

Zieria obcordata Recovery Plan



Draft for Public Comment

February 2005



Natural Heritage Trust

Helping Communities Helping Australia

An Australian Government Initiative



Department of
**Environment and
Conservation (NSW)**

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Department of Environment and Conservation Recovery Planning Program

Zieria obcordata
Draft Recovery Plan

**Prepared in accordance with the New South Wales
*Threatened Species Conservation Act 1995***

February 2005

Acknowledgments

This plan was prepared by Melanie Bannerman, Threatened Species Officer of the Department of Environment and Conservation, Threatened Species Unit, Western. Amendments were made to the draft by Geoff Roberston and Matt Cameron, Department of Environment and Conservation, Threatened Species Unit, Western.

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Executive Summary

Introduction

Zieria obcordata is endemic to New South Wales, where it is currently known from one site near Wellington and four small sites near Bathurst. It is a small, rounded shrub up to 50cm in height with distinctively aromatic, trifoliolate leaves. All known populations are small in number and occur on private land. Known and potential threats to the species include weed invasion, stochastic environmental events, clearing of habitat and other disturbances associated with development and inappropriate management with regards to fire and grazing due to a lack of knowledge about the species' biology and ecology.

Legislative Context

The *Threatened Species Conservation Act 1995* (TSC Act) provides a legislative framework to protect and encourage the recovery of threatened species, endangered populations and endangered ecological communities in NSW. Under this legislation the Director-General of Department of Environment and Conservation (DEC) has a responsibility to prepare Recovery Plans for all species, populations and ecological communities listed as endangered or vulnerable on the TSC Act schedules. Similarly, the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) requires the Commonwealth Minister for the Environment to ensure the preparation of a Recovery Plan for nationally listed species and communities or adopt plans prepared by others including those developed by State agencies. Both Acts include specific requirements for the matters to be addressed by Recovery Plans and the administrative process for preparing Recovery Plans.

Legal Status

Zieria obcordata is listed as 'endangered' under both the Commonwealth EPBC Act and Schedule 1 Part 1 of the NSW TSC Act.

Preparation of Plan

This draft Recovery Plan has been prepared to satisfy both the requirements of the TSC Act and the EPBC Act and therefore will be the only Recovery Plan for the species. It is the intention of the Director-General of DEC to forward the final version of this draft Recovery Plan to the Commonwealth Minister of the Environment for adoption, once it has been approved by the NSW Minister for the Environment.

This draft plan has been prepared with the assistance of interested parties with relevant expertise. Components within the plan do not necessarily represent the views nor the official positions of all the individuals or agencies consulted. The information in this draft Recovery Plan was accurate to the best of the knowledge of the Department of Environment and Conservation on the date it was approved.

Current Species Status

Z. obcordata is a small shrub with restricted distribution occurring near the townships of Wellington and Bathurst on the Central Western Slopes and Central Tablelands respectively

of NSW. At present the species is known from 5 separate geographic locations, with a total number of approximately 220 individual plants.

There are two main threats to *Z. obcordata*. These are weed invasion and chance environmental events such as drought, wildfire or the invasion of disease or pests. Other potential threats include habitat clearing, disturbance from development and inappropriate management with regards to fire and grazing of the species and/or its habitat.

Recovery Objectives

The overall aim of this recovery plan is to promote the recovery of *Zieria obcordata* in the wild.

The specific objectives are to:

1. determine the status and distribution of *Z. obcordata* throughout New South Wales;
2. protect all populations of *Z. obcordata* from known and potential threats;
3. ensure that there is no loss of *Z. obcordata* plants as a result of human-induced disturbances;
4. improve our knowledge and understanding of the species' habitat requirements, reproductive biology, ecology, genetic variability and the impact of threats, particularly from fire and grazing;
5. establish a representative and viable ex-situ seed bank;
6. achieve a cooperative approach, between the DEC and landholders, towards the conservation of the species.

Recovery Criteria

Recovery performance criteria are that:

1. any extant populations of *Z. obcordata* are located and recorded;
2. all *Z. obcordata* populations are adequately protected from threats;
3. no reduction in plant numbers due to human-induced causes occurs in any *Z. obcordata* population;
4. the ecology, habitat requirements, reproductive biology, genetic variation and impact of threats, particularly fire and grazing, on the species are better understood;
5. an ex-situ seed bank is successfully established;
6. a cooperative approach amongst all stakeholders towards the conservation of the species is achieved.

Recovery Actions

Recovery actions will be directed towards:

1. undertaking surveys for other extant populations of *Z. obcordata*;
2. monitoring of wild populations;
3. eradicating the threat of weed invasion at the Wellington population;
4. conducting research into the species' habitat requirements, reproductive biology and ecology;
5. conducting experimental studies into the impacts of fire and other physical disturbances such as grazing, on the species and mitigating any threats from these disturbances if required;
6. investigating the genetic diversity of all populations;
7. establishing a representative and viable ex-situ seed bank;
8. seeking landholders and the community's involvement in recovery actions;
9. establishing long-term protection of all sites and;
10. considering the benefits of nominating critical habitat for the species.

Biodiversity benefits

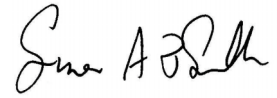
The preparation and long term implementation of recovery plans for threatened species, populations and ecological communities contributes to, and highlights the importance of conserving all biodiversity. The conservation of biodiversity has a number of wider community benefits. These include:

- provision and maintenance of a range of ecosystem functions on which we and all other species depend;
- contributing to increased biological and ecological knowledge of species, communities, habitats and ecosystems;
- potential medical, economic, agricultural and industrial products; and
- cultural, aesthetic and spiritual values.

The conservation of *Z. obcordata* populations and the habitat in which it occurs will also benefit other species that share the same habitat and have similar biology. This recovery plan will increase public awareness of *Z. obcordata* and hence raise the profile of all threatened species. This, in turn, will lead to greater opportunities for the conservation of threatened species and increased protection of biodiversity.

I now invite you to make a written submission to the DEC regarding this draft recovery plan by 8th April 2005. Please refer to Appendix 1 for details on how to make a submission.

Following consideration of comments the plan will be finalised by the DEC and submitted to the Director General and the Minister for the Environment.



SIMON A Y SMITH
Deputy Director General
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Table of Contents

| | |
|--|------------|
| Acknowledgments | ii |
| Executive Summary | iii |
| Table of Contents | vii |
| 1 Introduction | 1 |
| 2 Legislative Context..... | 1 |
| 2.1 State and Commonwealth Acts..... | 1 |
| 2.1.1 <i>Threatened Species Conservation Act 1995</i> | 1 |
| 2.1.2 <i>Environment Protection and Biodiversity Conservation Act 1999</i> ... | 1 |
| 2.1.3 <i>National Parks and Wildlife Act 1974</i> | 1 |
| 2.1.4 <i>Environmental Planning and Assessment Act 1979</i> | 2 |
| 2.1.5 <i>Native Vegetation Act 2003</i> | 2 |
| 2.2 Recovery plan preparation..... | 2 |
| 2.3 Recovery plan implementation..... | 3 |
| 2.4 Critical Habitat | 3 |
| 2.5 Environmental assessment..... | 4 |
| 3 Current Conservation Status | 4 |
| 4 Description and Taxonomy | 5 |
| 4.1 General | 5 |
| 4.2 Taxonomic description | 5 |
| 4.3 Taxonomic significance..... | 6 |
| 5 Distribution | 7 |
| 5.1 Current and historic distribution..... | 7 |
| 5.2 Tenure..... | 8 |
| 6 Habitat..... | 9 |
| 6.1 Topography, soils and microhabitat | 9 |
| 6.2 Vegetation..... | 10 |
| 6.3 Climate | 11 |
| 7 Biology and Ecology | 11 |
| 7.1 Reproductive Biology..... | 11 |
| 7.2 Population size..... | 12 |
| 8 Management Issues | 12 |
| 8.1 Threats and Reasons for Decline | 12 |

