



Department of  
Parks and Wildlife



Interim Recovery Plan No. **376**

## *Stylidium wilroyense*

**Interim Recovery Plan**  
**2017–2022**



**Department of Parks and Wildlife, Western Australia**

March 2017

## List of Acronyms

The following acronyms are used in this plan:

BGPA	Botanic Gardens and Parks Authority
CFF	Conservation of Flora and Fauna
CITES	Convention on International Trade in Endangered Species
CR	Critically Endangered
CPC	Conservation and Parks Commission
DAA	Department of Aboriginal Affairs
DPaW	Department of Parks and Wildlife
DRF	Declared Rare Flora
EPBC	Environment Protection and Biodiversity Conservation
GDTCRT	Geraldton District Threatened Flora and Communities Recovery Team
GPS	Global Positioning System
IBRA	Interim Biogeographic Regionalisation for Australia
IRP	Interim Recovery Plan
IUCN	International Union for Conservation of Nature
NRM	Natural Resource Management
PICA	Public Information and Corporate Affairs
SCB	Species and Communities Branch
TFSC	Threatened Flora Seed Centre
TPFL	Threatened and Priority Flora Database
UCL	Unallocated Crown Land
UNEP-WCMC	United Nations Environment Program World Conservation Monitoring Centre
WA	Western Australia

# Foreword

Interim Recovery Plans (IRPs) are developed within the framework laid down in Department of Parks and Wildlife Corporate Policy Statement No. 35 (DPaW 2015a) and Department of Parks and Wildlife Corporate Guideline No. 35 (DPaW 2015b). Plans outline the recovery actions that are required to urgently address those threatening processes most affecting the ongoing survival of threatened taxa or ecological communities, and begin the recovery process.

Parks and Wildlife are committed to ensuring that threatened flora (also known as Declared Rare Flora (DRF)) are conserved through the preparation and implementation of Recovery Plans (RPs) or IRPs, and by ensuring that conservation action commences as soon as possible and, in the case of Critically Endangered (CR) flora, always within one year of endorsement of that rank by the Minister.

This plan will operate from March 2017 to February 2022 but will remain in force until withdrawn or replaced. It is intended that, if *Stylidium wilroyense* is still listed as Threatened Flora in Western Australia following five years of implementation, this plan will be reviewed and the need for further recovery actions assessed.

This plan was given regional approval on 20 February 2017 and was approved by the Director of Science and Conservation on 22 March 2017. The provision of funds identified in this plan is dependent on budgetary and other constraints affecting the Department of Parks and Wildlife, as well as the need to address other priorities.

Information in this plan was accurate at March 2017.

**Plan preparation.** This plan was prepared by:

Robyn Luu	Project Officer, Department of Parks and Wildlife Species and Communities Branch, Locked Bag 104, Bentley Delivery Centre, Western Australia 6983.
Juliet Wege	Senior Research Scientist, Western Australian Herbarium, Department of Parks and Wildlife, Locked Bag 104, Bentley Delivery Centre, Western Australia 6983.
Andrew Brown	Threatened Flora Coordinator, Parks and Wildlife Species and Communities Branch, Locked Bag 104, Bentley Delivery Centre, Western Australia 6983.

**Acknowledgments.** The following people provided assistance and advice in the preparation of this plan:

Alanna Chant	Flora Conservation Officer, Department of Parks and Wildlife Geraldton District
Andrew Crawford	Principal Technical Officer, Threatened Flora Seed Centre, Department of Parks and Wildlife Science and Conservation Division
Anthony Desmond	Regional Leader Nature Conservation, Department of Parks and Wildlife Geraldton District
Fred and Jean Hort	Department of Parks and Wildlife volunteers
Amanda Shade	Assistant Curator (Nursery), Botanic Gardens and Parks Authority

Thanks also to the staff of the Western Australian Herbarium for providing access to Herbarium databases and specimen information, and other Parks and Wildlife staff for assistance in developing this plan.

Cover photograph by Jean and Fred Hort.

**Citation.** This plan should be cited as: Department of Parks and Wildlife (2017) *Stylidium wilroyense* Interim Recovery Plan 2017–2022. Interim Recovery Plan No. 376. Department of Parks and Wildlife, Western Australia.

# Summary

<b>Scientific name:</b>	<i>Stylidium wilroyense</i>	<b>NRM region:</b>	Northern Agricultural
<b>Family:</b>	Stylidiaceae	<b>IBRA regions:</b>	Avon Wheatbelt, Yalgoo, Geraldton Sandplains
<b>Common name:</b>	Wilroy Triggerplant (proposed)	<b>IBRA subregions:</b>	Avon Wheatbelt P1, Edel YAL01, Geraldton Hills GES01
<b>Flowering period:</b>	September – October	<b>Recovery team:</b>	Geraldton District Threatened Flora and Communities Recovery Team
<b>DPaW region:</b>	Midwest		
<b>DPaW district:</b>	Geraldton		
<b>Shires:</b>	Northampton, Greater Geraldton, Chapman Valley		

**Distribution and habitat:** *Stylidium wilroyense* is currently known from three extant locations over 155 kilometre range near Coolcalalaya, north-northeast of Yuna and south of Mullewa. At Wilroy the species grows in clayey-sand over laterite in *Acacia* shrubland, and at Coolcalalaya and Yuna it grows in yellow sand in dense *Banksia ashbyii* and *Eucalyptus* scrub or in open *Banksia sceptrum* and *Callitris arenaria* woodland (Chant 2012; Western Australian Herbarium 1998–).

