

INTERIM RECOVERY PLAN NO. 147

GIANT ANDERSONIA
(*ANDERSONIA AXILLIFLORA*)
INTERIM RECOVERY PLAN
2003-2008

Rebecca Evans, Sarah Barrett, Gillian Stack & Andrew Brown



Photograph: Ellen Hickman
August 2003

Department of Conservation and Land Management
Western Australian Threatened Species and Communities Unit (WATSCU)
PO Box 51, Wanneroo, WA 6946

FOREWORD

Interim Recovery Plans (IRPs) are developed within the framework laid down in Department of Conservation and Land Management (DCLM) 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.

DCLM 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Plan, which replaces IRP 30 (1999-2002), will operate from August 2003 to July 2008 but will remain in force until withdrawn or replaced.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 reviewed after five years and the need for a full Recovery Plan assessed.

This IRP was approved by the Director of Nature Conservation on 21 September 2003. The provision of funds identified in this Interim Recovery Plan is dependent on budgetary and other constraints affecting DCLM, as well as the need to address other priorities.

Information in this IRP was accurate at August 2003.

SUMMARY

Scientific Name:	<i>Andersonia axilliflora</i>	Common Name:	Giant Andersonia
Family:	Epacridaceae	Flowering Period:	October – November
Dept Region:	South Coast	Dept District:	Albany Work Centre
Shire:	Gnowangerup	Recovery Team:	Albany District Threatened Flora Recovery Team (ADTFRT)

Illustrations and/or further information: Barrett, S. (1996). *A Biological Survey of the Mountains in Southern Western Australia*. Department of Conservation and Land Management, unpublished report; Brown, A., Thomson-Dans, C. and Marchant, N. (Eds). (1998). *Western Australia's Threatened Flora*. Department of Conservation and Land Management, Western Australia; Druce, G. C. (1917). *Nomenclatorial notes: chiefly African and Australian*, Reprinted from: Report of the Botanical Society and Exchange Club of the British Isles (1916, suppl., 2): 604(1917), Fig. 21, p. 122; Meney, K. A., Nielszen, G. M., and Dixon, K. W. (1994). *Seed bank patterns in Restionaceae and Epacridaceae after wildfire in kwongan in southwestern Australia*, Journal of Vegetation Science, 5: 5-12.

Current status: *Andersonia axilliflora* was declared as Rare Flora in October 1996 and ranked as Critically Endangered (CR) in November 1998. The three year Interim Recovery Plan (IRP) that was prepared for this species in May 1999 will be replaced by this revised 5 year IRP. The species currently meets World Conservation Union (IUCN, 2000) Red List Category 'CR' under criteria A2e as all populations are threatened by *Phytophthora* and it is estimated that there will be a decline of 80% in the next three generations. The main threats are *Phytophthora*, wildfire and damage through recreational use. This IRP will be implemented in conjunction with the "Eastern Stirling Range Montane Heath Community" IRP (Barrett 1999), the *Persoonia micranthera* IRP (Stack and Brown 2002), the *Leucopogon gnaphalioides* IRP (Phillimore and Brown) and the *Dryandra montana* IRP (Kershaw, Holland and Brown).

Distribution and habitat: *Andersonia axilliflora* is confined to the upper slopes and summits of the eastern peaks of the Stirling Range National Park, where it grows in shallow rocky soil over schist, supporting dense low heath and scrub (Brown *et al.* 1998). The species is part of the Critically Endangered Eastern Stirling Range Montane Heath Community (Barrett 1999).

Critical habitat: The critical habitat for *Andersonia axilliflora* comprises the area of occupancy of the known populations; similar habitat within 200 metres of known populations; vegetation that links populations and additional nearby occurrences of similar habitat that do not currently contain the species but may have done so and may be suitable for translocations.

Habitat critical to the survival of the subspecies, and important populations: Given that this species is listed as Critically Endangered it is considered that all known habitat containing wild and translocated populations is habitat critical and that all populations are important.

