INTERIM RECOVERY PLAN NO. 83

STIRLING RANGE BEARD HEATH

(*LEUCOPOGON GNAPHALIOIDES*)

INTERIM RECOVERY PLAN

2001-2003

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Photograph: E. Hickman

January 2001

Department of Conservation and Land Management
Western Australian Threatened Species and Communities Unit
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Natural Heritage Trust
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DEPARTMENT OF Conservation AND LAND MANAGEMENT
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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 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This Interim Recovery Plan will operate from January 2001 to December 2003 but will remain in force until withdrawn or replaced. It is intended that, if the taxon is still ranked Critically Endangered, this IRP will be replaced by a full Recovery Plan after three years.

This IRP was approved by the Director of Nature Conservation on 12 April, 2001. 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 January 2001.

SUMMARY

Scientific Name: ***Leucopogon gnaphalioides***
Common Name: Stirling Range Beard Heath
Family: Epacridaceae
Flowering Period: August to September
CALM Region: South Coast
CALM District: Albany
Shire: Gnowangerup
Recovery Team: Albany District Threatened Flora Recovery Team (ADTFRT)

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.

Current status: *Leucopogon gnaphalioides* was declared as Rare Flora in November 1997 and was ranked as Critically Endangered (CR) in December of the same year. It currently meets World Conservation Union (IUCN, 1994) Red List Category 'CR' under criteria A1ae, B1+2bce, C1 due to populations being severely fragmented and a continued decline in area, quality of habitat and plant numbers. The main threats are disease, inappropriate fire regimes, trampling, grazing and weeds.

Habitat requirements: *Leucopogon gnaphalioides* is endemic to Western Australia where it is restricted to the rocky summits of hills on the Stirling Range National Park. Habitat is thick scrub/heath on shallow, brown, sandy, clay over schist.

Critical habitat: The critical habitat of *Leucopogon gnaphalioides* comprises the area of known populations, adjacent areas of similar habitat within 200 metres of populations, and other nearby occurrences of suitable habitat that are not currently known to contain populations of the species but which may be suitable for translocations.

Existing Recovery Actions: The following recovery actions have been or are currently being implemented -
1. Unsuccessful attempts were made to collect seed in December 1999 and early January 2000.
2. Sixty-seven cuttings were collected by CALM staff in 1999 and sent to the Botanic Gardens and Parks Authority (BGPA) to be used for propagation.
3. Testing conducted in 1995 by CALMScience found that samples of *Leucopogon gnaphalioides* taken from Bluff Knoll were infected with *Phytophthora cinnamomi*.
4. Aerial spraying of phosphite, for the control of *Phytophthora cinnamomi* (dieback), commenced in 1997.
5. Due to the continuing threat of dieback CALM will continue spraying populations as part of CALM's phosphite spraying program.
6. Staff from CALM's Albany District Office regularly monitor populations, particularly in relation to the impact of *Phytophthora cinnamomi* and effectiveness of phosphite application.
7. The Albany District Threatened Flora Recovery Team (ADTFRT) is overseeing the implementation of this IRP and will include it in its annual report to CALM's Corporate Executive and funding bodies.

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

Recovery criteria
Criteria for success: The number of individuals within populations and/or the number of populations have increased.
Criteria for failure: The number of individuals within populations and/or the number of populations have decreased.

Recovery actions
1. Coordinate recovery actions.
2. Apply phosphite.
3. Monitor the impact of phosphite.
4. Collect seed, cutting and tissue culture material.
5. Develop and implement a fire management strategy.
6. Monitor populations.
7. Develop and implement a rabbit control strategy.
8. Undertake weed control.
9. Conduct further surveys.
10. Obtain biological and ecological information.
11. Promote awareness.
12. Write a full Recovery Plan.

1. BACKGROUND

History

Leucopogon gnaphalioides was first collected from Stirling Range National Park by C.A. Gardner in 1928. All subsequent collections have been made from the park.

As part of the 'Biological Survey of Mountains in southern Western Australia' project, surveys of six mountain peaks were conducted in the Stirling Range National Park by S. Barrett[1] in 1996. One new population of *Leucopogon gnaphalioides* was discovered at that time and three previously reported populations confirmed (Barrett, 1996). Surveys conducted by staff from CALM's Albany District in 1997 and 2000 resulted in a further two new populations being discovered.

