Department of Parks and Wildlife

Interim Recovery Plan No. **364**

Lemon Spider Orchid (*Caladenia luteola*)

Interim Recovery Plan

2016–2021

Department of Parks and Wildlife, Western Australia

July 2016

List of acronyms

The following acronyms are used in this plan:

BGPA	Botanic Gardens and Parks Authority
CITES	Convention on International Trade in Endangered Species
CR	Critically Endangered
DAA	Department of Aboriginal Affairs
DMP	Department of Mines and Petroleum
DOP	Department of Planning
DPaW	Department of Parks and Wildlife
DRF	Declared Rare Flora (also shown as Threatened)
EPBC	Environment Protection and Biodiversity Conservation
IBRA	Interim Biogeographic Regionalisation for Australia
IRP	Interim Recovery Plan
IUCN	International Union for Conservation of Nature
LGA	Local Government Authority
NRM	Natural Resource Management
PEC	Priority Ecological Community
PICA	Public Information and Corporate Affairs
RP	Recovery Plan
SCB	Species and Communities Branch
SWALSC	South West Aboriginal Land and Sea Council
SWTFRT	Southern Wheatbelt Threatened Flora Recovery Team
TEC	Threatened Ecological Community
TPFL	Threatened and Priority Flora Database
TSSC	Threatened Species Scientific Committee
UNEP-WCMC	United Nations Environment Program World Conservation Monitoring Centre
WA	Western Australia
WANOSCG	Western Australian Native Orchid Study and Conservation Group

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 flora, fauna and ecological communities, and begin the recovery process.

Parks and Wildlife is committed to ensuring that threatened flora 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This plan will operate from July 2016 to June 2021 but will remain in force until withdrawn or replaced. It is intended that, if *Caladenia luteola* is still ranked CR 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 23 May 2016 and was approved by the Director of Science and Conservation on 1 July 2016. 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 July 2016.

Plan preparation: This plan was prepared by:

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

Kristine Brooks — Flora Conservation Officer, Parks and Wildlife former Great Southern District Wheatbelt Region

Ryan Phillips — Research Scientist, Botanic Gardens and Parks Authority and Australian National University

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

Cover photograph by Andrew Brown.

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Summary

Scientific name:	*Caladenia luteola*	**Shires:**	Woodanilling, Katanning
Family:	Orchidaceae	**IBRA region:**	Avon Wheatbelt
Common name:	Lemon Spider Orchid	**IBRA subregion:**	Avon Wheatbelt P2
Flowering period:	September–October	**NRM region:**	South West Catchment Council
DPaW region:	Wheatbelt	**Recovery team:**	Southern Wheatbelt Threatened Flora Recovery Team
DPaW district:	N/A		

Distribution and habitat: *Caladenia luteola* is endemic to Western Australia where it is known from three populations approximately 45km apart, two west of Woodanilling (Populations 1 and 7) and one east-south-east of Katanning (Population 6). Plants in Populations 1 and 7 grow among dense herbs and grasses in mixed woodland of *Eucalyptus wandoo, Acacia acuminata* and *Allocasuarina huegeliana* (Brown *et al*. 2008; Hopper and Brown 2001). Plants in Population 6 grow in yellow brown gravelly sand/loam in open *Eucalyptus longicornis* woodland.

Habitat critical to the survival of the species, and important populations: It is considered that all known habitat for wild populations is habitat critical to the survival of *Caladenia luteola*, and that all wild populations are important populations. Habitat critical to the survival of *C. luteola* includes the area of occupancy of populations and areas of similar habitat surrounding populations (these providing potential habitat for population expansion and for pollinators). It may also include additional occurrences of suitable 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: *Caladenia luteola* was listed as specially protected under the Western Australian *Wildlife Conservation Act 1950* on 17 February 2012. It is ranked as Critically Endangered (CR) in Western Australia under International Union for Conservation of Nature (IUCN 2001) criteria B1ab(iii,v)+2ab(iii,v); C2a(i) due to its extent of occurrence being less than 100km^2; populations being severely fragmented; there being a continuing decline in the area, extent and/or quality of habitat and the number of individuals; the total population size estimated to number fewer than 250 mature individuals; and no subpopulation estimated to contain more than 50 mature individuals. The species is not listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Threats: The main threats to *Caladenia luteola* are hydrological changes, poor recruitment, small declining populations, grazing, road maintenance, future mining, weed invasion, altered fire regimes, recreational activities 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. Surveys for *Caladenia luteola* have been undertaken by members of the Western Australian Native Orchid Study and Conservation Group (WANOSCG) and Parks and Wildlife between 1985 and 2015 with two new populations found.
2. Land managers have been notified of the location and threatened status of the *Caladenia luteola*.
3. Parks and Wildlife with assistance from the Southern Wheatbelt Threatened Flora Recovery Team (SWTFRT) is overseeing the implementation of this plan.

