



Government of **Western Australia**  
Department of **Environment and Conservation**

INTERIM RECOVERY PLAN NO. 300

# **IRONSTONE BEARD-HEATH**

*(Leucopogon spectabilis)*

## **INTERIM RECOVERY PLAN**

**2010-2015**



June 2010  
Department of Environment and Conservation  
Kensington

## FOREWORD

Interim Recovery Plans (IRPs) are developed within the framework laid down in Department of Conservation and Land Management (CALM) Policy Statements Nos. 44 and 50. Note: CALM formally became the Department of Environment and Conservation (DEC) in July 2006. DEC will continue to adhere to these Policy Statements until they are revised and reissued.

IRPs outline the recovery actions that are required to urgently address those threatening processes most affecting the ongoing survival of threatened taxa or 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This plan will operate from June 2010 to May 2015 but will remain in force until withdrawn or replaced. It is intended that, if the taxon is still ranked as Critically Endangered (CR), this IRP will be reviewed after five years and the need for further recovery actions assessed.

This IRP was given regional approval in June 2010 and was approved by the Director of Nature Conservation in July 2010. The provision of funds identified in this IRP is dependent on budgetary and other constraints affecting DEC, as well as the need to address other priorities.

Information in this IRP was accurate at June 2010.

## IRP PREPARATION

This IRP was prepared by Robyn Luu<sup>1</sup>, Jennifer Jackson<sup>2</sup> and Andrew Brown<sup>3</sup>.

<sup>1</sup> Project Officer, DEC Species and Communities Branch, Locked Bag 104, Bentley Delivery Centre, WA 6983.

<sup>2</sup> Conservation Officer, DEC Goldfields Region, 32 Brookman Street, Kalgoorlie, WA 6430

<sup>3</sup>Threatened Flora Coordinator, DEC Species and Communities Branch, Locked Bag 104, Bentley Delivery Centre, WA 6983.

## ACKNOWLEDGMENTS

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

Karl Brennan	Regional Ecologist, DEC Goldfields Region
Vanessa Clarke	Environmental Officer, DEC Native Vegetation Conservation Branch
Anne Cochrane	Senior Research Scientist, Threatened Flora Seed Centre, DEC Science Division
Monica Hunter	Ecologist, DEC Species and Communities Branch
Amanda Shade	Assistant Curator (Nursery) Botanic Gardens and Parks Authority

Thanks also to the staff of the W.A. Herbarium for providing access to Herbarium databases and specimen information, and DEC's Species and Communities Branch for assistance.

Cover photographs by Vanessa Clarke and Scott Reiffer.

## CITATION

This IRP should be cited as:

Department of Environment and Conservation (2010) Ironstone Beard-heath (*Leucopogon spectabilis*) Interim Recovery Plan 2010-2015. Interim Recovery Plan No. 300. Department of Environment and Conservation, Western Australia.

## SUMMARY

<b>Scientific Name:</b>	<i>Leucopogon spectabilis</i>	<b>Common Name:</b>	Ironstone Beard-heath
<b>Family:</b>	Epacridaceae	<b>Flowering Period:</b>	August to October
<b>DEC Region:</b>	Goldfields	<b>DEC District:</b>	N/A
<b>Shire:</b>	Yilgarn	<b>NRM Region:</b>	Avon
<b>Recovery Team:</b>	Goldfields Region Threatened Flora Recovery Team (GRTFRT)		

**Illustrations and/or further information:** Hislop, M. and Chapman, A.R. (2007) Three new geographically restricted species of *Leucopogon* (Ericaceae: Styphelioideae: Styphelieae) from south-west Australia. *Nuytsia* 17 (1): 165-184; Western Australian Herbarium (1998–) *FloraBase – The Western Australian Flora*. Department of Environment and Conservation. <http://florabase.dec.wa.gov.au/>.

**Current status:** *Leucopogon spectabilis* was declared as rare flora under the Western Australian *Wildlife Conservation Act 1950* on 9 April 2002. It is currently ranked as Critically Endangered (CR) under World Conservation Union (IUCN 2001) B1ab(iii,v)+2ab(iii,v) due to the extent of occurrence being less than 100 km<sup>2</sup>; area of occupancy less than 10 km<sup>2</sup> and there being a continuing decline in the area, extent and/or quality of habitat and number of mature individuals. As the species is not currently listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), a Species Profile and Threats (SPRAT) information sheet has been drafted and forwarded for assessment and listing. The main threats to the species are mining and inappropriate fire regimes.

