National Recovery Plan for the Red Swainson-pea *Swainsona plagiotropis*

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Australian Government





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Published by the Victorian Government Department of Sustainability and Environment (DSE) Melbourne, July 2010.

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ISBN 978-1-74208-967-6

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Citation: Tonkinson, D. and Robertson, G. 2010. National Recovery Plan for the Red Swainson-pea *Swainsona plagiotropis*. Department of Sustainability and Environment, Victoria.

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Cover photograph: Red Swainson-pea Swainsona plagiotropis by Terri Williams.

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Summary

The Red Swainson-pea *Swainsona plagiotropis* is endemic to inland south-eastern Australia, where it occurs in Victoria and New South Wales. Apparently once abundant and widely distributed across the inland plains, the species has probably suffered a decline in range and abundance with the conversion of much of its former range to agriculture. There are currently estimated to be some 200,000 plants occurring in about 60 wild populations. However, many of these populations are small, fragmented and in highly vulnerable locations such as on private land and on roadsides. Current threats include weed invasion, grazing, further loss of habitat and climate change. The Red Swainson-pea is listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999. This national Recovery Plan for the Red Swainson-pea 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 Red Swainson-pea *Swainsona plagiotropis* is a small, prostrate to decumbent perennial herb to 30 cm tall. The compound leaves are 5–10 cm long, with 17–23 narrow leaflets up to 17 mm in length. Leaflets are sparsely hairy below and usually hairless above. The inflorescence is a raceme 15–22 cm long, with a glabrous peduncle and 2–5 bright red flowers near the apex. Flowers are 10–15 mm long, have a characteristically sideways twisted keel and fade to violet with age. Flowering generally occurs in September and October. The hairy, ovoid fruits are 13–20 mm long and 9–10 mm wide, enclose up to 20 seeds and mature by late November. Although it is a perennial species, the Red Swainson-pea dies back to a woody rootstock during the drier months in most years. The species also seems highly responsive to seasonal moisture conditions and may not be detectable at all in very dry years, with large numbers reappearing in years with higher rainfall (description from Cunningham *et al.* 1988; Harden 1991 and Walsh & Entwisle 1996).

Distribution

The Red Swainson-pea is endemic to the riverine plains of inland south-eastern Australia, in Victoria and New South Wales (Figure 1).



Figure 1. Distribution of the Red Swainson-pea in south-eastern Australia

Most Victorian populations occur south and west of Echuca, between the Loddon River floodplain and just to the east of the Campaspe River (all in the Riverina bioregion *sensu* DEH 2000), with outlying records from near Warracknabeal (Murray Darling Depression bioregion) in the west and Benalla (Riverina bioregion) in the east. Populations in NSW are concentrated around Jerilderie, with an outlier 250 km to the north-west in the Willandra National Park (all within the Riverina bioregion) and a recently discovered population near Warren, 480 km north-east of Jerilderie (Darling Riverine Plain bioregion). Maps showing the distribution of the Red Swainson-pea are available from the Department of Environment,Climate Change and Water (DECCW) (for NSW) and the Department of Sustainability and Environment (DSE) (for Vic).

Habitat

The Red Swainson-pea occurs within the 350–450mm average annual rainfall band, in relatively open native grassland vegetation on seasonally waterlogged red–brown clay and clay loam soils. The vegetation is dominated by perennial native grasses including Wallaby-grasses *Austrodanthonia* species, Spear-grasses *Austrostipa* species and Spider-grass *Enteropogon acicularis*, often with scattered small shrubby bluebushes *Maireana pentagona, Maireana excavata* and *Maireana humillima*. These grasslands have a range of annual and perennial herbs including Scaly Buttons *Leptorhynchos squamatus*, Lemon Beauty-heads *Calocephalus citreus*, Small Vanilla-lily *Arthropodium minus*, Rough Burr-daisy *Calotis scabiosifolia*, Small-flowered Goodenia *Goodenia pusilliflora* and the Common Sunray *Triptilodiscus pygmaeus*. Actions in this recovery plan include survey for common and potential habitat that will lead to the identification of habitat critical to the survival of the species.

Population Information

About 60 populations of Red Swainson-pea are currently known (Appendix 1). Population sizes fluctuate markedly in response to seasonal conditions but total population size in good years probably exceeds 200,000 individuals. The geographic distribution of recent records of Red Swainson-pea suggests the existence of two large and extensive 'metapopulations': one centred on Jerilderie in southern NSW, the second between Echuca and Serpentine in northern Victoria. In addition, there are three disjunct occurrences: near Warren in northern NSW, Willandra National Park in western NSW and near Warracknabeal in western Victoria. Each of these five population groups is considered important to the long term survival and recovery of Red Swainson-pea and recovery actions are proposed for each of these. In addition, several site populations within each of the large metapopulations are identified further for recovery actions.

