

INTERIM RECOVERY PLAN NO. 289

PUNGENT JACKSONIA

(Jacksonia pungens)

INTERIM RECOVERY PLAN

2009-2014



November 2009

Department of Environment and Conservation
Kensington



Department of
Environment and Conservation
Our environment, our future 

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: the Department of 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, which results from a review of, and replaces, IRP No.32 *Jacksonia pungens* ms (Evans and English 1999), will operate from July 2009 to June 2014 but will remain in force until withdrawn or replaced. It is intended that, if the species is still listed as threatened, this IRP will be reviewed after five years and the need for further recovery actions assessed.

This IRP was given regional approval on 9 October 2009 and approved by the Director of Nature Conservation on 2 November 2009. 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 November 2009.

IRP PREPARATION

This IRP was prepared by Robyn Luu¹ and Andrew Brown².

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ACKNOWLEDGMENTS

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

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Joel Collins	Conservation Officer, DEC's Avon Mortlock District, Northam
Andrew Crawford	Principal Technical Officer (Threatened Flora Seed Centre), DEC Science Division
Anne Harris	Former Project Officer, DEC Species and Communities Branch
Bridgitte Long	Technical Officer (DRF Database), DEC Species and Communities Branch
Amanda Shade	Assistant Curator (Nursery), Botanic Gardens and Parks Authority
Benson Todd	Conservation Officer, DEC's Moora District, Jurien Bay

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 Benson Todd (DEC).

CITATION

This IRP should be cited as:

Department of Environment and Conservation (2009) Pungent jacksonia (*Jacksonia pungens*) Interim Recovery Plan 2009-2014. Interim Recovery Plan No. 289. Department of Environment and Conservation, Western Australia.

SUMMARY

Scientific Name:	<i>Jacksonia pungens</i>	Common Names:	Pungent Jacksonia
Family:	Papilionaceae	Flowering Period:	November to December (January)
DEC Regions:	Midwest and Wheatbelt	DEC Districts:	Moora and Avon-Mortlock
Shires:	Coorow, Moora and Dalwallinu	Recovery Teams:	Moora and Avon-Mortlock District Threatened Flora (and Communities) Recovery Teams

Illustrations and/or further information: Brown, A., Thomson-Dans, C. and Marchant, N. (Eds). (1998) *Western Australia's Threatened Flora*. Department of Conservation and Land Management, Western Australia; Chappill *et al.* (2007) Taxonomic revision of *Jacksonia* (Leguminosae: Mirbelieae). *Australian Systematic Botany*, 20: 473-623; DEC (2008) Western Australian Herbarium (1998-) *FloraBase – The Western Australian Flora*. Department of Environment and Conservation. <http://florabase.dec.wa.gov.au/>; Elliot, W.R. and Jones, D.L. (1990) *Encyclopaedia of Australian Plants Suitable for Cultivation* 5: pp. 463, Lothian Publishing Co., Melbourne.

Current status: *Jacksonia pungens* was declared as Rare Flora under the Western Australian *Wildlife Conservation Act 1950* in November 1997 and is currently ranked as Critically Endangered (CR) under World Conservation Union (IUCN 2001) Red List criteria A1c; B1+2c; C1 as, at the time of ranking, there were less than 250 mature individuals known and there was a continuing decline in the quality of the habitat and number of mature plants. Additional populations have since been found and the species no longer meets CR under the same criteria. It will be recommended to the Threatened Species Scientific Committee (TSSC) that the criteria of *J. pungens* be amended to CR B2ab(iii) (IUCN 2001) based on a decline in habitat quality. The species is listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as Endangered. The main threats are road, rail and firebreak maintenance activities, weeds, inappropriate fire regimes, vehicles, farming activities, rubbish dumping, grazing and trampling and gravel extraction.

Description: *Jacksonia pungens* is a densely branched grey shrub 30 cm to 1 m tall by 40 cm to 1 m wide with flowers scattered along branches. The conspicuous orange-red pea flowers have large persistent bracteoles that splay open during flowering and then close over the developing fruit. Pods are flattened, covered in downy hairs, and have woody valves that open before dehiscence.

Distribution and habitat: *Jacksonia pungens* is endemic to Western Australia where it is confined to the Marchagee/Dalwallinu areas. The species is found on well-drained soils ranging from yellow to brown sand or gravelly lateritic soil with quartzite over chert. Associated vegetation is characterised by tall shrubland of *Allocasuarina campestris* and *Actinostrobus*.

Habitat critical to the survival of the species, and important populations: Given that *Jacksonia pungens* 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. Habitat critical to the survival of *J. pungens* includes the area of occupancy of the important populations; areas of similar habitat surrounding and linking populations (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 *Jacksonia pungens* will also improve the health of associated native vegetation including the Endangered *Gastrolobium appressum* and *Daviesia dielsii*. There are no Threatened Ecological Communities known to occur near or in association with *J. pungens*.

International obligations: *Jacksonia pungens* is not listed under any specific international treaty and this IRP does not affect Australia's obligations under any other international agreements. However, 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.

