



Department of  
Parks and Wildlife



Interim Recovery Plan No. **360**

# Pyramid Mulla-mulla (*Ptilotus pyramidatus*)

**Interim Recovery Plan**  
**2016–2021**



**Department of Parks and Wildlife, Western Australia**  
February 2016

## List of Acronyms

The following acronyms are used in this plan:

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 (also known as Threatened Flora)
EN	Endangered
EPBC	Environment Protection and Biodiversity Conservation
FESA	Fire and Emergency Services
GBW	Greater Brixton Street Wetlands
IBRA	Interim Biogeographic Regionalisation for Australia
IRP	Interim Recovery Plan
IUCN	International Union for Conservation of Nature
NRM	Natural Resource Management
PEC	Priority Ecological Community
SCB	Species and Communities Branch
SRTFCRT	Swan Region Threatened Flora and Communities Recovery Team
SWALSC	South West Aboriginal Land and Sea Council
TEC	Threatened Ecological Community
TFSC	Threatened Flora Seed Centre
TPFL	Threatened Priority Flora Database
UNEP-WCMC	United Nations Environment Program World Conservation Monitoring Centre
VU	Vulnerable
WA	Western Australia
WAPC	Western Australian Planning Commission

# 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 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) flora, within one year of endorsement of that rank by the Minister.

This plan will operate from February 2016 to January 2021 but will remain in force until withdrawn or replaced. It is intended that, if *Ptilotus pyramidatus* is still ranked as CR in Western Australia, this plan will be reviewed after five years and the need for further recovery actions assessed.

This plan was given Department of Parks and Wildlife regional approval on 29<sup>th</sup> January 2016 and was approved by the Director of Science and Conservation on 8<sup>th</sup> February 2016. The provision of funds identified in this plan is dependent on budgetary and other constraints affecting Parks and Wildlife, as well as the need to address other priorities.

Information in this plan was accurate at February 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:

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Robert Davis	Botanist, Parks and Wildlife Science and Conservation Division
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Anne Harris	Flora Conservation Officer, Parks and Wildlife Swan Coastal District
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 departmental staff for assistance in developing this plan.

Cover photograph by Andrew Crawford.

**Citation:** This plan should be cited as: Department of Parks and Wildlife (2016) Pyramid Mulla-mulla (*Ptilotus pyramidatus*) Interim Recovery Plan 2016–2021. Interim Recovery Plan No. 360. Department of Parks and Wildlife, Western Australia.

# Summary

<b>Scientific name:</b>	<i>Ptilotus pyramidatus</i>	<b>Common name:</b>	Pyramid Mulla-mulla
<b>Family:</b>	Amaranthaceae	<b>Flowering period:</b>	early October
<b>DPaW region:</b>	Swan	<b>DPaW district:</b>	Swan Coastal
<b>Shire:</b>	City of Gosnells	<b>NRM region:</b>	Swan
<b>IBRA region:</b>	Swan Coastal Plain	<b>Recovery team:</b>	SRTFCRT
<b>IBRA subregion:</b>	Perth SWA02		

**Distribution and habitat:** *Ptilotus pyramidatus* is known from a single location near Kenwick where it grows in seasonally inundated habitat of *Melaleuca acutifolia*, *Verticordia plumosa* var. *brachyphylla*, *Hypocalymma angustifolium*, *Meeboldina cana*, *Chorizandra enodis*, rushes, sedges and species-rich native annual herbs and geophytes (Davis and Taus 2011).

**Habitat critical to the survival of the species, and important populations:** It is considered that all known habitat for *Ptilotus pyramidatus* is critical to its survival, and that the population is an important population. Habitat critical to the survival of *Ptilotus pyramidatus* includes the area of occupancy of the population, areas of similar habitat surrounding the population (this providing potential habitat for population expansion and for pollinators), 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:** *Ptilotus pyramidatus* is specially protected under the Western Australian *Wildlife Conservation Act 1950* and is ranked as Critically Endangered (CR) in Western Australia under International Union for Conservation of Nature (IUCN 2001) criteria B1ab(iii)+B2ab(iii); D due to its extent of occurrence estimated to be less than 100 km<sup>2</sup>; its area of occupancy estimated to be less than 10 km<sup>2</sup>; it being known to exist at only a single location; there being a continuing decline in the quality of habitat and its population size estimated to number fewer than 50 mature individuals. The species is listed as CR under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

**Threats:** Threats to the species include weeds, recreational activities, hydrological changes, fire, rabbits, insecure land tenure, changes to surrounding land uses, poor genetic diversity and dieback disease (*Phytophthora cinnamomi*).