Some populations important to the long-term survival and recovery of the Red Swainson-pea have been identified (Table 1). 'Importance' has been defined on the basis of:

- 'stronghold' populations within a region (i.e. areas of high abundance);
- populations that, if lost, would cause a significant range contraction; and
- populations that have been the focus of monitoring and conservation management, and hence have base-line data that will increase the understanding of the species' ecology.

It should be noted that other populations are not necessarily deemed unimportant by not being included on this list.

Decline and Threats

The Red Swainson-pea was apparently abundant and widely distributed within the main part of its range at the time of European settlement of the Riverina plains. While the species is still relatively widely distributed and can be locally abundant in years of good rainfall, it has almost certainly declined due to land use changes within much of its distribution, and is still at risk from a range of threats. Much of its range has been converted to agricultural use, especially in northern Victoria and central NSW, where most of the native grasslands have been degraded or lost through grazing, ploughing, cropping and sowing pasture grasses. This was probably the greatest previous threat and has resulted in extensive habitat loss and fragmentation of populations, many of which are now small and isolated. Many populations are on private land or in highly vulnerable locations such as on roadsides, with few populations currently protected on public land such as in national parks or conservation reserves.

Table 1. Populations important to the survival of the Red Swainson-pea (see Appendix 1 for more detailed information on populations)

Location	Land tenure	Comments	
New South Wales			
35 km north-west of Warren, NSW	private land	disjunct population; loss would cause significant range contraction	
Willandra National Park, NSW	public land	disjunct population; loss would cause significant range contraction	
Jerilderie metapopulation	I		
Innes Bridge Road, Jerilderie	Crown Reserve		
Travelling Stock Route, Newell Highway	roadside (Shire of Jerilderie)	large stand	
Urana Road, 20.9 km west of Urana RSL	roadside (Shire of Jerilderie)	large numbers	
Travelling Stock Route, west of Jerilderie Aerodrome	roadside (Shire of Jerilderie)	extensive site population	
Stock Route, Old Urana Road	roadside (Shire of Jerilderie)		
0–2 km S of substation on South Coree Road, Jerilderie	roadside (Shire of Jerilderie)		
5–6.5 km S of substation on South Coree Road, Jerilderie	roadside (Shire of Jerilderie)		
Jerilderie Nature Reserve	Dept. Environment , Climate Change and Water	large site population	
South-eastern corner of Jerilderie Aerodrome	Shire of Jerilderie land		
adjacent Newell Highway	private land	large site population	
adjacent South Coree Road	private land	large site population	
Yathong North	private land	large site population	
Victoria			
Bangerang, 10km north-east of Warracknabeal	private land	disjunct population; loss would cause significant range contraction	
Victorian metapopulation			
Terrick Terrick National Park	public land		
Patho Flora and Fauna Reserve	public land		
Serpentine-Echuca Road, Pine Grove	roadside (Shire of Loddon)	large site population	
Elmore-Mitiamo Road, Mitiamo	roadside (Shire of Loddon)	large numbers at 3 nearby sites	
Serpentine-Echuca Road, Mitiamo	roadside (Shire of Loddon)	extensive site population	
Hunter	rail reserve	good numbers in longest-monitored stand with some previous and on- going recovery actions	
Echuca aerodrome	Shire of Echuca	good numbers in 3 stands, location of previous recovery actions; one stand under threat	
Patho South	private land: Trust for Nature	with largest recorded site population	
Korong Vale	private land: Trust for Nature	large site population in south-west	
Torrumbarry	private land	large site population	
West population, Patho	private land	large site populations	
West population, Pine Grove	private land	large site population	
East population, Pine Grove	private land	large site population	
Angus/Terricks-Gunbower Road	private land	large site population	

Current threats include ongoing loss of habitat through land use change, weed invasion and climate change, and are detailed below. Not all threats affect all populations, or act continuously, and some may only act seasonally or under particular climatic or socio-economic conditions. Threats are discussed in further detail below:

<u>Weed invasion</u>: Competition from introduced pasture grasses and weeds, especially the canarygrasses *Phalaris* species is a major threat for some populations. Heavy grass swards may reduce population numbers by inhibiting the resprouting of adult plants and preventing seedling recruitment.