| | | |
|-----------|--|-----------|
| 8.1.1 | Weed invasion | 13 |
| 8.1.2 | Environmental Stochasticity | 13 |
| 8.1.3 | Inappropriate management..... | 13 |
| 8.1.4 | Development..... | 14 |
| 8.2 | Social and economic issues | 14 |
| 8.2.1 | Economic considerations | 14 |
| 8.2.2 | Social considerations | 15 |
| 8.3 | Biodiversity benefits..... | 15 |
| 8.4 | Roles and Interests of Indigenous Communities | 15 |
| 9 | Previous Actions Undertaken | 16 |
| 9.1 | Surveys | 16 |
| 9.2 | Cultivation | 16 |
| 9.3 | Protection..... | 17 |
| 10 | Species Ability to Recover | 17 |
| 11 | Recovery objectives and performance criteria..... | 18 |
| 11.1 | Objectives of the Recovery Plan | 18 |
| 11.2 | Recovery performance criteria | 18 |
| 12 | Recovery Actions | 19 |
| 12.1 | Action 1 – Surveys | 19 |
| 12.2 | Action 2 – Monitoring | 19 |
| 12.3 | Action 3 – Weed removal..... | 19 |
| 12.4 | Action 4 – Ecological research..... | 20 |
| 12.5 | Action 5 – Genetic research | 21 |
| 12.6 | Action 6 – Establish an ex-situ seed bank | 21 |
| 12.7 | Action 7 – Landholder and community involvement..... | 21 |
| 12.8 | Action 8 – Long term protection of sites..... | 22 |
| 12.9 | Action 9 - Consider nomination of Critical Habitat..... | 22 |
| 12.10 | Action 10 - Recovery Plan coordination | 23 |
| 13 | Alternative Management Strategies..... | 23 |
| 13.1 | No management action taken | 23 |
| 13.2 | Establish an ex-situ population..... | 23 |
| 14 | Preparation details | 23 |
| 14.1 | Date of last amendment | 24 |
| 14.2 | Review Date | 24 |
| | References | 27 |
| | Appendix 1: Making a submission on this Draft Recovery Plan ... | 28 |

1 Introduction

Zieria obcordata occurs only in New South Wales, where a total of 220 individual plants are currently known from one site near Wellington and four sites near Bathurst. The species is listed as endangered in New South Wales under the *Threatened Species Conservation Act, 1995* and nationally under the *Environment Protection and Biodiversity Conservation Act, 1999*.

As there are a number of very small populations, chance events could easily lead to local extinctions, potentially threatening the existence of the species. In addition, the small number of plants suggests that genetic variability and hence ability to withstand adverse effects may be greatly reduced. Currently one population is under threat from weed invasion. No other population appears to be under severe threat at present.

All known populations of *Z. obcordata* occur on private land. Therefore, all efforts to conserve the species must involve sympathetic management from the landholders. The intent of this Recovery Plan is to work cooperatively with landholders to protect *Z. obcordata* from threats and ensure its continued existence in the wild. Consultation has occurred with the relevant landholders throughout the development of this Plan and DEC will continue to liaise with these landholders in the implementation of the recovery actions.

2 Legislative Context

2.1 State and Commonwealth Acts

2.1.1 *Threatened Species Conservation Act 1995*

Zieria obcordata is listed as ‘endangered’ on Schedule 1 Part 1 of the *Threatened Species Conservation Act 1995* (TSC Act). It is an offence to harm, pick or damage the habitat of a threatened species unless the damage is the result of activities which have been licensed under section 91 of the TSC Act or have otherwise gained approval under the *Environmental Planning and Assessment Act 1979*.

2.1.2 *Environment Protection and Biodiversity Conservation Act 1999*

Z. obcordata is also listed as ‘endangered’ under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This act protects nationally listed threatened species and ecological communities, particularly in Commonwealth areas, and regulates the activities of Commonwealth agencies. It is an offence to undertake any such actions in areas under State or Territory jurisdiction, as well as Commonwealth owned areas, without obtaining prior approval from the Commonwealth Environment Minister. As *Z. obcordata* is listed nationally under the EPBC Act, any person proposing to undertake actions likely to have a significant impact on the species should refer the action to the Commonwealth Minister for the Environment, who will then decide whether the action requires EPBC Act approval.

2.1.3 *National Parks and Wildlife Act 1974*

The *National Parks and Wildlife Act 1974* (NPW Act) provides for the reservation, protection and management of natural areas and the protection of native fauna and flora. It includes

provisions for conservation agreements with other landholders and provisions for licensing of scientific investigation of threatened species. The NPW Act has been amended with regard to threatened species by the TSC Act. No known populations of *Z. obcordata* occur within a National Park or Nature Reserve. However any scientific investigation regarding the species must be licensed under the NPW Act.

2.1.4 *Environmental Planning and Assessment Act 1979*

Land use and development in NSW is subject to evaluation in accordance with the *Environmental Planning and Assessment Act 1979* (EP&A Act). Threatened species are to be taken into account by consent authorities when they are considering development applications under Part 4, and by determining authorities undertaking or approving activities under Part 5 of the Act. Under the *Western Lands Act 1901*, the Department of Infrastructure, Planning and Natural Resources may be the determining authority under the EP&A Act.

The TSC Act amendments to the environmental assessment provisions of the EP&A Act require that consent and determining authorities consider relevant recovery plans when exercising a decision making function under Parts 4 and 5 of the EP&A Act. When considering any activity that may affect *Zieria obcordata*, these authorities must consider the conservation strategy outlined in this plan.

2.1.5 *Native Vegetation Act 2003*

The *Native Vegetation Act 2003* (NV Act) replaced the *Native Vegetation Conservation Act 1997* (NVC Act). The NV Act has the following objectives:

- (a) to provide for , encourage and promote the management of native vegetation on a regional basis in the social, economic and environmental interests of the State,
- (b) to prevent broadscale clearing unless it leads to better environmental outcomes,
- (c) to protect native vegetation of high conservation value having regard to its contribution to such matters as water quality, biodiversity, or the prevention of salinity or land degradation,
- (d) to improve the condition of existing native vegetation, particularly where it has high conservation value, and
- (e) to encourage the revegetation of land, and the rehabilitation of land, with appropriate native vegetation,

in accordance with the principles of ecologically sustainable development.

Under the NV Act, native vegetation must not be cleared except in accordance with a development consent or a property vegetation plan (PVP) approved by the Minister in accordance with the Act. In determining whether to approve a PVP the Minister must have regard to Catchment Action Plans produced by Catchment Management Authorities. The Minister must not approve a PVP that proposes broadscale clearing of native vegetation unless the clearing will improve or maintain environmental outcomes.

2.2 *Recovery plan preparation*

The TSC Act provides a legislative framework to protect and encourage the recovery of threatened species, endangered populations and endangered ecological communities in NSW. Under this legislation the Director-General of Department of Environment and Conservation (DEC) has a responsibility to prepare Recovery Plans for all species, populations and

ecological communities listed as endangered or vulnerable on the TSC Act schedules. Similarly, the EPBC Act requires the Commonwealth Minister for the Environment to ensure the preparation of Recovery Plans for nationally listed species and communities or adopt plans prepared by others including those developed by State agencies. Both Acts include specific requirements for the matters to be addressed by Recovery Plans and the administrative process for preparing Recovery Plans.

This Recovery Plan has been prepared to satisfy both the requirements of the TSC Act and the EPBC Act and therefore will be the only Recovery Plan for the species. It is the intention of the Director-General of DEC to forward the final version of this draft Recovery Plan to the Commonwealth Minister of the Environment for adoption, once it has been approved by the NSW Minister for the Environment.