**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. Land owners and land managers have been made aware of this species and its location and their legal obligations in regards to its protection.
2. The Greater Brixton Street Wetlands (GBW) and about 400 hectares of adjoining land was searched with no other populations of *Ptilotus pyramidatus* found.
3. A Fire Management Strategy was developed for the GBW in January 2002 by Parks and Wildlife staff in consultation with relevant stakeholders including Friends Groups, Fire and Emergency Services (FESA) and City of Gosnells.
4. The City of Gosnells has undertaken two years surface and groundwater monitoring (Endemic Environmental Consultants 2011).

**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

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

- New populations have been found, increasing the number of known populations from one to two or more over the term of the plan; or
- The area of occupancy has increased by >30% over the term of the plan.

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

- The number of populations has decreased from one to none over the term of the plan; or
- The area of occupancy has decreased by 30% or more over the term of the plan.

### Recovery actions

1. Coordinate recovery actions
2. Monitor population
3. Ensure long-term protection of habitat
4. Maintain fencing
5. Undertake surveys
6. Confirm clonality in *Ptilotus pyramidatus*
7. Obtain biological and ecological information
8. Undertake weed control
9. Collect and store seed
10. Update the GBW fire management strategy
11. Undertake regeneration trials
12. Undertake hydrological monitoring

13. Undertake rabbit control
14. Remove rubbish
15. Develop and implement a translocation proposal
16. Determine susceptibility to *Phytophthora cinnamomi*
17. Maintain disease hygiene
18. Liaise with land managers and Aboriginal communities
19. Promote awareness
20. Map habitat critical to the survival of *Ptilotus pyramidatus*
21. Review this plan and assess the need for further recovery actions

# 1. Background

## History

*Ptilotus pyramidatus* was first collected by James Drummond in 1845 and, as it had not been seen for 146 years, was listed as Presumed Extinct in May 1991.

The species was re-discovered by Cate Tauss in 2010 during a flora and vegetation survey of the Greater Brixton Street Wetlands (GBW) conducted for the V & C Semeniuk Research Group. Greater Brixton Street Wetlands is a Bush Forever site (Number 387 - State of Western Australia 2000) and a Conservation Category Wetland, comprising of about 120 hectares of remnant vegetation. It is renowned as one of the most floristically rich areas on the Swan Coastal Plain. Most similar habitat to GBW has been cleared for farming and housing (Davis and Tauss 2011). At that time the plant was thought to represent an undescribed species which was later named *Ptilotus christineae* (Davis and Tauss 2011).

While curating the *Ptilotus* collection at the Western Australian Herbarium, Rob Davis came across a small line drawing of *P. pyramidatus*. It was clear from the habit depicted that it represented an earlier name for the recently published *P. christineae*. Subsequent examination of type material confirmed that *P. pyramidatus* was conspecific with *P. christineae* and the latter name was reduced to synonymy. The specimens which formed the basis for the description of *P. christineae*, represent the first collection of *P. pyramidatus* for more than 160 years (Davis 2012).

*Ptilotus pyramidatus* is currently known from one population comprising 112 genets with an extrapolated count of over 9,937 ramets within an area of occupation of 0.6 hectares, or over a 1.1 hectare area. The species is thought to be clonal and so may only consist of one or a few genetically different plants.

## Description

*Ptilotus pyramidatus* is an erect, perennial herb to 8cm high which forms annual shoots from slender, subterranean rhizomes. Its flowers are shortly pedicellate and white with pink margins (Davis and Tauss 2011). *Ptilotus pyramidatus* is distinguished from related species found in the Swan Coastal Plain by the combination of its slender rhizome, spatulate leaves, erect flowering shoot, five fertile stamens and wetland habitat (Davis and Tauss 2011).