**Habitat critical to the survival of the species, and important populations:** It is considered that all known habitat for natural populations is critical to the survival of *Stylidium wilroyense* and that natural populations are important populations. Habitat critical to the survival of the species includes the area of occupancy of populations and areas of similar habitat surrounding and linking populations (these providing potential habitat for population expansion and for pollinators). It may also include additional occurrences of similar habitat that may contain undiscovered populations of the species or be suitable for future translocations and the local catchment for the surface and/or groundwater that maintains the habitat of the species.

**Conservation status:** *Stylidium wilroyense* was listed as specially protected under the Western Australian *Wildlife Conservation Act 1950* on 6 November 2012. It is ranked as Critically Endangered (CR) in Western Australia under International Union for Conservation of Nature (IUCN) 2001 criteria C2a(i) due to a continuing decline in the numbers of mature individuals, and no population estimated to contain more than 50 mature individuals. Note: one population is now known to contain 79 mature individuals. The species is not listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

**Threats:** The main threats to *Stylidium wilroyense* are road and rail maintenance, altered fire regimes, grazing, poor recruitment, weeds, drought, infrastructure construction and maintenance and small population size.

**Existing recovery actions:** The following recovery actions have been or are currently being implemented and have been considered in the preparation of this plan:

1. Parks and Wildlife with the assistance of the Geraldton District Threatened Flora and Communities Recovery Team is overseeing the implementation of recovery actions for *Stylidium wilroyense*.
2. Land managers have been notified of the location and threatened status of the species.
3. Declared Rare Flora markers have been installed at Subpopulation 1b.
4. Control burns were undertaken at Population 5 in 2003 (for fire protection) and Subpopulation 1c in May 2015. Another control burn of three senescent plants at Population 4 is planned for Autumn 2017.
5. The species has been opportunistically surveyed for in areas of suitable habitat.
6. Approximately 45,000 seeds are stored in the Threatened Flora Seed Centre at –18°C. These have yet to be tested for viability.
7. Monitoring of the species has been carried out opportunistically with plant numbers and current threats recorded. Global Positioning System (GPS) locations of plants within the population have been recorded in Geographic Information System databases at Geraldton District, and at Species and Communities Branch.

**Plan objective:** The objective of this plan is to abate identified threats and maintain or enhance extant populations to ensure the long-term conservation of the species in the wild.

**Recovery criteria**

Recovery will be considered successful if one or more of the following take place over the term of the plan.

- There is no reduction in the extent of occurrence and the number of mature plants within known populations has remained within a 10% range or has increased by >10% from 178 to 195 or more or
- New populations have been found, increasing the number of known populations from six to seven or more, with no net loss of mature plants or
- The area of occupancy has increased by >10%, with no net loss of mature plants.

Recovery will be considered unsuccessful if one or more of the following take place over the term of the plan.

- Populations have been lost which result in a reduction in the extent of occurrence or
- The number of mature plants has decreased by >10% to 161 or less or
- The area of occupancy has decreased by >10%, with a net loss of mature plants.

**Recovery actions**

1. Coordinate recovery actions
2. Monitor populations
3. Achieve long-term protection of habitat
4. Install DRF markers
5. Undertake regeneration trials
6. Liaise with land managers and Aboriginal communities
7. Protect plants from herbivory
8. Collect and store seed

9. Develop and implement a fire management strategy
10. Obtain biological and ecological information
11. Undertake surveys for new populations
12. Develop and implement a translocation proposal
13. Map habitat critical to the survival of *Stylidium wilroyense*
14. Promote awareness
15. Review this plan and assess the need for further recovery actions

# 1. Background

## History

*Stylidium wilroyense* was first recognised as a distinct species when provided the informal name *S. sp.* Coolcalalaya (A.H. Burbidge) following two collections made in 1995, one by A. Burbidge during a biological survey of vacant Crown land south of Coolcalalaya and the other by D. Coates. However, the earliest known collection was made from the Wilroy area by J. Weber in 1975. A further collection was made from private property northeast of Mingenew in 1992, However, this population is no longer thought to be extant. In 2015 a collection was made by Hazel Dempster during an opportunistic survey of private property north-north-east of Yuna. A full survey in 2016 located more plants in an adjacent nature reserve. The species was described by Lowrie *et al.* in 1998 during a taxonomic revision of the *S. caricifolium* complex.

*Stylidium wilroyense* is currently known from six populations comprising around 178 mature individuals which are senescing, with little to no recruitment observed. A decline in the size of Population 1 (which is partly located on a rail reserve) has been observed, with numbers decreasing from 33 in 1995 to eight in 2016, including two plants removed during a rail upgrade.

## Description

*Stylidium wilroyense* is a basally-tufted, perennial herb 25 to 55cm tall with a contracted, woody stem stock that is partially obscured by dense, woolly hairs. The leaves are narrowly lanceolate to almost linear, 14 to 30cm long, 1.7 to 6.5mm wide, with in rolled margins and a scabrid to virtually glabrous surface. The leaves are subtended by membranous scale-leaves to 5.5cm long. The flowering stalk is densely glandular-hairy and is usually unbranched. The flowers have bright pink corolla lobes that are paired vertically, with the upper pair slightly larger than the lower pair, and the labellum is white with a pink papillose border and two papillose lateral appendages. The throat of the flower is white and bears six appendages (1 on each upper lobe and 2 on each lower lobe). The fruit is an ellipsoid capsule 6 to 12mm long.

*Stylidium wilroyense* is allied to members of the *S. caricifolium* species complex from which it can be distinguished by the following combination of features: a basally-tufted, perennial habit with dense woolly hairs that partially obscure the woody stem stock; mostly unbranched inflorescences and flowers with a pink corolla and conspicuous throat appendages. Despite variation in habitat across its distribution, the species is considered to be taxonomically cohesive.