2.3 Recovery plan implementation

The TSC Act requires that a public authority must take any appropriate measures available to implement actions included in a Recovery Plan for which they have agreed to be responsible. Public authorities and councils identified as responsible for the implementation of Recovery Plan actions are required by the TSC Act to report on measures taken to implement those actions. In addition, the Act specifies that public authorities must not make decisions that are inconsistent with the provisions of the Plan. Similarly, the EPBC Act specifies that a Commonwealth agency must not take any action that contravenes a Recovery Plan.

The public authority responsible for the implementation of this Recovery Plan is the Department of Environment and Conservation.

2.4 Critical Habitat

The TSC Act makes provision for the identification and declaration of Critical Habitat. Under this Act, Critical Habitat may be identified for any endangered species, population or ecological community occurring on NSW lands. Once declared, it becomes an offence to damage Critical Habitat (unless the action is exempted under the provisions of the TSC Act) and a Species Impact Statement is mandatory for all developments and activities proposed within declared Critical Habitat.

Under the EPBC Act, Critical Habitat may be registered for any nationally listed threatened species or ecological community. When adopting a Recovery Plan the Federal Minister for the Environment must consider whether to list habitat identified in the Recovery Plan as being critical to the survival of the species or ecological community. It is an offence under the EPBC Act for a person to knowingly take an action that will significantly damage Critical Habitat (unless the EPBC Act specifically exempts the action). This offence only applies to Commonwealth areas. However an action which is likely to have a significant impact on a listed species is still subject to referral and approval under the EPBC Act. Proposed actions within registered Critical Habitat on non-Commonwealth areas are likely to receive additional scrutiny by the Commonwealth Minister.

To date, Critical Habitat, as defined by the TSC Act and the EPBC Act, has not been declared for *Zieria obcordata*. This Recovery Plan identifies habitat features of the currently known *Z. obcordata* sites. These sites however, are more likely to be refuges where the species has survived or 'retreated to', rather than representing critical habitat features for occurrence of

the species. Nevertheless, it appears that in the current landscape, these habitat types are where the species presently survives and although it may not constitute critical habitat, it may warrant protection through declaration as critical habitat. This recovery plan proposes to assess the appropriateness of identifying and nominating critical habitat for *Zieria obcordata*.

2.5 Environmental assessment

The NSW EP&A Act requires that consent and determining authorities, and the Director-General of Department of Environment and Conservation as a concurrence authority, consider relevant Recovery Plans when exercising a decision-making function under Parts 4 and 5 of the EP&A Act. Decision-makers must consider known and potential habitat, biological and ecological factors and the regional significance of individual populations.

Local councils, the Department of Infrastructure, Planning and Natural Resources and Rural Lands Protection Boards are the main public authorities that must consider *Zieria obcordata* while undertaking or approving activities on private or crown land.

Any other action not requiring approval under the EP&A Act, and which is likely to have a significant impact on *Z. obcordata*, will require a Section 91 Licence from the Director-General of DEC under the provisions of the TSC Act, (except where there is provision in the TSC Act for such an action). A Section 91 Licence may be issued with or without conditions, or refused.

The EPBC Act regulates actions that may result in a significant impact on nationally listed threatened species and ecological communities. It is an offence to undertake any such actions in areas under State or Territory jurisdiction, as well as on Commonwealth-owned areas, without obtaining prior approval from the Commonwealth Environment Minister. As *Z. obcordata* is listed nationally under the EPBC Act, any person proposing to undertake actions likely to have a significant impact on this species should refer the action to the Commonwealth Minister for the Environment for consideration. The Minister will then decide whether the action requires EPBC Act approval.

Administrative guidelines are available from the Department of Environment and Heritage to assist proponents in determining whether their action is likely to have a significant impact. In cases where the action does not require EPBC Act approval, but will result in the death or injury of any *Z. obcordata*, and the species is in or on a Commonwealth area, a permit issued by the Commonwealth Minister under the EPBC Act will be required.

The Environment Minister can also delegate the role of assessment and approval to other Commonwealth Ministers under a Ministerial Declaration and to the States and Territories under bilateral agreements. The development of a bilateral agreement between NSW and the Commonwealth is not yet complete, but when in place will avoid the need for duplication of environmental assessment.

3 Current Conservation Status

Zieria obcordata is listed as ‘endangered’ under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the NSW *Threatened Species Conservation Act 1995* (TSC Act). The species is also listed as ‘endangered’ under the

4 Description and Taxonomy

4.1 General

Zieria obcordata Cunn. (Rutaceae) is a multi-stemmed, rounded perennial shrub up to 0.5 m in height and usually wider than high, sometimes tending towards a prostrate or sprawling habit (Figure 1). The species is distinctively aromatic and has been described as a ‘prostrate dwarf shrub’, ‘low sprawling sub-shrub’ and ‘compact, rounded sub-shrub’ (Briggs and Leigh 1990; herbarium records in Mackay and Gross 2000). *Z. obcordata* plants tend to occur around the base of granite boulders and in crevices between boulders, in eucalypt woodland with open low shrub understorey on moderate rocky slopes.

4.2 Taxonomic description

Zieria obcordata was originally described by Cunningham in Field (1825). The specific epithet refers to the characteristic obcordate (two-lobed, heart-shaped) apex of the central leaflet (Porteners 2000) (Figure 2).

Z. obcordata is described by Armstrong (1991a) and Briggs and Leigh (1990) as a dense, rounded, perennial, divaricate shrub 0.4 - 0.5 m high, with generally hairy branches. The leaves are small, opposite, hairy and comprised of three leaflets, with the upper surfaces covered in numerous small warts. The central leaflet is flattish, broad-oval to wedge-shaped, 3 - 10 mm long and 1.3 – 5.0 mm wide. The leaf tip is blunt, or notched and heart-shaped, or just recurved giving it a notched appearance. Secondary leaflets are similar but only about two-thirds the size. The leaf petiole is 1.5 – 3.0 mm long.

The inflorescences (clusters of individual flowers) are shorter than the leaves and the inflorescence stalk is hairy. The flowers are arranged singly or in small clusters in the leaf axils. Each flower is about 5 - 6 mm across with the petals being 2.0 - 2.5 mm long, white or pale-pink fading rapidly to white. The sepals are triangular, generally hairy and about 1 mm long. The fruit is a hairy capsule about 5 mm across which is deeply divided into four chambers. Each of the four chambers of the fruit contains one or rarely two elliptical seeds about 2 mm long (Briggs and Leigh 1990).



Figure 1: *Zieria obcordata* shrub (Photo: G. Robertson).



Figure 2: *Zieria obcordata* characteristic flowers and leaves (Photo: G. Robertson).

4.3 Taxonomic significance

There are 44 species of *Zieria* world wide, with 43 of these species being endemic to Queensland, New South Wales, Victoria, Tasmania and South Australia. Thirty-three (33) species occur in New South Wales (Armstrong 1991a).

The *Zieria* genus has an extremely high proportion of threatened species, compared with other genera. Seventeen of the 33 species in NSW (51.5%) are listed as threatened under the TSC Act and 22 of the 43 species throughout Australia are listed as threatened under the EPBC Act.

The large proportion of threatened *Zieria* species suggests that the genus is highly susceptible to threatening processes and human induced disturbances. Conservation, management and research of *Z. obcordata* may provide an insight into the requirements of not only this species but of the genus in general and may assist in guiding the recovery of other *Zieria* species. Furthermore, the differences in distribution between similar threatened *Zieria* species provides a potential insight into the extent and impact of threats on various species within the genus.

5 Distribution

5.1 Current and historic distribution

Zieria obcordata is endemic to NSW. It has a very restricted distribution with a geographic range of approximately 110km from near Bathurst on the Central Tablelands to near Wellington on the Central West Slopes of NSW (Figures 3 and 4).