## Illustrations and/or further information

Davis, R. W. (2012) Short Communication: *Ptilotus christineae* is synonymous with the previously Presumed Extinct taxon *P. pyramidatus*. *Nuytsia* 22(5): 335; Davis, R.W. and Tauss, C. (2011) A new and rare species of *Ptilotus* (Amaranthaceae) from a suburban wetland of the eastern Swan Coastal Plain, Western Australia. *Nuytsia* 21(3): 97–102; Western Australian Herbarium (1998–) *FloraBase—the Western Australian Flora*. Department of Parks and Wildlife. <http://florabase.dpaw.wa.gov.au/>.

## Distribution and habitat

*Ptilotus pyramidatus* is known from a single population in a seasonally inundated flat near Kenwick (V & C Semeniuk Research Group 2001). At a local scale, the hydrology and stratigraphy of the wetlands is complex with small, confined (artesian) aquifers and shallow aquitard layers of ferricrete or calcareous muds or clays that perch rainwater for varying lengths of time (Davis and Tauss 2011).

Species associated with *Ptilotus pyramidatus* include *Acacia lasiocarpa* var. *lasiocarpa*, *Borya scirpoidea*, *Bulbine semibarbata*, *Burchardia multiflora*, *Centrolepis aristata*, *Chorizandra enodis*, *Diuris laxiflora*, *Drosera heterophylla*, *D. menziesii* subsp. *menziesii*, *D. tubaestylis*, *Hypocalymma angustifolium*, *Meeboldina cana*, *Melaleuca acutifolia*, *Pheladenia deformis*, *Pogonolepis stricta*, *Ptilotus manglesii*, *Sowerbaea laxiflora*, *Stylidium divaricatum*, *Tribonanthes australis* and *Verticordia plumosa* var. *brachyphylla* (Davis and Tauss 2011).

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

TPFL population number & location	DPaW district	Shire	Vesting	Purpose	Manager
1. Kenwick	Swan Coastal	City of Gosnells	Private property	Freehold	WAPC

## Biology and ecology

*Ptilotus pyramidatus* is a clump-forming rhizomatous species. It is thought that the "clumps" are interconnected by below ground rhizomes and, if so, the whole population may comprise just one or few genetically distinct plants. The species resprouts in late June, grows through Winter and early Spring and flowers in early October, a time when many other annual and geophytic herbs at the site are desiccated and the soil surface is dry (Davis and Tauss 2011).

## Conservation status

*Ptilotus pyramidatus* is specially protected under the Western Australian *Wildlife Conservation Act 1950* and is ranked as Critically Endangered (CR) in Western Australia under International Union for Conservation of Nature (IUCN 2001) criteria B1 B2ab(iii)+B2ab(iii); D due to its extent of occurrence estimated to be less than 100 km<sup>2</sup>; its area of occupancy estimated to be less than 10 km<sup>2</sup>; it being known to exist at only a single location; there being a continuing decline in the quality of habitat and its population size estimated to number fewer than 50 mature individuals. The species is listed as CR under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

## Threats

- **Weeds.** Weeds, which include include *Sparaxis bulbifera*, *Moraea flaccida* and *Hyparrhenia hirta*, are a major threat to *Ptilotus pyramidatus*.
- **Recreational activities.** The habitat of *Ptilotus pyramidatus* is frequented by off-road vehicles and horse and motor bike riders. Waste is also dumped at the site. Although the area is fenced, the fence is frequently breached.

