National Recovery Plan for the Matted Flax-lily *Dianella amoena*

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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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Cover photograph: Matted Flax-lily *Dianella amoena* by Geoff Carr.

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Summary

The Matted Flax-lily (*Dianella amoena)* is a small, perennial, tufted lily endemic to Victoria, where it is distributed from the south-west to the east of the State, occurring in grassland and grassy woodland habitats. Much of this habitat has been cleared, and remaining populations of Matted Flax-lily are mostly small and highly fragmented. Current threats include ongoing clearing of habitat and weed invasion. There are estimated to be only about 1,400 plants remaining in about 120 locations. The Matted Flax-lily is listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999. This national Recovery Plan for the Matted Flax-lily is the first recovery plan for the species, and details the species' distribution and biology, conservation status, threats, and recovery objectives and actions necessary to ensure its long-term survival.

Species Information

Species Description

The Matted Flax-lily (*Dianella amoena)* G.W. Carr & P.F. Horsfall in the family Hemerocallidaceae (formerly included in the family Liliaceae) is a tufted, mat–forming perennial lily. Plants are rhizomatous and can form loose clumps up to 5 m wide. Rhizomes are yellow and slender, with shoots arising every 10–30 cm. Leaves are grey-green, dull crimson at the base, narrow and tapering, to 45 cm long by 12 mm wide, and broadly V-shaped, with a prominent abaxial keel along the midrib and loose clasping leaf sheaths. Blades, sheaths and midribs usually have small, irregularly spaced teeth. Leaves are deciduous in summer if plants are water-stressed (Gray & Knight 2001). The inflorescence is erect, 20–90 cm long, with a slender, arching scape that bears several bluish, star-shaped, nodding, sweetly fragrant flowers. Perianth segments are pale to deep blue-violet, recurved, elliptic, to 10 mm long by 3 mm, the outer tepals with five veins, the inner tepals with three veins. There are six stamens, to 7 mm long, with pale yellow filaments, orange strumae and pale lime-yellow anthers, while the style is whitish-translucent, to 6 mm long. Fruits are ovoid purple berries to 7 mm long, and seeds are shiny black and smooth, to 3 mm long. Flowering occurs from October to April (description from Carr & Horsfall 1995). Pollination is effected by native bees, as all *Dianella* species are ‘buzz pollinated', where pollen is released from the pollen tube in response to high frequency vibration from the wing beats of native bees (Carr & Horsfall 1995).

Distribution

The Matted Flax-lily is currently known to occur only in Victoria, where it is widely but patchily distributed from eastern to south-western Victoria, in the Victorian Volcanic Plains, South East Coastal Plain, South Eastern Highlands and Victorian Midlands bioregions (*sensu* DEH 2000). Anecdotal observations have also been reported from western Victoria, between Stawell and Horsham (C. Beardsell pers. comm.), although the identity of these plants has not been verified.

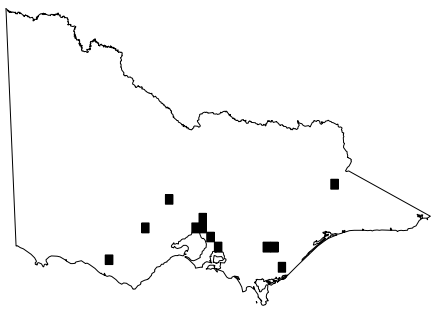

Figure 1 Distribution of the Matted Flax-Lilly

There are also two old (1881) records from Hobart, Tasmania (in the Tasmanian South East bioregion) attributed to *D. amoena*. There have been no further records since, and the species is now presumed extinct in Tasmania (DPIWE 2003). However, there is some doubt as to the correct identity of these specimens, as there are apparently several undescribed species of *Dianella* occurring in Tasmania that require formal recognition (G. Carr pers. comm.). In particular, the identification of *D. amoena* and *Dianella* sp. aff. *longifolia* needs to be clarified. Until confirmed specimens of *D. amoena* are found in Tasmania, its occurrence there remains in some doubt.

