Department of Parks and Wildlife

Interim Recovery Plan No. **374**

Leucopogon sp. Ongerup (A.S. George 16682) (A.S. George 16682)

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:

ADTFCRT	Albany District Threatened Flora and Communities Recovery Team
BGPA	Botanic Gardens and Parks Authority
CALM	Department of Conservation and Land Management
CITES	Convention on International Trade in Endangered Species
CR	Critically Endangered
DEC	Department of Environment and Conservation
DAA	Department of Aboriginal Affairs
DPaW	Department of Parks and Wildlife (also shown as Parks and Wildlife)
DRF	Declared Rare Flora
EN	Endangered
EPBC	Environment Protection and Biodiversity Conservation
GPS	Global Positioning System
IBRA	Interim Biogeographic Regionalisation for Australia
IRP	Interim Recovery Plan
IUCN	International Union for Conservation of Nature
LGA	Local Government Authority
MRWA	Main Roads Western Australia
NRM	Natural Resource Management
PICA	Public Information and Corporate Affairs
SCB	Species and Communities Branch
SWALSC	South West Aboriginal Land and Sea Council
SWTFRT	Southern Wheatbelt Threatened Flora Recovery Team
TFSC	Threatened Flora Seed Centre
TPFL	Threatened and Priority Flora Database
UCL	Unallocated Crown Land
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 2015*a*) and Department of Parks and Wildlife Corporate Guideline No. 35 (DPaW 2015*b*). 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 is 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) taxa, 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This plan will operate from March 2017 to February 2022 but will remain in force until withdrawn or replaced.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 the species is still listed as threatened in Western Australia, this plan will be reviewed after five years and the need for further recovery actions assessed.

This plan was given regional approval on 25 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.

Andrew Brown — Threatened Flora Coordinator, Department of 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:

Sarah Barrett — Threatened Flora Conservation Officer, Department of Parks and Wildlife Albany District

Brett Beecham — Regional Ecologist, Department of Parks and Wildlife, Wheatbelt Region

Andrew Crawford — Principal Technical Officer, Threatened Flora Seed Centre, Department of Parks and Wildlife Science and Conservation Division

Marie Edgley — Conservation Officer (Flora), Department of Parks and Wildlife, Wheatbelt Region

Michael Hislop — Contract Consultant, WA Herbarium

Amanda Shade — Assistant Curator (Nursery), Botanic Gardens and Parks Authority

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Cover photograph by Deanna Rasmussen.

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Summary

Scientific name:	*Leucopogon* sp. Ongerup (A.S. George 16682)	**IBRA regions:**	Mallee, Esperance Plains
Family:	Ericaceae	**IBRA subregions:**	Western Mallee, Fitzgerald
Common name:	None	**NRM regions:**	South West, South Coast
Flowering period:	July–August	**Recovery teams:**	Southern Wheatbelt Threatened Flora Recovery Team; Albany District Threatened Flora and Communities Recovery Team
DPaW regions:	Wheatbelt, South Coast		
DPaW district:	Albany		
Shires:	Dumbleyung, Gnowangerup		

Distribution and habitat: *Leucopogon* sp. Ongerup (A.S. George 16682) is restricted to two locations 110km apart – southeast of Ongerup (Population 1) and northeast of Kukerin (Population 2). Southeast of Ongerup it grows on pale-brown sand, clay, loam and sandy loam soils with laterite gravel and quartz fragments on a laterite ridge, overlying granite while northeast of Kukerin it grows in dry, pale yellow to white sand and sandy loam soil overlying laterite with some gravel on the soil surface.

Habitat critical to the survival of the species, and important populations: *Leucopogon* sp. Ongerup (A.S. George 16682) is listed as threatened flora in Western Australia, and it is considered that all known habitat for wild populations is critical to the survival of the species, and that all wild populations are important populations. Habitat critical to the survival of *L*. sp. Ongerup includes the area of occupancy of the populations and areas of similar habitat surrounding and/or linking subpopulations (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: *Leucopogon* sp. Ongerup (A.S. George 16682) was listed as specially protected under the Western Australian *Wildlife Conservation Act 1950* on 2 December 2014. It is ranked as Endangered (EN) in Western Australia under International Union for Conservation of Nature (IUCN) 2001 criterion D due to the population size estimated to number fewer than 250 mature individuals. Note: As there are 300 mature plants know known the species no longer meets EN D. The species is not currently listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Threats: Threats to *Leucopogon* sp. Ongerup (A.S. George 16682) include road and track maintenance, altered fire regimes, weeds, small population size, grazing, *Phytophthora* dieback, poor recruitment, gravel/sand extraction and drought.