The species was first collected by Alan Cunningham in 1822 at “Hills on Macquarie River” (Mackay and Gross 2000). Due to this very broad description the precise locality of the type specimen cannot be re-located (Briggs and Leigh 1990). The collection may have been from (or near) the current known location near Wellington or from another site not yet found. Following Cunningham’s collection the species was again collected in 1947 by Althofer at a locality east of Wellington, then by Ingram in 1963 west of Bathurst, then again in 1978 by both Coveny and Armstrong in separate collections from the Wellington site (Mackay and Gross 2000). The final collection of the species was made by Johnstone in 1994 near Crackerjack Rock (Mackay and Gross 2000).

The existence of a single population of *Z. obcordata* near Wellington and four small populations near Bathurst has been recently confirmed. A sixth population was previously recorded, also in the Bathurst area (Briggs and Leigh 1990), however, a recent survey of the site failed to locate *Z. obcordata* in this location. Searches for suitable habitat and populations between Bathurst and Wellington were conducted in Spring 2002. No further populations were discovered despite the existence of suitable ungrazed remnants in parts of the landscape. Further details of these searches are provided in Section 9.1 of this plan.

Twelve specimens of *Z. obcordata* have been lodged at various herbaria in Australia. A number of cuttings have also been taken from several populations for the purposes of cultivation. However, only a few have survived in the Australian National Botanic Gardens (ANBG), Canberra. Section 9.2 of this plan provides further information regarding these specimens.

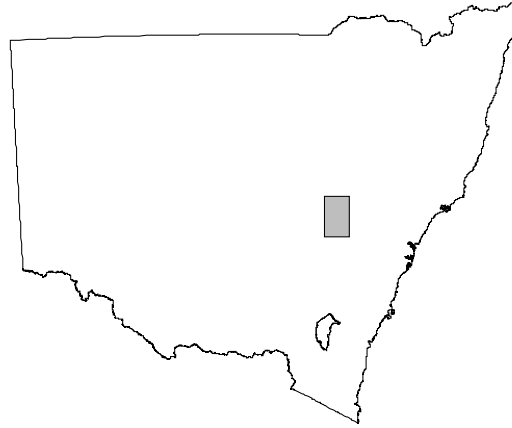


Figure 3: Range of *Z. obcordata* in New South Wales.

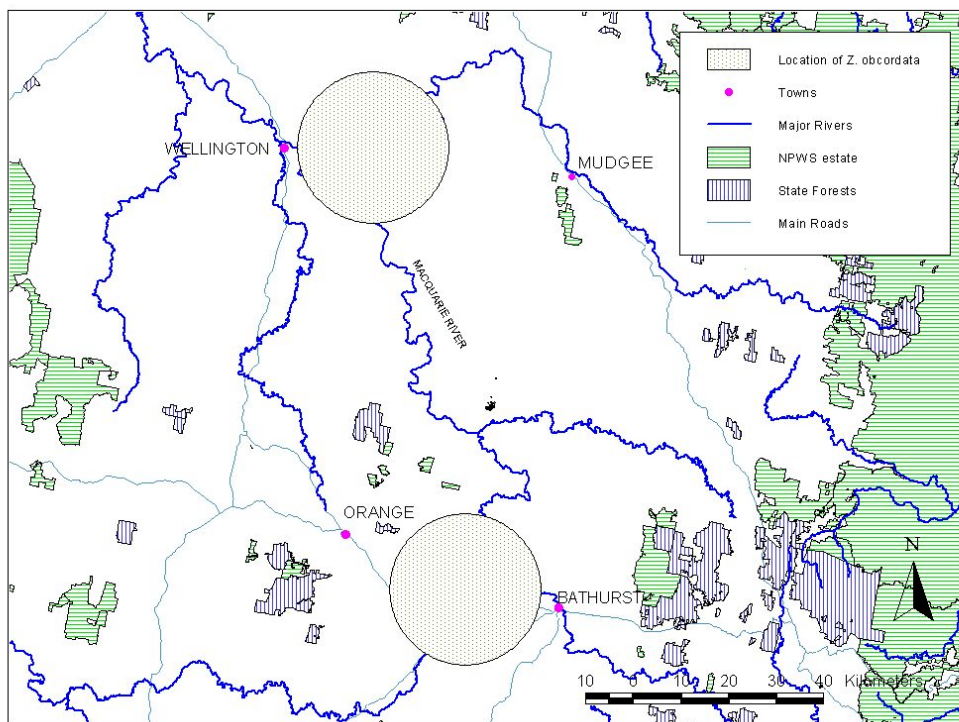


Figure 4: General location of *Z. obcordata* near Wellington and Bathurst, NSW.

5.2 Tenure

All known populations of *Z. obcordata* occur on private land within the Wellington and Evans Local Government Areas.

6 Habitat

6.1 Topography, soils and microhabitat

At both locations near Wellington and Bathurst *Zieria obcordata* grows (predominantly) on gentle to moderately steep, west- to north-facing slopes of low hills or ridges, in undulating terrain of low hills (Figure 5) (Briggs and Leigh 1990). The altitudes of the sites range from 500 to 830 m and all sites have granite boulders, outcrops, and/or exposed granite. The *Z. obcordata* plants typically occur around the base of the granite boulders, in crevices between the boulders, and nearby (Figure 6).

Soil types recorded at the sites are generally sandy &/or gravelly loams amongst granite boulders. They have been variously described as shallow sandy loam, and brown to dark brown, sometimes shallow, gravelly loams, with a substrate of outcropping, or extensively exposed, granite (sometimes pink) (Briggs and Leigh 1990). The soils at two sites have also been described as skeletal (Johnstone, herbarium records in Mackay and Gross 2000, Robertson pers. comm.).



Figure 5: *Zieria obcordata* habitat at ‘Bulbudgerree’ (Photo: G. Robertson).



Figure 6: Typical microhabitat of *Zieria obcordata* - growing amongst granite boulders (Photo: M. Bannerman).

6.2 Vegetation

Zieria obcordata occurs in a variety of vegetation types that can broadly be described as Eucalypt woodlands with open, low shrub understoreys (Briggs and Leigh 1990). Some habitats have also been described as shrublands dominated by species of *Acacia* (Armstrong 1991a).

Some of the more common species at the Bathurst sites include *Eucalyptus goniocalyx* (Bundy) and *Callitris endlicheri* (Black Cypress) in the upper-storey. Two of the Bathurst sites have been cleared in the past and therefore have no over-storey. However, past records and the surrounding vegetation suggest that *E. goniocalyx*, *E. macrorhyncha* and *C. endlicheri* were present prior to clearing. At the Wellington site *Angophora floribunda* (Rough-barked Angophora) and *Acacia implexa* (Hickery Wattle) are dominant in the upper-storey with some *Brachychiton populneus* (Kurrajong) present.

Under-storey species also vary between sites, although most have a shrubby under-storey with a groundcover of native grasses and rock ferns (*Cheilanthes sp.*). The under-storeys at the Bathurst sites contain predominantly *Acacia vestita* and *Dodonaea sp.* (Hopbush) with *Calytrix tetragona*, *Westringia eremicola* and *Brachyloma daphnoides* being present at some of the sites. The Wellington site is dominated mainly by *A. vestita* and *Pandorea pandorana* (Wonga Vine). *Stypandra glauca* and *Lepidosperma laterale* are also common to most sites.

The sixth site, from which *Z. obcordata* had been previously recorded but where the species was unable to be found in the 2002 surveys, contains predominantly *E. macrorhyncha* (Red Stringybark), *E. goniocalyx* (Bundy) and *C. endlicheri* (Black Cypress) in the upper-storey. Mid- and lower-storey species are also similar to other sites. However, the structure of the vegetation in the understorey differs considerably to that of the other sites. The mid-storey is denser, there is very little understorey and the groundcover, although grassy, contains more ground litter than the other sites.

