have been recorded since 1980, but recent estimates have not been made for many populations. Populations also fluctuate widely between seasons, especially following disturbance which appears to stimulate germination. Current threats include grazing, weed invasion and altered fire regimes. The Clover Glycine is listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. This National Recovery Plan for the Clover Glycine 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 Clover Glycine (*Glycine latrobeana)* of the Family Fabaceae is a decumbent to ascending herb growing to only a few cm high. Leaves are trifoliate, with sessile to subsessile leaflets 5–20 mm long and 4–12 mm wide, on petioles 5–50 mm long. Leaflets are of 2 types: leaflets of mature leaves are obovate to more or less orbicular and thin; leaflets of immature leaves are often elliptic with the upper surface glabrous and lower surface with sharp, stiff, appressed hairs. Stipules are suborbicular to broad-ovate or reniform, 1.5–2 mm long, striate. Stipellae are minute and are shed early. Up to eight small, compact, deep purple flowers are borne on peduncles 5–10 cm long. The bract is elliptic to broad-ovate, 0.5–1.2 mm long, the calyx 2.5–6 mm long, the lower three teeth about the same length as tube, while the petals are 8–9 mm long. The species generally flowers in spring in the lower elevation parts of its range and in summer in higher elevation areas. Seed pods are linear-lanceolate, 20–25 mm long and 5 mm wide, dark brown and contain 3–5 ovoid, smooth, dark brown seeds (description from Curtis & Morris 1975); Jessop & Toelken 1986; Jeanes 1996).

Seed is likely to remain dormant and viable in the soil for many years, and probably germinates in response to disturbance such as fire, as suggested by observations of high abundances of plants recorded shortly after fire. There is anecdotal reference to plants flowering particularly well after flooding at some locations (e.g. Inverleigh Reserve, Victoria). The role of prolonged inundation in affecting germination or flowering has not been studied, however this process may be important for populations across the wetter parts of the species' range.

Three other species of *Glycine* occur within the known range of *G. latrobeana* in Victoria, South Australia and Tasmania. *Glycine clandestina* is a twining herb, with upper leaves usually much longer and narrower than those of *G. latrobeana*, 1–8 cm long and 2–10 mm wide, while the lower petals are white, pale mauve, blue or purplish-pink. *Glycine microphylla* is a scrambling herb with stoloniferous stems that has fine, reticulate secondary veins on leaflets that run at near right-angles to the midrib. *Glycine tabacina* (absent in Tasmania) is a scrambling or twining herb that has persistent stipellae and longer (7–60 mm) leaflets that are never cuneate.

Distribution

The Clover Glycine is endemic to south-eastern Australia, where it is widely distributed from Port Pirie in South Australia, through much of Victoria to near Hobart in Tasmania (Figure 1). In South Australia the species occurs in the Flinders Lofty Block, Kanmantoo and Naracoorte Coastal Plain IBRA bioregions (*sensu* DEH 2000). In Victoria, the species occurs in the Australian Alps, Naracoorte Coastal Plain, South Eastern Highlands, South East Coastal Plain, Victorian Midlands and Victorian Volcanic Plains bioregions. In Tasmania it occurs (or

occurred) in the Flinders, Tasmanian Northern Midlands, Tasmanian Central Highlands, Tasmanian Northern Slopes and Tasmanian South East bioregions.

There is a 19th century record of *G. latrobeana* apparently from Delegate in south-eastern New South Wales. However, the species has not been seen since, despite searches in the area, and the veracity of the record remains in doubt.

Maps showing the distribution of *G. latrobeana* are available from the nature conservation agency in the respective State.