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 Southern Wheatbelt Threatened Flora Recovery Team (SWTFRT) and Albany District Threatened Flora and Communities Recovery Team (ADTFCRT), is overseeing the implementation of recovery actions for *Leucopogon* sp. Ongerup (A.S. George 16682).
2. The land manager has been notified of the location and threatened status of *Leucopogon* sp. Ongerup (A.S. George 16682).
3. Declared Rare Flora (DRF) markers have been installed at Subpopulations 1a, 1b and 2a. Markers aim to reduce the risk of accidental damage during road maintenance activities.
4. *Leucopogon* sp. Ongerup (A.S. George 16682) has been opportunistically surveyed for in areas of suitable habitat. Despite this no new populations have been located.
5. Approximately 2,700 seeds collected from Population 1 of *Leucopogon* sp. Ongerup (A.S. George 16682) are stored in the Threatened Flora Seed Centre (TFSC) at –18°C.

6. Monitoring has been carried out opportunistically with plant numbers and current threats recorded.

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 occur 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 300 to 330 or more or
- New populations have been found, increasing the number of known populations from two to three or more, with no net loss of mature plants or
- The area of occupancy has increased by >15%, with no net loss of mature plants.

Recovery will be considered unsuccessful if one or more of the following occur 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% from 300 to 270 or less or
- The area of occupancy has decreased by >15%, with a net loss of mature plants.

Recovery actions

1. Coordinate recovery actions
2. Monitor populations
3. Liaise with land managers and Aboriginal communities
4. Restrict access
5. Collect and store seed
6. Protect plants from herbivory
7. Develop and implement translocations
8. Undertake regeneration trials
9. Develop and implement a fire management strategy
10. Obtain biological and ecological information
11. Undertake surveys
12. Maintain disease hygiene measures
13. Undertake weed control
14. Map habitat critical to the survival of *Leucopogon* sp. Ongerup (A.S. George 16682)
15. Promote awareness
16. Review this plan and assess the need for further recovery actions

1. Background

History

Leucopogon sp. Ongerup (A.S. George 16682) was originally collected from west of Lake Grace in May 1964 by Alex George, and was first recognised as a distinct taxon by Mike Hislop in the late 1990's. It is not a *Leucopogon* in the strict sense but belongs to a large group of segregate species (40 to 50% of the total number of WA taxa currently in the genus) that are soon to be transferred to a greatly enlarged *Styphelia* (M. Hislop *pers. comm.*) (Quinn *et al.* 2003; Puente- Lelièvre *et al.* unpublished). This taxonomic uncertainty at the higher level is the major reason why a formal name has not yet been published for this species. Among the *Leucopogon* segregates, it belongs to a small group of seven species which include *Astroloma xerophyllum* and *A. stomarrhena* (Puente-Lelièvre *et al.* unpublished).

Leucopogon sp. Ongerup (A.S. George 16682) is currently known from two populations, comprising around 300 plants (counts undertaken between 2013 and 2015). The majority of plants occur on road reserves and private property while some occur on Unallocated Crown land (UCL). The UCL is part of the broader Tarin Rock Landscape Project undertaken by the South West Catchments Council and has some strategic management from Parks and Wildlife as part of a Regionally significant landscape management project.

Description

Leucopogon sp. Ongerup (A.S. George 16682) is an erect compact shrub, *c.* 60 cm high by 60 cm wide, arising from a fire-sensitive rootstock. In common with most members of *Leucopogon sens. lat.* the corolla is white and the lobes are prominently bearded on their inner surfaces. The fruit is a somewhat fleshy drupe (Barrett *et al.* 2013).

Leucopogon sp. Ongerup (A.S. George 16682) is relatively easily distinguished within its group of segregates and could only conceivably be confused with two taxa – *L.* sp. Bonnie Hill and *Astroloma* sp. sessile leaf:

- *Leucopogon* sp. Bonnie Hill occurs some distance to the east near Esperance and differs most obviously from *L.* sp. Ongerup in having deep, narrow and hairy grooves on the abaxial leaf surfaces, much longer and narrowly attenuate sepals and hairy rather than glabrous abaxial corolla lobes.

