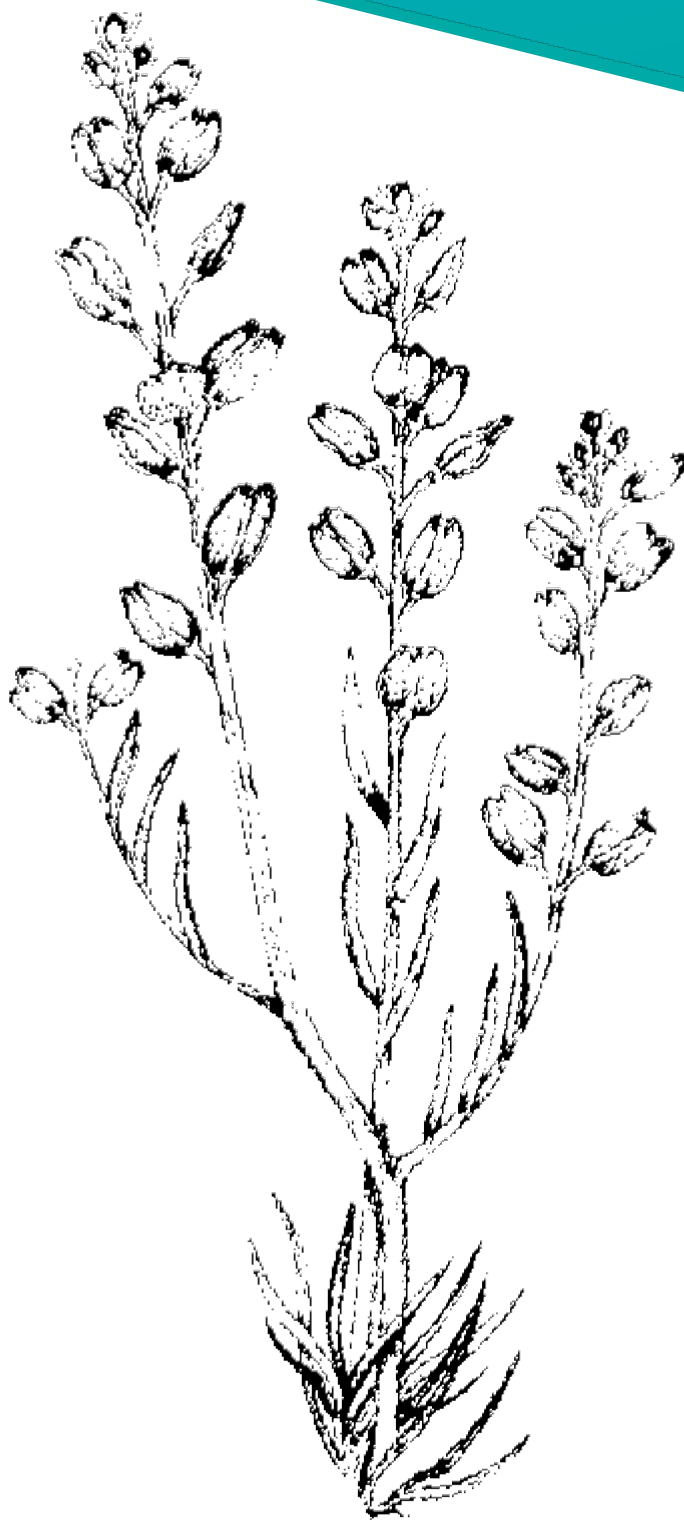


GINNINDERRA PEPPERCRESS

LEPIDIUM GINNINDERRENSE

ACTION PLAN



PREAMBLE

The Ginninderra Peppercress (*Lepidium ginninderrense* N.H.Scarlett) was declared an endangered species on 4 September 2001 (Instrument No. DI2001-299 under the *Nature Conservation Act 1980*). Under section 101 of the *Nature Conservation Act 2014*, the Conservator of Flora and Fauna is responsible for preparing a draft action plan for listed species. The first action plan for this species was prepared in 2003 (ACT Government 2003). This revised edition supersedes the earlier edition. This action plan includes the ACT Native Grassland Conservation Strategy set out in schedule 1 to the 'Nature Conservation (Native Grassland) Action Plans 2017', to the extent it is relevant.