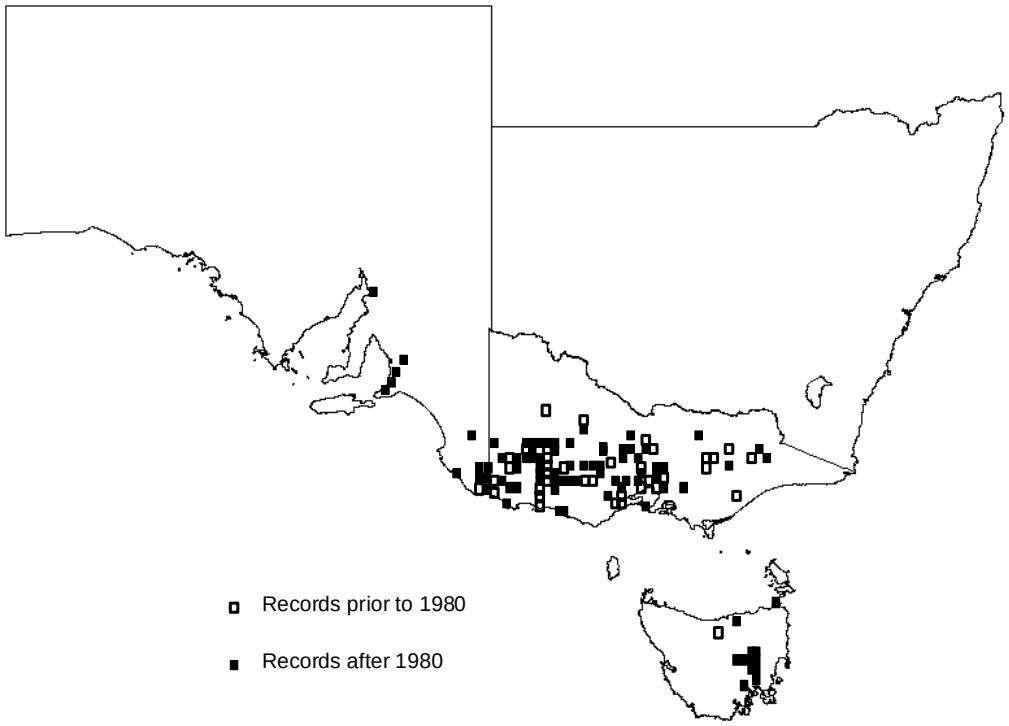

Figure 1. Distribution of *Glycine latrobeana*

Population Information

There are about 140 populations of Clover Glycine (43 in SA; 65 in Vic; 32 in Tas) recently recorded (post 1980), with perhaps 7,000 plants. However, abundance has not been recorded at many known populations, and population size fluctuates from year to year (Scarlett & Parsons 1993), according to disturbance history (e.g. fire, flooding, grazing), so current abundance is not known. Populations important to the survival of *G. latrobeana* have not yet been identified, but significant populations (based on size, geographic spread and land tenure) have been determined to occur in the following locations:

South Australia

- Belair National Park (Department for Environment and Heritage). Last recorded in 1990, abundance unknown.
- Mary Seymour Conservation Park (Department for Environment and Heritage). Last recorded in 1997, abundance unknown.
- Mount Billy Conservation Park (Department for Environment and Heritage). Recorded in 1998 as 'reasonably frequent' (SA Herbarium notes).
- Mount Magnificent Conservation Park (Department for Environment and Heritage). Three plants (1998).

- Penola Conservation Park (Department for Environment and Heritage). Last recorded in 1998, abundance unknown.
- Woolwash Native Forest Reserve (Department for Environment and Heritage). Last recorded in 1991, abundance unknown.
- Hindmarsh Valley Reservoir (SA Water). 1,000 plants shortly after fire (1994); 7 plants (2005).