*Stylidium wilroyense* is named for the type locality near Wilroy in Western Australia's northern Avon Wheatbelt (Lowrie *et al.* 1998).

## Illustrations and/or further information

Lowrie, A., Coates, D.J. and Kenneally, K.F. (1998) A taxonomic review of the *Stylidium caricifolium* complex (Stylidiaceae), from south-west Western Australia. *Nuytsia* 12(1): 43–57; Patrick, S. (2001) Declared Rare and Poorly Known flora in the Geraldton District. Department of Conservation and Land

Management; Western Australian Herbarium (1998–) *FloraBase—the Western Australian Flora*. Department of Parks and Wildlife. <https://florabase.dpaw.wa.gov.au/>.

## Distribution and habitat

*Stylidium wilroyense* is known from three locations over a distance of 155 kilometres north to south – near Coolcalalaya, north-northeast of Yuna and south of Mullewa. A more southerly population northeast of Mingenew is no longer believed extant. Using mining convex polygon, recent calculations estimate the extent of occurrence for known populations to be 251km<sup>2</sup> and the area of occupancy is less than 1km<sup>2</sup>.

At Wilroy *Stylidium wilroyense* grows in clayey-sand over laterite in *Acacia* shrubland. Associated species include *Stylidium acuminatum*, *Grevillea obliquistigma*, *G. paradoxa*, *Seringia hermanniifolia*, *Melaleuca* sp., *Senna* sp., *Darwinia capitellata* and *Ecdeiocolea monostachya*.

At Coolcalalaya and Yuna the species grows in yellow sand in dense *Banksia ashbyii* and *Eucalyptus* scrub with *Callitris arenaria*, *Allocasuarina campestris* and *Grevillea candelabroides* or in open *Banksia sceptrum* and *Callitris arenaria* woodland with *Homalocalyx chapmanii*, *Pileanthus peduncularis* and *Beaufortia aestiva*.

**Table 1. Summary of population land vesting, purpose and manager**

TPFL population number & location	Parks and Wildlife District	Shire	Vesting	Purpose	Manager
1a. SE of Mullewa	Geraldton	Greater Geraldton	PTA	Rail reserve	Brookfield Rail
1b. SE of Mullewa	Geraldton	Greater Geraldton	LGA	Road reserve	City of Greater Geraldton
1c. SE of Mullewa	Geraldton	Greater Geraldton	CPC	CFF	Parks and Wildlife
1d. SE of Mullewa	Geraldton	Greater Geraldton	CPC	CFF	Parks and Wildlife
2. ESE of Kalbarri	Geraldton	Northampton	LGA	Road reserve	Shire of Northampton
3. ESE of Kalbarri	Geraldton	Northampton	UCL		
4. ESE of Kalbarri	Geraldton	Northampton	UCL		
5. ESE of Kalbarri	Geraldton	Northampton	UCL		
6a. NNE of Yuna	Geraldton	Chapman Valley	Private property	Freehold	Landowners
6b. NNE of Yuna	Geraldton	Chapman Valley	CPC	CFF	Parks and Wildlife

## Biology and ecology

*Stylidium wilroyense* has been recorded flowering in late September and October with fruit set in November and early December. Like many perennial triggerplant species it is unlikely to flower under drought conditions.

Pollination of *Stylidium* flowers is achieved through the use of a sensitive ‘trigger’, which comprises the male and female reproductive organs fused into floral column that snaps forward quickly in response to touch, thereby depositing pollen onto the pollinator, or retrieving pollen if the stigma is developed. Reduction in seed-set after self-pollination (compared to that after cross-pollination) is widespread in the genus due to recessive lethal or incompatibility factors (James 1979; Coates 1982; Burbidge and James 1991). Specific pollinators have not been recorded for *S. wilroyense*, but based on observations of other taxa with similar floral morphologies (i.e. large flowers with a long corolla tube and a long

column), it is likely to be pollinated by native bees or bee-flies with long tongues (e.g. blue banded bees).

A herbarium collection and photographs of robust individuals from a recently burnt habitat at Coolcalalaya in 2004 (PERTH 06909639), together with follow up observations at this site in 2005 by D. Coates, suggest the species may be a resprouter. Resprouting and fire-stimulated flowering have been observed in other species of *Stylidium* with a similarly thickened stem stock that is partially or completely buried. Many species in the genus are disturbance opportunists and a lack of disturbance may contribute to population decline. Population decline through poor recruitment has been observed in the Critically Endangered perennial triggerplant *Stylidium amabile* and disturbance trials using fire and smoke water have been successful at inducing recruitment (Chant and Page 2010).