Benefits to other species/ecological communities: Recovery actions implemented to improve the quality or security of the habitat of *Andersonia axilliflora* will also improve the health of the Critically Endangered Threatened Ecological Community (TEC) "Eastern Stirling Range Montane Heath and Thicket Community" in which it occurs and which includes several other threatened plant taxa including *Dryandra montana*, *Sphenotoma drummondii*, *Darwinia collina*, *D. squarrosa*, *Banksia brownii*, *Leucopogon gnaphalioides*, *Deyeuxia drummondii* and *Persoonia micranthera*.

International obligations: This plan is fully consistent with the aims and recommendations of the Convention on Biological Diversity, ratified by Australia in June 1993, and will assist in implementing Australia's responsibilities under that Convention. However, as *Andersonia axilliflora* is not listed under any international agreement, the implementation of other international environmental responsibilities is not affected by this plan.

Role and interests of indigenous people: There are no known indigenous communities interested or involved in the management of areas affected by this plan.

Social and economic impacts: The implementation of this recovery plan is unlikely to cause significant adverse social and economic impacts. All populations occur in the Stirling Range National Park.

Evaluation of the Plan's Performance: The Department of Conservation and Land Management (DCLM), in conjunction with the Recovery Team will evaluate the performance of this IRP. The plan is to be reviewed within five years of its implementation.

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

1. Stirling Range National Park Rangers are aware of the location and threatened status of the species.

2. Aerial phosphite spraying has been undertaken and is ongoing.
3. Approximately 8500 seeds have been collected and stored in DCLM's Threatened Flora Seed Centre (TFSC).
4. The Botanic Garden and Parks Authority (BGPA) currently have one cultivated plant of *A. axilliflora* grown from a seedling provided by the Threatened Flora Seed Centre (TFSC).
5. Tissue culture trials have been undertaken by the Botanic Gardens and Parks Authority (BGPA) but have so far been unsuccessful.
6. An IRP has been prepared for the Threatened Ecological Community in which *Andersonia axilliflora* occurs.
7. A demographic study has commenced in association with a study on the fire ecology of the Montane Community.
8. Staff from DCLM's Albany Work Centre regularly monitor all populations of the species and have established monitoring plots to assess the impact of *P. cinnamomi* and phosphite application.
9. Staff from DCLM's Albany Work Centre are overseeing the implementation of this IRP and will include information on progress in an annual report to DCLM's Corporate Executive and funding bodies.
10. The alignment of the Ridge Walk has been assessed regarding possible effects on threatened species and communities and has been found to be of no current threat.

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

Recovery criteria

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

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

Recovery actions

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| <ol style="list-style-type: none"> 1. Coordinate recovery actions 2. Apply phosphite and monitor its effect 3. Develop and implement a fire management strategy 4. Collect seed and cutting material | <ol style="list-style-type: none"> 6. Conduct further surveys 7. Obtain biological and ecological information 8. Promote community awareness 9. Review this IRP and revise it or prepare a full Recovery Plan if necessary |
| <ol style="list-style-type: none"> 5. Monitor populations | |

1. BACKGROUND

History

Andersonia axilliflora was initially named *Sphincterostoma axilliflorum* in 1859 by Stschegl in *Bulletin de la Societe Impriale des Naturalistes de Moscou* 32(1) 22 from Drummond's collection V. No. 301. However, in 1917 it was placed in *Andersonia* by Druce.

Surveys of the Stirling Range by staff from DCLM, Botanic Garden and Parks Authority (BGPA) and others have resulted in the discovery of eleven populations of *Andersonia axilliflora*, on peaks in the eastern section of the Stirling Range.

The Eastern Peak Route, now known as the Ridge Walk, was developed in the 1930s and runs from Bluff Knoll to Ellen Peak. The alignment of this route has been assessed regarding possible effects on threatened species and communities and has been found to be of no current threat.

Fire has had a major impact on the flora of the Stirling Range including *Andersonia axilliflora*. There is an anecdotal report of a fire in the 1950s, and records of major fires in the eastern Stirling Range in February 1972, April 1991 and October 2000. The intense fire of 1991 burnt most populations of *A. axilliflora* and a large portion of the eastern Stirling Range. Although only a small number of adult plants escaped the fire, seedlings were observed during the following year. Pre-fire adult plants exceeded 1 m in height; however, after eight years post-fire many seedlings ranged from 20-40 cm in height and had not flowered. In 1999 there were some 700+ juvenile plants and less than 200 mature plants. The 2000 fire burnt many populations again, further taxing the soil seed bank. All populations are under threat from dieback (*Phytophthora cinnamomi*), which affects both mature plants and seedlings. In 2002, there were approximately 440 mature plants and 660 juveniles.