Victoria

- Cobra Killac Wildlife Reserve (Parks Victoria). 'locally common', also many plants on adjacent private land (2004).
- Yarra Valley Parklands, Eltham (Parks Victoria). 300 plants (2005).
- Black Range State Park (Parks Victoria). 600–700 plants (1991); 30 plants (2004).
- Lake Omeo (Committee of Management). 120 plants (2005). This area also contains a range of threatened and undescribed plants.
- Yan Yean Reservoir (Melbourne Water). 1,000 plants (1989); 150 plants (2002).
- Meruka Park, Eltham (Nillumbik Shire). 10 plants (2002).
- Bryces Plain - Alpine National Park (Parks Victoria). 375 plants (1982); none seen (2004).
- Grampians National Park (Parks Victoria). At least two populations recorded since 1999; 18 plants in fenced enclosures at Boreang Picnic Area (2004).
- Hohnes Flora Reserve (Parks Victoria). >20 plants (1999).
- Mokepilly roadside, western Victoria (Shire of Northern Grampians). 50 plants (1998).
- Inverleigh Common Flora Reserve (Parks Victoria). 175 plants (1997).
- Arthurs Seat State Park (Parks Victoria). Four plants (1996).
- Plenty Gorge Conservation Area (Parks Victoria). 100 plants (1995).
- Reef Hills State Park (Parks Victoria). Eight plants (1995).
- Bay of Islands Coastal Park (Parks Victoria). Two plants (2004).
- Gatum Flora Reserve (Parks Victoria). Five plants (1994).
- Brisbane Ranges National Park (Parks Victoria). Last recorded in 1989, abundance unknown.
- Port Campbell National Park (Parks Victoria). Last recorded in 1989, abundance unknown.
- Mount Richmond National Park (Parks Victoria). Last recorded in 1982, abundance unknown.
- Fryers Ridge Flora Reserve (Parks Victoria). Last recorded in 1981, abundance unknown.
- Nunniong Plain Natural Features and Scenic Reserve (Department of Sustainability and Environment). Year and abundance unknown.
- Main Ridge Flora Reserve (Parks Victoria). Last recorded in 1970, abundance unknown.

Tasmania

- Cape Portland Conservation Area (Tasmanian Parks and Wildlife Service). Last recorded 1991, abundance unknown.
- Pontville Rifle Range (Commonwealth). 1,200 plants (1996)
- Remarkable Rock Forest Reserve (Forestry Tasmania). >100 plants (1996).
- Wayatinah Forest Reserve (Forestry Tasmania). Last recorded in 1987, abundance unknown.

There are likely to be more scattered populations throughout the geographic range of the species, notably on private land in Victoria and Tasmania (and potentially South Australia), and further surveys are vital to establish current status and abundance of these populations. Wherever possible, these sites should be surveyed and assessed during the implementation of this Recovery Plan.

Habitat

The Clover Glycine occurs mainly in grassland and grassy woodland habitats, less often in dry forests, and only rarely in heathland. Populations occur from sea level to c. 1,200 m altitude

(900 m in Tasmania). In Victoria, plants grow in a range of soil types including alluvial soils, and those derived from sandstones, mudstones, granite and basalt. Soils are usually clay, but may also have high loam content. Tasmanian populations occur on a well-drained basalt, dolerite or sandstone substrates (Lynch 1994).

Specific habitat includes:

Grasslands and Grassy Woodlands
On the east coast of Tasmania the Clover Glycine occurs in grassland dominated by *Austrodanthonia* spp. (Wallaby Grass) and usually with *Elymus scaber* (Common Wheat-grass) and *Poa rodwayi* (Velvet Tussock-grass). Sites also contain a range of inter-tussock forbs, and occasional emergent *Allocasuarina verticillata* (Drooping Sheoak). At other sites, grassland was dominated by *Poa labillardierei* (Common Tussock-grass) with a range of intertussock forbs (Kirkpatrick *et al*. 1995). In the Tasmanian Midlands habitat includes lowland grassland dominated by *Themeda triandra* (Kangaroo Grass) and sometimes within *Austrodanthonia caespitosa* (Common Wallaby-grass) (habitat information from Kirkpatrick *et al*. 1995).

In Victoria on the western basalt plains, the species occurs in grassland dominated by *T. triandra* with a varying richness of herbs (Kirkpatrick *et al*. 1995). Sites in the Grampians/Black Range area include intermittently flooded *Eucalyptus leucoxylon* (Yellow Gum) woodland with *Eucalyptus aromaphloia* (Scentbark) in the streamlines, and an understorey of mixed grasses and shrubs.