<u>Grazing</u>: Many populations of Red Swainson-pea occur on private land used for agriculture, and grazing is probably still a threat over much of its range. Roadside populations are also at risk from grazing, especially as many roadsides have been grazed during the extensive drought that has affected much of the range of the Red Swainson-pea. Grazing is likely to be most deleterious to the species during active growth, flowering or fruiting. However, light grazing during non-sensitive times may be beneficial by reducing competition, especially dense grass swards.

<u>Habitat degradation/destruction</u>: Much of the range of the Red Swainson-pea has been converted to agricultural use, and a considerable amount of habitat has been lost already. The northern-most populations at Warren NSW are subject to ongoing clearing. The site of at least one population on private land in Victoria (Pine Grove) has recently been converted from grazing to cropping, and it is uncertain if the species still persists there. The Echuca Aerodrome population may be threatened by a proposed runway extension. All roadside populations are at risk from road maintenance activities and from fire and weed control measures such as ploughing and herbicide application.

<u>Inappropriate fire regimes</u>: Too frequent fires or fires at the wrong time, while the plant is in active growth, may pose a threat. However, periodic fires may be beneficial by reducing competition from grasses by preventing thick swards developing.

Salinity: Increasing soil salinity is a minor but increasing threat in some areas.

<u>Climate change</u>: Virtually all of the range of the Red Swainson-pea is likely to be affected by climate change, through increased temperatures, increased evaporation rates and decreased rainfall expected to affect south-eastern Australia with global warming. This will lead to further loss of habitat, as the seasonally wet sites favoured by the species gradually dry out. This is likely to reduce opportunities for growth, flowering, seed set and especially recruitment, which will lead to long-term population declines and local extinctions. Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases is listed as a Key Threatening Process under the EPBC Act.

Recovery Information

Current Conservation Actions

Several initiatives to conserve the Red Swainson-pea are already occurring, including:

- Two private properties at Patho South and Korong Vale with threatened native grassland communities present, including significant populations of Red Swainson-pea, have been purchased by Trust for Nature and are being managed for conservation of the native grassland communities.
- On-going annual monitoring of several populations.
- Fencing and signposting of one private property and several significant roadside populations.
- Establishment of two ex-situ populations for research and seed bank development.

Strategy for Recovery

The strategy for recovery of the Red Swainson-pea is to establish a network of protected populations across the range of the species, such that the full range of genetic variation is preserved, there are no further declines, its status of Vulnerable does not worsen, and conservation management actions eventually lead to an increase in the number and extent of populations. As many populations occur on private land, incentives and other mechanisms will be used to encourage voluntary conservation... Actions to be implemented under this plan include surveys that will identify areas of critical and potential habitat vital to the long-term survival of the species. These surveys will target the areas where Red Swainson-pea was previously known to occur, and areas that may support potentially

suitable habitat. Further investigation into reproductive strategies, fecundity and recruitment levels, including identification of pollinators is also needed. As populations of this species are known to fluctuate considerably in response to seasonal conditions, drawing conclusions about the success of recovery actions may take up to a decade or more, depending on the frequency of favourable seasons.

Recovery Objectives

The **Overall Objective** of recovery is to minimise the probability of extinction of the Red Swainsonpea 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, the **Specific Objectives** of recovery for Red Swainson-pea are to:

- 1. Determine distribution, abundance and population structure
- 2. Identify habitat requirements
- 3. Ensure that all populations and their habitat are protected and managed appropriately
- 4. Manage threats to populations
- 5. Identify key biological characteristics
- 6. Determine life history and viability of populations
- 7. Maintain ex situ collections
- 8. Build community support for its conservation

Program Implementation and Evaluation

This Recovery Plan guides recovery actions for the Red Swainson-pea and will be implemented and managed by the Department of Sustainability and Environment (in Vic) and the Department of Environment, Climate Change and Water (in NSW), 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 recovery of the Red Swainson-pea. The Recovery Plan will run for five years from the date of its adoption under the EPBC Act, and will be reviewed and revised within five years of the date of its adoption.