- *Leucopogon* sp. sessile leaf has significantly larger leaves and floral parts (e.g. sepals 6.5 to 9.2 mm long 4.2 to 5.3 (circumference), and corolla tube 6.2 to 7.8 mm long 3.4 to 4.2 (circumference) in *L.* sp. Ongerup) and a fruit which is wider than long rather than longer than wide. *Astroloma* sp. sessile leaf occurs in a small area of the eastern Darling Range (Barrett *et al.* 2013).

Illustrations and/or further information

Western Australian Herbarium (1998–) FloraBase- the Western Australian Flora. Department of Parks and Wildlife https://florabase.dpaw.wa.gov.au/

Distribution and habitat

Leucopogon sp. Ongerup (A.S. George 16682) is restricted to two locations 110 km apart – Southeast of Ongerup (Population 1) and northeast of Kukerin (Population 2).

Southeast of Ongerup it grows on pale-brown sand, clay, loam and sandy loam soils with laterite gravel and quartz fragments on a laterite ridge overlying granite. Associated species at this site include *Eucalyptus ecostata*, *E. uncinatus* and *E. pleurocarpa* over *Acacia myrtifolia, Banksia cirsioides*, *B. sphaerocarpa*, *Beaufortia micrantha*, *Calothamnus sanguineus*, *Daviesia incrassata*, *Gahnia ancistrophylla*, *Gastrolobium spinosum*, *Hakea marginata*, *H. trifurcata*, *Isopogon* sp. Fitzgerald River, *Lambertia denticulatus*, *L. inermis*, *Leptospermum* sp., *Leucopogon gibbosus*, *Mesomelaena stygia*, *Neurachne alopecuroidea*, *Petrophile squamata*, *Taxandria spathulata* and *Xanthorrhoea platyphylla*. The area of occupancy at this location is 0.2 km^2 (Barrett *et al*. 2013).

Northeast of Kukerin it grows on a simple slope in dry, pale yellow to white sand and sandy loam soil overlying laterite with some gravel on the soil surface. Associated species include *Banksia baueri*, *B. nivea* subsp. *nivea*, *B. sphaerocarpa*, *Eremaea pauciflora* and *Leptospermum erubescens*. The area of occupancy at this location is 0.035 km^2 (Barrett *et al*. 2013).

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

TPFL population number & location	Parks and Wildlife Region	Shire	Vesting	Purpose	Manager
1a. SE of Ongerup	South Coast	Gnowangerup	LGA	Road reserve	Shire of Gnowangerup
1b. SE of Ongerup	South Coast	Gnowangerup	LGA	Road reserve	Shire of Gnowangerup
1c. SE of Ongerup	South Coast	Gnowangerup	Private property	Freehold	Landowners
2a. NE of Kukerin	Wheatbelt	Dumbleyung	MRWA	Road reserve	MRWA
2b. NE of Kukerin	Wheatbelt	Dumbleyung	Non vested	UCL	Tarin Rocks Landscape Project, Parks and Wildlife

Biology and ecology

As with most members of the genus, *Leucopogon* sp. Ongerup (A.S. George 16682) is thought to be a re-seeder that is killed by fire. At Population 2, the majority of plants occur close to the edge of the road and on and around the edges of a disused gravel extraction area. Plants occur very sparsely in the surrounding vegetation where little disturbance occurs (Barrett *et al*. 2013).

Leucopogon sp. Ongerup (A.S. George 16682) is not thought to be long-lived, with an upper limit of approximately 20 years estimated. This is the case with most non-lignotuberous epacrids (pers. observation, M. Hislop). Plants at both populations appear even aged with very few seedlings or juveniles observed (none at Population 1 and one at Population 2) (Barrett *et al*. 2013).

As with most species of *Leucopogon*, floral configuration suggests *Leucopogon* sp. Ongerup (A.S. George 16682) is a generalist with many different kinds of insects probably able to effect pollination. The fleshy fruit of many epacrids (even those with relatively small fruit) are attractive to emus. Ants are also known to distribute the fruit of those species with smaller fruit (Barrett *et al*. 2013).

