

WAGIN BANKSIA

(*BANKSIA OLIGANTHA*)

RECOVERY PLAN



Department of Environment and Conservation
Kensington



Australian Government



Department of
Environment and Conservation

Our environment, our future



FOREWORD

Interim Recovery Plans (IRPs) are developed within the framework laid down in Department of Conservation and Land Management (CALM) [now Department of Environment and Conservation (DEC)] Policy Statements Nos. 44 and 50. Note: the Department of 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This Interim Recovery Plan will operate from May 2006 to April 2011 but will remain in force until withdrawn or replaced. It is intended that, if the taxon is still ranked Endangered (WA), this IRP will be reviewed after five years and the need for a full Recovery Plan assessed.

This IRP was given regional approval on 13 February, 2006 and was approved by the Director of Nature Conservation on 22 February, 2006. The allocation of staff time and provision of funds identified in this Interim Recovery Plan is dependent on budgetary and other constraints affecting DEC, as well as the need to address other priorities.

This IRP has been updated with information contained herein accurate as at April 2008.

This IRP was prepared with financial support from the Australian Government to be adopted as a National Recovery Plan under the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

IRP PREPARATION

This IRP was prepared by Julie Patten¹, Kim Kershaw² and Bethea Loudon³.

¹ Former Project Officer, Species and Communities Branch, DEC, PO Box 51 Wanneroo, 6946.

² Former Flora Conservation Officer, DEC's Great Southern District, PO Box 100, Narrogin, 6312.

³ Flora Conservation Officer, DEC's Great Southern District, PO Box 811, Katanning, 6317.

ACKNOWLEDGMENTS

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

| | |
|-----------------|--|
| Greg Durell | District Operations Officer, DEC's Great Southern District |
| Anne Cochrane | Manager, DEC's Threatened Flora Seed Centre |
| Andrew Crawford | Senior Technical Officer DEC's Threatened Flora Seed Centre |
| Dr David Coates | Principal Research Scientist, WA Herbarium, DEC |
| Amanda Shade | Horticulturalist, Botanic Garden and Parks Authority |
| Brian Collins | College of Science and Technology, Notre Dame University |
| Peta Whitaker | Technical Officer, School of Environmental Biology, Curtin University |
| Cas Liber | Banksia Study Group Leader, Association of Societies For Growing Australian Plants |

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 photograph by Babs and Bert Wells.

CITATION

This Interim Recovery Plan should be cited as:

Department of Environment and Conservation (2008). *Wagin banksia (Banksia oligantha) Recovery Plan*. Interim Recovery Plan No. 220. Department of Environment and Conservation, Perth, Western Australia.

SUMMARY

| | | | |
|-------------------------|-------------------------------------|--------------------------|--|
| Scientific Name: | <i>Banksia oligantha</i> | Common Name: | Wagin Banksia |
| Family: | Proteaceae | Flowering Period: | October – November |
| DEC Region: | Wheatbelt | DEC District: | Great Southern |
| Shires: | Katanning, Kojonup, Wagin, Wickepin | Recovery Teams: | Great Southern District Threatened Flora Recovery Team |

Illustrations and/or further information: Broadbent L.M. and Coates D.J. (unpublished) Genetic divergence among and diversity within two rare *Banksia* species and their common close relative in the subgenus *Isostylis* R.Br. (Proteaceae); Brown, A., Thomson-Dans, C. and Marchant, N. (Eds). (1998) *Western Australia's Threatened Flora*. Department of Conservation and Land Management, Western Australia; Buehrig, R.M. and Durrell G.S (1996) *Declared Rare and poorly known Flora in the Narrogin District* Wildlife Management Program No. 30. Department of Conservation and Land Management, Western Australia; George, A.S. (1988) *New taxa and notes on Banksia L.f. (Proteaceae)*. Nuytsia. Vol. 6 pp 312-313; Graham, M and Mitchell, M (1997) *Declared Rare Flora in the Katanning District*, Wildlife Management Program No. 25. Department of Conservation and Land Management, Western Australia; Holiday and Watton (1990) *A field guide to Banksias*, Hamlyn Australia; Wrigley and Fagg (1989) *Banksias, Warratah and Grevilleas and all other plants of the Australian Proteaceae Family*, Collins Publishers, Sydney.

Current status: *Banksia oligantha* was declared as Rare Flora in September 1987 under the Western Australian *Wildlife Conservation Act 1950* and currently meets World Conservation Union (IUCN 2000) Red List Category Endangered (EN) under criteria B1ab(iii) + B2ab(iii) due to its limited geographic range, severe fragmentation and continuing decline in the quality of habitat. The species is also listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The main threats are poor recruitment, inappropriate fire regimes, grazing by rabbits, limited habitat, fragmentation, drought, chemical drift and weeds. Salinity may also possibly become a threat in the future.

Description: *Banksia oligantha* is an erect shrub or small tree to 4 m high with few main stems and no lignotuber. It has a superficial resemblance to *Dryandra sessilis* when not in flower. Its leaves are angular-obovate, 2-3 cm long, very concave and have 2-4 sharp points along each side. Flower heads hold 20-35 flowers which are cream with a red base. *Banksia oligantha* is closely related to *B. cuneata*, differing in its fewer flowered inflorescences, creamy yellow flowers, roughened basal bark and its follicles which open readily in the absence of fire.