- **Hydrological changes.** A study by V & C Semeniuk Research Group (2001) found the hydrology of GBW had been altered by local drains, tracks and possibly land uses in the broader catchment, resulting in the area no longer being subject to natural, regular flooding.
- **Inappropriate fire regimes.** It is thought the species regenerates from rhizomes following fire. However, there may be negative post-fire effects due to habitat modification and weed invasion. A Fire Management Strategy developed for the GBW in January 2002 will be updated.
- **Rabbits (*Oryctolagus cuniculus*).** Grazing by rabbits is a direct threat and weeds may increase following soil disturbance, nutrient addition and the introduction of weed seeds.
- **Change to surrounding land uses.** Land surrounding the GBW is zoned rural but is under review with a possibility of re-zoning as industrial.
- **Poor genetic diversity.** It is thought that known plants comprise one or a few clones.
- **Dieback disease.** Dieback (*Phytophthora cinnamomi*) may kill plants or degrade associated habitat. Note: it is not known if *Ptilotus pyramidatus* is directly susceptible to dieback disease and testing is required.

The intent of this plan is to provide actions that will mitigate immediate threats to *Ptilotus pyramidatus*. Although climate change and drought may have a long-term effect on the species, direct actions to prevent the impact of climate change and drought are beyond the scope of this plan.

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

TPFL population no & location	Land status	Year / no. of plants	Current condition	Threats
<b>1. Kenwick</b>	WAPC	2012 3 clumps* 2013 112 genets** (9,937 ramets). Area of occupancy 0.6 hectares)	Moderate	Weeds, hydrological changes, recreational activities, fire, rabbits

Note: The single known population (**bold text**) is considered to be an important population; \*as *Ptilotus pyramidatus* is rhizomatous it is thought that "clumps" are interconnected and comprise of one or a few individual plants. \*\*a genet is a group of genetically identical individuals originating from a single ancestor. Ramet = individual in such a population.

## 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 *Ptilotus pyramidatus* 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 *Ptilotus pyramidatus* and important populations

*Ptilotus pyramidatus* is ranked as CR in Western Australia and it is considered that all known habitat for the wild population is critical to the survival of the species, and that the wild population is an important population. Habitat critical to the survival of *P. pyramidatus* includes the habitat occupied by the population, areas of similar habitat surrounding the population (these providing potential habitat for population expansion and for pollinators), 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 *Ptilotus pyramidatus* will also benefit the two Declared Rare flora (DRF) and seven Priority flora listed in the table below:

**Table 3. Conservation-listed flora species occurring within 500m of *Ptilotus pyramidatus***

Species name	Conservation status (WA)	Conservation status (EPBC Act)
<i>Eremophila glabra</i> subsp. <i>chlorella</i>	DRF (CR)	-
<i>Lepidosperma rostratum</i>	DRF (EN)	EN
<i>Schoenus pennisetis</i>	Priority 1	-
<i>Comesperma rhadinocarpum</i>	Priority 2	-
<i>Eryngium</i> sp. <i>subdecumbens</i> (G.J. Keighery 5390)	Priority 3	-
<i>Aponogeton hexatepalus</i>	Priority 4	-
<i>Grevillea thelemanniana</i> subsp. <i>thelemanniana</i>	Priority 4	-
<i>Hydrocotyle lemnoides</i>	Priority 4	-
<i>Verticordia lindleyi</i> subsp. <i>lindleyi</i>	Priority 4	-

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

Although not yet confirmed, *Ptilotus pyramidatus* may occur in the "Herb rich saline shrublands in clay pans (Swan Coastal Plain Community type 7)" or "Herb rich shrublands in clay pans (Swan Coastal Plain Community type 8)" Threatened Ecological Communities (TECs). Both TECs are listed as Vulnerable (VU) in Western Australia and CR under the EPBC Act.

Two rare and two Priority fauna species listed in the table below will benefit from the management of *Ptilotus pyramidatus*.

Species name	Conservation status (WA)	Conservation status (EPBC Act)
<i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo)	Threatened (EN)	EN
<i>Leioproctus douglasiellus</i> (a bee)	Threatened (EN)	CR
<i>Leioproctus bilobatus</i> (a bee)	Priority 2	-
<i>Isoodon obesulus fusciventer</i> (Quenda)	Priority 5	-

## 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. *Ptilotus pyramidatus* 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. Brixton Street and associated wetlands were listed in the Australian Register of Significant Wetlands in November 2000.