Conservation status

Leucopogon sp. Ongerup (A.S. George 16682) was listed as specially protected under the Western Australian *Wildlife Conservation Act 1950* on 2 December 2014. It is ranked as Endangered (EN) in Western Australia under International Union for Conservation of Nature (IUCN) 2001 criterion D due to the population size estimated to number fewer than 250 mature individuals. Note: As there are 300 mature plants know known the species no longer meets EN D. The species is not currently listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Threats

- **Road and track maintenance.** Plants at Subpopulation 2a are located in a disturbed area very close to the edge of the road and are therefore at risk of being damaged during road maintenance. General threats from maintenance activities include grading, chemical spraying, construction of drainage channels, and the slashing of roadside vegetation (which promotes weeds). An access track which is most likely used recreationally also connects the road and the nearby railway line bisecting Subpopulation 2b. The track is easily accessible and appears to be in current use as the vegetation along the track is not overgrown. Vehicles have the potential to damage the *Leucopogon* sp. Ongerup (A.S. George 16682) plants and its habitat as well as spread disease.
- **Altered fire regimes.** It is not known how *Leucopogon* sp. Ongerup (A.S. George 16682) responds to fire but it is likely, as with the fire response of other members of the genus, to recruit from soil-stored seed after fire or following soil disturbance. Frequent burning would however deplete the soil seed store. Fire may also facilitate weed invasion and when it occurs should be followed up with appropriate weed control.
- **Small population size.** Low genetic diversity within populations could limit long term viability.
- **Grazing.** Rabbits (*Oryctolagus cuniculus*) are a threat to Subpopulations 1a and 1b through grazing, warren construction and increased nutrient levels. Grazing may also have an impact on the establishment of seedlings thereby limiting natural recruitment.
- ***Phytophthora* dieback.** Dieback (*Phytophthora cinnamomi*) may kill plants or degrade associated habitat. Note: Dieback is not currently present at Population 1 and it is not known if *Leucopogon* sp. Ongerup (A.S. George 16682) is directly susceptible to dieback disease. However, members of the Ericaceae family generally are susceptible to Dieback and testing of the species' susceptibility to the pathogen is required.
- **Poor recruitment.** The species is thought to require disturbance such as fire to recruit, however, if disturbance is frequent and occurs at the wrong time of the year, populations may not persist.
- **Gravel/sand extraction.** This was a past threat to Population 2 but it is not known if further extraction of gravel/sand is likely to occur in the future.
- **Drought.** Seedling recruitment and survival are likely to be affected by drought. Drought may also delay surveys for additional populations, given plants are unlikely to be flowering and therefore difficult to detect.
- **Weed invasion.** Weeds 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 the easy ignition of high fuel loads, which are produced annually by

many grass weed species. Weed loads at both populations do not appear to currently be a problem but will need to be monitored.

The intent of this plan is to provide actions that will mitigate immediate threats to *Leucopogon* sp. Ongerup (A.S. George 16682). 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	
1a. S of Ongerup	Shire road reserve	2002 3 2003 20 2005 50+[1 dead] 2013 *220 2015 48	Healthy	Good	Road maintenance, rabbits, *Phytophthora* dieback
1b. S of Ongerup	Shire road reserve	2003 **100 2005 **200+ 2007 100 2013 *220 2015 220	Healthy	Excellent	Road maintenance, rabbits, *Phytophthora* dieback
1c. S of Ongerup	Private property	2003 **100+ 2005 **200+	Healthy	Excellent	*Phytophthora* dieback
2a. NE of Kukerin	MRWA road reserve	2002 20 2003 ***20+ 2013 12	Healthy		Road maintenance, gravel/sand extraction
2b. NE of Kukerin	UCL	2003 ***20+ 2013 20	Healthy		Road and track maintenance, gravel extraction

Note: all populations in **bold text** are considered to be important populations, [ ] = number of dead, * = total for Subpopulations 1a and 1b, ** = total for Subpopulations 1b and 1c combined; *** = total for Subpopulations 2a and 2b.

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 *Leucopogon* sp. Ongerup (A.S. George 16682) may require assessment.

Actions that could 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.
- Introduction, spread or amplification of *Phytophthora* dieback.

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

As *Leucopogon* sp. Ongerup (A.S. George 16682) is listed as threatened in Western Australia it is considered that all known habitat for wild populations is critical to the survival of the species, and that

all wild populations are important populations. Habitat critical to the survival of *L*. sp. Ongerup includes the area of occupancy of the populations and areas of similar habitat surrounding the populations and linking subpopulations (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 *Leucopogon* sp. Ongerup (A.S. George 16682) will also benefit the Threatened and Priority flora species listed in the table below.

