

INTERIM RECOVERY PLAN NO. 283

Lepidosperma gibsonii

INTERIM RECOVERY PLAN

2008-2012



26 August 2008

Mount Gibson Mining Limited PO Box 55 West Perth 6872
Extension Hill Pty Ltd PO Box 82 West Perth WA 6872
Coffey Environments (formerly ATA Environmental), Dilhorn House, 2 Bulwer St, Perth 6000
Botanic Gardens & Parks Authority PO Box 48 Floreat WA 6014
Department of Environment and Conservation Locked Bag 104 Bentley Delivery Centre WA 6983

FOREWORD

Interim Recovery Plans (IRPs) are developed within the framework laid down in Department of Conservation and Land Management (CALM) Policy Statement No's. 44 and 50 (CALM, 1992 and 1994 respectively) and the draft Statement No. 9 (CALM, 1999). Note that CALM formally became the Department of Conservation and Environment (DEC) in July 2006. DEC will continue to adhere to these Policy Statements until they are revised and reissued.

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

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This Interim Recovery Plan will operate from April 2008 to April 2012 but will remain in force until withdrawn or replaced. It is intended that this Interim Recovery Plan will be reviewed after 4 years and the need for a full Recovery Plan assessed at that time.

An Interim Recovery Plan (IRP) for *Lepidosperma gibsonii* was required by the Minister for the Environment (State) and the Minister for the Environment and Heritage (Commonwealth) under environmental approvals granted to Mount Gibson Mining Limited (MGM) and Extension Hill Pty Ltd (EHPL) in 2007 and 2008 for iron ore mining at Extension Hill and Extension Hill North, in the Mt Gibson Ranges, approximately 350km north east of Perth. The plan will be implemented by MGM and EHPL (the "project proponents") in close consultation with DEC and the Botanic Gardens and Parks Authority (BGPA).

This Plan has been prepared in accordance with Condition 7.2 of Ministerial Statement 753 (24th October, 2007). The Plan includes a timetable and actions to:

- 1) locate and report any additional populations of the species;
- 2) enhance the survival of existing populations of the species; and
- 3) expand the existing populations or establish new populations.

This IRP was approved by the Director of Nature Conservation on 3 September, 2008.

Information in this IRP was accurate at July 2008.

ACKNOWLEDGMENTS

This IRP was prepared by Ms Martine Scheltema and Cassyanna Gray of Coffey Environments.

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

Dr Mathew Barrett	Botanic Gardens and Parks Authority
Dr Ben Miller	Botanic Gardens and Parks Authority
Shaun Grein	Coffey Environments

CITATION

This IRP should be cited as:

Department of Environment and Conservation (2008) *Lepidosperma gibsonii* Interim Recovery Plan 2008-2012. Interim Recovery Plan No. 283. Department of Environment and Conservation, Western Australia.

SUMMARY

Scientific Name:	<i>Lepidosperma gibsonii</i>	Flowering Period:	Recorded for May and June
Family:	Cyperaceae	DEC District:	Geraldton
DEC Region:	Midwest	Recovery Team:	Geraldton District Threatened Flora Recovery Team
Shire:	Yalgoo		

Illustrations and/or further information:

Barrett, R.L. (2007) *New Species of Lepidosperma (Cyperaceae) Associated with Banded Ironstone in Southern Western Australia*. *Nuytsia* **17**:37-60.

Meisner, R. and Caruso, Y. (2008) *Flora and Vegetation of Banded Ironstone Formations of the Yilgarn Craton: Mt Gibson and Surrounding Area*, in preparation.

Current status: Declared Rare Flora under the Western Australian *Wildlife Conservation Act 1950* [*Lepidosperma gibsonii* Barrett, R.L. under Wildlife Conservation (Rare Flora) Notice 2008, 22 January 2008] and is ranked as Vulnerable under World Conservation Union (IUCN 2001) Red List criterion VU D2 as it is known from one location (14 populations, one genetic population).

Distribution: *Lepidosperma gibsonii* is restricted to the mid-west region of Western Australia where it occurs in the Mt Gibson Ranges and adjoining areas. Within the Mt Gibson Ranges area it prefers steep slopes or gullies that provide increased water availability from the Ranges. Outside of the Ranges, it appears to prefer granite outcrops and breakaways, flow lines down slope of granite outcrops / breakaways and loamy flats within 4kms of the Ranges. The geographical extremes of the populations are less than 8kms apart.

History: *Lepidosperma gibsonii* was listed as Declared Rare Flora under the Western Australian *Wildlife Conservation Act 1950* [as *Lepidosperma* sp. Mt Gibson (R. Meisner & Y. Caruso)] on 12 December 2006. A census was undertaken in 2006 (ATA Environmental, 2006) to determine the population size, distribution and age spectrum of *Lepidosperma gibsonii* within the Mt Gibson Ranges. Eight discrete populations of *Lepidosperma gibsonii* were recorded from the slopes of the Banded Iron Formation (BIF) of the Mt Gibson Ranges, with a total population of 17,618 plants (ATA Environmental, 2006). In 2007-2008 a further six populations were located increasing the total population to 45,013 plants. Five of the six additional populations occurred on or were associated with granite outcrops and breakaways outside the Mt Gibson Ranges (Coffey Environments, 2008a,b). The sixth population was located within the Mt Gibson Ranges, to the south of Mt Gibson South (Figure 1).

Areas with similar geology (BIF or chert) and vegetation to that at the Mt Gibson Ranges were surveyed by ATA Environmental (2006) but no additional populations of the species were located. Areas surveyed during the targeted survey included banded iron formation and granite hills within a 20km radius of Mt Gibson including Mt Singleton, Yandhanoo Hill, the old Bonnie Mine and other smaller unnamed BIF hills in the area. In addition a helicopter based Rapid Habitat Assessment was undertaken of approximately 10,000m² area bounded by Mt Gibson, Windamurra, Yalgoo and Koolanooka. The Rapid Habitat Assessment focused on 30 BIF and granite hills within the area (ATA Environmental, 2006).

A preliminary study undertaken by Botanic Gardens and Parks Authority (BGPA) in 2006 focused on genetic variations of *Lepidosperma gibsonii* using standard population genetic statistics. The preliminary study found high genetic variation within eight discrete *Lepidosperma gibsonii* populations located within the Mt Gibson Ranges. The observed microsatellite variation was uniformly distributed over the distribution of the species, therefore Mt Gibson can be considered as a single provenance unit for *L. gibsonii* (Botanic Gardens and Parks Authority, 2006b).

MGM and EHPL have commenced the funding of a 3 plus year research plan by BGPA on *L. gibsonii* to facilitate the continued in-situ survival and improvement in the conservation status of *L. gibsonii* over time, which assists in the development of a recovery plan. The research and development plan addresses Condition 7.1 of Ministerial Statement 753. The research plan includes conservation genetics, population demography,

breeding biology, population viability analysis, environmental interactions and plant health, restoration and translocation and ex situ conservation (BGPA, 2008). The Research Plan commenced in February 2007.