For the purposes of this Recovery Plan, *D. amoena* is deemed to be endemic to Victoria. Maps showing the distribution of *D. amoena* are available from the Department of Sustainability and Environment, Victoria (DSE).

Habitat

The Matted Flax-lily generally occurs in grassland and grassy woodland habitats, on well drained to seasonally wet fertile sandy loams to heavy cracking clay soils derived from Silurian or Tertiary sediments, or from volcanic geology (Carr & Horsfall 1995; Gray & Knight 2001). The native grasses *Themeda triandra*, *Microlaena stipoides* var. *stipoides*, *Elymus scaber* var. *scaber*, *Poa labillardierei* and *Austrodanthonia racemosa* var. *racemosa* generally dominate the ground layer at most sites (Carr & Horsfall 1995). Associated tree species include *Acacia melanoxylon*, *Eucalyptus pauciflora* subsp*. pauciflora*, *E. ovata*, *E. camaldulensis*, *E. melliodora*, *E. goniocalyx*, *E. polyanthemos* subsp. *vestita* and *E. macrorhyncha* subsp. *macrorhyncha*. Some sites lack a tree canopy. Most *D. amoena* sites also contain a high cover of introduced plant species. In most instances the surrounding landscape has been severely altered post-European settlement through vegetation clearing for agriculture or urbanisation. Commonly occurring introduced species include *Briza maxima*, *B. minor*, *Holcus lanatus*, *Hypochoeris radicata*, *Plantago lanceolata*, *Romulea rosea*, *Anthoxanthum odoratum*, *Dactylis glomerata* and *Phalaris aquatica.* Recovery actions include mapping of habitat critical to survival.

Population Information

The Matted Flax-lily has been recorded from about 120 sites (DSE Flora Information System), although the number of reproductively independent populations may be much less than this, probably closer to 50. Most populations are small and highly fragmented, and there is thought to be only around 2,500 plants in total. However, individuals are often difficult to distinguish in the field, due to the strongly rhizomatous habit of the species. Plants often form clumps that can spread over an area of up to 20 m x 20 m, although are usually much smaller, and comprise many apparently isolated individual shoots. Therefore, the number of genetically distinct plants may be quite small. The majority of populations comprise just a few plants.

Many sites where *D. amoena* has been recorded are in the northern suburbs of Melbourne, including Bundoora, Eltham, Craigieburn, Reservoir, Epping and South Morang. Other sites occur within a rural landscape at St Andrews and Yarra Glen, Traralgon in the La Trobe Valley, Lyndhurst near Cranbourne in Melbourne's south-east, Castlemaine and Harcourt areas in central Victoria, Kyneton Rifle Range, and rail reserves at Riddells Creek (Macedon Ranges Shire). Other populations occur on the Victorian Volcanic Plains between Sunbury and Bacchus Marsh, with an outlier further west near Mortlake. A highly disjunct population occurs near Omeo in far eastern Victoria.

Significant populations necessary to the long term survival and recovery of the Matted Flax-lily have been determined using several criteria including numbers of plants, condition of habitat, research populations and outlying populations, whose loss would result in a significant range contraction. Currently, 21 of c. 120 known sites of *D. amoena* are listed as significant here (Table 1), including three translocation sites. However, this low number of sites is a reflection of the general lack of information for most sites, especially of abundance, threats and tenure. Important populations of Matted Flax-lily will be determined as a recovery action in this Recovery Plan.

