INTERIM RECOVERY PLAN NO. 71

Plant assemblages of the Billeranga System

Interim Recovery Plan

2000-2003

by

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Photograph: Robert Gomer

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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

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.

CALM is committed to ensuring that Critically Endangered, and where appropriate and feasible, other threatened ecological communities are conserved through the preparation and implementation of Recovery Plans or Interim Recovery Plans. CALM will also ensure that conservation action commences as soon as possible and always within three years of endorsement of Vulnerable rank by CALM's Director of Nature Conservation.

This Interim Recovery Plan will operate from 2 November 2000 but will remain in force until withdrawn or replaced.

The provision of funds identified in this Interim Recovery Plan is dependent on budgetary and other constraints affecting CALM, as well as the need to address other priorities.

Information in this IRP was accurate at 31 October 2000.

SUMMARY

Name: Plant assemblages of the Billeranga System.

Description: Plant assemblages of the Billeranga System (Beard 1976) covering the outcrop of the Billeranga group of Proterozoic rocks as expressed in the Billeranga Hills. The plant assemblage comprises *Melaleuca filifolia – Allocasuarina campestris* thicket on clay sands over laterite on slopes and ridges; open mallee over mixed scrub on yellow sand over gravel on slopes; *Eucalyptus loxophleba* woodland over sandy clay loam or rocky clay on lower slopes and creeklines; and mixed scrub or scrub dominated by *Dodonaea inaequifolia* over red/brown loamy soils on the slopes and ridges of the southern hills.

IBRA Bioregion: Geraldton Sandplains

CALM Region: Midwest Region

CALM District: Geraldton

Shire: Morawa

Recovery Team: Geraldton District Threatened Flora Recovery Team

Current status: Assessed by the TEC Scientific Advisory Committee on 29 October 1999 as Vulnerable. The ranking was endorsed by CALM's Director of Nature Conservation on 24 November 1999.

Critical Habitat: The area of occupancy of the occurrences corresponding to the outcrop of the Billeranga group of Proterozoic rocks (Beard 1976).

IRP Objective(s): To maintain the overall health of the community and reduce the level of threat to ensure the community does not move to the Endangered category.

Criteria for success: Maintenance of the diversity and composition of the native species in the community and of the full range of its occurrences.

Criteria for failure: An increased level of modification of occurrences of the community as measured by a decline in the diversity and composition of the native species.

Summary of Recovery Actions

1. Form a Recovery Team
2. Map the components of the community
3. Fence occurrences where appropriate
4. Monitor the extent and boundaries of the community
5. Design and implement a program for flora monitoring
6. Liaise with current owners, land managers and other interested groups
7. Encourage and assist landowners to utilise incentives and mechanisms for conserving the community
8. Design and implement weed control strategy
9. Design and apply appropriate fire management plans
10. Acquire occurrences for the conservation estate

1 BACKGROUND

History, defining characteristics of ecological community, and conservation significance

A 'System' is a specific series of plant communities recurring in a catenary sequence or mosaic pattern linked to topographic, pedological and/or geological features. The Billeranga System has a distinctive geology, topography and vegetation, different from that of any other comparable system (Beard 1976). It covers the outcrop of the Billeranga group of Proterozoic rocks as expressed in the Billeranga Hills comprising sandstone, acid lavas, chert, siltstone and shale (Baxter and Lipple 1985). The lower portion of the hills consist of Archaean Gneiss which was incised by river action in mid-Proterozoic times to produce river channels. The channels were in-filled by Proterozoic Neereeno Sandstone which was later on buried by andestic lava flows (Morawa Lavas). The Billeranga Hills are therefore a very ancient buried landscape (Register of the National Estate 2000).

It is estimated that the original area of the Billeranga system was 3 250 ha, of which 1 897 ha remains. This represents a loss of 58% (mostly from the lower lying areas) of the area of a plant community that was originally restricted in distribution. Another 1 000 ha (52%) of the remaining vegetation has been modified by grazing and/or weed invasion. Only 80 ha (~ 4%) is in a conservation reserve, vested in the National Parks and Nature Conservation Authority (NPNCA) and managed by Department of Conservation and Land Management.

