

Short-Petalled Beyeria

(Beyeria lepidopetala)

RECOVERY PLAN



Department of Environment and Conservation
201 Foreshore Drive, Geraldton, WA 6530

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 and threatened ecological communities 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 and communities, always within one year of endorsement of that rank by the Minister.

This IRP will operate from April 2008 to March 2013 but will remain in force until withdrawn or replaced. It is intended that, if the species is still ranked as Vulnerable or its status deteriorates to Endangered or Critically Endangered, this IRP will be reviewed after five years and the need for a full Recovery Plan will be assessed.

This IRP was approved by the Director of Nature Conservation on the 30 April 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 at April 2008.

This IRP was prepared with financial support from the Australian Government to be adopted as a National Recovery Plan under the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

IRP PREPARATION

This Interim Recovery Plan was prepared by Alanna Chant¹ and Andrew Brown².

¹ Flora Conservation Officer, DEC's Geraldton District, PO Box 72 Geraldton, WA 6530.

² Threatened Flora Coordinator, Species and Communities Branch, DEC, Locked Bag 104, Bentley Delivery Centre.

ACKNOWLEDGMENTS

The following people have provided assistance and advice in the preparation of this Interim Recovery Plan:

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Anthony Desmond	Program Leader Nature Conservation, Midwest Region, DEC, Geraldton
Michael Jones	Horticulturalist, Botanic Gardens and Parks Authority, Perth
Sue Patrick	Formerly, Senior Research Scientist, WA Herbarium, DEC, Kensington
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John Riley	Admin Officer, Flora, Species and Communities Branch, DEC, Kensington
Gillian Stack	Project Officer, Species and Communities Branch, DEC, Kensington
Robyn Luu	Project Officer, Species and Communities Branch, DEC, Kensington

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 Alanna Chant.

CITATION

Department of Environment and Conservation (2009) Short-petalled *Beyeria* (*Beyeria lepidopetala*) Recovery Plan . Commonwealth Department of the Environment, Water, Heritage and the Arts, Canberra.

SUMMARY

Scientific Name:	<i>Beyeria lepidopetala</i>	Common Name:	Short-petalled Beyeria
Family:	Euphorbiaceae	Flowering Period:	July - August
DEC Region:	Midwest	DEC District:	Geraldton
Shire:	Northampton	Recovery Team:	Geraldton District Threatened Flora Recovery Team

Illustrations and/or further information: Atkins, K. (2008) *Declared Rare and Priority Flora List for Western Australia*. Department of Environment and Conservation, Western Australia; Bentham, G. (1873) *Flora Australiensis: a description of the plants of the Australian territory. Volume VI, Thymeleae to Dioscorideae*. Reeve, London; Brown, A., Thomson-Dans, C. and Marchant, N. (1998) *Western Australia's Threatened Flora*, Department of Conservation and Land Management, Perth, Western Australia; *Western Australian Herbarium FloraBase 2 – Information on the Western Australian Flora* (2006) <http://www.calm.wa.gov.au/science/>. Department of Environment and Conservation, Perth, Western Australia; Hopper, S.D. *et al.* (1990) *Western Australia's Endangered Flora*. Department of Conservation and Land Management, Perth, Western Australia; Leigh, J., Boden, R. and Briggs, J. (1984) *Extinct and Endangered Plants of Australia*. Macmillan, Victoria; Marchant, N. and Keighery, G. (1979) Poorly collected and presumably rare vascular plants in W.A. *Kings Park Research Notes* 5:55; Mueller, F. (1859) *Fragmenta Phytographiae Australiae* 1(5):230.

Current status: *Beyeria lepidopetala* was declared as Rare Flora under the Western Australian *Wildlife Conservation Act 1950* in May 1991 and was listed as presumed extinct at that time. Following its rediscovery in 1994 and further populations being found between 2003 and 2006, the species was ranked as Vulnerable (VU) under World Conservation Union (IUCN 2001) Red List Criterion D2 due to populations having a restricted area of occupancy (less than 20 km²) and the low number of locations (less than five) such that it is prone to the effects of human activities or stochastic events within a very short period of time. The main threats include clearing, inappropriate fire regimes, track and firebreak maintenance, weeds, rabbits and feral pigs. *B. lepidopetala* is listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Description: *Beyeria lepidopetala* is an erect, open shrub between 25 cm and 1.7 m tall, with stellate hairs on the branches. The leaves, which are presented on a short petiole and are up to 15 cm long, are glabrous above with distinctive white stellate hairs on the underside and are narrowly oblong in shape with the margins distinctly rolled under. The flowers are green in colour, with both male and female flowers on slender pedicels to ca. 12 mm long. The pedicel of the female flower thickens upwards after flowering. The five calyx segments of the male flower are almost circular in outline, ca. 2 mm in diameter and overlapping. Those of the female flower are narrower and more rigid. The petals are broad, hairy on the inside, fringed, and shorter than the calyx lobes. There are numerous stamens and each anther cell has a small terminal appendage. The stigma is three-lobed and the fruit is a three-celled ovoid globular capsule, which is three seeded and ca. 6 mm long. At one population the male and female flowers appeared on different plants but occur on one plant in the type specimen (Patrick 2001).