Indigenous consultation: Although the Department of Indigenous Affairs Aboriginal Heritage Sites Register does not list any significant sites near *Jacksonia pungens* input and involvement is being sought through the South West Aboriginal Land and Sea Council (SWALSC) and Department of Indigenous Affairs to determine if there are any issues or interests. As this is not expected to be completed before the approval of the IRP, further consultation has been included as a recovery action to ensure there has been Indigenous engagement in relation to the recovery actions posed in this plan.

Social and economic impact: As some *Jacksonia pungens* populations occur on private property, Shire, Main Roads Western Australia (MRWA) and WestNet Rail road and rail reserves, the protection of the species at these sites may potentially affect development and asset protection measures.

Affected interests: Private property owners, Shires, MRWA and WestNet Rail.

Evaluation of the plan's performance: DEC, in conjunction with the Moora and Avon-Mortlock District Threatened Flora Recovery Teams (MDTFRT 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.

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

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

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

Existing recovery actions: The following recovery actions have been or are currently being implemented.

1. Land owners and land managers have been made aware of the existence of this species and its locations.
2. Moora District staff held onsite meetings with the Coorow Shire and WestNet Rail officials in 1997 and 2007. A further onsite meeting was held between WestNet Rail and DEC staff about tagging of plants before a major works program on rail lines.
3. A fixed point monitoring framework for determining population trends was established in 2001.
4. Declared Rare Flora (DRF) markers have been installed at all road and rail reserve populations.
5. 9473 seeds collected from Populations 1 and 3 between January 1997 and January 2007 are stored in DEC's TFSC. Further seed collections made from Populations 1, 5, 6, 8 and 10 and Subpopulations 3c, 7a, 7b and 12a have yet to be processed.
6. Eighteen plants were raised at BGPA from seedlings derived from germination tests. However, after three months all had died.
7. A basic fire management strategy has been prepared for the species. Monitoring of fire response of a burnt population has been undertaken.
8. New populations were discovered in the Shires of Dalwallinu and Moora in 2008 by Andrew Crawford from DEC's TFSC.
9. Staff from DEC's Avon-Mortlock District have liaised with the landholder of property containing Subpopulation 12b and have surveyed native vegetation remnants on the property.
10. DEC's Science Division staff collected population structure data for the largest population of *Jacksonia pungens* in 2001 for use as a baseline for future monitoring.
11. A survey of populations was undertaken by Denise True and Anne Harris in 2003. Information recorded included population counts of mature and dead individuals, population status, habitat details and status, threat assessments and other notable attributes.
12. Two articles were published in DEC's "WATSNU" Newsletter. *Jacksonia pungens* also featured in a schools activity book, threatened species magnets series, greeting cards and watercolour posters.
13. An information sheet containing photographs, a description of the plant, its habitat type, threats and management actions has been produced. This information sheet was updated and redistributed in 2008.
14. The MDTFRT and AMDTFRT will oversee the implementation of this IRP and will include information on progress in their annual reports to DEC's Corporate Executive and funding bodies.
15. Staff from DEC's Moora and Avon-Mortlock Districts are monitoring all known populations.

Recovery actions

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|---|--|
| 1. Coordinate recovery actions | 10. Remove rubbish from Subpopulation 3b |
| 2. Conduct further surveys | 11. Develop and implement a Fire Response Plan |
| 3. Implement disturbance trials | 12. Repair fence at Population 2 |
| 4. Develop translocation proposals | 13. Map habitat critical to the survival of <i>Jacksonia pungens</i> |
| 5. Monitor populations | 14. Obtain biological and ecological information |
| 6. Collect population structure data | 15. Promote awareness |
| 7. Undertake weed control | 16. Propose ranking criteria change |
| 8. Liaise with relevant land managers and Indigenous groups | 17. Review the IRP and assess the need for further recovery actions |
| 9. Collect seed | |

1. BACKGROUND

Analysis of outputs and effectiveness of IRP 32 (1999-2002): This IRP replaces IRP No. 32, prepared by Rebecca Evans and Val English. The information below has been extracted from a Recovery Plan Review undertaken by Amanda Fairs in 2008.

The criteria for success in the previous plan (the number of individuals within populations and/or the number of populations have increased) has been met, as the number of known populations in the wild has increased from 3 to 12.

At the commencement of the previous plan, the habitat of the species was considered to be in very poor to poor condition as it was very weedy and highly disturbed by road and rail maintenance operations. A total of 182 mature plants were known at that time. The habitat condition is now considered healthy for four populations, and the number of mature individuals has climbed to 298 (2008). This has primarily been through extensive survey which has extended the species range by 30 km. The condition of habitat in other populations is still poor and highly disturbed and no extant plants have been located in three populations.

Recovery Actions carried out through the previous plan include:

Action 3. A basic fire management strategy has been prepared for the species. Monitoring of fire response of the burnt population has been undertaken.

Action 5. The species was surveyed and nine new occurrences were located, extending its range by 30 km.

Action 7. DEC's Threatened Flora Seed Centre (TFSC) has eight collections containing over 4279 seeds. Germination trials report a 97 to 100% success rate.

Action 10. DEC's Science Division staff collected population structure data for the largest population of *Jacksonia pungens* for use as a baseline for future monitoring. A final report summarising the findings was not completed however due to funding constraints.

Action 12. Two articles were published in DEC's "WATSNU" Newsletter. An information sheet has also been produced.