A three year Interim Recovery Plan (IRP) prepared for *Andersonia axilliflora* in May 1999 will be replaced by this revised 5 year IRP. A draft IRP has been written by Sarah Barrett¹ for the Critically Endangered ecological community, 'Montane thicket and heath of the South-West Botanical Province above approximately 900 m above sea level' (hereafter abbreviated to 'Eastern Stirling Range Montane Heath and Thicket Community'), of which *A. axilliflora* is the key indicator species. The threatened ecological community (TEC) IRP outlines recovery actions for many of the same processes that are threatening *A. axilliflora* and both IRPs should be taken into account when management actions are implemented.

Description

Andersonia axilliflora is the tallest growing species in the genus. It is a sturdy shrub to 3 m with erect branchlets and distinctive crowded triangular leaves. The leaves are broad at the base, where they clasp the stem, and taper to a point. The floral leaves at the ends of the branches are creamy white, and extend beyond the thirty or so hidden flowers. Each cream flower, about 1 cm long, is enclosed in stiff calyx lobes, which also taper to a point. (Brown *et al.* 1998).

Distribution and habitat

Andersonia axilliflora occurs at high altitudes in the eastern section of the Stirling Range between Mt Success and Ellen Peak. The Stirling Range is approximately 90 km north of Albany, near Western Australia's southern coastline. The species has been identified as the key indicator species for the Critically Endangered Eastern Stirling Range Montane Heath and Thicket Community (Barrett 1999).

Habitat is low, dense heath and scrub on rocky shallow soil over schist. The community is also characterized by species such as *Kunzea montana*, *Beaufortia anisandra*, *Sphenotoma* sp. Stirling Range, *Andersonia echinocephala*, several *Darwinia* species, *Banksia solandri*, *Calothamnus crassus* and *Dryandra concinna* (Barrett 1999).

¹ Sarah Barrett, Conservation Officer, DCLM's Albany Work Centre

Several other threatened flora species that also occur within the community include *Dryandra montana*, *Sphenotoma drummondii*, *Darwinia collina*, *D. squarrosa*, *Banksia brownii* and *Persoonia micranthera* (Barrett 1999).

Biology and ecology

A. axilliflora is known to be highly susceptible to dieback (*Phytophthora cinnamomi*), ranking 9 on a scale of 1 to 10 where 7 is considered a significant risk (Keighery 1988). Most populations occur in areas known to be infected with dieback and laboratory testing has suggested that the species is highly susceptible to the disease.

Fire kills adult plants of this species. However, the death of mature plants is compensated for as it also stimulates the germination of soil-stored seed. Frequent fire, on the other hand, may result in the decline of populations by killing seedlings before they reach maturity.

It appears that this species, like several other montane species (e.g. *Persoonia micranthera*), is slow-growing and takes a relatively long time to reach reproductive maturity. Mature plants grow up to 3 m tall; however, after eight years post-fire most seedlings ranged from 20 to 40 cm tall. Several plants at Population 3 started to flower for the first time 9 years after the area was burnt in the 1991 fire.

The level of germination seen after the 2000 fire suggests that the seed may remain viable in the soil for very long periods and that seed has dormancy mechanisms or physical attributes that prevent all seed germinating in response to one fire event. It is likely that additional information would be gained following study of flower and fruit production, on-plant and soil seed banks and seed longevity in the soil (at present, flowering is being measured and assessed annually).

A study of the biology and conservation of Western Australian Epacridaceae states that the genus *Andersonia* is endemic to Western Australia and has the greatest species diversity in the Albany region (Keighery 1996). Two *Andersonia* species are listed as being pollinated by birds but Keighery suggests that insects, possibly moths and butterflies, pollinate most species. A beetle has been observed pollinating at Population 1. Seed is probably dispersed by gravity or wind (Keighery 1996).