MGM and EHPL had Ministerial approval to take approximately 8201 plants (or 47% of the population known at the time of environmental approval) during mining. An addendum approval 20 February 2008 allowed for the taking of an additional 700 plants associated with the Great Northern Highway re-alignment representing 19.8% (8,900 plants) of the known population (45,013 plants) of the species as at June 2008.

Description: *L. gibsonii* is a fine-leaved herb (sedge), to 0.6 m high. Culms terete, scarcely finely ribbed, pale green, fully erect, culms 0.32-0.51 x 0.32-0.51mm, to 35-45cm tall. Rhizome compact. Leaves angular, distinctly diamond-shaped, pale green, compressed, 0.43 x 0.40mm, 35-45cm high. Bracts pale tan, glabrous. Base cross-hatched. Inflorescence simple or with one small branch at the base, loose-linear, 32-51mm long, 2.5-3.5mm wide. Inflorescence bract 10.0-39.1mm long. Scales 6-8, broadly triangular, white, 0.45-0.47mm long. Seeds 1.25-1.40 x 0.87-0.89mm, cream, becoming mottled brown with age, smooth, no ribs. Inner floral bract 2.01 x 0.94mm, opaque sides grading to rusty red keel. Style base caducous. Style 1.29mm to branches which are 0.55mm long. Anthers not seen. Anther filaments 2.01mm long (Meisner & Caruso, 2006).

Habitat Requirements: Based on current knowledge *Lepidosperma gibsonii* appears to be restricted to the gullies and slopes of the Mt Gibson Ranges and immediately adjoining breakaways 350km north-north-east of Perth on the edge of the Yalgoo Botanical Region. Within the Mt Gibson Ranges area it prefers steep slopes or gullies that provide increased water availability from the Ranges. Outside of the Ranges, it appears to prefer granite outcrops and breakaways, flow lines down slope of granite outcrops / breakaways and loamy flats.

Habitat critical to the survival of the species, and important populations: It is considered that all known habitat supporting the existing population, and any successfully transplanted populations, is habitat critical to its survival and that all populations are important populations. The habitat critical to the survival of *L. gibsonii* may also include additional nearby occurrences of similar habitat that do not currently contain the species but may have done so in the past and may be suitable for translocations. Translocation trials will assist in determining whether additional areas of similar habitat are suitable for growing the species.

Benefits to other Species/Ecological Communities: Recovery actions implemented to preserve the quality and security of the habitat of *Lepidosperma gibsonii* will also preserve remnant vegetation in which it is located and supports the Declared Rare Flora (DRF) taxon *Darwinia masonii* and priority flora *Chamelaucium* sp. Yalgoo (P1), *Acacia cerastes* (P1), *Personia pentasticha* (P2) and *Podotheca unisetata* (P3) (see Figure 1).

International Obligations: This plan is fully consistent with the aims and recommendations of the Convention on Biological Diversity, ratified by Australia in June 1993, and will assist in implementing Australia's responsibilities under that Convention. The taxon is not listed under the United Nations Environment Program World Conservation Monitoring Centre (UNEP-WCMC) Convention on International Trade in Endangered Species (CITES). This IRP does not affect Australia's obligations under international agreements.

Indigenous Consultation: There are two registered Native Title claims (the Badimia People and the Widi Mob) over the Mt Gibson area that include the habitat, and potential habitat, of *Lepidosperma gibsonii*. In agreements with MGM and EHPL, the claimant groups have recorded a general interest in the environment of the area. There are registered ethnographic or archaeological sites within the habitat of *Lepidosperma gibsonii*.

Affected Interests: The known populations of *Lepidosperma gibsonii* occurs across a variety of land tenures including pastoral lease, road reserves, Crown reserve (Reserve 17367), unallocated Crown land (UCL), mining leases and native title areas. Affected parties include Mount Gibson Mining Limited, Extension Hill Pty Ltd, Pindiddy Aboriginal Corporation, Australian Wildlife Conservancy, the Badimia People and the Widi Mob.

Social and Economic Impacts: The implementation of this Recovery Plan will result in some economic impact through MGM and EHPL funding the development and implementation of this plan and because sections of the population that are protected in accordance with statutory environmental approvals have resulted in restricted access to underlying iron ore deposits. Mineral tenements are held over the area containing approximately 41,769 plants, or 93% of the known population of *Lepidosperma gibsonii*.

Evaluation of Plan's Performance: The Department of Environment and Conservation (DEC), Mount Gibson Mining Limited, Extension Hill Pty Ltd and the Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA), in conjunction with BGPA will evaluate the performance of this Interim Recovery Plan. In addition to annual reporting on progress and evaluation against the criteria for success and failure, the plan will be reviewed following four years of implementation.

Existing Recovery Actions: The following recovery actions have been or are currently being implemented –

1. Management of the non-mining areas that include *Lepidosperma gibsonii* populations by MGM and EHPL in consultation with DEC, DEWHA and BGPA are consistent with environmental legislation.
2. A comprehensive population census was completed by ATA Environmental within the Mt Gibson Ranges in 2006. Additional surveys were undertaken in 2007 and 2008.
3. Studies into the genetic structure of *Lepidosperma gibsonii* were completed by BGPA in September 2006 as part of a preliminary study on *Lepidosperma gibsonii*.
4. A three year (minimum) research programme by BGPA on *Lepidosperma gibsonii* to facilitate the continued in-situ survival and improvement in the conservation status of *Lepidosperma gibsonii* over time, which assists in the development of a recovery plan. The research and development plan commenced in February 2007 and addresses Condition 7.1 of Ministerial Statement 753. The research plan includes conservation genetics, population demography, breeding biology, population viability analysis, environmental interactions and plant health, restoration and translocation and ex situ conservation (BGPA, 2008).
5. An Environmental Management Plan has been prepared by MGM and EHPL in accordance with the Conditions of Ministerial Statement 753. The Environmental Management Plan provides measures to limit the risk of secondary mining impacts on the species (i.e. inadvertent disturbance, excessive dust deposition, fire impact and weed invasion), and also provides for monitoring to track plant condition.
6. A representative monitoring framework will be established across the population for detailed condition monitoring.

Interim Recovery Plan Objectives: The objective of this Interim Recovery Plan as outlined in Condition 7.2 of Ministerial Statement 753 (24th October 2007) is to maintain or improve the conservation status of *Lepidosperma gibsonii* during the preparation of the Recovery Plan.

Recovery Criteria:

Criteria for success: The number of *in situ* individuals in areas of current occupancy outside of the approved clearing footprint to remain stable (i.e. equal to 2008 census result) or increase over the term of the Interim Recovery Plan.

Criteria for failure: The number of *in situ* adult individuals in areas of current occupancy outside of the approved clearance footprint has decreased by more than 10% and/or the number of individuals within a population and/or the number of populations decreasing by 20% or more over the term of the Interim Recovery Plan.

Note that in the event of a significant fire event, it is expected that population numbers will initially decrease. However, it is anticipated that the population will resume a similar status to the pre-fire population as it is a re-sprouting species. The timeframe will be taken into account when conducting a post fire population census to avoid over- or under-estimating the recovery success or failure.