## Aboriginal consultation

A search of the Department of Aboriginal Affairs (DAA) Aboriginal Heritage Sites Register revealed no sites of Aboriginal significance in the general area of populations of *Ptilotus pyramidatus*. 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 the management of 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

*Ptilotus pyramidatus* occurs on land managed by the WAPC for conservation and will be transferred to Parks and Wildlife within the next 12 months for gazettal as a Nature Reserve. In the meantime some social and economic impacts may occur through the implementation of recovery actions (controlling weeds and rabbits, fencing maintenance) and restrictions imposed on the management of the land, including maintenance of road infrastructure.

## Affected interests

*Ptilotus pyramidatus* occurs on land that is currently being managed by the WAPC for conservation and will be transferred to Parks and Wildlife within the next 12 months for gazettal as a Nature Reserve.

## Evaluation of the plan's performance

Parks and Wildlife with assistance from the Swan Region Threatened Flora and Communities Recovery Team (SRTFCRT), 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

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

- New populations have been found, increasing the number of known populations from one to two or more over the term of the plan; or
- The area of occupancy has increased by >30% over the term of the plan.

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

- The number of populations has decreased from one to none over the term of the plan; or
- The area of occupancy has decreased by 30% or more over the term of the plan.

## 3. Recovery actions

### Existing recovery actions

Parks and Wildlife, with the assistance of the SRTFCRT, is overseeing the implementation of recovery actions for *Ptilotus pyramidatus*.

The GBW and about 400 hectares of adjoining rural land was searched during several intensive, multi-season surveys, with no other occurrences of *Ptilotus pyramidatus* found.

A Fire Management Strategy was developed for the GBW by Parks and Wildlife staff, in consultation with Friends Groups, Fire and Emergency Services (FESA) and City of Gosnells in January 2002. The plan's aim is to help maintain the high conservation values of the site by controlling fire frequency and using fire control methods that promote bushland regeneration.

The City of Gosnells has undertaken two years monitoring of surface and groundwater to the northwest and northeast of the GBW (Endemic Environmental Consultants 2011).

## 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 SRTFCRT will coordinate the implementation of this plan and will include information on progress in annual reports.

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

### 2. Monitor population

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

<b>Action:</b>	Monitor population
<b>Responsibility:</b>	Parks and Wildlife (Swan Coastal District), with assistance from the SRTFCRT
<b>Cost:</b>	\$1,000 per year

### 3. Ensure long-term protection of habitat

Parks and Wildlife will seek to have habitat containing *Ptilotus pyramidatus* declared a conservation reserve.

<b>Action:</b>	Ensure long-term protection of habitat
<b>Responsibility:</b>	Parks and Wildlife (Swan Region, SCB) Nature Conservation Covenant Program and Land Unit)
<b>Cost:</b>	\$4,000 in years 1–3

## 4. Maintain fencing

The fence surrounding *Ptilotus pyramidatus* requires maintenance to prevent access. Locks and chains should be replaced and breaches in the fence repaired.

<b>Action:</b>	Maintain fencing
<b>Responsibility:</b>	Parks and Wildlife (Swan Coastal District), WAPC
<b>Cost:</b>	\$5,000 per year

## 5. Undertake surveys

Surveys should be undertaken in areas of potentially suitable habitat with all surveyed areas recorded and the presence or absence of *Ptilotus pyramidatus* documented to improve survey efficiency and prevent duplication of effort. Where feasible, volunteers will be encouraged to participate.

<b>Action:</b>	Undertake surveys
<b>Responsibility:</b>	Parks and Wildlife (Swan Coastal District), with assistance from the SRTFCRT
<b>Cost:</b>	\$1,000 per year

## 6. Confirm clonality in *Ptilotus pyramidatus*

Genetic research is required to confirm the extent of clonality in *Ptilotus pyramidatus*.

<b>Action:</b>	Confirm clonality in <i>Ptilotus pyramidatus</i>
<b>Responsibility:</b>	Parks and Wildlife (Science and Conservation Division, Swan Coastal District)
<b>Cost:</b>	\$10,000 in years 1 and 2

## 7. Obtain biological and ecological information

Research on the biology and ecology of *Ptilotus pyramidatus* should 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 dieback and the effectiveness of control techniques.
8. The impact of changes in hydrology.