The majority of the recovery actions included in the previous plan have now been partially or fully implemented or are no longer required. **Action 14** (Write a full Recovery Plan) became redundant as DEC no longer produces full recovery plans and current IRPs have been extended to five year terms. **Action 2** (undertake weed control), **Action 3** (Develop and implement a fire management strategy), **Action 8** (Propagate plants for translocation) and **Action 9** (Develop a translocation proposal) were lowered in priority during the term of the IRP. **Action 11** (Install signs to deter illegal wildflower picking) was not undertaken as it was thought the signs may attract attention to the rare species. **Action 6** (Maintain fence at Population 2) was considered a lower priority as the plant had since died. **Actions 1, 4, 5, 10, 12** and **13** and other recovery actions included in the plan are being implemented, are ongoing and are included in this revised plan. New recovery actions included in this plan are to remove rubbish from Subpopulation 3b, implement disturbance trials and map critical habitat.

History

The first known collection of *Jacksonia pungens* was made from the Marchagee area by C. Chapman in 1979. In 1996, a survey of the original collection site and local conservation reserves was undertaken by D. Papenfus. Two new populations were found near the original site. While collecting seed for the species in January 2008, six new populations were located further west near Dalwallinu, showing the species range to be greater than originally thought. The species is currently known from 12 populations together containing 298 mature plants.

Information from specimens housed at the Herbarium indicates that the taxon was locally abundant in un-grazed areas but was geographically restricted. Populations of *Jacksonia pungens* and its habitat are impacted by maintenance operations along road and rail reserves.

An Interim Recovery Plan (IRP) was developed for the species in 1999 (Evans and English 1999). Additional information collected since that plan was prepared has been incorporated into this plan.

Description

Jacksonia pungens is a densely branched grey shrub 30 cm to 1 m tall by 40 cm to 1 m wide with flowers scattered along branches. The conspicuous orange-red pea flowers have persistent bracteoles that splay open during flowering and then close over the developing fruit. Pods are flattened, covered in downy hairs, and have woody valves that open before dehiscence (Chappill *et al.* 2007).

The species is distinguished by its pungent branchlets and flowers with broad papery calyx lobes and long spreading fine hairs (Chappill *et al.* 2007).

Distribution and habitat

Jacksonia pungens is endemic to Western Australia where it is confined to the Marchagee/Dalwallinu areas, growing on well-drained soils ranging from yellow to brown sand or gravelly lateritic soil with quartzite over chert. Associated vegetation is characterised by tall shrubland of *Allocasuarina campestris* and *Actinostrobos* (Chappill *et al.* 2007).

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

Pop. No. & Location	DEC District	Shire	Vesting	Purpose	Manager
1a. South of Marchagee	Moora	Coorow	MRWA	Road Reserve	MRWA
1b. South of Marchagee	Moora	Coorow	MRWA	Road Reserve	MRWA
1c. South of Marchagee	Moora	Coorow	Shire of Coorow	Road Reserve	Shire
1d. South of Marchagee	Moora	Coorow	Shire of Coorow	Road Reserve	Shire
1e. South of Marchagee	Moora	Coorow	Shire of Coorow	Road Reserve	Shire
2. South of Marchagee	Moora	Coorow	Freehold	Private Property	Landowners
3a. South of Marchagee	Moora	Coorow	Freehold	Private Property	Landowners
3b. South of Marchagee	Moora	Coorow	Shire of Coorow	Road Reserve	Shire
3c. South of Marchagee	Moora	Coorow	Public Transport Authority	Rail reserve	WestNet Rail
4. South of Marchagee	Moora	Coorow	Public Transport Authority	Rail reserve	WestNet Rail
5. West of Dalwallinu	Moora	Moora	Shire of Moora	Road Reserve	Shire
6. West of Dalwallinu	Moora	Moora	Shire of Moora	Road Reserve	Shire
7a. West of Dalwallinu	Moora	Moora	Shire of Moora	Road Reserve	Shire
7b. West of Dalwallinu	Moora	Moora	Shire of Moora	Road Reserve	Shire
8. West of Dalwallinu	Avon-Mortlock	Dalwallinu	Shire of Dalwallinu	Road Reserve	Shire
9. West of Dalwallinu	Avon-Mortlock	Dalwallinu	Shire of Dalwallinu	Road Reserve	Shire
10. West of Dalwallinu	Avon-Mortlock	Dalwallinu	Shire of Dalwallinu	Road Reserve	Shire
11. West of Dalwallinu	Avon-Mortlock	Dalwallinu	Shire of Dalwallinu	Road Reserve	Shire
12a. West of Dalwallinu	Avon-Mortlock	Dalwallinu	Shire of Dalwallinu	Road Reserve	Shire
12b. West of Dalwallinu	Avon-Mortlock	Dalwallinu	Freehold	Private Property	Landowners

Populations in **bold text** are considered to be important populations. MRWA = Main Roads Western Australia.

Biology and ecology

Jacksonia pungens is known to flower in November and December and occasionally also in January with flowers lasting just a few weeks. The species is said to fruit prolifically and its seed has a high germination rate.

