INTERIM RECOVERY PLAN NO 136

GYPSUM GOODENIA

(*GOODENIA INTEGERRIMA*)

INTERIM RECOVERY PLAN

2003-2008

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Photograph A. Cochrane

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Western Australian Threatened Species and Communities Unit (WATSCU)
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Natural Heritage Trust
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Government of Western Australia

DEPARTMENT OF Conservation AND LAND MANAGEMENT
Conserving the nature of WA

FOREWORD

Interim Recovery Plans (IRPs) are developed within the framework laid down in Department of Conservation and Land Management (the Department) Policy Statements Nos. 44 and 50.

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

The Department is committed to ensuring that at least Critically Endangered taxa are conserved through the preparation and implementation of Recovery Plans or Interim Recovery Plans and by ensuring that conservation action commences as soon as possible and always within one year of endorsement of that rank by the Minister.

This Interim Recovery Plan will operate from May 2003 to April 2008 but will remain in force until withdrawn or replaced. It is intended that this IRP will be reviewed after five years and the need for a full Recovery Plan assessed.

This IRP was approved by the Director of Nature Conservation on 11 July, 2003. The provision of funds identified in this Interim Recovery Plan is dependent on budgetary and other constraints affecting the Department, as well as the need to address other priorities.

Information in this IRP was accurate at May 2003.

SUMMARY`

Scientific Name: ***Goodenia integerrima***
Family: Goodeniaceae
DCLM Region: Wheatbelt
Shire: Lake Grace

Common Name: Gypsum Goodenia
Flowering Period: Late October to November
DCLM Districts: Katanning
Recovery Teams: Katanning District Threatened Flora Recovery Team (KDTFRT)

Illustrations and/or further information: Brown, A., Thomson-Dans, C. and Marchant, N. (Eds). (1998) *Western Australia's Threatened Flora*. Department of Conservation and Land Management, Western Australia; Western Australian Herbarium (1998) FloraBase - Information on the Western Australian Flora. Department of Conservation and Land Management, Western Australia. http://www.DCLM.wa.gov.au/science/.

Current status *Goodenia integerrima* was declared as Rare Flora under the Western Australian *Wildlife Conservation Act 1950* in March 1998. It currently meets World Conservation Union (IUCN 2000) Red List Category Endangered (EN) under criterion D as less than 250 mature individuals are known. The main threats are extraction of gypsum, salinity, grazing and inappropriate fire regimes.

Distribution and habitat: *Goodenia integerrima* is endemic to Western Australia where it is restricted to the Lake King area. Here it grows on elevated gypsum dunes in sandy-clay soils with samphire and other dwarf shrub species such as *Pimelea halophila* (Brown *et al*. 1998).

Critical habitat: The critical habitat for *Goodenia integerrima* is the area of vegetation in which it occurs, remnant vegetation immediately adjacent to the current habitat of the species, corridors of intact vegetation that are linked to the habitat of the species, the local catchment for the groundwater that provides habitat for the species and additional occurrences of appropriate habitat that do not currently contain the species.

Habitat critical to the survival of the species, and important populations: Given that this species is listed as threatened it is considered that all known habitat for wild and translocated populations is habitat critical.

Benefits to other species/ecological communities: There are no threatened ecological communities or other threatened species in the immediate vicinity of *Goodenia integerrima*. However, recovery actions implemented to improve the quality or security of the habitat of the species, such as weed control and rehabilitation, will benefit the remnant bushland habitat in which it occurs.

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 *Goodenia integerrima* is not listed under any international agreement, the implementation of other international environmental responsibilities is not affected by this plan.

Role and interests of indigenous people: There are no known indigenous communities interested or involved in the management of areas affected by this plan. Therefore no role has been identified for indigenous communities in the recovery of this species.

Social and economic impacts: The implementation of this recovery plan is unlikely to cause any significant adverse social and economic impacts. The species occurs on rises in large salt lakes in a Nature Reserve. It is not known to occur in any areas of Private property.

Evaluation of the Plans Performance: The Department of Conservation and Land Management, in conjunction with the Recovery Team will evaluate the performance of this IRP. 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.