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

## 8. Undertake weed control

Weeds are a threat to *Ptilotus pyramidatus* and the following actions should be implemented:

1. Determine which weeds are present.
2. Select appropriate techniques; herbicide, mowing or hand weeding.
3. Control invasive weeds by hand removal and/or spot spraying when they first emerge.
4. Revegetate with site-specific species to maintain low weed levels.
5. Monitor the success of treatments on weeds, and the tolerance of *Ptilotus pyramidatus* and associated native plant species.
6. Report on the method and success of treatments, and their effect on *Ptilotus pyramidatus* and associated species.

Information on the biology of serious weeds of clay pans and some case studies on control to be found in Brown and Brooks (2002).

<b>Action:</b>	Undertake weed control
<b>Responsibility:</b>	Parks and Wildlife (Swan Coastal District), WAPC
<b>Cost:</b>	\$10,000 per year, as required

## 9. Collect and store seed

To guard against the extinction of the single known natural population it is recommended that seed be collected and stored at Parks and Wildlife's Threatened Flora Seed Centre (TFSC) and the Botanic Gardens and Parks Authority (BGPA). Collections should aim to sample and preserve the maximum range of genetic diversity possible (which should be determined by an appropriate molecular technique such as genetic fingerprinting if feasible). If it is not feasible to collect seed, living collections from cuttings or storage of tissue culture material should be undertaken.

<b>Action:</b>	Collect and store seed
<b>Responsibility:</b>	Parks and Wildlife (Swan Coastal District, TFSC), BGPA
<b>Cost:</b>	\$1,000 per year

## 10. Update the GBW fire management strategy

The 2002 GBW fire management strategy should be updated to include measures to protect *Ptilotus pyramidatus*.

<b>Action:</b>	Update the GBW fire management strategy
<b>Responsibility:</b>	Parks and Wildlife (Swan Coastal District), WAPC, FESA, City of Gosnells, relevant stakeholders, Friends Groups
<b>Cost:</b>	\$10,000 in years 1 and 2, and \$6,000 in years 3–5

## 11. Undertake regeneration trials

Disturbance events (physical or fire) undertaken in conjunction with weed control may be the most effective means of germinating *Ptilotus pyramidatus* seed in the wild. Records will be maintained for future research.

<b>Action:</b>	Undertake regeneration trials
<b>Responsibility:</b>	Parks and Wildlife (Science and Conservation Division, Swan Coastal District)
<b>Cost:</b>	\$10,000 in years 1 and 3, \$4,000 in years 2, 4 and 5

## 12. Undertake hydrological monitoring

Studies by V & C Semeniuk Research Group (2001) recommend monthly monitoring of groundwater and surface water in the GBW. Information obtained from monitoring will help in the management of the wetland habitat of *Ptilotus pyramidatus*. Re-designation of drainage is required to ensure the hydrology of the area more closely mimics historical conditions.

<b>Action:</b>	Undertake hydrological monitoring
<b>Responsibility:</b>	Parks and Wildlife (Swan Coastal District), with assistance from V & C Research Group
<b>Cost:</b>	To be determined

## 13. Undertake rabbit control

When monitoring ascertains the threat of rabbits is high, baiting using 1080 oats should be undertaken.

<b>Action:</b>	Undertake rabbit control
<b>Responsibility:</b>	Parks and Wildlife (Swan Coastal District), WAPC
<b>Cost:</b>	\$4,000 in years 1, 3 and 5

## 14. Remove rubbish

Remove rubbish dumped near *Ptilotus pyramidatus*.