Table 1 Location, population, threat and management information for Matted Flax-lily

Location	Size	Manager	Threats	Comments
Yan Yean Reservoir, Yan Yean	~200 plants	Melbourne Water	• weed invasion	many large, extensively rhizomic clumps
Mill Park Lakes, South Morang	114 plants	City of Whittlesea	• weed invasion	reserve with a 'Trust for Nature' covenant
Traralgon rail reserve, Latrobe City Council	~110 plants	V/Line	• inappropriate fire/slashing regimes • rail works • weed invasion	most of pop. occurs immediately beside rail line ballast; some plants on adjoining road reserve, managed by Vic Roads
Cherry St Grassland, Macleod	~100 plants	Committee of Management comprising City of Darebin & City of Banyule	• weed invasion • inappropriate fire/slashing regimes	
Plenty Valley town centre	~100 plants	private land	• weed invasion • inappropriate fire/slashing regimes • urban development	plants occur on three parcels of private land
Riddell's Creek rail reserve, Mt. Macedon Shire	~80 plants	V/Line	• weed invasion • inappropriate fire/slashing regimes • rail works	recent rail works have damaged site and plants
Springthorpe Buffer, Mont Park	~75 plants	City of Darebin	• weed invasion • inappropriate fire/slashing regimes	
crown reserve, Whittlesea	~50 plants 180 plants*	Merri Creek Management Committee	• weed invasion • inappropriate fire/slashing regimes	translocation site to increase small natural population
Harcourt rail reserve, Mount Alexander Shire	~30 plants	V/Line	• weed invasion • inappropriate fire / slashing regimes	most northern population
Gresswell Hill, Bundoora	28 plants	La Trobe University Committee of Management	• weed invasion • inappropriate fire/slashing regimes	
Harry Pottage Reserve, Macleod	~25 plants	City of Darebin (part)	• weed invasion • inappropriate fire/slashing regimes	site comprises several different land tenures
Gresswell Forest Reserve, Macleod	~25 plants	La Trobe University Committee of Management	• weed invasion • inappropriate fire/slashing regimes	
Simpson Army Barracks, Watsonia	10 plants	Department of Defence	• weed invasion • inappropriate fire/slashing regimes	
Browns Nature Reserve, Greensborough	8 plants	Parks Victoria & Doug Frood	• weed invasion	
Candlebark Park, Templestowe	8 plants	City of Manningham & Parks Victoria	• weed invasion, esp. • inappropriate fire/slashing regimes	pop. includes three very large clumps that cover c. 20 x 20 m each
Caledonia Flora & Fauna Reserve, St Andrews	3 plants	Parks Victoria	• weed invasion • herbivore grazing	small reserve containing many other threatened plants
Cobra Killuc Wildlife Reserve	unknown	Parks Victoria	• unknown	significant geographic disjunction
Lake Omeo, Benambra	unknown	unknown tenure	• weed invasion • inappropriate fire/slashing regimes	significant geographic disjunction; area has many other threatened plant species
Somerton Grassland Reserve	~350 plants*	Parks Victoria	• weed invasion	translocated population
Craigieburn Grassland Reserve	~180 plants*	Parks Victoria	• weed invasion	translocated population
Fawkner Grassland Reserve	~100 plants *	Merri Creek Management Committee	• weed invasion	

* denotes translocated plants

Decline and Threats

The Matted Flax-lily was only described in 1995, and therefore historical distribution and abundance are not known. However, from its current distribution and habitat preferences, it can be deduced that the species was likely to have been considerably more common and widespread across the extent of temperate grasslands and grassy woodlands in Victoria prior to European settlement. Much of this habitat has already been lost through agricultural, urban and industrial development. The majority of remaining sites are in highly tenuous locations such as on roadsides, railway lines, private land or in small reserves within the urban landscape. The species is at risk from a range of threats, mostly due to the nature of the remaining limited, fragmented habitat. Principal short-term threats to Matted Flax-lily are habitat destruction or disturbance, weed invasion and population fragmentation. Major current threats are summarised as follows:

Weed invasion/competition: Almost all sites where the Matted Flax-lily occurs contain a high cover of introduced plant species, especially pasture grasses and other weeds. These weeds can smother plants and reduce space for new stalks to develop and seed to germinate or seedlings to establish. Commonly occurring introduced weed species include *Briza maxima*, *B. minor*, *Holcus lanatus*, *Hypochoeris radicata*, *Plantago lanceolata*, *Romulea rosea*, *Anthoxanthum odoratum*, *Dactylis glomerata* and *Phalaris aquatica.* A range of other weeds including African Boxthorn *(Lycium ferocissimum)*, St John's Wort (*Hypericum perforatum)* and garden escapees such as English Ivy *(Hedera helix)* are threats at some sites, while Blackberry *(Rubus fruticosus* s.l.) and *Watsonia* spp. are affecting many sites along rail reserves. Unreserved sites such as roadsides and railway lines are particularly prone to weed invasion if not actively managed. While weed control is an essential activity at many sites, indiscriminate herbicide application can itself be a threat, as herbicide application will kill Matted Flax-lily. Sites affected by individual weeds include *Watsonia* spp. and *Pinus* spp. at the Traralgon site, Chilean Needle-grass (*Nassella neesiana)* at Templestowe Candlebark site, Sweet Vernal-grass (*Anthoxanthum odoratum)* at St Andrews site, and *Watsonia* spp. at the Yan Yean site.

At some grassland sites, competition from native grasses such as Kangaroo Grass may be occurring, through biomass accumulation after long periods without fire. Periodic burning may be required to reduce this competition, although the response of *D. amoena* to fire is not known, and will need to be investigated prior to implementing any burning program to reduce competition.

Habitat destruction and disturbance: Much of the habitat of the Matted Flax-lily has already been cleared, and some sites where the species still occurs are destined for urban development. Populations occurring along roadsides and rail reserves are at high risk of disturbance or destruction through maintenance activities and vehicle movement, while populations on private land are at risk from land use change, such as from grazing to cropping, or through urban development. Slashing of vegetation along roads and rail lines before seed set is likely to be detrimental.

Population fragmentation. A consequence of extensive habitat and population destruction is that remaining populations are often small and genetically isolated from one another, such that some ecological processes such as pollination have been severely disrupted. In *Dianella* species, pollination is effected by native bees, and plants will not produce seed unless bee-pollinated. As such the welfare of the bees and their habitat becomes a key component of recovery considerations. Fruits are relatively heavy, and probably rely on being eaten and dispersed by birds and reptiles. The Matted Flax-lily apparently does not readily regenerate from seed *in situ* (Gray & Knight, 2001), and no seedlings have been seen at any site (G. Carr & M. White pers. comm.), indicating that at least some processes upon which the species relies have probably been disrupted.

Recovery Information

Current Conservation Measures

A number of initiatives are underway to protect and enhance populations of Matted Flax-lily, including:

Weed control at Gresswell Forest Reserve (City of Darebin & La Trobe University Committee of Management); Railway Avenue, Glengarry (Rail Trail Committee); Traralgon Railway Reserve (V/Line and Vic Roads) and McFarlenes Rd, Yinnar (Latrobe City Council).

Fencing of populations at road reserve, Coldstream (Shire of Yarra Ranges) and Pauciflora Conservation Reserve, Hazelwood (Hazelwood Power).

Reservation principally for protection of Matted Flax-lily of Mill Park Lakes, South Morang (City of Whittlesea) (also with a Trust for Nature covenant & is proposed conservation reserve); Public land west of Whittlesea Public Gardens (DSE) and Springthorpe Buffer, Mont Park (DSE & City of Darebin).

Translocation of plants, including both removal of plants from sites to be destroyed and planting out into protected sites. Plants were salvaged from the Hume Freeway (Craigieburn) site in 2004, and transplanted into reserves at Craigieburn, Fawkner, Somerton and Whittlesea. Translocation was facilitated by DSE and Parks Victoria and managed by Peter Wlodarczyk (Greybox and Grasslands Indigenous Nursery: GAGIN). Plants were salvaged from the Riddell's Creek Rail Reserve and established in cultivation prior to replating within protected sections of the rail reserve and on council managed reserved land. There has been 80–90% survival rate of translocated plants (to 2009).

Information brochure on conservation of the Matted Flax-lily was prepared and distributed to local Landcare and community conservation groups.

Proposed permanent protection and management of 80% of highest priority basalt plains grassland habitats within the proposed expansion of Melbourne's urban growth boundaries, which will include some sites for *D. ameona*.

