Government of **Western Australia**
Department of **Environment and Conservation**

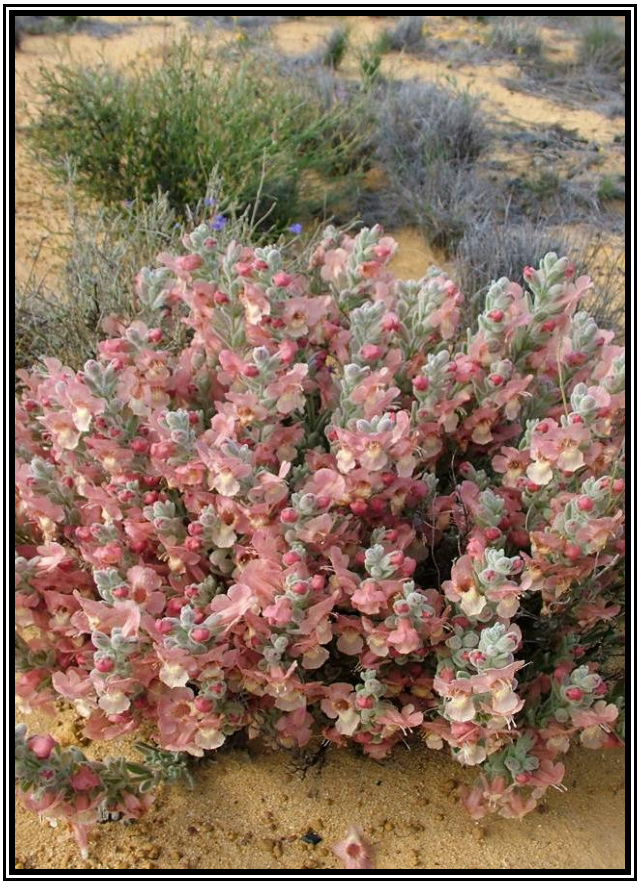
INTERIM RECOVERY PLAN NO. 284

WOOLLY FOXGLOVE

(*Pityrodia axillaris*)

INTERIM RECOVERY PLAN

2008-2013



June 2008

Department of Environment and Conservation
Kensington

FOREWORD

Interim Recovery Plans (IRPs) are developed within the framework laid down in Department of Conservation and Land Management (CALM) Policy Statements Nos. 44 and 50. Note: CALM formally became the Department of Environment and Conservation (DEC) in July 2006. DEC will continue to adhere to these Policy Statements until they are revised and reissued.

IRPs outline the recovery actions that are required to urgently address those threatening processes most affecting the ongoing survival of threatened taxa or threatened ecological communities, and begin the recovery process.

DEC is committed to ensuring that threatened taxa 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This IRP will operate from June 2008 to May 2013 but will remain in force until withdrawn or replaced. It is intended that, if the species is still ranked CR at the end of the five-year term, this IRP will be reviewed and the need for further recovery actions assessed.

This IRP was given regional approval on 11 August 2008 and approved by the Director of Nature Conservation on 5 September 2008. The allocation of staff time and provision of funds identified in this IRP is dependent on budgetary and other constraints affecting DEC, as well as the need to address other priorities.

Information in this IRP was accurate as at June 2008.

IRP PREPARATION

This IRP was prepared by Kym Pryor[1], Rebecca Hayes[1], Joel Collins[2], Catherine Page[3] and Andrew Brown[4].

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ACKNOWLEDGMENTS

The following people have provided assistance and advice in the preparation of this IRP:

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Andrew Crawford	Principal Technical Officer (Threatened Flora Seed Centre), DEC Science Division
Anne Cochrane	Senior Research Scientist (Threatened Flora Seed Centre), DEC Science Division
Bridgitte Long	Technical Officer (DRF Database), DEC Species and Communities Branch
Gemma Phelan	Conservation Officer (Back from the Brink), DEC Geraldton District
Victoria Cunningham	Technical Officer (Threatened Flora Seed Centre), DEC Science Division

Thanks also to the staff of the W.A. Herbarium for providing access to Herbarium databases and specimen information, and DEC's Species and Communities Branch for assistance.

Cover photograph by Catherine Page (DEC).

CITATION

This IRP should be cited as:
Department of Environment and Conservation (2008) Woolly foxglove (*Pityrodia axillaris*) Interim Recovery Plan 2008-2013. Interim Recovery Plan No. 284 Department of Environment and Conservation, Western Australia.

SUMMARY

Scientific Name:	*Pityrodia axillaris*	**Common Name:**	Woolly foxglove, Native foxglove
Family:	Lamiaceae	**Flowering Period:**	July - December
DEC Region:	Midwest and Wheatbelt	**DEC District:**	Geraldton and Avon-Mortlock
Shire:	Dalwallinu and Perenjori	**Recovery Team:**	Geraldton and Avon-Mortlock District Threatened Flora (and Communities) Recovery Teams.