<b>Action:</b>	Remove rubbish
<b>Responsibility:</b>	Parks and Wildlife (Swan Coastal District), WAPC
<b>Cost:</b>	\$5,000 per year

## 15. Develop and implement a translocation proposal

Translocation may be deemed desirable for the conservation of this species. If required, a translocation proposal will be developed and suitable translocation sites selected. Information on the translocation of threatened plants and animals in the wild is provided in Parks and Wildlife's Corporate Policy Statement No. 35 (DPaW 2015a); Corporate Guideline No. 35 (DPaW 2015b) and Corporate Guideline No. 36 (DPaW 2015c), and the Australian Network for Plant Conservation translocation guidelines (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, Swan Coastal District), BGPA
<b>Cost:</b>	\$42,000 in years 1 and 2; and \$26,500 in years 3–5 as required

## 16. Determine susceptibility to *Phytophthora cinnamomi*

The level of susceptibility of *Ptilotus pyramidatus* to *Phytophthora cinnamomi* is not known and plants grown from seed will be forwarded to Forest and Ecosystem Management Division for testing. The susceptibility of associated species will also be recorded.

<b>Action:</b>	Determine susceptibility to <i>Phytophthora cinnamomi</i>
<b>Responsibility:</b>	Parks and Wildlife (Swan Coastal District, Forest and Ecosystem Management Division)
<b>Cost:</b>	\$3,000 in years 1 and 2

## 17. Maintain disease hygiene

Although it is not known if *Ptilotus pyramidatus* is directly affected by dieback disease, degradation of its habitat as a result of the disease may impact on the species. Dieback hygiene (outlined in CALM 2003) will be followed during installation and maintenance of firebreaks and when walking into the population during wet soil conditions. Signs advising of the dieback risk and the high conservation values of the site will be installed if required.

<b>Action:</b>	Maintain disease hygiene
<b>Responsibility:</b>	Parks and Wildlife (Swan Coastal District)
<b>Cost:</b>	\$4,000 per year



## 18. Liaise with land managers and Aboriginal communities

Staff from Parks and Wildlife's Swan Coastal District will liaise with land managers to ensure that the population of *Ptilotus pyramidatus* is not accidentally damaged or destroyed and the habitat is maintained in a suitable condition for the conservation of the species. Aboriginal consultation will take place to determine if there are any issues or interests in areas that are habitat for the species.

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

## 19. Promote awareness

The importance of biodiversity conservation and the protection of *Ptilotus pyramidatus* will be promoted 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 (Swan Region, SCB and Corporate Relations), with assistance from the SRTFCRT
<b>Cost:</b>	\$7,000 in years 1 and 2; \$5,000 in years 3–5

## 20. Map habitat critical to the survival of *Ptilotus pyramidatus*

Although spatial data relating to habitat critical to the survival of *Ptilotus pyramidatus* 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>Ptilotus pyramidatus</i>
<b>Responsibility:</b>	Parks and Wildlife (SCB, Swan Region)
<b>Cost:</b>	\$6,000 in year 2

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

If *Ptilotus pyramidatus* is still ranked as 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.

<b>Action:</b>	Review this plan and assess the need for further recovery actions
<b>Responsibility:</b>	Parks and Wildlife (SCB, Swan Region)
<b>Cost:</b>	\$6,000 in year 5