Recovery actions

1. Coordinate recovery actions and liaise with stakeholders.
2. Continue the implementation of the *Lepidosperma gibsonii* research programme (including conservation genetics, population demography, breeding biology, population viability analysis, environmental interactions and plant health, restoration and translocation and *ex-situ* conservation).
3. Report any additional populations of *Lepidosperma gibsonii*.
4. Implement *Lepidosperma gibsonii* condition monitoring programme.
5. Implement fire management strategy.
6. Manage secondary impacts of mining on *Lepidosperma gibsonii*.
7. Manage inappropriate grazing pressure on *Lepidosperma gibsonii*.
8. Undertake translocation trials as part of the *Lepidosperma gibsonii* Research Programme.
9. Maintain adequate seed/germplasm and cutting collections to ensure material with a broad genetic base is available for on-going *ex situ* conservation.
10. Promote awareness of *Lepidosperma gibsonii* and Recovery Plan initiatives.
11. Review ranking of species and prepare a full Recovery Plan if the review of the Interim Recovery Plan indicates this is necessary.

1. BACKGROUND

History

Lepidosperma gibsonii is a newly described species that was recognised as such in January 2006 (Barrett, 2007). The species was not represented by any specimen in the WA Herbarium, and was recognised after Russell Barrett from Botanic Gardens and Parks Authority (BGPA) carried out a preliminary study of unsorted *Lepidosperma* specimens and found that there are many more taxa of *Lepidosperma* than have previously been recognised. Consequently, funding was made available to BGPA from MGM and EHPL to examine patterns of genetic variation within *Lepidosperma gibsonii* (formerly *Lepidosperma* sp. Mt Gibson) as part of a preliminary study to provide some fundamental information on which the effects of removal of plants could be evaluated.

A comprehensive survey of the populations within the Mt Gibson Ranges was undertaken by ATA Environmental (2006). Discrete populations were defined using the DEC definition to delineate populations (i.e. 500m separation between populations). Using this criteria a total of eight discrete populations were recorded from within the Mt Gibson Ranges. A further six populations were identified in 2007 and 2008, five of which were located outside the Ranges (Coffey Environments, 2008a,b). Recent work has identified additional extensions to known population groups and possibly two new population areas (currently under study July 2008).

Lepidosperma gibsonii was listed as Declared Rare Flora under the Western Australian *Wildlife Conservation Act 1950* [as *Lepidosperma* sp. Mt Gibson (R. Meissner & Y Caruso 3)] on 12 December 2006 and is ranked as Vulnerable under World Conservation Union (IUCN 2001) Red List criterion VU D2 as it is known from one location (14 populations, one genetic population)

MGM and EHPL are currently funding a 3 plus year research plan by BGPA on *Lepidosperma gibsonii* to facilitate the continued in-situ survival and improvement in the conservation status of *L. gibsonii* over time, which assists in the development of a recovery plan. The research and development plan addresses Condition 7.1 of Ministerial Statement 753. The research plan includes conservation genetics, population demography, breeding biology, population viability analysis, environmental interactions and plant health, restoration and translocation and ex situ conservation (BGPA, 2008). The research plan commenced in 2007.

MGM and EHPL had Ministerial approval to take approximately 8201 plants or 47% of the total number of plants recorded during the ATA Environmental (2006) survey of the Mt Gibson Ranges. An addendum approval 20 February 2008 allowed for the taking of an additional 700 plants associated with the Great Northern Highway re-alignment representing 19.8% (8,900 plants) of the revised known population (45,013 plants) of the species as at June 2008.

Description

Lepidosperma gibsonii is a fine-leaved herb (sedge), to 0.6 m high. Culms terete, scarcely finely ribbed, pale green, fully erect, culms 0.32-0.51 x 0.32-0.51mm, to 35-45cm tall. Rhizome compact. Leaves angular, distinctly diamond-shaped, pale green, compressed, 0.43 x 0.40mm, 35-45cm high. Bracts pale tan, glabrous. Base cross-hatched. Inflorescence simple or with one small branch at the base, loose-linear, 32-51mm long, 2.5-3.5mm wide. Inflorescence bract 10.0-39.1mm long. Scales 6-8, broadly triangular, white, 0.45-0.47mm long. Seeds 1.25-1.40 x 0.87-0.89mm, cream, becoming mottled brown with age, smooth, no ribs. Inner floral bract 2.01 x 0.94mm, opaque sides grading to rusty red keel. Style base caducous. Style 1.29mm to branches which are 0.55mm long. Anthers not seen. Anther filaments 2.01mm long.

Lepidosperma gibsonii was initially thought to be taxonomically most closely related to *Lepidosperma ferricola* (formerly *Lepidosperma* sp. Mt Jackson, L.Mattiske 193-2/572), which was recorded from Mt Jackson during surveys of Portman Iron Ore Ltd Kooyanobbing Expansion Project in 2001. The taxonomic status of *Lepidosperma gibsonii* has been investigated by BGPA as part of research into the species funded by MGM and EHPL. Results indicate that *Lepidosperma gibsonii* has been found to be more closely related to *L. costale* (and related entities) than to *L. ferricola*. There are clear differences in stem cross-section and seed morphology between *L. costale* and *L. gibsonii*. *L. gibsonii* is superficially similar to *L. ferricola*.

Key differences between *L. gibsonii* and *L. ferricola* are:

L. gibsonii

Culms scarcely finely ribbed, 0.32-0.51 x 0.32-0.51mm. Leaves angular, distinctly diamond-shaped, 0.43 x 0.40mm. Scales 6-8, broadly triangular, acute, 0.45-0.47mm long. Seeds 1.25-1.40 x 0.87-0.89mm, smooth, no ribs, dull. Style base caducous. Style 1.29 mm to branches which are 0.55mm long. Anther filaments 2.01 mm long.

L. ferricola

Culms finely ribbed, 0.73-0.80 x 0.56-0.70mm. Leaves somewhat angular and compressed, 0.47-0.61 x 0.42-0.53mm. Scales 6-7, narrowly triangular to almost linear, acuminate, 0.82-1.31mm long, apex with minute bristles. Seeds 1.73-2.43 x 0.84-1.14mm, smooth with three suture lines, glossy. Small style base present on seed apex. Style 2.10mm to branches which are 3.43mm long. Anther filaments 4.25mm long.

Distribution and habitat

L. gibsonii is restricted to Western Australia where it occurs within and in the vicinity of the Mt Gibson Ranges, that are located approximately 80km northeast of Wubin and 350km north east of Perth. Within the Mt Gibson Ranges, the species prefers steep slopes or gullies that provide increased water availability from the Ranges. The populations occurring outside of the Ranges are associated with low granite outcrops and breakaways, flow lines down slope of granite outcrops / breakaways and loamy flats in close proximity to the breakaways. In the majority of locations from where *L. gibsonii* has been recorded, the soils range from skeletal on the upper slopes often in association with the margins of larger areas of exposed ironstone, Banded Ironstone Formation (BIF) or granitic outcropping to deeper, sandy loams on the side slopes and gully floor.