Recovery Objectives, Actions and Performance Criteria

No.	Action		Performance Criteria							
Specific	Specific Objective 1: Determine distribution, abundance and population structure									
1.1	Determine the extent and number of plants in all populations believed to support more than 500 plants, to enable an accurate population status assessment to be undertaken.	•	Surveys of populations determine area occupied/number of plants.							
	Responsibility: DSE/DECCW									
1.2	Acquire baseline population data for the Warren, Willandra and Bangerang (NSW) populations.	•	Surveys of populations determine area occupied/number of plants.							
	Responsibility: DECCW									
1.3	Map existing and new populations.	٠	Population maps prepared and used in conservation							
	Responsibility: DSE		management.							
Specific	: Objective 2: Identify habitat requirements									
2.1	Survey known habitat and collect floristic and environmental information describing community ecology and condition.	•	Habitat critical for survival identified and defined.							
	Responsibility: DSE/DECCW									
2.2	Identify and survey potential habitat, particularly near outlying populations at Warren, Willandra National Park and Bangerang (NSW), using ecological and bioclimatic information indicating habitat preference.	•	Predictive model for potential habitat developed and tested.							
	Responsibility: DSE/DECCW									
2.3	Map areas of important and potentially suitable habitat.	٠	Habitat critical for survival and potential habitat mapped.							
	Responsibility: DSE/DECCW									
Specific	c Objective 3: Ensure that all populations and their habitat are protected and manag	ged a	ppropriately							
3.1	Incorporate protective actions in relevant park or reserve management plans.	•	Actions to protect species incorporated in relevant management							
	Responsibility: DSE/PV/DECCW		plans.							
3.2	Incorporate actions to protect the species into local government documents and procedures.	•	Actions to protect species incorporated into current local government documents and procedures.							
	Responsibility: DSE/DECCW									
3.3	Negotiate Public Authority Management Agreements under the <i>FFG Act</i> 1988 for populations at Echuca aerodrome and on roadsides within the Shire of Loddon (Vic).	•	Important populations on public land have effective statutory protection.							

	Responsibility: DSE/DECCW		
3.4	Negotiate joint management agreements for Travelling Stock Reserves, particularly in relation to those near Jerilderie on the Newell Highway, South Coree Road, Urana Road, Old Urana Road and west of the Jerilderie Aerodrome (NSW).	•	Important populations on public land have effective statutory protection.
	Responsibility: DSE/DECCW		
3.5	Negotiate land management agreements, including Conservation Covenants, with private landowners for populations at Patho, Pine Grove and Torrumbarry (Vic).	•	Effective ongoing protection for important populations on private land.
	Responsibility: DSE		
3.6	Encourage participation in voluntary conservation agreements or other incentive schemes using provisions within NSW State legislation for the population at Warren and the large populations on private land near Jerilderie.	•	Effective ongoing protection for important populations on private land.
	Responsibility: DECCW		
Specif	ic Objective 4: Manage threats to populations		
4.1	Identify current and potential threats to the species and its habitat.	٠	Prescriptions prepared for threat abatement.
	Responsibility: DSE/DECCW		
4.2	Control threats from pest plants using spot spraying in and around roadside stands and other sites.	•	A measurable reduction in the impact of weeds on all sites; Swainsona population sizes maintained (or increased) and
	Responsibility: DSE/PV/DECCW/LGA		increased seed production at treated sites.
4.3	Install protective measures such as fencing and signposting at significant roadside populations in Vic and NSW.	•	Number of populations protected.
	Responsibility: DSE/DECCW/LGA		
4.4	Identify appropriate disturbance regimes (including targeted grazing and burning) to maintain habitat and promote population maintenance or increase.	•	Preparation of management prescriptions for grazing at five high priority private property sites plus Terrick Terrick NP, Patho FFR
	Responsibility: DSE/PV/TfN/DECCW		(Vic) and Jerilderie NR (NSW).
		•	Ecological burning trials established and monitored at three sites.
Specif	ic Objective 5: Identify key biological characteristics		
5.1	Evaluate current reproductive and regenerative status, including seed bank status of each population and determine longevity, fecundity and recruitment levels.	•	Seed bank/regenerative potential quantified for each population.
	Responsibility: DSE/DECCW		
5.2	Determine seed germination requirements.	٠	Stimuli for recruitment/regeneration identified.
	Responsibility: RBG		