Habitat requirements: *Banksia oligantha* occurs in areas of deep white to yellow-brown sand in open low woodland over heath in which it is sometimes dominant. It is located both in low lying areas close to river systems and on higher well-drained dune systems. Associated species include *Actinostrobus pyramidalis*, *Adenanthos pungens* subsp. *effusus*, *A. cygnorum*, *Banksia attenuata*, *B. prionotes*, *Casuarina huegeliana*, *Conospermum distichum*, *Conostylis drummondii*, *Dryandra cuneata*, *Eremaea pauciflora*, *Eucalyptus occidentalis*, *Jacksonia* sp. *Lambertia ilicifolia*, *Lechenaultia pulvinaris*, *Leptospermum spinescens*, *L. erubescens*, *Lyginia barbata*, *Nuytsia floribunda*, *Petrophile ericifolia*, *P. longifolia*, and *Regelia cymbifolia*.

Habitat critical to the survival of the species, and important populations: Habitat critical to the survival of *Banksia oligantha* is area of occupancy of important populations and areas of similar habitat surrounding important populations (i.e. deep white to yellow-brown sand in open low woodland over heath) and additional occurrences of similar habitat that do not currently contain the species but may have done so in the past and may be suitable for translocations. These areas of similar habitat are important where they provide potential habitat for natural range extension and/or for allowing pollinators or biota essential to the continued existence of the species to move between populations.

Given that *Banksia oligantha* is listed as Endangered, it is considered that all known habitat for wild and translocated populations is habitat critical to its survival, and that all wild and translocated populations are important populations.

Benefits to other species or ecological communities: In one population *Banksia oligantha* occurs with the Declared Rare Flora (DRF) species *Conostylis drummondii* (EN) and *Adenanthos pungens* subsp. *effusus* (CR) and the Priority species *Regelia cymbifolia* (Priority 4). In another it occurs with the DRF species *Lechenaultia pulvinaris* (VU). Recovery actions implemented to improve the quality or security of the habitat of *Banksia oligantha* will also improve the status of these DRF and priority species.

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. *Banksia oligantha* is also specifically listed under the United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) Convention on International Trade in Endangered Species (CITES).

Indigenous consultation: Advice is being sought through the Department of Indigenous Affairs to determine whether there are any issues or interests identified in the plan. A search of the Department of Indigenous Affairs Aboriginal Heritage Sites Register has identified burial sites in the vicinity of one *Banksia oligantha* population and there are a number of unmarked graves in the area (Eugene Eades¹ personal communication). The Indigenous community living at the Marribank site are keen to be involved in the protection of the rare flora on their property and DEC has been liaising with them. Input and involvement will be sought from any Aboriginal groups that have an active interest in areas that are habitat for *B. oligantha* and this is discussed under relevant recovery actions.

Social and economic impact: The implementation of this recovery plan is unlikely to cause significant adverse social or economic impacts. However, as four populations (Populations 1b, 2c, 3b, 4) are located on private property, one population (Population 1c) on a Shire Road Reserve, and one population (Population 2) on a Native Settlement, their protection may potentially affect farming, Shire and cultural activities. Actions will involve liaison and cooperation with all stakeholders with regard to these areas.

Affected interests: Stakeholders potentially affected by the implementation of this plan include the Shire of Wagin, as managers of the land that contains Population 1c, and the owners of private land where Populations 1b, 2c, 3b and 4 occur.

Evaluation of the Plans Performance: DEC will evaluate the performance of this IRP in conjunction with the Great Southern District Threatened Flora Recovery Team. In addition to annual reporting on progress with listed actions and comparison against the criteria for success and failure, the plan is to be reviewed within five years of its implementation.

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

1. The owners and managers of land containing all but the recently discovered Population 4 have been formally notified of the presence of *Banksia oligantha* on their properties.
2. Rabbit control has been periodically implemented at Population 1.
3. In June 1988 plants located on private property and the adjacent road reserve (Subpopulations 1a,b) were fenced and placed into Wangeling Gully Nature Reserve under a joint agreement with the landowner. The southern boundary of the nature reserve (Subpopulation 1c) was also re-fenced at that time.
4. Subpopulations 2a and 2b were fenced in the early 1990s.
5. Mature fruits were collected from Populations 1 and 2 in 1993. Approximately 1,600 follicles are stored in DEC's Threatened Flora Seed Centre (TFSC) at -18°C. Fruits were collected from Population 4 in March 2004.
6. The Botanic Garden and Parks Authority (BGPA) currently have one plant of *Banksia oligantha* in their nursery.
7. A study of the pollination biology and genetic divergence and diversity of two rare *Banksia* species and common close relative is still in progress and is aimed for completion in 2008.
8. A study of the reproductive biology of *Banksia oligantha* was carried out by Curtin University staff in 1996. It showed that honeyeaters were the main pollinators but insects also played a role in pollination.
9. A one year project is investigating the influence of salinity and waterlogging on the germination and seedling growth of selected native species including *Banksia oligantha*.
10. Preliminary results suggest that the species is moderately susceptible to *Phytophthora cinnamomi*.
11. The habitat of Population 1 was sampled in 1999 and found to be free of dieback.
12. No plants of the species were located when two sites were searched in 1989 where sightings were reported south of Arthur River Bridge on the Albany Highway and on a farm south of Population 1.
13. In March 2001, soil samples were taken from Population 1 and 2 to measure salinity and pH.
14. Staff from DEC's Great Southern District regularly monitor populations of *Banksia oligantha*.
15. The Great Southern District Threatened Flora Recovery Team is overseeing the implementation of this IRP

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 by ten percent or more over the five years of the plan.

Criteria for failure: The number of individuals within populations and/or the number of populations have decreased by ten percent or more over the five years of the plan.