**Description:** *Leucopogon spectabilis* is an erect, narrow and sparingly branched shrub, to about one metre high. The leaves are spirally arranged, directed steeply upward and narrowly elliptic. The flowers are white, erect or spreading (Hislop and Chapman 2007).

**Habitat requirements:** *Leucopogon spectabilis* is restricted to the Helena and Aurora Ranges, 100 km northeast of Southern Cross. The taxon occurs on exposed ironstone ridges, growing in shallow, red, brown loam in rock crevices, among very open shrubland communities (Hislop and Chapman 2007).

**Habitat critical to the survival of the species, and important populations:** It is considered that all known habitat for wild populations is critical to the survival of the species, and that all wild populations are important populations. Habitat critical to the survival of *L. spectabilis* includes the area of occupancy of populations, areas of similar habitat surrounding and linking populations (these providing potential habitat for population expansion and for pollinators), additional occurrences of similar habitat that may contain undiscovered populations of the species or be suitable for future translocations, and the local catchment for the surface and/or groundwater that maintains the habitat of the species.

**Benefits to other species or ecological communities:** Recovery actions implemented to improve the quality or security of the habitat of *Leucopogon spectabilis* will also improve the status of associated native vegetation, including one Declared Rare and 16 Priority flora species and one Priority 1 Ecological Community.

**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. *Leucopogon spectabilis* is not listed under any specific international treaty however, and this IRP does not affect Australia's obligations under any other international agreements.

**Indigenous Consultation:** A search of the Department of Indigenous Affairs Aboriginal Heritage Sites Register has identified three sites of Aboriginal significance within the vicinity of populations of *Leucopogon spectabilis*. Input and involvement is being sought through the South West Aboriginal Land and Sea Council (SWALSC) and Department of Indigenous Affairs to determine if there are any issues or interests. As this is not expected to be completed before the approval of the IRP, further consultation has been included as a recovery action to ensure there has been Indigenous engagement in relation to the recovery actions posed in this plan.

**Social and economic impacts:** The implementation of this recovery plan has potential to cause significant adverse social and economic impact. Although all *Leucopogon spectabilis* populations occur in a Conservation Park, mineral exploration leases cover the area where *L. spectabilis* is known to occur and there is potential for economic impact should mining be approved. Recovery actions refer to continued liaison between stakeholders with regard to these areas.

**Affected interests:** The implementation of this plan has some implications as mining tenement holders will be affected by actions referred to in this plan (see above).

**Evaluation of the Plan's Performance:** The DEC in conjunction with the Goldfields Region Threatened Flora Recovery Team (GRTFRT) will evaluate the performance of this IRP. 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. Relevant stakeholders have been made aware of the existence of this species and its locations.
2. Surveys for *Leucopogon spectabilis* have been undertaken.
3. Approximately 25984 fruit collected from *Leucopogon spectabilis* in November 2007 are stored in DEC's Threatened Flora Seed Centre (TFSC) at -18°C.
4. Staff from DEC's Goldfields Region and botanical consultants working for mining companies regularly monitor populations.
5. The GRTFRT and DEC are overseeing the implementation of this IRP and will include information on progress in their annual report to DEC's Corporate Executive and funding bodies.

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

### Recovery Criteria

**Criteria for success:** The number of populations have increased and/or the number of mature individuals have increased by ten percent or more over the term of the plan.

**Criteria for failure:** The number of populations have decreased and/or the number of mature individuals have decreased by ten percent or more over the term of the plan.

### Recovery actions

1. Coordinate recovery actions
2. Map habitat critical to the survival of *Leucopogon spectabilis*
3. Achieve long term protection of habitat
4. Collect seed and other material to preserve genetic diversity
5. Monitor populations and refine knowledge on the distribution, numbers and extent of all populations
6. Conduct further surveys
7. Develop and implement a fire management strategy
8. Obtain biological and ecological information
9. Active Conservation Park (Reserve) management
10. Liaise with relevant mineral exploration lease holders and Indigenous groups
11. Promote awareness
12. Review this IRP and assess the need for further recovery actions

## 1. BACKGROUND

### History

*Leucopogon spectabilis* was first collected by N. Gibson and M. Lyons during a survey within the Coolgardie Bioregion of Western Australia between 1995 and 1997 (Gibson *et al.* 1997). The species was only known from this collection until survey work between 2002 and 2008 resulted in a further three populations being found.

The Helena and Aurora Ranges, in which *Leucopogon spectabilis* is located, was recommended to be included as part of the Mount Manning Range Nature Reserve in 1990 (Henry-Hall, 1990). This recommendation was endorsed by the Goldfields Region Regional Management Plan (CALM, 1994b), and the Helena and Aurora Range Conservation Park was created in December 2005. Currently, the area is under significant threat from mining and exploration activities. The taxon is known from four populations together containing approximately 898 mature individuals.