The Billeranga System consists of a number of plant communities including *Melaleuca filifolia – Allocasuarina campestris* thicket on yellow brown clay sands over laterite on the mid to upper slopes and ridges; open mallee (including *Eucalyptus jucunda, E. eudesmoides, E. loxophleba* and *E. pyriformis*) over mixed scrub on yellow brown sand over gravel on the western slopes; and *Eucalyptus loxophleba* woodland with mixed understorey over brown sandy clay loam on lower slopes, valleys and creeklines (True and O'Callaghan 1998, author personal observations). The mixed scrub (including *Acacia acuminata, Allocasuarina campestris* and *Dodonaea inaequifolia*) and *Dodonaea inaequifolia* dominated scrub is restricted to the red loamy soils of the slopes and summits of the southern portion of these hills; the latter is thought to occur nowhere else in Western Australia (Beard 1976).

The Billeranga System contains a number of taxa that are listed as Priority. These are either totally confined to the hills (P1) or are very restricted in their distribution in Western Australia (P3) (Table 1).

Table 1: Priority taxa found in the Billeranga Hills (Dept. of CALM 1999)

Conservation category*	Species Name
P1	*Acacia pterocaulon* *Baeckea* sp. Billeranga Hills
P3	*Acacia nodiflora* *Calytrix chrysantha* *Geleznowia verrucosa* subsp. *verrucosa* *Grevillea stenostachya* *Lepidobolus densus*

A list of taxa that occur in quadrats (True and O'Callaghan 1998) and from author personal observations in occurrences in the community is given in Appendix 1.

Extent and location of occurrences

The Billeranga Hills are located approximately 15 km south-west of Morawa, in the Shire of Morawa. The range is approximately 19 km long and 2-4 km wide, and lies in a north-south direction. There are five occurrences with all, except 85 ha, on private land. All have been modified to some degree and one or more of the following threats are currently affecting or have the potential to affect the occurrences: grazing, weed invasion and fire (Table 2).

Table 2: Summary of occurrence information and threats

Occ.	Land Status	Estimated area (ha)	Condition	Threats
1	Private land	578 ± 50	Slightly modified	Weed invasion and inappropriate fire regimes
2	Private land	35 ± 10	Moderately modified	Weed invasion and inappropriate fire regimes
3	Private land	40 ± 10	Slightly modified	Weed invasion and inappropriate fire regimes
4	Private land and Class A Nature Reserve	658 ± 77	Moderately modified	Grazing, weed invasion and inappropriate fire regimes
5	Private land	586 ± 110	Moderately modified	Grazing, weed invasion and inappropriate fire regimes

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 (a) occupied (continuously, periodically or occasionally) by an organism or group of organisms; or (b) once occupied (continuously, periodically or occasionally) by an organism, or group of organisms, and into which organisms of that kind that the potential to be reintroduced. (sections 207A and 528 of Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)).

The critical habitat for the plant assemblage of the Billeranga System comprises the area of occupancy of the known occurrences corresponding to the outcrop of the Billeranga group of Proterozoic rocks (Beard 1976) and includes:

- Clay sands over laterite on slopes and ridges for the *Melaleuca filifolia – Allocasuarina campestris* thicket association.
- Yellow sand over gravel on slopes for the open mallee over mixed scrub association.
- Red/brown loamy soils on the slopes and ridges for the mixed scrub or scrub dominated *Dodonaea inaequifolia* association.
- Sandy clay loam or rocky clay on lower slopes and creeklines for the *Eucalyptus loxophleba* woodland association.

Biological and ecological characteristics

The variation in the floristic composition of the community on the Billeranga System is assumed to correspond to different aspects/exposures, soil/substrate types and depths, and moisture regimes. Determination of this variation is a priority in this Interim Recovery Plan (IRP).

Threatening processes

All the occurrences are adjacent to farm-cleared land with little vegetation buffer. Potential and current threatening processes to individual occurrences were summarised in Table 2 and are elaborated as follows:

Clearing

Clearing for agriculture in the Shire of Morawa has been extensive with more than 80% cleared (P. Whale, personal communication[1]). The last mass clearing of the Billeranga System – mostly on the lower-lying areas - occurred 50 years ago. Any new proposals to clear one hectare or more of any portion of the community on private land would be subject to assessment in accordance with the Memorandum of Understanding for the protection of remnant vegetation on private land in the agricultural region of Western Australia (Government of Western Australia 1997).

Grazing

Up until 10 years ago, occurrences 1 (partially), 2 and 3 were grazed; these are now fenced. Part of occurrence 4 has recently been fenced with funding from the Remnant Vegetation Protection scheme, with support from CALM WATSCU. The other occurrences, however, are still being grazed. Grazing has caused alterations to the species composition of much of the occurrences by the selective grazing of edible species, the introduction of weeds and nutrients, trampling and general disturbance.