Measures proposed in this action plan complement those proposed in the action plans for Natural Temperate Grassland, Yellow Box/Red Gum Grassy Woodland, and component threatened species such as the Striped Legless Lizard (*Delma impar*), Grassland Earless Dragon (*Tympanocryptis pinguicolla*) and the Golden Sun Moth (*Synemon plana*).

CONSERVATION STATUS

Lepidium ginninderrense is recognised as a threatened species in the following sources:

National

Vulnerable species – *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) according to the following criteria: low population size, restricted area of occupancy, and no evidence of continuing decline (Department of Environment and Heritage 2016). A National Recovery Plan has been prepared (Environment ACT 2005), and about 20 hectares of the Lawson suburb has been added to the Register of Critical Habitat (Department of the Environment and Heritage 2005).

Listed Critical Habitat: northwest corner of Lawson Grasslands (former Belconnen Naval Transmission Station), ACT - *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) according to the following criteria:

'Ginninderra Peppercress has a very restricted distribution and occurs at only one location. Therefore, the habitat is used to meet all essential life cycle requirements including seed dispersal processes, recruitment, etc. The only known population of *Lepidium ginninderrense* occurs in the habitat in the corner of Lawson Grasslands in the Australian Capital Territory.

Therefore, it is a key habitat for breeding, dispersal and the ongoing survival of Ginninderra Peppercress; and as 100% of the plants occur on this site, the habitat is critical to maintain genetic stock and potential long-term evolutionary development Criterion (e).'

Note that the EPBC listing of the critical habitat was made in 2005 before the discovery of the smaller Franklin population.

Australian Capital Territory

Endangered – *Nature Conservation Act 2014*.
Special Protection Status Species – *Nature Conservation Act 2014*.

CONSERVATION OBJECTIVES

The overall objective of this plan is to preserve the species in perpetuity in the wild across its natural geographic range in the ACT. This includes the need to maintain natural evolutionary processes.

Specific objectives of the action plan are to:

- Conserve all ACT populations because the species is not known to occur outside the ACT.
- Manage the species and its habitat to maintain the potential for evolutionary development in the wild.

- Enhance the long-term viability of populations through management of adjacent grassland to increase habitat area, and by establishing new populations.

SPECIES DESCRIPTION AND ECOLOGY

DESCRIPTION

The Ginninderra Peppercress (*Lepidium ginninderrense* N.H.Scarlett) is a perennial herb to a maximum height of about 20 cm, with one to six branched stems arising from a rootstock. Stems are striate and moderately papillose. Leaves are thick and fleshy, glabrous and shiny on the upper surface. Rosette leaves are widely spaced and very narrow (1.5–2.0 mm wide) and 15–55 mm long. Lower stem leaves are up to 35 mm long, broad lanceolate in outline and pinnatifid with 1–3 pairs of linear pinnae. Upper stem leaves are narrow and mostly unlobed. The inflorescence is an elongating raceme with a maximum length of 15 cm. Flowers are small, with four stamens, no petals and six nectaries. The four sepals are less than 1 mm long and about 0.5 mm wide, green and with scarios margins. Fruits are flat, bilocular, 2-seeded and bluntly obovate, 4–5 mm long and 3–3.5 mm broad and notched at the apex. Seeds are orange, obovoid and about 1.5 mm long (Scarlett 2001). *Lepidium ginninderrense* flowers in late spring. It sets seed mainly in December and the majority of seed is dispersed before August (Avis 2000).

DISTRIBUTION

There are two known extant populations of *L. ginninderrense*, both in the ACT. The larger population occurs in grassland in the north-west corner of Lawson Grasslands (former Belconnen Naval Transmission Station) in the suburb of Lawson (the type locality).