Habitat requirements: *Beyeria lepidopetala* is currently recorded over a range of approximately 60 km, from the south west corner of Kalbarri National Park (Population 1) to the north-east corner of Kalbarri National Park and adjacent Pastoral lease (Populations 2, 3 and 4). Although there are currently no living plants in the south western population, the habitat is recorded as being yellow sandy clay in a gully containing open mallee heath and low heath on a limestone ridge above the gully. Both areas are regenerating following fire. At the north eastern locations *B. lepidopetala* is found on yellow sand with *Banksia sceptrum*, *Eucalyptus beardiana*, *Beaufortia squarrosa*, *Thryptomene* sp., *Verticordia oculata*, *Calothamnus blepharospermus* and *Diplopeltis huegelii*.

Habitat critical to the survival of the species and important populations: The habitat critical to the survival of *Beyeria lepidopetala* comprises the area of occupancy of the known populations, and similar habitat near the known populations and additional occurrences of similar habitat (yellow sandy clay soil in open mallee woodland, low heath on limestone ridges and yellow sandplain with *Eucalyptus beardiana* and *Banksia sceptrum*) that do not currently contain the species but may have done so in the past and may be suitable for translocations.

Given that the species is currently known from just three extant populations and one presumed extinct population, it is considered that all known habitat for wild and possible future translocated populations is habitat critical to the species' survival, and all populations, including translocated populations, are important populations.

Benefits to other species or ecological communities: Recovery actions implemented to improve the quality or security of habitat of *Beyeria lepidopetala* will also assist in protecting other Rare and Priority Flora that occur in association with it. *Caladenia bryceana* subsp. *cracens*, which is ranked as Endangered by DEC and Vulnerable under the Commonwealth EPBC Act, and *B. cygnorum* and *Anthocercis intricata*, which are listed as Priority 3 by DEC, occur in association with Population 1, while *Eucalyptus beardiana*, which is listed as Endangered by DEC and Vulnerable under the Commonwealth EPBC Act, occurs in association with Populations 2 and 3.

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. However, as *Beyeria lepidopetala* is not specifically listed under any international agreement, the implementation of other international environmental responsibilities is not affected by this plan.

Role and interests of Indigenous people: According to the Department of Indigenous Affairs Aboriginal Heritage Sites Register, no sites of Aboriginal significance are known at or near populations of the species covered by this recovery plan. However, the local organization representing the Indigenous community, the Yamatji Land and Sea Council, was consulted in order to identify any possible Indigenous interest in recovery of *Beyeria lepidopetala* and a representative from that group has been invited to become a member of the Geraldton District Threatened Flora Recovery Team. This will enable ongoing liaison with the Indigenous community and involvement in flora recovery where they have an interest. Continued liaison between DEC and the Indigenous community will identify areas in which collaboration will assist implementation of recovery actions.

Social and economic impact: Two extant populations of *Beyeria lepidopetala* occur on a pastoral property that has recently been purchased through the Australian Bush Heritage Fund for the purpose of conservation. Part of one of these populations (Subpopulation 2b) extends into the adjacent Kalbarri National Park. Two other populations (one currently presumed extinct) are also found within Kalbarri National Park. The implementation of this recovery plan is therefore unlikely to have any social or economic impact.

Affected interests: Stakeholders potentially affected by the implementation of this plan include DEC and the leaseholders of the pastoral property.

Evaluation of the plan's performance: DEC will evaluate the performance of this recovery plan in conjunction with the Geraldton District Threatened Flora Recovery Team (GDTFRT). In addition to annual reporting on progress with listed actions and comparison against the criteria for success and failure, the plan is to be reviewed within five years of its implementation.

Completed Recovery Actions

1. Relevant land managers have been made aware of the location and threatened status of the species and staff from DEC's Geraldton District are maintaining contact with them.
2. Declared Rare Flora (DRF) markers are in place at populations that may be under threat from track or fire break maintenance activities.
3. Rabbit control has been conducted on the pastoral lease that contains Populations 2 and 3.
4. Staff from DEC's Geraldton District and members of the GDTFRT have undertaken surveys in areas that appear to be suitable habitat for this species.
5. Members of the WA Wildflower Society collected the species in two locations (Populations 2 and 3) while undertaking flora surveys on a pastoral property north east of Kalbarri.
6. The pastoral lease where Populations 2 and 3 occur has been purchased through the Australian Bush Heritage Fund. Managers have been employed to undertake management actions to protect the areas' conservation values.
7. DEC's Geraldton District is undertaking protective fire management strategies within the National Park where Populations 1 and 3 occur.

