



***Bertya* sp. Cobar-Coolabah
(Cunningham & Milthorpe s.n., 2/8/73)
Recovery Plan**



July 2002

**NSW
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NSW National Parks and Wildlife Service
43 Bridge Street
(PO Box 1967)
Hurstville NSW 2220
Tel: 02 95856444
www.npws.nsw.gov.au

For further information contact
Threatened Species Unit, Western Directorate.
NSW National Parks and Wildlife Service
P.O. Box 2111
Dubbo NSW 2830
Tel (02) 6883 5330

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Photographer: Matt Cameron

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***Bertya* sp. Cobar-Coolabah**
(Cunningham & Milthorpe s.n., 2/8/73)
Recovery Plan

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

July 2002

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This Recovery Plan was prepared by Robyn Molsher (NPWS-Western). Matt Cameron, Geoff Robertson and Matthew Chambers (NPWS – Western) played a key role editing and in developing recovery actions. Doug Binns (SFNSW) provided helpful comments on the final draft.

Foreword

The conservation of threatened species, populations and ecological communities is crucial for the maintenance of this State's unique biodiversity. In NSW, the *Threatened Species Conservation Act 1995* (TSC Act) provides the framework to conserve and recover threatened species, populations and ecological communities through the preparation and implementation of recovery plans.

The preparation and implementation of recovery plans are identified by both the National Strategy for the Conservation of Australia's Biological Diversity and the approved NSW Biodiversity Strategy as a key strategy for the conservation of threatened flora, fauna and invertebrates. The object of a recovery plan is to document the research and management actions required to promote the recovery of a threatened species, population or ecological community and to ensure its ongoing viability in nature.

This plan describes our current understanding of *Bertya* sp. Cobar-Coolabah, documents research and management actions undertaken to date and identifies actions required and parties responsible to ensure ongoing viability of the species in the wild.

NSW National Parks and Wildlife Service has prepared the *Bertya* sp. a Cobar-Coolabah Recovery Plan with the assistance of a number of people. I thank these people for their efforts to date and look forward to their continued contribution to the recovery of the species.



BOB DEBUS MP
Minister for the Environment

Executive Summary

Introduction

Bertya sp. Cobar-Coolabah occurs only in New South Wales, where it is known from four sites: two western and two coastal sites. It is a slender shrub or small tree to 4 metres high with dark green leaves that have a white lower surface. One population has already disappeared in western New South Wales and two of the remaining populations are senescent. Threats to the species include grazing, inappropriate fire and disturbance regimes and clearing.

Legal Status

Bertya sp. Cobar-Coolabah (Cunningham & Milthorpe s.n., 2/8/73) is listed in NSW as 'Vulnerable' on Schedule 2 of the *Threatened Species Conservation Act* 1995 (TSC Act). It is also listed nationally on the *Environment Protection and Biodiversity Conservation Act* (EPBC Act) 1999 as 'Vulnerable'. This species is not listed in the 1997 IUCN Red List of Threatened Plants.

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 National Parks and Wildlife 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 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.

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 National Parks and Wildlife to forward this Recovery Plan to the Commonwealth Minister of the Environment for adoption, once it has been approved by the NSW Minister for the Environment.

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 including 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.

The only public authority responsible for the implementation of this Recovery Plan is the NSW National Parks & Wildlife Service.

The EPBC Act specifies that a Commonwealth agency must not take any action that contravenes a Recovery Plan.

Recovery Objectives

The overall objectives of this Recovery Plan are to clarify the conservation status of *Bertya* sp. Cobar-Coolabah in NSW and to ensure the viability of known populations.

Specific objectives of this Recovery Plan are to:

1. limit grazing impacts at the Coolabah population;
2. survey potential habitat for further populations;
3. ensure there is recruitment at senescent populations;
4. raise awareness of the conservation significance of *Bertya* sp. Cobar-Coolabah and involve the community in the recovery program.

Recovery Criteria

Recovery criteria for *Bertya* sp. Cobar-Coolabah are as follows:

1. Coolabah population is protected from grazing;
2. the distribution is better understood in the Cobar-Coolabah and coastal areas;
3. viability, dormancy and germination cues of seed understood;
4. management strategies to encourage recruitment at Gibraltar Range and Coolabah implemented;
5. educational material is disseminated and the community is involved in the implementation of the recovery plan.