5.3	Investigate impacts of soil disturbance, fire, salinity and soil moisture on flowering, seed set and recruitment.	•	Management strategies identified to maintain, enhance or restore processes fundamental to reproduction and survival.
	Responsibility: DSE/DECCW		
Specifi	c Objective 6: Determine life history, population trends and viability of populations		
6.1	Develop population monitoring protocols.	•	Techniques for monitoring developed and implemented.
	Responsibility: DSE/DECCW		
6.2	Monitor population trends and responses against recovery actions at the Terrick Terrick NP, Glasson's and Hunter Rail Reserve populations (Vic) and the Newell Highway and Jerilderie NR and Aerodrome populations (NSW).	•	Annual census data collected, population growth rates determined and Population Viability Analysis completed.
	Responsibility: DSE/DECCW		
6.3	Using census data and experimental growth studies, investigate the impact of predicted decrease in winter rainfall on populations.	•	Impact of climate change predicted and adaptive measures taken (e.g. new population(s) established to east of current distribution in bigher rainfall areas)
	Responsibility: DSE/DECCW		
Specifi	c Objective 7: Maintain <i>ex situ</i> collections		
7.1	Maintain ex situ collections for display, research and to safeguard against loss.	٠	At least 100 mature genetically distinct plants from a range of
	Responsibility: RBG		populations in cultivation.
7.2	Collect and store reproductive material.	•	Seed from 10 populations in long-term storage.
	Responsibility: RBG/DSE/DECCW		
Specifi	c Objective 8: Build community support for its conservation		
8.1	Identify opportunities for community involvement in the recovery plan and implement them.	•	Presentation(s) to community nature conservation groups undertaken.
	Responsibility: DSE/DECCW	٠	Private landholders informed of fencing incentives provided by
		٠	Local shires educated, including contractors of roadside work.

Abbreviations: DECC – Department of Environment, Climate Change and Water (NSW); DSE – Department of Sustainability and Environment (Vic); LGA – Local Government Authority; PV – Parks Victoria; RBG – Royal Botanic Gardens, Melbourne; TfN – Trust for Nature

Affected interests

Organisations with an interest in the conservation of the Red Swainson-pea include state environment agencies, local government and private landowners:

- Department of Sustainability and Environment (Vic)
- Parks Victoria
- North Central Catchment Management Authority
- Shire of Loddon (Vic)
- Shire of Echuca (Vic)
- Trust for Nature (Vic)
- Department of Environment ,Climate Change and Water (NSW)
- Livestock Health and Pest Authority (travelling Stock Routes)
- Shire of Jerilderie (NSW)
- Private landowners in Vic & NSW

Role and Interests of Indigenous People

Indigenous communities on whose traditional lands the Red Swainson-pea occurs are being advised, through the relevant regional Indigenous facilitator, of this Recovery Plan. Indigenous communities will be invited to be involved in the implementation of the Recovery Plan.

Biodiversity Benefits

This Recovery Plan includes a number of actions with potential benefits for other species and vegetation communities in south-eastern Australia, these will principally occur 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 Red Swainson-pea, particularly those species with similar life forms and/or ecological requirements. A number of threatened plants co-occur with Red Swainson-pea, including *Diuris protena*, *Maireana cheelii*, *Pimelea spinescens*, *Sclerolaena napiformis*, *Pterostylis* sp. aff. *basaltica*, *Swainsona murrayana*, *Leptorhynchos scaber*, *Prasophyllum* sp. aff. *suaveolens* (Hunter) and *Cullen parvum*. Lowland Temperate Grassland/Riverina Plains Grassland is recognised as a threatened community in Victoria, and is likely to be threatened in NSW. The community is currently proposed for listing as threatened under the *Environment Protection and Biodiversity Conservation Act* 1999. The Recovery Plan will also provide an important public education focus, 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 invasion and habitat degradation.

Social and Economic Impacts

The implementation of this Recovery Plan is unlikely to cause significant adverse social and economic impacts. Several important populations of Red Swainson-pea in both Victoria and New South Wales occur on public land already managed for nature conservation. Populations on roadsides will be increasingly protected through agreements with Local Government, and erection of signs and fencing where required. A significant number of Red Swainson-pea populations occur on private land and adjacent roadsides periodically used for stock movement and supplementary grazing. The relatively small areas requiring protection will have negligible impact on other uses such as stock movement through these sites. Many populations occur on private land, where potential social and economic impacts are likely to be of most concern. Two important populations occur on land owned by 'Trust for Nature', and are already being managed for protection. Protection of other sites on private land will be achieved through voluntary conservation agreements with landowners, and targeted funding incentives will be used to defray landowner costs for protection measures on private land. Issues such as change in land use and potential expansion of airfields may impact on Red Swainson-pea, and other measures such as offsets will need to be assessed.

Management Practices

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, and inappropriate fire regimes. A range of strategies will be necessary to alleviate these threats including protective fencing, signage, weed control, and fire management. 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 Red Swainson-pea and associated flora, and its response to environmental processes. Demographic censusing will be necessary to gather life history information and to monitor the success of particular management actions. In addition, *ex situ* conservation measures will be a useful adjunct and will include seed storage and plant cultivation. Community participation in recovery actions will be sought, particularly in regard to recovery team membership and implementation of on-ground works.