Table 3. Conservation-listed flora species occurring within 500m of *Leucopogon* sp. Ongerup (A.S. George 16682)

Species name	TPFL population adjacent to	Conservation status (WA)	Conservation status (EPBC Act 1999)
Banksia pseudoplumosa	1	DRF (EN)	EN
Hibbertia priceana	1	DRF (EN)	CR
Lasiopetalum fitzgibbonii	2	Priority 3	-
Spyridium oligocephalum	1	Priority 4	-

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

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. The species is not listed in the United Nations Environment Program World Conservation Monitoring Centre 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 no sites of Aboriginal significance adjacent to populations of *Leucopogon* sp. Ongerup (A.S. George 16682). However, input and involvement has been sought through the South West Aboriginal Land and Sea Council (SWALSC) and DAA to determine if there are any issues or interests with respect to management for this species in the vicinity of these sites. Future involvement of Aboriginal people 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

Management of private land containing a population of *Leucopogon* sp. Ongerup (A.S. George 16682) may need to be modified to restrict stock access. Road and firebreak maintenance and other activities (such as gravel/sand extraction) in the vicinity of subpopulations situated on Shire of Gnowangerup and Main Roads Western Australia (MRWA) managed road reserves will also have to be modified to prevent impact on the plants and its associated habitat.

Affected interests

The implementation of this plan has some implications for the private landholder, the Shire of Gnowangerup, MRWA, and Department of Lands, particularly as populations occur on lands that are not specifically managed for conservation.

Evaluation of the plan's performance

Parks and Wildlife, with assistance from the Southern Wheatbelt Threatened Flora Recovery Team (SWTFRT) and Albany District Threatened Flora and Communities Recovery Team (ADTFCRT), will evaluate the performance of this plan. In addition to annual reporting on progress and evaluation against the criteria for success and failure, the plan will be reviewed 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 occur 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 300 to 330 or more or
- New populations have been found, increasing the number of known populations from two to three or more, with no net loss of mature plants or
- The area of occupancy has increased by >15%, with no net loss of mature plants.

Recovery will be considered unsuccessful if one or more of the following occur 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 270 or less or
- The area of occupancy has decreased by >15%, with a net loss of mature plants.

3. Recovery actions

Existing recovery actions

Parks and Wildlife, with the assistance of the SWTFRT and ADTFCRT, is overseeing the implementation of recovery actions for *Leucopogon* sp. Ongerup (A.S. George 16682).

Land managers have been notified of the location and threatened status of *Leucopogon* sp. Ongerup (A.S. George 16682). Notifications detail the current Declared Rare Flora (DRF) status of the species, the associated legal obligations in regards to its protection, and contact details for management assistance.

DRF markers have been installed at Subpopulations 1a, 1b and 2a. Markers aim to reduce the risk of accidental damage during road maintenance activities.

Leucopogon sp. Ongerup (A.S. George 16682) has been opportunistically surveyed for in areas of suitable habitat. Surveys include:

- Habitat on private property remnants and road reserves near Population 1.
- The Tarin Rocks area.
- Suitable habitat on private property east and west of Population 1.
- Opportunistic surveys over the last 14 years by Epacrid specialist Mike Hislop.
- Local botanist Sue Oborne (Ongerup Wildflower Society) has been aware of this species for several years but has not located more populations.

Approximately 2,700 seeds collected from Population 1 are stored in the Threatened Flora Seed Centre (TFSC) at –18°C (see table 4).

Table 4. TFSC seed collection details for *Leucopogon* sp. Ongerup (A.S. George 16682)

Accession number	Date collected	TPFL population number	Type	No. fruit in storage	No. seed in storage	Estimated germinable seed
01741	1/09/2005	1	B/60, B/50	1,303	2,148	438
02430	16/10/2007	1	B/20	411	511	142

Note: 'B' = a bulked collection and the number of plants sampled.

Monitoring 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 Albany District, and at Species and Communities Branch (SCB).

Future recovery actions

The following recovery actions are listed in approximate order of decreasing 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 SWTFRT and ADTFCRT, will oversee the implementation of recovery actions for *Leucopogon* sp. Ongerup (A.S. George 16682).

Action:	Coordinate recovery actions
Responsibility:	Parks and Wildlife (Wheatbelt Region and Albany District), with assistance from the SWTFRT and ADTFCRT
Cost:	$8,000 per year

2. Monitor populations

Monitoring of *Leucopogon* sp. Ongerup (A.S. George 16682) and its habitat should be undertaken to identify trends or potential management requirements. Population monitoring should record the health and expansion or decline in the population, 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 *L*. sp. Ongerup are included in other recovery actions detailed below.

Action:	Monitor populations
Responsibility:	Parks and Wildlife (Wheatbelt Region and Albany District), with assistance from the SWTFRT and ADTFCRT
Cost:	$8,000 per year

3. Liaise with land managers and Aboriginal communities

As the species is known from just two populations with a significant portion occurring on private property and road reserves, it is important that staff from Parks and Wildlife Wheatbelt and South Coast Regions liaise with land managers and Shires to ensure populations of *Leucopogon* sp. Ongerup (A.S. George 16682) are not accidentaly damaged or destroyed and 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.