Recovery Actions

In order to achieve the objectives, a number of specific actions are identified by this Recovery Plan:

1. protection of the Coolabah population;
2. survey;
3. investigation of recruitment;
4. management strategies for the Coolabah and Gibraltar Range populations
5. community liaison and awareness.



BRIAN GILLIGAN
Director-General

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1 Relevant Legislation

1.1 Commonwealth Legislation

Bertya sp. Cobar-Coolabah (Cunningham and Milthorpe s.n., 2/8/73) is listed nationally on the *Environment Protection and Biodiversity Conservation Act* (EPBC Act) 1999 as 'Vulnerable'. 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.

1.2 State Legislation

Threatened Species Conservation Act 1995 (TSC Act): Provides for the protection and recovery of threatened species; the declaration of critical habitat for those species; the proper assessment of any action affecting threatened species, or their habitat; and the licensing of actions that are likely to result in harm to a threatened species or damage to its habitat. *Bertya* sp. Cobar-Coolabah is listed on Schedule 2 of the TSC Act as 'Vulnerable'.

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 Act has been amended in regard to threatened species by the TSC Act 1995. One of the populations of *Bertya* sp. Cobar-Coolabah occurs in Gibraltar Range National Park, an area gazetted under the *National Parks and Wildlife Act* 1974 (NPW Act), and in the care and management of the New South Wales National Parks and Wildlife Service.

Environmental Planning and Assessment Act 1979 (EP&A Act): Provides for the proper assessment of the environmental impact of proposed activities. Assessment of the impact on threatened species has been integrated into the Act through amendments under the TSC Act. Clearing and development applications under consideration by Local Government and other public authorities, which are within the predicted range of *Bertya* sp. Cobar-Coolabah and contain suitable habitat, will need to consider the impact of the proposal on this species.

Native Vegetation Conservation Act 1997 (NVC Act): The clearing of native vegetation in NSW is subject to consent from the Department of Land and Water Conservation in accordance with the NVC Act. The Act is integrated with the EP&A Act, and requires that threatened species are taken into account by the consent authority when considering clearing applications under Part 4 of the EP&A Act. *Bertya* sp. Cobar-Coolabah occurs in the following Regional Vegetation

Committee areas: Cobar (proposed), Northern Slopes and Plains, Northern Tablelands and Clarence.

Western Lands Act 1901: Under the *Western Lands Act 1901*, the Department of Land and Water Conservation may be a determining authority under the EP&A Act. Recovery Plans are one of the matters which should be taken into account by consent authorities as identified under the Department of Urban Affairs and Planning's "Guide to Section 79C" guidelines.

Rural Fires Act 1997: Provides for the preparation of bush fire management plans. These plans may restrict the use of fire or other particular fire hazard reduction activities in all or specified circumstances or places to which the plan applies.

1.3 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 National Parks and Wildlife 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 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.

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 National Parks and Wildlife to forward this Recovery Plan to the Commonwealth Minister of the Environment for adoption, once it has been approved by the NSW Minister for the Environment.

1.4 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 including 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.

Public authority responsible for the implementation of this Recovery Plan is the NSW National Parks & Wildlife Service.

The EPBC Act specifies that a Commonwealth agency must not take any action that contravenes a Recovery Plan.

1.5 Critical Habitat

Under the TSC 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. Since *Bertya* sp. Cobar-Coolabah is a Vulnerable species Critical Habitat cannot be declared.

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). Although this offence only applies to a Commonwealth area, any action that is likely to have a significant impact on a listed species occurring within registered Critical Habitat on other areas 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.

1.6 Environmental Assessment

The New South Wales *Environmental Planning and Assessment Act 1979* (EP&A Act) requires that consent and determining authorities, and the Director-General of National Parks and Wildlife, 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.

Any other action not requiring approval under the EP&A Act, and which is likely to have a significant impact on *Bertya* sp. Cobar-Coolabah, will require a Section 91 Licence from the Director-General of National Parks and Wildlife under the provisions of the TSC Act. Such a 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 *Bertya* sp. Cobar-Coolabah 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 Environment Australia, 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 harm of a member of *Bertya* sp. Cobar-Coolabah and the member is in, or on a Commonwealth area, a permit issued by the Commonwealth Minister under the EPBC Act will be required.