## Conservation status

*Stylidium wilroyense* was listed as specially protected under the Western Australian *Wildlife Conservation Act 1950* on 6 November 2012. It is ranked as Critically Endangered (CR) in Western Australia under International Union for Conservation of Nature (IUCN) 2001 criteria C2a(i) due to a continuing decline in the numbers of mature individuals, and no population estimated to contain more than 50 mature individuals. Note: one population is now known to contain 79 mature individuals. The species is not listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

## Threats

- **Road and rail maintenance.** Threats include grading, chemical spraying, construction and maintenance of drainage channels and mowing roadside vegetation. Adjacent landowners need to be informed of the location of populations to prevent accidental damage during fence and firebreak maintenance or other activities.
- **Altered fire regimes.** Fire may be needed to stimulate recruitment in *Stylidium wilroyense* from soil-stored seed. However, frequent fire is likely to facilitate weed invasion and should be followed up with appropriate weed control.
- **Grazing.** Grazing by rabbits and kangaroos is a potential threat to Populations 1 and 4. Grazing may also have an impact on the establishment of seedlings thereby limiting natural recruitment.
- **Poor recruitment.** Populations currently comprise mature individuals with no natural recruitment observed. The species may require a disturbance event to recruit but if it is too frequent, occurs at the wrong time of the year or is followed by a drought, populations are likely to be impacted.
- **Weed invasion.** Weeds, which are a potential threat to populations of *Stylidium wilroyense*, suppress early plant growth by competing with the species and associated native vegetation for soil moisture, nutrients and light. They also exacerbate grazing pressure and increase the fire hazard due to high fuel loads.
- **Drought.** Drought may affect plant health, regeneration, and delay surveys for additional populations given that plants are unlikely to flower and therefore be more difficult to detect.
- **Infrastructure construction and maintenance.** New power line work which had the potential to impact on the species during installation and maintenance, was proposed for land in the vicinity of Population 1. This proposal appears to not to be going ahead at present but may in the future.
- **Small population size.** Low genetic diversity could limit the long term viability of the species.



The intent of this plan is to identify actions that will mitigate immediate threats to *Stylidium wilroyense*. Although climate change may have a long-term effect on the species, actions taken directly to prevent its impact are beyond the scope of this plan.

**Table 2. Summary of population information and threats**

TPFL population number & location	Land status	Year/no. mature plants	Condition		Threats
			Plants	Habitat	
<b>1a. SE of Mullewa (Wilroy)</b>	Rail reserve	1995 20–30 2004 10+ 2006 8 2007 6 2011 9 2015 5 2016 5	Healthy	Excellent	Rail maintenance, altered fire regimes, grazing (rabbits), powerline maintenance, poor recruitment, small population size
<b>1b. SE of Mullewa (Wilroy)</b>	Road reserve	1995 3+ 2011 3 2014 2 2015 2 2016 2	Healthy/ moderate	Excellent	Road maintenance, altered fire regimes, grazing (rabbits), powerline maintenance, poor recruitment, small population size
<b>1c. SE of Mullewa (Wilroy)</b>	Nature reserve	1995 3 2011 2 2014 4 2015 2 2016 1	Healthy	Excellent	Poor recruitment, road maintenance, powerline maintenance, small population size
1d. SE of Mullewa (Wilroy)	Nature reserve	2011 1 2014 0 2016 0		Excellent	Poor recruitment, powerline maintenance, small population size
<b>2. ESE of Kalbarri (Coolcalalaya)</b>	Road reserve	2004 3 2011 15 2015 18 2016 17	Healthy	Excellent	Road maintenance, altered fire regimes, poor recruitment, small population size
<b>3. ESE of Kalbarri (Coolcalalaya)</b>	UCL	1990 10+ 2011 20 2015 65 2016 8 (partial survey)	Healthy	Excellent	Altered fire regimes, small population size
<b>4. ESE of Kalbarri (Coolcalalaya)</b>	UCL	1995 2 2011 1 2015 5	Moderate	Excellent	Altered fire regimes, small population size, grazing
<b>5. ESE of Kalbarri (Coolcalalaya)</b>	UCL	2005 20 2009 0 2015 4	Healthy	Excellent	Poor recruitment, altered fire regimes, small population size
<b>6a. NNE of Yuna</b>	Private property	2015 Two clumps			Small population size
<b>6b. NNE of Yuna</b>	Nature reserve	2016 79	Healthy	Excellent	Altered fire regimes, small population size

**Note:** all extant populations are considered to be important populations.

## Guide for decision-makers

Section 1 provides details of current and possible future threats. Actions for development and/or land clearing in the immediate vicinity of *Stylidium wilroyense* may require assessment. Actions that result in any of the following may potentially significantly impact the species:

- Damage or destruction of occupied or potential habitat.

- Alteration of the local surface hydrology or drainage.
- Reduction in population size.
- A major increase in disturbance in the vicinity of a population.

## Habitat critical to the survival of the species, and important populations

*Stylidium wilroyense* is listed as Threatened in Western Australia and it is considered that all known habitat for the wild populations is critical to the survival of the species, and that wild populations are important populations. Habitat critical to the survival of the species includes the area of occupancy of populations and areas of similar habitat surrounding and linking populations (these providing potential habitat for population expansion and for pollinators). It may also include additional occurrences of similar habitat that may contain undiscovered populations of the species or be suitable for future translocations, and the local catchment for the surface and/or groundwater that maintains the habitat of the species.

## Benefits to other species or ecological communities

Recovery actions implemented to improve the quality or security of the habitat of *Stylidium wilroyense* will also benefit the Priority flora listed in the table below:

**Table 3. Conservation-listed flora species occurring within 500m of *Stylidium wilroyense***

Species name	Conservation status (WA)	Conservation status (EPBC Act 1999)
<i>Stylidium pendulum</i>	Priority 1	-
<i>Dasymalla glutinosa</i>	Priority 3	-
<i>Gompholobium cinereum</i>	Priority 3	-
<i>Grevillea candicans</i>	Priority 3	-
<i>Grevillea granulosa</i>	Priority 3	-
<i>Melaleuca barlowii</i>	Priority 3	-
<i>Psammomoya implexa</i>	Priority 3	-

For a description of conservation codes for Western Australian flora and fauna see [https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/Conservation\\_code\\_definitions\\_18092013.pdf](https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/Conservation_code_definitions_18092013.pdf)

## International obligations

This plan is fully consistent with the aims and recommendations of the Convention on Biological Diversity, ratified by Australia in June 1993, and will assist in implementing Australia's responsibilities under that Convention. *Stylidium wilroyense* is not listed under Appendix II in the United Nations Environment Program World Conservation Monitoring Centre (UNEP-WCMC) Convention on International Trade in Endangered Species (CITES), and this plan does not affect Australia's obligations under any other international agreements.