Illustrations and/or further information: Patrick, S.J. (2001) *Declared Rare and Poorly Known Flora in the Geraldton District*, Department of Conservation and Land Management, Western Australia; Druce, G.C. (1917) *Nomenclatorial notes: chiefly African and Australian* by G. Claridge Druce Reprinted from: Report of the Botanical Society and Exchange Club of the British Isles for 1916 (1917) pp. 601-653; Patrick, S.J. (2001) *Declared Rare and Poorly Known Flora in the Geraldton District*, Wildlife Management Programs No. 26, Department of Conservation and Land Management; Western Australian Herbarium (2007) *FloraBase 2 – Information on the Western Australian Flora*, Department of Environment and Conservation, Perth, Western Australia. http://florabase.dec.wa.gov.au.

Current status: *Pityrodia axillaris* was declared as Rare Flora under the Western Australian *Wildlife Conservation Act 1950* in July 2004 and is ranked as Critically Endangered under World Conservation Union (IUCN 2001) Red List criteria C1+C2a(i)b due to the number of individuals in the wild being in steady decline with extreme fluctuation in numbers observed, and all populations containing less than 50 mature individuals. The species is not currently listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Pityrodia axillaris is known from six populations, totalling 94 mature plants, in the Shires of Dalwallinu and Perenjori. The main threats to the species are land clearing, road maintenance and lack of suitable natural disturbance (physical or fire).

Description: *Pityrodia axillaris* is a small shrub to 30 cm high. Stems are cylindrical, and like the leaves and calyx, are covered with dense, white, woolly hairs. Leaves are stalkless, egg-shaped, tapered toward the base and wrinkled beneath the woolly covering, 2-4 cm long and 1-1.5 cm wide. Flowers are either solitary or arranged in clusters of 3-5 along a main stem. Corolla can be deep red, apricot, dusky pink or yellowish scarlet, smooth on the outside with a dense hairy ring inside above the ovary, 2.5-3 cm long. Each flower has 5 petals with wavy to tooth-like edges, 4 stamens extending beyond the flower tube with the style extending further beyond them. The fruit is egg-shaped with two humps at the top.

The species is closely related to *Pityrodia terminalis* and *P. augustensis*, which are distinguished by differences in their leaf shape and corolla. *P. terminalis* is also a taller, more erect plant, with different flower colour (Patrick 2001).

Distribution and habitat: *Pityrodia axillaris* is found in disturbed areas of deep yellow sand in *Allocasuarina* and *Acacia* shrubland approximately 200 km south-east of Geraldton. The distance between the most northern and most southern subpopulations is 58 km.

Habitat critical to the survival of the species, and important populations: Habitat critical to the survival of the species includes the area of occupancy of important populations, areas of similar habitat surrounding important populations (i.e. *Acacia* shrubland over deep yellow sand), additional occurrences of similar habitat that may contain important populations, and the local catchment for the surface and/or groundwater that maintains the habitat of the species.

Given that *Pityrodia axillaris* is ranked as CR, 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.

Benefits to other species or ecological communities: Recovery actions implemented to improve the quality or security of the habitat of *Pityrodia axillaris* will also improve the health of associated native vegetation. Additionally, two Critically Endangered and two Priority Flora occur in association with *Pityrodia axillaris*.

Pityrodia axillaris is not known to occur in association with any Threatened Ecological Community.

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. *Pityrodia axillaris* is not listed under any specific international treaty, and this IRP does not affect Australia's obligations under any other international agreements.

Indigenous consultation: Involvement of the Indigenous community is being sought through Department of Indigenous Affairs to determine whether there are any issues or interests identified in the plan. A search of the Department of Indigenous Affairs Aboriginal Heritage Sites Register has identified one site, Buntine Rock, approximately 4 km WNW of

Population 1. There are no known sites of Aboriginal significance in the immediate vicinity of populations of *Pityrodia axillaris*. Where no role is identified for the indigenous community associated with this species in the development of the recovery plan, opportunities may exist through cultural interpretation and awareness of the species. Indigenous involvement in the implementation of recovery actions will be encouraged.

Continued liaison between DEC and the indigenous community will identify areas in which collaboration will assist implementation of recovery actions.

Social and economic impact: The implementation of this recovery plan is unlikely to cause significant adverse social or economic impact. Most populations occur on road and rail reserves, with one in a nature reserve.

Affected interests: Two populations and two subpopulations occur on Shire of Dalwallinu road reserves, one subpopulation occurs within a DEC managed nature reserve, one population and two subpopulations occur on Main Roads WA reserves and two subpopulations occur on a WestNet Rail reserve.