**Table 4. Summary of recovery actions**

Recovery action	Priority	Responsibility	Completion date
Coordinate recovery actions	High	Parks and Wildlife (Swan Region), with assistance from the SRTFCRT	Ongoing
Monitor population	High	Parks and Wildlife (Swan Coastal District), with assistance from the SRTFCRT	Ongoing
Ensure long-term protection of habitat	High	Parks and Wildlife (Swan Region, SCB Nature Conservation Covenant Program and Land Unit)	2018
Maintain fencing	High	Parks and Wildlife (Swan Coastal District), WAPC	Ongoing
Undertake surveys	High	Parks and Wildlife (Swan Coastal District), with assistance from the SRTFCRT	2020
Confirm clonality in <i>Ptilotus pyramidatus</i>	High	Parks and Wildlife (Science and Conservation Division, Swan Coastal District)	2017
Obtain biological and ecological information	High	Parks and Wildlife (Science and Conservation Division, Swan Coastal District)	2018
Undertake weed control	High	Parks and Wildlife (Swan Coastal District), WAPC	Ongoing
Collect and store seed	High	Parks and Wildlife (Swan Coastal District, TFSC), BGPA	Ongoing
Update the GBW fire management strategy	High	Parks and Wildlife (Swan Coastal District), WAPC, FESA, City of Gosnells, relevant stakeholders, Friends Groups	Developed by 2016 with implementation ongoing
Undertake regeneration trials	High	Parks and Wildlife (Science and Conservation Division, Swan Coastal District)	2021
Undertake hydrological monitoring	High	Parks and Wildlife (Swan Coastal District), with assistance from V & C Research Group	Ongoing
Undertake rabbit control	High	Parks and Wildlife (Swan Coastal District), WAPC	Ongoing
Remove rubbish	High	Parks and Wildlife (Swan Coastal District), WAPC	2021
Develop and implement a translocation proposal	High	Parks and Wildlife (DPaW Science, Swan Coastal District), BGPA	2021
Determine susceptibility to <i>Phytophthora cinnamomi</i>	Medium	Parks and Wildlife (Swan Coastal District, Forest and Ecosystem Management Division)	2018
Maintain disease hygiene	Medium	Parks and Wildlife (Swan Coastal District)	Ongoing
Liaise with land managers and Aboriginal communities	Medium	Parks and Wildlife (Swan Coastal District)	Ongoing
Promote awareness	Medium	Parks and Wildlife (Swan Region, SCB and Corporate Relations), with assistance from the SRTFCRT	Ongoing
Map habitat critical to the survival of <i>Ptilotus pyramidatus</i>	Medium	Parks and Wildlife (SCB, Swan Region)	2018
Review this plan and assess the need for further recovery actions	Medium	Parks and Wildlife (SCB, Swan Region)	2021

## 4. Term of plan

This plan will operate from February 2016 to January 2021 but will remain in force until withdrawn or replaced. If the species is still ranked CR after five years, the need for further recovery actions will be determined.

## 5. References

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- Department of Parks and Wildlife (2015a) Corporate Policy Statement No. 35 *Conserving Threatened Species and Ecological Communities*. Perth, Western Australia.
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- Department of Parks and Wildlife (2014) Policy Statement No. 3 Management of *Phytophthora* disease. Department of Parks and Wildlife, Western Australia.
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- State of Western Australia (2000) *Bush Forever*. Western Australian Planning Commission, Perth.
- Western Australian Herbarium (1998–) *FloraBase– the Western Australian Flora*. Department of Parks and Wildlife. <http://florabase.dpaw.wa.gov.au/>.

## 6. Taxonomic description

Taxonomic description for *Ptilotus pyramidatus* follows *P. christineae* (Davis and Tausse 2011):

*Perennial herb* to 8cm high. *Rhizome* glabrous, 1–1.8mm in diam., branched. *Shoots* annual, well-spaced. *Flowering stems* erect, one per shoot, with indistinct, pink ribs, glabrous or with sparse, white, sub-verticillate hairs. *Basal leaves* glossy, spatulate, 8–35mm long, 2–10mm wide, glabrous or with very sparse hairs. *Cauline leaves* alternate, oblanceolate to spatulate, 8–15mm long, 2–5mm wide, glabrous or with very sparse hairs. *Inflorescence* spiciform, terminal, ovate, maturing to loosely cylindrical, 30–45(–50)mm long, 18–25mm diam. *Bracts* broadly obovate, 4.2–5mm long, translucent; midrib pink-maroon with sparse, white, sub-verticillate hairs abaxially, becoming glabrous toward margins. *Bracteoles* similar to bracts, 5–6mm long, apices slightly recurved. *Flowers* shortly pedicellate. *Outer tepals*, lanceolate, concave, 9–9.4mm long; adaxially white with pink margins, glabrous except for proximal, long, white, contorted, nodose hairs; abaxially pink, densely hairy, the hairs long, white and sub-verticillate. *Inner tepals*, similar to outer tepals but narrower, 8.5–8.7mm long; margins narrowly involute; apices glabrous, translucent. *Staminal cup* symmetrical, 0.8–1mm long, glabrous. *Stamens* 5; filaments and anthers white, ageing to pinkish. *Style* ± straight, central to sub-central, white, 1.8–2mm long. *Ovary* stipitate, glabrous, green. *Seed* not seen.