### Description

*Leucopogon spectabilis* is an erect, narrow and sparingly branched shrub to about one metre high. The leaves are spirally arranged, directed steeply upward and narrowly elliptic. The flowers are white, erect or spreading. The species is named from the Latin *spectabilis* meaning remarkable or spectacular, and refers to the large flowers and long inflorescences which make this an attractive species (Hislop and Chapman 2007).

*Leucopogon spectabilis* is distinguished from its closest relatives *L. apiculatus* and *L. validus* by its shorter bracts, bracteoles and longer style (former), and its longer, thinner leaves and larger flowers (latter) (Hislop and Chapman 2007).

### Distribution and habitat

*Leucopogon spectabilis* is restricted to four populations over a geographic range of approximately 7 km in the Helena and Aurora Ranges, 100 km northeast of Southern Cross. It has an extent of occurrence of approximately 3 km<sup>2</sup>. The taxon occurs on exposed ironstone ridges, growing in shallow, red, brown loam in rock crevices, among very open shrubland communities dominated by *Banksia arborea* (P4), *Calycopeplus paucifolius* and *Melaleuca leiocarpa* and *Tetratheca aphylla* subsp. *aphylla* (DRF) (Hislop and Chapman 2007). Associated species include *Tetratheca aphylla* subsp. *aphylla* (DRF), *Melaleuca uncinata*, *Stenanthemum newbeyi* (P3), *Acacia quadrimarginea*, *Alyxia buxifolia*, *Dodonaea viscosa*, *Neurachne anularis* (P3), *Isotoma petraea* and *Ptilotus obovatus*.

**Table 1. Summary of population land vesting, purpose and manager**

Pop. No. & Location	DEC District	Shire	Vesting	Purpose	Manager
<b>1a. Helena and Aurora Ranges</b>	Kalgoorlie	Yilgarn	Conservation Commission of Western Australia	Conservation Park	DEC
<b>1b. Helena and Aurora Ranges</b>	Kalgoorlie	Yilgarn	Conservation Commission of Western Australia	Conservation Park	DEC
<b>2a. Helena and Aurora Ranges</b>	Kalgoorlie	Yilgarn	Conservation Commission of Western Australia	Conservation Park	DEC
<b>2b. Helena and Aurora Ranges</b>	Kalgoorlie	Yilgarn	Conservation Commission of Western Australia	Conservation Park	DEC
<b>2c. Helena and Aurora Ranges</b>	Kalgoorlie	Yilgarn	Conservation Commission of Western Australia	Conservation Park	DEC
<b>3a. Helena and Aurora Ranges</b>	Kalgoorlie	Yilgarn	Conservation Commission of Western Australia	Conservation Park	DEC
<b>3b. Helena and Aurora Ranges</b>	Kalgoorlie	Yilgarn	Conservation Commission of Western Australia	Conservation Park	DEC
<b>3c. Helena and Aurora Ranges</b>	Kalgoorlie	Yilgarn	Conservation Commission of Western Australia	Conservation Park	DEC
<b>3d. Helena and Aurora Ranges</b>	Kalgoorlie	Yilgarn	Conservation Commission of Western Australia	Conservation Park	DEC
<b>3e. Helena and Aurora Ranges</b>	Kalgoorlie	Yilgarn	Conservation Commission of Western Australia	Conservation Park	DEC

<b>3f. Helena and Aurora Ranges</b>	Kalgoorlie	Yilgarn	Conservation Commission of Western Australia	Conservation Park	DEC
<b>4. Helena and Aurora Ranges</b>	Kalgoorlie	Yilgarn	Conservation Commission of Western Australia	Conservation Park	DEC

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

## Biology and ecology

There is little known about the biology and ecology of *Leucopogon spectabilis*, and recovery actions refer to a need for research.

## Threats

*Leucopogon spectabilis* was declared as rare flora under the Western Australian *Wildlife Conservation Act 1950* on 9 April 2002. It is currently ranked as Critically Endangered (CR) under World Conservation Union (IUCN 2001) B1ab(iii,v)+2ab(iii,v) due to its extent of occurrence being less than 100 km<sup>2</sup>, its area of occupancy less than 10 km<sup>2</sup> and there being a continuing decline in the area, extent and/or quality of habitat and number of mature individuals. As the species is not currently listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), a Species Profile and Threats (SPRAT) information sheet has been drafted and forwarded for assessment and listing. The main threats to the species are mining and inappropriate fire regimes.