¹ Eugene Eades – Marribank Resident

Recovery actions

1. Coordinate recovery actions
2. Map total habitat
3. Formally notify land owner
4. Develop a fire management strategy
5. Conduct disturbance trials
6. Obtain biological and ecological information
7. Conduct Rabbit control
8. Fence Subpopulation 2c and Population 4
9. Monitor populations
10. Conduct further surveys
11. Begin translocation process
12. Liaise with land managers
13. Promote awareness
14. Seek long-term protection of habitat
15. Review the IRP, and assess the need for further recovery actions

1. BACKGROUND

History

Banksia oligantha was collected from an area north west of Wagin by Ken Wallace in 1984 and formally described by Alex George 1988. The specific name, derived from the Latin *oligo* (few) and *anthos* (flower), refers to its few flowered inflorescence. Previous nomenclatural synonyms include *B. aff. cuneata* and *B. sp. Wagin*. Searches in the area have since located just three other populations, the most recent being discovered in March 2004. Two populations are in decline with just a single seedling sighted since monitoring began.

Description

Banksia oligantha is an erect shrub or small tree to 5 m with few main stems. It has a superficial resemblance to *Dryandra sessilis* when not in flower. Its grey bark is smooth, becoming lightly fissured with age. Stems are hairy (hirsute to pubescent), becoming smooth (glabrous) over time. The leaves of juvenile plants resemble oak/acorn leaves and become more rigid and pointed with age. When mature, leaves are shining green above and pale below, obovate to angular-obovate, 1.5-3.7 cm long and 4-20 mm wide, and quite concave. The leaf margins have 2-4 1 mm prickly 'teeth' on each side. Flower heads are dome shaped, 2.5-3cm wide, and hold 20-35 distinctive flowers (contrasting with 50 for *B. cuneata* and up to 6000 for *B. grandis*). Flowers are initially cream with a red base but turn orange-brown with age. Fruits have between 1 and 6 pale grey, dark mottled follicles which open spontaneously in the absence of fire (Graham and Mitchell 1997, Brown *et al.* 1998).

Banksia oligantha is closely related to *B. cuneata* but differs in its fewer-flowered inflorescence, creamy yellow flowers, roughened basal bark, shiny green upper surface of leaves and follicles which open readily in the absence of fire.

Distribution and habitat

Banksia oligantha occurs over a range of about 100 km in deep white to white-grey, yellow-brown sands in the 450-500mm rainfall zone between Harrismith and Kojonup. It is located both in low lying areas close to river systems but also occurs on higher dune systems. It is generally found in tall open low woodland over heath in which it is sometimes dominant. Four populations, consisting of 9 subpopulations, are known and together contain approximately 1,700 mature plants (Buehrig and Durrell 1996).

Associated native species include *Actinostrobus pyramidalis*, *Adenanthos pungens* subsp. *effusus*, *A. cygnorum*, *Allocasuarina humilis*, *Banksia attenuata*, *B. baueri*, *B. sphaerocarpa*, *B. prionotes*, *Baeckea crispiflora*, *Caustis dioica*, *Conospermum distichum*, *Casuarina huegeliana*, *Conospermum distichum*, *Conostylis drummondii*, *Corymbia calophylla*, *Calytrix lechenaultii*, *Desmocladius fasciculatus*, *Dryandra cuneata*, *Eremaea pauciflora*, *Eucalyptus occidentalis*, *Hakea prostrata*, *Jacksonia furcellata*, *Isopogon teretifolius*, *Lambertia ilicifolia*, *Lechenaultia pulvinaris*, *Leptospermum spinescens*, *L. erubescens*, *Lyginia barbata*, *Melaleuca subtrigona*, *Nuytsia floribunda*, *Patersonia occidentalis*, *Petrophile ericifolia*, *Petrophile longifolia*, and *Regelia cymbifolia*.

Summary of population land vesting, purpose and tenure

| Pop. No. & Location | DEC District | Shire | Vesting | Purpose | Tenure |
|---------------------|----------------|----------|-------------------------|---------------------------------|----------------|
| 1a. Tarwonga | Great Southern | Wagin | Conservation Commission | Conservation of Flora and Fauna | Nature Reserve |
| 1b. Tarwonga | Great Southern | Wagin | Unvested | Private Property | Freehold |
| 1c. Tarwonga | Great Southern | Wagin | Shire of Wagin | Road Reserve | Non DEC Act |
| 2a. Katanning | Great Southern | Kojonup | Unvested | Aboriginal Reserve | Non DEC Act |
| 2b. Katanning | Great Southern | Kojonup | Unvested | Aboriginal Reserve | Non DEC Act |
| 2c. Katanning | Great Southern | Kojonup | Unvested | Private Property | Freehold |
| 3a. Dudinin | Great Southern | Wickepin | Conservation Commission | Conservation of Flora and Fauna | Nature Reserve |
| 3b. Dudinin | Great Southern | Wickepin | Unvested | Private Property | Freehold |
| 4. Toolibin | Great Southern | Wickepin | Unvested | Private Property | Freehold |

Biology and ecology

The genus *Banksia* consists of two subgenera - *Banksia* with 72 species and *Isostylis* with 3 species, *B. ilicifolia*, *B. cuneata* and *B. oligantha* (George 1981, 1988). George (1981) commented on the similarity of the subgenus *Isostylis* to the genus *Dryandra* but argued that if *Isostylis* were to be removed from *Banksia* it should be in its own genus. The most common species in the subgenus is *B. ilicifolia* which grows on coastal sandplains north and south of Perth. It is separated by at least 50 km from the two rare wheatbelt species, *B. cuneata* and *B. oligantha* (Taylor and Hopper 1988). Both wheatbelt species are recently described and occur in a small area of remnant vegetation in the central and southern wheatbelt.