Evaluation of the plan's performance: DEC in conjunction with the Geraldton and Avon-Mortlock District Threatened Flora (and Communities) Recovery Teams (GDTFRT and AMDTFRT) will evaluate the performance of this IRP. 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.

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

Recovery criteria

Criteria for success: The number of populations has increased and/or the number of mature individuals in populations has increased by twenty percent or more over the term of the plan.
Criteria for failure: The number of populations has decreased and/or the number of mature individuals in populations has decreased by twenty percent or more over the term of the plan.

Completed Recovery Actions

1. Land managers, including the Shires of Perenjori and Dalwallinu, have been made aware of the threatened nature of *Pityrodia axillaris*, its location and their legal obligations to protect it.
2. DRF markers have been installed at Populations 1, 3,4, 5 and 6
3. Species-specific surveys, undertaken in 1999 using early Herbarium records found four populations. Two new populations were found during surveys taken in 2001.
4. The BGPA holds approximately 264 *Pityrodia axillaris* seeds, collected near Maya in 2003 (A. Shade[1] pers. comm.).
5. Two monitoring plots were established in November 2007 at population 5b, north of Maya.

Ongoing and future recovery actions

1. Staff from DEC's Geraldton and Avon-Mortlock Districts are monitoring all known populations.
2. The Geraldton and Avon-Mortlock District Threatened Flora (and Communities) Recovery Teams (GDTFRT and AMDTFRT) are overseeing the implementation of this IRP.

Recovery actions

1. Coordinate recovery actions
2. Liaise with relevant land managers and Indigenous groups
3. Monitor populations
4. Collect seed and cutting material
5. Install DRF markers
6. Develop and implement a fire management strategy
7. Conduct further surveys
8. Nominate *Pityrodia axillaris* for listing as Critically Endangered under the Commonwealth EPBC Act
9. Undertake weed control
10. Map habitat critical to the survival of Pityrodia axillaris
11. Obtain biological and ecological information
12. Promote awareness
13. Review the IRP and the need for further recovery actions

[1] Amanda Shade, Assistant Curator, Botanic Gardens and Parks Authority

1. BACKGROUND

History

Named by Robert Brown in 1810 from a collection made in Queensland in 1802 (Munir 1979), *Pityrodia* is a common widespread Australian member of the Lamiaceae family which includes the well known genera *Hemiandra* and *Prostanthera.* Some 56 species have been described, 27 of which are found in Western Australia. All are commonly known as native foxgloves due to the resemblance of their flowers to those of that genus. According to records held at the Western Australian Herbarium, *Pityrodia axillaris* was first collected by Roe in the early 19th century and was described as a species of *Dasymalla* by Endlicher in 1839. Druce placed the species in *Pityrodia* in 1917 and made the new combination *P. axillaris* (Endl.) Druce, but included *P. terminalis* as a synonym (Munir 1979). In 1972 Alex George regarded *P. axillaris* and *P. terminalis* as separate species (Munir 1979).

Pityrodia axillaris has been historically collected from near Perenjori to Pithara, over a range of some 115 km. There is also a collection from 'Lake Moore', but as the lake covers a very large area the precise collection site is unknown. As at 2007, extant populations are known to occur between Caron and Buntine, over a range of 58 km.

Some 21 collections of the species were made between 1921 and 1974. However, it was collected only once between 1974 and 1997. In 1999, surveys were carried out by CALM staff, based on Herbarium records. Although *Pityrodia axillaris* could not be relocated at some sites, populations 1-4 were re-found and documented. Further survey in 2001 resulted in the discovery of two new populations, and it was noted that plants were found growing in recently disturbed areas. Similar comments were made during the 2007 survey, where most of the plants were found growing in slightly different locations to what was recorded in 2001, again in recently disturbed areas. A new Subpopulation (6b) was also located, whilst Subpopulation 6a had been reduced to just one plant.

Pityrodia axillaris is currently known from six populations in the Shires of Perenjori and Dalwallinu. Populations 1, 2 and 3 in Dalwallinu have severely declined in size since 1999 and it is estimated that there are now just 94 mature plants in the wild.

Description

Pityrodia axillaris is a small shrub to 30 cm in height. Stems are cylindrical, and like the leaves and calyx, are covered with dense, white, woolly hairs. Leaves are stalkless, egg-shaped, tapered toward the base and wrinkled beneath the woolly covering, 2-4 cm long and 1-1.5 cm wide. Flowers have five petals with wavy to tooth-like edges, four stamens extending beyond the flower tube with the style extending further beyond them. Flowers are either solitary or arranged in clusters of 3-5 along a main stem, forming a long and narrow inflorescence. The calyx is divided almost to the base into five egg-shaped lobes which are 14-18 mm long. The corolla can be deep red, dusky pink, apricot or yellowish scarlet in colour, smooth on the outside with a dense hairy ring inside above the ovary, 2.5-3 cm long. The fruit is egg-shaped with two humps at the top and remains enclosed in the calyx.