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

Criteria for recovery success: The plan will be deemed a success if one or more of the following take place over the term of the plan.

- No important populations have been lost and the number of mature plants within these populations has remained within a 15% range or has increased by >15% from 73 to 84 or more or
- New populations have been found, increasing the number of known populations from three to four or more with no net loss of mature plants or
- The area of occupancy has increased by >15% over the term of the plan with no net loss of mature plants.

Criteria for recovery failure: The plan will be deemed a failure if one or more of the following take place over the term of the plan.

- Important populations have been lost or
- The number of mature plants has decreased by >15% from 73 to 62 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. Ensure long-term protection of habitat
3. Monitor populations
4. Install protective cages or fencing
5. Undertake weed control
6. Install DRF markers
7. Collect and store seed and fungal isolates
8. Undertake surveys
9. Remove rubbish
10. Develop and implement a fire management strategy
11. Obtain biological and ecological information
12. Develop and implement a translocation proposal
13. Liaise with land managers and Aboriginal communities
14. Map habitat critical to the survival of *Caladenia luteola*
15. Promote awareness
16. Review this plan and assess the need for further recovery actions

1. Background

History

The first collection of *Caladenia luteola* was made west of Woodanilling in October 1986. This population has since declined from over 50 plants when first discovered to none seen in 2015. In 2009 a second population comprising 50 mature plants (70 plants seen in 2015) was discovered east of Katanning and in 2014 a third population comprising 2 plants was located west of Woodanilling. The species was named in 2001 (Hopper and Brown 2001).

Description

Growing to 35cm high, *Caladenia luteola* has single hairy leaf and one to three pale yellow flowers to 9cm across. The species is distinguished from the related *C. caesarea* by its paler yellow to cream flowers and distinctive labellum with narrower less conspicuous stripes and markings. The species is named from the Latin *luteolus* (pale yellow), alluding to its flower colour (Hopper and Brown 2001).

Illustrations and/or further information

Brown, A.P., Dixon, K., French, C. and Brockman, G. (2013) Field Guide to the Orchids of Western Australia. Simon Nevill Publications, Floreat, Western Australia; Brown, A.P., Dundas, P., Dixon, K. and Hopper, S. (2008) *Orchids of Western Australia*. University of Western Australia Press, Crawley, Western Australia; Western Australian Herbarium (1998–) *FloraBase— Western Australian Flora*. Department of Parks and Wildlife. http://florabase.dpaw.wa.gov.au/.

Distribution and habitat

Caladenia luteola is endemic to Western Australia where it is known from three populations approximately 45km apart, two west of Woodanilling (Populations 1 and 7) and one east-south-east of Katanning (Population 6). Plants in Populations 1 and 7 grow among dense herbs and grasses in a woodland of *Eucalyptus wandoo, Acacia acuminata* and *Allocasuarina huegeliana* (Brown et al. 2008; Hopper and Brown 2001). Plants in Population 6 grow in yellow brown gravelly sand/loam in open *Eucalyptus longicornis* woodland.

Note: populations 2-5 are now known to be the recently described *Caladenia straminichila*.

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

TPFL population number & location*	Parks and Wildlife Region	Shire	Vesting	Purpose	Manager
1a. W of Woodanilling	Wheatbelt	Woodanilling	Unvested	Government requirements	DOP
1b. W of Woodanilling	Wheatbelt	Woodanilling	LGA	Road reserve	Shire of Woodanilling
6a. ESE Katanning	Wheatbelt	Katanning	Water Corporation	Water reserve	Water Corporation
6b. ESE Katanning	Wheatbelt	Katanning	Water Corporation	Water reserve	Water Corporation
6c. ESE Katanning	Wheatbelt	Katanning	Private property		Landowners
7. W of Woodanilling	Wheatbelt	Woodanilling	Private property	Unknown	Landowners

* Populations 2–5 are now considered a different species.