Action:	Liaise with land managers and Aboriginal communities
Responsibility:	Parks and Wildlife (Wheatbelt Region and Albany District)
Cost:	$4,000 per year

4. Restrict access

The access track bisecting Subpopulation 2b is easily accessible and appears to be in current use. An investigation is required to assess what the track is used for (potentially strategic access for fire suppression activities) and whether it is necessary. If the track is not necessary, a barricade or bollards will be erected.

Action:	Restrict access
Responsibility:	Parks and Wildlife (Wheatbelt Region)
Cost:	$10,000 in years 1 and 2

5. Collect and store seed

Although seed has been collected from the species, further collections are required for future research and/or establishing new populations. Collections should aim to sample and preserve the maximum range of genetic diversity possible by collecting from the widest range of reproductive plants.

Action:	Collect and store seed
Responsibility:	Parks and Wildlife (Wheatbelt Region and Albany District, TFSC)
Cost:	$10,000 per year

6. Protect plants from herbivory

When annual monitoring of *Leucopogon* sp. Ongerup (A.S. George 16682) ascertains the threat posed by herbivores such as rabbits is high, baiting using 1080 oats should be undertaken. Where areas of high infestation occur, 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 which are being heavily grazed.

Action:	Protect plants from herbivory
Responsibility:	Parks and Wildlife (Wheatbelt Region and Albany District), landowners
Cost:	$10,000 in year 1; $8,000 per years 2-5

7. Develop and implement translocations

Translocations may be required for the long term conservation of *Leucopogon* sp. Ongerup (A.S. George 16682) with the first priority being augmentation of 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 2015*a*), Parks and Wildlife Corporate Guideline No. 36 (DPaW 2015*c*) 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.

Action:	Develop and implement translocations
Responsibility:	Parks and Wildlife (Science and Conservation Division, Wheatbelt Region and Albany District), BGPA
Cost:	$42,000 in years 1 and 2; and $26,500 in subsequent years as required

8. Undertake regeneration trials

Leucopogon sp. Ongerup (A.S. George 16682) may regenerate from soil-stored seed following disturbance, different disturbance techniques should be investigated (i.e. soil disturbance, smoke water and fire), to determine the most successful and appropriate method and optimal time interval between disturbance events to maintain populations. Any disturbance trials will need to be undertaken in conjunction with weed control.

Action:	Undertake regeneration trials
Responsibility:	Parks and Wildlife (Science and Conservation Division, Wheatbelt Region and Albany District)
Cost:	$10,000 in years 1 and 3, $4,000 in years 2, 4 and 5

9. Develop and implement a fire management strategy

The risk of fire occurring within the habitat of populations will be minimised where possible except where it is being used to assist recovery. A fire management strategy will be developed that recommends fire frequency, intensity, seasonality, precautions to prevent bushfire and strategies for reacting to bushfire, and the need, method of construction and maintenance of firebreaks, and associated weed control measures, including actions to minimise the risk of unplanned fire. Permanent quadrats will be established to monitor post-fire to either prescribed or unplanned fires response. All data relating to fire response of the species will be entered into the Threatened Priority Flora (TPFL) fire response data base.

Action:	Develop and implement a fire management strategy
Responsibility:	Parks and Wildlife (Wheatbelt Region and Albany District), landowners
Cost:	$10,000 in year 1, and $6,000 in years 2–5

10. Obtain biological and ecological information

Research on the biology and ecology of *Leucopogon* sp. Ongerup (A.S. George 16682) should include:

1. Identification of pollinators and their required habitat.
2. Seed viability.
3. Conditions necessary for natural germination.
4. Response to disturbance, competition, drought and grazing.
5. Longevity of plants, time taken to reach maturity, and minimum viable population size.
6. Determination of the level of susceptibility of *Leucopogon* sp. Ongerup (A.S. George 16682) to *Phytophthora cinnamomi*.

Action:	Obtain biological and ecological information
Responsibility:	Parks and Wildlife (Science and Conservation Division, Wheatbelt Region and Albany District)
Cost:	$50,000 in years 1–3

11. Undertake surveys

Areas of potential suitable habitat should be surveyed for the presence of *Leucopogon* sp. Ongerup (A.S. George 16682) during its flowering period. All surveyed areas will be recorded and the presence or absence of the species documented to increase survey efficiency and prevent duplication of effort.