This population is on flat ground near Ginninderra Creek at an altitude of 590 metres, near the estimated original boundary between Natural Temperate Grassland and Box–Gum Woodland (ACT Government 2005). The Lawson site includes over 100 hectares of Natural Temperate Grassland, most of which is surrounded by a security fence. The average number of plants recorded in six counts between 2000 and 2009 was 1715, with

numbers varying considerably from year to year without obvious trends. The estimated area occupied over this period increased from 90 x 30 metres to about 200 x 100 metres (Avis 2000, ENSR 2008, AECOM 2009).

A second population was discovered in 2012 about 6 km north-north-east of Lawson in the Gungahlin suburb of Franklin (altitude 610 metres) in an 18 hectare paddock containing disturbed grassland and remnant Box-Gum Woodland (Taws 2013, Taylor *et al.* 2014). In spring 2012 this population occupied an area of about 9 x 4 metres and contained 50 plants (ACT Government, unpublished data). Three additional sub-populations were found at the Franklin site by environmental contractors in 2014. Staff from Conservation Research (ACT Government) surveyed the site in February 2015 and recorded 377 plants across 12 sub-populations.

There is an historical record from the suburb of Reid in 1952, between the Canberra Institute of Technology and St Johns Church. A subsequent search failed to relocate this population (M. Gray pers. comm. in Scarlett 2001) and it is likely that the site has since been developed.

Lepidium ginninderrense has only been recorded from these three sites in the ACT and is not known from outside the ACT. The species is spatially disjunct from the other four members of the allied section *Papillosa* in *Lepidium* that occur in south-eastern Australia, which are mainly ephemeral or annual herbs confined to the inland plains west and north of the Eastern Highlands (Hewson 1981, Scarlett 2001).

The most up to date distribution data for this species is publicly available on the ACT Government’s mapping portal ([Visit the ACTmapi website](#)).

HABITAT AND ECOLOGY

At Lawson, *L. ginninderrense* grows on the floodplain of the Ginninderra Creek, in and around slight depressions which are subject to winter inundation (Avis 2000, Scarlett 2001, AECOM 2009). The depressions may be natural or some may be former vehicle tracks (HLA 2006). Soil testing close to *L. ginninderrense* plants recorded a pale yellow brown silty clay loam layer to at least 300 mm deep, with the texture suggesting alluvium originating from Ginninderra Creek and the colour suggesting

periodic inundation (AECOM 2009). The depressions carry little vegetation cover and the surface (with a dark microbiotic crust) cracks on drying (Rowell, pers. obs. 2009). The habitat has similarities with that of the endangered Winged Peppergrass (*L. monoplocoides*), which occurs in inland NSW and Victoria (Mavromihalis 2010).

Native grassland species associated with *L. ginninderrense* at Lawson include Wallaby Grasses (*Rytidosperma* spp), Windmill Grass (*Chloris truncata*), Lemon Beauty-heads (*Calocephalus citreus*) and Fuzzweed (*Vittadinia muelleri*). *Lepidium ginninderrense* is also often associated with low-growing annual exotic forbs and grasses which colonise the same habitat. It is generally not found among taller native and exotic grasses in the same area, which may out-compete *L. ginninderrense* for light and other resources (Avis 2000, HLA 2006, AECOM 2009).

The former Reid site was a flat area of grassland less than one kilometre from the Molonglo River, and the habitat description is similar: 'locally rather common, in depressions with little vegetation in grassland' (Scarlett 2001).

At the Franklin site the *L. ginninderrense* plants occur with other native grassland species in a number of small patches scattered across an otherwise weedy paddock. The plants are concentrated in and around bare areas that typically have a dark microbiotic crust. These bare areas are probably perched clay-lined depressions over rock or impervious subsoil.

The vegetation surrounding the *L. ginninderrense* patches is dominated by dense Phalaris (*Phalaris aquatica*) and Tall Speargrass (*Austrostipa bigeniculata*), but the species composition within patches themselves resembles that of Lawson; shorter Wallaby Grasses, Windmill Grass, Fuzzweed, Scrambled Eggs (*Goodenia pinnatifida*) and Lemon Beauty-head, the latter being a species typical of occasionally inundated grassland ('Ephemeral Drainage-line Grassy Wetland', DSE 2009) which is present at both sites.