Investigations, including population size class structure, soil seed bank density and population dynamics, has shown that many plants are in areas where soil had been disturbed by earthworks associated with road maintenance. This suggests that the species is a disturbance opportunist and will germinate from a persistent seed bank following disturbances such as light ripping, grading and fire.

Threats

Jacksonia pungens was declared as Rare Flora under the Western Australian *Wildlife Conservation Act 1950* in November 1997 and is currently ranked as Critically Endangered (CR) under World Conservation Union (IUCN 2001) Red List criteria A1c; B1+2c; C1 as, at the time of ranking, there were less than 250 mature individuals known and there was a continuing decline in the quality of the habitat and number of mature plants. Additional populations have since been found and the species no longer meets CR under the same criteria. It will be recommended to the Threatened Species Scientific Committee (TSSC) that the criteria of *J. pungens* be amended to CR B2ab(iii) (IUCN 2001) based on a decline in habitat quality. The species is listed under the

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as Endangered. The main threats are road, rail and firebreak maintenance activities, weeds, inappropriate fire regimes, vehicles, farming activities, rubbish dumping, grazing and trampling and gravel extraction.

- **Road, rail and firebreak maintenance** such as construction of drainage channels, mowing and grading of roadside vegetation, and re-sleepering of rail lines is a threat to populations.
- **Weeds** are a threat to all populations, especially those on rail and road reserves, but also to a lesser extent in populations that occur on private property.
- **Inappropriate fire regimes.** Although it is likely that occasional fire is needed for recruitment from soil-stored seed, frequent fire may impact the viability of populations if they occur before juvenile plants reach maturity.
- **Vehicles** can be driven on the batter within the road reserve at Subpopulation 1c with several plants damaged in the past.
- **Farming activities** such as fence and firebreak maintenance may damage plants that are growing close to fence lines and firebreaks. Populations of *Jacksonia pungens* are also close enough to crops to be affected by herbicide and fertiliser applications from adjacent farmland.
- **Rubbish dumping** is a threat to Subpopulation 3b.
- **Grazing and trampling** by stock (sheep) is a threat to Population 2 and Subpopulation 3b. Although there are no extant plants at either site, stock have impacted on the habitat by digging, trampling and breaking foliage as well as increasing nutrient levels in the soil from droppings.
- **Gravel extraction** is a potential threat to Subpopulation 3b. Although no extant plants are present a soil seed bank may still remain at this site. WestNet Rail and the Shire of Coorow are aware that gravel extraction is not to occur in the area and this is considered a low threat.

The intent of this plan is to provide actions that will deal with immediate threats to *Jacksonia pungens*. 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.

Table 2. Summary of population information and threats

Pop. No. & Location	Land Status	Year/No. plants	Plant Condition	Threats
1a. South of Marchagee	MRWA road reserve	1996 57 (19) [5] 2003 209 (37) [62] 2006 148 [5]	Disturbed Moderate Healthy	Road and firebreak maintenance, weeds, inappropriate fire regimes
1b. South of Marchagee	MRWA road reserve	2001 18 2003 21 (4) [6] 2006 19 [1]	Poor Moderate Healthy	Road maintenance, weeds, inappropriate fire regimes
1c. South of Marchagee	Shire road reserve	1996 3 1998 14+ 2001 6 (1) [3] 2003 1+(4) 1/2006 20 (20) 12/2006 30 (8)	Disturbed Moderate Poor Healthy Healthy Healthy	Road maintenance, vehicles, weeds, appropriate fire regimes, farming activities
1d. South of Marchagee	Shire road reserve	2003 (1) 2006 0	Healthy	Road maintenance, weeds, inappropriate fire regimes
1e South of Marchagee	Shire road reserve	2003 1 2006 0	Healthy	Road maintenance, weeds, inappropriate fire regimes
2. South of Marchagee	Private property	1996 1 2001 0 2003 0	Undisturbed	Weeds, inappropriate fire regimes, farming activities, grazing and trampling
3a. South of Marchagee	Private property	1996 2 2001 0 2003 0	Poor	Gravel extraction, weeds, inappropriate fire regimes, grazing and trampling
3b. South of Marchagee	Shire road reserve	1996 70 (10) 1996 2 2001 0 [1] 2003 0	Very poor	Firebreak and road maintenance, gravel extraction, weeds, inappropriate fire regimes, rubbish dumping, farming activities
3c. South of Marchagee	Rail reserve	1996 70 (10) 2000 48 (3) [3] 2003 189 (18) [148] 2005 (200+)	Very poor Moderate	Firebreak/rail/track maintenance, weeds, inappropriate fire regimes