Most populations of *Leucopogon gnaphalioides* have been burnt at least once over the last 20 years. Subpopulation 2a was burnt in 1983, Populations 1, 3, 4 and 7 in 1991, and Population 5 in summer 1996. Seedlings of *Leucopogon gnaphalioides* have been observed following fire. A major fire, which occurred in October 2000, burnt most populations of *L. gnaphalioides* with few plants remaining unburnt. The species is currently known from seven populations, many of which no longer have extant plants. All but two of these populations are infected with dieback (*Phytophthora cinnamomi*).

Description

Leucopogon gnaphalioides has densely hairy branches. Leaves are dense, imbricate, sub-appressed, erect, ovate to lanceolate, concave and convex, multi-nerved and dull grey. The leaf apex is acute. The top of the leaf is glabrous, basal inside of leaf has appressed hairs. The leaf margin has long, dense hairs. The inflorescence is comprised of a cluster of short spikes at the end of branches, branchlets are hairy, short bracts are keeled. Calyx is white, tips acute, dorso is pubescent, margin has long, dense cilia. *L. gnaphalioides* differs from *L. elegans* and *L. ovata* in having larger flowers, hairy bracts and larger, hairy leaves (Stschegleew, 1859).

Distribution and habitat

Leucopogon gnaphalioides is endemic to Western Australia where it is restricted to rocky mountain summits in the Stirling Range National Park. Habitat is thick scrub/heath on shallow, brown, sandy, clay over schist.

Associated species include *Actinotus rhomboideus*, *Sphenotoma* sp. Stirling Range, *Acacia drummondii*, *Kunzea montana*, *Calothamnus crassus*, *Beaufortia anisandra*, *Agonis marginata, A. floribunda*, *Lepidosperma* sp., *Helichrysum macranthum*.

Leucopogon gnaphalioides occurs with other Declared Rare Flora species *Dryandra montana*, *Andersonia axilliflora* and *Persoonia micrantha*. Populations 1, 3, 4, 5, 6 and 7 are also a component of the Critically Endangered Eastern Stirling Range Montane Heath Community (Barrett, 2000).

Critical Habitat

Critical habitat is habitat identified as being critical to the survival of a listed threatened species or community. Habitat means 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 have the potential to be reintroduced. (*Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)).

The critical habitat for *Leucopogon gnaphalioides* comprises:

- The habitat of known populations.
- Similar habitat within 200 metres of known populations (these provide potential habitat for natural recruitment). Areas of similar habitat that may be used for future translocation.

Biology and ecology

Little is known about the biology and ecology of species in the genus *Leucopogon,* however, a study by Keighery (1996) on the Western Australian Epacridaceae reports that the greatest species diversity in *Leucopogon* is on the south coastal sandplains. *Leucopogon* species have unspecialised flowers and are mainly pollinated by bees, but are also visited by a range of other insects including flies, wasps, butterflies and moths. The fruits of *Leucopogon* are fleshy drupes and are mostly animal dispersed, usually after ingestion by birds. Most genera in the Epacridaceae contain species that are susceptible to *Phytophthora cinnamomi* (dieback), with those taxa most at threat being geographically

[1] Sarah Barrett, Flora Conservation Officer, CALM Albany District

restricted and including *Leucopogon gnaphalioides* (Keighery, 1996). *L. gnaphalioides* has a ranking of 7/8 on a scale of 1 to 10 where 7 is considered a significant risk (Keighery, 1988).

Post fire observations of *Leucopogon gnaphalioides* suggest that adult plants are killed by fire, with recruitment occurring from soil-stored seed (personal observation S. Barrett). However, the long-term conservation of populations would be compromised if fire recurs before seedlings have had a chance to reach maturity.

Threats

Leucopogon gnaphalioides was declared as Rare Flora in November 1997 and was ranked as Critically Endangered (CR) in December 1997. It currently meets World Conservation Union (IUCN, 1994) Red List Category 'CR' under criteria A1ae, B1+2bce, C1 due to populations being severely fragmented and a continued decline in area, quality of habitat and plant numbers. The main threats are disease, inappropriate fire regimes, trampling, grazing and weeds. This IRP will be implemented in conjunction with the "Eastern Stirling Range Montane Heath Community" IRP (Barrett, 2000) and the IRPs for *Persoonia micranthera* (Evans *et al*., 1999a), *Andersonia axilliflora* (Evans *et al*., 1999b) and *Dryandra montana* (Kershaw *et al*., 1997). Management of the species has also been incorporated into the Stirling Range and Porongurup National Parks Management Plan (CALM, 1999).