Existing Recovery Actions: The following recovery actions have been or are currently being implemented -
1. Many surveys have been undertaken for the species by DCLM's Katanning District staff, DCLM's Science staff and private consultants.
2. The Katanning District Threatened Flora Recovery Team (KDTFRT) is overseeing the implementation of this IRP and will include information on progress in its annual report to DCLM's Corporate Executive and funding bodies.
3. Staff from DCLM's Katanning District office regularly monitor all known populations.

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

Recovery criteria

Criterion for success: The number of individuals within populations and/or the number of populations have increased by 10% or more.

Criterion for failure: The number of individuals within populations and/or the number of populations have decreased by 10% or more.

Recovery actions

1. Coordinate recovery actions.
2. Reconfirm and monitor populations.
3. Collect seed and cutting material.
4. Liaise with adjacent leaseholders.
5. Conduct further surveys.
6. Undertake rabbit control.
7. Develop and implement a fire management strategy.
8. Promote awareness.
9. Obtain biological and ecological information.
10. Review the need for a full RP or updated IRP and prepare if necessary.

1. BACKGROUND

History

Alex. George made the first known collection of *Goodenia integerrima* from Lake King in 1965. Surveys were then undertaken in the Lake King area by Dianna Papenfus as part of a Commonwealth Government funded project, however, no new populations were located. Surveys were also carried out near Lake Varley and Lake Pallarup without success. Between 1993 to 1996, as part of a "Review of Botanical Values on a Range of Gypsum Dunes in the Wheatbelt of WA" (Mattiske, 1995), some 30 lakes were surveyed but no new populations of *G. integerrima* were found. A. Wilson also conducted surveys of salt lake margins in the Esperance area in 1988 but was unable to locate any new populations.

Goodenia integerrima is currently known from three populations, together containing around 130 mature plants. Population counts have not been undertaken since 1997 and need to be done again to see if any changes have occurred.

Description

Goodenia integerrima is a ground-hugging or slightly ascending perennial herb which grows to about 9 cm tall. The leaves are linear, 1 to 2 mm wide, clustered and have re-curved margins on the upper surface. The flowers are in sub-umbels, up to about 8 cm long, with a yellow and brown corolla, about 7 mm long (Brown *et al*. 1998).

Goodenia integerrima is not closely allied to any other species, but the form of the hairs and the seeds are closest to *G. fascicularis* (Carolin 1990). Its low-growing habit, yellow flowers with a brown throat, and unusual habitat on rises in salt lakes distinguish it from other species (Brown *et al*. 1998).

Biology and ecology

Mattiske (1996) suggests that *Goodenia integerrima* is likely to be a gypsophylic plant species that is unique to a single lake. Its rarity is borne out by its not being found elsewhere despite extensive surveys.

Distribution and habitat

Goodenia integerrima is endemic to Western Australia where it is restricted to Lake King. The species grows on elevated islets in sandy, clay soils with samphire and other dwarf shrub species such as *Pimelea halophila* which is Priority 2 (Brown *et al*. 1998).

Critical habitat

Critical habitat is habitat identified as being critical to the survival of a listed threatened species or listed threatened ecological community. Habitat is defined as the biophysical medium or media occupied (continuously, periodically or occasionally) by an organism or group of organisms or once occupied (continuously, periodically or occasionally) by an organism, or group of organisms, and into which organisms of that kind have the potential to be reintroduced. (*Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)).

The critical habitat for *Goodenia integerrima* comprises:

- the area of occupancy of the known populations,
- areas of similar habitat ie. on elevated islets in gypsum dunes in sandy, clay soils with samphire and other dwarf shrub species such as *Pimelea halophila*, within 200 metres of known populations (these provide potential habitat for natural range extension),
- corridors of remnant vegetation that link populations (these are necessary to allow pollinators to move between populations and are usually road and rail verges),
- the local catchment which supplies groundwater and habitat for the species (the species occurs in rises on a salt lake and is dependent on maintenance of local surface hydrology),

- additional occurrences of similar habitat ie. on elevated islets in sandy, clay soils with samphire and other dwarf shrub species such as *Pimelea halophila* that do not currently contain the species (these represent possible translocation sites).

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

Given that this species is listed as Endangered it is considered that all known habitat for wild and any future translocated populations is habitat critical.