Observation of changes in the density and distribution of the Lawson population suggest that *L. ginninderrense* is not an annual, which is supported by nursery experience where plants often survive more than a year (Taylor pers. comm. 2015). The species could be classified as either a biennial or (possibly short-lived) perennial or ephemeral (Avis 2000, ENSR 2008, ENSR-AECOM 2009, Taylor pers. comm. 2015).

Recruitment often occurs in bare patches or where spring annuals have died down in summer (Avis 2000, HLA 2006).

Recent recruits (single-stemmed, not flowering, approximately 3 cm tall), new stems sprouting from the base of older plants and plants bearing flowers and fruits, have been observed in autumn surveys, and seed appears to be shed in autumn and winter (Avis 2000, HLA 2006), though viable seed has been collected as early as November (Taylor *et al.* 2014).

Lepidium is a large genus in which polyploidy is common, and material from the *L. ginninderrense* type locality has been determined to be tetradecaploid (14 sets of chromosomes, Dierschke *et al.* 2009). The genus is characterised by an autogamous mating system (plants self-fertilise), but the flowers of *L. ginninderrense* carry six nectaries, suggesting that insect pollination (and potential outcrossing) may also occur.

PREVIOUS AND CURRENT MANAGEMENT

The Lawson site is a former communication facility, currently managed by the Department of Defence (Defence). Defence has managed the site with advice from the ACT Government and specialist consultants, more recently under an environmental management plan (SMEC 2008).

Key components of management have been weed and biomass management and monitoring of kangaroo grazing pressure. In relation to *L. ginninderrense*, the environmental management plan prescribes continued monitoring of the size, distribution and viability of the population, appropriate weed control and management, maintenance of the surrounding grassland structure and diversity to favour *L. ginninderrense*, and management of the resident kangaroo population at a stable level compatible with maintaining the ecological values of the site (SMEC 2008).

The site was resumed from pastoral leases for Defence use in 1939, at which time it had not been ploughed, fertilised or sown with introduced pasture species. Low levels of sheep grazing continued, the site was slashed at least annually to meet Defence operational requirements, and clovers were sown around the base of some transmission masts (Crawford

and Rowell 1995). In 1995 a small (10 metre x 10 metre) enclosure was erected around a small group of *L. ginninderrense* plants to protect them from sheep grazing. In 1997 sheep were removed, and the site was mown in accordance with a grassland management plan developed by Defence and the ACT Government (Avis 2000). Phalaris, Ryegrass (*Lolium rigidum*) and Subterranean Clover (*Trifolium subterranean*) are scattered across the Lawson site (AECOM 2009), suggesting some pasture improvement during this period.

Mowing became unnecessary as the kangaroo population enclosed by the security fence increased. By 2006 kangaroo numbers and grazing pressure were high and, in association with ongoing dry conditions, had the potential to damage the endangered Natural Temperate Grassland ecological community and the habitat of several threatened species (Cooper 2009).

Lepidium ginninderrense is not thought to be directly grazed by kangaroos at moderate densities when other feed is available, but in 2007 two enclosures were constructed to protect most of the population from trampling, the effects of overgrazing of the surrounding grasses and any risk of direct grazing (ENSR 2008). After kangaroo numbers were reduced in 2008, research was begun by the ACT Government on fertility control of the kangaroo population with the aim of maintaining their numbers within a range compatible with conservation of grassland values (SMEC 2008, ACT Government 2010). The gates to the enclosures were opened to readmit kangaroos, which then reduced the density of the grasses around the *L. ginninderrense* plants (AECOM 2009).

The Lawson *L. ginninderrense* population was counted nine times between 1997 and 2011, and the survey month and methods have varied (Table 1). The surveys between 2006 and 2009 used similar methods, with plants counted and mapped for each square metre of the known distribution.