Management practices required for conservation of the Red Swainson-pea include:

- Control of pest plants.
- Identification and protection of populations in instruments such as public land management plans and planning overlays under local government procedures.
- Investigation of the biology and ecology of the species to enable better targeted conservation management actions.

Acknowledgments

We thank the following people for their contributions to this Recovery Plan: Deanna Marshall (Department of Sustainability and Environment, Victoria); Mark Tscharke (Parks Victoria); Tym Barlow (Ecology Australia Pty Ltd) and Dr R.F. Parsons and Mr Neville Scarlett (La Trobe University, Bundoora).

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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 and abundance									
1.1	Determine extent & abundance	1	100%	DSE/DECCW	\$10,000	\$10,000	\$0	\$0	\$0	\$20,000
1.2	Baseline data NSW populations	1	100%	DECCW	\$7,500	\$7,500	\$0	\$0	\$0	\$15,000
1.3	Map populations	1	100%	DSE/DECCW	\$0	\$0	\$5,000	\$0	\$0	\$5,000
2	Habitat requirements									
2.1	Survey known habitat	1	100%	DSE	\$5,000	\$5,000	\$0	\$0	\$0	\$10,000
2.2	Identify, survey potential habitat	2	75%	DSE	\$0	\$5,000	\$5,000	\$5,000	\$0	\$15,000
2.3	Map habitat	1	100%	DSE	\$0	\$0	\$3,000	\$3,000	\$0	\$6,000
3	Habitat protection									
3.1	Public land management plans	1	100%	DSE	\$2,000	\$0	\$0	\$0	\$2,000	\$4,000
3.2	Local govt plans, overlays	1	100%	DSE/DECCW/LGA	\$2,000	\$0	\$0	\$0	\$2,000	\$4,000
3.3	PAMAs (Vic)	1	100%	DSE/LGA	\$0	\$8,000	\$0	\$0	\$0	\$8,000
3.4	Stock reserve protection NSW	1	100%	DECCW	\$0	\$8,000	\$0	\$0	\$0	\$8,000
3.5	Private land agreements Vic	1	100%	DSE	\$0	\$8,000	\$0	\$0	\$0	\$8,000
3.6	Private land agreements NSW	1	100%	DECCW	\$0	\$8,000	\$0	\$0	\$0	\$8,000
4	Threat management									
4.1	Identify current, potential threats	1	100%	DSE/PV/	\$3,000	\$3,000	\$0	\$0	\$0	\$6,000
				DECCW						
4.2	Control weeds	1	100%	PV/DECCW/LGA	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$25,000
4.3	Install signs, fences	1	100%	DSE/DECCW/LGA	\$3,000	\$3,000	\$2,000	\$2,000	\$2,000	\$12,000
4.4	Develop disturbance regime	2	75%	DSE/DECCW/TfN	\$0	\$30,000	\$0	\$0	\$0	\$25,000
5	Biology & ecology									
5.1	Determine longevity, viability	2	75%	DSE	\$5,000	\$5,000	\$3,000	\$0	\$0	\$13,000
5.2	Determine seed germination	2	75%	RBG	\$5,000	\$5,000	\$0	\$0	\$0	\$10,000
5.3	Investigate disturbance impact	2	75%	DSE	\$0	\$0	\$10,000	\$10,000	\$5,000	\$25,000
6	Life History, pop. viability									
6.1	Develop monitoring protocols	1	100%	DSE	\$2,000	\$0	\$0	\$0	\$0	\$2,000
6.2	Monitor population trends	1	100%	DSE	\$3,000	\$3,000	\$6,000	\$6,000	\$8,000	\$26,000
6.3	Model climate change impact	3	75%	DSE, DECCW	\$0	\$0	\$10,000	\$10,000	\$10,000	\$30,000
7	Ex situ Cultivation									
7.1	Maintain ex-situ collections	2	100%	RBG	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$5,000
7.2	Collect, store reprod. material	2	100%	DSE/DECCW/RBG	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$5,000
8	Community support									
8.1	Community extension	1	100%	DSE/DECCW	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$20,000
				TOTALS	\$58,500	\$119,500	\$55,000	\$47,000	\$40,000	\$315,000