South Australian sites include low lying, seasonally inundated grassy woodlands dominated by *Eucalyptus viminalis* subsp. *cygnetensis* (Manna Gum) and/or *E. leucoxylon* subsp. *leucoxylon* (Yellow Gum) or *E. obliqua* (Messmate Stringybark) (SA Herbarium data, and Armstrong *et al.* 2003).

Other Woodlands
At Nunniong Plateau in eastern Victoria, *G. latrobeana* was recorded in sub-alpine woodlands (c. 1200 m above sea level) on red-brown clays with an overstorey of *Eucalyptus pauciflora* (Snow Gum), with scattered *Hakea microcarpa* (Small-fruit Hakea) interspersed with grassy species such as *T. triandra, Poa* spp*., Deyeuxia* spp*.* (bent grasses) and *E. scaber*, and various forbs. At Reef Hills State Park in north-eastern Victoria plants occur in herb-rich woodland.

Forests
At Yarra Valley Parklands and Meruka Park near Melbourne, vegetation is described as Valley Grassy Forest, dominated by *Eucalyptus melliodora* (Yellow Box), with scattered *Acacia paradoxa* (Hedge Wattle). Field layer comprises *Austrodanthonia* spp. (wallaby grasses) and various forbs. Other former sites in this area occurred in Grassy Dry Forest with *E. polyanthemos* (Red Box).

Decline and Threats

The Clover Glycine remains widely distributed across most of its historic range. However, many populations are now small and isolated as a result of extensive habitat destruction and degradation throughout its distribution. A number of early collections (pre 1920) are from areas long cleared, cultivated or grazed, such as Nambrock Plain near Sale, Little River near Melbourne (and possibly Delegate in NSW), and the species no longer occurs at these locations. A variety of current and potential threats exist at the known populations of *G. latrobeana* although, as the species occurs across such a large range and in a variety of habitats, individual threats will vary according to populations, distribution and location. A large number of populations occur on private land or on unreserved public roadsides, and these are especially at risk from disturbance or changed land use. Major threats are discussed below:

Weed invasion/competition
Weed invasion is a major problem faced by many populations of Clover Glycine. Weeds may suppress growth and recruitment of plants and may change biomass loads such that wildfire becomes too frequent for *G. latrobeana* and other indigenous species. Given the broad distribution and different habitats occupied by *G. latrobeana*, there are many introduced weeds that threaten populations, notably various annual grasses (e.g. *Briza minor*, *Vulpia* sp.), perennial grasses (e.g. *Dactylis glomerata* Cocksfoot, *Anthoxanthum odoratum* Sweet Vernal-grass and *Nasella trichotoma* Serrated Tussock) and woody weeds (e.g. *Chrysanthemoides*

monilifera Boneseed and *Acacia longifolia* Sallow Wattle). Very little specific site assessment has been undertaken to identify problem weeds, although at the following Victorian sites, weed invasion is considered a major threat (problem weeds in brackets):

- Grampians NP (*Aira* spp., *Briza minor*, *Hypochoeris* spp., *Trifolium* spp.)
- Arthurs Seat SP (*Chrysanthemoides monilifera* Boneseed*, Sollya heterophylla* Bluebell Creeper, annual grasses incl. *Briza minor*, *Vulpia* spp., *Acacia longifolia* Coast Wattle)
- Reef Hills SP (*Hypericum perforatum* St Johns Wort)
- Hohnes FR (*Dactylis glomerata* Cocksfoot, *Anthoxanthum odoratum* Sweet Vernal-grass)
- Lake Omeo (*Cynosurus echinatus* Rough Dog's-tail, *Plantago lanceolata* Ribwort, *Hypochoeris radicata* Cat's Ear, *Trifolium angustifolium* Narrow-leaf Clover)
- Nunniong Plain NFR (*Holcus lanatus* Yorkshire Fog, *H. radicata*)
- Inverleigh Common FR (*Nasella trichotoma* Serrated Tussock)
- Brisbane Ranges NP (competition from *Pteridium esculentum* Austral Bracken)

Ulex europaeus (Gorse) is a major threat to sites on private land in Tasmania's Midlands (P. Bell DPIPWE Tas pers. comm.)