These surveys showed considerable variation in plant numbers between years, as well as changes in the distribution of plants. Population estimates for Lawson have ranged from less than 50 plants to more than 3000 plants (Table 1). In some surveys dense clusters of single-stemmed plants were noted, suggesting that recruitment was occurring. These clusters of plants were not always found in subsequent years, indicating some mortality of young plants. The height and density of the vegetation surrounding the *L. ginninderrense* plants has also varied considerably in the last 20 years, in response to drought and years with heavier rainfall, and with variations in the number of kangaroos on the site.

The Franklin site is managed by the ACT Government, which undertakes slashing along tracks and fence lines. The site was previously under a grazing lease and the presence of clovers and Phalaris indicates previous pasture improvement of at least parts of the site. A lack of grazing by stock or kangaroos on this site often results in an accumulation of a large amount of vegetation (grass) biomass, and the ACT Government plans to undertake occasional biomass reduction activities (burning/slashing/grazing) to manage the vegetation biomass at this site.

Table 1. Number of *Lepidium ginninderrense* plants recorded in Lawson surveys, 1997 to 2011.

Date of survey	Number of plants	Reference
1997	<50	Environment ACT in Avis 2000
1999	80	Environment ACT in Avis 2000
April/May 2000	2243	Avis 2000
February 2005	875	HLA
April 2006	3523	HLA
February 2007	1181	HLA
February 2008	1328	ENSR-AECOM

Date of survey	Number of plants	Reference
Feb-March 2009	1137	ENSR-AECOM
November 2011	406	Taylor <i>et al.</i> 2014

EX-SITU CONSERVATION AND TRANSLOCATION

Existing plants of *L. ginninderrense* from Lawson were found to produce large numbers of viable seed, and the ACT Government has taken advantage of the opportunities this allows for translocation and ex-situ conservation, as recommended by Young (2001). These programs have been conducted according to the principles outlined in the Australian Network for Plant Conservation 'Guidelines for the Translocation of Threatened Plants in Australia' (Vallee *et al.* 2004) and 'Plant Germplasm Conservation in Australia' (Offord and Meagher 2009). The following has been undertaken:

- Australian National Botanic Gardens (ANBG) staff collected seed from most of the available plants at Lawson in 2008 and 2011 to capture the existing genetic diversity. The seed is stored under controlled conditions in the National Seed Bank by maternal line (Guja *et al.* 2013).
- Germination testing after four years of seed storage under controlled conditions resulted in 100% viability and germination (Taylor *et al.* 2014). Seed collection and replacement intervals will be determined by seed longevity. Seed longevity will be determined from germination trials of stored seed.

Ginninderra Peppergrass



- In 2012 the ANBG grew 1589 plants from Lawson seed for seed production. The plants were grown on plant benches under shadecloth and good seed set was achieved, apparently without any significant insect activity (J. McAuliffe pers. comm. Sept 2014).
- In September 2013 most of the Lawson seed production plants held at the ANBG were translocated to selected sites at Crace (1093 plants) and Dunlop (487 plants) grassland nature reserves by Greening Australia and the ACT Government. Site preparation included raking away of thatch where necessary. Planting sites were selected for their similarity to the existing *L. ginninderrense* sites, i.e. flat or gently sloping sites which might accumulate water, with sparse Wallaby/Speargrass grassland and Lemon Beauty-heads as a key indicator species. Significant rain (70 mm) fell in the week of planting, and plants were watered six weeks after planting. Dunlop Reserve was being grazed by sheep so the planting site was protected by temporary fencing that excluded sheep but not kangaroos (Cook 2013, N Taws pers. comm. September 2014). Subsequent searches of these sites in spring 2014 failed to locate any of the translocated plants or any seedlings derived from them (pers. obs. A Rowell, N Taws, J McAuliffe, October 2014). Follow up searches in February 2015 also failed to locate any surviving or germinated plants (pers. obs. E Cook, G Baines February 2015). The reason translocated plants failed to establish is not well understood but is probably related to unseasonably hot and dry conditions following translocation.
- At the time of writing, over 200,000 seeds were held in the National Seed Bank (Taylor *et al.* 2014), including over 500 from the Franklin population (Cook 2013).