Threats

Goodenia integerrima was declared as Rare Flora under the Western Australian *Wildlife Conservation Act 1950* in March 1998. It currently meets World Conservation Union (IUCN 2000) Red List Category 'EN' under criterion D as less than 250 mature individuals are known. Threats include:

- **Extraction of gypsum** and activities associated with mining, such as vehicle usage. Currently there are two mining leases with gypsum being mined in an area adjacent to the *G. integerrima* and *Pimelea halophila* (P2) populations.

- **Rising groundwater and increasing salinity** due to agricultural clearing. All populations occur on rises in samphire flats that are seasonally wet/waterlogged and susceptible to excessive inundation and increasing salinity. Assessment and monitoring of the populations is required.

- **Grazing** by rabbits (*Oryctolagus cuniculus*). Grazing may impact on the establishment of *G. integerrima* seedlings thereby limiting natural recruitment. In addition, disturbance of soil by rabbit warren construction and increased nutrient levels from their droppings may affect the habitat of the species and encourage weeds. In recent years, the impact of rabbits has declined due to rabbit baiting by many landholders, and the introduction of the calici virus.

- **Inappropriate fire regimes** may affect the viability of populations of *Goodenia integerrima*. It is not known what the fire response of the species is, however, frequent fire is likely to kill adult plants before regenerating or juvenile plants reach maturity. Further research is required and will be addressed in Recovery Action 9.

Summary of population information and threats

Pop. No. & Location	Land Status	Year/No. plants	Condition	Threats
1. Lake King	Nature Reserve	1997 30	Healthy	Gypsum extraction, salinity, grazing, inappropriate fire regimes
2. Lake King	Nature Reserve	1997 50	Healthy	Gypsum extraction, salinity, grazing, inappropriate fire regimes
3. Lake King	Nature Reserve	1997 50	Healthy	Gypsum extraction, salinity, grazing, inappropriate fire regimes

Benefits to other species/ecological communities

There are no other threatened species or threatened ecological communities in the immediate vicinity of *Goodenia integerrima*. However, recovery actions implemented to improve the quality or security of the habitat of the species, such as weed control and rehabilitation, will benefit the remnant bushland habitat in which it occurs.

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 *Goodenia integerrima* is not listed under any international agreement, the implementation of other international environmental responsibilities is not affected by this plan.

Role and interests of indigenous people

There are no known indigenous communities interested or involved in the management of areas affected by this plan. Therefore no role has been identified for indigenous communities in the recovery of this species.

Social and economic impacts

The implementation of this recovery plan is unlikely to cause any significant adverse social and economic impacts. The species occurs on rises in large salt lakes in a Nature Reserve. It is not known to occur in any areas of Private property.

Evaluation of the Plans Performance

The Department of Conservation and Land Management, in conjunction with the Recovery Team will evaluate the performance of this IRP. 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.

Guide for decision-makers

Section 1 provides details of current and possible future threats. Any on-ground works (clearing, firebreaks etc) in the immediate vicinity of *Goodenia integerrima* will require assessment. On ground works should not be approved unless the proponents can demonstrate that they will not have an impact on the taxon, its habitat or potential habitat.

2. RECOVERY OBJECTIVE AND CRITERIA

Objectives

The objective of this Interim Recovery Plan is to abate identified threats and maintain and/or enhance *in situ* populations to ensure the long-term preservation of the taxon in the wild.

Criteria for success: The number of individuals within populations and/or the number of populations have increased by 10% or more.
Criteria for failure: The number of individuals within populations and/or the number of populations have decreased by 10% or more.

3. RECOVERY ACTIONS

Existing recovery actions

Numerous surveys for new populations of *Goodenia integerrima* have been undertaken by DCLM Katanning District staff, DCLM Science staff and private consultants.

The Katanning District Threatened Flora Recovery Team (KDTFRT) is overseeing the implementation of this IRP and will include information on progress in its annual report to DCLM's Corporate Executive and funding bodies.

Staff from DCLM's Katanning District office regularly monitor all populations.

Future recovery actions

Where populations occur on lands other than those managed by DCLM, permission has been or will be sought from the appropriate land managers prior to recovery actions being undertaken.