2 Current Conservation Status

Bertya sp. Cobar-Coolabah is currently listed in NSW as ‘Vulnerable’ on Schedule 2 of the *Threatened Species Conservation Act* 1995 (TSC Act). This species was previously known in NSW only from the Cobar-Coolabah area.

Bertya sp. Cobar-Coolabah is also listed nationally on the *Environment Protection and Biodiversity Conservation Act* (EPBC Act) 1999 as ‘Vulnerable’. It is not listed in the 1997 IUCN Red List of Threatened Plants.

Briggs and Leigh (1996) assign a conservation code of 2V to this species indicating that it is a vulnerable taxon with a geographic range of less than 100 km.

3 Description

3.1 General

Scientific Nomenclature: *Bertya* sp. Cobar-Coolabah (Cunningham and Milthorpe s.n., 2/8/73)
Family: Euphorbiaceae

Bertya sp. Cobar-Coolabah is a slender shrub or small tree to 4 metres high (Harden 1990) that consists of either slender multiple stems or a single trunk up to 70-90 mm in width (NSW Herbarium notes) (Figure 1). The branches and stems are covered with whitish to brown, dense, intertwined hairs.

Leaves are short-stalked, opposite, occasionally alternate, ovate or oblong-elliptical, thick, 10-80 mm long and 5-25 mm wide with margins curved under (Cunningham *et al.* 1992, NSW Herbarium notes). The upper surface is dark-green and hairless and the under-surface is velvety-woolly.

Flowers lack stalks and have 1-3 female and male flowers clustered together and surrounded by four thick, yellowish to golden brown, hairy bracts. The capsule is ovoid to globose, 8-9 mm long with dense, long weak hairs and contains two to three seeds.



photo by Matt Cameron

Figure 1. *Bertya* sp. Cobar-Coolabah

3.2 Taxonomic Significance

Bertya is an endemic genus to Australia, with an estimated 25 species. The genus is found in Queensland, New South Wales and Victoria.

Bertya sp. Cobar-Coolabah was first collected in NSW by G. M. Cunningham in July 1969 in preparation for the publication of “Plants of Western New South Wales”. In this publication it is described as *Bertya oppositifolia* (F. Muell. & O’Shanesy) which uses the older taxonomic identity (Cunningham *et al.* 1992). Harden (1990) lists the species as *Bertya* sp. Cobar-Coolabah and acknowledges that the identity of this taxon is still unresolved but is either *B. opponens* (F. Muell. Ex Benth.) Guymmer (synonymously known as *B. oppositifolia* F. Muell. & O’Shanesy) which was previously recorded only from Queensland, or a new closely related species.

The new combination *Bertya opponens* (F. Muell ex Benth.) Guymer, based on *Croton opponens* (Bentham 1863-78), was made for the name of the plant described as *Bertya oppositifolia* F. Muell & O'Shanesy. The holotype of *Croton opponens* was examined and found to be conspecific with the type of the later *Bertya oppositifolia* (Guymer 1985).

In 1999, individuals from both the coastal and western populations of *Bertya* sp. Cobar-Coolabah in NSW were examined by the Queensland Herbarium and considered to be *B. opponens* (D. Halford pers. comm.). However, although there was no doubt on this identification for the two western populations, fertile material was required from the coastal populations to confirm the identification. Similarly, the National Herbarium of NSW found that the opposite leaves, four conspicuous bracts, four perianth segments, the styles divided up into four lots and the densely villous capsule, as described for *Bertya opponens*, so closely matched the material of *Bertya* sp. Cobar-Coolabah that it was difficult to believe that it belonged to a different taxon (Teresa James 1987 in National Herbarium of NSW notes). The *Bertya* genus in NSW is currently under revision, which will clarify the taxonomic identity of this species (M. Fatemi pers. comm.). It is possible that the two western populations are a different species to the two coastal populations as the tomentum of the latter is considerably more orange (J. Austen pers. comm.).

If all four populations of *Bertya* sp. Cobar-Coolabah are found to be *Bertya opponens*, implications will arise at a Commonwealth level but not at a state level as the distribution will still be considered restricted in NSW. However, if the western populations are found to be a different species to the coastal populations then the distribution of *Bertya* sp. Cobar-Coolabah will be further restricted in the state and the actions contained in this Recovery Plan will need to be reviewed.