Recovery Objectives

The **Overall Objective** of recovery is to minimise the probability of extinction of the Matted Flax-lily 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 Matted Flax-lily are to:

1. Determine distribution, abundance and population structure
2. Determine habitat requirements
3. Manage threats to populations
4. Identify key biological functions
5. Determine growth rates and viability of populations
6. Establish a population in cultivation
7. Undertake translocations to bolster existing populations or establish new populations
8. Build community support for conservation

Program Implementation

This Recovery Plan guides recovery actions and will be managed by the Department of Sustainability and Environment. A Threatened Flora Recovery Team, consisting of scientists, land managers and field naturalists has been established to oversee threatened flora recovery in Victoria in general. Technical, scientific, habitat management or education components of the Recovery Plan will be referred to specialist sub-committees on research, *in situ* management, community education and cultivation. Regional Recovery Teams will be responsible for preparing work plans and monitoring progress toward recovery.

Program Evaluation

This Recovery Plan will be revised before the end of five years after the Plan was adopted under the EPBC Act. The Recovery Team will be responsible for annual assessments of progress towards recovery. This Recovery Plan will be reviewed within five years of the date of its adoption.

Recovery Actions

Action	Description	Performance Criteria
Specific objective 1: Determine distribution, abundance and population structure		
1.1	Clarify taxonomy to enable the accurate identification of Matted Flax-lily. **Responsibility: DSE, NHV, DPIPWE**	• Clarify taxonomic identity of uncertain records of *D. amoena* in Vic, including western Vic, Rowville, Parwin Valley, Sunshine North, Tottenham and Yinnar.
1.2	Determine the area and extent of populations, including estimates of the number, size, structure and population change. **Responsibility: DSE**	• All known populations with accurate information on location and land manager • Twenty populations mapped for population size, condition and habitat.
Specific objective 2: Determine habitat requirements		
2.1	Accurately survey all known sites. **Responsibility: DSE**	• Habitat critical to survival mapped for 10 populations.
2.2	Identify and survey potential / historical habitat, using ecological and bioclimatic information that may indicate habitat preference. **Responsibility: DSE**	• Predictive model for potential habitat developed and tested at five sites.
Specific objective 3: Manage threats to populations		
3.1	Legally protect unreserved populations on public land. **Responsibility: DSE, LG**	• Negotiate Public Authority Management Agreements under the *FFG Act* 1988 with relevant land managers where the species occurs, particularly along roadsides and rail reserves.
3.2	Legally protect populations on private land. **Responsibility: DSE**	• Initiate protection measures such as binding management agreements or land purchase at key sites on private land.
3.3	Control threats from pest plants. **Responsibility: DSE, PV, LG**	• Weed control programs developed and implemented at 10 important sites where weeds are deemed to be a threat to long-term persistence of the population. • Measurable seedling recruitment detected in treated populations.
3.4	Control threats from damage or disturbance by fencing or caging plants, or through modifying other management activities. **Responsibility: DSE, PV, LG**	• Measurable reduction in damage to plants (where they are found to be seriously threatened by vehicles or other physical damage) in the following populations: Cherry St Grassland, Macleod; Harry Pottage Reserve, Macleod; Mill Park Lakes, South Morang; Simpson Army Barracks; Public land west of the Whittlesea Public Gardens; Springthorpe Buffer, Mont Park; Lake Omeo, Benambra; Candlebark Park, Templestowe; Riddells Creek, Mt. Macedon Shire; Traralgon Railway Reserve.
Specific objective 4: Identify key biological functions		
4.1	Evaluate current seed bank status, longevity, fecundity and recruitment levels. **Responsibility: DSE**	• Seed bank / regenerative potential quantified at 5 selected, important sites.