The species is closely related to *Pityrodia terminalis* and *P. augustensis* with *P. terminalis* distinguishable by its oblong leaves and deep purple-pink to claret red or pale pink corolla which has fine, short hairs on the outside and is smooth inside apart from a dense hairy ring around the ovary. *P. augustensis* can be distinguished by its narrowly elliptic leaves, globular fruit and a deep lilac corolla with branched hairs inside the tube and with sparsely woolly hairs on the inside of petals (Patrick 2001).

Distribution and habitat

Pityrodia axillaris is found some 200 km south-east of Geraldton in the shires of Perenjori and Dalwallinu. As survey information is limited, it is difficult to accurately estimate the area of occupancy, although, based on extrapolations of the information available, it is estimated to be approximately 0.001 km^2. The extent of occurrence is estimated to be approximately 30 km^2.

The species is found in areas of yellow sand-plain with *Allocasuarina campestris, A. acutivalvis, Melaleuca cordata, Acacia* sp., *Dampiera* sp., *Verticordia* sp., *Hakea* sp. and *Grevillea* sp.

Summary of population land vesting, purpose and management

Pop. No. & Location	DEC District	Shire	Vesting	Purpose	Manager
1. North of Wubin	Avon-Mortlock	Dalwallinu	Unvested	Road Reserve	Shire of Dalwallinu
2. North of Wubin	Avon-Mortlock	Dalwallinu	Unvested	Road Reserve	Shire of Dalwallinu
3a. North of Wubin	Avon-Mortlock	Dalwallinu	Unvested	Road Reserve	Shire of Dalwallinu
3b. North of Wubin	Avon-Mortlock	Dalwallinu	Conservation Commission	Conservation of Flora and Fauna	Department of Environment and Conservation
3c. North of Wubin	Avon-Mortlock	Dalwallinu	Unvested	Road Reserve	Shire of Dalwallinu
4. South of Caron	Avon-Mortlock	Dalwallinu	Main Roads WA	Road Reserve	Main Roads WA
5a. North of Maya	Geraldton	Perenjori	Main Roads WA	Road Reserve	Main Roads WA
5b. North of Maya	Geraldton	Perenjori	Public Transport Authority	Rail Reserve	WestNet Rail
6a. North of Maya	Geraldton	Perenjori	Main Roads WA	Road Reserve	Main Roads WA
6b. North of Maya	Geraldton	Perenjori	Public Transport Authority	Rail Reserve	WestNet Rail

Populations in **bold text** are considered to be important populations

Biology and ecology

Although *Pityrodia axillaris* was discovered nearly two centuries ago very little is known about its biology and ecology. Shrubs flower between July and early December.

The species is known to be a disturbance opportunist. In 2006, staff from DEC's Geraldton district attempted to locate and survey all known populations of *Pityrodia axillaris*, but were unable to locate the species. It has been noted that populations appear to rapidly decline once plants reach maturity. The absence of natural disturbance (physical or fire) at the population sites may therefore account for the species not being found during the 2006 search.

Surveys conducted in 2007 located all but Subpopulation 3b. Populations 4 and Subpopulations 5a and 5b were recorded from slightly different locations to those that had been previously described. This may indicate that a disturbance event (physical or fire) occurred close to the original location, facilitating germination, whilst populations in the undisturbed areas had died of old age in absence of recruitment. Subpopulation 6b may also have emerged as a result of this process. Populations 1 and 2, and Subpopulations 3a, 3c and 6a all recorded a drop in population sizes, with Population 2 locally extinct.

Threats

Pityrodia axillaris was declared as Rare Flora under the Western Australian *Wildlife Conservation Act 1950* in 2004 and is currently ranked as Critically Endangered under World Conservation Union (IUCN 2001) Red List criteria C1+C2a(i)b due to the number of individuals in the wild being in steady decline with extreme fluctuation in numbers observed, and all populations containing less than 50 mature individuals. The species is not currently listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The main threats to the species are land clearing, road maintenance, weed intrusion and lack of natural disturbance (physical or fire).

Land clearing is a historical threat to the species. It is likely that suitable habitat has been cleared in the past, and that some populations that were known from historical records have been destroyed due to their habitat being cleared.

Road maintenance is a current threat to the species. Although the species is thought to be a disturbance opportunist, with currently known populations found in areas that have had recent disturbance, further scraping of vegetation on road verges may cause direct damage to plants and encourage weed invasion. Fire is predicted

to be the most effective natural trigger for germination, however this is yet to be tested (J. Collins[2] pers. comm.).

Weed invasion is currently a threat to all *Pityrodia axillaris* populations found in roadside vegetation.