There is very little precise information about the lifespan of *Banksia oligantha*, however, observations of plants in Population 2c suggests this may be around 10-30 years. Populations 1 and 3 have an even age structure with virtually no seedling recruitment and little variation in population structure (medium aged to old plants), whereas Population 2 has a wide range of plant sizes and ages. The factors influencing the different ages and recruitment are not well understood. Lack of disturbance such as fire may be affecting recruitment, poor rainfall and grazing by rabbits may be affecting seedling survival and seed predation by insects and cockatoos may also be contributing factors.

Although fire kills adult plants of *Banksia oligantha* as it has thin bark and no lignotuber, seeds are released from its fruits and germinate in the ash bed at this time. The even age structure of some populations provides evidence that this has occurred in the past. However, fire is not essential for seedling establishment as is indicated by the large number of seedlings present at Population 2 in the absence of fire or any other apparent disturbance.

A study carried out on the genetic divergence and diversity in two rare *Banksia* species and a common close relative in the subgenus *Isostylis* has shown that there are low levels of genetic diversity in *B. oligantha* populations (Broadbent and Coates, unpublished). This suggests the species may have survived as small populations before widespread land clearing occurred in the area.

A study of four *Banksia oligantha* seedlings has shown the species to be moderately susceptible to *Phytophthora cinnamomi* (A. Cochrane², unpublished data). However, it is not believed to be a major threat as associated indicator species in the habitat of populations have not shown evidence of infection.

Tests on seed collected for storage indicates a high germination rate. Samples ranged from 50% through to 100%, with most results being 77% or greater (Cochrane unpublished data). Seeds collected by staff of the Botanic Gardens and Parks Authority (BGPA) had 95% viability. Seed is likely to be viable for some time as the closely related *Banksia cuneata* retains high seed viability for around ten years (Stace and Coates 2001).

In 1996 Curtin University staff carried out a study on the reproductive biology of *B. oligantha* and found six species of honeyeaters feeding on flowers. Honeybees were the most common insect visitors. However, only about 4% of honeybees collected pollen during their foraging and they tended to move between inflorescences on the same plant rather than between plants. Ants, flies, butterflies, beetles and native bees were also seen collecting nectar or pollen from *B. oligantha* (Collins and Whitaker, unpublished report).

Threats

Banksia oligantha was declared as Rare Flora in September 1987 under the Western Australian *Wildlife Conservation Act 1950*. It currently meets DEC Policy 50 and World Conservation Union (IUCN 2000) Red List Category Endangered (EN) under criteria B1ab(iii) + B2ab(iii) due to its limited geographic range, severe fragmentation and continuing decline in the quality of habitat (IUCN 2000). The species is also listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The main threats are as follows:

- **Poor recruitment** is a major threat to the species. Population 1 has decreased from between 500-800 mature plants in 1988 to 135 in 2004. Population 3 has also declined dramatically from 110 in 1997 to 13 in 2004. Only one seedling has been noted at Population 1 with no seedlings seen at Population 3.

² Anne Cochrane – Manager DEC's Threatened Flora Seed Centre (TFSC)

- **Inappropriate fire regimes** may affect the viability of populations. As adult plants are killed by fire and seeds of *Banksia oligantha* are thought to germinate following fire, the soil seed bank would be rapidly depleted if fires recurred before regenerating or juvenile plants reached maturity. Conversely, it is likely that occasional fires are required for reproduction of this species. Population 2, which was burnt in 1975, 1977 and 1989, has a wide range of plant sizes and ages.
- **Introduced animals** such as rabbits may be threatening *Banksia oligantha* populations. Rabbits impact through soil digging and burrows dug near the root of plants, erosion, the addition of nutrients to soil and the introduction of weed seeds. At Populations 1 and 3 the lack of recruitment may be a direct result of grazing of young seedlings by rabbits.
- **Poor habitat condition** is a significant factor for this species as it is bird pollinated and the condition of the surrounding habitat and corridors will impact on pollination activity.
- **Chemical drift** from agricultural herbicide spraying may be impacting on populations that are close to agricultural land.

Possible long term threats include;

- **Weed invasion** is currently a minor problem for mature plants but may impact on future recruitment. Weeds suppress early plant growth by competing for soil moisture, nutrients and light. They also exacerbate grazing pressure and increase the fire hazard due to the easy ignition of high fuel loads that are produced annually by many grass weed species.
- **Salinity** may affect populations in the future as two populations occur on low plains in an area that is largely cleared farmland.
- **Dieback** is a possible future threat as the species is moderately susceptible to *Phytophthora cinnamomi*.

Summary of population information and threats

| Pop. No. & Location | Land Status | Year No. plants | Habitat Condition | Threats |
|----------------------|---------------------------|---|-----------------------|--|
| 1a. Tarwonga | Nature Reserve | 1988 500-800* 2001 198 (1) [286]* 2004 135 [174]* | Population in decline | Inappropriate fire regimes, grazing, poor recruitment, salinity. |
| 1b. Tarwonga | Private Property | *Combined, see above | Population in decline | Inappropriate fire regimes, rabbits, poor recruitment, salinity. |
| 1c. Tarwonga | Shire Road Reserve | *Combined, see above | Population in decline | Inappropriate fire regimes, rabbits, poor recruitment, salinity. |
| 2a. Katanning | Native Settlement reserve | 2000 100+ 2004 433 (133) | Healthy | Inappropriate fire regimes. |
| 2b. Katanning | Native Settlement reserve | 2001 199 (49) 2004 923+ (378+) | Healthy | Inappropriate fire regimes. |
| 2c. Katanning | Private Property | 2000 5 2004 26 (26) | Healthy | Inappropriate fire regimes, grazing. |
| 3a. Dudinin | Nature Reserve | 1997 30 2004 5 [43] | Population in decline | Inappropriate fire regimes, poor recruitment, drought. |
| 3b. Dudinin | Private Property | 1997 c. 80 1998 66 [59] 2004 8 [34] | Population in decline | Inappropriate fire regimes, poor recruitment, drought, chemical drift. |
| 4. Toolibin | Private Property | 2004 188(35)[36] | Healthy | Inappropriate fire regimes, weeds, rabbits. |

() = number of seedlings; [] = number of dead plants.