1. Coordination

The KDTFRT is coordinating the implementation of recovery actions for *Goodenia integerrima* and will include information on progress in the annual report to DCLM's Corporate Executive and funding bodies.

Action: Coordinate recovery actions
Responsibility: DCLM (Katanning District) through the KDTFRT
Estimated Cost: $600 per year.

2. Monitoring

Known populations of *Goodenia integerrima* will be monitored and plant counts undertaken during the species October, November flowering period. Monitoring will include weed invasion, habitat degradation, salinity levels and population stability (expansion or decline), pollinator activity, seed production, recruitment, and longevity. Soil salinity and pH readings will be taken during winter and summer.

Action: Monitor populations
Responsibility: DCLM (Katanning District) through the KDTFRT
Estimated Cost: $2,700 per year.

3. Germplasm collections

Preservation of germplasm is essential to guard against extinction if wild populations are lost. Seed and cutting collections can also be used to propagate plants for translocations and to establish a living collection at the Botanic Gardens and Parks Authority (BGPA).

Action: Collect seed and cutting material
Responsibility: DCLM (Katanning District, TFSC) and BGPA, through the KDTFRT
Estimated Cost: $3,400 per year.

4. Liaison

Lease holders have yet to be notified about the presence of *Goodenia integerrima* adjacent to the land that is currently being mined for gypsum. Staff from DCLM's Katanning District will liaise with them to ensure that populations are not damaged or destroyed accidentally.

Action: Liaise with adjacent leaseholders
Responsibility: DCLM (Katanning District) through the KDTFRT
Estimated Cost: $900 per year.

5. Surveys

Further surveys, supervised by DCLM staff and with assistance of local volunteers and wildflower society members, will be conducted during the flowering period (Late October to November) of *Goodenia integerrima*.

Action: Conduct further surveys
Responsibility: DCLM (Katanning District) through the KDTFRT
Estimated Cost: $2,200 per year.

6. Rabbit control

Rabbits have the potential to cause minor damage to the species at all populations. Where identified as a need during monitoring DCLM will initiate control using the most appropriate method in cooperation with land users.

Action: Undertake rabbit control
Responsibility: DCLM (Katanning District) through the KDTFRT
Estimated Cost: $900 per year.

7. Fire management strategy

The response of *Goodenia integerrima* to fire is not known. However, frequent fire may prevent the accumulation of sufficient soil stored seed to allow regeneration of the populations. Fire should therefore be prevented from occurring in this area at least in the short term. A fire management strategy will be developed to determine fire control measures and fire frequency.

Action: Develop and implement a fire management strategy
Responsibility: DCLM (Katanning District) through the KDTFRT
Estimated Cost: $2,700 in first year and $1,000 in subsequent years.

8. Community awareness

The importance of biodiversity conservation and the need for the long-term protection of *Goodenia integerrima* in the wild will be promoted to the public through the local print, electronic media and poster displays. An information sheet, which includes a description of the plant, its habitat type, threats, management actions and photos will be produced. Formal links with local naturalist groups and interested individuals will also be encouraged.

Action: Promote awareness
Responsibility: DCLM (Katanning District, Corporate Relations) through the KDTFRT
Estimated Cost: $1,600 in first year and $900 in subsequent years.

9. Biology and ecology

Better knowledge of the biology and ecology of *Goodenia integerrima* will provide a scientific basis for management of the wild populations. An understanding of the following is necessary for effective management:

1. The pollination biology of *Goodenia integerrima*
2. The soil seed bank dynamics, seed life and the effect of disturbance, competition, rainfall and grazing on germination and seedling survival.
3. Reproductive strategies, phenology and seasonal growth.
4. Population genetic structures, levels of genetic diversity and minimum viable population size.
5. The impact of salinity on *Goodenia integerrima* and its habitat.

Action: Obtain biological and ecological information
Responsibility: DCLM (Science Division, Katanning District) through the KDTFRT
Estimated Cost: $19,200 per year for five years

10. Review Interim Recovery Plan

At the end of the fourth year of the five-year term of this Interim Recovery Plan, the need for a full Recovery Plan, or a review of this IRP, will be assessed and a plan prepared if necessary.