Threats

Andersonia axilliflora was declared as Rare Flora in October 1996 and ranked as Critically Endangered (CR) in November 1998. The species currently meets World Conservation Union (IUCN, 2000) Red List Category 'CR' under criteria A2e as all populations are threatened with *Phytophthora* and drought death and it is estimated that there will be a decline of 80% in the next three generations. The main threats are *Phytophthora*, wildfire and damage through recreational use.

- ***Phytophthora cinnamomi*** is a major threat to all known populations of the species. *Andersonia axilliflora* is highly susceptible to the pathogen, which kills susceptible plants by invading their root system and severely reducing their ability to take in water and nutrients. Many other species in the community in which *A. axilliflora* occurs are also affected by the disease. In relatively undisturbed habitat *Phytophthora* spreads through root-to-root contact and through free water flow. Although it spreads most quickly downhill it is capable of moving uphill. It also spreads through movement of infected soil, by foot (see Recreational Use) or by vehicles during firebreak and track use. *P. cinnamomi* thrives best in mild moist conditions such as that produced by spring, autumn or summer rainfall. The interactions of fire and dieback are not completely understood but field observations suggest that fire in areas where the disease is already present increases susceptibility (unpublished observation S. Barrett).
- **Wildfire** may adversely affect the long-term viability of *Andersonia axilliflora* populations. During a 1991 fire most adult plants were killed and seedling survival rates were low with approximately 50% of individuals dying from *P. cinnamomi* infection (unpublished observation S. Barrett). Seedlings take a minimum of 9 years to mature (become reproductive) with most plants assessed at Populations 1 yet to flower 11 years post-fire. Another major fire burnt many populations in October 2000, killing most juveniles in Populations 1, 3, 5, 6, 7, 8, 9, 10 and 11. However, there has since been germination of seed in Populations 1 and 9 showing that there was still viable seed persisting in the soil. If a third major fire occurs before seed is produced in significant quantities, the soil seed store will be seriously depleted.

- **Recreational Use** of the Stirling Range is high. Uses include hiking, camping and rock climbing, all of which may result in disease introduction/movement, trampling and secondary track formation. A major focus for recreational use in the eastern Stirling Range is the Ridge Walk which runs from Ellen Peak to Bluff Knoll. This walk is usually completed in two to three days thus requiring camping in the area overnight. Most visitors do not tend to deviate from the Walk but assessment, monitoring and regulation of visitor numbers may be necessary to ensure *Andersonia axilliflora* populations and high priority areas in the Montane Heath and Thicket Community are not compromised by visitation, e.g. camping and toileting.
- **Grazing** by herbivores is having a minor impact on the habitat and some individual *Andersonia axilliflora* plants but the identity of the herbivore is unclear (personal communication S. Barrett).

Summary of population information and threats

Pop. No. & Location	Land status	Year / No. Plants	Fire History	Phosphite	Condition	Threats
1. Stirling Range	National Park	1999 20 (500) [20] 2001 100+ (c. 600) [many] 2003 250+ (500+)	Pre 1972 Apr 1991 Oct 2000	Apr & May 1997	Moderate	<i>P. cinnamomi</i> , fire, recreational use
2ab. Stirling Range	National Park	1999 (90) 2001 5 (15) 2002 5*	Not 1991 Not 2000	Apr 1998	Poor	<i>P. cinnamomi</i> , fire, recreational use, grazing
3ab Stirling Range	National Park	1998 (100) 2000 100* 2003 70*	Oct 2000		Poor	<i>P. cinnamomi</i> , fire, recreational use
4a-e Stirling Range	National Park	2000 150 (150) 2003 50 [5]	Apr 1991 Not 2000	Apr & May 1997	Moderate	<i>P. cinnamomi</i> , fire, recreational use
5. Stirling Range	National Park	2000 20 [5] 2003 3 (4)	Some 1991 Oct 2000	Apr 1998 Mar & Apr 2001	Poor	<i>P. cinnamomi</i> , fire, recreational use
6. Stirling Range	National Park	1997 75 [25] 2002 0 (30)	C. half 1991 Oct 2000		Moderate	<i>P. cinnamomi</i> , fire, recreational use
7. Stirling Range	National Park	1997 20+	Apr 1991		Moderate	<i>P. cinnamomi</i> , fire, recreational use
8. Stirling Range	National Park	1997 50+	Apr 1991		Moderate	<i>P. cinnamomi</i> , fire, recreational use
9a. Stirling Range	National Park	2000 0 (300) [150] 2002 0 (100)* 2003 0 (100)*	Apr 1991 Oct 2000	Apr 1998	Poor	<i>P. cinnamomi</i> , fire, recreational use
9b. Stirling Range	National Park	See 9a above	Apr 1991	Apr 1998	Poor	<i>P. cinnamomi</i> , fire, recreational use
10. Stirling Range	National Park	1999 15 (250) 2002 11 (5)	Not 2000	Apr & May 1997	Moderate	<i>P. cinnamomi</i> , fire, recreational use
11. Stirling Range	National Park	2000 0 (24) [20]	Apr 1991		Poor	<i>P. cinnamomi</i> , fire, recreational use