		2006	0 (700+)		
4. South of Marchagee	Rail reserve	2007	2	Healthy	Firebreak maintenance, inappropriate fire regimes
5. West of Dalwallinu	Road reserve	2008	22 [8]	Poor	Road maintenance, weeds, inappropriate fire regimes
6. West of Dalwallinu	Road reserve	2007	8	Poor	Road maintenance, weeds, inappropriate fire regimes
7a. West of Dalwallinu	Road reserve	2007	1	Poor	Road maintenance, weeds, inappropriate fire regimes
7b. West of Dalwallinu	Road reserve	2007	1	Poor	Road maintenance, weeds, inappropriate fire regimes
8. West of Dalwallinu	Road reserve	2008	8 [2]	Disturbed	Road maintenance, weeds, inappropriate fire regimes
9. West of Dalwallinu	Road reserve	2008	43 [2]	Disturbed	Road maintenance, weeds, inappropriate fire regimes
10. West of Dalwallinu	Road reserve	2008	8	Disturbed	Road maintenance, weeds, inappropriate fire regimes
11. West of Dalwallinu	Road reserve	2008	5	Disturbed	Road maintenance, weeds, inappropriate fire regimes
12a. West of Dalwallinu	Road reserve	2008	2	Disturbed	Road maintenance, weeds, inappropriate fire regimes
12b. West of Dalwallinu	Private property	2008	1	Healthy	Firebreak maintenance, weeds, inappropriate fire regimes

() = seedlings, [] = dead. MRWA = Main Roads Western Australia.

Guide for decision-makers

Section 1 provides details of current and possible future threats. Development and/or land clearing in the immediate vicinity of *Jacksonia pungens* will require 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

Given that *Jacksonia pungens* is ranked as critically endangered, it is considered that all known habitat for wild populations is critical to their survival and that all wild populations are important populations. Habitat critical to the survival of *J. pungens* includes the area of occupancy of populations; areas of similar habitat surrounding and linking populations (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 *Jacksonia pungens* will also improve the health of associated native vegetation and the two threatened species listed in the table below:

Table 3. Conservation-listed flora species occurring in habitat of *Jacksonia pungens*

Species Name	Conservation Status (Western Australia)	Conservation Status (EPBC Act 1999)
<i>Gastrolobium appressum</i>	Endangered	Vulnerable
<i>Daviesia dielsii</i>	Endangered	Vulnerable

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

International obligations

Jacksonia pungens is not listed under any specific international treaty and this IRP does not affect Australia's obligations under any other international agreements. However, 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.

Indigenous consultation

Although the Department of Indigenous Affairs Aboriginal Heritage Sites Register does not list any significant sites near *Jacksonia pungens* input and involvement is being sought through the South West Aboriginal Land and Sea Council (SWALSC) and Department of Indigenous Affairs to determine if there are any issues or interests. As this is not expected to be completed before the approval of the IRP, further consultation has been included as a recovery action to ensure there has been Indigenous engagement in relation to the recovery actions posed in this plan.

Social and economic impact

As some *Jacksonia pungens* populations occur on private property and on Shire, Main Roads Western Australia (MRWA) and WestNet Rail road and rail reserves, the protection of the species at these sites potentially affects development and asset protection measures. Recovery actions refer to continued liaison between stakeholders with regard to these areas.

Affected interests

The implementation of this plan has some implications for land owners and managers including private property owners, the Coorow, Moora and Dalwallinu shires, Main Roads Western Australia (MRWA) and WestNet Rail. Recovery actions refer to continued liaison between stakeholders with regard to all of these areas.

Evaluation of the plan's performance

DEC, in conjunction with the Moora and Avon-Mortlock District Threatened Flora Recovery Teams (MDTFRT 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 viable *in situ* populations to ensure the long-term preservation of the species in the wild.

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

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

3. RECOVERY ACTIONS

Existing recovery actions

Appropriate people have been made aware of *Jacksonia pungens* and its location. Private property owners, Coorow, Moora and Dalwallinu Shires, WestNet Rail and MRWA have been notified about populations of the species. These notifications detailed the Declared Rare status of the species and the associated legal obligations.

DEC Moora District staff held an onsite meeting with the Shire of Coorow and WestNet Rail officials in 1997 and 2007. The meetings were held to inform authorities of the plants location and the need for its conservation.

A further onsite meeting was held between WestNet Rail and DEC staff to discuss tagging of *Jacksonia pungens* prior to a works program on rail lines. The species was not in flower at the time and tagging was

postponed. WestNet Rail subsequently employed a botanist to survey all rail reserve populations of DRF, including this taxon.

A fixed point monitoring framework for determining population trends was established in 2001. Research on the population size and health structure of *Jacksonia pungens* and limited investigations on its seed bank dynamics was undertaken by DEC's Science Division.

Declared Rare Flora (DRF) markers have been installed at all road and rail reserve populations. Awareness of the significance of these markers is being promoted to relevant bodies such as Shires, MRWA and WestNet Rail. To this end, posters, dashboard stickers and can holders have been produced and distributed. These illustrate DRF markers and inform of their purpose.

Approximately 9473 seeds collected from Populations 1 and 3 between January 1997 and January 2007 are stored in DEC's TFSC. An initial germination rate of 95% was recorded. The germination rates after storage were 99 and 100%. Further seed collections were made from Populations 1, 5, 6, 8, 9 and 10 and Subpopulations 3c, 7a, 7b and 12a but have yet to be processed.

Eighteen Seedlings of *Jacksonia pungens* produced during viability testing at the TFSC were provided to the BGPA. However, after three months all seedlings had died and there are currently no living plants of this species held at BGPA.

A basic fire management strategy has been prepared for the species. Monitoring of fire response of burnt population has been undertaken.

Andrew Crawford from the TFSC discovered new populations of *Jacksonia pungens* in the Shires of Dalwallinu and Moora in 2008, extending its known range further to the east (Collins 2008).