Action: Review the need for a Full Recovery Plan or updated IRP
Responsibility: DCLM (WATSCU, Katanning District) through the KDTFRT
Estimated Cost: $20,800 once in the final year if required.

4. TERM OF PLAN

This Interim Recovery Plan will operate from May 2003 to April 2008 but will remain in force until withdrawn, updated or replaced, as under Action 10 above.

5. ACKNOWLEDGMENTS

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

Brett Beecham	Regional Ecologist, DCLM Wheatbelt Region, Narrogin
Bruce Bone	District Manager, DCLM Katanning District
Anne Cochrane	Manager, DCLM Threatened Flora Seed Centre
Mal Graham	Previously District Operations Officer, DCLM Katanning District
Bethea Loudon	Conservation Officer, DCLM Katanning District
Amanda Shade	Horticulturalist, Botanic Garden and Parks Authority

We would like to thank the staff of the W.A. Herbarium for providing access to Herbarium databases and specimen information, and DCLM's Wildlife Branch for their extensive assistance.

6. REFERENCES

Brown, A., Thomson-Dans, C. and Marchant, N. (Eds). (1998) *Western Australia's Threatened Flora*. Department of Conservation and Land Management, Western Australia.

DCLM (1992) Policy Statement No. 44 *Wildlife Management Programs*. Department of Conservation and Land Management, Western Australia.

DCLM (1994) Policy Statement No. 50 *Setting Priorities for the Conservation of Western Australia's Threatened Flora and Fauna*. Department of Conservation and Land Management, Western Australia.

Carolin, R. (1990) Nomenclatural notes and new taxa in the genus *Goodenia* (Goodeniaceae). *Telopea* 3(4), 517-570.

Mattiske Consulting Pty Ltd (1995) *A Review of Botanical Values on a Range of Gypsum Dunes in the Wheatbelt of Western Australia*. Final Report for Australian Nature Conservation Agency Save the Bush Program 1993/94 Project SS6007, Part A.

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World Conservation Union (1994) *IUCN red list categories prepared by the IUCN Species Survival Commission*, as approved by the 40th meeting of the IUCN Council. Gland, Switzerland.

7. TAXONOMIC DESCRIPTION

Carolin, R. (1990) Nomenclatural notes and new taxa in the genus *Goodenia* (Goodeniaceae). *Telopea* 3(4), 517-570.

Goodenia integerrima is a decumbent to ascending herb to c. 9 cm. *Stems* terete, glabrous. *Leaves* thick, fasciculate, linear, to 7 cm long, 1-2 mm wide, sessile with a broadened base, acute, involute with a narrow channel on upper surface, with a few short scattered ± appressed simple hairs. *Flowers* arranged in terminal umbels; bracts leaf-like but smaller; pedicels c. 5 mm long, with very few short scattered hairs, indistinctly articulate just below ovary; bracteoles absent. *Sepals* narrow-deltoid, c. 3 mm long and 0.6 mm wide, acute,

entire, glabrous, adnate to ovary for °– ¾ its length. *Corolla* yellow with brownish throat, c. 7 mm long, glabrous outside, ± pubescent inside throat; anterior pocket indistinct, c. ½ as long as ovary; tube c. 2 mm long; superior lobes narrow-oblong, c. 4 mm long and 0.5 mm wide, lower wing almost obsolete above auricle; inferior lobes oblong, 2 mm long, 1 mm wide; wings c. 1 mm wide, scarcely ½ as long as lobes; connate part of inferior lobes c. 3 mm long. *Stamen* filaments linear, 1.5 mm long; anthers elliptic, 0.8 mm long. *Ovary* glabrous; septum scarcely ½ as long as loculus; ovules 6-8; style 2 - 2.5 mm long, pubescent towards top; indusium transverse-oblong, 0.8 mm long, 1.5 mm wide, brownish, villous-pubescent, with ± concave orifice beset with white bristles c. 2 mm long. *Fruit* globular, c. 2.5 mm diam., glabrous. *Seeds* flat, dark grey-brown, orbicular, c. 1.5 mm diam., reticulate, with prominent rim; wing c. 0.3 mm wide, mucilaginous.