Number in () = number of juveniles. Number in [] = number of dead plants. * = total for subpopulations combined.

Note: It is likely that the eleven currently recognised populations previously occurred as three larger populations that have become fragmented as a result of dieback and fire.

Critical habitat

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

The critical habitat for *Andersonia axilliflora* comprises:

- the area of occupancy of known populations;
- areas of similar habitat within 200 metres of known populations, i.e. thicket, low, dense heath or scrub on shallow rocky soils at high altitude (these provide potential habitat for natural range extension);
- areas of vegetation that link populations (necessary to allow pollinators to move between populations); and

- additional occurrences of similar habitat that do not currently contain the species but may have done so in the past (these represent possible translocation sites).

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

Given that this species is listed as Critically Endangered it is considered that all known habitat is habitat critical. In addition, all populations, including future translocated populations, are or will be considered important populations.

Benefits to other species/ecological communities

Recovery actions implemented for *Andersonia axilliflora* will improve the status of the Critically Endangered Eastern Stirling Range Montane Heath and Thicket Community in which it occurs. It will also improve the status of other threatened flora taxa including *Dryandra montana*, *Sphenotoma drummondii*, *Darwinia collina*, *D. squarrosa*, *Banksia brownii*, *Leucopogon gnaphalioides*, *Deyeuxia drummondii* and *Persoonia micranthera*.

International Obligations

This plan is fully consistent with the aims and recommendations of the Convention on Biological Diversity, ratified by Australia in June 1993, and will assist in implementing Australia's responsibilities under that Convention. However, as *Andersonia axilliflora* is not listed under any international agreement, the implementation of other international environmental responsibilities is not affected by this plan.

Role and interests of indigenous people

There are no known indigenous communities interested or involved in the management of specific areas affected by this plan.

Social and economic impacts

The implementation of this recovery plan is unlikely to cause significant adverse social and economic impacts. All populations occur in the Stirling Range National Park.

Evaluation of the Plans Performance

The Department of Conservation and Land Management (DCLM), in conjunction with the Albany District Threatened Flora Recovery Team will evaluate the performance of this IRP. The plan is to be reviewed within five years of its implementation. Any changes to management, including implementation or amendment of recovery actions, will be documented accordingly.

Guide for decision-makers

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

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 by 10% or more.

Criteria for failure: The number of individuals within populations and/or the number of populations have

decreased by 10% or more.

3. RECOVERY ACTIONS

Existing recovery actions

Stirling Range National Park Rangers are aware of the threatened nature of the species and of its location.

To control dieback in the eastern Stirling Range, aerial spraying of phosphite commenced in Autumn 1997 and Populations 1, 3, 4 and 10 were sprayed that year. This appears to have had a positive impact and phosphite applications have taken place regularly since then. Survival of juvenile plants in infested areas in Population 1 from 1997 to 2000 was approximately 59% for plants sprayed with phosphite compared with 14% in those excluded from phosphite (unpublished data S Barrett).