Inappropriate fire regimes

Periodic disturbance appears to be required for maintenance of *G. latrobeana* populations. Complete fire exclusion may be deleterious to *G. latrobeana* through competition, especially from grasses, weed invasion and/or lack of recruitment opportunities. Conversely, frequent (e.g. annual) spring-summer burning is likely to reduce populations as plants are killed before they can mature and set seed. Such a frequent fire regime is believed to have led to the disappearance of many populations on rail reserves in Victoria (Scarlett & Parsons 1993). However, the timing and frequency of fire has not been determined, and appropriate fire management is likely to vary between habitat types across the range of the species. Any prescribed use of fire should be conducted concurrently with careful weed management, especially in agricultural and urban contexts where surrounding areas have high weed content. Removal of biomass such as through slashing may be beneficial to maintaining open habitat for *G. latrobeana*, but is unlikely to provide recruitment opportunity. Frequent (e.g. annual) slashing may tend to promote increased cover of introduced species.

Grazing

A high level of grazing by native and introduced herbivores threatens many populations in Victoria, and potentially in South Australia and Tasmania, with populations on private land probably at particular risk from grazing. Domestic stock, rabbits and possibly high numbers of kangaroos in some locations are the main source of grazing pressure. Many private land populations may be threatened by high, continuous livestock grazing, where plants are prevented from producing seed, or allowing seedlings to establish. At several sites on public land (e.g. Black Range SP), plants were most often observed growing under the protection of shrubs, suggesting grazing pressure may be high at the sites. Light grazing may also be beneficial under some circumstances, where it reduces plant biomass that otherwise might compete with *G. latrobeana*, but does not directly threaten the plants. However, grazing management needs to be carefully considered in the conservation of *G. latrobeana.* There is little site-specific information to identify sites where grazing is a threat, although the following Victorian populations are deemed most at risk from grazing:

- Black Range SP
- Bay of Islands CP (rabbits)
- Inverleigh Common FR
- Plenty Gorge RP (rabbits)
- Yarra Valley Parklands (rabbits)
- Yan Yean Reservoir (kangaroos?)
- Nunniong Plain NFR (cattle grazing?)
-

Disturbance

Human-induced disturbance such as vehicle movement and trampling by visitors is perceived to be a risk at the following sites in Victoria:

- Grampians NP (sites near Lake Bellfield)
- Grampians NP (trampling at the Boreang camping ground site)
- Arthurs Seat SP (trampling, vehicle damage)
- Inverleigh Common FR (vehicle damage)
- Lake Omeo (vehicle damage)

Recovery Information

Existing Conservation Measures

A number of measures have been undertaken for the conservation of Clover Glycine at several sites - these include:

- Weed control: Yarra Valley Parklands; Inverleigh Common Flora Reserve.
- Herbivore control: Yarra Valley Parklands; Plenty Gorge Regional Park.
- Fencing to control visitor and vehicle access: Yarra Valley Parklands; Inverleigh Common Flora Reserve; Boreang Camping Ground, Grampians National Park.
- Conservation covenants have been placed on parcels of private land that support four of the recorded populations in Tasmania (under the *Nature Conservation Act 2002*).

Recovery Objectives

The overall objective of recovery is to minimise the probability of extinction of *G. latrobeana* in the wild and to increase the probability of important populations becoming self-sustaining in the long term. Within the life span of this Recovery Plan (five years), the specific objectives of recovery for *G. latrobeana* are to:

1. Determine distribution, abundance and population structure
2. Determine habitat requirements
3. Ensure that key populations and their habitat are protected and managed
4. Manage threats to populations
5. Identify key biological functions
6. Determine growth rates and viability of populations
7. Establish a population in cultivation
8. Build community support for conservation

Program Implementation and Evaluation

This Recovery Plan guides recovery actions for *G. latrobeana* and will be implemented and managed as resources permit by the relevant nature conservation agency in each State, 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 *G. latrobeana*. The Recovery Plan will run for a maximum of 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	Clarify taxonomy to enable a more accurate assessment of distribution and abundance. **Responsibility: NHV, DSE, DPIPWE, DEH**	• Taxonomic identity of doubtful *G. latrobeana* records clarified.