Appendix 1. Population and location information for Red Swainson-pea

Abundance (ap number of plant	proximate is)	Extent of Population	IBRA Bioregion	Locality		
Most recent known abundance	Maximum recorded abundance	(ha)		Site Name	Latitude; Longitude	
Victorian Popul	ations					
20,000		unknown	Riverina	Angus/Terricks-Gunbower Road	36.01.40; 144.23.43	
102,250		29.0	Riverina	West pop., Patho South	36.08.55; 144.25.37	
6,280		0.4	Riverina	East pop., Patho South	36.09.04; 144.26.22	
12,290		30.0	Riverina	West pop., Patho	36.04.58; 144.26.08	
8,600+		3.5	Riverina	North pop., Patho	36.05.24; 144.27.11	
7,800		0.24	Riverina	Serpentine-Echuca Road, Pine Grove	36.08.43; 144.21.41	
7,720+		3.14	Riverina	Torrumbarry	36.02.01; 144.27.54	
3,700		9.2	Riverina	Pine Grove 1	36.09.40; 144.22.55	
2,300		3.2	Riverina	West pop., Pine Grove	36.15.22; 144.24.24	
1,250		5.0	Riverina	East pop., Pine Grove	36.15.20; 144.25.16	
1,000+		3.0	Riverina	North 1 pop., Pine Grove	36.12.10; 144.26.33	
1,000+		5.0	Riverina	North 2 pop., Pine Grove	36.12.54; 144.24.51	
2,365		unknown	Riverina	Echuca Aerodrome site 1	36.09.31; 144.45.37	
2,100+		unknown	Riverina	Echuca Aerodrome site 2	36.09.05; 144.45.41	
640+		unknown	Riverina	Echuca Aerodrome site 3	36.09.29; 144.45.52	
2,138		0.5	Riverina	Hunter Rail Reserve	36.26.37; 144.30.28	
1,489		1.3	Riverina	Patho Flora and Fauna Reserve	36.06.45; 144.28.01	
1,000+		0.18	Riverina	Elmore-Mitiamo Road/Coutts Road 1, Mitiamo	36.14.29; 144.15.20	
1,000		0.25	Riverina	Wharparilla	36.09.28; 144.40.16	
780		2.0	Riverina	Elmore-Mitiamo Road/Coutts Road 2, Mitiamo	36.14.51; 144.15.44	
566		1.0	Riverina	West pop., Pine Grove	36.12.45; 144.25.48	
500+		unknown	Riverina	Central pop., Pine Grove	36.13.18; 144.26.20	
500+		unknown	Riverina	Korong Vale	36.19.17; 143.51.10	
450		0.12	Riverina	Mitiamo Rail Reserve	36.12.03; 144.13.11	
420		0.16	Riverina	Elmore-Mitiamo Road, Mitiamo	36.14.14; 144.15.01	
270		0.03	Riverina	Elmore-Mitiamo Road, Prairie	36.18.00; 144.18.54	
270	1,000+ (1991)	14	Riverina	Serpentine-Echuca Road, Mitiamo	36.13.41; 144.14.18	
150		0.15	Riverina	Mitiamo-Kerang Road, Mitiamo	36.12.32; 144.13.33	
175		3.0	Riverina	Terrick Terrick NP, Mitiamo	36.05.37; 144.15.48	
28		0.07	Riverina	Dingee-Rochester Road, Kamarooka North	36.22.20; 144.23.20	