## Aboriginal consultation

A search of the Department of Aboriginal Affairs (DAA) Aboriginal Heritage Sites Register revealed one site of Aboriginal significance adjacent to a population of *Stylidium wilroyense* (site #18907; Irwin River; historical, mythological, camp, natural feature, water source; no gender restrictions). Input and involvement has been sought through the DAA to determine if there are any issues or interests with respect to management for this species. Opportunity for future Aboriginal involvement in the implementation of the plan is included as an action in the plan. Aboriginal involvement in management of land covered by an agreement under the *Conservation and Land Management Act 1984* is also provided for under the joint management arrangements in that Act, and will apply if an agreement is established over any reserved lands on which this species occurs.

## Social and economic impacts

The implementation of this plan may result in some social and economic impacts for the Shires of Northampton and Chapman Valley, the City of Greater Geraldton, Brookfield Rail and private property owners through the implementation of recovery actions (regeneration trials, controlling herbivores and weeds) and restrictions imposed on the management of the land, including maintenance of road and rail infrastructure.

## Affected interests

The implementation of this plan has some implications for the Shires of Northampton and Chapman Valley, the City of Greater Geraldton, Brookfield Rail and private property owners, particularly as some populations occur on lands which are not specifically managed for conservation.

## Evaluation of the plan's performance

Parks and Wildlife, with assistance from the Geraldton District Threatened Flora and Communities Recovery Team (GDTFCRT), will evaluate the performance of this plan following five years of implementation.

# 2. Recovery objective and criteria

### **Plan objective**

The objective of this plan is to abate identified threats and maintain or enhance *in situ* populations to ensure the long-term conservation of the species in the wild.

**Recovery criteria**

Recovery will be considered successful if one or more of the following take place over the term of the plan.

- There is no reduction in the extent of occurrence and the number of mature plants within known populations has remained within a 10% range or has increased by >10% from 178 to 195 or more or
- New populations have been found, increasing the number of known populations from six to seven or more, with no net loss of mature plants or
- The area of occupancy has increased by >10%, with no net loss of mature plants.

Recovery will be considered unsuccessful if one or more of the following take place over the term of the plan.

- Populations have been lost which result in a reduction in the extent of occurrence or
- The number of mature plants has decreased by >10% to 161 or less or
- The area of occupancy has decreased by >10%, with a net loss of mature plants.

## 3. Recovery actions

### Existing recovery actions

Parks and Wildlife, with the assistance of the GDTCRT, is overseeing the implementation of recovery actions for *Stylidium wilroyense*.

Notifications to land owners/managers detail the current Declared Rare Flora (DRF) status of *Stylidium wilroyense* and the associated legal obligations in regards to its protection.

DRF markers have been installed at Subpopulation 1b. Markers aim to reduce the risk of accidental damage during road maintenance activities.

Following a control burn at Population 5 in 2003, 20 seedlings were recorded in 2005. Senescing plants in Subpopulation 1c were burnt in May 2015 in an attempt to stimulate recruitment. However, no new recruits were recorded. A control burn of three senescent plants at Population 4 is planned for 2017.

Surveys for *Stylidium wilroyense* include:

- Surveys in the Wilroy area by Sue Patrick in 1995 with plants located in a nature reserve and rail reserve.
- Survey of roads, firebreaks and old gravel pits in the Wilroy area by Departmental staff in 2004, 2006, 2007 and 2011.
- Survey of the rail corridor between Morawa and Mullewa by Ernie Stead-Richardson for the Brookfield Rail Upgrade Project. One new plant was located. Brookfield Rail also commissioned flora and vegetation surveys in 2010 and 2011 by consultants ENV and Aecom who failed to locate any new plants (Aecom 2011; ENV 2010).
- Surveys of bushland in the Canna area and between Mullewa and Morawa over 20 years by local wildflower expert Paul Offzsanka.
- Surveys of the Pallotine Mission and adjoining private properties between Wilroy and Canna by recently retired amateur naturalist Brother Willem Van Veen.

- Surveys of known locations in the Coolcalalaya area in 2003, 2005 and 2011 by Departmental staff and volunteer Fred Hort.
- Survey of private property by Hazel Dempster in 2015.

Approximately 45,000 *Stylidium wilroyense* seed has been processed and stored in the Threatened Flora Seed Centre (TFSC) at  $-18^{\circ}\text{C}$  (see table 4). The seed has yet to be tested for viability.

**Table 4. TFSC collection details for *Stylidium wilroyense***

Accession number	Date collected	TPFL population number	Number of plants collected (B: Bulk, I:Individual)	No. seed in storage	Estimated germinable seed
04322-1		1 (cultivated Geraldton TAFE)	I/1	96	-
04439-1	12/11/2014	1	I/1, I/1	132	Not yet tested
05780-1	12/11/2015	3	I/49	42,375	Not yet tested
05780-2	12/11/2015	3	B/11	2,960	Not yet tested
05851-1	9/12/2015	2	I/9	Not yet processed	
05852-1	10/12/2015	5	I/3	Not yet processed	

Monitoring has been carried out opportunistically with plant numbers and current threats recorded. Global Positioning System (GPS) locations of plants within populations have been recorded in Geographic Information System databases at Geraldton District and at Species and Communities Branch (SCB).