Biology and ecology

Caladenia luteola flowers in September and October with fruit set between mid-October and November. The number of flowering plants is lower in years of poor rainfall. Based on the biology of closely related species of *Caladenia*, it is likely that *C. luteola* attracts nectar foraging insects but does not provide nectar (Phillips *et al*. 2009).

While clonality has not been examined in *Caladenia luteola*, it is likely to occasionally be clonal based on its clumping habit. The species does not require fire to flower. Germination requires the presence of mycorrhizal fungi and based on observations of related *Caladenia* species it is likely that *C. luteola* partners exclusively with a specific mycorrhizal fungus. High specificity for a specialized rare fungus may explain the orchid's rarity (Swarts *et al*. 2010).

Conservation status

Caladenia luteola was listed as specially protected under the Western Australian *Wildlife Conservation Act 1950* on 17 February 2012. It is ranked as Critically Endangered (CR) in Western Australia under International Union for Conservation of Nature (IUCN 2001) criteria B1ab(iii,v)+2ab(iii,v); C2a(i) due to its extent of occurrence being less than 100km^2; populations being severely fragmented; there being a continuing decline in the area, extent and/or quality of habitat and the number of individuals; the total population size estimated to number fewer than 250 mature individuals; and no subpopulation estimated to contain more than 50 mature individuals. The species is not listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Threats

- **Hydrological changes.** Changed hydrology has the potential to adversely alter the orchids' habitat.

- **Poor recruitment and declining population size.** In the area containing Population 1, 50 flowering plants were found during a survey in September 1986 but no plants were found in September 2015.
- **Grazing by kangaroos and rabbits.** Although grazing does not appear to kill plants it reduces the reproductive output of the species when flowers or fruiting capsules are eaten.
- **Road maintenance.** Threats to Population 7 and Subpopulation 1b include grading, chemical spraying, construction of drainage channels and the mowing of roadside vegetation.
- **Small population size.** *Caladenia luteola* is known from just three populations comprising 72 mature plants (note 70 of these are found in a single population) and the likelihood of the species declining due to chance demographic or environmental events is high.
- **Habitat degradation due to weed invasion.** The habitat of both populations is weedy. Weeds suppress early plant growth by competing for soil moisture, nutrients and light. They also increase the fire hazard due to high fuel loads.
- **Altered fire regimes.** Fires that occur during winter and spring when the leaf is present and the new tuber is being formed may kill plants.
- **Recreational activities.** Rubbish dumping, firewood removal, gravel removal and vehicle access are minor threats to Population 6.
- **Future mining operations.** A mineral extraction lease covers the site of Population 6 and future mining has the potential to severely impact the habitat.
- **Drought.** This is a threat to the species as habitat is drying and fewer plants are flowering each year.
- **Land vesting.** Whilst the species is protected due to its listing as Declared Rare Flora (DRF), no populations are in Conservation Estate.

The intent of this plan is to identify actions that will mitigate immediate threats to *Caladenia luteola*. 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. of plants	Current condition (habitat)	Threats
1a. W of Woodanilling	C class reserve	1986 50 1992 8 2011 6 2012 1 (1) 2013 1 2014 0 2015 0	Good to degraded (some areas very weedy)	Grazing, hydrological changes, weeds, fire, small population size
1b. W of Woodanilling	Road reserve	1986 2 2011 0 2013 0 2015 0	Good to degraded (some areas very weedy)	Grazing, hydrological changes, road maintenance, weeds, fire, small population size
6a. ESE Katanning	Water reserve	2009 50 2011 70 2012 86 2013 86	Excellent	Weeds, hydrological changes, fire, recreational activities, mining, grazing
6b. ESE Katanning	Water reserve	2011 146 2012 95 2013 95 2014 12 2015 70*	Very good	Weeds, hydrological changes, fire, mining, grazing
6c. ESE Katanning	Private	2012 32	Healthy	Fence maintenance, weeds,

	property			fire
7. W of Woodanilling	Private property	2014 2	Healthy	Unknown

Populations in **bold text** are considered to be important populations. * = total for subpopulations 6a–c combined; Note: Populations 2–5 have been re-determined as a different species; ( ) = number of seedlings.