Abundance (ap number of plan	proximate ts)	Extent of Population	IBRA Bioregion	Locality		
Most recent known abundance	Maximum recorded abundance	(ha)		Site Name	Latitude; Longitude	
25+		0.34	Riverina	Diggora West	36.26.03; 144.30.28	
25		1.0	Riverina	East Creek, Mitiamo	36.10.18; 144.17.40	
25		1.0	Riverina	Black Box site, Pine Grove	36.12.51; 144.25.01	
10		0.05	Riverina	Echuca-Serpentine Road, Mitiamo	36.13.10; 144.15.08	
10		0.02	Riverina	Orchard Road, Tennyson	36.16.29; 144.24.50	
1+		0.15	Riverina	Mitiamo-Kerang Road, Pyramid Hill	36.05.42; 144.06.40	
1+		unknown	Riverina	Dingee North	36.19.35; 144.14.22	
1+	16 (1980)	0.01	Riverina	Wharparilla Flora and Fauna Reserve	36.07.16; 144.42.58	
1+		0.01	Murray Darling Depression	north-west of Bangerang	36.10.05; 142.31.33	
?	1000+ (1989)	126	Riverina	Site 1, Mitiamo	36.13.00; 144.15.00	
?	100 (1991)	10	Riverina	Echuca-Toolamba Railway Stock Route	36.10.00; 144.48.00	
?	40 (1991)	0.04	Riverina	Bayliss Road, Dingee	36.19.53; 144.15.22	
?	30 (1991)	unknown	Riverina	Irving Road, Corop North	36.24.00; 144.52.00	
?	11+ (1991)	?destroyed	Riverina	Fiery Flat	36.22.55; 143.51.26	
?	3 (1986)	unknown	Riverina	Whites Pit Road, Pompapiel	36.20.06; 144.01.51	
?	1+ (1991)	unknown	Riverina	near Campaspe River, Echuca South	36.08.36; 144.43.38	
?	1+ (1989)	unknown	Riverina	Dingee to Mitiamo road, c. 3 km N of Prairie	36.16.00; 144.13.00	
0 (1991)	129 (1980)	6.3	Riverina	north-west of Prairie	36.16.13; 144.11.41	
0 (1991)	100 (1980)	destroyed	Riverina	Dingee-Rochester Road A	36.22.21; 144.24.30	
0 (1991)	35 (1980)	0.02	Riverina	Tang Tang Swamp	36.22.18; 144.17.21	
0 (1991)	30 (1980)	0.5	Riverina	Two Tree Road, Corop	36.31.39; 144.51.28	
0 (1991)	3 (1980)	0.004	Riverina	Pine Grove Cemetery	36.13.32; 144.27.16	
0	1+ (1991)	cropped	Riverina	North-east pop., Patho	36.04.34; 144.27.07	
0	1+ (1991)	unknown	Riverina	Echuca Rail Reserve	36.09.18; 144.45.17	
0	1+ (1980)	unknown	Riverina	'Hunter	36.27.00; 144.31.00	
0	1+ (1962)	unknown	Riverina	Dingee North	36.20.00; 144.14.00	
0	1+ (1963)	unknown	Riverina	Dingee	36.22.00; 144.14.00	
0	1+ (1992)	unknown	Riverina	north-east of Elmore-Mitiamo Road, Mitiamo	36.13.10; 144.14.22	
0	1+ (1992)	cropped	Riverina	Dullard Road, Pine Grove North	36.08.58; 144.28.41	

Abundance (app number of plant	proximate	Extent of Population	IBRA Bioregion	Locality		
Most recent known abundance	Maximum recorded abundance	(ha)		Site Name	Latitude; Longitude	
NSW Population	าร	-				
24,000		68	Riverina	Travelling Stock Route along Newell Highway, Jerilderie	35.38; 145.71	
1,000	20,000+	60	Riverina	Jerilderie Nature Reserve, South Coree Road, Jerilderie	35.36; 145.71	
7,000		35	Riverina	Adjacent to Newell Highway, Jerilderie	35.37; 145.71	
6,500		46	Riverina	Urana Road, 21 km W of Urana	35.29; 146.08	
3,000		24.5	Riverina	Travelling Stock Route, west of Jerilderie Aerodrome	35.22.00; 145.43.00	
2,500		30	Riverina	Adjacent to South Coree Road, Jerilderie	35.36; 145.70	
2,000+		85	Riverina	Yathong North	35.18.30; 145.54.00	
1,835		6	Riverina	Stock Route, Old Urana Road	35.18.00; 145.53.00	
1,500		25	Riverina	Crown Reserve, Innes Bridge Road, Jerilderie	35.33; 145.97	
600		7.5	Riverina	0-2km S of substation on South Coree Road, Jerilderie	35.36; 145.68	
600		5.5	Riverina	5-6.5km S of substation on South Coree Road, Jerilderie	35.36; 145.65	
500		unknown	Riverina	Jerilderie	35.36; 145.78	
340		unknown	Riverina	South-eastern corner of Jerilderie Aerodrome	35.23.00; 145.43.00	
100+		1.1	Riverina	Elliott Lane, Jerilderie	35.35; 145.92	
100		unknown	Darling Riverine Plains	Site 1, 35km NW of Warren	31.34; 147.54	
5		unknown	Darling Riverine Plains	Site 2, 35km NW of Warren	31.23; 147.46	
1+		unknown	Riverina	Urana-Jerilderie road	35.17.00; 146.05.00	
1+		unknown	Riverina	9.4km E of Colombo Creek bridge, west of Urana	35.28; 146.06	
1+		unknown	Riverina	5km NW along Coonong Siding Road from Morundah Road	35.18; 146.22	
1		0.001	Riverina	Urana Road	35.28; 146.02	
1		0.01	Riverina	Urana Road, 30 km W of Urana RSL	35.28; 145.98	
1		unknown	Riverina	Boorooban Paddock, Willandra National Park	33.18; 144.07	
0 (1991)	2 (1984)	0.01	Riverina	Conargo Road, 15.4km W of Jerilderie PO	35.35; 145.58	