Very few weeds were present at the Bathurst sites when they were surveyed in 2002. Exotic species that were found included: Blackberry (*Rubus fruticosus*), Quaking Grass (*Briza maxima*), Saffron Thistle (*Carthamus lanatus*), Heliotrope (*Heliotropium amplexicaule*) and Flatweed or Catsear (*Hypochaeris radicata*) (Robertson pers. comm.). The Wellington site also contained the exotic Tree of Heaven (*Ailanthus altissima*), which commonly occurred throughout the surrounding landscape.

6.3 Climate

Wellington has a climate characterised by cool wet winters and hot summers with variable rain. The average summer maximum temperature is 31°C and the average winter maximum temperature is 16°C. The mean annual rainfall is 613 mm, with winter having an average of 149 mm over three months (median 135 mm) and summer an average of 166 mm over three months (median 128 mm) indicating the variability of summer rains. These records are based on the equivalent of 78-116 years of records (Bureau of Meteorology).

Bathurst has cold winters and mild wet summers. The average summer maximum temperature is 27°C and the average winter maximum temperature is 12°C. The mean annual rainfall is 629 mm with winter having an average of 142 mm over three months (median 123 mm) and summer an average of 190 mm over three months (median 162 mm). These records are based on the equivalent of 74-90 years of records (Bureau of Meteorology).

7 Biology and Ecology

7.1 Reproductive Biology

The flowering period for *Z. obcordata* occurs in spring (Armstrong 1991a; Briggs and Leigh 1990). However, phenological data collected from herbarium specimens indicate that plants can flower from September through to March. Recent surveys conducted in 2002 found the plants flowering from September to November with very few plants flowering in late November. Additionally, specimens with fruits have only been collected from September to November (Mackay and Gross 2000).

Armstrong (1991b, in Mackay and Gross 2000) also reports that the species possesses functional pollen but is genetically self-incompatible, thus requiring outcross pollen to set seed. All populations at present contain sufficient plant numbers for cross-pollination to occur within each population and the Bathurst populations occur close enough to enable cross-pollination to occur between sites. The Wellington population, however, is geographically separated from the Bathurst populations. Therefore it is unlikely that cross-pollination occurs between the two localities and highly likely that the Wellington population is genetically distinct from the Bathurst populations. Genetic investigations will be required to determine this.

No formal studies have yet been conducted on pollination in this species, although native bees, hover flies and a bush fly have been observed on *Z. obcordata* plants and flowers, suggesting that these may be pollinators (Robertson pers. comm.; Thompson 1999).

Very little else is known about the reproductive biology and ecology of *Z. obcordata* and further research is required in these areas to better understand the requirements of the species.

7.2 Population size

At present five separate existing populations of *Z. obcordata* are known from two general locations. These are from Bathurst and Wellington. These populations comprise of 221 individual live plants covering a combined area of approximately 1.5 hectares.

In 1988, the single population near Wellington contained approximately 100 mature healthy plants over 0.5 ha. No seedlings were observed (Briggs and Leigh 1990). Armstrong (in Mackay and Gross 2000) had previously described the species at this site in 1978 as 'locally occasional'. In September 2002, 77 healthy plants were found.

Another recent survey conducted in October 2002 around the Bathurst sites revealed the following populations counts: 10 plants at Crackerjack Rock site 1, 49 plants at Crackerjack Rock site 2, 58 plants at the Ophir Road site and 27 plants at the Pine Ridge site. Current estimates of population size and the area occupied by each population are provided in Table 1. The sixth site near Bathurst (known as Crackerjack Rock site 3), where *Z. obcordata* was unable to be found in 2002, has also been included, as it was a previously known and confirmed *Z. obcordata* site.

Table 1: *Zieria obcordata* population sizes and areas occupied as at October 2003.

| Location | Total Number of Plants | Area occupied (ha) |
|---------------------|------------------------|--------------------|
| Bulbudgerree | 77 | 1.0 |
| Crackerjack Rock 1 | 10 | 0.05 |
| Crackerjack Rock 2 | 49 | 0.05 |
| Ophir Road | 58 | 0.25 |
| Pine Ridge | 27 | 0.10 |
| Crackerjack Rock 3* | 0 | 0 |
| TOTAL | 221 | 1.45 |

*Previously known site. *Z. obcordata* not found in 2002 surveys.

8 Management Issues

8.1 Threats and Reasons for Decline

Zieria obcordata is a rare species, characterised by extremely low population numbers, in specific habitat, across a highly restricted geographic range (Cropper 1993). It is likely that the species has declined across its range since European settlement of the area. However, it is unknown whether this decline is continuing at present. Not enough is known about the life history and biology of the species to determine whether recent disappearances at previously known locations are localised extinctions at this stage or whether a viable seedbank exists in the soil at these locations. Nevertheless, the species is rare with less than 220 known individual plants being recorded in 2003. With such critically low numbers, it is vital that known and potential threats and causes of decline are identified and if possible, mitigated.

8.1.1 Weed invasion

Weed invasion is a significant threat to *Z. obcordata* at the Wellington site with a major infestation of the Tree of Heaven (*Ailanthus altissima*) throughout the population. This species suckers vigorously from roots and has a tendency to expand over considerable areas in a short period of time (Cunningham *et al* 1992). Many medium to large trees and numerous small suckers were observed at the Wellington site in and around the core habitat area of *Z. obcordata*. This species is likely to overtake the rocky outcrop on which *Z. obcordata* occurs and out-compete numerous native species, including *Z. obcordata*. Weeds at the Bathurst site included Blackberry (*Rubus fruticosus*), Quaking Grass (*Briza maxima*), Saffron Thistle (*Carthamus lanatus*), Heliotrope (*Heliotropium amplexicaule*) and Flatweed or Catsear (*Hypochaeris radicata*) (Robertson, pers. comm.). These weeds did not occur in large numbers and are unlikely to pose a threat to *Z. obcordata* at these sites.

8.1.2 Environmental Stochasticity

Z. obcordata is a highly restricted and rare species, known from only two locations across a geographic range of 100km. Stochastic environmental events such as severe drought, wildfire or the introduction of a pest or disease pose a significant threat to the survival of these populations, with one event likely to cause either localised or complete extinction of the species.

8.1.3 Inappropriate management

Appropriate management of *Z. obcordata* is difficult without adequate knowledge and understanding about the biology and ecology of the species. This lack of knowledge may lead to inappropriate management of the species or the environment in which it inhabits, potentially threatening the survival of the species. Possible threats that may arise due to a lack of knowledge about the species are outlined below.

High frequency fire

“High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition” is listed as a Key Threatening Process under the NSW TSC Act 1995. The response of *Z. obcordata* to fire is unknown. Nevertheless, until further knowledge is gained in regards to this, high frequency fire should be avoided in areas where *Z. obcordata* occurs or is known to have previously occurred.

Excessive browsing

There is no conclusive evidence to show that browsing by either domestic stock and/or native herbivores has a significant impact on *Z. obcordata* populations. Clear evidence shows that the species is palatable to herbivores (Briggs and Leigh 1990, Shelley pers. comm.). However, the extent and severity of browsing on *Z. obcordata* is unknown. Nevertheless, excessive grazing and trampling caused by hooved stock has the potential to threaten the species. Monitoring of the wild population should occur to determine if grazing poses a significant threat to the species and at this stage, a precautionary approach with regards to browsing should be taken, with excessive browsing on *Z. obcordata* being avoided where possible.