The above action also benefits the Critically endangered Eastern Stirling Range Montane Heath and Thicket Community and many other Declared Rare and Priority species that occur there. Due to the continuing threat from dieback these areas will be sprayed at regular intervals as part of DCLM's phosphite program.

Between October 1996 and February 1997 staff from DCLM's Threatened Flora Seed Centre (TFSC) collected over 8,500 *Andersonia axilliflora* seeds from Populations 4, 6, 7, and 8. Initial germination tests resulted in no more than 20% germination (unpublished data A. Cochrane²). Further tests are being conducted in order to understand more about the germination requirements of the species.

The Botanic Garden and Parks Authority (BGPA) currently have a single *Andersonia axilliflora* plant that was grown from seed in 1995. Twelve plants were held in the nursery in 1999 but all but one rapidly died after appearing to grow well initially. The cause of their deaths is unknown but could be due to fungal infection (although no seedlings of other native species growing nearby were affected), intolerance of soil media, dislike of humidity, over watering or some other factor (personal communication A. Shade).

Tissue culture trials have also been conducted by BGPA staff but were unsuccessful.

Staff from Albany Work Centre regularly monitor populations, taking particular note of the impact of *Phytophthora cinnamomi* and the effectiveness of phosphite application. Six control and six spray plots were in place on Bluff Knoll and plant decline within the plots was assessed in order to determine the effectiveness of the spray treatment (Barrett 1998). New control and spray plots are monitoring survival in vegetation burnt in 2000. Additional monitoring plots are in place for other populations (2, 6 and 9). However, follow up assessments are sometimes limited as access is difficult and time consuming (Hickman 1997). Monitoring in 2002 suggests populations are stable or in decline with Populations 5 and 10 in particular having poor post-fire recruitment.

Demographic monitoring commenced in 2001 as part of a larger study of the fire ecology of the Montane Heath and Thicket TEC (C. Yates and S. Barrett)

An Interim Recovery Plan for the 'Eastern Stirling Range Montane Heath and Thicket Community' has been written by S. Barrett. Many of the recovery actions outlined in the IRP can be applied to *A. axilliflora* and implementation of the two plans will be integrated.

The Albany District Threatened Flora Recovery Team (ADTFRT) has overseen the implementation of the previous IRP and included information on progress in its annual report to DCLM's Corporate Executive and funding bodies.

Future recovery actions

1. Coordination

² Anne Cochrane, Manager, DCLM's Threatened Flora Seed Centre

The Albany District Threatened Flora Recovery Team (ADTFRT) will continue to coordinate recovery actions for *Andersonia axilliflora* and include information on progress in their annual report to DCLM's Corporate Executive and funding bodies.

Action: Coordinate recovery actions
Responsibility: DCLM (Albany Work Centre) through the ADTFRT
Cost: \$400 per year

2. Phytophthora

Andersonia axilliflora and the ecological community in which it grows are both severely impacted by dieback (*Phytophthora cinnamomi*). DCLM will continue the application of phosphite, an action that will have the added benefit of protecting a number of other threatened plant species. Following the application of phosphite, monitoring is required; particularly its impact on native species and the control of *P. cinnamomi* achieved

Action: Apply phosphite and monitor its effect
Responsibility: DCLM (Albany Work Centre, Dieback Disease Coordinator) through the ADTFRT
Cost: \$31,000 per year for the first, third and fifth years for phosphite application and \$6,600 per year for monitoring

3. Fire management strategy

Fire kills adult plants of this species and regeneration is from seed. The species has been observed to take between 9 and 10 years to mature, flower and set fruit. Fires that occur in less than 10 year intervals may result in this species setting insufficient seed for regeneration. Fire should therefore if possible be prevented from occurring in the area of populations, except where it is being used experimentally as a recovery tool. A fire management strategy will be developed to determine fire control measures and fire frequency.

Action: Develop and implement a fire management strategy
Responsibility: DCLM (Albany Work Centre) through the ADTFRT
Cost: \$1,600 in the first year and \$300 in subsequent years

4. Seed and cutting material

Preservation of germplasm is essential to guard against extinction if wild populations are lost. Such collections are also needed to propagate plants for translocations. The collections made by the TFSC in 1996 and 1997 are quite large. However, as only 20% of the seed collected germinated in the initial tests further collections should be made, particularly from other populations. At this time cuttings will also be obtained to enhance the living collection at the BGPA.