1.2	Undertake surveys to determine the area and extent of populations, the number, size and structure of populations, and inference or estimation of population change. **Responsibility: DSE, DPIPWE, DEH**	• 100 current population sites searched [during the?] flowering season, and sites mapped for population size, condition and habitat.
Specific Objective 2: Determine habitat requirements		
2.1	Survey known habitat and collect floristic and environmental information relevant to community ecology and condition. **Responsibility: DSE, PV, DPIPWE, DEH**	• Species/habitat specific survey design prepared. • Habitat critical to survival mapped for any extant populations.
2.2	Identify and survey potential habitat, using ecological and bioclimatic information that may indicate habitat preference. **Responsibility: DSE, DPIPWE, DEH**	• Searches undertaken of historical sites incl. Mount Richmond NP, Port Campbell NP (Vic); Big Heath NP (SA). • Predictive model for potential habitat developed & tested at five sites.
Specific Objective 3: Ensure that key populations and their habitat are protected and managed appropriately		
3.1	Protect unreserved populations on public Land. **Responsibility: DSE**	• Public Authority Management Agreement in place for roadside population at Mokepilly, west Vic. • Special Protection Zones in Paddys Ranges SF, Tallageira SF (Vic) in place if they are deemed to contain important populations upon reassessment. • Actions to protect species incorporated in relevant management plans.
3.2	Protect populations on private land. **Responsibility: DSE, DPIPWE, DEH**	• Private land management agreements in consultation with landowners at private land sites deemed to be important initiated.
Specific Objective 4: Manage threats to populations		
4.1	Control threats from pest plants at priority sites. **Responsibility: PV, DPIPWE, DEH**	• Reduction in cover of target weeds at 50 treated sites.
4.2	Control threats from pest animals at priority sites. **Responsibility: PV, DPIPWE, DEH**	• Reduction in damage by pest animals (notably rabbits) at and near all sites. Brisbane Range NP, Black Range NP, Nunniong Plain NFR, Bay of Islands CP. • Populations with likely threat from grazing determined, protection initiated.
4.3	Control the threat of direct damage by human activities. **Responsibility: PV, DPIPWE, DEH**	• Impact of visitor activity (trampling, vehicle use) monitored and reduced if required. • Measurable reduction in damage to plants in affected populations where protection measures are implemented. • Prevention of potentially damaging track maintenance activities by improving communication between land managers and contractors.
Specific Objective 5: Identify key biological functions		
5.1	Evaluate current reproductive status, seed bank status, longevity, fecundity and recruitment levels. **Responsibility: DSE, DPIPWE, DEH**	• Reproductive ecology and regenerative potential quantified for four representative sites. • Seed bank potential quantified for 10 representative sites.
5.2	Identify key stimuli for seed germination requirements. **Responsibility: DSE, DPIPWE, DEH**	• Stimuli for recruitment identified. • Management strategies identified to maintain, enhance or restore processes fundamental to reproduction and survival.
5.3	Identify optimal fire regimes to maintain habitat. **Responsibility: DSE, DPIPWE, DEH**	• Preparation and implementation of management prescriptions undertaken for ecological burning at five sites.

Specific Objective 6: Determine the growth rates and viability of populations		
6.1	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, DPIWE, DEH**	• Techniques for monitoring developed and implemented. • Population growth rates determined and Population Viability Analysis completed for five populations.
Specific Objective 7: Establish a population in cultivation		
7.1	Establish a seed bank and determine seed viability. **Responsibility: DSE, RBG, DPIPWE, DEH**	• Seed from 10 representative populations in storage.
Specific Objective 8: Build community support for conservation		
8.1	Identify opportunities for community involvement in the conservation of the Clover Glycine. **Responsibility: DSE, PV, DPIPWE, DEH**	• Community nature conservation and Landcare groups aware of the species and support its conservation.