Lack of suitable natural disturbance events (physical or fire) is a possible threat to the species. Disturbance stimulates the germination of soil-stored seed, and lack of suitable disturbance events will lead to population senescence.

The intent of this plan is to provide actions that will deal with immediate threats to *Pityrodia axillaris*. Although climate change may have a long-term effect on the species, actions taken directly to prevent the impact of climate change are beyond the scope of this plan.

Summary of population information and threats

Pop. No. & Location	Land Status	Year/No. plants	Condition	Threats
1. North of Wubin	Road Reserve	1999 ca. 50 2001 ca. 35 2003 30 (6) 2007 3	Poor	Road maintenance, weeds, lack of suitable natural disturbance
2. North of Wubin	Road Reserve	1999 19 2007 0	Possibly Extinct	Road maintenance, weeds, lack of suitable natural disturbance
3a. North of Wubin	Road Reserve	1999 3 2003 2 2007 2	Poor	Road maintenance, weeds, lack of suitable natural disturbance
3b. North of Wubin	Nature Reserve	1999 37* 2003 27*	Unknown	Unknown
3c. North of Wubin	Road Reserve	1999 37* 2003 27* 2007 3	Poor	Road maintenance, weeds, lack of suitable natural disturbance
4. South of Caron	Road Reserve	1999 5 2006 - 2007 1[#]	Moderate	Road maintenance, weeds, lack of suitable natural disturbance
5a. North of Maya	Road Reserve	2001 13* 2007 71*	Healthy	Road maintenance, weeds, lack of suitable natural disturbance
5b. North of Maya	Rail Reserve	2001 13* 2007 71*	Healthy	Road maintenance, weeds, lack of suitable natural disturbance
6a. North of Maya	Road Reserve	2001 20 2007 1	Healthy	Road maintenance, weeds, Lack of suitable natural disturbance
6b. North of Maya	Rail Reserve	2007 13	Healthy	Road maintenance, weeds, lack of suitable natural disturbance

Populations in **bold text** are considered to be important populations , [#] It is believed the original 5 plants died and the 1 plant recorded in 2007 is suspected to be a new plant, ( ) = seedlings, * = combined count for subpopulations, - = not recorded.

Guide for decision-makers

Section 1 provides details of current and possible future threats. Development and/or land clearing in the immediate vicinity of *Pityrodia axillaris* populations requires assessment. On-ground works should not be approved unless the proponents can demonstrate that their actions will have no significant negative impact on the species, its habitat or potential habitat or on the local surface hydrology, such that drainage in the habitat of the species would be altered.

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

Habitat critical to the survival of the species includes:

- The area of occupancy of important populations.
- Areas of similar habitat surrounding important populations (i.e. native shrubland on yellow sands).
- Remnant vegetation that surrounds and links populations (this is necessary to allow pollinators to move between populations and provides habitat for population expansion).

[2] Joel Collins, Flora Conservation Officer, DEC

- Additional occurrences of similar habitat that may contain important populations or be suitable for future translocations.
- The local catchment for the surface and groundwater that maintains the habitat of the species.

Given that *Pityrodia axillaris* is ranked as Critically Endangered, it is considered that all known habitat for wild populations is habitat critical to the survival of the species, and that all wild populations are important populations.

Benefits to other species or ecological communities

Recovery actions implemented to improve the quality or security of the habitat of *Pityrodia axillaris* will also improve the health of associated native vegetation including two Critically Endangered and two Priority flora species listed in the table below.

Species Name	**Conservation Status (Western Australia)**	**Conservation Status (EPBC Act 1999)**
Gyrostemon reticulatus	Critically Endangered	Critically Endangered
Stylidium amabile	Critically Endangered	-
Angianthus micropodioides	Priority 3	-
Gnephosis setifera	Priority 1	-

For a description of Priority categories see Atkins (2008).

There are no Threatened Ecological Communities known to occur near or in association with *Pityrodia axillaris*.

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. *Pityrodia axillaris* is not listed under any specific international treaty and this IRP does not affect Australia's obligations under any other international agreements.

Indigenous consultation

Involvement of the Indigenous community is being sought through Department of Indigenous Affairs to determine whether there are any issues or interests identified in the plan. A search of the Department of Indigenous Affairs Aboriginal Heritage Sites Register has identified one site (Buntine Rock) approximately 4 km WNW of Population 1. However, there are no known sites of Aboriginal significance at populations of *Pityrodia axillaris*. Where no role is identified for the indigenous community associated with this species in the development of the recovery plan, opportunities may exist through cultural interpretation and awareness of the species. Indigenous involvement in the implementation of recovery actions will be encouraged.

Continued liaison between DEC and the indigenous community will identify areas in which collaboration will assist implementation of recovery actions.