Staff from DEC's Avon-Mortlock District have liaised with the owner of private property containing Subpopulation 12b. Two other bush remnants were surveyed on the property at that time with no new populations located.

Staff from DEC's Science Division collected population structure data for the largest population of *Jacksonia pungens* in 2001 for use as a baseline for future monitoring. A final report summarising the findings was not completed however due to funding constraints.

A survey of populations was undertaken by Denise True and Anne Harris in 2003. Information recorded included counts of mature and dead individuals, population status, habitat details, threat assessments and other notable attributes. The data collected gives a good indication of the stability of each population.

Two articles were published in DEC's "WATSNU" Newsletter. *Jacksonia pungens* also featured in a schools activity book, threatened species magnets, greeting cards and watercolour posters. An information sheet containing photographs, a description of the plant, its habitat type, threats and management actions has also been produced. This poster is available to anyone interested in Declared Rare Flora (DRF) and is distributed to owners of land that contains this species, and to landowners who live in close proximity to known populations. The information sheet was revised in 2008, redistributed and is now available on DEC's website, Naturebase.

The MDTFRT and AMDTFRT will oversee the implementation of this IRP and will include information on progress in their annual reports to DEC's Corporate Executive and funding bodies.

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

Future recovery actions

Where recovery actions occur on lands other than those managed by DEC, permission has been or will be sought from land owners and land managers prior to recovery actions being undertaken. The following recovery actions are generally in order of descending priority, influenced by their timing over the life of the plan.

However this should not constrain addressing any of the actions if funding is available and other opportunities arise.

1. Coordinate recovery actions

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

Action: Coordinate recovery actions
Responsibility: DEC (Moora and Avon-Mortlock Districts) through the MDTFRT and AMDTFRT
Cost: \$1,500 per year

2. Conduct further surveys

New populations located near Dalwallinu in 2008 suggest a larger species range than originally thought. Further surveys by DEC staff and, where possible, volunteers from the local community, wildflower societies and naturalists clubs will be conducted during the taxons flowering period (October to November, December). All known populations will be resurveyed, as will nearby areas of suitable habitat, especially if disturbance (mechanical or fire) has occurred within the previous three to four years.

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

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

3. Implement disturbance trials

Observation suggests that disturbance events may be required to germinate *Jacksonia pungens* seed in the wild. Different disturbance techniques should be investigated (i.e. soil disturbance and fire), to determine the most successful and appropriate method.

Action: Implement disturbance trials
Responsibility: DEC (Science Division, Moora and Avon-Mortlock Districts) through the MDTFRT and AMDTFRT
Cost: \$3,400 in years 1 and 3, \$700 in years 2, 4 and 5

4. Develop translocation proposals

Jacksonia pungens populations contain small and declining numbers of mature individuals, and no populations are located on secure tenure. Translocations may therefore be needed for the long-term conservation of this species. This will require the development of a translocation proposal and selection of suitable translocation sites. Information on the translocation of threatened plants and animals in the wild is provided in the Department's Policy Statement No. 29 *Translocation of Threatened Flora and Fauna*. All translocation proposals require endorsement by the Department's Director of Nature Conservation.

Action: Develop translocation proposals
Responsibility: DEC (Science Division, Moora and Avon-Mortlock Districts) through the MDTFRT and AMDTFRT
Cost: \$36,000 in the third and fourth years, and \$3,500 in other years

5. Monitor populations

Monitoring of factors such as illegal picking, weed invasion, grazing, habitat degradation, population stability (expansion or decline), pollinator activity, seed production, recruitment and longevity is essential.

Action: Monitor populations
Responsibility: DEC (Moora and Avon-Mortlock Districts) through the MDTFRT and AMDTFRT
Cost: \$3,500 per year

6. Continue to collect population structure data

Population structure data was collected for the largest population of *Jacksonia pungens* in 2001 for use as a baseline for future monitoring. This data will continue to be collected as per the original project. A report summarising the findings will need to be written on completion.

Action: Continue to collect population structure data
Responsibility: DEC (Science Division, Moora and Avon-Mortlock Districts) through the MDTFRT and AMDTFRT
Cost: \$5,000 in years 1, 2 and 3; \$10,000 in year 4

7. Undertake weed control

Weeds potentially threaten all populations of *Jacksonia pungens* and 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 when weeds first emerge.
4. Schedule weed control to include other threatened flora populations within the District.
5. Regularly monitor weeds and implement additional weed control if required.

As the tolerance of associated native plant species to herbicides at *Jacksonia pungens* populations is not known, weed control will be undertaken in conjunction with research and done in a manner that minimises negative impacts on associated native flora.

Action: Undertake weed control
Responsibility: DEC (Science Division, Moora and Avon-Mortlock Districts) through the MDTFRT and AMDTFRT
Cost: \$5,000 per year, as required

8. Liaise with relevant land managers and Indigenous groups

Staff from DEC's Moora and Avon-Mortlock Districts will liaise with land managers to ensure that populations of *Jacksonia pungens* 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 (Moora and Avon-Mortlock Districts) through the MDTFRT and AMDTFRT
Cost: \$500 per year

9. Collect seed

Although seed has been collected from all populations of *Jacksonia pungens*, additional collections are required. Seed will be stored at DEC's TFSC.