Abbreviations: DPIPWE – Department of Primary Industries, Parks, Water & Environment (Tas); DSE – Department of Sustainability and Environment (Victoria); PV – Parks Victoria; RBG – Royal Botanic Gardens, Melbourne

Management Practices

The philosophy of the strategy for recovery is habitat conservation, restoration and management combined with an understanding of the ecological and biological requirements of *Glycine latrobeana*. The emphasis is on using knowledge to better implement *in situ* management techniques that protect populations and promote regeneration and recruitment. To achieve this, recovery actions are primarily structured to (i) acquire baseline data, (ii) assess habitat condition including ecological and biological function, (iii) protect populations to maintain or improve population growth and (iv) to engage the community in recovery actions.

On-ground site management will aim to mitigate threatening processes and thereby insure against extinction. Major threats requiring management include accidental destruction, competition from pest plants, inappropriate fire regimes and grazing by pest animals. A range of strategies will be necessary to alleviate these threats including weed control, fire management, fencing, and control of pest animals. Broadscale protection measures applicable to all populations include legal protection of sites, habitat retention and liaison with land managers including private landholders. In addition, searches of known and potential habitat should continue to better define the distributions and size of populations.

The Recovery Plan also advocates strategies to fill some of the major gaps in our knowledge to date. These include an understanding of the mechanisms underlying recruitment and regeneration. Successful *in situ* population management will be founded on understanding the relationships between *G. latrobeana* and associated flora, and its response to environmental processes. These are directly linked to biological function and are thus vital to recovery. Demographic censusing will be necessary to gather life history information and to monitor the success of particular management actions. In addition to the above, *ex situ* conservation measures will be required and will include seed storage. Community participation in recovery actions will be sought, particularly in regard to recovery team membership and implementation of on-ground works. To maintain the genetic diversity of *G. latrobeana*, all sites from Victoria need to be protected. Larger sites on protected public land should be managed to ensure the long-term survival with the aim to increase abundance. Private land sites should also be offered similar protection, where practicable.

Affected Interests

Important populations of *G.latrobeana* are managed by the Department of Sustainability and Environment (Vic), Parks Victoria, Department of Primary Industries, Parks, Water and Environment and the Parks and Wildlife Service (Tas) and Department for Environment and Heritage (SA). Other populations occur on land owned or managed by regional authorities, local government and private landholders.

Role and Interests of Indigenous People

Indigenous communities on whose traditional lands *G. latrobeana* occurs have been advised, through the relevant regional Indigenous facilitator, of the preparation of this Recovery Plan and invited to provide comments and be involved in the implementation of the plan.

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 *Glycine latrobeana*, particularly those species with similar life forms and/or flowering responses.

Habitat of *G. latrobeana* occurs in lowland native grassland, which is recognised as a nationally threatened community (Kirpatrick *et al.* (1995), and has recently been nominated for EPBC Act listing (under the name Natural Temperate Grassland).

In the Tasmanian Midlands habitat includes lowland grassland dominated by *Themeda triandra* (Kangaroo Grass) and sometimes within *Austrodanthonia caespitosa* (Common Wallaby-grass): the former community is listed as Critically Endangered on the EPBC Act

Populations also occur in Lowland Native Grasslands of Tasmania and Natural Temperate Grasslands of the Victorian Volcanic Plain and are listed as Critically Endangered Communities under the EPBC Act.

Western Basalt Plains Grassy Woodland, which also has been recently nominated as a threatened ecological community under the EPBC Act.

A number of regionally and nationally threatened flora and fauna co-occur with *G. latrobeana,* including:

- *Carex tasmanica* (Curly Sedge) (VU) (Tas)
- *Caladenia formosa* (Elegant Spider-orchid) (VU) (Vic)
- *Cullen parvum* (Small Scurf-pea) (EN) (Vic)
- *Delmar impar* (Striped Legless Lizard) (EN) (Vic)
- *Diuris fragrantissima* (Sunshine Diuris) (EN) (Vic)
- *Dodonaea procumbens* (Trailing Hop-bush) (VU) (Vic)
- *Prasophyllum validum* (Sturdy Leek-orchid) (VU) (Vic)
- *Prasophyllum olidum* (Fragrant Leek-orchid) (CR) (Tas)
- *Prasophyllum incorrectum* (Golfers Leek-orchid) (CR) (Tas)
- *Pterostylis basaltica* (Basalt Rustyhood) (EN) (Vic)
- *Pterostylis cucullata* (Leafy Greenhood) (VU) (SA)
- *Pterostylis wapstrarum* (Fleshy Greenhood) (CR) (Tas)
- *Pterostylis ziegeleri* (Grassland Greenhood) (VU) (Tas)
- *Rutidosis leptorhynchoides* (Button Wrinklewort) (EN) (Vic)
- *Thelymitra epipactoides* (Metallic Sun-orchid) (EN) (Vic)
- *Thesium australe* (Austral Toad-flax) (VU) (Vic)

The Recovery Plan will also provide an important public education role as threatened flora have the potential to act as ‘flagship species’ for highlighting broader nature conservation and biodiversity issues such as land clearing, grazing, weed invasions and habitat degradation.

Social and Economic Impacts

The implementation of this recovery plan is unlikely to cause significant adverse social and economic impacts. Most populations occur on public land, either crown land reserved for various public purposes, or on road reserves, managed by a variety of local and State government agencies. Any protection measures required at these sites (eg. fencing, signage, track closures) will have minimal impact on current recreational and commercial activities. Protection of these populations has been negotiated with the relevant land manager. Protection

of the few populations on private land or on land managed by other authorities will be achieved through voluntary agreements with landowners and managers.

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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	Taxonomy	2	100%	NHV, DSE, DPIPWE, DEH	$10,000	$0	$0	$0	$0	$10,000
1.2	Surveys	1	100%	DSE, DPIPWE, DEH	$20,000	$20,000	$20,000	$20,000	$20,000	$100,000
2	**Habitat requirements**									
2.1	Known habitat	1	100%	DSE, PV, DPIPWE, DEH	$20,000	$20,000	$0	$0	$0	$40,000
2.2	Potential habitat	2	70%	DSE, DPIPWE, DEH	$0	$0	$20,000	$20,000	$20,000	$60,000
3	**Habitat protection**									
3.1	Public land	1	90%	DSE, DPIPWE, DEH	$0	$10,000	$10,000	$10,000	$0	$30,000
3.2	Private land	1	60%	DSE, DPIPWE, DEH	$0	$20,000	$20,000	$20,000	$0	$60,000
4	**Threat management**									
4.1	Pest plants	1	90%	PV, DPIPWE, DEH	$40,000	$20,000	$20,000	$10,000	$10,000	$100,000
4.2	Pest animals	1	90%	PV, DPIPWE, DEH	$20,000	$20,000	$10,000	$10,000	$10,000	$70,000
4.3	Human damage	1	70%	PV, DPIPWE, DEH	$0	$10,000	$10,000	$10,000	$0	$30,000
5	**Biological functions**									
5.1	Reproductive status	2	100%	DSE, DPIPWE, DEH	$15,000	$15,000	$15,000	$10,000	$10,000	$65,000
5.2	Seed germination	3	100%	DSE, DPIPWE, DEH	$0	$0	$5,000	$5,000	$0	$10,000
5.3	Fire regimes	1	80%	DSE, DPIPWE, DEH	$5,000	$10,000	$15,000	$15,000	$5,000	$50,000
6	**Population viability**									
6.1	Censusing	1	100%	DSE, DPIPWE, DEH	$20,000	$20,000	$15,000	$15,000	$10,000	$80,000
7	**Cultivation**									
7.1	Seed bank	3	100%	DSE, RBG, DPIPWE, DEH	$5,000	$5,000	$2,000	$2,000	$2,000	$16,000
8	**Community support**									
8.1	Community extension	1	60%	DSE, PV, DPIPWE, DEH	$5,000	$10,000	$10,000	$10,000	$5,000	$40,000
				TOTALS	$160,000	$180,000	$172,000	$157,000	$92,000	$761,000