- **Mining and associated exploration activities** are a major threat to *Leucopogon spectabilis*. The species is confined to a banded ironstone range in an area that has a high number of mining proposals and extensive exploration (past, current and proposed) associated with mining. Mining and exploration activities have the potential to disturb or destroy habitat, increase access, spread weeds and pollute groundwater and soil.
- **Inappropriate fire regimes** are a threat to all populations of *Leucopogon spectabilis*. It is not known how the species responds following fire and therefore fire should be prevented from occurring in the area, except where it is used experimentally. Fire may also facilitate weed invasion and should be followed up with appropriate weed control.

The intent of this plan is to provide actions that will deal with immediate threats to *Leucopogon spectabilis*. Although climate change may have a long-term effect on the species, actions taken directly to prevent the impact of climate change are beyond the scope of this plan.

**Table 2. Summary of population information and threats**

Pop. No. & Location	Land Status	Year / No. of plants	Current Condition	Threats
1a. Helena & Aurora Ranges	Conservation Park	1995 50 2002 150	Unknown	Mining, insecure land tenure, inappropriate fire regimes
1b. Helena & Aurora Ranges	Conservation Park	2002 8	Healthy	Mining, insecure land tenure, inappropriate fire regimes
2a. Helena & Aurora Ranges	Conservation Park	2002 65	Healthy	Mining, insecure land tenure, inappropriate fire regimes
2b. Helena & Aurora Ranges	Conservation Park	2002 20	Healthy	Mining, insecure land tenure, inappropriate fire regimes
2c. Helena & Aurora Ranges	Conservation Park	2002 15	Healthy	Mining, insecure land tenure, inappropriate fire regimes
3a. Helena & Aurora Ranges	Conservation Park	2004 100	Healthy	Mining, insecure land tenure, inappropriate fire regimes
3b. Helena & Aurora Ranges	Conservation Park	2004 50	Healthy	Mining, insecure land tenure, inappropriate fire regimes
3c. Helena & Aurora Ranges	Conservation Park	2004 200	Healthy	Mining, insecure land tenure, inappropriate fire regimes
3d. Helena & Aurora Ranges	Conservation Park	2004 50	Healthy	Mining, insecure land tenure, inappropriate fire regimes
3e. Helena & Aurora Ranges	Conservation Park	2004 100	Healthy	Mining, insecure land tenure, inappropriate fire regimes
3f. Helena & Aurora Ranges	Conservation Park	2005 40	Healthy	Mining, insecure land tenure, inappropriate fire regimes
4. Helena & Aurora Ranges	Conservation Park	2006 100	Healthy	Mining, insecure land tenure, inappropriate fire regimes

## Guide for decision-makers

Section 3 provides details of current and possible future threats. Development and/or land clearing in the immediate vicinity of *Leucopogon spectabilis* will require assessment. On-ground works should not be approved unless the proponents can demonstrate that their actions will have no significant negative impact on the species, its habitat or potential habitat or on the local surface hydrology, such that drainage in the habitat of the species would be altered.

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

It is considered that all known habitat for wild populations is critical to the survival of the species, and that all wild populations are important populations. Habitat critical to the survival of *L. spectabilis* includes the area of occupancy of populations, areas of similar habitat surrounding and linking populations (these providing potential habitat for population expansion and for pollinators), additional occurrences of similar habitat that may contain undiscovered populations of the species or be suitable for future translocations, and the local catchment for the surface and/or groundwater that maintains the habitat of the species.

## Benefits to other species or ecological communities

Recovery actions implemented to improve the quality or security of the habitat of *Leucopogon spectabilis* will also improve the status of associated native vegetation. One DRF (Vulnerable) and 16 Priority flora occur in the vicinity of *L. spectabilis*. These taxa are listed in the table below:

**Table 3. Conservation-listed flora species occurring in vicinity of *Leucopogon spectabilis***

Species name	Conservation Status (WA)	Conservation Status (EPBC Act 1999)
<i>Tetradlea aphylla</i> subsp. <i>aphylla</i>	DRF, Vulnerable	Vulnerable
<i>Acacia adinophylla</i>	Priority 1	
<i>Acacia</i> sp. Bungalbin Hill	Priority 1	
<i>Baeckea</i> sp. Helena and Aurora Range	Priority 1	
<i>Hibbertia lepidocalyx</i> subsp. <i>tuberculata</i>	Priority 1	
<i>Homalocalyx grandiflorus</i>	Priority 1	
<i>Lepidosperma bungalbin</i>	Priority 1	
<i>Lepidosperma ferricola</i>	Priority 1	
<i>Phlegmatospermum eremaeum</i>	Priority 2	
<i>Astartea</i> sp. Bungalbin Hill	Priority 3	
<i>Grevillea georgeana</i>	Priority 3	
<i>Mirbelia</i> sp. Helena and Aurora	Priority 3	
<i>Neurachne annularis</i>	Priority 3	
<i>Spartothamnella</i> sp. Helena and Aurora Range	Priority 3	
<i>Stenanthemum newbeyi</i>	Priority 3	
<i>Banksia arborea</i>	Priority 4	
<i>Daviesia purpurascens</i>	Priority 4	