8.1.4 Development

Development for rural-residential purposes is also considered to be a threat to *Z. obcordata*. Clearing for development purposes immediately adjacent to *Z. obcordata* sites may introduce threats from invading weeds, high numbers of native herbivores concentrated in the remaining areas of habitat, and other threats related to potential development. Such developments potentially pose additional threats to the species. Experiences with other species (including another *Zieria* species) in similar situations has exposed potential threats (Briggs, pers. comm. and Robertson, pers. comm.) including:

- physical damage from built structures,
- dumping of building rubble,
- introduction of weeds,
- competition from garden-escape plant species,
- escape of snails and slugs from gardens,
- introduction of other invertebrate pests,
- introduction of pathogens via garden plantings (eg fungi, viruses etc),
- altered water regimes due to changed run-off or run-on,
- run-on of garden fertilisers which would alter soil chemistry,
- potential drift, or direct application, of insecticides or herbicides (which could affect both the plants and essential pollinators),
- habitat modification from garden plantings eg increased shading from planted trees/shrubs, or removal of trees/shrubs from the area of the population,
- increased trampling and pollution from people and pets, and
- possible increase in native herbivore numbers due to attraction to lawn and water.

Such threats may directly impact on *Z. obcordata* plants or indirectly affect them by encouraging weed growth and other potential competitors.

Although *Z. obcordata* is located in rural areas, the potential for these areas to be subdivided and developed for rural residential purposes has already been demonstrated and may pose a threat to existing populations, should further development occur in the future.

8.2 Social and economic issues

8.2.1 Economic considerations

Any adverse social and economic consequences of conserving *Z. obcordata* are either unknown or insignificant at this stage.

The properties that support the presently known populations of this species are privately owned and currently used for grazing or have been in the recent past. Due to the rocky nature of the sites, the poor soils, and the moderate to moderately steep slopes, it is unlikely they would be further developed for grazing or agriculture. Hence, protection of the species at these sites from current and/or increased grazing pressure is unlikely to impose any significant social or economic consequences on the landholders, especially considering the relatively small area they occupy.

Rural-residential development is a potential threat, particularly for agriculturally poor sites that are close to towns with expanding populations. As the *Z. obcordata* populations are only

small in area, it is possible that negotiations regarding any potential developments may enable plans to be adjusted and adequate buffer zones around populations established and enforced, as was the case at a site near Bathurst. Given that the areas in consideration are small, and usually occur in very rocky sites (including exposed bedrock), such compromises should not have any significant economic consequences on proposed developments.

In addition, the direct costs of achieving the objectives of this recovery plan will be minimal and borne by Government.

8.2.2 Social considerations

Social benefits that may result from the implementation of this Recovery Plan include increased public awareness and understanding of threatened species and the threats that affect them as well as the benefits associated with the maintenance of biodiversity and sustainable ecosystems. In addition, landholders that become involved in recovery actions for the species will gain a sense of ‘ownership’ of these actions and pride in the knowledge that they have been involved in the conservation of a threatened species for both current and future generations.

Submissions from the community regarding other likely social and economic consequences of implementing the actions in this Recovery Plan are welcome during the draft exhibition period.

8.3 Biodiversity benefits

The conservation of *Z. obcordata* in its natural habitat will also benefit other plant and animal species and will protect the rock outcrop communities in which they occur. Various fauna species that have been identified at the sites include the Red-bellied Black Snake, Shingleback, Swamp Wallaby, Echidna, Eastern Grey Kangaroo, Wedge-tailed Eagle and Brown Falcon. Invertebrate species and pollinators associated with *Z. obcordata* will also be protected within the community. The protection of these species will contribute to the overall conservation of biodiversity within the granite rock outcrop communities of the Central West of NSW.

Given that the genus *Zieria* has the highest proportion of threatened species in the state, the protection of other *Zieria* species that occur in or near the habitat of *Z. obcordata* will be a benefit to the genus. *Zieria cytisoides* has also been identified in similar rocky outcrops within the range of *Z. obcordata* and will therefore also benefit from the protection of these outcrops.

8.4 Roles and Interests of Indigenous Communities

Zieria obcordata was used by Aboriginal people for its medicinal properties. In particular, the leaves of the plant were used for the treatment of headaches. The medicinal properties of the plant are enhanced by the presence of companion plants that also occur in the habitat of *Z. obcordata* (B. Allen, pers. comm.).

9 Previous Actions Undertaken

9.1 Surveys

In 1988 Briggs and Leigh (1990) checked all known records of *Zieria obcordata* in the field and searched for the species in potential habitat areas. They confirmed and assessed the Wellington population and the two Bathurst populations then known. Similar granite outcrops in the vicinity of Wellington and Bathurst were also searched but with no success. All the areas that were searched had been subjected to domestic stock grazing and much of the native understorey was destroyed (Briggs and Leigh 1990).

Further surveys in the Bathurst and Wellington areas were conducted by DEC in 2002. Surveys involved both on ground searches in areas of suitable habitat and road based surveys for further potential habitat. A total of 22.5 person hours were spent searching suitable habitat and 103 km of road based surveys were conducted. The surveys confirmed the location of five discreet populations (one near Wellington and four around Bathurst) and assisted in identifying potential habitat where further surveys are required.

9.2 Cultivation

Z. obcordata is very difficult to maintain in cultivation (Briggs and Leigh 1990) and previous attempts to establish plants ex-situ have either failed or resulted in very low survival rates. At present, a total of 9 plants survive in the Australian National Botanic Gardens, Canberra following numerous attempts over the past 25 years to establish ex-situ populations. In 1978 the Sydney Royal Botanic Gardens took cuttings from the Wellington population. By 1988, only one of these cuttings had survived at the Australian National Botanic Gardens in Canberra. None had survived in Sydney (Armstrong pers. comm. in Briggs and Leigh 1990).

Cuttings were again taken from both the Wellington and Bathurst locations in 1988 and sent to Canberra (Briggs and Leigh 1990). The strike rate for these cuttings was 20%, survivorship was 10% and growth rates were very slow. The best growth was achieved with plants in a very sandy well-drained soil. Eight plants cloned from 3 parent plants from the Wellington site were still alive in 1990 (Briggs and Leigh 1990) and are presumed to be 8 of the 9 plants that currently survive at the ANBG in Canberra (Pedersen pers. comm.). The remaining plant is presumed to be either the single plant surviving from 1978 or another cutting taken in 1988 from Wellington.

Other attempts to cultivate plants have proved unsuccessful. One plant from the Bathurst site and four from Wellington were established in pots at CSIRO Division of Plant Industry in Canberra in 1988 however, none survived. Attempts to establish specimens at Burrendong Arboretum in Wellington also failed (Briggs pers. comm.). Cuttings taken from four plants at one of the Bathurst populations in 1994 and established in pots at Mt Annan Botanic Gardens in western Sydney did not survive beyond 1999. All currently surviving plants have originated from the Wellington population with no plants surviving from the Bathurst populations.

The cultivation difficulties encountered with this species highlight the necessity for it to be conserved in its natural habitat (Briggs and Leigh, 1990). Past attempts to establish ex-situ populations have been largely unsuccessful and further attempts are likely to be extremely difficult. Therefore, all efforts to conserve the species in-situ are considered to be of highest

priority, with attempts to establish an ex-situ seed bank considered a more appropriate action than cultivating an ex-situ population.

9.3 Protection

Two of the four Bathurst populations have been fenced off from domestic stock and native herbivores. One of these populations exists within a fenced area surrounding a residence. The other population has been fenced as a result of a decision in the Land & Environment Court to protect the population (see below). The remaining two populations are unfenced, although attempts have been made to prevent browsing on a couple of plants by erecting chicken wire around the individual plants. Fencing was also erected around the Wellington site in the past but was not completed. At present, this site remains partially fenced off from domestic stock, although sheep continue to graze in the area for a couple of weeks per year and native herbivores have unrestricted access to the site.