4 Distribution

4.1 Current and Historical Distribution

Bertya sp. Cobar-Coolabah is currently only known from four sites in New South Wales: two western and two coastal sites (Figure 2). This includes the earliest recorded site in the Cobar-Coolabah area, as well as the more recently discovered populations in Jacks Creek State Forest (south-west of Narrabri), Gibraltar Range National Park (north-west of Grafton) and Kangaroo River State Forest (north-west of Coffs Harbour).

The original site, on a property near Coolabah, is the only site in far-western NSW where the species is known to still exist, although the population is senescent and not in good health. This population comprises 500-600 plants but there are indications that there were perhaps two to three times this number originally with senescent individuals either dying or being blown-out gradually over the past 20

years (J. Austen pers. comm.). Another population existed on a property approximately 50km further west as recently as 1982, but a decade of continual drought in the area, followed by a large bushfire, may have contributed to the demise of the population (L. Miller pers. comm.).

The largest population of *Bertya* sp. Cobar-Coolabah occurs at Jacks Creek State Forest, part of the Pilliga forests. The size of this population may be in excess of 5 million plants (J. Austen pers. comm.). There is limited disturbance at the site, other than by apiarists clearing small areas for sites and the construction and maintenance of fire-breaks.

The Gibraltar Range National Park population comprises approximately 20 plants at an advanced age. The Kangaroo River State Forest population comprises about 500 individuals and, like the Gibraltar Range site, plants are situated on cliff edges. It is not known why the species is restricted to these areas, but possibilities are inappropriate fire regimes that have eliminated the species from other areas, and edaphic factors that may have advantaged *Bertya* sp. Cobar-Coolabah relative to other species which prefer wetter habitats.

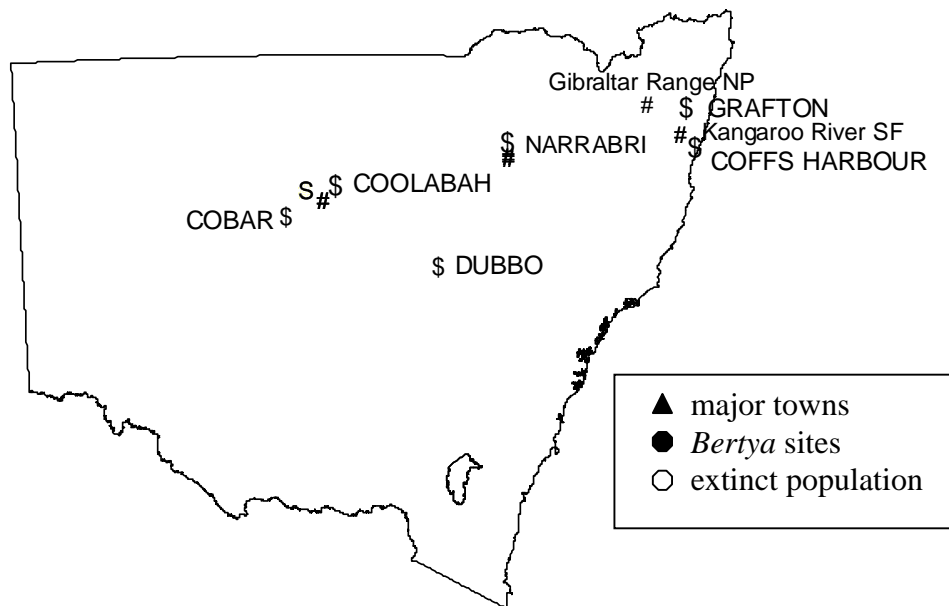


Figure 2. Localities of *Bertya* sp. Cobar-Coolabah in New South Wales

4.2 Translocation

There has been no known translocation of *Bertya* sp. Cobar-Coolabah in NSW nor is any proposed in this Recovery Plan.

5 Habitat

The known populations of *Bertya* sp. Cobar-Coolabah within NSW occur in a number of different habitats, ranging from stony mallee ridges and cypress pine forests of the inland, to cliff edges in the high rainfall eastern fall areas of the Great Dividing Range.