Approximately 40% the known population (ie 17,840 of the 45,013 plants recorded) are from slopes and gullies within the Mt Gibson Ranges, occurring in nine more or less discrete populations (using 500m separation as the definition of a discrete population following the standard DEC definition). Two populations sampled within the Mt Gibson Ranges were combined as the Extension Hill South population as they are separated by less than 500m. Genetic investigations by BGPA using standard population genetic statistics found high genetic variation within the eight discrete *L. gibsonii* populations within the Mt Gibson Ranges. The variation was apparently uniformly distributed over the distribution of the species within the Ranges. The populations within the Mt Gibson Ranges can be considered as a single provenance unit for *L. gibsonii* (BGPA, 2006b).

Of the balance of the population, the majority (i.e. 23,012 plants) are associated with breakaways and granite outcrops within 4km of the Ranges, occurring in four discrete populations (Figure 1). One population consists of two sub-populations (Population C and Population E), which are less than the DEC definition of 500m separation distance between populations.

The geographical extremes of the populations are less than 8km apart, thus making the species a highly restricted, narrow endemic.

Summary of population information

Pop. No.	Location	No of Plants	Year of survey	Habitat Type	Reference	Tenure
1	Extension Hill North	777	2006	BIF Slopes	ATA 2006	Pastoral and mining leases
2	Extension Hill	7,424	2006	BIF Slopes	ATA 2006	Pastoral and mining leases
3	Extension Hill South	4,307	2006	BIF Slopes	ATA 2006	Pastoral and mining leases, Unallocated Crown land
4	Iron Hill North	265	2006	BIF Slopes	ATA 2006	Unallocated Crown land, mining lease
5	Iron Hill South	118	2006	BIF Slopes	ATA 2006	Crown reserve, mining lease
6	Iron Hill East	675	2006	BIF Slopes	ATA 2006	Unallocated Crown land, Crown reserve, mining lease
7	Mt Gibson	3,617	2006	BIF Slopes	ATA 2006	Crown reserve, mining lease
8	Mt Gibson South	435	2006	BIF Slopes	ATA 2006	Crown reserve, mining lease
9	South Mt Gibson South	4,384	2008	BIF Slopes	Coffey 2008a, b	Unallocated Crown land, Crown reserve, mining lease
10	Emu Proof Fence	160	2008	Granite breakaways	Coffey 2008a	Pastoral lease, mining lease
11	Population C	5,225	2008	Granite breakaways	Coffey 2008a	Pastoral lease, mining lease
12	Population D	3,244	2008	Granite breakaways	Coffey 2008a	Pastoral lease
13	Population E	4,030	2008	Granite breakaways	Coffey 2008a	Pastoral lease, mining lease, road reserve
14	Population F	10,352	2008	Granite breakaways	Coffey 2008b	Pastoral and mining leases
	Total	45,013				

L. gibsonii has been recorded from a number of vegetation communities including three thicket and one heath community (Bennett, 2000) on BIF in the Mt Gibson Ranges, and low woodland and thicket communities for the populations associated with granite breakaways.

Mt Gibson Ranges populations

- T1 Dense Thicket of mixed species dominated by *Acacia* species, *Allocasuarina acutivalvis* subsp. *prinsepiana*, *Calycopeplus paucifolius* and *Melaleuca nematophylla* over Low Shrubland in jaspilite rocks and pockets of loam.
- T3 Dense Thicket dominated by *Acacia assimilis*, *Allocasuarina acutivalvis* subsp. *prinsepiana* and *Melaleuca nematophylla* over Low Shrubland of *Hemigenia* sp. Paynes Find and *Hibbertia crassifolia* in loam pockets in jaspilite rocks.
- T6 Thicket of *Acacia acuaria* and *Acacia stowardii* over Low Shrubland of mixed species with large numbers of *Darwinia masonii* in loam with abundant rocks on the surface.
- HS1 Low Heath of *Ptilotus obovatus* with emergent shrubs of *Acacia stowardii* and *Calycopeplus paucifolius* over Herbs in loamy clay large amongst large boulders.

Emu proof fence population Low Woodland of *Eucalyptus kochii* subsp. *plenissima*, *Eucalyptus kochii* subsp. *horistes* over Tall Open Scrub dominated by *Allocasuarina acutivalvis*, *Acacia aneura*, *Micromyrtus clavata* and *Acacia acuminata* on clayey loamy soil.

Populations C & D *Allocasuarina acutivalvis* subsp. *prinsepiana*, *Melaleuca uncinata*, *Acacia assimilis* subsp. *assimilis*, and *Melaleuca nematophylla*.

Population E Low Open Woodland of *Eucalyptus leptopoda* subsp. *arctata* with occasional *Allocasuarina acutivalvis* subsp. *prinsepiana* over a Tall Open Woodland *Melaleuca uncinata* and *Acacia aneura* var. *aneura* over a Tall Scrubland dominated by *Acacia masliniana* over a Low Shrubland

dominated by *Micromyrtus clavata* and *Thryptomene cuspidate* over a Very Open Herbland of *Ecdeiocolea monostachya* and *Hyalosperma glutinosum* subsp. *glutinosum*.

Population F *Allocasuarina acutivalvis* subsp. *prinsepiana*, *Melaleuca uncinata*, *Acacia assimilis* subsp. *assimilis*, and *Melaleuca nematophylla*.

Biology and Ecology

Although the known distribution of *L. gibsonii* appears to be restricted, it demonstrates traits of strong ecological resilience namely:

- (i) it is a re-sprouting species and therefore capable of surviving fire and grazing to a greater extent than a seeder species;
- (ii) *Lepidosperma* as a genus is well known to be highly resistant to root pathogens, particularly *Phytophthora*. It would be expected that *L. gibsonii* would have a similar resistance and would therefore be unlikely to be directly impacted by the root rot fungi;
- (iii) The species demonstrates vigorous subsoil rhizome sprouting indicating that the plant can respond to seasonal moisture and is probably capable of producing a shoot to flower in one year; and
- (iv) Clump size and branching patterns indicate that individual clumps are long lived, probably in the multiple of decades and potentially longer. Overall the species is probably long-lived, resilient to fire and grazing and disease tolerant.

Initial research by BGPA suggest that the species is water rather than nutrient limited, with rapid growth rates in standard soil mixes indicating that the substrate may be less important than water harvesting attributes.

L. gibsonii flowering has been recorded for May and June, with mature seed recorded for September. As the rainfall in the region is unreliable, *L. gibsonii* is likely to respond opportunistically (at least with vegetative growth) to rainfall events (i.e. tropical cyclonic summer rainfall events and southern winter cold fronts).

Threats

The main threat to *L. gibsonii* is direct removal and loss of habitat by mining, with possible secondary threats associated with nearby mining operations and natural environmental factors.

Threats include:

- **Mining (direct removal):** Approximately 40% of the known population of *L. gibsonii* (as at June 2008) occupies outcropping ironstone formations that are highly prospective for iron ore. Conditional environmental approval has been provided for the removal of 8,900 plants of the pre-disturbance population. The taking of 8,900 plants represents 19.8% of the known population as at June 2008.
- **Mining (secondary threats):** Nearby mining also presents secondary threats through dust, inadvertent disturbance such as cracking of rock faces, and other effects on reproductive biology that may lead to a decline in recruitment rate. Populations at Extension Hill South, Emu Proof Fence and Iron Hill North are considered to be at greatest risk from secondary effects of mining.
- **Limited Habitat:** *L. gibsonii* appears to be restricted to the steep slopes and gullies of the major hills that comprise the 6km long Mt Gibson Ranges and to granite breakaways and outcrops in the general vicinity of the Ranges (ie within 4km of the Ranges).
- **Weed invasion:** No significant weed invasion has been observed to date. Weed invasion is a potential threat to *L. gibsonii*.