- **Disease** is a threat to all populations of *Leucopogon gnaphalioides*. *Phytophthora cinnamomi* has been visually confirmed in Populations 1, 3, 4, 6 and 7.

- **Inappropriate fire regimes** may adversely affect the long-term viability of populations. Fires in 1983, 1991 and 1996 killed many adult plants. Most populations were again burnt in October 2000. Although soil-stored seed germinates following fire, if fires recur before plants are mature there is a significant risk of depleting the seed store.

- **Trampling:** Currently, visitors do not tend to deviate from the Eastern Peak walking Route, however, the alignment and condition of the route requires assessment to ensure *Leucopogon gnaphalioides* populations are not compromised by disease introduction, trampling or track formation.

- **Grazing** by herbivores may have an impact on the habitat of *Leucopogon gnaphalioides* and some individual plants at Populations 3, 4 and 5. The identity of the herbivore is unclear, however, rabbits, quokkas and brushtail possums are present at the site (personal communication S. Barrett).

- **Weed invasion** including *Hypochaeris* sp. and *Cerastium glomeratum*, is a minor threat to Population 5. The population is located on a rocky area where weed seeds blow in. In addition, the area was burnt in 1996, which served to exacerbate the problem. Weeds suppress early plant growth by competing for soil moisture, nutrients and light (Lynch 1987; Saunders *et al*. 1987; Taylor 1987).

- **Drought** may directly impact on the species by causing a reduction in flowering, seed set and population recruitment, and an increased mortality rate of adult plants and seedlings.

Summary of population information and threats

Pop. No. & Location	Land Status	Year/No. plants	Condition	Threats
*1. Isongerup Peak	National Park	2000 40+	Burnt	Disease (dieback), inappropriate fire
*2A. Mondurup Peak	National Park	1995 25 2000 12 (5) [2 dead] 2000 0	Burnt	Disease (dieback), inappropriate fire, drought
*2B. Mondurup Peak	National Park	2000 5 2000 0	Burnt	Disease (dieback), inappropriate fire
*3. Bluff Knoll Plateau	National Park	1996 1000 [500 dead] 2000 50+ (100+)	Burnt	Disease (dieback), inappropriate fire, grazing
*4. Ellen Peak	National Park	1995 50 [20 dead] 2000 30+ [5 dead]	Burnt	Disease (dieback), inappropriate fire, grazing
5. Toolbrunup Peak	National Park	1996 15 1999 2	Poor	Disease (dieback), inappropriate fire, weeds, grazing, trampling
*6. Pyungoorup Peak	National Park	1997 20+ 2000 15+ [3 dead]	Burnt	Disease (dieback), inappropriate fire
*7. Coyanerup Peak	National Park	2000 (5+) [2 dead] 2000 0	Burnt	Disease (dieback), inappropriate fire

Note: Numbers in brackets () refers to seedlings. *refers to populations that were burnt in October/November 2000 fire. Some populations have not yet been assessed for numbers of surviving plants.

Guide for decision-makers

Section 1 provides details of current and possible future threats. Developments in the immediate vicinity of any of the populations or within the defined critical habitat of *Leucopogon gnaphalioides* require assessment. Developments should only be approved if the proponents can demonstrate that they will not have an impact on the species, its habitat or potential habitat, or have the potential to spread or amplify dieback disease.

2. RECOVERY OBJECTIVE AND CRITERIA

Objectives

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

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

3. RECOVERY ACTIONS

Existing recovery actions

Attempts to collect seed were made in December 1999 and early January 2000 but were unsuccessful. It was found that fruits were not forming properly (personal communication A. Cochrane[2]).

Cuttings collected by CALM staff in 1999 were sent to the BGPA for propagation. From 67 cuttings taken, 10 struck (approximately 15%), two of which have since died. A number of different hormone treatments were trialed on the cuttings, but no one treatment was more successful than the others (personal communication A. Shade[3]).

Testing conducted by CALMScience in 1995 found that samples of *Leucopogon gnaphalioides* taken from Bluff Knoll were infected with *Phytophthora cinnamomi* (personal communication J. Webster[4]).

In order to control *Phytophthora cinnamomi*, aerial spraying with phosphite commenced in 1997. Additional populations of *Leucopogon gnaphalioides* were sprayed with phosphite in 1998. The spraying program also covered other threatened species and a threatened community. The following table outlines previous dates at which populations were sprayed with phosphite.