Action: Collect seed
Responsibility: DEC (TFSC, Moora and Avon-Mortlock Districts) through the MDTFRT and AMDTFRT
Cost: \$3,500 per year

10. Remove rubbish from Subpopulation 3b

Rubbish has been dumped at the site of Subpopulation 3b and will need to be removed.

Action: Remove rubbish from Subpopulation 3b
Responsibility: DEC (Moora District), Shire of Coorow through the MDTFRT
Cost: \$500 in year 1

11. Develop and implement a Fire Response Plan

If possible, fire will be prevented from occurring in the habitat of populations, except where it is being used experimentally as a recovery tool. Although a basic fire management strategy has been prepared for the species, it and monitoring results of a burnt Subpopulation (3c) can be used to develop a Fire Response Plan. The Plan should include fire frequency, intensity, season, and control measures.

Action: Develop and implement a Fire Response Plan
Responsibility: DEC (Moora and Avon-Mortlock Districts) through the MDTFRT and AMDTFRT
Cost: \$2,500 in first year and \$1,000 in subsequent years

12. Repair fence at Population 2

Stock are accessing the habitat of Population 2 through a broken fence and the habitat is being trampled and grazed.

Action: Repair fence at Population 2
Responsibility: DEC (Moora District) through the MDTFRT
Cost: \$3,000 in year 1

13. Map habitat critical to the survival of *Jacksonia pungens*

It is a requirement of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) that spatial data relating to habitat critical to the survival of the species be determined. Although this is alluded to 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 their survival will also be determined.

Action: Map habitat critical to the survival of *Jacksonia pungens*
Responsibility: DEC (Species and Communities Branch (SCB), Moora and Avon-Mortlock Districts) through the MDTFRT and AMDTFRT
Cost: \$3,100 in year 2

14. Obtain biological and ecological information

Improved knowledge of the biology and ecology of *Jacksonia pungens* will provide a better scientific basis for managing wild populations and should include:

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, Moora and Avon-Mortlock Districts) through the MDTFRT and AMDTFRT
Cost: \$10,000 per year

15. Promote awareness

The importance of biodiversity conservation and the need for the long-term protection of wild populations of *Jacksonia pungens* 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 reproduced, 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 Moora and Avon-Mortlock District offices.

To minimise the risk of accidental or deliberate destruction, the exact locations of *Jacksonia pungens* 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, Moora and Avon-Mortlock Districts) through the MDTFRT and AMDTFRT
Cost: \$1,600 in year 1 and \$1,000 in years 2-5

16. Propose ranking criteria change for *Jacksonia pungens*

At the next meeting of the TSSC the ranking of *Jacksonia pungens* will be recommended to be amended from CR A1c; B1+2c; C1 to CR B2ab(iii) (IUCN 2001). The species no longer meets the current criteria as it is now known from twelve populations and 298 mature individuals.

Action: Propose ranking criteria change for *Jacksonia pungens*
Responsibility: DEC (SCB, Moora and Avon-Mortlock Districts) through MDTFRT and AMDTFRT
Cost: \$1,000 in year 1

17. Review this IRP and assess the need for further recovery actions

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

Action: Review this IRP and assess the need for further recovery actions
Responsibility: DEC (SCB, Moora and Avon-Mortlock Districts) through the MDTFRT and AMDTFRT
Cost: \$2,000 in year 5

Table 4. Summary of recovery actions

Recovery Actions	Priority	Responsibility	Completion date
Coordinate recovery actions	High	MDTFRT and AMDTFRT	Ongoing
Conduct further surveys	High	DEC (Moora and Avon-Mortlock Districts) through the MDTFRT and AMDTFRT	Ongoing
Implement disturbance trials	High	DEC (Science Division, Moora and Avon-Mortlock Districts) through the MDTFRT and AMDTFRT	Ongoing
Develop translocation proposals	High	DEC (Moora and Avon-Mortlock Districts) through the MDTFRT and AMDTFRT	Ongoing
Monitor populations	High	DEC (Moora and Avon-Mortlock Districts) through the MDTFRT and AMDTFRT	Ongoing
Continue to collect population structure data	High	DEC (Science Division, Moora and Avon-Mortlock Districts) through the MDTFRT and AMDTFRT	2014
Undertake weed control	High	DEC (Science Division, Moora and Avon-Mortlock Districts) through the MDTFRT and AMDTFRT	Ongoing
Liaise with relevant land managers and Indigenous groups	High	DEC (Moora and Avon-Mortlock Districts) through the MDTFRT and AMDTFRT	Ongoing
Collect seed	High	DEC (TFSC, Moora and Avon-Mortlock Districts) through the MDTFRT and AMDTFRT	Ongoing
Remove rubbish from Population 3b	High	DEC (Moora District) Shire of Coorow through the MDTFRT	2010
Develop and implement a Fire Response Plan	High	DEC (Moora and Avon-Mortlock Districts) through the MDTFRT and AMDTFRT	Developed by 2010 with implementation ongoing