THREATS

The main threats to the survival of the two populations (and therefore to the species) are likely to be habitat loss from urban development and habitat degradation from intended or unintended actions associated with land management and/or visitor activities.

The surviving (and one extinct) populations occur/occurred in areas where competing grass

tussocks and other plant growth is short and open and, subsequently, there is little competition for space and light (Avis 2000, ENSR-AECOM 2009, HLA 2006, Scarlett 2001). The sites also appear to be occasionally or seasonally wet, either through periodic flooding (Lawson) or where rainfall collects (both sites). This wetting and drying may help maintain the open habitat and facilitate *L. ginninderrense* seed germination. Disturbance of the existing drainage patterns or inappropriate management may lead to changes in this open habitat that are not favourable for *L. ginninderrense* (including high levels of vegetation biomass and weed invasion), and it is important to identify and implement management practices that are conducive to the maintenance of the habitat in the appropriate condition. Individual plants may be quite short-lived, which could make the populations vulnerable to even short-term disturbances.

CONSERVATION ISSUES AND INTENDED MANAGEMENT ACTIONS

PROTECTION

The Lawson and Franklin populations require protection as they are the only known populations of the species. The Lawson population of *L. ginninderrense* occurs on land under Commonwealth (Department of Defence) control. The population is currently afforded protection due to the land being surrounded by a man-proof fence and the Department of Defence restricting access to authorised persons. The Franklin population occurs on Territory land that is not formally protected in reserve but is managed by the ACT Government to conserve *L. ginninderrense* and other threatened species. The species is not known to occur outside the ACT and so all populations in the ACT require protection to help ensure the overall conservation objective is achieved.

ENVIRONMENTAL OFFSET REQUIREMENTS

Environmental offset requirements for species and ecological communities in the ACT are outlined in the ACT Environmental Offsets Policy and associated documents including the ACT Environmental Offsets Assessment

Methodology and the Significant Species Database. In the Assessment Methodology and Database, some of the threatened species have special offset requirements to ensure appropriate protection. The Ginninderra Peppercreep has been determined as not able to withstand further loss in the ACT so offsets for this species are not appropriate.

SURVEY, MONITORING AND RESEARCH

It is possible that the species exists elsewhere in the ACT given the recent discovery of a second small population at the Franklin site. However, because the species is small and difficult to detect in grassland, surveys aimed solely at finding additional populations are unlikely to be practical. Discovery of new populations is likely to be through surveys for other plant species or from opportunistic observations from naturalists and other interested persons.

All known populations of *L. ginninderrense* will need to be monitored to determine population trends and to evaluate the effects of management.

Recovery of the species will rely largely on expanding the size/area of existing populations and establishing new populations. Research is required to determine optimal habitat conditions for the species (to maintain and expand existing populations) and how to establish new populations.

Priority research areas include:

- Improved knowledge of life history and ecology, such as plant longevity, seed longevity, conditions associated with germination and recruitment and effects of surrounding vegetation biomass.
- Methods for establishing additional populations, such as translocation of plants, in association with the Australian National Botanic Gardens, Greening Australia and other parties.
- Investigations of chemistry, composition and structure of soil at the known sites, to assist with identification of similar sites for establishment of other populations.
- Determination of the chromosome number in the small Franklin population. Due to the high frequency of polyploidy in *Lepidium*

(Dierschke *et al.* 2009), this should take place before seed from this population is used in seed orchards with Lawson plants or for translocation.

MANAGEMENT

Due to the small size and fragmented distribution of the populations, management actions will be directed towards maintaining existing conditions and ensuring that activities occurring nearby do not adversely affect the sites. Management actions at the Lawson site need to take into account the presence of Natural Temperate Grassland ecological community (Endangered - EPBC Act 1999, NC Act 2014), the Golden Sun Moth (*Synemon plana*: Critically Endangered - EPBC Act 1999) and the Perunga Grasshopper (*Perunga ochracea*: vulnerable - NC Act 2014).