4.2	Determine seed germination requirements. **Responsibility: RBG**	• Stimuli for recruitment identified. • Management strategies identified to maintain, enhance or restore regenerative processes fundamental to survival and reproduction.
4.3	Investigate the role of fire and other potential disturbance factors in ecology of Matted Flax-lily. **Responsibility: DSE**	• Fire ecology determined and prescribed burning plans developed at Gresswell Reserve, Macleod; Browns Reserve, Greensborough; Gresswell Hill, Bundoora; Riddell's Creek; Traralgon railway reserve; Harcourt rail reserve.
4.4	Investigate the ecology & habitat requirements of native bee pollinators of Matted Flax-lily. **Responsibility: DSE**	• Bee pollinator requirements determined and included in site management for conservation of Matted Flax-lily.
Specific objective 5: Determine the growth rates 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**	• Techniques for monitoring developed and implemented at 10 important sites. • Growth rates and population viability determined for important populations.
Specific objective 6: Establish populations in cultivation		
6.1	Establish and maintain populations in cultivation for research and reintroductions. **Responsibility: RBG, GAGIN**	• Population of at least 20 genetically distinct plants maintained in cultivation.
6.2	Establish a seed bank and determine seed viability. **Responsibility: RBG, DSE**	• Seed from 10 populations is in long term storage, and viability determined.
Specific objective 7: Undertake translocations to bolster existing populations or establish new populations		
7.1	Prepare a translocation plan identifying populations requiring supplementation and opportunities/risks for establishing new populations, following the guidelines in Vallee *et al*. (2004). **Responsibility: DSE, GAGIN**	• Plan prepared identifying translocation requirements, five sites for supplementation and one new site for reintroduction.
7.2	Undertake reintroductions of Matted Flax-lily. **Responsibility: DSE, PV, GAGIN**	• Translocated plants established at five supplementation sites and one reintroduction site.
Specific objective 8: Build community support for conservation		
8.1	Identify opportunities for community involvement in the conservation of Matted Flax-lily. **Responsibility: DSE, PV**	• Community nature conservation and Landcare groups aware of the species and support its conservation.

Abbreviations: DPIWE = Department of Primary Industries, Water and Environment (Tas); DSE = Department of Sustainability and Environment (Vic); GAGIN = Greybox and Grasslands Indigenous Nursery; LG = Local Government; NHV = National Herbarium of Victoria; PV = Parks Victoria; RBG = Royal Botanic Gardens, Melbourne

Affected Interests

The Department of Sustainability and Environment, Parks Victoria, Melbourne Water, Banyule City Council, Darebin City Council, City of Manningham, City of Whittlesea, La Trobe University and managers of road and rails reserves manage important populations of Matted Flax-lily. Many recently recorded populations are on private land, and their relative importance is unclear, thus specific targeted recovery actions other than immediate field survey and assessment cannot be assigned.

Role and Interests of Indigenous People

Indigenous communities on whose traditional lands the Matted Flax-lily occurs have been advised, through the relevant DSE Regional Indigenous Facilitator, of the preparation of this Recovery Plan and invited to provide comments and be involved in the implementation of the Recovery 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, specifically Grasslands and Grassy Woodlands. 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 Matted Flax-lily, particularly those species with similar life forms and/or flowering responses. Many rare and threatened species co-exist with *D. amoena*, eg. Maroon Leek-orchid *Prasopyllum frenchii*, while a small reserve in St Andrews contains 17 Victorian rare and threatened plant species, highlighting the botanical significance of this site. 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, especially as this species persists in inner-city areas where education programs can reach a large audience.

Social and Economic Impacts

There are likely to be some social and economic impacts resulting from the implementation of this Recovery Plan. A number of sites where the Matted Flax-lily occurs are in the outer urban area of Melbourne. Sites on private land are at risk from urban development, while some sites on public land are at risk of associated development of infrastructure (e.g. roads, housing, schools). Adequately protecting to make meaningful conservation gains is likely to be expensive, due to the high value of potential development land in urban areas. Reserve management costs are also likely to be much higher per unit area. Most remaining sites contain only a few scattered plants within mostly weedy habitat, and their small size and subsequent large edge-to-area ratios makes them much more susceptible to external pressures and disturbance.