Populations in **bold text** are considered to be Important Populations

Guide for decision-makers

Section 1 provides details of current and possible future threats. Proposed developments and on-ground works (clearing, firebreaks etc) in the immediate vicinity of habitat critical to the survival of *Banksia oligantha* will require assessment (WA). Works should not be approved unless the proponents can demonstrate that they will have no significant impact on the species, its habitat or potential habitat, or the local surface or ground water hydrology.

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

Habitat critical to the survival of *Banksia oligantha* is the area of occupancy of important populations and areas of similar habitat surrounding important populations (i.e. among other halophytic shrubs on clay sands with gypsum or white-grey shallow sand over clay) and additional occurrences of similar habitat that do not currently contain the species but may have done so in the past and may be suitable for translocations. These areas of similar habitat are important where they provide potential habitat for natural range extension and/or for allowing pollinators or biota essential to the continued existence of the species to move between populations.

Given that *Banksia oligantha* is listed as Endangered, it is considered that all known habitat for wild and translocated populations is habitat critical to its survival, and that all wild and translocated populations are important populations.

Benefits to other species or ecological communities

In one population *Banksia oligantha* occurs with the Declared Rare Flora (DRF) species *Conostylis drummondii* (Endangered under both the *Wildlife Conservation Act 1950* and the EPBC Act) and *Adenanthos pungens* subsp. *effusus* (Critically Endangered under the *Wildlife Conservation Act 1950* and Endangered under the EPBC Act) and the Priority species *Regelia cymbifolia* (P4). In another it occurs with the Priority 4 species *Lechenaultia pulvinaris* (Endangered under the EPBC Act). Recovery actions implemented to improve the quality or security of the habitat of *Banksia oligantha* will also improve the status of these DRF and priority species.

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. *Banksia oligantha* is also specifically listed under the United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) Convention on International Trade in Endangered Species (CITES).

Indigenous consultation

Advice is being sought through the Department of Indigenous Affairs to determine whether there are any issues or interests identified in the plan. A search of the Department of Indigenous Affairs Aboriginal Heritage Sites Register has identified burial sites in the vicinity of one *Banksia oligantha* population and there are a number of unmarked graves in the area (Eugene Eades³ personal communication). The Indigenous community living at the Marribank site are keen to be involved in the protection of the rare flora on their property and DEC has been liaising with them. Input and involvement will be sought from any Aboriginal groups that have an active interest in areas that are habitat for *B. oligantha* and this is discussed under relevant recovery actions.

Social and economic impacts

The implementation of this recovery plan is unlikely to cause significant adverse social or economic impacts. However, as four populations (Populations 1b, 2c, 3b, 4) are located on private property, one population (Population 1c) on a Shire Road Reserve, and one population (Population 2) on a Native Settlement, their protection may potentially affect farming, Shire and cultural activities. Actions will involve liaison and cooperation with all stakeholders with regard to these areas.

Affected interests

Stakeholders potentially affected by the implementation of this plan include the Shire of Wagin, as managers of the land that contains Population 1c, and the owners of private land where Populations 1b, 2c, 3b and 4 occur.

³ Eugene Eades – Marribank Resident

Evaluation of the Plans Performance

DEC will evaluate the performance of this IRP in conjunction with the Great Southern District Threatened Flora Recovery Team. In addition to annual reporting on progress with listed actions and comparison against the criteria for success and failure, the plan is to be reviewed within five years of its implementation.

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 ten percent or more over the five years of the plan.

Criteria for failure: The number of individuals within populations and/or the number of populations have decreased by ten percent or more over the five years of the plan.

3. RECOVERY ACTIONS

Existing recovery actions

The owners and managers of land containing all but the recently discovered Population 4 have been formally notified of the presence of *Banksia oligantha* on their properties. Notification details the Declared Rare status of the taxon and the associated legal responsibilities to protect it.

Rabbit control has been periodically implemented at Population 1. Fumigation of rabbit warrens was conducted by DEC District staff in October 1988. Poison free bait runs were carried out in February 2002 to begin to attract rabbits to the oats and the population was baited with 1080 oats in March 2002. This controlled rabbits to some degree however they have increased in numbers again.

In June 1988 plants located on private property and the adjacent road reserve (Subpopulations 1a and 1b) were fenced and placed into Wangeling Gully Nature Reserve under a joint agreement with the landowner. The southern boundary of the Nature Reserve (Subpopulation 1c) was also re-fenced at that time.

Subpopulations 2a and 2b were fenced in the early 1990s. The land is managed by an Aboriginal community who have a strong desire to protect the population and DEC staff have been actively working with them.

Mature fruits were collected from Populations 1 and 2 in 1993. Approximately 1,600 follicles are stored in DEC's Threatened Flora Seed Centre (TFSC) at -18°C. Initial germination rates from extracted seed varied between 50 and 100% with most results at 77% or above. After one year in storage the germination rate was 100% (unpublished data A. Crawford). Fruit was again collected from subpopulations 2a and 2b in November 2003 and from Population 1 in February 2004. Fruits were collected from Population 4 in 2004.