Weed invasion

Weeds can have significant impacts on a community through competition with the native species, prevention of regeneration and alteration of fire regimes (Hobbs and Mooney 1993). Disturbances such as fires and grazing can predispose areas to weed invasion if weed propagules are present. All of the occurrences of this community are close to agricultural areas that act as weed sources, and are vulnerable to weed invasion following any disturbance. At present, weed levels in all but occurrence 1 are quite high.

Altered fire regimes

Fire can cause alterations to the species composition by increasing the number of weeds. As well, an increase in the frequency of fire can prevent species from completing growth and reproductive cycles. Although, there have been no documented incidence of fire, the risk of frequent fire is increased by the presence of grassy weeds in the understorey, as they are likely to be more flammable than many of the original native species in the understorey.

Guide for decision-makers

Section 1 provides details of current and possible future threats. Developments in the immediate vicinity of the occurrences require assessment. No developments should be approved unless the proponents can demonstrate that they will have no significant impact on the ecological community.

Current status

The ‘Plant assemblages of the Billeranga System’ community meets the following criteria for Vulnerable (VU):

B) The ecological community can be modified or destroyed and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations.

Recovery strategy

To devise, in close liaison with landowners, recovery actions for all known occurrences, and promote and assist their conservation.

To conduct appropriate research into the ecology of the community to develop further understanding about the management actions required to maintain or improve its condition.

2 RECOVERY AIM AND CRITERIA

Aim

- To improve the long term security of the plant community by protecting and maintaining the known occurrences, and reducing the level of threat so that the community will not move into the Endangered category.

Criteria for success

- Improvement in the condition of known occurrences of the community measured by a reduction in grazing pressure, weed invasion and inappropriate fire regime by encouraging landholders to fence occurrences and implement weed control strategies and fire management plans.
- No further loss of area covered by the community.

Criterion for failure

- Significant undefined clearing of the community and/or sustained or increased level of modification of occurrences of the community as measured by a decline in the diversity and composition of the native species and increase in weed diversity using existing and potential

3 RECOVERY ACTIONS

All but one of the occurrences occur on land not managed by CALM. Land managers will be notified of the importance of the community and, if not already protected, their cooperation sought to ensure that on-farm activities do not affect the occurrences. As well, permission and cooperation will be sought from the appropriate land managers prior to any recovery actions being taken.

3.1 Existing Recovery Action

The Geraldton District Threatened Flora Recovery Team (GTFRT) is the recovery team for this ecological community and is responsible for overseeing Recovery Actions. Its membership has been expanded to include a CALM WATSCU member with expertise in ecological community conservation. The Recovery Team will continue to report annually to CALM's Corporate Executive.

3.2 Essential Recovery Actions

3.2.1 Map the components of the community

A vegetation map (with species lists) of the Billeranga System will be produced using aerial photography and ground survey. This information will be added to the TECs database as recommended in English and Blyth (1999).

Action: Map the components of the community
Responsibility: GTFRT
Estimated cost: $5,500 for one year.

3.2.2 Fence occurrences where appropriate

Seek to fence the remaining occurrences to ensure stock is excluded and vehicle access can be limited to management needs only. For those occurrences that are already fenced, seek funds to assist in the maintenance and repair of the fences.

Action: Fence occurrences where appropriate
Responsibility: GTFRT in liaison with landowners
Estimated cost: GTFRT to determine costs and seek funds through other sources.

3.2.3 Monitor the extent and boundaries of the community

Monitor the extent, and determine and compare the condition of the known occurrences. The boundary of the occurrences should be monitored regularly and can be determined from current aerial photographs and annual ground-truthing. This information will be added to the TECs database as recommended in English and Blyth (1999).

Action: Monitor the extent and boundaries of the community
Responsibility: GTFRT
Estimated cost: $2,000 for the initial monitoring, $500 for subsequent monitoring

3.2.4 Design and implement a program for flora monitoring

Data collected will include plant species diversity, species richness and weed levels. Occurrences will be monitored regularly to provide information on condition. The program could include installing permanent quadrats on occurrences 1, 2 and 3, and re-scoring quadrats erected in 1997 (True and O'Callaghan 1998) on occurrences 4 and 5, as well as taking photographs from the same area. This information will be added to the TECs database as recommended in English and Blyth (1999).