[2] Anne Cochrane, Manager, Threatened Flora Seed Centre
[3] Amanda Shade, Horticulturist, Botanic Garden and Parks Authority
[4] Janet Webster, Technical Officer, CALMScience

Population	Location	Area sprayed	Dates
1	Isongerup Peak	8 hectares	15/5/97 6/4/2000
3	Bluff Knoll	22 hectares	8/5/97 5/4/2000
4	Ellen Peak (summit)	1 hectare	30/3/98 19/3/99 19/4/99
6	Pyungoorup Peak	3.5 hectares	4/3/98 18/3/99

Due to the continuing threat of dieback, CALM's Albany District staff will continue spraying these areas as part of CALM's phosphite spraying program.

Stirling Range National Park Rangers are aware of the critically endangered status of *Leucopogon gnaphalioides* and where it occurs in the park. Staff from CALM's Albany District Office regularly monitor populations in relation to the impact of *Phytophthora cinnamomi* and the effectiveness of phosphite. Six control and 6 spray plots have been set up on Bluff Knoll and species' increase or decline is being assessed to determine the effectiveness of spray treatment (Barrett and Grant, 1997).

The Albany District Threatened Flora Recovery Team (ADTFRT) is overseeing the implementation of this IRP and will include it in its annual report to CALM's Corporate Executive and funding bodies.

Staff from CALM's Albany District Office regularly monitor all populations.

Future recovery actions

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

1. Coordinate recovery actions

The ADTFRT will continue overseeing the implementation of recovery actions for *Leucopogon gnaphalioides* and will include information on progress in its annual report to CALM's Corporate Executive and funding bodies.

Action: Coordinate recovery actions
Responsibility: CALM (Albany District) through the ADTFRT
Cost: $400 per year

2. Apply phosphite

The habitat in which *Leucopogon gnaphalioides* occurs is either severely infected or has the potential to become infected with dieback. CALM will continue applying phosphite to populations 1, 3, 4 and 6, which are currently have the disease. Phosphite will also be applied to Population 7, which has not yet been sprayed. Application of Phosphite to the habitat of *L. gnaphalioides* will also protect a number of other threatened plant species in the area.

Action: Apply phosphite
Responsibility: CALM (Albany District, Dieback Disease Coordinator) through the ADTFRT
Cost: $1100 in first year, $3200 in second year and $21,900 in third year

3. Monitor the impact of phosphite

Following the application of phosphite, monitoring its impact on *Phytophthora cinnamomi* and any detrimental effects on *Leucopogon gnaphalioides* species is required.

Action: Monitor the impact of phosphite
Responsibility: CALM (Albany District, Dieback Disease Coordinator) through the ADTFRT
Cost: $1,100 per year

4. Collect seed, cutting and tissue culture material

Attempts to collect seed have so far been unsuccessful and other methods such as cuttings and/or tissue culture material may need to be used to establish *ex-situ* collections. Also, due to the October 2000 fire that burnt most populations, it will not be possible to collect seed until regenerating plants have reached maturity. Cutting material may be available from those populations in 3-4 years.

Action: Collect seed, cutting and tissue culture material
Responsibility: CALM (Albany District, TFSC) and the BGPA, through the ADTFRT
Cost: $3,300 per year

5. Develop and implement a fire management strategy

Fire kills adult plants of the species with regeneration occurring from germination of soil stored seed. As frequent fire may result in few plants reaching maturity, with insufficient soil stored seed for regeneration, it should be prevented from reoccurring in areas containing *Leucopogon gnaphalioides* for at least 6 years. The development of a fire management strategy has been recommended in the Threatened Ecological Community IRP. The fire management strategy, which should define fire control measures, and fire frequency and timing, will be developed in consultation with relevant authorities and land managers.

Action: Develop and implement a fire management strategy
Responsibility: CALM (Albany District) through the ADTFRT
Cost: $2,400 in first year and $1,000 in subsequent years

6. Monitor populations

Following the October 2000 fire, populations will need to be monitored for post fire recruitment. Habitat degradation (including the impact of dieback), population stability (expansion or decline), weed invasion, pollination activity, seed production, longevity and predation should also be monitored.

Action: Monitor populations
Responsibility: CALM (Albany District) through the ADTFRT
Cost: $1,800 per year

7. Develop and implement a rabbit control strategy

The development of a rabbit control strategy is recommended in the Threatened Ecological Community IRP. A rabbit control program should be designed and implemented, focusing on areas where the vegetation is most impacted on by rabbit activities such as grazing and warren digging. The use of myxomatosis, calici virus, and 1080 baiting are options in areas where macropods occur as they are vulnerable to pindone.