The Botanic Garden and Parks Authority (BGPA) currently have one plant of *Banksia oligantha* in their nursery.

To complete work on the pollination biology of the species Science Division staff collected seeds of *Banksia oligantha* from Populations 1 and 2 in March 2001. Work includes studies on the genetic divergence and diversity of two rare *Banksia* species and common close relative in the subgenus *Isostylis*. The study is still in progress and is aimed for completion in 2008.

A study of the reproductive biology of *Banksia oligantha* was carried out by Curtin University staff in 1996. It showed that honeyeaters were the main pollinators but insects also played a role in pollination.

A one year project supported by National Heritage Trust funding is investigating the influence of salinity and waterlogging on the germination and seedling growth of selected native species including *Banksia oligantha*. This project aims to identify species tolerance to hydrologic change and is being undertaken by Anne Cochrane,

Manager of DEC's Threatened Flora Seed Centre.

Four seedlings of *Banksia oligantha* were tested for their susceptibility to *Phytophthora cinnamomi*. Results show that the species is moderately susceptible to the disease (A. Cochrane⁴, unpublished data).

Dieback interpretation/sampling of the area that contains Population 1 was carried out by Glevan Dieback Consultants in June 1999. The area was found to be free of dieback.

Following unconfirmed sightings of *Banksia oligantha* in 1989, searches were carried out in an area south of Arthur River Bridge on the Albany Highway and on a farm south of Population 1. No plants of the species were seen at either site.

In March 2001, soil samples were taken from Population 1 and 2 to measure salinity and pH. Salinity levels were low and pH was around 6.5. These results will be used as baseline data for comparison with future results.

Staff from DEC's Great Southern District regularly monitor populations of *Banksia oligantha*.

The Great Southern District Threatened Flora Recovery Team is overseeing the implementation of this IRP and will include information on progress in its annual report to DEC's Corporate Executive and funding bodies.

Future recovery actions

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

1. Coordinate recovery actions

The GSDTFRT and NDTFRT will continue to coordinate recovery actions for *Banksia oligantha* and other Declared Rare Flora in their districts. They will include information on progress in their annual report to DEC's Corporate Executive and funding bodies.

Action: Coordinate recovery actions
Responsibility: DEC (Great Southern District) through the GSDTFRT
Cost: \$2,200 per year

2. Map total habitat

Although habitat critical to the species' survival is described in Section 1, the areas as described have not yet been mapped and that will be redressed under this action. If any additional populations are located, then total habitat will also be determined and mapped for these locations.

Action: Map total habitat
Responsibility: DEC (Great Southern District) through the GSDTFRT
Cost: \$4,000 in the first year

3. Formally notify land owner

The owner of land that contains Population 4 needs to be formally notified of the presence of *Banksia oligantha*.

Action: Formally notify land owner
Responsibility: DEC (Wildlife Branch)
Cost: \$100 in first year

4. Develop a fire management strategy

⁴ Anne Cochrane – Manager DEC's Threatened Flora Seed Centre (TFSC)

Once the role of fire in the recruitment of *Banksia oligantha* is understood (through research and disturbance trials), a fire management plan will be developed that details the frequency and intensity of fires and control measures necessary to prevent inappropriate fire.

Action: Develop a fire management strategy
Responsibility: DEC (Great Southern District) through the GSDTFRT
Cost: \$2,400 for preparation in first year, \$1,000 per year for implementation

5. Conduct disturbance trials

Populations 1 and 3 have an even age structure with little or no natural recruitment and as many mature plants are senescing it is likely that disturbance or fire is required to induce recruitment from soil-stored seed. Trials involving different disturbance mechanisms will be implemented to gain a better understanding of the mechanisms required for recruitment.

Action: Conduct disturbance trials to promote regeneration
Responsibility: DEC (Great Southern District) through the GSDTFRT
Cost: \$4000 per year for the first two years and \$700 per there after.

6. Obtain biological and ecological information

Improved knowledge of the biology and ecology of *Banksia oligantha* 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 and the role of various disturbances (including fire), competition, rainfall and grazing on germination and recruitment.
2. The impact of herbicide treatments on *Banksia oligantha* and its habitat.
3. An investigation into the mating system and pollination biology of *Banksia oligantha*.
4. An investigation of population genetic structure, levels of genetic diversity and minimum viable population size.

Action: Obtain biological and ecological information
Responsibility: DEC (Science Division, Great Southern District) through the GSDTFRT
Cost: \$20,000 in second and third and fourth years

7. Conduct rabbit control

Rabbits may eat emerging seedlings and are thought to stress adult plants through root damage when constructing warrens. A rabbit control program in the areas of Populations 1, 3 and 4 will be implemented in consultation with landholders.

Action: Conduct rabbit control
Responsibility: DEC (Great Southern District) through the GSDTFRT
Cost: \$2,000 in first year, \$1,000 per year thereafter

8. Fence Subpopulation 2C and Population 4

Population 2c is currently not fenced from stock. Options including using Conservation Volunteers Australia or Green Corps to carry out fencing or getting a contractor to do the work will be investigated and a fence erected to protect the area from stock. Population 4 requires rabbit proof fencing.

Action: Fence Subpopulation 2c and Population 4
Responsibility: DEC (Great Southern District) through the GSDTFRT
Cost: \$9,000 in first year

9. Monitor populations

Annual monitoring of factors such as population stability (expansion or decline), habitat degradation, pollinator activity, seed production, recruitment, longevity and predation is essential. Particular attention will be paid to the level of threat posed by weeds and rabbits and if this should increase, appropriate control will be undertaken.