5.1 Coolabah

At this site *Bertya* sp. Cobar-Coolabah grows in shallow red earth on a mallee ridge. Soil surface texture ranges from loamy sands to sandy clay loams. Vegetation around the base of the mallee ridge is predominantly a mix of eucalypt and cypress. Many of the *Bertya* trees at this site are growing in the middle of mallee trees, but it is not known whether the former established before the latter or vice versa.

5.2 Jacks Creek State Forest

The species grows on low rises in shallow red earth on red sandstone and does not extend into the typical sandy gullies and flat wetter areas of the Pilliga scrub. This forest is predominantly a mix of eucalypt and cypress, growing along an extensive shallow ridge of red sandstone. The large population of *Bertya* sp. Cobar-Coolabah also extends, in some places, on to the adjoining private holdings on the eastern side of the forest.

5.3 Kangaroo River State Forest

Kangaroo River State Forest is predominantly a dry open eucalypt forest with wetter elements existing in the sheltered gullies and creek lines. *Bertya* sp. Cobar-Coolabah grows on a rock outcrop on a cliff edge in very thin lithosol soils surrounded by open forest. The outcrop is sparsely vegetated by shrubs and herbs, other species including *Lantana camara* and *Dendrobium speciosum s.l.*

5.4 Gibraltar Range National Park

This population occurs in similar habitat to the Kangaroo River State Forest population, with both situated in the high rainfall escarpment areas of the Eastern Fall country of the Clarence Valley. At this site *Bertya* sp. Cobar-Coolabah grows on granite. The population is set amongst eucalypt forest on a precipitously steep cliff edge at moderate altitudes (800-900 m) along the eastern escarpment (Binns 1994). The ridge crest above the cliff is generally a mixture of wet and dry sclerophyll tall open forest.

6 Biology and Ecology

6.1 Longevity

The NSW Herbarium records indicate that the herbarium specimens were plants collected in 1973 from individuals in the Coolabah population that were 10 to 15 feet high (3-5 m). Considering that these plants are still of a similar height, they were probably mature individuals 26 years ago, which suggests that the species is long lived given suitable conditions.

6.2 Reproductive Biology

6.2.1 Breeding system

The primary mechanism for pollen dispersal in *Bertya* sp. Cobar-Coolabah is probably wind given that the flowers lack chemical and colour attractants and the styles and anthers are exposed. However, European honeybees have been observed visiting *Bertya* sp. Cobar-Coolabah flowers.

6.2.2 Flowering and Fruiting

The capsules develop from the flowers in a small cluster located at the union of the leaf and stem. The capsules usually contain 1-3 seeds.

Flowering is generally believed to occur between July and August (Harden 1990), although timing is more dependent on the individual site characteristics. The Coolabah population has been observed flowering as early as June, whereas the Jacks Creek State Forest population usually flowers July to August. The two coastal populations, because of their different climatic and seasonal variations, normally flower in October-November, but can flower as late as February (J. Austen pers. obs.). However, plants in the Gibraltar Range population on the coast were observed to be in advanced bud in August 1991 and some plants had begun flowering (D. Binns pers. comm.).

In a study of flowering, Austen (1999) found that the number of seed capsules produced per branch and per individual varied greatly according to the site. In the Coolabah population, due to the advanced age of the plants, the only viable stem material suitable for flower production was on the last 150 mm of the branch. A typical individual, however, may contain 100 to 200 flowers in varying ratios of male to female flowers (average of 45 flowers/m² of foliage, $n=50$ plants) (J. Austen pers. comm.).

The Jacks Creek State Forest population had the highest observed abundance of male and female flowers of any of the four main populations. The flowers per area of foliage were as high as 150 flowers/m² on some individuals (J. Austen pers. comm.). These facts may reflect the apparent overall health of this population.

Although this may also have been due to the above average rainfall recorded at this site in 1998.

The coastal populations had a much lower flowering ratio, which may have been due to the late flowering of the populations relative to the inland populations, or to the xeric nature of the outcrops on which the plant grew. The latter possibly influencing the amount of moisture available to the plants. Many individuals in the Kangaroo River State Forest population had no observed flowers or capsules on them, and the highest recorded amount of capsules on an individual was 240 capsules in an area of slightly less than 1 m². A similar situation occurred in the small population at Gibraltar Range National Park, where many of the 20 individuals did not have any capsules on them at all (J. Austen pers. comm.).