- **Grazing:** Minor grazing pressure from kangaroos, feral goats and rabbits of *L. gibsonii* has been observed. According to the BGPA (2006a) plants have been observed to be actively re-sprouting following grazing, although grazing may prevent flowering in the short term.
- **Fire:** *L. gibsonii* is a re-sprouting species and therefore capable of surviving fire and grazing to a greater extent than a seeder species, however a fire management plan will be required due to increased pressure on the population.

A summary of the threats faced by each population is provided below.

Summary of population information

Pop. No.	Location	No of Plants	Year of survey	Habitat Type	Reference	Condition	Threat
1	Extension Hill North	777	2006	BIF Slopes	ATA 2006	Healthy	Ministerial ap take this popula
2	Extension Hill	7,424	2006	BIF Slopes	ATA 2006	Healthy	Ministerial ap take this popula
3	Extension Hill South	4,307	2006	BIF Slopes	ATA 2006	Healthy	Proximity to mi environmental f
4	Iron Hill North	265	2006	BIF Slopes	ATA 2006	Healthy	Proximity to mi environmental f
5	Iron Hill South	118	2006	BIF Slopes	ATA 2006	Healthy	Environmental f
6	Iron Hill East	675	2006	BIF Slopes	ATA 2006	Healthy	Environmental f
7	Mt Gibson	3,617	2006	BIF Slopes	ATA 2006	Healthy	Environmental f
8	Mt Gibson South	435	2006	BIF Slopes	ATA 2006	Healthy	Environmental f
9	South Mt Gibson South	4,384	2008	BIF Slopes	Coffey 2008a, b	Healthy	Environmental f
10	Emu Proof Fence	160	2008	Granite breakaways	Coffey 2008a	Healthy	Proximity to mi environmental f
11	Population C	5,225	2008	Granite breakaways	Coffey 2008a	Healthy	Environmental f
12	Population D	3,244	2008	Granite breakaways	Coffey 2008a	Healthy	Environmental f
13	Population E	4,030	2008	Granite breakaways	Coffey 2008a	Healthy	Realignment Northern High impact on 700 this population, to mining, env factors
14	Population F	10,352	2008	Granite breakaways	Coffey 2008b	Healthy	Environmental f
	Total	45,013					

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

As this taxon is declared as Rare Flora under the Western Australian *Wildlife Conservation Act 1950* it is considered that all currently known habitat supporting the existing populations are critical. These habitats still need to be better understood to determine the substrates and spatial location within the landscape and relation to other flora species to better define those elements that define critical habitat for the survival of *L. gibsonii*. Hence, other nearby habitat that *L. gibsonii* is not present in for reasons such as overgrazing, might have supported this species in the past and may be suitable for future translocations. Translocation trials will assist in determining whether additional areas of similar habitat are considered suitable for growing the species.

Benefits to other species/ecological communities

Recovery actions implemented to preserve the quality and security of the *L. gibsonii* habitat will also preserve vegetation that similarly supports the Declared Rare Flora (DRF) taxon *Darwinia masonii* and the priority flora *Chamelaucium* sp. Yalgoo (P1), *Acacia cerastes* (P1), *Persoonia pentasticha* (P2) and *Podotheca unisetata* (P3) (Figure 1).

International obligations

This plan is fully consistent with the aims and recommendations of the Convention on Biological Diversity, ratified by Australia in June 1993, and will assist in implementing Australia's responsibilities under that Convention. The taxon is not listed under the United Nations Environment Program World Conservation Monitoring Centre (UNEP-WCMC) Convention on International Trade in Endangered Species (CITES). This IRP does not affect Australia's obligations under international agreements.

Indigenous Consultation

There are two registered Native Title claims (the Badimia People and the Widi Mob) over the Mt Gibson region that include the habitat, and potential habitat, of *L. gibsonii*. In agreements with MGM and EHPL, the claimant groups have recorded a general interest in the environment of the area. There are registered ethnographic or archaeological sites within the habitat of *L. gibsonii* that are of cultural significance to both groups.

Affected Interests

The known populations of *L. gibsonii* occurs across a variety of land tenures including pastoral lease, Crown Reserve (Reserve 17367), unallocated Crown land (UCL), mining leases and native title application areas. Affected parties include Mount Gibson Mining Limited, Extension Hill Pty Ltd, Pindiddy Aboriginal Corporation (Ninghan Station), Australian Wildlife Conservancy (Mt Gibson Station), the Badimia People and the Widi Mob.

Social and economic impacts

The implementation of this Interim Recovery Plan will have some economic impact through MGM and EHPL funding the development and implementation of this plan and because sections of the population that are protected in accordance with statutory environmental approvals have resulted in restricted access to underlying iron ore deposits. Mineral leases are held over the area containing the entire population of *L. gibsonii*.

Guide for decision-makers

Section 1 provides details of current and possible future threats. Any further development in the vicinity of existing or potential habitat requires further assessment. Any further development should be assessed in terms of the ability of the proponents to demonstrate that they will not have a long-term deleterious impact on the species, its habitat or potential natural habitat.

Evaluation of the Plan's performance

The Department of Environment and Conservation (DEC), the Geraldton District Threatened Flora Recovery Team (GDTFRT), Mount Gibson Mining Limited (MGM), Extension Hill Pty Ltd (EHPL) and the Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA), in conjunction with BGPA, will evaluate the performance of this Interim Recovery Plan. In addition to annual reporting on progress and evaluation against the criteria for success and failure, the plan will be reviewed following four years of implementation.

2. RECOVERY OBJECTIVE AND CRITERIA

Recovery Plan Objective:

The objective of this Interim Recovery Plan as outlined in Condition 7.2 of Ministerial Statement 753 (24th October 2007) is to maintain or improve the conservation status of *L. gibsonii* during the preparation of the Recovery Plan.

Recovery Criteria:

Criteria for success: The number of *in situ* individuals in areas of current occupancy outside of the approved clearance footprint to remain stable (i.e. equal to the 2008 census result) or increase over the term of the Interim Recovery Plan.

Criteria for failure: The number of *in situ* adult individuals in areas of current occupancy outside of the approved clearance footprint has decreased by more than 10% and / or the number of individuals within a population and /or the number of populations decreasing by 20% or more over the term of the Interim Recovery Plan.

Note that in the event of a significant fire event, it is expected that population numbers will initially decrease. However, it is anticipated that the population will resume similar status to the pre-fire population as it is a re-sprouting species. The timeframe will be taken into account when conducting a post fire population census to avoid over or under-estimating the recovery success or failure.

3. RECOVERY ACTIONS

Roles and Responsibilities

The respective roles and responsibilities of the various agencies and organizations involved in the Interim Recovery Plan are outlined below.