Action: Develop and implement a rabbit control strategy
Responsibility: CALM (Albany District) through the ADTFRT
Cost: Dependent on strategy used

8. Undertake weed control

As weeds are a minor threat to Population 5, the following actions should be implemented:

1. Select appropriate herbicides after determining which weeds are present.
2. Control invasive weeds by hand removal or spot spraying around *Leucopogon gnaphalioides* plants when weeds first emerge.
3. Schedule weed control to coincide with spraying at other threatened flora populations in the district.

The tolerance of associated native plant species to herbicides at the site of *Leucopogon gnaphalioides* is not known and weed control programs will be undertaken in conjunction with research.

Action: Undertake weed control
Responsibility: CALM (Albany District, CALMScience) through the ADTFRT
Cost: $700 per year

9. Conduct further surveys

Further surveys by CALM staff with assistance of naturalist and wildflower society members, will be conducted during the species' flowering period (August to September).

Action: Conduct further surveys
Responsibility: CALM (Albany District) through the ADTFRT
Cost: $3,200 per year

10. Obtain biological and ecological information

Increased knowledge of the biology and ecology of the species will provide a scientific basis for management of *Leucopogon gnaphalioides* in the wild. Investigations will include:

1. Studying the soil seed bank dynamics and the role of disturbance (eg fire), competition, rainfall and grazing on recruitment and seedling survival.
2. Determining reproductive strategies, phenology and seasonal growth.
3. Investigating of the mating system and pollination biology of the species.
4. Investigating population genetic structure, levels of genetic diversity and minimum viable population size.
5. Investigating the impact of dieback disease and the effectiveness of control techniques on *Leucopogon gnaphalioides* and its habitat.

Action: Obtain biological and ecological information
Responsibility: CALM (CALMScience, Albany District) through the ADTFRT
Cost: $17,700 per year

11. Promote awareness

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

Due to the susceptibility of the habitat of this species to dieback, the need for dieback hygiene procedures will be included in information provided to visitors to sites where the species occurs.

Action: Promote awareness
Responsibility: CALM (Albany District, Corporate Relations) through the ADTFRT
Cost: $1,100 in first year and $700 in subsequent years

12. Write a full Recovery Plan

At the end of the second-year of this IRP, the need for further recovery will be assessed. If *Leucopogon gnaphalioides* is ranked as Critically Endangered at that time a full Recovery Plan will be developed that prescribes actions required for its long-term recovery.

Action: Write a full Recovery Plan
Responsibility: CALM (WATSCU, Albany District) through the ADTFRT
Cost: $18,000 in third year

4. TERM OF PLAN

This Interim Recovery Plan will operate from November 2000 to October 2003 but will remain in force until withdrawn or replaced. It is intended that, if the taxon is still ranked Critically Endangered, this IRP will be replaced by a full Recovery Plan after three years.

5. ACKNOWLEDGMENTS

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

Sarah Barrett	Flora Conservation Officer, CALM Albany District
Anne Cochrane	Manager, CALM Threatened Flora Seed Centre
Rebecca Evans	Former Project Officer, WA Threatened Species and Communities Unit
Greg Keighery	Principal Research Scientist, CALMScience
Amanda Shade	Horticulturalist, Botanic Garden and Parks Authority
Russell Smith	Ecologist, CALM Central Forest

Janet Webster Technical Officer, CALMScience

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

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7. TAXONOMIC DESCRIPTION

Stschegleew, S. (1859) Descriptio epacridearum novarum, *Bulletin de la Societe Imperiale des naturalistes de Moscou*, 32(1): 14.

Leucopogon gnaphalioides has tomentose branches. Leaves are dense, imbricate, subappressed, erect, ovate to lanceolate, concave and convex, multinerved and dull grey. Apex is acute. The top of the leaf is glabrous, basal inside of leaf has appressed hairs, leaf margin has long, dense hairs. Inflorescence is composed of cluster of short spikes at the end of branches, branchlets are hairy, short bracts are keeled. Calyx is white, tips acute, dorso is pubescent, margin has long, dense cilia.

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

Leucopogon gnaphalioides is an erect shrub growing up to one metre in height. The leaves are ribbed, have hairs on the edges and tightly overlap along the length of the stem. Flowers are white with beards of hair in the throat and are packed into dense spikes at the ends of the stem.