Action: Design and implement a program for flora monitoring
Responsibility: GTFRT
Estimated cost: GTFRT to determine costs and seek funds through other sources

3.2.5 Liaise with current owners, land managers and other interested groups

With all but one occurrences on private land, the involvement of land managers, landowners and local community groups in the recovery of the community wherever possible and practical is essential to the recovery process.

Action: Liaise with current owners, land managers, and other interested groups
Responsibility: GTFRT
Estimated cost: $1,000 for the first year (+ 10% increment for subsequent years).

3.2.6 Encourage and assist landowners to utilise incentives and mechanisms for conserving the community

Incentives for protection include the CALM's Land for Wildlife scheme, covenanting schemes and other funds that are available to ensure long term protection of the community.

Action: Encourage and assist landowners to utilise the available incentives and mechanisms for conserving the community
Responsibility: GTFRT

Estimated cost: $Nil

3.2.7 Design and implement weed control strategy

As all occurrences are adjacent to cleared farmland and have some degree of weed infestation, a weed control strategy is required that takes into account the nature of the community and the need for continuing maintenance. The weed control program should include:

1. Determining which weeds and native species are present.
2. The selection of the appropriate herbicide and establishing priorities for treatment.
3. The control of invasive weeds by hand or spot spraying as soon as the weeds emerge.
4. Rehabilitation through reintroduction of local native species where such species are no longer capable of regenerating following weed control.

Action: Design and implement weed control strategy
Responsibility: GTFRT
Estimated cost: GTFRT to determine costs

3.2.8 Design and apply appropriate fire management plans

A fire management plan should be developed with landowners and the relevant authorities. The plan should deal with issues such as knowledge of the recovery of the community and its component species from fire; minimising wildfires; the need for, design and position of firebreaks/fire-fighting access tracks; fire management including the need for and design of prescribed fire and fire suppression. The plan should include an annual fire monitoring and reporting schedule.

Action: Design and apply appropriate fire management plans
Responsibility: GTFRT
Estimated cost: GTFRT to determine costs

3.2.9 Seek to acquire occurrences for the conservation estate

To secure the long-term recovery of this community, CALM should seek funds and negotiate with landowners to acquire occurrences and adequate buffer areas if and when they become available. Such areas should then be declared Class A reserves for the purpose of 'Conservation of Flora and Fauna' and vested in the Conservation Commission.

Action: Seek to acquire the occurrence for conservation
Responsibility: CALM (Land Acquisitions Section)
Estimated cost: CALM to negotiate costs on a market/valuation basis.

4 TERM OF PLAN

This Interim Recovery Plan (IRP) will operate from 2 November 2000 for three years but will remain in force until withdrawn or replaced.

5 ACKNOWLEDGMENTS

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John Blyth — Principal Ecologist, CALM, Wildlife Research Centre, Woodvale
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Greg Keighery,	Senior Research Scientist, CALM, Wildlife Research Centre, Woodvale
Mike Meinema	District Manager, CALM Geraldton
Chris and Joan Moffet	Bellaranga Farmstay, Morawa
Robyn Stephens	Director, Acacia Environmental Consultancy

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Appendix 1: List of species found in each occurrence of the Billeranga System
(Note: this is not a comprehensive list)

	Occurrence				
Species	**1**	**2**	**3**	**4***	**5***
Acacia acuaria	+				
Acacia acuminata			+		+
Acacia andrewsii					+
Acacia assimilis subsp. *assimilis*	+			+	+
Acacia blakelyi				+	+
Acacia colletioides	+	+	+		
Acacia hemiteles					+
Acacia erinacea	+	+		+	+
Acacia latipes subsp. *latipes*				+	+
Acacia multispicata				+	+
Acacia neurophylla subsp. *neurophylla*	+			+	+
Acacia nodiflora	+			+	
Acacia pterocaulon	+			+	+
Acacia restiacea				+	
Acacia tratmaniana				+	
Acacia tetragonophylla	+	+			+
Acacia ulicina					+
Acanthocarpus canaliculatus					+
Aira caryophyllea				+	+
Allocasuarina campestris	+			+	+
Anthocercis genistoides	+			+	+
Astroloma serratifolium	+			+	+
Austrostipa elegantissima				+	+
Austrostipa trichophylla					+
Baeckea margarethae				+	
Baeckea sp. Billeranga Hills	+	+	+		
Beaufortia squarrosa				+	+
Brachysema aphyllum			+	+	
Calothamnus quadrifidus					
Calytrix chrysantha				+	+
Calytrix ecalycata				+	+
Cheilanthes austrotenuifolia				+	+
Comesperma scoparium				+	+
Comesperma volubile				+	
Cryptandra arbutiflora				+	
Dampiera lavandulacea				+	
Dampiera salahae					+
Dianella revoluta					+
Dioscorea hastifolia				+	+
Dodonaea inaequifolia	+	+	+	+	+
Dodonaea larraeoides					+
Drosera pallida				+	
Ecdeiocolea monostachya					+
Enchylaena tomentosa				+	+
Eremophila clarkei	+	+		+	
Eremophila glabra					+
Eremophila oldfieldii subsp. *oldfieldii*	+				+
Erodium cygnorum				+	+
Eucalyptus eudesmoides				+	+
Eucalyptus jucunda				+	+
Eucalyptus leptopoda				+	