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 *Caladenia luteola* may require assessment. Actions that could result in any of the following may potentially result in a significant impact on 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

Caladenia luteola is ranked as CR in Western Australia and it is considered that all known habitat for wild populations is habitat critical to the survival of the species, and wild populations are important populations. Habitat critical to the survival of *Caladenia luteola* 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 suitable 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 *Caladenia luteola* will also improve the status of associated native vegetation. The species is not associated with any Threatened Ecological Communities (TECs), Priority Ecological Communities (PECs) or other Threatened species.

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 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 no sites of Aboriginal significance in the area of populations of *Caladenia luteola*. 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. Opportunity for future Aboriginal involvement in the implementation of the recovery 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 recovery plan may result in some social and economic impact through restrictions imposed on the management of land on which *Caladenia luteola* occurs, including maintenance of road infrastructure and future development and asset protection.

Affected interests

The implementation of this plan has some implications for the Shire of Woodanilling, the Water Corporation and private property owners, particularly as populations occur on land not specifically managed for conservation. Recovery actions refer to continued liaison between affected stakeholders.

Evaluation of the plan's performance

Parks and Wildlife, with assistance from the Southern Wheatbelt Threatened Flora Recovery Team (SWTFRT), 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 extant populations to ensure the long-term conservation of the species in the wild.

Recovery criteria

Criteria for recovery success: The plan will be deemed a success if one or more of the following take place over the term of the plan.

- No important populations have been lost and the number of mature plants within those populations has remained within a 15% range or has increased by >15% from 73 to 84 or more or
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- Important populations have been lost or
- The number of mature plants has decreased by >15% from 73 to 62 or less or
- The area of occupancy has decreased by >15% with a loss of mature plants.

3. Recovery actions

Existing recovery actions

Parks and Wildlife with assistance from the SWTFRT are overseeing the implementation of recovery actions for *Caladenia luteola*.

Land managers have been made aware of *Caladenia luteola* and its locations. Notifications detail the current DRF status of the species and the associated legal obligations in regards to its protection.

Surveys for *Caladenia luteola* were undertaken by members of the Western Australian Native Orchid Study and Conservation Group (WANOSCG) and staff from Parks and Wildlife between 1985 and 2015 with two new populations found.

Future recovery actions

The following recovery actions are listed 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 SWTFRT will oversee the implementation of recovery actions for *Caladenia luteola* and will include information on progress in annual reports.

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

2. Ensure long-term protection of habitat

Caladenia luteola is not represented in the conservation reserve system and Parks and Wildlife will investigate ways and means of improving the security of its habitat. This may include vesting change, acquiring land or developing management plans in consultation with land managers.

Action:	Ensure long-term protection of habitat
Responsibility:	Parks and Wildlife (Wheatbelt Region, Species and Communities Branch (SCB), Nature Conservation Covenant Program and Land Unit), Department of Planning (DOP) and Department of Mines and Petroleum (DMP)
Cost:	$3,000 per year

3. Monitor populations

Monitoring of *Caladenia luteola* 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 (inundation and drought). Specific monitoring of hydrology and activities relating to research into the biology and ecology of *Caladenia luteola* are included in other recovery actions detailed below.

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

4. Install protective cages or fencing

To protect *Caladenia luteola* plants from grazing, caging or fencing may be required. The need for this will be determined during monitoring.

Action:	Install protective cages or fencing
Responsibility:	Parks and Wildlife (Wheatbelt Region)
Cost:	$15,000 in years 1, 3 and 5

5. Undertake weed control

Weeds are a threat to all populations of *Caladenia luteola* and the following actions are recommended:

1. Determine which weeds are present and map them.
2. Control invasive weeds by hand removal and/or spot spraying when they first emerge.
3. Monitor the success of the treatment on weed death, and the tolerance of *Caladenia luteola* and associated native plant species.
4. Report on the method and success of the treatment.
5. Revegetate with site-specific species (in autumn) to suppress weeds.