Social and economic impact

The implementation of this recovery plan is unlikely to cause significant adverse social or economic impact. Most populations occur on road and rail reserves, with one in a nature reserve.

Affected interests

Two populations occur on Shire of Dalwallinu road reserves, one subpopulation in a DEC managed nature reserve, one population and one subpopulation on a Main Roads WA reserve and one population and one subpopulation on a WestNet Rail reserve.

Evaluation of the plan's performance

DEC, in conjunction with the Geraldton and Avon-Mortlock District Threatened Flora (and Communities)

Recovery Teams (GDTFRT and AMDTFRT) will evaluate the performance of this IRP. 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

Objective: The objective of this IRP is to abate identified threats and maintain or enhance viable *in situ* populations to ensure the long-term preservation of the species in the wild.

Criteria for success: The number of populations has increased and/or the number of mature individuals in populations has increased by twenty percent or more over the term of the plan.
Criteria for failure: The number of populations has decreased and/or the number of mature individuals in populations has decreased by twenty percent or more over the term of the plan.

3. RECOVERY ACTIONS

Completed recovery actions

Land managers, including the Shires of Perenjori and Dalwallinu, Main Roads WA and WestNet Rail, have been made aware of the threatened nature of *Pityrodia axillaris*, its location and their legal obligations to protect the species.

DRF markers have been installed at Populations 1, 3, 4, 5 and 6.

Surveys undertaken in 1999, targeting populations of *Pityrodia axillaris* known from early Herbarium records, resulted in the finding of four populations. An additional two populations were discovered in 2001. Further searches were conducted in 2007 resulting in the discovery of 64 plants.

Two monitoring plots to determine growth rates, phenology and plant longevity following disturbance, were established at Subpopulation 5b in November 2007. This subpopulation was chosen as it is currently the largest known and its history is reasonably well documented:

The BGPA holds approximately 264 *Pityrodia axillaris* seeds that were collected north of Maya in October 2003. This seed lot has been determined to have 70% viability (cut test) (A. Shade[1] pers. comm.). Attempts were made to collect seed from Maya populations however plants did not set seed in 2007 (A. Crawford[2] pers. comm.).

Ongoing and future recovery actions

The GDTFRT and AMDTFRT are overseeing the implementation of this IRP.

Staff from DEC's Geraldton and Avon-Mortlock Districts are monitoring all known populations.

Where recovery actions are implemented on lands other than those managed by DEC, permission has been or will be sought from appropriate land managers prior to actions being undertaken. 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.

1. Coordinate recovery actions

The GDTFRT and AMDTFRT will continue to coordinate the implementation of recovery actions for *Pityrodia axillaris* and other Declared Rare Flora in their respective Districts and will include information on progress in their annual reports to DEC's Corporate Executive and funding bodies.

Action: Coordinate recovery actions

Responsibility: DEC (Geraldton and Avon-Mortlock Districts) through the GDTFRT and AMDTFRT
Cost: $1,500 annually.

2. Nominate *Pityrodia axillaris* for listing as Critically Endangered under the Commonwealth EPBC Act.

Staff from DEC's Species and Communities Branch (SCB) will develop a Species Profile and Threats (SPRAT) and nomination form for this species, and forward it to the Commonwealth Department of Environment, Water, Heritage and the Arts for referral to the Threatened Species Scientific Committee (TSSC) for endorsement under the EPBC Act.

Action: Nominate *Pityrodia axillaris* for listing as Critically Endangered under the Commonwealth EPBC Act
Responsibility: DEC (Species and Communities Branch)
Cost: $1,400 in the first year.

3. Liaise with relevant land managers and Indigenous groups

Staff from DEC's Geraldton and Avon-Mortlock Districts will liaise with land managers to ensure that populations of *Pityrodia axillaris* are not accidentally damaged or destroyed. Input and involvement will also be sought from any indigenous groups that have an active interest in the areas that are habitat for the species.

Action: Liaise with relevant land managers and Indigenous groups
Responsibility: DEC (Geraldton and Avon-Mortlock Districts) through the GDTFRT and AMDTFRT
Cost: $500 annually.

4. Monitor populations

Monitoring of factors such as weed invasion, grazing, habitat degradation, population stability (expansion or decline), pollinator activity, seed production, recruitment and longevity is essential. All populations will be inspected regularly and Rare Flora Report Forms completed.

Action: Monitor populations
Responsibility: DEC (Geraldton and Avon-Mortlock Districts) through the GDTFRT and AMDTFRT
Cost: $2,500 annually.

5. Collect seed and cutting material

Seed collection and storage is vital for the preservation of the species if the natural populations are lost. In addition to accessions held by the BGPA, seed will be collected from all extant populations and stored at DEC's Threatened Flora Seed Centre (TFSC). Collections will aim to sample the genetic diversity of the species. Cuttings will also be collected to build a living collection at BGPA. The "Germplasm Conservation Guidelines for Australia", produced by the Australian Network for Plant Conservation (ANPC), will be used as a minimum standard to guide this process (ANPC 1997).