Action: Collect seed and cutting material
Responsibility: DCLM (TFSC, Albany Work Centre) through the ADTFRT
Cost: \$5,000 per year

5. Monitoring

Annual monitoring of factors such as habitat degradation (including weed invasion and plant diseases such as *Phytophthora cinnamomi*), population stability (expansion or decline), pollination activity, seed production, recruitment and longevity is essential. Herbivores are also having a minor impact on some populations of *Andersonia axilliflora* and monitoring is needed in order to assess if action will be required in the future.

Action: Monitor populations
Responsibility: DCLM (Albany Work Centre) through the ADTFRT
Cost: \$1,600 per year

6. Surveys

Further surveys by Departmental staff and community volunteers will be conducted during flowering period of the species (October to November) to attempt to find additional populations.

Action: Conduct further surveys
Responsibility: DCLM (Albany Work Centre) through the ADTFRT
Cost: \$2,500 per year in the first, third and fifth years

7. Biology and ecology

Improved knowledge of the biology and ecology of *Andersonia axilliflora* will provide a better scientific basis for its management in the wild. An understanding of the following is particularly necessary for effective management:

1. Soil seed bank dynamics (size and viability of seed bank, level of grazing or damage of seed) and the role of various disturbances (including fire), competition, rainfall and grazing in germination and recruitment.
2. The pollination biology of the species.
3. The requirements of pollinators.
4. Factors determining the level of flower and fruit abortion.
5. The reproductive strategies, phenology and seasonal growth of the species.
6. The population genetic structure, levels of genetic diversity and minimum viable population size.
7. The impact of dieback disease and control techniques on *Andersonia axilliflora* and its habitat.
8. The impact of fire on *Andersonia axilliflora* and its habitat.

Action: Obtain biological and ecological information
Responsibility: DCLM (Science Division, Albany Work Centre) through the ADTFRT
Cost: \$14,200 per year in the second, third and fourth years

8. Community awareness

Bushwalkers, researchers and other visitors may inadvertently damage plants of *Andersonia axilliflora* that are close to the Ridge track through trampling or the introduction of disease. This may be minimized by providing all visitors with information on the need to protect the habitat. A review of the 'code of conduct' for backpacking in the Stirling Range National Park is provided in the IRP for the Stirling Range Montane Heath and Thicket Community.

It is important that biodiversity conservation and the need for the long-term protection of wild populations of *Andersonia axilliflora* be promoted to the community through appropriate media. 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 and management actions will be produced.

Action: Promote community awareness
Responsibility: DCLM (Albany Work Centre) through the ADTFRT
Cost: \$1,000 in the first year and \$400 in subsequent years

9. Review this IRP and revise it or prepare a full Recovery Plan if necessary

If the taxon is still ranked as Critically Endangered at the end of the fourth year of the five-year term of this Interim Recovery Plan the need to rewrite this IRP or to replace it with a full Recovery Plan (RP) will be determined.

Action: Review this IRP and revise it or prepare a full Recovery Plan if necessary
Responsibility: DCLM (WATSCU, Albany Work Centre) through the ADTFRT
Cost: \$20,300 in the fifth year (if full a Recovery Plan is required)

4. TERM OF PLAN

This Interim Recovery Plan will operate from August 2003 to July 2008 but will remain in force until withdrawn or replaced. If the taxon is still ranked Critically Endangered after five years, the need to rewrite this IRP or to replace it with a full Recovery Plan will be determined.