A positive covenant under section 88B of the *Conveyancing Act 1919* has also been placed on one of the Bathurst sites. The covenant specifies that a fence and signs marked “Restricted Area” must be erected and maintained around the *Z. obcordata* population. It also states that no stock are to enter the fenced area and that no activities are to be carried out in or near the site that will impact on the health and wellbeing of the species. Such activities include spraying, picking of the species, grazing within the area and any activity that is likely to modify the nutrient or moisture content of the area. It is the responsibility of Evans Shire Council and the landholder to ensure that the specifications of the Covenant are adhered to. Both the council and the landholder are aware of their responsibilities and consultation with DEC will occur, if necessary, regarding any concerns with the adequacy of the covenant.

10 Species Ability to Recover

Z. obcordata exists in five small populations within a very limited range. No populations exist within conservation reserves and the ecology of the species is poorly understood, particularly with regard to the effects of threats on the species.

The five remaining populations appear to be viable. There are a variety of size classes in each population and plants have recently been observed flowering and producing fruit. In addition, the known and obvious threats to the species can be readily managed which should enhance the species chances of survival and assist in its recovery.

Provided the recovery actions are implemented and a precautionary approach is taken to management of the species, the chances of *Z. obcordata* recovering in the wild are promising.

11 Recovery objectives and performance criteria

11.1 Objectives of the Recovery Plan

The overall aim of this recovery plan is to promote the recovery of *Zieria obcordata* in the wild.

The specific objectives are to:

1. determine the status and distribution of *Z. obcordata* throughout New South Wales;
2. protect all populations of *Z. obcordata* from known and potential threats;
3. ensure that there is no loss of *Z. obcordata* plants as a result of human-induced disturbances;
4. improve our knowledge and understanding of the species' habitat requirements, reproductive biology, ecology, genetic variability and the impact of threats, particularly from fire and grazing;
5. establish a representative and viable ex-situ seed bank;
6. achieve a cooperative approach, between the DEC and landholders, towards the conservation of the species.

11.2 Recovery performance criteria

Recovery performance criteria are that:

1. any extant populations of *Z. obcordata* are located and recorded;
2. all *Z. obcordata* populations are adequately protected from threats;
3. no reduction in plant numbers due to human-induced causes occurs in any *Z. obcordata* population;
4. the ecology, habitat requirements, reproductive biology, genetic variation and impact of threats, particularly fire and grazing, on the species are better understood;
5. an ex-situ seed bank is successfully established;
6. a cooperative approach amongst all stakeholders towards the conservation of the species is achieved.

12 Recovery Actions

12.1 Action 1 – Surveys

The Department of Environment and Conservation will continue to identify potential habitat and undertake targeted surveys for *Z. obcordata* in suitable areas with the permission of relevant landholders. Surveys will be completed within 12 months of commencement of the Recovery Plan. In undertaking surveys for new populations of *Z. obcordata*, the DEC will seek to involve students, volunteers, community groups and landholders in the survey effort.

If new populations are located, information will be collected regarding their location, habitat, demographics and potential threats. Information gained from these surveys will be stored in the NSW Wildlife Atlas and specimens will be lodged with the NSW Herbarium. The DEC will also inform all relevant landholders and councils of any new distributional data within 3 months following the surveys, so that informed habitat management decisions can be made.

Outcome:

The existence of further *Z. obcordata* populations will be determined and will provide additional data regarding the distribution of the species, habitat requirements and threats, which in turn will provide further research opportunities for this species.

Agency responsible for implementation:

Department of Environment and Conservation

12.2 Action 2 – Monitoring

To determine whether populations of *Z. obcordata* are declining, remaining stable or increasing, a monitoring program will be developed and implemented. Base-line data will be collected at the commencement of the recovery plan and monitoring will be conducted annually.

Outcome:

A standardised monitoring protocol will be established and monitoring of populations commenced. Ongoing monitoring will also assist in identifying trends in mortality and recruitment over time, which will further assist in guiding management efforts.

Agency responsible for implementation:

Department of Environment and Conservation

12.3 Action 3 – Weed removal

The Tree of Heaven (*Ailanthus altissima*) poses a significant threat to the Wellington population. With the permission of the relevant landholder, a weed removal program will be

developed and undertaken to eradicate *Ailanthus altissima* from the core habitat of *Z. obcordata* at this site.

Outcome:

The threat to the Wellington population from *Ailanthus altissima* will be eradicated.

Agency responsible for implementation:

Department of Environment and Conservation

12.4 Action 4 – Ecological research

There has been limited study of the life history attributes of the genus *Zieria* (Armstrong 2002, Auld 2001). Further research is required particularly in the areas of population ecology and reproductive biology. Specific areas of research that are required for this species include:

- examining flowering, pollination and seed set;
- determining the viability of seeds and seed bank dynamics including the period of time required to establish an adequate seed bank;
- investigating the germination requirements of the species and seedling survival;
- determining plant longevity, mortality and recruitment rates;
- identifying habitat requirements.

In addition to this research, experimental studies on the effects of fire and other physical disturbances such as grazing, should be conducted on the species. If particular disturbances are determined to be a threat to the species, appropriate measures will be taken to minimise these threats. These measures may include the erection of fences around the populations and/or individual plants. Options to protect these populations will be discussed with the relevant landholders. In the meantime, a precautionary approach to these disturbances should be taken, with high frequency fires (less than 10 year interval) and excessive browsing being avoided in areas where the species occurs.

The DEC will encourage the involvement of research institutes and universities in this action, which will be implemented throughout the duration of the Recovery Plan. The DEC may also provide funding for research in particular areas to be conducted.

Outcome:

The overall knowledge and understanding of the species' ecology will be improved, which, in turn, will guide conservation and management actions and benefit the species in the long term. Specific outcomes may include an increased knowledge of the species habitat requirements, a better understanding of the impacts of threats on the species and improved understanding of the reproductive biology of the species. In addition, the impacts of fire and grazing on the species will be determined and measures taken to minimise these threats if required.

Agency responsible for implementation:

Department of Environment and Conservation

12.5 Action 5 – Genetic research

No genetic investigations have been carried out for *Z. obcordata* in order to determine the relationships between the different populations. The DEC will examine the extent and pattern of genetic diversity across the populations and will also confirm the genetic origins of the ex-situ plants in the Australian National Botanic Gardens, Canberra.

Outcome:

The extent of genetic diversity within and between the populations will be determined, which will assist in guiding future management decisions.

Agency responsible for implementation:

Department of Environment and Conservation

12.6 Action 6 – Establish an ex-situ seed bank

Z. obcordata occurs in very low numbers in the wild and is in danger of extinction as a result of local stochastic events. It is important therefore, to establish a viable and representative seed bank as insurance against losses in the wild. The Department of Environment and Conservation will undertake research to determine the viability of seeds and investigate the germination requirements of the species. From their investigations, they will also determine the most appropriate storage conditions required and establish a seed bank with seeds collected from the five individual populations. The aim will be to establish a seed bank within 5 years of commencement of the Recovery Plan.

Outcome:

Seeds will be collected from each population and suitably stored. This will assist in providing stock for possible future reintroduction of the species, should the species become extinct in the wild.

Agency responsible for implementation:

Department of Environment and Conservation

12.7 Action 7 – Landholder and community involvement

It is important that landholders and the community be made aware of the significance of threatened species and their habitats and their role in the maintenance of biodiversity. The DEC has and will continue to liaise with relevant landholders regarding the conservation and management of *Z. obcordata* on their properties. An information leaflet for *Z. obcordata* has already been designed and distributed to landholders and the general community and landholders will be encouraged to participate in the monitoring of the populations on their land.

Outcome:

Community appreciation and support for the conservation and protection of *Z. obcordata* will be enhanced and interested landholders will be involved in the monitoring of the populations on their properties.