Repair fence at Population 2	High	DEC (Moora District) through the MDTFRT	2010
Map habitat critical to the survival of <i>Jacksonia pungens</i>	Medium	DEC (Species and Communities Branch (SCB), Moora and Avon-Mortlock Districts) through the MDTFRT and AMDTFRT	2011
Obtain biological and ecological information	Medium	DEC (Science Division, Moora and Avon-Mortlock Districts) through the MDTFRT and AMDTFRT	2014
Promote awareness	Medium	DEC (SCB, Strategic Development and Corporate Affairs Division, Moora and Avon-Mortlock Districts) through the MDTFRT and AMDTFRT	Ongoing
Propose ranking criteria change for <i>Jacksonia pungens</i>	Medium	DEC (SCB, Moora and Avon-Mortlock Districts) through MDTFRT and AMDTFRT	2010
Review this IRP and assess the need for further recovery actions	Medium	DEC (Moora and Avon-Mortlock Districts) through the MDTFRT and AMDTFRT	2014

4. TERM OF PLAN

This IRP will operate from July 2009 to June 2014 but will remain in force until withdrawn or replaced. If the species is still listed as threatened after five years, the need for further recovery actions will be determined.

5. REFERENCES

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- World Conservation Union (2001) *IUCN Red List Categories: Version 3.1*. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.

6. TAXONOMIC DESCRIPTION

Chappill, J.A., Wilkins, C.F. and Crisp, M.D. (2007) Taxonomic revision of *Jacksonia* (Leguminosae: Mirbelieae). *Australian Systematic Botany*, 20: 473-623.

Erect, densely branching, domed, *shrub* 0.3–1×0.4–1 m, not resinous. *Branches* grey-green, terete, ribbed, apex not curled, not tapering to a stiff point, not divaricately branching, ultimate lateral branchlets scattered along branches, short, determinate, not articulated, unbranched, terete, straight, pungent, 8–73×1.5–2 mm, penultimate branches at mid-point of their length 2.2–4.3mm wide, hairs dense, spreading or appressed, straight, peltate, white or gold, 0.7–0.9 mm long. *Seedling leaves* absent on mature plants. *Scale leaves* persistent, appressed, ovate with entire margin, dark brown, apex innocuous, 1.3–3.7× 0.7–1.6 mm. *Flowers* scattered on the long pungent branchlets, subtending scale leaves 3–7×1.5–5 mm. *Pedicels* straight, 1.5–5.5 mm, not lengthening in

fruit. *Bracteoles* persistent on middle of pedicel, ovate with entire margin, 5.7–9.3× 2.1–5 mm. *Buds* golden brown with hairs of two types—dense, spreading, straight, peltate, golden hairs 0.2 mm long and scattered, spreading, straight, peltate, white hairs 3.5 mm long, ellipsoid, strongly angular, 11.3–13.2×6.5–7.5 mm, apiculum 0.7–1.2 mm, same colour as bud, straight, tips fused in bud. *Hypanthium* not ribbed, 0.8–1.4 mm long. *Calyx* chartaceous, all lobes splayed at flowering, becoming brittle and covering developing fruit after flowering, margins flat after flowering, inner surface green to pink, the widest point at mid-point of lobes, adaxial and abaxial lobes alike, 10.3–13.7×2–6 mm, fused for 1.2–1.5 mm. *Standard* orange-red with red markings, without red veins on outer surface, auricles absent or present, 0.2–0.3×0.4–1 mm, callosities present at apex of claw, emarginate indent 2.2 mm long without an apiculum, lamina 7.7–10.2×7.8–11.2 mm, claw 0.8–1.1×0.7–0.9 mm; *wings* orange-red with red markings, straight, obovate, apex entire or notched, lamina 8.1–9.2×2.5–3.5 mm, claw 1.3–1.7 mm long; *keel* red, apex obtuse, marginal hairs absent, lamina 7.3–8.1×3.7–5.4 mm, claw 2.2–2.5 mm long. *Stamen* filaments white with pink apex, uniform width, 5.7–10.3×0.3–0.35 mm; *anthers* cream when dried, ellipsoid, 0.85–1.1×0.4–0.5 mm, connective same colour as anther cells. *Gynoecium* *stipe* 1.3–1.5 mm long; *ovary* 4.3×1.3–2.1 mm, external hairs 0.9–1.1 mm long; *style* 4.5–5.1×0.25–0.3 mm; *stigma* not capitate; *ovules* 2. *Fruit* woody, without horizontal cracks, with dense, appressed, straight, peltate, white or golden external hairs 1.1 mm long, inner surface with dense, white hairs 0.1 mm long, ellipsoid without a persistent style, straight, flattened in TS, 6.7–7.1×4.8–5.4 mm, dehiscence from apex along both sutures, valve edges not incurved after dehiscence, dropped at or before dehiscence, without persistent petals, pedicel straight. *Seeds* ellipsoid with small radicular lobe, yellow or green with or without black spots and stripes, smooth, without cuticular wrinkles, 2.9–4.2×2–2.8 mm. *Seedling* stem terete; first *juvenile leaves* opposite, elliptic with entire margin, with dense hairs 0.1 mm long, alternate from 2nd node, dentate from 5th node, largest leaf obovate, internodes 2.5 mm long; *scale leaves* developing after 7 nodes.