6.2.3 Seed dispersal

The exact mechanism for seed dispersal is not known. Observations of capsule design suggest that the release of the seed is achieved through an explosive release, projecting the seed a short distance away from the parent plant. Movement by water may aid seed dispersal, where the substrate is hard enough to allow for surface run-off. Investigation of the seedbank in all sites showed that the majority of seeds were clustered around the base of the plant in a decreasing density that radiated outwards from under the canopy.

6.2.4 Seed germination

Seed viability and germination cues for *Bertya* sp. Cobar-Coolabah have not been investigated to date. Research on other threatened members of the *Bertya* genus indicates the seeds may contain a form of conditional dormancy (Scott 1997). This was determined after gibberellic acid (a germination hormone) was the only successful germination treatment in an experiment involving both heat and manual scarification.

6.3 Population Structure

Each population of *Bertya* sp. Cobar-Coolabah has a different age structure.

The Coolabah population is almost solely made up of mature and senescent individuals. Only two seedlings were observed in the entire population of 500-600 plants (J. Austen pers. comm.).

Jacks Creek State Forest has the largest and most robust population of *Bertya* sp. Cobar-Coolabah in New South Wales (>5 million plants). Almost the entire population consists of an even distribution of male and female plants and an even distribution of seedlings (J. Austen pers. comm.). Reproductive and germination

success does not appear to be limited given the high densities of *Bertya* sp. Cobar-Coolabah in some areas. At one site, density was as high as 24 plants per 100 m².

At Kangaroo River State Forest, the *Bertya* sp. Cobar-Coolabah population comprises approximately 500 plants with an equal number of juveniles as adult and senescent individuals. The number of seedlings is small, which is possibly due to a lack of disturbance in the past few years such that stimulation of the seedbank has not occurred.

The Gibraltar Range National Park population comprises approximately 20 plants and is similar to the Coolabah population in that it is senescent, comprising a single age class of over mature individuals. No seedlings, juveniles or young adult plants were observed in this population in 1999 (J. Austen pers. comm.). However, in 1991 young plants were observed, perhaps indicating the coastal populations are relatively short-lived (D. Binns pers. comm.).

7 Management Issues

7.1 Threats and Reasons for Decline

Within far-western NSW, one population has disappeared and the remaining population near Coolabah is senescent and appears to have declined in size. The Jacks Creek State Forest and Kangaroo River State Forest populations appear stable (although seedlings are few in the latter), and the Gibraltar Range National Park population is small and senescent. Potential threats to the species vary between sites but include grazing, inappropriate disturbance and fire regimes, clearing, and drought.

7.1.1 Grazing

Feral goats have been observed grazing on coppicing stems at the base of trunks as well as standing erect to browse on the lower branches of *Bertya* sp. Cobar-Coolabah. at the Coolabah site. Grazing by goats may also be responsible for the lack of seedlings at the site. There is no evidence that grazing by native or introduced herbivores occurs in the other three populations.

7.1.2 Disturbance

The lack of seedlings observed in the Coolabah and Gibraltar Range National Park populations suggests that either seedlings are being removed or the necessary germination cues are not present. The Coolabah population has not been disturbed by fire for at least 25 years and perhaps 40 years (A. Loffler pers. comm.). While the germination cues at three of the sites are not known, fire and disturbance appear to trigger germination at Jacks Creek State Forest where seedlings are abundant. Disturbance can stimulate seed banks and create a trigger for germination.

7.1.3 Fire

The response of *Bertya* sp. Cobar-Coolabah to fire is not known. There is some indication that the species may resprout from the roots following disturbance. There is prolific regrowth of plants following grading of the fire break adjacent to Jacks Creek State Forest.

Kangaroo River State Forest is burnt on a 3-5 year burn cycle at an intensity high enough to remove fine fuel loads (Coffs Harbour Management Area EIS 1995). The burn is broad scale and is not controlled within compartment boundaries. The last recorded fire in the compartment that contains the *Bertya* sp. Cobar-Coolabah population was in November 1994. Although the population itself is confined to a rock outcrop and is not burnt, burning the surrounding area may prevent expansion of the *Bertya* population by eliminating any seedlings or suckers that do appear.