Agency responsible for implementation:

Department of Environment and Conservation

12.8 Action 8 – Long term protection of sites

Although all present landholders are supportive of the protection of *Z. obcordata* on their properties, long-term protection of the populations should be established to provide protection for the future, should ownership of any properties change hands. Long-term protection may be achieved through Voluntary Conservation Agreements between the Minister for the Environment and the owners. Alternatively, covenants may be placed on the properties to provide protective measures for the populations, as has been done with one site already. In addition, the presence of the species on private land should be alerted to future potential purchasers, developers and council staff through council records. The recording of the presence of *Z. obcordata* on section 149 Certificates under the provisions of the *Environmental Planning and Assessment Act 1979* will assist in achieving this.

The options of long term security of the sites will be discussed and encouraged with the relevant landholders. The DEC recognises that a range of options may be used to achieve protection of populations on private land and that the suitability of these options will depend on the circumstances and preferences of individual landholders. The DEC will also discuss with relevant councils the recording of the species on section 149 Certificates (EP&A Act) for the relevant properties.

Outcome:

The establishment of long term security measures, which will provide further protection for the species and its habitat.

Agency responsible for implementation:

Department of Environment and Conservation

12.9 Action 9 - Consider nomination of Critical Habitat

The benefits of identifying and nominating critical habitat for the species will be considered. If nomination of critical habitat is considered to be appropriate for the species, the DEC, after consultation with the relevant landholders, will make a recommendation to the Minister for the declaration of critical habitat.

Outcome:

The need to identify and nominate critical habitat for *Z. obcordata* will be determined and a recommendation will be made to the Minister if appropriate.

Agency responsible for implementation:

Department of Environment and Conservation

12.10 Action 10 - Recovery Plan coordination

Effective coordination of this plan is essential to ensure its implementation is conducted in a timely, cost-effective and efficient manner. Coordination of this plan will involve liaison with other recovery programs to ensure that actions do not adversely impact upon other threatened species. Coordination will also involve effective liaison with relevant government agencies, landholders and other stakeholders.

Outcome:

The Recovery Plan will be implemented in an efficient and coordinated manner to achieve the stated objectives.

Agency responsible for implementation:

Department of Environment and Conservation

13 Alternative Management Strategies

13.1 No management action taken

An alternative strategy for the management of *Z. obcordata* is to undertake no management action for the species. This species is endemic to NSW and is listed both statewide and nationally as endangered. All *Z. obcordata* populations occur outside conservation reserves, across a limited geographic range and are all with a total number of 221 individual plants. If no management action is undertaken to protect this species, it is highly likely that the five remaining populations will become extinct. Therefore, no management action is considered not to be an appropriate strategy.

13.2 Establish an ex-situ population

In order to provide insurance against the loss of *Z. obcordata* in the wild, this recovery plan aims to undertake ex-situ conservation of the species. The establishment of an ex-situ population could be attempted. However, the difficulties in the past of maintaining an ex-situ population of *Z. obcordata* suggest that these attempts would probably be unsuccessful. Therefore the establishment of an ex-situ population is not considered appropriate. An ex-situ seed bank has been proposed instead.

14 Preparation details

This recovery plan was prepared by Melanie Bannerman, Threatened Species Officer of the Department of Environment and Conservation, Environment Protection and Regulation Division, Threatened Species Unit, Dubbo.

14.1 Date of last amendment

No amendments have been made to date.

14.2 Review Date

This Recovery Plan and the conservation status of *Zieria obcordata* will be reviewed by the DEC within five years of the date of publication. In evaluating the success or otherwise of the Recovery Plan, the DEC will liaise with other relevant stakeholders including the Commonwealth Department of Environment and Heritage, Wellington and Evans Shire Councils and the relevant landholders of the properties where *Z. obcordata* occurs.

Table 2: Costing Table

| Action No: | Description | Priority | Estimated Cost/yr | | | | | Total Cost | Responsible party/funding source | In-kind | Cash |
|--------------|---|----------|-------------------|----------|----------|-----------|---------|------------------|----------------------------------|---------|-----------|
| | | | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | | | | |
| 12.1 | Surveys | 1 | \$10,000 | | | | | \$10,000 | DEC | | \$10,000 |
| 12.2 | Monitoring: | | | | | | | | | | |
| | i. collect baseline data | 1 | \$3,050 | | | | | \$3,050 | DEC | | \$3,050 |
| | ii. ongoing monitoring | 1 | | \$1,500 | \$1,500 | \$1,500 | \$1,500 | \$6,000 | DEC | | \$6,000 |
| 12.3 | Weed removal | 1 | \$5,000 | | \$5,000 | | | \$10,000 | DEC | | \$10,000 |
| 12.4 | Ecological research | 1 | | \$5,000 | \$5,000 | \$5,000 | | \$15,000 | DEC | | \$15,000 |
| | Investigate fire & grazing | 1 | | \$10,000 | | | | \$10,000 | DEC | | \$10,000 |
| | Fencing | 1 | | | | ^\$10,000 | | ^\$10,000 | DEC | | ^\$10,000 |
| 12.5 | Genetic research | 1 | | \$15,000 | | | | \$15,000 | DEC | | \$15,000 |
| 12.6 | Ex-situ Conservation: | | | | | | | | | | |
| | i. seed collection & storage | 1 | \$4,000 | | | | | \$4,000 | DEC | | \$4,000 |
| | ii. germination trials | 1 | \$10,000 | | | | | \$10,000 | DEC | | \$10,000 |
| 12.7 | Landholder and Community Involvement | 1 | Ψ | Ψ | Ψ | Ψ | Ψ | Ψ | DEC | Ψ | |
| 12.8 | Long term protection of sites | 1 | Ψ | Ψ | Ψ | Ψ | Ψ | Ψ | DEC | Ψ | |
| 12.9 | Consider Nomination of Critical Habitat | 2 | | | | Ψ | | Ψ | DEC | Ψ | |
| 12.10 | Recovery Plan Coordination | 1 | \$1,750 | \$1,750 | \$1,750 | \$1,750 | \$1,750 | \$8,750 | DEC | \$8,750 | |
| Total | | | \$33,800 | \$33,250 | \$13,250 | \$18,250 | \$3,250 | \$101,800 | | \$8,750 | \$93,050 |

Priority ratings are: 1- Action critical to meeting plan objectives, 2- Action contributing to meeting plan objectives, 3-Desirable, but not essential action.

‘In-Kind’ Funds represent salary component of permanent staff and current resources.

‘Cash’ Funds represent the salary component for temporary staff and other costs such as the purchasing of survey and laboratory equipment.

^ Funds only required if investigation identifies a threat from browsing.

Ψ No direct cost as action is liaison

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Appendix 1: Making a submission on this Draft Recovery Plan

You are invited to make a written submission to the DEC regarding this draft recovery plan. To make your submission as effective as possible, please:

- refer to the section or action of the plan you wish to address;
- briefly explain the reasons for your comments;
- provide source information or examples where possible; and
- provide your name and address to enable receipt of your submission to be acknowledged.

The DEC will consider all written submissions received during the period of public exhibition and must provide a summary report of those submissions to the Minister for the Environment prior to final approval of this recovery plan.

Please note, that for the purposes of the NSW *Privacy and Personal Information Protection Act* 1998 any comments on this draft recovery plan, including your personal details, will be a matter of public record and will be stored in the DEC records system. Following approval of the plan by the Minister, copies of all submissions, unless marked “confidential”, will be available, by arrangement, for inspection at the DEC office responsible for the preparation of the recovery plan.

Should you not wish to have your personal details disclosed to members of the public once the recovery plan has been adopted, please indicate below that you wish your personal details to remain confidential to DEC and not available for public access. Further information on the *Privacy and Personal Information Protection Act* 1998 may be obtained from any office of the DEC or from the website: www.environment.nsw.gov.au

Submissions should be received no later than the advertised date. Submissions should be addressed to:

The Director General
Department of Environment and Conservation (NSW)
c/- *Zieria obcordata* Recovery Plan Coordinator
Threatened Species Unit
PO Box 2111,
Dubbo NSW 2830
Ph: (02) 6883 5342



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