## Future recovery actions

The following recovery actions are roughly in order of descending priority, influenced by their timing over the term of the plan. However, this should not constrain addressing any recovery action if funding is available and other opportunities arise. Where these recovery actions are implemented on lands other than those managed by Parks and Wildlife, permission has been or will be sought from the appropriate land managers prior to actions being undertaken.

### 1. Coordinate recovery actions

Parks and Wildlife with assistance from the GDTCRT will oversee the implementation of recovery actions for *Stylidium wilroyense* and will include information on progress in annual reports.

<b>Action:</b>	Coordinate recovery actions
<b>Responsibility:</b>	Parks and Wildlife (Geraldton District), with assistance from the GDTCRT
<b>Cost:</b>	\$8,000 per year

## 2. Monitor populations

Monitoring of populations and their habitat should be undertaken to identify trends or potential management requirements. Population monitoring should record the health and expansion or decline in populations, and other observations such as pollinator activity or seed production. Site monitoring should include observations of grazing, habitat degradation including weed invasion, and hydrological status (drought). Specific monitoring of hydrology and activities relating to research into the biology and ecology of *Stylidium wilroyense* are included in other recovery actions detailed below.

<b>Action:</b>	Monitor populations
<b>Responsibility:</b>	Parks and Wildlife (Geraldton District), with assistance from the GDTCFRT
<b>Cost:</b>	\$8,000 per year

## 3. Achieve long-term protection of habitat

Improved security of Unallocated Crown Land (UCL) containing Populations 3, 4, 5 and private property containing Subpopulation 6a will be investigated.

<b>Action:</b>	Achieve long-term protection of habitat
<b>Responsibility:</b>	Parks and Wildlife (Geraldton District, SCB), State Land Services
<b>Cost:</b>	\$4,000 per year

## 4. Install DRF markers

DRF markers are needed at Subpopulation 1c to reduce the risk of accidental damage during road maintenance activities.

<b>Action:</b>	Install DRF markers
<b>Responsibility:</b>	Parks and Wildlife (Geraldton District)
<b>Cost:</b>	\$4,000 in year 1

## 5. Undertake regeneration trials

Habitat disturbance (physical or fire) is known to promote recruitment in many species of *Stylidium* and it is recommended that disturbance trials, such as the one planned at Population 4 for Autumn 2017, be undertaken for *S. wilroyense*. Permanent quadrats will be established to monitor the response of the species.

<b>Action:</b>	Undertake regeneration trials
<b>Responsibility:</b>	Parks and Wildlife (Science and Conservation Division, Geraldton District)
<b>Cost:</b>	\$10,000 per year

## 6. Liaise with land managers and Aboriginal communities

Staff from Parks and Wildlife Geraldton District will liaise with land owners/managers to ensure populations of *Stylidium wilroyense* are not accidentally damaged or destroyed, and the habitat is maintained in a suitable condition for the conservation of the species. Consultation with the Aboriginal community will take place to determine if there are any issues or interests in areas that are habitat for the species and opportunities will be provided for Aboriginal people to be involved in implementing this plan.

<b>Action:</b>	Liaise with land managers and Aboriginal communities
<b>Responsibility:</b>	Parks and Wildlife (Geraldton District)
<b>Cost:</b>	\$4,000 per year

## 7. Protect plants from herbivory

When annual monitoring of *Stylidium wilroyense* ascertains the threat posed by rabbits and kangaroos is high, baiting for rabbits using 1080 oats should be undertaken and ripping or fumigating warrens may also be implemented. Control measures are likely to be required on an ongoing basis. Additional protective measures such as fencing or caging of plants or groups of plants may be required in areas that are heavily grazed.

<b>Action:</b>	Protect plants from herbivory
<b>Responsibility:</b>	Parks and Wildlife (Geraldton District), landowners
<b>Cost:</b>	\$20,000 in year 1; \$8,000 per years 2-5

## 8. Collect and store seed

To guard against the extinction of natural populations of *Stylidium wilroyense* it is recommended that seed be collected and stored at the TFSC. Collections should aim to sample the maximum range of genetic diversity possible by collecting from the widest range of reproductive plants.

<b>Action:</b>	Collect and store seed
<b>Responsibility:</b>	Parks and Wildlife (Geraldton District, TFSC)
<b>Cost:</b>	\$10,000 per year

## 9. Develop and implement a fire management strategy

A fire management strategy will be developed in consultation with land owners/managers, that recommends fire frequency, intensity and seasonality, precautions to prevent bushfire and strategies for reacting to bushfire, and the need, method of construction and maintenance of firebreaks. The risk of fire occurring in the habitat of populations should be minimised, except where it is being used to assist recovery. All data relating to fire response of the species will be entered into the Threatened Priority Flora (TPFL) fire response data base.

<b>Action:</b>	Develop and implement a fire management strategy
<b>Responsibility:</b>	Parks and Wildlife (Geraldton District), landowners
<b>Cost:</b>	\$10,000 in year 1, and \$6,000 in years 2-5

## 10. Obtain biological and ecological information

It is recommended that research on the biology and ecology of *Stylidium wilroyense* include:

1. Identification of pollinators and their habitat requirements.
2. Soil seed bank dynamics.
3. Seed viability.
4. Conditions necessary for natural germination.
5. Response to disturbance, competition, drought, inundation and grazing.
6. Longevity of plants, time taken to reach maturity, and minimum viable population size.
7. The impact of changes in hydrology.