Action: Monitor populations
Responsibility: DEC (Great Southern District) through the GSDTFRT
Cost: \$2,000 per year

10. Conduct further surveys

Further surveys will be conducted during the flowering period of *Banksia oligantha* (October to November). Habitat Critical maps (Action 2) may be a useful tool in desktop surveys done prior to field work. Volunteers from the local community, Wildflower Society and Naturalist Clubs will be encouraged to be involved in surveys supervised by DEC staff. Areas considered suitable for translocation will also be noted.

Action: Conduct further surveys
Responsibility: DEC (Great Southern District) through the GSDTFRT
Cost: \$3,000 per year for first four years

11. Begin translocation process

As there is currently no natural recruitment occurring in Populations 1 and 3 the need for translocation will be considered. If required, plants will be propagated and a translocation proposal developed. Information on the translocation of threatened animals and plants in the wild is provided in DEC Policy Statement No. 29 *Translocation of Threatened Flora and Fauna*. All translocation proposals require endorsement by the Director of Nature Conservation.

Action: Begin translocation process
Responsibility: DEC (Science Division, Great Southern District) through the GSDTFRT
Cost: \$1000 in first year for seed collection and storage, \$5,300 in fifth year

12. Liaise with land managers

Staff from DEC's Great Southern District will continue to liaise with private land owners and land managers to ensure that populations are not accidentally damaged or destroyed. Land owner input and involvement will be sought in the management of populations. Input and involvement will also be sought from any Aboriginal groups that may have an active interest in areas that contain *Banksia oligantha*.

Action: Liaise with land managers
Responsibility: DEC (Wildlife Branch, Great Southern District) through the GSDTFRT
Cost : \$600 per year

13. Promote awareness

The importance of biodiversity conservation and the need for the long-term protection of wild populations of *Banksia oligantha* will be promoted to the community through poster displays and the local print and electronic media. Formal links with local naturalist groups, catchment groups and interested individuals will also be encouraged. An information sheet, which includes a description of the plant, its habitat, threats, recovery actions and photos will be produced. A reply paid postal drop of a pamphlet that illustrates *Banksia oligantha* and describes its distinctive features and habitat will be distributed to residents of Shires that contain possible habitat for the taxon.

Action: Promote awareness
Responsibility: DEC (Great Southern District) through the GSDTFRT
Cost: \$1,400 in first year, \$700 in second year and \$600 in remaining years.

14. Seek long-term protection of habitat

Staff from the DEC's Great Southern District will continue to liaise with landowners and managers to ensure that populations are not accidentally damaged or destroyed. In addition, ways and means of improving the security of populations and their habitat will be investigated. This may include purchase, conservation covenants or the Land for Wildlife scheme.

Action: Seek long-term protection of habitat
Responsibility: DEC (Great Southern District) through the GSDTFRT
Cost: To be determined

15. Review the IRP, and assess the need for further recovery actions

If the species is still ranked as Endangered (WA) at the end of the fourth year of the five-year term of this Interim Recovery Plan, the need for further recovery actions and an update to this IRP will be assessed.

Action: Review the IRP, and assess the need for further recovery actions
Responsibility: DEC (Species and Communities Branch, Great Southern District) through the GSDTFRT
Cost: \$23,000 in the fifth year (if required)

4. TERM OF PLAN

Western Australia

This Interim Recovery Plan will operate from May 2006 to April 2011 but will remain in force until withdrawn or replaced. If the taxon is still ranked as Endangered (WA) after five years, this IRP will be reviewed and if necessary, further recovery actions put in place.

Commonwealth

In accordance with the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) this adopted recovery plan will remain in force until revoked.

The recovery plan must be reviewed at intervals of not longer than 5 years.

5. REFERENCES

- Broadbent L.M. and Coates D.J. (unpublished) Genetic divergence among and diversity within two rare *Banksia* species and their common close relative in the subgenus *Isostylis* R.Br> (Proteaceae).
- Brown, A., Thomson-Dans, C. and Marchant, N. (Eds). (1998) *Western Australia's Threatened Flora*. Department of Conservation and Land Management, Western Australia.
- Buehrig, RM and Durrell G.S (1996) *Declared Rare and poorly known Flora in the Narrogin District Wildlife Management Program No. 30*. Department of Conservation and Land Management, Western Australia.
- CALM (1994) Policy Statement No. 50 Setting Priorities for the Conservation of Western Australia's Threatened Flora and Fauna. Perth, Western Australia.
- CALM (1995) Policy Statement No. 29 Translocation of Threatened Flora and Fauna. Perth, Western Australia.
- Collins B. G. and Whitaker, P. K. (Unpublished report) Reproductive biology in fragmented populations of the rare *Banksia oligantha*.
- George, A.S. (1981) *The genus Banksia L.f. (Proteaceae)* Nuytsia. Vol. 13 pp 239-473
- George, A.S. (1988) *New taxa and notes on Banksia L.f. (Proteaceae)* Nuytsia. Vol. 6 (1988) pp 312-313
- Graham, M and Mitchell, M (1997) Declared Rare Flora in the Katanning District, Wildlife Management Program No. 25, Department of Conservation and Land Management
- IUCN (2000) *IUCN red list categories prepared by the IUCN Species Survival Commission, as approved by the 51st meeting of the IUCN Council*. Gland, Switzerland.
- Lamont (1991) *Seed bank and population dynamics of Banksia cuneata: the role of time, fire and moisture*. Botanical Gazette 152, 114-122
- Stace H.M. and Coates D.J. (2001) *Matchstick Banksia Recovery Plan*, Wildlife management Program No 23, Department of Conservation and Land Management, Western Australia.
- Taylor, A and Hopper, S.D. (1988) *The Banksia Atlas* Australian Government Publishing Service, Canberra.