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

6. Install DRF markers

DRF markers are required at Subpopulation 6b to alert road maintenance workers and reduce the risk of accidental impact to the site.

Action:	Install DRF markers
Responsibility:	Parks and Wildlife (Wheatbelt Region)
Cost:	$4,000 in year 1

7. Collect and store seed and fungal isolates

To guard against the extinction of natural populations of *Caladenia luteola* it is recommended that seed along with samples of the orchid's symbiotic fungus be collected and stored at the Botanic Gardens and Parks Authority (BGPA). 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 and fungal isolates
Responsibility:	Parks and Wildlife (Wheatbelt Region) and BGPA
Cost:	$10,000 per year

8. Undertake surveys

Surveys should be undertaken in areas of potentially suitable habitat. Where feasible, volunteers from WANOSCG, landcare groups, wildflower societies and naturalist clubs will be encouraged to participate. 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), with assistance from the SWTFRT and WANOSCG
Cost:	$10,000 per year

9. Remove rubbish

Rubbish dumped in the area of Population 6 will be removed during summer to avoid spreading disease. Signs to advise the public about the illegality of rubbish dumping will be erected where needed.

Action:	Remove rubbish
Responsibility:	Parks and Wildlife (Wheatbelt Region) and Shire of Katanning
Cost:	$10,000 in year 1

10. Develop and implement a fire management strategy

Caladenia luteola is thought to be killed by fire if it occurs while the plant is in active growth. It is important therefore that a fire regime with appropriate fire frequency, intensity and seasonality be applied to areas occupied by the species. A fire management strategy will be developed in consultation with land managers, that includes recommendations on fire frequency, intensity and seasonality, and strategies for reacting to and preventing wildfire. All data relating to fire response of the species will be entered into the Threatened Priority Flora (TPFL) fire response database is recommended.

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

11. Obtain biological and ecological information

It is recommended that research on the biology and ecology of *Caladenia luteola* include:

1. Identification of the fungal symbiont associated with *Caladenia luteola* and its distribution in the wild.
2. Identification of pollinators and their habitat requirements.
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.

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

12. Develop and implement a translocation proposal

Translocations may be required for the long term conservation of *Caladenia luteola* if natural populations decline.

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. Translocation is not an alternative to *in situ* conservation and is not a suitable ameliorative, compensatory, or mitigating measure for development and should be considered as a last resort when all other options are deemed inappropriate or have failed (Vallee *et al*. 2004).

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 a translocation proposal
Responsibility:	Parks and Wildlife (Science and Conservation Division, Wheatbelt Region) and BGPA
Cost:	$42,000 in years 1 and 2; and $26,500 in subsequent years as required

13. Liaise with land managers and Aboriginal communities

Staff from Parks and Wildlife Wheatbelt Region will liaise with land managers to ensure that populations of *Caladenia luteola* 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 implimenting this plan.

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

14. Map habitat critical to the survival of *Caladenia luteola*

Although habitat critical to the survival of *Caladenia luteola* is alluded to in Section 1, it has not yet been mapped. If additional populations are located, habitat critical to their survival will also be determined and mapped.

Action:	Map habitat critical to the survival of *Caladenia luteola*
Responsibility:	Parks and Wildlife (SCB and Wheatbelt Region)
Cost:	$6,000 in year 2

15. Promote awareness

The importance of biodiversity conservation and the protection of *Caladenia luteola* will be promoted to the public. Formal links with local naturalist groups and interested individuals will also be encouraged.

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

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

If *Caladenia luteola* is still ranked CR 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 and Wheatbelt Region)
Cost:	$6,000 in year 5