For a description of the Priority categories see Atkins (2008).

*Leucopogon spectabilis* also occurs in association with one Priority Ecological Community (PEC).

**Table 4. Priority Ecological Community (PEC) in which *Leucopogon spectabilis* occurs in association**

TEC Title	Conservation Status (WA)	Conservation Status (EPBC Act 1999)
Helena and Aurora Range vegetation complexes (banded ironstone formation)	Priority 1	–

For a description of the TEC and PEC categories see DEC (2007).

## 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. *Leucopogon spectabilis* is not listed under any specific international treaty however and this IRP does not affect Australia's obligations under any other international agreements.

## **Indigenous Consultation**

A search of the Department of Indigenous Affairs Aboriginal Heritage Sites Register has identified three sites of Aboriginal significance within the vicinity of populations of *Leucopogon spectabilis*. These sites are listed as Bungalbin (site #5600), artefacts; Helena/Aurora Ranges Gully (site #18730), mythological/historical; and Mount Jackson Ranges (site #22944), mythological. There are no restrictions to the first two sites and access to the areas is open. Access to the third site (#22944) however is closed to males only.

Input and involvement is being sought through the South West Aboriginal Land and Sea Council (SWALSC) and Department of Indigenous Affairs to determine if there are any issues or interests. As this is not expected to be completed before the approval of the IRP, further consultation has been included as a recovery action to ensure there has been Indigenous engagement in relation to the recovery actions posed in this plan.

## **Social and economic impacts**

The implementation of this recovery plan has potential to cause significant adverse social and economic impacts. Although all *Leucopogon spectabilis* populations occur in a Conservation Park mineral exploration leases cover the area where *L. spectabilis* is known to occur, and there is potential for economic impact should mining be approved. Recovery actions refer to continued liaison between stakeholders with regard to these areas.

## **Affected interests**

The implementation of this plan has some implications as mining tenement holders will be affected by actions referred to in this plan (see above).

## **Evaluation of the Plan's Performance**

The DEC in conjunction with the Goldfields Region Threatened Flora Recovery Team (GRTFRT) will evaluate the performance of this IRP. 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**

### **Objective**

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

**Criterion for success:** The number of populations have increased and/or the number of mature individuals have increased by ten percent or more over the term of the plan.

**Criterion for failure:** The number of populations have decreased and/or the number of mature individuals have decreased by ten percent or more over the term of the plan.

## **3. RECOVERY ACTIONS**

### **Existing recovery actions**

Relevant stakeholders have been made aware of the existence of this species and its locations. These notifications detail the current status of the species as Declared Rare Flora (DRF) and the associated legal obligations in regards to their protection.

Numerous surveys for *Leucopogon spectabilis* have been undertaken. From 1995 to 1997 a survey of the flora and plant communities within the Coolgardie Bioregion resulted in the first collection of the species (Gibson *et al.* 1997). Further survey between 2002 and 2008 by DEC staff resulted in another three populations being discovered.



Approximately 25,984 *Leucopogon spectabilis* fruit collected in November 2007 are stored in DEC's Threatened Flora Seed Centre (TFSC) at  $-18^{\circ}\text{C}$ . The fruit has yet to be processed and the seed germination tested.

Staff from DEC's Goldfields Region regularly monitor populations.

The GRTFRT and DEC are overseeing the implementation of this IRP and will include information on progress in their annual report to DEC's Corporate Executive and funding bodies.

### Future recovery actions

Where recovery actions occur on lands other than those managed by DEC, permission has been or will be sought from appropriate owners/land managers prior to recovery actions being undertaken. The following recovery actions are generally in order of descending priority, influenced by their timing over the life of the plan. However this should not constrain addressing any of the actions if funding is available and other opportunities arise.

#### 1. Coordinate recovery actions

The GRTFRT and DEC will continue to oversee the implementation of the recovery actions for *Leucopogon spectabilis* and will include information on progress in their annual report to DEC's Corporate Executive and funding bodies.