6. TAXONOMIC DESCRIPTION

George, A. S., (1988) *New taxa and notes on Banksia L.f. (Proteaceae)*, In: Nuytsia. - Vol. 6 (1988) pp312-313

A shrub to 3m high, with 1 or few stems, apparently without lignotuber. Bark smooth becoming lightly fissured on lower part of trunk, grey. *Branchlets* hirsute and closely pubescent, becoming glabrous, pale orange-brown or yellow, becoming grey. *Leaves* scattered, obovate to angular-obovate, obtuse but mucronate, very concave, deep green and shining above, paler below with many pits; margins not recurved, with usually 2-4 mucronate teeth c. 1 mm long; lamina 1.5-3.7 cm long, 4-20mm wide when flattened; petiole 2-3 mm long. *Inflorescences* terminal, numerous, 20-35 flowered, 2.5-3 cm wide at anthesis. *Inflorescence bracts* linear but thick and densely tomentose in lower half, acute and appressed-pubescent at apex, 2-4 mm long. *Common and floral bracts* 4 mm long, narrowly linear, acute densely white-villous, the apical hairs straighter and brown. *Perianth* 21-23 mm long including limb of 3-3.5 mm, red in lower half grading to cream above, the limb pale yellow, all turning orange-brown; claws somewhat broadened above glabrous base, then narrowed towards limb, appressed-pubescent outside, glabrous inside; limb glabrous. *Hypogynous scales* oblong but narrowed towards obtuse apex, 2 mm long. *Pistil* 19-24 mm long, thickened above ovary than tapering, glabrous; pollen-presenter c. 1 mm long, slightly thickened. *Old flowers* caducous. *Follicles* 1-6, ± ovoid, somewhat curved, 14-19 mm long, 10-15 mm high, 8-9 mm wide; valves smooth, closely tomentose, pale grey with dark mottling, remaining closed or sometimes opening spontaneously, beaked at stylar point; lips c. 1 mm wide, wider at base. *Seed body* ± cuneate, 4 mm long and wide, irregularly wrinkled and grey-brown on outer face, with a few short ridges and black on inner face; wing transversely semi-elliptic to ovate, not notched, 5-6 mm high, 13-16 mm wide, wrinkled, pale brown grading to almost black along lower margin.

SUMMARY OF RECOVERY ACTIONS AND COSTS

| Recovery Action | DEC | Year 1 Other | Ext | DEC | Year 2 Other | Ext | DEC | Year 3 Other | Ext | DEC | Year 4 Other | Ext | DEC | Year 5 Other | Ext |
|---|--------|------------------|--------|--------|-----------------|--------|--------|-----------------|--------|--------|-----------------|--------|--------|-----------------|--------|
| Coordinate recovery actions | 1200 | 500 | 500 | 1200 | 500 | 500 | 1200 | 500 | 500 | 1200 | 500 | 500 | 1200 | 500 | 500 |
| Map total habitat | 3000 | 0 | 1000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Formally notify land owner | 100 | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Develop a fire management strategy | 1400 | 0 | 1000 | 500 | 0 | 500 | 500 | 0 | 500 | 500 | 0 | 500 | 500 | 0 | 500 |
| Conduct disturbance trials to promote regeneration at Populations 1 & 3 | 1500 | 0 | 2500 | 1500 | 0 | 2500 | 500 | 0 | 200 | 500 | 0 | 200 | 500 | 0 | 200 |
| Obtain biological and ecological information | 0 | 0 | 0 | 10000 | 0 | 10000 | 10000 | 0 | 10000 | 10000 | 0 | 10000 | 0 | 0 | 0 |
| Conduct Rabbit control | 1800 | 0 | 200 | 800 | 0 | 200 | 800 | 0 | 200 | 800 | 0 | 200 | 800 | 0 | 200 |
| Fence Subpopulation 2c and Population 4 | 2000 | 0 | 7000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Monitor populations | 1000 | 0 | 1000 | 1000 | 0 | 1000 | 1000 | 0 | 1000 | 1000 | 0 | 1000 | 1000 | 0 | 1000 |
| Conduct further surveys | 1000 | 500 | 1500 | 1000 | 500 | 1500 | 1000 | 500 | 1500 | 1000 | 500 | 1500 | 0 | 0 | 0 |
| Begin translocation process | 300 | 0 | 700 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3000 | 0 | 2300 |
| Liaise with land managers | 600 | 0 | 0 | 600 | 0 | 0 | 600 | 0 | 0 | 600 | 0 | 0 | 600 | 0 | 0 |
| Promote awareness | 600 | 0 | 800 | 600 | 0 | 100 | 600 | 0 | 0 | 600 | 0 | 0 | 600 | 0 | 10000 |
| Seek long-term protection of habitat | | To be determined | | | | | | | | | | | 0 | 0 | 0 |
| Review the IRP, and assess the need for further recovery actions | | | | | | | | | | | | | 15300 | 0 | 7700 |
| Total | 14,500 | 1,000 | 16,200 | 17,200 | 1,000 | 16,300 | 16,200 | 1,000 | 13,900 | 16,200 | 1,000 | 13,900 | 23,500 | 500 | 22,400 |
| Yearly Total | | 31,700 | | | 34,500 | | | 31,100 | | | 31,100 | | | 46,400 | |

Ext = External funding (funding to be sought). Other = funds contributed by NHT, in-kind contribution and BGPA.

Total DEC: \$87,600
Total Other: \$4,500
Total External Funding: \$82,700
Total costs: \$174,800