Table 3. Summary of recovery actions

Recovery action	Priority	Responsibility	Completion date
Coordinate recovery actions	High	Parks and Wildlife (Wheatbelt Region), with assistance from the SWTFRT	Ongoing
Ensure long-term protection of habitat	High	Parks and Wildlife (Wheatbelt Region, SCB Nature Conservation Covenant Program and Land Unit), DOP and DMP	Ongoing
Monitor populations	High	Parks and Wildlife (Wheatbelt Region), with assistance from the SWTFRT and WANOSCG	Ongoing
Install protective cages or fencing where required	High	Parks and Wildlife (Wheatbelt Region)	2021
Undertake weed control	High	Parks and Wildlife (Wheatbelt Region) and Shire of Woodanilling	Ongoing
Install DRF markers	High	Parks and Wildlife (Wheatbelt Region)	2017
Collect and store seed and fungal isolates	High	Parks and Wildlife (Wheatbelt Region) and BGPA	2021
Undertake surveys	High	Parks and Wildlife (Wheatbelt Region), with	Ongoing

		assistance from the SWTFRT and WANOSCG	
Remove rubbish	High	Parks and Wildlife (Wheatbelt Region) and Shire of Katanning	2017
Develop and implement a fire management strategy	High	Parks and Wildlife (Wheatbelt Region)	Developed by 2017 with implementation ongoing
Obtain biological and ecological information	High	Parks and Wildlife (Science and Conservation Division, Wheatbelt Region) and BGPA	2019
Develop and implement a translocation proposal	High	Parks and Wildlife (Science and Conservation Division, Wheatbelt Region) and BGPA	2021
Liaise with land managers and Aboriginal communities	Medium	Parks and Wildlife (Wheatbelt Region)	Ongoing
Map habitat critical to the survival of *Caladenia luteola*	Medium	Parks and Wildlife (SCB and Wheatbelt Region)	2018
Promote awareness	Medium	Parks and Wildlife (Wheatbelt Region, SCB and PICA), with assistance from the SWTFRT	Ongoing
Review this plan and assess the need for further recovery actions	Medium	Parks and Wildlife (SCB and Wheatbelt Region)	2021

This plan will operate from July 2016 to June 2021 but will remain in force until withdrawn or replaced. If *Caladenia luteola* is still ranked CR after five years, the need for further recovery actions will be determined and a revised plan prepared if necessary.

5. References

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6. Taxonomic description

Caladenia luteola

Hopper, S.D. and Brown, A.P. (2001) Contributions to Western Australian Orchidology: 2. New taxa and circumscriptions in *Caladenia*. *Nuytsia* 14 (1 & 2): 27–307.

Plant solitary or in dense clumps. *Leaf* erect, linear, 8–20cm x 3–5mm, pale green, basal third usually irregularly blotched with red-purple. *Scape* 15–30cm tall. *Flowers* 1 or 2, *c*. 6–9cm across, lemon yellow to cream with pale to dark maroon to brown stripes and markings; floral odour faint, like burning metal. *Sepals and petals* stiffly held, linear-lanceolate in basal 1/6–1/5, then abruptly narrowing to a dark maroon to brown densely glandular long-acuminate filamentous apex lacking a tumescent osmophore; glandular hairs elongate, cylindrical. *Dorsal sepal* erect and slightly incurved, 4.5–7cm x 2–3mm. *Lateral sepals* spreading basally then obliquely downcurved, 4.5–7.5cm x 2.5–5mm. *Petals* obliquely ascending near base, then downcurved, 4.5–6.5cm x 2.5–3.5mm. *Labellum* lemon-yellow to cream with dark maroon to brown stripes and markings to the apex, stiffly articulate on a claw *c*. 1.5–2mm wide; lamina triangular to rhomboidal in outline when flattened, 10–20 x 8–11mm, obscurely 3–lobed, erect with entire margins in basal third, horizontal in middle third, apical third sharply recurved, margins at widest point moderately curved upwards and terminated with horizontal to slightly downcurved calli, distal margins with widely spaced serrate to dentate pale yellow with a dark maroon to brown tip, calli decrescent towards the apex. *Lamina calli* in 6–11 pairs in 2 rows extending at least half the length of the labellum, cream, glistening on top, anvil-shaped, the longest *c*. 1mm tall, slightly decrescent distally, elongate-oval. *Column c*. 13–15 x 3–6mm, narrowly winged, creamy yellow to yellow with brown stripes and blotches, sparsely hirsute with dark glandular trichomes especially on the central ridge. *Anther c*. 2–3 x 2–3mm, yellow or greenish-yellow. *Pollinia c*. 2mm long, yellow. *Stigma c*. 3mm wide. *Capsule* not seen.