Ongoing and future recovery actions

8. Staff from DEC's Geraldton District regularly monitor populations of the species.
9. The GDTFRT is overseeing the implementation of this recovery plan and will include information on progress in annual reports to DEC's Corporate Executive and funding bodies.

Recovery plan objective: The objective of this recovery plan is to abate identified threats and maintain or enhance *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 within the known populations has increased by ten 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 within the known populations has decreased by ten percent or more over the term of the plan.

Recovery actions

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| 1. Coordinate recovery actions | 8. Undertake trials to stimulate recruitment |
| 2. Map habitat critical to the survival of <i>Beyeria lepidopetala</i> | 9. Develop and implement a fire management strategy |
| 3. Liaise with relevant land managers | 10. Obtain biological and ecological information |
| 4. Monitor populations | 11. Conduct further surveys |
| 5. Implement rabbit control if necessary | 12. Collect seed |
| 6. Implement weed control if necessary | 13. Promote awareness |
| 7. Implement feral pig control if necessary | 14. Review the recovery plan and assess the need for further |

recovery actions

1. BACKGROUND

History

Beyeria lepidopetala was described by Ferdinand von Mueller in 1859 from specimens collected in a rocky location near the Murchison River by Augustus Oldfield.

The species was known from the type collection only until rediscovered in Kalbarri National Park by R. Cranfield in 1994 (Population 1). Cranfield stated that the species was 'frequent', however only one plant was found during a survey conducted in 1995 and despite intensive surveys between 1997 and 2004 no plants could be located at the site. It is possible that either the initial locality may not have been correctly recorded, or the population may have experienced a rapid decline. A further three populations of *Beyeria lepidopetala* were discovered during Wildflower Society flora surveys conducted between 2003 and 2006. These were located on a pastoral lease adjacent to the north-eastern edge of Kalbarri National Park (Populations 2 and 3) with Population 3 extending into the park and Population 4 contained within the park. A total of 2173 mature individuals are now known over a range of several kilometres.

Description

Beyeria lepidopetala is an erect, open shrub to between 25 cm and 1.7 m tall with stellate hairs on the branches and narrowly oblong leaves to 15 cm long on a short petiole. The leaves are glabrous above with distinctive white stellate hairs on the underside and have margins that are distinctly rolled under. The flowers are green in colour, with both male and female flowers on slender pedicels to ca. 12 mm long. The pedicel of the female flower thickens upwards after flowering. The five calyx segments of the male flower are almost circular in outline, ca. 2 mm in diameter and overlapping. Those of the female flower are narrower and more rigid. The petals are broad, hairy on the inside, fringed, and shorter than the calyx lobes. There are numerous stamens and each anther cell has a small terminal appendage. The stigma is three-lobed and the fruit is a three-celled ovoid globular capsule, which is three seeded and ca. 6 mm long (Patrick 2001).

Beyeria lepidopetala is distinguished by the rolled margins to the leaves, the stellate hairs on the stems and underside of the leaves and the solitary male and female flowers that are most commonly found on separate plants but can also occur on the same plant. The species is distinguished from other *Beyeria* species in having stellate hairs, a three seeded capsule, linear leaves and short globular anthers on a bifid connective (Grieve 1998).

Distribution and habitat

Beyeria lepidopetala is endemic to Western Australia where it appears to be confined to the Kalbarri-Murchison area. The species is currently recorded in two locations some 60 km apart, the first (Population 1) in the south west corner of Kalbarri National Park and the second (Populations 2, 3 and 4) in the north east corner of Kalbarri National Park and adjacent pastoral lease. The type specimen is believed to have been collected between these two locations near the Murchison River.

At the south western location (Population 1) *Beyeria lepidopetala* grew in a gully on yellow sandy clay in mallee heath that was regenerating after fire. Associated species include *Beyeria cygnorum*, *Melaleuca lanceolata*, *Hibbertia hypericoides*, *Grevillea* sp. and *Lasiopetalum* sp. At the north-eastern location (Populations 2, 3 and 4), the species is found on yellow sand with *Banksia sceptrum*, *Eucalyptus beardiana*, *Beaufortia squarrosa*, *Thryptomene* sp., *Acacia* sp., *Pileanthus vernicosa*, *Verticordia oculata*, *Calothamnus blepharospermus* and *Diplopeltis huegelii*. The type specimen was collected from a rocky area near the Murchison River.