**Action:** Coordinate recovery actions  
**Responsibility:** DEC (Goldfields Region, Species and Communities Branch (SCB)) through the GRTFRT  
**Cost:** \$3,000 per year

#### 2. Map habitat critical to the survival of *Leucopogon spectabilis*

It is a requirement of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC act) that spatial data relating to habitat critical to the survival of the species be determined. Although this habitat is alluded to in Section 1, it has not yet been mapped and will be addressed under this action. If additional populations are located, then habitat critical to their survival will also be determined and mapped.

**Action:** Map habitat critical to the survival of *Leucopogon spectabilis*  
**Responsibility:** DEC (Goldfields Region, SCB) through the GRTFRT  
**Cost:** \$3,000 in year 2

#### 3. Achieve long term protection of habitat

The conservation status of land that supports the species will be reviewed and the possibility of evoking the process of including the Helena and Aurora Ranges into the Mount Manning Range Nature Reserve, or upgrading the status of the area to 'class A' reserve, will be initiated. This action will secure habitat on which the taxon occurs.

**Action:** Achieve long term protection of habitat  
**Responsibility:** DEC (Goldfields Region, Land Acquisition Branch) through the GRTFRT  
**Cost:** \$1,500 per year

#### 4. Collect seed and other material to preserve genetic diversity

Seed has been collected however additional collections are required from all populations for storage by DEC's TFSC to ensure the genetic diversity of the species is captured. Cuttings will also be collected to establish a living collection at Kings Park.

**Action:** Collect seed and other material to preserve genetic diversity

**Responsibility:** DEC (Goldfields Region, TFSC), BGPA through the GRTFRT  
**Cost:** \$2,500 per year

## 5. Monitor populations and refine knowledge on the distribution, numbers and extent of all populations

Monitoring of factors such as grazing, weed invasion, habitat degradation, hydrology, population stability (expansion or decline), pollinator activity, seed production, recruitment, and longevity is essential.

**Action:** Monitor populations and refine knowledge on the distribution, numbers and extent of all populations  
**Responsibility:** DEC (Goldfields Region) through the GRTFRT  
**Cost:** \$3,500 per year

## 6. Conduct further surveys

It is recommended that other areas of potential habitat be surveyed for the presence of *Leucopogon spectabilis* during its flowering period. All surveyed areas will be recorded and the presence or absence of the species documented to increase survey efficiency and reduce unnecessary duplicate surveys. Where possible, volunteers from the local community, landcare groups, the Wildflower Society of WA (Inc) and naturalists clubs will be encouraged to become involved.

**Action:** Conduct further surveys  
**Responsibility:** DEC (Goldfields Region) through the GRTFRT  
**Cost:** \$3,000 in years 1, 3 and 5

## 7. Develop and implement a fire management strategy

Fire control will be implemented in the habitat of populations and fire excluded if possible, except where it is being used experimentally as a recovery tool. A fire management strategy will be developed that recommends fire frequency, intensity, season, and control measures.

**Action:** Develop and implement a fire management strategy  
**Responsibility:** DEC (Goldfields Region) through the GRTFRT  
**Cost:** \$2,500 in first year and \$1,000 in subsequent years

## 8. Obtain biological and ecological information

Increased knowledge of the biology and ecology of the species will provide a scientific basis for management of *Leucopogon spectabilis* in the wild. Overall investigations will ideally include:

1. Study of the soil seed bank dynamics and the role of various factors including disturbance, competition, drought, inundation and grazing in recruitment and seedling survival.
2. Determination of reproductive strategies, phenology and seasonal growth.
3. Investigation of pollination biology.
4. Investigation of population genetic structure, levels of genetic diversity and minimum viable population size.
5. The impact of changes in hydrology in the habitat.

**Action:** Obtain biological and ecological information  
**Responsibility:** DEC (Science Division, Goldfields Region) through the GRTFRT  
**Cost:** \$20,000 per year

## 9. Active Conservation Park (Reserve) Management

This includes closing any old roads and tracks that may encourage visitors to sites near known populations; managing visitors with the provision of a range of low impact nature-based recreation and tourism

opportunities, whilst facilitating their enjoyment, understanding and appreciation of the conservation values of the area.

**Action:** Active Conservation Park (Reserve) Management  
**Responsibility:** DEC (Goldfields Region) through the GRTFRT  
**Cost:** \$10,000 per year

#### 10. Liaise with relevant mineral exploration lease holders and Indigenous groups

Staff from DEC's Goldfields Region will liaise with appropriate mineral exploration lease holders to ensure that populations of *Leucopogon spectabilis* are not accidentally damaged or destroyed. Indigenous consultation will take place to determine if there are any issues or interests, and if so, any specific management requirements, in areas that are habitat for *L. spectabilis*.