Department of Environment and Conservation (DEC)

The DEC is responsible for administration and enforcement of the *Wildlife Conservation Act 1950*, the *Conservation and Land Management Act 1984* and the *Environmental Protection Act 1986* and undertakes a range of activities in relation to identifying, conserving and protecting threatened flora and fauna. The DEC is a signatory to this plan and will be partly responsible for implementation of a number of recovery actions as specified in this section, including monitoring of the implementation and performance of the Plan itself.

Geraldton District Threatened Flora Recovery Team (GDTFRT)

The role of the GDTFRT, which is a non-statutory association of stakeholders committed to the recovery of threatened species, is to assist in coordinating the recovery of threatened flora in the DEC Geraldton District. The GDTFRT also plays an active role in implementing recovery actions where possible.

Department of Environment, Water, Heritage and the Arts (DEWHA)

The DEWHA is responsible for administration and enforcement of the *Environment Protection and Biodiversity Conservation Act 1999*. The DEWHA will liaise with the local DEC in Geraldton and the WA Environmental Protection Authority to assess the suitability of the Interim Recovery Plan.

Mount Gibson Mining Limited (MGM) and Extension Hill Pty Ltd (EHPL)

MGM and EHPL are co-proponents of the Mount Gibson Iron Ore Mine and Infrastructure Project and are jointly responsible for all statutory commitments and obligations for this project. The proponents have a responsibility to undertake, or to engage suitably qualified consultants to undertake, the specified recovery actions relevant to the populations on their mining tenements, or those populations impacted by activities associated with the project.

Botanic Gardens and Parks Authority (BGPA)

BGPA is contracted to the project proponents to undertake research into the species as per the Conservation and Restoration Research Proposal for *Darwinia masonii* and *Lepidosperma gibsonii*.

Existing recovery actions

Management of the non-mining areas that include *L. gibsonii* populations by the project proponents in consultation with DEC, DEWHA and BGPA are consistent with environmental legislation.

A population census of *L. gibsonii* in areas of BIF within the Mt Gibson Ranges was completed by ATA Environmental in 2006. Additional populations were located in 2007 and 2008, increasing the known population from 17,618 plants to 45,013 plants. Further work, not yet completed, is likely to extend this total population number further as at July 2008.

An Environmental Management Plan has been developed in accordance with requirements of Ministerial Statement 753 (24th October 2007). This plan provides measures to limit the risk of secondary mining impacts on the species (i.e. inadvertent disturbance, excessive dust deposition, fire impact, altered hydrology and weed invasion), and also provides for monitoring to track plant condition.

A DEC Conservation Officer from the Midwest Regional Office has monitored population health since the population was listed in 2006.

A preliminary study undertaken by BGPA in 2006 focused on genetic variations of *L. gibsonii* using standard population genetic statistics. The study found high genetic variation within eight discrete *L. gibsonii* populations located on BIF within the Mt Gibson Ranges. The observed microsatellite variation was uniformly distributed over the distribution of the species, therefore Mt Gibson can be considered as a single provenance unit for *L. gibsonii* (BGPA, 2006b).

The proponents have commenced the funding of a 3 plus year research plan by BGPA on *L. gibsonii* to facilitate the continued *in-situ* survival and improvement in the conservation status of *L. gibsonii* over time, which assists in the development of a recovery plan. The research and development plan addresses Condition 7.1 of Ministerial Statement 753. The research plan includes conservation genetics, population demography, breeding biology, population viability analysis, environmental interactions and plant health, restoration and translocation and *ex-situ* conservation (BGPA, 2008). The research plan commenced in 2007.

Future recovery actions

Many of the actions described below were initiated in 2006, and are ongoing. This section details the planned implementation of these recovery actions, and others, from the commencement of the Interim Recovery Plan once approved, in 2008.

1. Coordinate recovery actions and liaise with stakeholders

The GDTFRT will continue to coordinate the implementation of recovery actions for *L. gibsonii* and other Declared Rare Flora in their district.

MGM will ensure the implementation of research, management and recovery actions for *L. gibsonii* in consultation with DEC, DEWHA, BGPA and GDTFRT, and other relevant stakeholders and indigenous groups. An annual progress report will be produced by 30th June each year. Liaison with stakeholders is addressed in the Environmental Management Plan and associated procedures for the Mt Gibson Iron Ore Mine and Infrastructure Project.

Action: Coordinate recovery actions, liaise with stakeholders and provide an annual report
Responsibility: MGM, EHPL, DEC and GDTFRT.
Timing: ongoing until 2012

2. Continue implementation of the *Lepidosperma gibsonii* research programme

A comprehensive programme of research into the conservation genetics, population demography, breeding biology, population viability analysis, environmental interactions and plant health, restoration and translocation and *ex-situ* conservation of *Lepidosperma gibsonii* is currently being implemented and is ongoing. The key research fields are described below. The initial research programme will extend to December 2010, at which time the direction of future research will be reviewed. The nature of some of the research is longer term (5 years minimum).

Research includes conservation genetics, population ecology and viability, propagation studies, *ex-situ* storage of germplasm and restoration. These actions are outlined below:

2a. Conservation Genetics

Actions: Assessment of genetic variation has been completed. Further work will focus on three areas to benchmark the genetic study relative to other species of *Lepidosperma*:

- Genetic survey of remaining populations and recently discovered populations;
- Comparative survey of other species to benchmark the observed variation in DRF species compared with closely related *Lepidosperma* species; and
- DNA sequencing of other *Lepidosperma* species to determine species relationships and place *L. gibsonii* in phylogenetic perspective.

Responsibility: MGM, EHPL and BGPA

Timing: 2007 – 2010 (initially)

2b. Population Demography

Action: Investigate fire, demography, tools for monitoring plant demographic changes.

Responsibility: MGM, EHPL and BGPA

Timing: 2007 – 2010 (initially)

2c. Breeding Biology

Action: Investigate seed research, seed production, soil seed bank, phenology, genetic analysis of breeding systems and dispersal.

Responsibility: MGM, EHPL and BGPA

Timing: 2007 – 2010 (initially)

2d. Population Viability Analysis

Action: Undertake modeling of population persistence using parameters obtained from Population Demography and Breeding Biology.

Responsibility: MGM, EHPL and BGPA

Timing: 2007 – 2010 (initially)

2e. Environmental Interactions and Plant Health

Action: Investigate biotic and abiotic associations, habitat requirement assessment, eco-physiology, impacts of associations on plant health and tools to monitor plant health.

Responsibility: MGM, EHPL and BGPA

Timing: 2007 – 2010 (initially)

2f. Restoration and Translocation

Action: Investigate reconstruction of habitat, propagation, translocations and tools to monitor rehabilitation, dust and water table lowering.

Responsibility: MGM, EHPL and BGPA
Timing: 2007 – 2010 (initially)

2g. *Ex-situ Conservation*

Action: Evaluation of the conservation effectiveness of off-site conservation collections (living, cryogenic and seed banking) at state seed banking facilities at the Kings Park Seed Technology Centre, Kings Park Science laboratory and the DEC Threatened Flora Seed Centre.