Management Practices

Management practices required to conserve the Matted Flax-lily include:

- Fencing and signposting to protect sites and prevent inadvertent damage.
- Weed control.
- Burning or light seasonal grazing to reduce plant competition and maintain an open sward where required.
- Consultation with public land managers and private landholders where the species occurs or is likely to occur.
- Covenants or other conservation agreements for protection of significant private land sites, though negotiation with landowners.
- Encouraging and facilitating community participation in recovery actions.
- Surveys and publicity to locate new populations, especially on roadsides and private land.

- *Ex situ* conservation measures, including seed storage.
- Research into the ecology and management of the species and its habitat, especially in disturbance regimes, pollination and germination *in-situ*.

Management practices detrimental to the conservation of the Matted Flax-lily include:

- Heavy, prolonged grazing of sites.
- Ploughing or other soil disturbance.
- Urban development and other changing land use e.g. from grazing to cropping.

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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**				$0	$0	$0	$0	$0	$0
1.1	Taxonomy	1	100%	DSE, NHV, DPIPWE, TH	$7,500	$7,500	$0	$0	$0	**$15,000**
1.2	Extent & abundance	1	100%	DSE	$5,000	$5,000	$5,000	$5,000	$5,000	**$25,000**
2	**Habitat requirements**				$0	$0	$0	$0	$0	$0
2.1	Known habitat	1	100%	DSE, LG	$15,000	$15,000	$0	$0	$0	**$30,000**
2.2	Potential habitat	2	75%	DSE	$0	$10,000	$10,000	$10,000	$0	**$30,000**
3	**Threat management**				$0	$0	$0	$0	$0	$0
3.1	PAMAs	1	100%	DSE	$0	$10,000	$10,000	$0	$0	**$20,000**
3.2	Private land agreements	1	100%	DSE	$0	$10,000	$10,000	$0	$0	**$20,000**
3.3	Pest plant control	1	100%	DSE, PV, LG	20,000	20,000	15,000	15,000	15,000	**$85,000**
3.4	Damage, disturbance control	1	100%	DSE, PV, LG	20,000	20,000	15,000	15,000	15,000	**$85,000**
4	**Biology & ecology**				$0	$0	$0	$0	$0	$0
4.1	Longevity, fecundity	2	75%	DSE	$10,000	$10,000	$10,000	$5,000	$0	**$35,000**
4.2	Seed germination	2	75%	RBG	$0	$5,000	$5,000	$0	$0	**$10,000**
4.3	Fire, disturbance ecology	2	75%	DSE	$0	$15,000	$15,000	$15,000	$0	**$45,000**
4.4	Pollinator ecology	2	75%	DSE	$0	$10,000	$10,000	$10,000	$5,000	**$35,000**
5	**Growth rates, pop. viability**				$0	$0	$0	$0	$0	$0
5.1	Population trends, viability	1	100%	DSE	$10,000	$10,000	$10,000	$10,000	$10,000	**$50,000**
6	**Cultivation**				$0	$0	$0	$0	$0	$0
6.1	Ex-situ population	2	100%	RBG, GAGIN	$3,000	$3,000	$3,000	$3,000	$3,000	**$15,000**
6.2	Seed bank	2	100%	RBG, DSE	$2,000	$2,000	$5,000	$5,000	$2,000	**$16,000**
7	**Translocations**				$0	$0	$0	$0	$0	$0
7.1	Translocation plan	1	100%	DSE, GAGIN	$3,000	$3,000	$0	$0	$0	**$6,000**
7.2	Translocation implementation	1	100%	DSE, PV, GAGIN	$0	$0	$15,000	$15,000	$15,000	**$45,000**
8	**Community support**				$0	$0	$0	$0	$0	$0
8.1	Community involvement	1	100%	DSE, PV	$4,000	$4,000	$4,000	$4,000	$4,000	**$20,000**
				TOTALS	**$99,500**	**$159,500**	**$142,000**	**$112,000**	**$74,000**	**$587,000**