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

Pop. No. & Location	DEC District	Shire	Vesting	Purpose	Manager
1. S of Kalbarri	Geraldton	Northampton	Conservation Commission of Western Australia	National Park	DEC
2. NE of Kalbarri	Geraldton	Northampton	Unallocated Crown Land	Pastoral Lease	Australian Bush Heritage Fund
3. NE of Kalbarri	Geraldton	Northampton	Unallocated Crown Land	Pastoral Lease	Australian Bush Heritage Fund
4. NE of Kalbarri	Geraldton	Northampton	Conservation Commission of Western Australia	National Park	DEC

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

Biology and ecology

The genus *Beyeria* contains approximately fifteen species, ten of which occur in the south west of Western Australia. *Beyeria* species are all shrubs with sticky undivided leaves and insignificant unisexual flowers that are either monoecious or dioecious. The genus is closely related to *Bertya*, with one of the main differences being the presence of petals in *Beyeria*. The specific name *lepidopetala* is from the Greek *lepis* (scale) and *petalon* (petal), referring to the minute petals, which are reduced to scales (Leigh *et al.* 1984).

There is little information available on the biology and ecology of *Beyeria lepidopetala*. At the site where it was recorded by R. Cranfield in 1994 (Population 1) the habitat was regenerating after a recent fire and the species was recorded as ‘frequent’. The population then appeared to decline rapidly and subsequent surveys failed to locate the species suggesting it may be a short-lived disturbance opportunist. At Population 2 plants were recorded as appearing to have regenerated after a fire that is believed to have occurred within the last ten years. These plants appeared quite young. However, plants in Populations 3 and 4 do not appear to be regenerating after a recent fire and are recorded as appearing older and larger than those in Population 2. No obvious decline has been recorded since these three populations were discovered between 2003 and 2006. Many species that occur in fire-prone environments have dormancy-breaking cues related to fire as there is an advantage in linking seedling emergence to the immediate post-fire environment (Gill 1981).

Beyeria species are generally insect pollinated however, the morphological characters of *B. lepidopetala* suggest that it is possibly wind pollinated. This evidence includes the imperfect, small colourless flowers, numerous stamens and the extended flower presentation (S. Patrick¹ personal communication).

Threats

Beyeria lepidopetala was declared as Rare Flora in May 1991 under the Western Australian *Wildlife Conservation Act 1950* and was listed as presumed extinct at that time. Following its rediscovery in 1994 and further populations being found in 2003 the species was ranked as Vulnerable (VU) under World Conservation Union (IUCN 2001) Red List Criterion D2 as it has a very restricted area of occupancy and may be prone to the effects of human activities or stochastic events within a short period of time. *Beyeria lepidopetala* is listed as Endangered (EN) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Population 1 appears to have declined rapidly to presumed extinction and, as there is no information available on the likely cause, other populations may be at risk of similar decline. There is very little known about the appropriate fire interval for this species, however populations occur in a fire prone environment and it is likely that altered or inappropriate fire regimes are a possible threat. Gaining information on the species’ biology and ecology, including appropriate fire interval and dormancy breaking cues will contribute to the health of populations. Threats include:

¹ Sue Patrick, Formerly, Senior Research Scientist, DEC, Kensington

- **Inappropriate fire regimes** during the reproductive phase of *Beyeria lepidopetala* (i.e. flowering, pollination, seed growth and seed dispersal) may result in low/nil seed production, and fire should not occur in populations until regenerating or seedling plants are sufficiently large to produce flowers. High fire frequency may also lead to the degradation of the habitat of *B. lepidopetala* due to a depletion of the soil seed bank and a temporary increase in the availability of nutrients for weed establishment (Panetta and Hopkins 1991). Appropriate infrequent summer fire may be an important part of the life cycle of this species and be necessary for regeneration.
- **Rapid population decline** has been recorded in Population 1 of *Beyeria lepidopetala*. The species was recorded as being frequent at the site in 1994 but by 1997 no individuals could be located. It is possible that *B. lepidopetala* is either a short-lived disturbance opportunist, or the population has declined due to an unknown threat. A lack of information regarding the species and its longevity makes it difficult to determine appropriate management actions for extant populations.
- **Feral Pigs** (*Sus scrofa*) have been recorded in Population 1. Feral pigs can introduce weed seeds and nutrients. They can also damage flora and their habitat by digging large areas of soil in search of food. Such soil disturbance encourages establishment of weeds.
- **Rabbits** (*Oryctolagus cuniculus*) are present at Population 1 where *Beyeria lepidopetala* has been recorded in the past and are also high in number at Populations 2 and 3 (M. Quick², personal communication). Although no grazing of *B. lepidopetala* plants has been observed, rabbits may impact on recruitment by grazing seedlings, causing extensive soil disturbance and introducing weed seed and nutrients.
- **Weed infestations** are not currently impacting *Beyeria lepidopetala* populations. However, due to plants being located in areas that are adjacent to tracks and fire breaks, weeds could become a threat in the future. Where weed infestation becomes severe *B. lepidopetala* may be affected by direct competition, a decrease in habitat diversity and an increased fuel load.
- **Track and fire break maintenance** has the potential to threaten *Beyeria lepidopetala* plants in areas where populations occur adjacent to tracks and firebreaks. This threat is not considered imminent as populations occur on land managed for conservation and liaison is being maintained with the land managers to ensure that protective planning is undertaken.