**Action:** Liaise with relevant land managers and Indigenous groups  
**Responsibility:** DEC (Goldfields Region) through the GRTFRT  
**Cost:** \$500 per year

#### 11. Promote awareness

The importance of biodiversity conservation and the protection of *Leucopogon spectabilis* will be promoted to the public. This will be achieved through an information campaign using local print and electronic media and by setting up poster displays. An information sheet that includes a description of the plant, its habitat type, threats and management actions, and photos will be produced. Formal links with naturalist groups and interested individuals will also be encouraged.

**Action:** Promote awareness  
**Responsibility:** DEC (Goldfields Region, SCB, Strategic Development and Corporate Affairs Division) through the GRTFRT  
**Cost:** \$2,000 in year 1 and \$1,000 in years 2-5

#### 12. Review this IRP and assess the need for further recovery actions

If *Leucopogon spectabilis* is still ranked as CR at the end of the five-year term of this IRP, the need for further recovery actions, or a review of this IRP will be assessed and a revised plan prepared if necessary.

**Action:** Review this IRP and assess the need for further recovery actions  
**Responsibility:** DEC (SCB, Goldfields Region) through the GRTFRT  
**Cost:** \$2,000 in year 5

**Table 5. Summary of Recovery Actions**

Recovery Action	Priority	Responsibility	Completion Date
Coordinate recovery actions	High	DEC (Goldfields Region) through the GRTFRT	Ongoing
Map habitat critical to the survival of <i>Leucopogon spectabilis</i>	High	DEC (SCB, Goldfields Region) through the GRTFRT	2011
Achieve long term protection of habitat	High	DEC (Goldfields Region, Land Acquisition Branch) through the GRTFRT	2014
Collect seed and other material to preserve genetic diversity	High	DEC (Goldfields Region, TFSC), BGPA through the GRTFRT	2014
Monitor populations and refine knowledge on the distribution, numbers and extent of all populations	High	DEC (Goldfields Region) through the GRTFRT	Ongoing
Conduct further surveys	High	DEC (Goldfields Region) through the GRTFRT	Ongoing
Develop and implement a fire management strategy	High	DEC (Goldfields Region) through the GRTFRT	Developed by 2011 with implementation ongoing
Obtain biological and ecological	Medium	DEC (Science Division, Goldfields Region)	2014

information		through the GRTFRT	
Active Conservation Park (Reserve) Management	High	DEC (Goldfields Region) through the GRTFRT	Ongoing
Liaise with relevant mineral exploration lease holders and Indigenous groups	High	DEC (Goldfields Region) through the GRTFRT	Ongoing
Promote awareness	Medium	DEC (Goldfields Region, SCB, and Strategic Development and Corporate Affairs Division) through the GRTFRT	Ongoing
Review this IRP and assess the need for further recovery actions	Medium	DEC (SCB, Goldfields Region) through the GRTFRT	2015

#### 4. TERM OF PLAN

This IRP will operate from June 2010 to May 2015 but will remain in force until withdrawn or replaced. If the species is still ranked CR after five years, the need for further recovery actions will be determined.

#### 5. REFERENCES

- Atkins, K. (2009) *Declared Rare and Priority Flora List for Western Australia*. Department of Environment and Conservation, Perth, Western Australia.
- Department of Conservation and Land Management (1992) Policy Statement No. 44 *Wildlife Management Programs*. Department of Conservation and Land Management, Western Australia.
- Department of Conservation and Land Management (1994a) 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.
- Department of Conservation and Land Management (1994b). Regional Management Plan Goldfields Region 1994-2004. Department of Conservation and Land Management, Western Australia.
- Department of Environment and Conservation (2007) *Definitions, categories and criteria for Threatened and Priority Ecological Communities*. Department of Environment and Conservation, Western Australia. <http://www.dec.wa.gov.au/management-and-protection/threatened-species/wa-s-threatened-ecological-communities.html>.
- Gibson, N., Lyons, M.N. and Lepschi, B.J. (1997) Flora and vegetation of the eastern goldfields ranges, Part I: Helena and Aurora Range. *CALMScience* 2(3): 231-246.
- Henry-Hall, N (1990). *Nature Conservation Reserves in the Eastern Goldfields, Western Australia, Southern Two Thirds of CTCR System 11*. Unpublished Report to the EPA Red Book Task Force 1990.
- Hislop, M. and Chapman, A.R. (2007) Three new geographically restricted species of *Leucopogon* (Ericaceae:Styphelioideae: Styphelieae) from south-west Australia. *Nuytsia* 17 (1): 165-184.
- Western Australian Herbarium (1998-) *FloraBase – The Western Australian Flora*. Department of Environment and Conservation. <http://florabase.dec.wa.gov.au/>.
- World Conservation Union (2001) *IUCN Red List Categories: Version 3.1*. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.