Responsibility: MGM, EHPL, BGPA and DEC
Timing: 2007 – 2010 (initially)

3. Conduct further surveys and report any new populations of *Lepidosperma gibsonii*

Any new populations of *Lepidosperma gibsonii* that may be located through opportunistic surveys will be reported to DEC to ensure DEC has accurate data on the species.

The DEC will survey areas of potential habitat for the presence of *Lepidosperma gibsonii* during the flowering period. All surveyed areas will be recorded and the presence or absence documented to increase survey efficiency and reduce duplicate surveys. Where possible the GDTFRT and volunteers from the local community should be involved in surveys, supervised by DEC staff.

Action: Report any new populations of *Lepidosperma gibsonii* to DEC
Responsibility: MGM, EHPL, BGPA, DEC and GDTFRT
Timing: ongoing to 2012

4. Establish and Implement *Lepidosperma gibsonii* condition monitoring programme

Monitoring of factors such as weed invasion, grazing, habitat degradation, population stability (expansion or decline), pollinator activity, seed production, recruitment, and longevity is essential. The DEC and GDTFRT will inspect populations regularly and will prepare Rare Flora Reports Forms.

The condition of *Lepidosperma gibsonii* populations not directly impacted by mining will be monitored for any indirect impacts from mining that include risks such as excessive dust deposition and possible weed invasions, and other potential threats such as grazing by introduced or native animals that may impact on plant condition. A representative subset of approximately 715 individual plants (2.5% of total pre—mining adult population) will be monitored in detail annually. In addition, dust monitoring will be undertaken on a monthly basis in permanent quadrats to assess dust deposition on *Lepidosperma gibsonii*. Populations closest to the mine (eg Extension Hill South) will be monitored monthly to assess any changes in condition prior to evidence of acute stress or mortality. Visual inspections of the populations closest to the mine (eg Extension Hill South) will be undertaken weekly. Populations located further away from the mine will be inspected quarterly. The results of the monitoring program will be used to guide subsequent management of the species in relation to mining activities.

The research program will investigate and develop suitable measures to assess plant health and will collect detailed demographic data from approximately 2% of the population in long term monitoring plots as part of the research program.

Action: Undertake condition monitoring
Responsibility: MGM, EHPL, DEC and GDTFRT
Timing: Annually (Oct – Nov), 2008 - 2012

5. Implement Fire Management Strategy

Lepidosperma gibsonii is a re-sprouting species and therefore capable of surviving fire and grazing to a greater extent than a seeder species. However increased pressure on the population necessitates the development of a

fire management plan. An Environmental Management Plan and fire management procedures are being developed that capture the frequency and intensity of fires and identify control measures necessary to prevent inappropriate fires which may impact on the species directly, or its habitat. Fire management procedures are to include training of emergency response personnel in fire fighting; site based fire fighting equipment; vehicle maintenance including safety check to reduce fire hazards, fire suppression systems on selected plant and equipment; locating fire breaks; fire break maintenance; fire reporting system in line with legislative requirements; incident control; fire cause investigation and analysis; and liaison with neighbours and the Fire and Emergency Services Association (FESA) with regard to bushfires.

Action: Implement Environmental Management Plan and Fire Management Strategies
Responsibility: MGM and EHPL
Timing: ongoing for life of mine

6. Manage Secondary Impacts of Mining

The size and condition of the *Lepidosperma gibsonii* population may be impacted by secondary impacts of mining, including excessive dust deposition, introduction or spread of weeds and altered hydrology. An Environmental Management Plan and associated procedures have been prepared that detail management protocol to minimize the impact of mining on significant flora, including *Lepidosperma gibsonii*. Management actions and procedures include a site access protocol; weed identification and recording systems; restricted access permitting systems to areas with weed infestations of high biodiversity impact rating; description and pictures of weed species likely to be problematic; weed control procedures that take proximity to significant flora in to consideration; and monitoring to assess the effectiveness of weed control measures. The site access protocol is to include site induction, permit to access restricted areas including areas around *Darwinia masonii* and *Lepidosperma gibsonii* and Malleefowl mounds, defined weed areas, fire risk management and control, vehicle inspection procedure, restricted access signage and a wash down facility for vehicles on site. Dust management procedures are to include the identification of airborne dust, active response to non fixed dust sources, depositional dust monitoring, dust control systems on fixed plant, incident response and prevailing weather considerations in blast schedule.

Secondary impacts of mining are not expected to impact on most of the populations located on the granite breakaways as they are some distance from the key mine impact zone.

The Environmental Management Plan and associated procedures will operate in areas under the control of MGM or EHPL, which is generally the mining tenement areas (ie mining, general, miscellaneous and exploration leases).

Action: Implement Environmental Management Plan and associated procedures
Responsibility: MGM and EHPL
Timing: ongoing for life of mine

7. Manage inappropriate grazing pressure

Grazing pressure from kangaroos, feral goats and rabbits of *Lepidosperma gibsonii* has been observed. Some areas of Ninghan Pastoral Station will have impacts from both historical and ongoing sheep grazing. Plants have been observed to be actively re-sprouting following grazing, although grazing may prevent flowering in the short term. The impact of grazing by native and introduced animals (goats and rabbits) will be assessed as part of monitoring the condition of *Lepidosperma gibsonii* (Recovery Action 4). Generally, minor gazing pressure has been observed to date although in some areas, this has been significant. In the event that grazing pressure is impacting on the health of plants/populations, the impacting animal population will be controlled through trapping, baiting, poisoning, shooting, exclusion fencing and other means as detailed in the Environmental Management Plan and associated procedures. In the event that native animals are impacting on plant health through grazing pressure alternate management procedures for plant populations at risk may be developed following consultation with DEC, as required.

Action:	Undertake condition monitoring; implement Environmental Management Plan and associated feral or other introduced animal procedures. Restrict native animal access as required following consultation with DEC, as required.
Responsibility:	MGM and EHPL
Timing:	ongoing for life of mine

8. Translocation Trials

The habitat critical to the survival of *Lepidosperma gibsonii* may also include additional nearby occurrences of similar habitat that do not currently support the species but may have done so in the past and may be suitable for future translocation. Translocation trials undertaken as part of the Research Programme will assist in determining whether additional areas of similar habitat are considered suitable for growing *Lepidosperma gibsonii*. The findings of the Research Program and the translocation trials will be used in the rehabilitation of areas disturbed by mining as outlined in the Environmental Management Plan.

Action:	Describe biotic and abiotic environments and habitat requirements. Trial <i>in-situ</i> planting methods. Identify critical parameters for the long-term viability of re-established populations of <i>Lepidosperma gibsonii</i> and related species. Derive quantitative completion criteria which demonstrate maintenance of viable population dynamics and resilience in <i>Lepidosperma gibsonii</i> .
Responsibility:	MGM, EHPL and BGPA
Timing:	2007 – 2010 (initially)

9. Maintain adequate seed/germplasm collections to ensure material with a broad genetic base is available for translocation and on-going *ex-situ* conservation

Involves seed banking and germplasm protection strategies to provide long-term security for identified key genotypes and conservation back-up collection in terms of risk-managing accidental loss of crucial genotypes. Seed will also be provided to DEC to be stored at the DEC Threatened Flora Seed Centre.