Table 2. - Summary of population information and threats

Pop. No. & Location	Year	No. plants	Condition	Threats
1. S of Kalbarri	1994	'Frequent'	Healthy	Feral pigs, rabbits, unexplained decline, track and fire break maintenance, weeds
	1995	1	Moderate	
	1996	1	Moderate	
	1999	0	Not located	
	2000	0	Not located	
	2003	0	Not located	
	2005	0	Not located	
2. NE of Kalbarri	2004	20	Healthy	Inappropriate fire regimes, rabbits, track and fire break maintenance, weeds
	2005	20	Healthy	
	2006	600	Healthy	
3. NE of Kalbarri	2004	200	Healthy	Inappropriate fire regimes, rabbits, track and fire break maintenance, weeds
	2005	200	Healthy	
	2006	73	Healthy	
4. NE of Kalbarri	2006	1500	Healthy	Inappropriate fire regimes, track and fire break maintenance

Guide for decision-makers

Table 2 provides details of current and possible future threats. Developments in the immediate vicinity of the populations or within the defined habitat critical to the survival of *Beyeria lepidopetala* require assessment for the potential for a significant level of impact.

² Margaret Quick, former owner Eurardy Station

Habitat critical to the survival of the species and important populations

The habitat critical to the survival of *Beyeria lepidopetala* comprises the area of occupancy of known populations and similar habitat near known populations (yellow sandy clay soil in open mallee woodland, low heath on limestone ridges and yellow sandplain with *Eucalyptus beardiana* and *Banksia sceptrum*) that do not currently contain the species but may have done so in the past and may be suitable for translocations.

Given that the species is currently known from just three extant populations and one presumed extinct population, it is considered that all known habitat for wild and possible future translocated populations is habitat critical to the species' survival, and all populations, including translocated populations, are important populations.

Benefits to other species or ecological communities

Recovery actions implemented to improve the quality or security of habitat of *Beyeria lepidopetala* will also assist in protecting other Rare and Priority Flora that occur in association with it. *Caladenia bryceana* subsp. *cracens*, which is ranked as Endangered in WA and Vulnerable under the Commonwealth EPBC Act, and two Priority 3 species, *Beyeria cygnorum* and *Anthocercis intricata*, occur in the area of Population 1 and *Eucalyptus beardiana*, which is ranked as Endangered in Western Australian and Vulnerable under the Commonwealth EPBC Act, occurs in association with Populations 2 and 3.

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. However, as *Beyeria lepidopetala* is not specifically listed under any international agreement, the implementation of other international environmental responsibilities is not affected by this plan.

Role and interests of Indigenous people

According to the Department of Indigenous Affairs Aboriginal Heritage Sites Register, no sites of Aboriginal significance are known at or near populations of the species covered by this recovery plan. However, the local organization representing the Indigenous community, the Yamatji Land and Sea Council, was consulted in order to identify any possible Indigenous interest in recovery of *Beyeria lepidopetala* and a representative from that group has been invited to become a member of the Geraldton District Threatened Flora Recovery Team. This will enable ongoing liaison with the Indigenous community and involvement in flora recovery where they have an interest. Continued liaison between DEC and the Indigenous community will identify areas in which collaboration will assist implementation of recovery actions.

Social and economic impacts

Two extant populations of *Beyeria lepidopetala* occur on a pastoral property that has recently been purchased through the Australian Bush Heritage Fund for the purpose of conservation. Part of one of these populations (Subpopulation 2b) extends into Kalbarri National Park and Population 4 occurs wholly in the park. Population 1 (currently presumed extinct) was also located within Kalbarri National Park. The implementation of this recovery plan is therefore unlikely to have any social or economic impact.

Affected interests

Stakeholders potentially affected by the implementation of this plan include DEC and the pastoral property leaseholders.

Evaluation of the plan's performance

DEC will evaluate the performance of this recovery plan in conjunction with the Geraldton District Threatened Flora Recovery Team. 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

Objectives

The objective of this recovery plan is to abate identified threats and maintain or enhance *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 individuals within the known populations has increased by ten percent or more over the term of the plan.

Criteria for failure: The number of populations has decreased and/or the number of individuals within the known populations has decreased by ten percent or more over the term of the plan.

3. RECOVERY ACTIONS

Completed recovery actions

Managers of the pastoral lease that contains Populations 2 and 3 have been informed of the presence of DRF on land under their management. The notification details the Declared Rare status of *Beyeria lepidopetala* and associated legal obligations. There has been on-site liaison with regard to conservation of the species between DEC's Geraldton District Flora Conservation Officer and DEC's National Park staff (Populations 1 and 4).

Declared Rare Flora (DRF) markers have been installed at all populations that occur near tracks and fire breaks. These markers alert track maintenance workers to the presence of each population, and enable them to take appropriate care.

The previous pastoral lease holders conducted ongoing and opportunistic rabbit control until their lease was sold in 2005. Rabbit activity and the impact on vegetation was monitored and communicated to DEC's Geraldton District Flora Conservation Officer.