<b>Action:</b>	Obtain biological and ecological information
<b>Responsibility:</b>	Parks and Wildlife (Science and Conservation Division, Geraldton District)
<b>Cost:</b>	\$50,000 in years 1–3

## 11. Undertake surveys for new populations

Surveys should be undertaken from mid-September through October with all surveyed areas recorded and the presence or absence of *Stylidium wilroyense* documented to improve survey efficiency and prevent duplication of effort. Where feasible, volunteers will be encouraged to participate.

<b>Action:</b>	Undertake surveys for new populations
<b>Responsibility:</b>	Parks and Wildlife (Geraldton District), with assistance from the GDTFCRT and volunteers
<b>Cost:</b>	\$10,000 per year

## 12. Develop and implement a translocation proposal

Translocations may be required for the long term conservation of *Stylidium wilroyense*, with the first priority being augmentation of the populations.

Information on the translocation of threatened plants and animals in the wild is provided in Parks and Wildlife Corporate Policy Statement No. 35 (DPaW 2015a), Parks and Wildlife Corporate Guideline No. 36 (DPaW 2015c) and the Australian Network for Plant Conservation translocation guidelines (Vallee *et al.* 2004). The 2004 guidelines state that a translocation may be needed when a species is represented by few populations and the creation of additional self-sustaining, secure populations may decrease its susceptibility to catastrophic events and environmental stochasticity. For small populations which may be declining in size or subject to high levels of inbreeding, successful population enhancement may increase population stability and hence long-term viability.

Depending on the characteristics of the species, Vallee *et al.* (2004) suggest a minimum viable population size estimated between 50 and 2,500 individuals will be required. Suitable translocation sites may include where the taxon occurs, where it was known to have occurred historically and other areas that have similar habitat (soil, associated vegetation type and structure, aspect etc.), within the known range of the taxon (Vallee *et al.* 2004).



All translocation proposals require endorsement by the department's Director of Science and Conservation. Monitoring of translocations is essential and will be included in the timetable developed for the Translocation Proposal.

<b>Action:</b>	Develop and implement a translocation proposal
<b>Responsibility:</b>	Parks and Wildlife (Science and Conservation Division, Geraldton District), BGPA
<b>Cost:</b>	\$42,000 in years 1 and 2; and \$26,500 in subsequent years as required

### 13. Map habitat critical to the survival of *Stylidium wilroyense*

Although spatial data relating to habitat critical to the survival of *Stylidium wilroyense* is alluded to in Section 1, it is not yet mapped. If additional populations are located, habitat critical to their survival will also be determined and mapped.

<b>Action:</b>	Map habitat critical to the survival of <i>Stylidium wilroyense</i>
<b>Responsibility:</b>	Parks and Wildlife (SCB, Geraldton District)
<b>Cost:</b>	\$6,000 in year 2

### 14. Promote awareness

The importance of biodiversity conservation and the protection of *Stylidium wilroyense* will be promoted through contact with affected land managers/owners, and more broadly through the print and electronic media and by setting up poster displays. Formal links with local naturalist groups and interested individuals will also be encouraged.

<b>Action:</b>	Promote awareness
<b>Responsibility:</b>	Parks and Wildlife (Geraldton District, SCB, Public Information and Corporate Affairs (PICA)), with assistance from the GDTCFRT
<b>Cost:</b>	\$7,000 in years 1 and 2, \$5,000 in years 3–5

### 15. Review this plan and assess the need for further recovery actions

If *Stylidium wilroyense* is still listed as Threatened at the end of the five-year term of this plan, the need for further recovery actions or a review of this plan will be assessed and a revised plan prepared if necessary.

<b>Action:</b>	Review this plan and assess the need for further recovery actions
<b>Responsibility:</b>	Parks and Wildlife (SCB, Geraldton District)
<b>Cost:</b>	\$6,000 at the end of year 5

**Table 5. Summary of recovery actions**

Recovery action	Priority	Responsibility	Completion date
Coordinate recovery actions	High	Parks and Wildlife (Geraldton District), with assistance from the GDTFCRT	Ongoing
Monitor populations	High	Parks and Wildlife (Geraldton District), with assistance from the GDTFCRT	Ongoing
Achieve long-term protection of habitat	High	Parks and Wildlife (Geraldton District, SCB), State Land Services	2021
Install DRF markers	High	Parks and Wildlife (Geraldton District)	2017
Undertake regeneration trials	High	Parks and Wildlife (Science and Conservation Division, Geraldton District)	2021
Liaise with land managers and Aboriginal communities	High	Parks and Wildlife (Geraldton District)	Ongoing
Protect plants from herbivory	High	Parks and Wildlife (Geraldton District), landowners	Ongoing
Collect and store seed	High	Parks and Wildlife (Geraldton District, TFSC)	2021
Develop and implement a fire management strategy	High	Parks and Wildlife (Geraldton District), landowners	Developed by 2017, implementation ongoing
Obtain biological and ecological information	High	Parks and Wildlife (Science and Conservation Division, Geraldton District)	2019
Undertake surveys for new populations	High	Parks and Wildlife (Geraldton District), with assistance from the GDTFCRT and volunteers	Ongoing
Develop and implement a translocation proposal	Medium	Parks and Wildlife (Science and Conservation Division, Geraldton District), BGPA	2021
Map habitat critical to the survival of <i>Stylidium wilroyense</i>	Medium	Parks and Wildlife (SCB, Geraldton District)	2018
Promote awareness	Medium	Parks and Wildlife (Geraldton District, SCB, PICA), with assistance from the GDTFCRT	2021
Review this plan and assess the need for further recovery actions	Medium	Parks and Wildlife (SCB, Geraldton District)	2021

## 4. Term of plan

This plan will operate from March 2017 to February 2022 but will remain in force until withdrawn or replaced. If the species is still listed as Threatened Flora after five years, a review of this plan will be completed, the need for further recovery actions determined, and a revised plan prepared if necessary.