Action:	Maintain adequate seed/germplasm collections
Responsibility:	MGM, EHPL through BGPA, DEC
Timing:	ongoing until 2012

10. Promote awareness of *Lepidosperma gibsonii*

The status of *Lepidosperma gibsonii* and the measures to preserve the species will be promoted to mine site staff and contractors. The significance of the species will continue to be communicated to personnel working at and around the Extension Hill mine site, through an environmental induction and an Environmental Handbook.

The importance of biodiversity conservation and the need for the long-term protection of wild populations of *Lepidosperma gibsonii* will be promoted to the community by DEC and the GDTFRT through poster displays and the local print and electronic media.

Actions:	1. Promote awareness for the need for protection of <i>L. gibsonii</i> through poster displays and the local print and electronic media; and 2. Continue environmental inductions and Environmental Handbook dissemination
Responsibility:	MGM, EHPL, DEC and GDTFRT
Timing:	1. ongoing until 2012

11. Review the need for a full Recovery Plan and Review ranking of species

In accordance with Condition 6.3 of Ministerial Statement 753, the relevance and effectiveness of the plan will be reviewed within 4 years of the commencement of ground disturbing activities and the plan updated as necessary. The ranking of the species (currently Vulnerable) will be reviewed as part of the review of the IRP.

Action: Review the Interim Recovery Plan and the ranking of the species and prepare a full Recovery Plan as necessary.
Responsibility: MGM, EHPL, DEC, GDTFRT, in association with BGPA
Timing: February 2011

4. TERM OF PLAN

This Recovery Plan will operate from 2008 to 2012 but will remain in force until withdrawn or replaced. The plan will be reviewed in 2011 based on the ranking of the taxon at that time.

5. REFERENCES

- ATA Environmental (2006). *Targeted Survey at Mt Gibson for a new Lepidosperma sp. Mt Gibson*. Report No: 2006/090.
- Barrett, R.L. (2007) *New Species of Lepidosperma (Cyperaceae) Associated with Banded Ironstone in Southern Western Australia*. *Nuytsia* **17**:37-60
- Botanic Gardens and Parks Authority (2006a). *Lepidosperma sp. Mt Gibson Research: Phase One: Progress Report, June 2006*. Unpublished Paper.
- Botanic Gardens and Parks Authority (2006b). *An integrated research program into practical outcomes for ex situ and in situ conservation, restoration and translocation of the Lepidosperma sp. Mt Gibson: Phase One: Genetic Variation*. Unpublished Report prepared for Mt Gibson Mining Limited.
- Botanic Gardens and Parks Authority (BGPA) (2008) Conservation and Restoration Research Proposal *Darwinia masonii* and *Lepidosperma gibsonii*: An integrated research program into ex situ and in situ conservation, restoration and translocation of *Darwinia masonii* and *Lepidosperma gibsonii*. 2007-2010 Version 2 April 2008.
- Department of Conservation and Land Management (1992). Policy Statement Number 44: Wildlife Management Programs. May 1992.
- Department of Conservation and Land Management (1994). Policy Statement Number 50: Setting priorities for the conservation of Western Australia's Threatened Flora and Fauna. 22 August 1994.
- Department of Conservation and Land Management (1995). Policy Statement Number 29: Translocation of Threatened Flora and Fauna. Revised July 1995.
- Department of Conservation and Land Management (1999). Draft Policy Statement Number 9: Conserving Threatened Species and Ecological Communities. In preparation.
- Coffey Environments (2008a) Letter report to Asia Iron Group. Reference MGM-2005-004-LEPD_010_bbs(b). January 2008.
- Coffey Environments (2008b) Letter report to Asia Iron Group. Reference MGM-2005-004-LEPD_013_pldk. March 2008
- Government Gazette, Western Australia (2008). Government Gazette Part 1: Conservation CO302, *Wildlife Conservation Act 1950*, Wildlife Conservation (Specially Protected Fauna) Notice 2008, pp 185-191, 22 January 2008.
- IUCN (2001). *IUCN red list categories prepared by the IUCN Species Survival Commission*, as approved by the 51st meeting of the IUCN Council. Gland, Switzerland.
- Meisner, R. and Caruso, Y. (2008). *Flora and Vegetation of Banded Ironstone Formations of the Yilgarn Craton: Mt Gibson and Surrounding Area*. Report in preparation.

6. TAXONOMIC DESCRIPTION

Lepidosperma gibsonii is a fine-leaved herb (sedge), to 0.6 m high. Culms terete, scarcely finely ribbed, pale green, fully erect, culms 0.32-0.51 x 0.32-0.51mm, to 35-45cm tall. Rhizome compact. Leaves angular, distinctly diamond-shaped, pale green, compressed, 0.43 x 0.40mm, 35-45cm high. Bracts pale tan, glabrous. Base cross-hatched. Inflorescence simple or with one small branch at the base, loose-linear, 32-51mm long, 2.5-3.5mm wide. Inflorescence bract 10.0-39.1mm long. Scales 6-8, broadly triangular, white, 0.45-0.47mm long. Seeds 1.25-1.40 x 0.87-0.89mm, cream, becoming mottled brown with age, smooth, no ribs. Inner floral bract 2.01 x 0.94mm, opaque sides grading to rusty red keel. Style base caducous. Style 1.29mm to branches which are 0.55mm long. Anthers not seen. Anther filaments 2.01mm long.

ESTIMATED COSTS

No	Recovery Actions – <i>Lepidosperma gibsonii</i>	Estimated Cost
1	Coordinate recovery actions and liaise with stakeholders.	\$5000 pa
2	Continue the implementation of the <i>Lepidosperma gibsonii</i> research programme (including conservation genetics, population demography, breeding biology, population viability analysis, environmental interactions and plant health, restoration and translocation and ex situ conservation).	<u>Stage 1*</u> \$215,900 (complete) <u>Stage 2</u> \$1.11 million over 3 years* * Costs include Darwinia masonii research program
3	Conduct further survey and report any additional populations of <i>Lepidosperma gibsonii</i>	Reporting of each additional population \$5000* *Does not include costs of surveying of additional populations
4	Implement <i>Lepidosperma gibsonii</i> condition monitoring programme.	\$25,000 pa
5	Implement fire management strategy	\$10,000pa
6	Manage secondary impacts of mining on <i>Lepidosperma gibsonii</i>	\$50,000
7	Manage inappropriate grazing pressure on <i>Lepidosperma gibsonii</i>	\$10,000pa
8	Undertake translocation trials as part of the <i>Lepidosperma gibsonii</i> Research Programme	Cost included in Recovery Action 2
9	Maintain adequate seed/germplasm and cutting collections to ensure material with a broad genetic base is available for on-going <i>ex situ</i> conservation.	\$10,000pa
10	Promote awareness of <i>Lepidosperma gibsonii</i> and Recovery Plan initiatives	\$5,000pa
11	Review ranking of species and prepare a full Recovery Plan if the review of the Interim Recovery Plan indicates this is necessary.	\$10,000pa

FIGURE 1

LOCATION OF SIGNIFICANT FLORA SPECIES IN THE MT GIBSON AREA