Staff from DEC's Geraldton District, Species and Communities Branch (SCB) and WA Herbarium have undertaken intensive surveys of suitable habitat for this species.

Members of the WA Wildflower Society collected the species in two locations (Populations 2 and 3) while undertaking flora surveys on a pastoral property north east of Kalbarri.

The lease on the pastoral property where Populations 2 and 3 occur has been purchased for conservation through the Australian Bush Heritage Fund. Reserve managers have been appointed to undertake management actions to protect the areas' conservation values.

During surveys in 2006, DEC's Geraldton District Flora Conservation Officer located a new population (Population 4) containing 1500 plants.

DEC's Geraldton District implements fire management strategies within Kalbarri National Park where Population 1 occurs.

Ongoing and future recovery actions

Staff from DEC's Geraldton District regularly monitor all populations of this species and maintain liaison with relevant land managers.

The GDTFRT are overseeing the implementation of this recovery plan and will include information on progress in its annual report to DEC's Corporate Executive and funding bodies.

Where populations occur on lands other than those managed by DEC, permission has been or will be sought from appropriate land managers prior to recovery actions being undertaken. The following recovery actions are roughly in order of descending priority, however this should not constrain addressing any of the other priorities if funding is available and other opportunities arise.

1. Coordinate recovery actions

The Geraldton District Threatened Flora Recovery Team will coordinate recovery actions for *Beyeria lepidopetala* and other Declared Rare Flora in their district. They will include information on progress in their annual report to DEC's Corporate Executive and funding bodies.

Action: Coordinate recovery actions
Responsibility: DEC (Geraldton District) through the GDTFRT
Cost: \$1,000 per year

2. Map habitat critical to the survival of *Beyeria lepidopetala*

Although habitat critical to the survival of *Beyeria lepidopetala* is described in Section 1, the areas have not yet been mapped and that will be redressed under this action. If additional populations are located, then habitat critical to their survival will also be determined and mapped.

Action: Map critical habitat critical to the survival of *Beyeria lepidopetala*
Responsibility: DEC (Geraldton District and SCB) through the GDTFRT
Cost: \$1,000 in the second year

3. Liaise with relevant land managers

Staff from DEC's Geraldton District will continue to liaise with relevant land managers to ensure that populations are not accidentally damaged or destroyed. This will include liaison with managers of the Pastoral Lease on which Populations 2 and 3 occur and with National Park staff responsible for park management and fire management where Populations 1 and 4 occur.

Action: Liaise with relevant land managers
Responsibility: DEC (Geraldton District) through the GDTFRT
Cost: \$1,000 per year

4. Monitor populations

Annual monitoring of factors such as habitat degradation (due to weed invasion, rabbits, feral pigs and plant senescence), population stability (expansion or decline), pollinator activity, seed production, recruitment, longevity and predation is essential. The visibility of DRF markers will also be monitored to ensure they remain effective and have not faded or become covered by vegetation. Any populations burnt during fire will be monitored for regeneration, and data recorded to advance the knowledge of the biology of the species.

Action: Monitor populations
Responsibility: DEC (Geraldton District) through the GDTFRT
Cost: \$2,000 per year

5. Implement rabbit control if necessary

The level of threat posed by rabbits varies from year to year with environmental conditions and rabbit numbers. If monitoring ascertains that the threat to populations of *Beyeria lepidopetala* is high, baiting using 1080 oats will be undertaken in summer months when less green feed is available as an alternative food source.

Action: Implement rabbit control if necessary
Responsibility: DEC (Geraldton District) through the GDTFRT; relevant land managers
Cost: \$700 in first, third and fifth years

6. Implement weed control if necessary

Although weeds are not currently recorded as having an impact on *Beyeria lepidopetala*, all populations occur near tracks and fire breaks where there is potential for weeds to be introduced. If weeds become established they could impact on *B. lepidopetala* by competing for resources, degrading habitat, exacerbating grazing pressure and increasing the risk and severity of fire. Weed control will be undertaken should any new infestations be recorded during regular monitoring. All applications of weed control will be followed by a report on the method, timing and success of the treatment and any adverse effect on *B. lepidopetala* and associated native plant species. Copies will be retained at the District and provided to Species and Communities Branch.

Action: Implement weed control if necessary
Responsibility: DEC (Geraldton District) through the GDTFRT and relevant land managers
Cost: \$1,300 per year

7. Implement feral pig control if necessary

Feral pig activity has been recorded at Population 1. Feral pigs can damage threatened flora and their habitat by digging large areas of soil in search of food. They can also introduce weed seeds and nutrients and the soil disturbance they create encourages establishment of weeds. Should *Beyeria lepidopetala* be rediscovered in the vicinity of this recorded location, feral pig control will be necessary to protect plants.