Action: Collect seed and cutting material
Responsibility: DEC (TFSC, Geraldton and Avon-Mortlock Districts) and BGPA through the GDTFRT and AMDTFRT
Cost: $3,500 annually, if required.

6. Install DRF markers

While DRF markers have been installed at Populations 1, 3, 4, 5 and 6, Population 2 remains unmarked. DRF markers will be installed on road verges at this population to protect the potential soil-stored seed bank. Markers alert contractors and organisations working in the area of the presence of Declared Rare Flora, and the need to avoid damage to the site.

Action: Install DRF markers

Responsibility: DEC (Geraldton and Avon-Mortlock Districts) through the GDTFRT and AMDTFRT
Cost: $1,500 in year 1.

7 Implement disturbance trials

Observational evidence suggests that suitable natural disturbance events (physical or fire) are the most effective means of germinating *Pityrodia axillaris* seed in the wild with all current populations in areas that have undergone recent disturbance. Using small controlled burns to promote germination has proven successful with *Pityrodia scabra*, and is predicted to have a similar positive effect on *P. axillaris* (J. Collins[3] pers. comm.). Different disturbance techniques should be investigated (i.e. soil disturbance and fire), to determine the most successful and appropriate method. Records will need to be maintained for future research.

Action: Implement disturbance trials
Responsibility: DEC (Science Division, Geraldton and Avon-Mortlock Districts) through the GDTFRT and AMDTFRT
Cost: $3,400 in year 1, $700 in years 2 to 4 and $1,500 in year 5

8. Conduct further surveys

Further surveys by DEC staff and, where possible, volunteers from the local community, wildflower societies and naturalists clubs will be conducted during the flowering period of *Pityrodia axillaris* (July to December). All existing populations will be resurveyed, as will nearby areas of suitable habitat, especially if disturbance (physical or fire) has occurred recently (within 3-4 years) in the area.

Summaries of areas surveyed, including rare flora report forms where necessary, will be sent to the Species and Communities Branch and also retained at the relevant District Office as a record, even if the species is not found.

Action: Conduct further surveys
Responsibility: DEC (Geraldton and Avon-Mortlock Districts) through the GDTFRT and AMDTFRT
Cost: $3,000 in years 1, 3 and 5.

9. Undertake weed control

Weeds potentially threaten all populations and subpopulations of *Pityrodia axillaris*. The following actions will be implemented:
1. Monitor all populations for weed invasion.
2. Select appropriate herbicides after determining which weeds are present.
3. Control invasive weeds by hand removal or spot spraying around *Pityrodia axillaris* plants when weeds first emerge.
4. Schedule weed control to include spraying at other threatened flora populations within the District.
5. Regularly monitor weeds and implement additional weed control if required.

The tolerance of associated native plant species to herbicides at the *Pityrodia axillaris* population is not known and weed control programs will be undertaken in conjunction with research and in a manner that minimises negative impacts on associated native flora.

Action: Undertake weed control
Responsibility: DEC (Science Division, Geraldton and Avon-Mortlock Districts) through the GDTFRT and AMDTFRT
Cost: $5,000 annually, as required

[3] Joel Collins, Flora Conservation Officer, DEC

10. Map habitat critical to the survival of *Pityrodia axillaris*

While this species is not currently listed under the EPBC Act, this is a future intention, and it is a requirement of the EPBC Act that spatial data relating to habitat critical to the survival of *Pityrodia axillaris* be determined. Although this is described in Section 1, it has not yet been mapped and will be addressed under this action. If additional populations are located, then habitat critical to the survival of the species will be determined and mapped for these locations also.

Action: Map habitat critical to the survival of *Pityrodia axillaris*
Responsibility: DEC (SCB, Geraldton and Avon-Mortlock Districts) through the GDTFRT and AMDTFRT
Cost: $3,100 in year 2

11. Obtain biological and ecological information

Improved knowledge of the biology and ecology of *Pityrodia axillaris* will provide a better scientific basis for managing wild populations. An understanding of the following is particularly necessary for effective management:

1. The species' pollination biology and identification of pollinators.
2. Soil seed bank dynamics, including seedbank location and viability.
3. Conditions necessary for germination.
4. Longevity of plants, and time taken to reach maturity.
5. Genetic diversity and minimum viable population size.
6. Species response to disturbance (physical or fire) following Adaptive Management principles.