## 5. References

- AECOM Australia Pty Ltd (2011) Flora and Population data summary: *Stylidium wilroyense* (P2). Report prepared for Westnet Rail Ltd.
- Burbidge, A.H. and James S.H. (1991) Postzygotic seed abortion in the genetic system of *Stylidium* (Angiospermae: Stylidiaceae). *Journal of Heredity* 82: 319–328.
- Chant, A. (2012) Form to nominate a Western Australian species for listing as threatened, change of category or delisting 2012. Department of Parks and Wildlife, WA.
- Chant, A. and Page, C. (2010) *Stylidium amabile* disturbance trial. *Watsnu* 16(1): 4–5.

- Coates, D.J. (1982) Chromosome variation and species relationships in the scale-leaved triggerplants (*Stylidium* section *Squamosae*). *Australian Journal of Botany* 30: 121–130.
- Department of Parks and Wildlife (2015a) Corporate Policy Statement No. 35 *Conserving Threatened Species and Ecological Communities*. Perth, Western Australia.
- Department of Parks and Wildlife (2015b) Corporate Guideline No. 35 *Listing and Recovery of Threatened Species and Ecological Communities*. Perth, Western Australia.
- Department of Parks and Wildlife (2015c) Corporate Guideline No. 36 *Recovery of Threatened Species through Translocation and Captive Breeding or Propagation*. Perth, Western Australia.
- ENV Australia Pty Ltd (2010) Westnet Rail Upgrade – Narngulu to Tilley (Morawa) Flora and Vegetation Assessment. Prepared for Strategen.
- Government of Australia (1999) Environment Protection and Biodiversity Conservation Act.
- International Union for Conservation of Nature (2001) IUCN Red List Categories: Version 3.1. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.
- James, S.H. (1979) Chromosome numbers and genetic systems in the Trigger Plants of Western Australia (*Stylidium*; Stylidiaceae). *Australian Journal of Botany* 27: 17–25.
- Lowrie, A., Coates, D.J. and Kenneally, K.F. (1998) A taxonomic review of the *Stylidium caricifolium* complex (Stylidiaceae), from south-west Western Australia. *Nuytsia* 12(1): 43–57.
- Patrick, S. (2001) Declared Rare and Poorly Known flora in the Geraldton District. Department of Conservation and Land Management.
- Vallee, L., Hogbin, T., Monks, L., Makinson, B., Matthes, M. and Rossetto, M. (2004) Guidelines for the Translocation of Threatened Australian Plants. Second Edition. The Australian Network for Plant Conservation. Canberra, Australia.
- Western Australian Herbarium (1998–) *FloraBase—the Western Australian Flora*. Department of Parks and Wildlife. <http://florabase.dpaw.wa.gov.au/>.

## 8. Taxonomic description

The following description was compiled in August 2016 using available collections at the Western Australian Herbarium and associated photographs.

### ***Stylidium wilroyense***

*Perennial herb* 25–55 cm high, with contracted, woody stems partly obscured by dense woolly hairs and becoming shallowly-buried with age; stilt roots absent. *Glandular trichomes* 0.2–3 mm long, with a translucent stalk and red or reddish black, ellipsoid head. *Leaves* in a basal tuft, narrowly lanceolate to ±linear, 14–30 cm long, 1.7–6.5 mm wide, acute, involute, scabrous on the lower surface and upper midrib or subglabrous, subtended by membranous scale-leaves 1–5.5 cm long. *Scapes* 1–c. 20 per individual, 25–55 cm long, 1–2.5 mm wide, densely glandular-hairy. *Inflorescence* racemiforme, occasionally with 2-flowered branches at the base, c. 10–25-flowered; bracts narrowly lanceolate or linear, acute, entire, glandular-hairy, 4–10 mm long; prophylls positioned at the base of the pedicels, linear or subulate, 2–4 mm long; pedicels 2–22 mm long, glandular-hairy; buds erect. *Hypanthium* ellipsoid, 3–6 mm long, 1.5–3.5 mm wide, glandular-hairy. *Calyx lobes* free, 3.5–6 mm long, subacute or acute, entire, glandular-hairy. *Corolla* bright pink with a white throat, undersurface glandular-hairy, with the lobes paired vertically; tube 5–6 mm long; anterior (upper) lobes obovate, larger than the posterior pair, 7–11 mm long, 4–6 mm wide; posterior (lower) lobes obovate, 5–9 mm long, 3–5 mm wide.

*Labellum* reflexed at anterior sinus, ovate, 1.5–2.1 mm long, sparsely glandular-hairy on the undersurface, with pink papillose border and pink papillose lateral appendages 0.8–1 mm long. *Throat appendages* 6 (in 2 basally-fused groups comprising 1 anterior and 2 smaller posterior appendages), white basally, pink distally; anterior appendages wing-like, asymmetrically and irregularly tapering to an acute apex, 2.5–4 mm long; posterior appendages subulate or deltate, 0.7–1.2 mm long. *Column* 15–17 mm long, straight when extended, evenly tapered, glabrous; corona present but rudimentary; stigma sessile, entire. *Capsules* ellipsoid, 6–12 mm long excluding calyx lobes. *Seeds* brown, elliptic in outline (flattened in T.S.), 2–2.5 mm long, surface finely contoured.