Action:	Undertake surveys
Responsibility:	Parks and Wildlife (Wheatbelt Region and Albany District), with assistance from the SWTFRT, ADTFCRT and volunteers
Cost:	$10,000 per year

12. Maintain disease hygiene measures

To protect populations from disease, disease hygiene (as outlined in Department of Parks and Wildlife 2014) will be followed and operations restricted to dry soil conditions. Purpose-built signs advising of the dieback risk and high conservation values of the sites will be installed if required.

Action:	Maintain disease hygiene measures
Responsibility:	Parks and Wildlife (Wheatbelt Region and Albany District)
Cost:	$4,000 per year

13. Undertake weed control

If weeds are considered an ongoing threat to populations, the following actions may need to be undertaken:

1. Determine which weeds are present and map them.
2. Control invasive weeds by hand removal and/or spot spraying as they first emerge.
3. Monitor the success of weed treatments on weed death, and the tolerance of *Leucopogon* sp. Ongerup (A.S. George 16682) and associated native plant species to the treatment methods.
4. Report on the method and success of the treatment.
5. Revegetate with site-specific species (in autumn) to supress weeds.

Action:	Undertake weed control
Responsibility:	Parks and Wildlife (Wheatbelt Region and Albany District)
Cost:	$10,000 per year, as required

14. Map habitat critical to the survival of *Leucopogon* sp. Ongerup (A.S. George 16682)

Although habitat critical to the survival of *Leucopogon* sp. Ongerup (A.S. George 16682) is alluded to in Section 1, it has not yet been mapped and will be addressed under this action. Mapping of habitat critical to the survival of the species will be undertaken to facilitate its protection and appropriate management. If additional populations are located, then habitat critical to their survival will also be determined and mapped.

Action:	Map habitat critical to the survival of *Leucopogon* sp. Ongerup (A.S. George 16682)
Responsibility:	Parks and Wildlife (SCB, Wheatbelt Region and Albany District)
Cost:	$6,000 in year 2

15. Promote awareness

The importance of biodiversity conservation and the protection of *Leucopogon* sp. Ongerup (A.S. George 16682) will be promoted through direct contact with land managers 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.

Action:	Promote awareness
Responsibility:	Parks and Wildlife (Wheatbelt Region and Albany District, SCB, Public Information and Corporate Affairs (PICA)), with assistance from the SWTFRT and ADTFCRT
Cost:	$7,000 in years 1 and 2; $5,000 in years 3–5

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

If *Leucopogon* sp. Ongerup (A.S. George 16682) 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.

Action:	Review this plan and assess the need for further recovery actions
Responsibility:	Parks and Wildlife (SCB, Wheatbelt Region and Albany District)
Cost:	$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 (Wheatbelt Region and Albany District), with assistance from the SWTFRT and ADTFCRT	Ongoing
Monitor populations	High	Parks and Wildlife (Wheatbelt Region and Albany District), with assistance from the SWTFRT and ADTFCRT	Ongoing
Liaise with land managers and Aboriginal communities	High	Parks and Wildlife (Wheatbelt Region and Albany District)	Ongoing
Investigate track purpose and restrict access	High	Parks and Wildlife (Wheatbelt Region)	2018
Collect and store seed	High	Parks and Wildlife (Wheatbelt Region and Albany District, TFSC)	2021
Protect plants from herbivory	Medium	Parks and Wildlife (Wheatbelt Region and Albany District), landowners	Ongoing
Develop and implement translocations	High	Parks and Wildlife (Science and Conservation Division, Wheatbelt Region and Albany District), BGPA	2021
Undertake regeneration trials	Medium	Parks and Wildlife (Science and Conservation Division, Wheatbelt Region and Albany District)	2021
Develop and implement a fire management strategy	Medium	Parks and Wildlife (Wheatbelt Region and Albany District), landowners	Developed by 2017, implementation ongoing
Obtain biological and ecological information	Medium	Parks and Wildlife (Science and Conservation Division, Wheatbelt Region and Albany District)	2019
Undertake surveys	High	Parks and Wildlife (Wheatbelt Region and Albany District), with assistance from the SWTFRT, ADTFCRT and volunteers	Ongoing
Maintain disease hygiene measures	High	Parks and Wildlife (Wheatbelt Region and Albany District)	Ongoing
Undertake weed control	Medium	Parks and Wildlife (Wheatbelt Region and Albany District)	Ongoing
Map habitat critical to the survival of *Leucopogon* sp. Ongerup (A.S. George 16682)	Medium	Parks and Wildlife (SCB, Wheatbelt Region and Albany District)	2018
Promote awareness	Medium	Parks and Wildlife (Wheatbelt Region and Albany District, SCB, PICA), with assistance from the SWTFRT and ADTFCRT	2021
Review this plan and assess the need for further recovery actions	Medium	Parks and Wildlife (SCB, Wheatbelt Region and Albany 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 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