Priority management actions include:

- Manage vegetation biomass to maintain an open habitat structure.
- Control weeds if they pose a threat to the populations or the site.
- Manage grazing pressure, if it threatens the populations or the site, by reducing the number of herbivores and/or fencing known *L. ginninderrense* populations.
- Avoid incompatible activities, such as development of facilities, recreational use or access tracks in or near the sites, especially where these may alter drainage or introduce weeds.
- Maintain a low profile for the sites where the species is located; the appropriateness of signage and fencing will need careful consideration.
- Incorporate appropriate statements of management actions in relevant plans and strategies.
- Seek expert advice on best practices with regard to management of the species, particularly regarding maintenance of an open habitat and putting in place specific management actions as indicated by monitoring. Biomass management, hydrology and weed control are likely to be key issues for management consideration.

- Continue field collection of seed from the Lawson and Franklin populations for storage in the National Seed Collection, with seed replaced at appropriate intervals determined by seed longevity testing.
- Maintain an ex-situ 'insurance' population (plants and/or seed bank) while there is a high risk of extant populations becoming extinct.

IMPLEMENTATION

Implementation of this action plan and the ACT Native Grassland Conservation Strategy will require:

- Land planning and land management areas of the ACT Government to take into account the conservation of threatened species.
- Allocation of adequate resources to undertake the actions specified in the strategy and action plans.
- Liaison with other jurisdictions (particularly NSW) and other land holders with responsibility for the conservation of a threatened species or community.
- Collaboration with universities, CSIRO, Australian National Botanic Gardens and other research institutions to facilitate and undertake required research.
- Collaboration with non-government organisations, such as Greening Australia, to undertake on-ground actions.
- Engagement with the community, where relevant, to assist with monitoring and other on-ground actions, and to help raise community awareness of conservation issues.

OBJECTIVES, ACTIONS AND INDICATORS

Table 2. Objectives, Actions and Indicators

Objective	Action	Indicator
1. Conserve all ACT populations because the species is not known to occur outside the ACT.	Apply formal measures to protect all populations.	All populations protected by appropriate formal measures.
	Ensure protection measures include requirement to conserve the species in the long-term.	Protection measures include requirement for conservation management.
	Maintain alertness to the possible presence of the species while conducting vegetation surveys in suitable habitat.	Vegetation surveys in suitable habitat also aim to detect the species.
	Maintain a seed bank as insurance against loss of extant population(s).	Seed bank in the National Seed Collection is maintained and seed collected at regular intervals (determined by seed longevity).
2. Manage the species and its habitat to maintain the potential for evolutionary development in the wild.	Monitor populations and effects of management actions.	Trends in abundance are known. Management actions are recorded.
	Manage habitat to maintain its suitability for the species.	Suitable habitat conditions are maintained by site management. Potential threats (e.g. weeds) are avoided or managed. At least 80% of plants are in suitable habitat. Extant populations are stable or increasing.
3. Enhance the long-term viability of populations through management of adjacent grassland to increase habitat area and by establishing new populations.	Undertake or facilitate research and trials into increasing the size of populations or establishing new populations.	Research and trials have been undertaken to increase the size of populations or to establish new populations. Population size increased or new population(s) established.
4. Improved understanding of the species' ecology, habitat and threats.	Undertake or facilitate research on appropriate methods for managing the species and its habitat (slashing/grazing/ burning etc.), vegetation biomass, lifecycle, germination, recruitment and genetics.	Research undertaken and reported and where appropriate applied to the conservation management of the species.

5. Promote a greater awareness of, and strengthen stakeholder and community engagement in the conservation of the species.	Undertake or facilitate stakeholder and community engagement and awareness activities.	Engagement and awareness activities undertaken and reported.
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PERSONAL COMMUNICATIONS

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