#### 6. TAXONOMIC DESCRIPTION

##### *Leucopogon spectabilis*

Hislop, M. and Chapman, A.R. (2007) Three new geographically restricted species of *Leucopogon* (Ericaceae:Styphelioideae: Styphelieae) from south-west Australia. *Nuytsia* 17 (1): 165-184.

Erect, narrow and sparingly branched *shrubs* to c. 100 cm high. Young *branchlets* light brown, glabrous, with grey longitudinal bands developing on older wood, the bark at maturity uniformly grey and rather fissured. *Leaves* spirally arranged, steeply antrorse, narrowly elliptic, 15–25 mm long, 2.9–5.2 mm wide; apex attenuate, sub-pungent; base attenuate; petiole moderately well defined, light brown or yellowish, 1.5–2 mm long, glabrous; lamina 0.25–0.35 mm thick, adaxially concave or flat; surfaces glabrous, discolourous, slightly shiny and dark green above, with rather indistinct venation or with 3–5 grooves evident, paler below with 5–7 fairly inconspicuous, flat slightly raised primary veins, the midrib not differentiated; margins glabrous on mature leaves. *Inflorescence* erect, terminal and upper axillary, axis (20–)25–65 mm long, with 14–32 flowers and often up to 3 sterile bracts between the terminal flower and the bract like rudiment; indumentum of moderately dense, patent, straight hairs, 0.05–0.07 mm long; *flowers* erect or spreading, pedicellate below the bracteoles for 0.4–

2.1 mm and also sometimes above the bracteoles for up to 0.5 mm. *Fertile bracts* triangular or ovate, 0.7–1.3 mm long, 0.6–0.7 mm wide, obtuse or subacute; abaxial surface glabrous, with distinct venation; adaxial surface with appressed hairs; margins ciliolate. *Bracteoles* ovate, 1.1–1.6 mm long, 0.7–0.9 mm wide, acute, keeled; abaxial surface glabrous, green on either side of the keel, becoming scarious towards the margins; adaxial surface with appressed hairs distally; margins ciliolate. *Sepals* ovate or narrowly ovate, 2.5–3.3 mm long, 0.9–1.1 mm wide, acute or subacute; abaxial surface glabrous, with moderately conspicuous venation, mostly greenish but often with pink interveinal stripes distally; adaxial surface with appressed hairs in distal half; margins ciliolate and scarious or scarious only towards base. *Corolla tube* white, broadly campanulate, as long as or shorter than sepals (by up to 0.6 mm), (1.3–)1.5–2 mm long, 1.8–2.6 mm wide, glabrous externally and internally; *lobes* white, widely spreading from base and usually recurved, 3.1–4.4 mm long, 0.8–1.3 mm wide at base, glabrous externally, densely bearded internally, indumentum white, 0.6–1 mm long near apex, slightly shorter towards base and then with some longer reflexed basal hairs extending into the top of the tube by up to 0.9 mm, the glabrous tip 0.1–0.2 mm long. Corolla lobes white, much longer than tube (ratio = 2–2.3:1). *Anthers* partially exerted from tube (by  $\frac{2}{3}$ – $\frac{3}{4}$  of length), (1.4–)1.6–2.2 mm long, usually prominently recurved at apex; sterile tips with conspicuous pale apices, 0.5–0.7 mm long; *filaments* terete, attached  $\frac{1}{3}$ – $\frac{1}{2}$  above anther base, 0.5–0.9 mm long, adnate to the tube just below the sinus. *Ovary* depressed-obovoid to depressed-globose, 0.4–0.6 mm long, 0.6–0.8 mm wide, glabrous, 5-locular; *style* 0.5–0.8 mm long, tapering smoothly from a broad base (0.3–0.4 mm wide) to a point *c.* half way up the style and then cylindrical above, included within the corolla tube; *stigma* slightly expanded and 5 lobed; *nectary* annular, 0.2–0.3 mm long, very shallowly lobed, glabrous. Mature *fruit* not seen but the somewhat immature fruit present on the holotype is depressed obovoid in shape with well defined transverse ridges and longitudinal grooves.