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6. Taxonomic description

Draft taxonomic description for *Leucopogon* sp. Ongerup (A.S. George 16682) (to be formally named *Styphelia disjuncta* Hislop & Puente-Lel., *sp. nov.*) provided by Michael Hislop.

Erect, compact shrubs to *c.* 60 cm high and 60 cm wide, branching from close to the base but with a fire-sensitive rootstock. Young *branchlets* with a dense indumentum of mostly retrorse, straight to prominently decurved hairs, 0.05–0.15 mm long. *Leaves* steeply antrorse to antrorse-appressed, ovate to narrowly ovate, 3.0–6.8 mm long, 1.2–2.4 mm wide; apex long-mucronate, with a rather delicate, scarcely pungent mucro, 0.4–1.0 mm long; base obtuse to rounded; petiole well-defined, broad, 0.3–0.5 mm long, glabrous or sparsely hairy on abaxial surface, hairy on adaxial surface and margins; lamina 0.2–0.3 mm thick, strongly concave adaxially, longitudinal axis gently incurved; surfaces slightly discolorous, shiny; adaxial surface glabrous, or with a few scattered hairs towards the base and apex, venation not evident; abaxial surface glabrous, paler, shallowly grooved, with 7–9 raised primary veins and broad, shallow grooves between; margins of most leaves conspicuously hyaline (only those produced towards the end of a growth flush without hyaline margins), variably ciliate to ± glabrous. *Inflorescence* erect; axis 1.9–2.6 mm long, 1-flowered, terminal extension flattened and lobed on either side of the bud rudiment. *Fertile bract* ovate, 1.3–1.8 mm long, 1.0–1.3 mm wide, subtended by 4 or 5 smaller, sterile bracts. *Bracteoles* broadly ovate, ovate or elliptic, 2.0–2.6 mm long, 1.7–1.8 mm wide, obtuse, with a very short sub-terminal mucro < 0.1 mm long, abaxial surface shortly hairy, straw-coloured, multi-veined and striate, becoming scarious towards the margins; margins ciliolate. *Sepals* narrowly ovate-elliptic, 4.2–5.3 mm long, 1.6–2.0 mm wide, obtuse to acute, indistinctly mucronate, the mucro to 0.2 mm long; abaxial surface with a sparse to moderately dense indumentum of short, antrorse hairs, straw-coloured, striate with 9–11 raised veins, becoming scarious towards the margins; adaxial surface with a well-defined patch of hairs towards the base and other scattered hairs in the upper half; margins ciliate with hair 0.05–0.20 mm long. *Corolla tube* white, narrowly obovoid or narrowly ellipsoid, shorter than the sepals, 3.4–4.2 mm long, 1.8–2.0 mm wide, hairs extending well down the internal surface of the tube below the lobes. *Corolla lobes* white, from shorter than to occasionally as long as the tube (ratio = 0.80–1.0: 1), either spreading from the base or shortly erect basally and then spreading and recurved above, 3.2–4.0 mm long, 1.0–1.2 mm wide at base; external surface glabrous, internal surface densely bearded, the hairs twisted, ornamented; glabrous tips 0.3–0.5 mm long. *Anthers* partially exserted from the tube (by 1/2–2/3 of their length), 1.7–2.2 mm long, apex emarginate. *Filaments* terete, 0.4–0.5 mm long, attached 1/2–2/3 above the anther base. *Nectary* annular, 0.4–0.5 mm long, shallowly lobed, glabrous. *Ovary* globose, 0.9–1.2 mm long, 0.9–1.1 mm wide, pale green, glabrous, deeply rugose, 3-locular. *Style* 3.9–5.2 mm long, exserted from the tube, well-differentiated from the ovary apex, papillate below the stigma; *stigma* distinctly expanded. *Fruit* obovoid, 3.0–3.5 mm long, 1.8–2.2 mm wide, much shorter than the calyx, shallowly rugose with indistinct longitudinal grooves also evident; the apical surface abruptly raised towards the style base; gynophore absent.