Action: Obtain biological and ecological information
Responsibility: DEC (Science Division, Geraldton and Avon-Mortlock Districts) through the GDTFRT and AMDTFRT
Cost: $10,000 annually

12. Promote awareness

The importance of biodiversity conservation and the need for the long-term protection of wild populations of *Pityrodia axillaris* will be promoted to the community through poster displays and the local print and electronic media. Formal links with local naturalist groups and interested individuals will also be encouraged. An information sheet will be produced, and will include a description of the plant, its habitat, threats, recovery actions and photos. This will be distributed to the public through DEC's Geraldton and Avon-Mortlock District office and at the offices and libraries of the Shires of Perenjori and Dalwallinu. Such information distribution may lead to the discovery of new populations.

To minimise the risk of accidental or deliberate destruction, the exact location of *Pityrodia axillaris* will be kept from the general public. Such information should, however, be given to relevant land managers and government authorities.

Action: Promote awareness
Responsibility: DEC (SCB, Strategic Development and Corporate Affairs Division, Geraldton and Avon-Mortlock Districts) through the GDTFRT and AMDTFRT
Cost: $1,600 in year 1 and $1,000 in years 2-5.

13. Review the IRP and the need for further recovery actions

At the end of the five-year term of this IRP, the plan will be reviewed and the need for further recovery actions assessed.

Action: Review the IRP and the need for further recovery actions
Responsibility: DEC (SCB, Geraldton and Avon-Mortlock Districts) through the GDTFRT and

AMDTFRT

Cost: $2,000 in year 5.

Summary of recovery actions

Recovery Actions	Priority	Responsibility	Completion date
Coordinate recovery actions	High	GDTFRT and AMDTFRT	Ongoing
Nominate *Pityrodia axillaris* for listing as Critically Endangered under the Commonwealth EPBC Act	High	Species and Communities Branch	2009
Liaise with relevant land managers and Indigenous groups	High	DEC (Geraldton and Avon-Mortlock Districts) through the GDTFRT and AMDTFRT	Ongoing
Monitor populations	High	DEC (Geraldton and Avon-Mortlock Districts) through the GDTFRT and AMDTFRT	Ongoing
Collect seed and cutting material	High	DEC (TFSC, Geraldton and Avon-Mortlock Districts) and BGPA through the GDTFRT and AMDTFRT	2013
Install DRF markers	High	DEC (Geraldton and Avon-Mortlock Districts) through the GDTFRT and AMDTFRT	2008
Implement disturbance trials	High	DEC (Science Division, Geraldton and Avon-Mortlock Districts) through the GDTFRT and AMDTFRT	Ongoing
Conduct further surveys	High	DEC (Geraldton and Avon-Mortlock Districts) through the GDTFRT and AMDTFRT	Ongoing
Undertake weed control	Medium	DEC (Science Division, Geraldton and Avon-Mortlock Districts) through the GDTFRT and AMDTFRT	Ongoing
Map habitat critical to the survival of *Pityrodia axillaris*	Medium	DEC (SCB, Geraldton and Avon-Mortlock Districts) through the GDTFRT and AMDTFRT	2009
Obtain biological and ecological information	Medium	DEC (Science Division, Geraldton and Avon-Mortlock Districts) through the GDTFRT and AMDTFRT	2011
Promote awareness	Medium	DEC (SCB, Strategic Development and Corporate Affairs Division, Geraldton and Avon-Mortlock Districts) through the GDTFRT and AMDTFRT	2010
Review the IRP and the need for further recovery actions	Medium	DEC (Geraldton and Avon-Mortlock Districts) through the GDTFRT and AMDTFRT	2013

4. TERM OF PLAN

This IRP will operate from June 2008 to May 2013 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 and an update of this IRP will be assessed.

5. REFERENCES

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6. TAXONOMIC DESCRIPTION

Excerpt from Patrick S.J. (2001) *Declared Rare and Poorly Known Flora in the Geraldton District – Wildlife Management Program No. 26*, Department of Conservation and Land Management, Western Australia. p259-260.

A tomentose undershrub to 30 cm tall, with terete stems, the stems, leaves and calyx with a dense white woolly covering of branched hairs but without scales. The leaves are sessile, obovate or oblong-obovate, wedge-shaped and tapering to the base, not constricted towards the middle and with entire margins. They are wrinkled beneath the woolly covering, usually 2-4 cm long, 1-1.5 cm wide. The flowers are solitary or arranged in cymes of 3-5 flowers which form a leafy terminal raceme. The calyx is persistent, divided almost to the base into five obovate lobes, 14-18 mm long. The corolla is deep red to yellowish scarlet in colour, 2.5-3 cm long. It is glabrous on the outside, with a dense hairy ring inside above the ovary and with minute clubbed hairs extending to the large central lobe of the lower lip. There are five spreading undulate-denticulate corolla lobes. The four stamens extend beyond the corolla tube and the style extends beyond them. The fruit is obovoid, unridged, with two humps at the top, and is enclosed within the persistent calyx.