Action: Implement feral pig control if necessary
Responsibility: DEC (Geraldton District) through the GDTFRT
Cost: \$1,000 per year

8. Undertake trials to stimulate recruitment

Disturbance trials will be conducted near Population 1, and possibly Populations 2, 3 and 4, to ascertain which methods are most effective in stimulating regeneration. Experimental treatments will include physical soil disturbance, smoke treatment and possibly prescribed burning. It is also possible that seasonal changes may contribute to dormancy breaking, therefore observation of seasonal influence will be recorded.

Monitoring of all trials will detail the general response of associated habitat as well as that of *Beyeria lepidopetala*, and will also record any negative impacts such as the level and species of weeds that may invade the area following disturbance. Monitoring of regeneration will continue for at least three years, and monitoring of *B. lepidopetala* recruitment will continue as per other populations. Information regarding post fire regeneration and time until seed set will be used in developing future fire management plans. If found to be beneficial, disturbance will be implemented periodically to stimulate recruitment.

Action: Undertake trials to stimulate recruitment
Responsibility: DEC (Geraldton District) through the GDTFRT
Cost: \$1,600 in second, third and fourth years

9. Develop and implement a fire management strategy

It is likely that this species requires occasional hot summer fire (December- April) for recruitment from soil stored seed, however, frequent fires during its flowering and seeding phase may be detrimental.

Fire also promotes the introduction and proliferation of weed species. Fire should therefore be prevented from occurring in the habitat of populations until sufficient knowledge has been obtained regarding the appropriate fire interval, except where it is being used experimentally as a recovery tool. A fire management strategy will be developed in consultation with land managers to determine fire control measures and fire frequency.

Action: Develop and implement a fire management strategy
Responsibility: DEC (Geraldton District) through the GDTFRT in consultation with relevant land managers
Cost: \$5,000 in first year, and \$1,300 in subsequent years

10. Obtain biological and ecological information

Research designed to increase understanding of the biology and ecology of the species will provide a scientific basis for management of *Beyeria lepidopetala* in the wild. Research would ideally include:

- Longevity of plants, and time taken to reach maturity
- The role of disturbance in regeneration
- The size and viability of the soil seed bank
- Seed dispersal mechanisms
- Factors determining the level of flower and seed viability
- Genetic variation within and between populations

Action: Obtain biological and ecological information

Responsibility: DEC (Science Division, Geraldton District and SCB) through the GDTFRT

Cost: \$10,000 per year in years two, three and four

11. Conduct further surveys

Further surveys by DEC staff and, where possible, community volunteers will be conducted during the flowering period of the species. Populations 2 and 3 have not yet been fully surveyed and it is possible that the pastoral lease contains further populations. Records of areas surveyed will be sent to SCB and retained at the District, regardless of whether *Beyeria lepidopetala* is located.

Action: Conduct further surveys

Responsibility: DEC (Geraldton District) through the GDTFRT

Cost: \$2,500 per year in the first, third and fifth years

12. Collect seed

It is necessary to store germplasm as a genetic resource, ready for use in translocations and as an *ex-situ* genetic 'blueprint' of the species. The germplasm stored will include seed and tissue culture material. Seed collections are required from all populations to maintain adequate representation of the genetic diversity of the species.

Action: Collect seed

Responsibility: DEC (TFSC and Geraldton District) through the GDTFRT

Cost: \$2,400 in the first, third and fifth years

13. Promote awareness

The importance of biodiversity conservation and the need for long-term protection of wild populations of *Beyeria lepidopetala* 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 District office and at the office and library of the Shire of Northampton and the Kalbarri Tourist Information Centre. Such information distribution may lead to the discovery of new populations.

Action: Promote awareness

Responsibility: DEC (Geraldton District) through the GDTFRT

Cost: \$2,200 in first year, and \$1,100 per year in subsequent years

14. Review the recovery plan and assess the need for further recovery actions

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

Action: Review the recovery plan and assess the need for further recovery actions

Responsibility: DEC (SCB, Geraldton District) through the GDTFRT

Cost: \$1,000 in the fifth year

Table 3. Summary of recovery actions

Recovery Actions	Priority	Responsibility	Completion date
Coordinate recovery actions	High	DEC (Geraldton District) through GDTRFT	Ongoing
Map habitat critical to the survival of <i>Beyeria lepidopetala</i>	High	DEC (Geraldton District) through the GDTFRT	2009
Develop and implement a fire management strategy	High	DEC (Geraldton District) through the GDTFRT	Develop by 2009 with implementation ongoing
Liaise with relevant land managers	High	DEC (Geraldton District) through the GDTFRT	Ongoing
Monitor populations	High	DEC (Geraldton District) through the GDTFRT	Ongoing. Annually if possible
Implement rabbit control if necessary	Medium	DEC (Geraldton Division) through the GDTFRT	Ongoing
Implement weed control if necessary	Medium	DEC (Geraldton Division) through the GDTFRT	Ongoing
Implement feral pig control if necessary	Medium	DEC (Geraldton Division) through the GDTFRT	Ongoing
Undertake trials to stimulate recruitment	Medium	DEC (Geraldton District) through the GDTFRT	2010
Obtain biological and ecological information	Medium	DEC (Geraldton District, Science Division) through the GDTFRT	Ongoing
Conduct further surveys	Medium	DEC (Geraldton District) through the GDTFRT	Annually
Collect seed	Medium	DEC (Geraldton District, Science Division) through the GDTFRT	2011
Promote awareness	Low	DEC (Geraldton District) through the GDTFRT	Ongoing
Review the recovery plan and assess the need for further recovery actions	Low	DEC (Geraldton District, Species and Communities Branch) through the GDTFRT	2011