7.1.4 Clearing

While the four populations are not under serious threat from broad scale clearing, small scale clearing may occur in the Jacks Creek State Forest area along road verges as part of trail/firebreak maintenance and to establish sites for apiarists. The freehold land adjoining Jacks Creek State Forest has largely been cleared for grazing, but *Bertya* sp. Cobar-Coolabah still exists in unmodified areas on some properties. *Bertya* sp. Cobar-Coolabah appears resilient to temporary clearing with regrowth common. The coastal populations are relatively protected from future clearing as both are inaccessible.

7.1.5 Drought

While drought alone may not be a sufficient mechanism to negatively impact on *Bertya* sp. Cobar-Coolabah populations, it may act in concert with other disturbance factors, particularly when it is for an extended period, and result in reduced seedling recruitment and increased juvenile mortality, particularly in the western semi-arid woodland areas. The assumed disappearance of the population near Cobar may have been related to the extreme drought throughout the 1980's, which may have killed off any seedlings that germinated following the 1984 bushfire (L. Miller pers. comm.). While the coastal populations are relatively drought free, given the generally reliable rainfall on the coast, they can be subject to significant spring droughts in some years and stands on rock outcrops may be more subject to water stress than western stands on deeper soils.

7.2 Social and Economic Considerations

Bertya sp. Cobar-Coolabah has no known commercial value and no *Bertya* species are used in horticultural cultivation (Wrigley and Fagg 1996). Any adverse social

and economic consequences resulting from the implementation of this plan are either unknown or insignificant. Submissions from the community and concerned stakeholders regarding the social and economic impacts of this plan will be welcomed during the public exhibition period.

7.3 Biodiversity Benefits

The preparation of this Recovery Plan will also benefit species other than *Bertya* sp. Cobar-Coolabah that have similar ecological and habitat requirements.

7.4 Species Ability to Recover

The potential for this species to recover is high if appropriate management strategies are in place. *Bertya* sp. Cobar-Coolabah is resilient to clearing and appears to readily establish under favourable management.

7.5 Current *Ex-situ* Programs

There are currently no known *ex-situ* programs operating for *Bertya* sp. Cobar-Coolabah.

8 Previous Actions Undertaken

8.1 Clarification of Taxonomic Identity

A PhD study is currently underway to clarify the taxonomic status of the species within the *Bertya* genus in NSW (M. Fatemi pers. comm.). Data from morphology, anatomy, ultrastructure and allozyme analysis will be used in the study.

8.2 Existing Site Management

Two of the populations are on State Forest Lands and although the species is not harvested, it is potentially at risk from damage as a result of logging and roading activities. Populations in State Forests are, however, managed according to ESFM (Ecologically Sustainable Forest Management) principles and are covered by specific management conditions under existing or proposed Threatened Species Licences. These conditions have been agreed upon by NPWS and are designed to ensure appropriate management and minimise any potential threats to this species from forestry activities.

9 Recovery Objectives and Performance Criteria

9.1 Objectives of the Recovery Plan

The overall objectives of this Recovery Plan are to clarify the conservation status of *Bertya* sp. Cobar-Coolabah in NSW and to ensure the viability of known populations.

Specific objectives of this Recovery Plan are to:

1. limit grazing impacts at the Coolabah population;
2. survey potential habitat for further populations;
3. ensure there is recruitment at senescent populations;
4. raise awareness of the conservation significance of *Bertya* sp. Cobar-Coolabah and involve the community in the recovery program.

9.2 Recovery Performance Criteria

Recovery criteria for *Bertya* sp. Cobar-Coolabah are as follows:

1. Coolabah population is protected from grazing;
2. the distribution is better understood in the Cobar-Coolabah and coastal areas;
3. viability, dormancy and germination cues of seed understood;
4. management strategies to encourage recruitment at Gibraltar Range and Coolabah implemented;
5. educational material is disseminated and the community is involved in the implementation of the recovery plan.

10 Recovery Actions

10.1 Action 1 – Protection of Coolabah Population

The Coolabah population is small, appears to be senescent and feral goats have been observed grazing on stems and lower branches. Grazing by goats may also be responsible for the lack of seedlings in the population.