Eucalyptus loxophleba	+		+	+	+
Eucalyptus pyriformis				+	+
Eucalyptus salmonophloia					+
Geleznowia verrucosa				+	
Goodenia pulchella				+	+
Grevillea biformis subsp. *biformis*				+	+
Grevillea dielsiana	+	+		+	+
Grevillea hakeoides subsp. *hakeoides*					+
Grevillea levis				+	
Grevillea paniculata				+	
Grevillea stenostachya			+		
Grevillea teretifolia	+				
Hakea preissii					+
Hakea recurva					+
Hakea scoparia			+	+	
Hemigenia obovata	+				
Hibbertia acerosa	+				
Hibbertia exasperata				+	
Hibbertia huegelii				+	+
Hibbertia spicata				+	+
Jacksonia densiflora					+
Jacksonia fasciculata				+	
Jacksonia floribunda				+	
Keraudrenia hermanniifolia				+	+
Lawrencella rosea				+	+
Lepidobolus densus					+
Lepidosperma scabrum					+
Lepidosperma squamatum					+
Lepidosperma tenue					+
Leucopogon insularis				+	+
Lysiosepalum rugosum					+
Maireana brevifolia	+			+	+
Melaleuca acuminata subsp. *websteri*					+
Melaleuca adnata				+	+
Melaleuca barlowii					+
Melaleuca cordata				+	
Melaleuca coronicarpa subsp. *coronicarpa*					+
Melaleuca eleuterostachya					+
Melaleuca filifolia	+		+	+	+
Melaleuca nematophylla			+	+	
Melaleuca oldfieldii					+
Melaleuca radula				+	+
Melaleuca steedmanii			+	+	
Melaleuca uncinata				+	
Mesomelaena graciliceps				+	
Mirbelia trichocalyx				+	+
Neurachne alopecuroidea				+	
Olearia revoluta				+	+
Osteospermum clandestinum				+	
Patersonia occidentalis	+	+		+	
Petrophile conifera	+			+	+
Petrophile ericifolia subsp. *subpubescens*				+	+
Pimelea avonensis				+	
Plectrachne drummondii					+
Prostanthera magnifica	+				
Ptilotus obovatus	+			+	+
Rhagodia drummondii				+	+

Rhodanthe spicata				+	
Ricinocarpos velutinus	+	+		+	+
Santalum spicatum			+		+
Scaevola spinescens				+	+
Sclerolaena uniflora					+
Senna artemisioides subsp. *filifolia*				+	
*Senna glutinosa su*bsp. *charlesiana*					+
Stylidium repens				+	+
Stypandra glauca				+	+
Templetonia aculeata				+	+
Thysanotus patersonii				+	+
Trachymene ornata				+	
Verticordia densiflora var. *stelluligera*				+	+
Waitzia acuminata					+
Waitzia nitida				+	
Wurmbea densiflora					+
Xylomelum occidentale					+

* Data mainly from True and O'Callaghan (1998).

Summary of costs for each Recovery Action

Recovery action	Year 1	Year 2	Year 3
Existing			
Form a Recovery Team	$Nil	$Nil	$Nil
Essential/Desirable			
Map the components of the community	$5,500	-	-
Fence occurrences where appropriate	*	*	*
Monitor the extent and boundaries of the community	$2,000	$500	$500
Design and implement a program for flora monitoring	*	*	*
Liaise with current owners, land managers and other interested groups	$1,000	$1,100	1,220
Encourage and assist landowners to utilise incentives and mechanisms for conserving the community	$Nil	$Nil	$Nil
Design and implement weed control strategy	*	*	*
Design and apply appropriate fire management plans	*	*	*
Acquire occurrences for the conservation estate	CALM to negotiate based on market value		

* Geraldton District Threatened Flora Recovery Team to calculate costs