4. TERM OF PLAN

Western Australia

This IRP will operate from April 2008 to March 2013 but will remain in force until withdrawn or replaced. If the taxon is still ranked VU (WA) after five years, the need for further recovery actions and an update of this IRP will be assessed.

Commonwealth

In accordance with the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) this adopted recovery plan will remain in force until revoked.

The recovery plan must be reviewed at intervals of not longer than 5 years.

5. REFERENCES

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6. TAXONOMIC DESCRIPTION

Bentham, G. and Mueller, F. (1873)

A viscid shrub of several feet tall, the branches sprinkled with a scabrous stellate pubescence. Leaves on very short petioles, oblong or linear, ½ to 1 in long, rather thick, obtuse with revolute margins, glabrous above, white-tomentose underneath. Flowers monoecious, both males and females solitary on rather slender pedicels of ¼ to ½ in., the female pedicel as in most species thickening upwards after flowering. Male calyx-segments nearly orbicular, about ¾ line diameter, much imbricate. Petals short, broad hairy inside, alternating with 5 prominent disk-glands. Stamens numerous; anther cells short, distinct, each with a small terminal appendage. Female calyx-segments rather narrower and more rigid than in the males; petals larger and fringed but yet shorter than the calyx. Stigma broadly but distinctly 3 lobed. Capsule ovoid-globular, nearly 3 lines long.

Leigh, J., Boden, R. and Briggs, J. (1984)

Shrub to 1.7m high. *Leaves* are leathery, oblong or oblong-linear, the edges rolled under, 2-2.5 cm long and shortly-stalked, smooth and hairless above and densely white-velvety below. *Flowers* are unisexual and borne singly in the leaf axils on sparsely-hairy peduncles that are 1.2 cm long in male flowers and 2.5 cm long in female flowers and several times longer than the calyx. Fully developed male flowers have never been seen but the immature male flowers have orbicular, overlapping calyx lobes and small petals. Female flowers have almost round calyx lobes barely 2 mm long and extremely minute, bearded, heart-shaped petals. The petals in both male and female flowers emerge from the calyx recesses only slightly, if at all. *Fruit* is a capsule which has not been seen in the mature state. *Flowering* time unknown.

Derivation: lepidopetala from the Greek, *lepis*, scale, and *petalon*, petal, referring to the minute petals which are reduced to scales.

SUMMARY OF RECOVERY ACTIONS AND COSTS

Recovery Action	Year 1			Year 2			Year 3			Year 4			Year 5		
	DEC	Other	Ext.	DEC	Other	Ext.	DEC	Other	Ext.	DEC	Other	Ext.	DEC	Other	Ext.
Coordinate recovery actions	1000			1000			1000			1000			1000		
Map habitat critical to the survival of <i>Beyeria lepidopetala</i>				200		800									
Liaise with land managers	1000			1000			1000			1000			1000		
Monitor populations	1000		1000	1000		1000	1000		1000	1000		1000	1000		1000
Implement rabbit control if necessary	400	300					400	300					400	300	
Implement weed control if necessary	300	500	500	300	500	500	300	500	500	300	500	500	300	500	500
Implement feral pig control if necessary	500		500	500		500	500		500	500		500	500		500
Undertake trials to stimulate recruitment				1000		600	1000		600	1000		600			
Develop and implement a fire management strategy	1000	1000	3000	500	500	300	500	500	300	500	500	300	500	500	300
Obtain biological and ecological information				1000		9000	1000		9000	1000		9000			
Conduct further surveys	1000	500	1000				1000	500	1000				1000	500	1000
Collect seed	1000		1400				1000		1400				1000		1400
Promote awareness	1100		1100	1100			1100			1100			1100		
Review the recovery plan and assess the need for further recovery actions													400	600	
Total	8300	2300	8500	7600	1000	12700	9800	1800	14300	7400	1000	11900	8200	2400	4700
Yearly Total	19,100			21,300			25,900			20,300			15,300		

Ext. = External funding (funding to be sought), Other = funds contributed by in-kind contribution and BGPA.

Total DEC: \$41,300

Total Other: \$8,500

Total External Funding: \$52,100

Total Costs: \$101,900