5. ACKNOWLEDGMENTS

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

Anne Cochrane	Manager, DCLM's Threatened Flora Seed Centre
Amanda Shade	Horticulturalist, Botanic Garden and Parks Authority
Brian Shearer	Phosphite Program Research Scientist, DCLM's Science Division

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

6. REFERENCES

- Barrett, S. (1999). *Eastern Stirling Range Montane Heath and Thicket Community, Interim Recovery Plan*, Department of Conservation and Land Management, Western Australia, unpublished report.
- Barrett, S. (1998). Assessments of the plant sensitivity to phosphonate and the effectiveness of applications on native communities in the south coast region. Pp. 33-45 in '*Control of Phytophthora and Diplodina Canker in Western Australia*'. Final Report to the Threatened Species and Communities Section, Biodiversity Group, Environment Australia, unpublished.
- Barrett, S. (1996). *A Biological Survey of the Mountains in Southern Western Australia*. Department of Conservation and Land Management, Western Australia, unpublished report.
- Brown, A., Thomson-Dans, C. and Marchant, N. (Eds). (1998). *Western Australia's Threatened Flora*. Department of Conservation and Land Management, Western Australia.
- Druce, G.C. (1917). *Nomenclatorial notes: chiefly African and Australian*, Reprinted from: Report of the Botanical Society and Exchange Club of the British Isles (1916, suppl., 2) 604 (1917), Fig. 21, p. 122.
- Herford, I. (1997) *Stirling Range and Porongurup National Parks Draft Management Plan*. Department of Conservation and Land Management for The National Parks and Nature Conservation Authority, Western Australia.
- Keighery, G.J. (1988). *Dieback briefing paper. I, Epacridaceae*. Department of Conservation and Land Management, Western Australia.
- Keighery, G.J. (1996). Phytogeography, biology and conservation of Western Australian Epacridaceae, *Annals of Botany*, 77: 347-355.
- Menet, K.A., Nielssen, G.M., and Dixon, K.W. (1994). Seed bank patterns in Restionaceae and Epacridaceae after wildfire in kwongan in southwestern Australia. *Journal of Vegetation Science*, 5: 5-12.
- Stack, G. and Brown, A. (2002). *Small-flowered Snottygobble (Persoonia micranthera) Interim Recovery Plan*. Department of Conservation and Land Management, Western Australia, in press.
- DCLM (1995) Policy Statement No. 29 *Translocation of Threatened Flora and Fauna*. Department of Conservation and Land Management, Western Australia.
- DCLM (1994) Policy Statement No. 50 *Setting Priorities for the Conservation of Western Australia's Threatened Flora and Fauna*. Department of Conservation and Land Management, Western Australia.
- DCLM (1992) Policy Statement No. 44 *Wildlife Management Programs*. Department of Conservation and Land Management, Western Australia.
- DCLM (1998) Western Australian Herbarium FloraBase – Information on the Western Australian Flora. Department of Conservation and Land Management, Western Australia.
<http://www.calm.wa.gov.au/science/>
- World Conservation Union (2000) *IUCN red list categories prepared by the IUCN Species Survival Commission, as approved by the 51st meeting of the IUCN Council*. Gland, Switzerland.

7. TAXONOMIC DESCRIPTION

Druce (1917)

Andersonia axilliflora is a robust shrub, often exceeding 2 m in height. Leaves 20 -35 mm long, 8 - 15 mm wide at base, increasing in size acropetally to the bracts, lanceolate, usually erect and concave, sometimes undulate and subspirally twisted, grooved, glabrous. Inflorescences terminal often \pm oblong, often containing more than 30 flowers flattened in the axils of their bracts, terminating the shoots, with the apex withering after anthesis; bracts lanceolate and concave, usually erect often twice as long as the subtended flower; bracteoles often as long as sepals, carinate, acuminate, considerably flattened laterally. Sepals c. 12 mm long in the larger flowers, lanceolate -acuminate, those opposite the bracteoles usually complicate, usually glabrous, creamy white. Corolla somewhat shorter than calyx; lobes c. twice as long as tube, glabrous, usually acuminate, erect at the time of anther dehiscence; tube pubescent above the middle, often sparingly so. Stamens c. 3/4 as long as corolla, far exceeding tube, not becoming exerted by filament elongation, filaments glabrous, stout, flattened; anthers linear, c. 6 mm long, often about twice as long as filaments, attached at base, with the prominent connective continuing to the apex; pollen in tetrads. Ovary c. 2 mm high; loculi rather rounded, puberulent above; hypogynous scales rather less than 1/2 as long as ovary, often \pm united; style cylindrical, not becoming exerted beyond the calyx, scabridulous; stigma truncate or slightly clavate.