NPWS will seek the cooperation of the landholder to allow access and permit a fence to be constructed around half the population to protect it from grazing pressure. Photopoints will be established and the abundance, health and recruitment of plants monitored annually for five years or until the impact of grazing is understood. If grazing is found to have an impact, it will be recommended that the entire (or as much as possible) population be fenced. NPWS will also liaise with the landholder to achieve the long-term protection of the population through a Voluntary Conservation Agreement.

Outcome

Examination of the impact of grazing on *Bertya* sp. Cobar-Coolabah and protection from grazing pressure. Changes in population size and overall health will be monitored annually.

Agency responsible for implementation

NSW National Parks and Wildlife Service

10.2 Action 2 – Survey

Undertake a survey of potential habitat for *Bertya* sp. Cobar-Coolabah in the Cobar- Coolabah area and in coastal areas. The Coolabah population is the only known remaining population in this area as the other population further west has died out. It is not known, however, whether other populations occur in the area. The Coolabah population is currently the western extent of the species distribution within the state. Coastal areas require survey for *Bertya* sp. Cobar-Coolabah as there are potentially many locations where the species could occur. Both coastal locations were discovered during systematic broad scale vegetation sampling where there is a low probability of finding species rare in the landscape. There is a good chance that this species is under surveyed in coastal areas, perhaps due to a preference for inaccessible locations – ie cliffs and rocky outcrops.

Outcome

Increased certainty of the distribution of *Bertya* sp. Cobar-Coolabah in the Cobar-Coolabah area and sub-coastal hinterland.

Agency responsible for implementation

NSW National Parks and Wildlife Service

10.3 Action 3 – Investigation of recruitment

At two of the four known sites the populations consist of mature and senescent individuals with very few/no seedlings. This may be due to lack of appropriate disturbance cues to trigger germination of seed. The biology of germination and subsequent survival of seedlings need to be studied so that appropriate management strategies can be implemented. Experiments that determine the nature of any dormancy mechanism, seed viability and other cues to germination such as heat will be conducted. The action will be informed by the enclosure proposed at the Coolabah site. If seedlings appear and survive, grazing will have been shown to be the primary cause of the senescent age structure.

Outcome

The biology of germination and seedling survival is understood.

Agency responsible for implementation

NSW National Parks and Wildlife Service

10.4 Action 4 – Management strategies for the Coolabah and Gibraltar Range Populations

Appropriate management strategies for senescent populations at Coolabah, the Gibraltar Range and potentially Kangaroo River State Forest are developed. Once the viability, seed dormancy, germination and grazing studies are complete it may be possible to manipulate management at these locations to stimulate recruitment. This may mean fencing populations, burning at appropriate times and intervals or other measures.

Outcome

Improved survival prospects for senescent populations.

Agency responsible for implementation

NSW National Parks and Wildlife Service

10.5 Action 5 – Community Liaison and Awareness

Encourage landholders, community groups and the general public to become aware of and be involved in the recovery effort for *Bertya* sp. Cobar-Coolabah through the preparation and distribution of information sheets.

NPWS will liaise with private landholders to emphasise the conservation significance of populations of *Bertya* sp. Cobar-Coolabah occurring on or adjacent to their properties. The NPWS will seek to secure sympathetic management of *Bertya* sp. Cobar-Coolabah habitat by private landholders. In order to achieve greater protection of populations on private land, the NPWS recognises that a variety of suitable measures may be implemented (e.g. property management plans and voluntary conservation agreements). The precise nature of management arrangements will depend largely on the circumstances and cooperation of private landholders. Liaison with private landholders will commence in the first year of the plan.

Outcome

Community appreciation and support for the conservation of *Bertya* sp. Cobar-Coolabah and threatened species in general. Sympathetic management in areas where *Bertya* sp. Cobar-Coolabah occurs.

Agency responsible for implementation

NSW National Parks and Wildlife Service

11 Alternative Management Strategies

This section considers a series of alternative options for the recovery of *Bertya* sp. Cobar-Coolabah and reasons for their exclusion as recovery actions in this plan.

11.1 Option 1. No Management Action Taken

As the species is possibly *Bertya opponens* which has a wide distribution throughout the remainder of its range in Queensland, the occurrence of the species within NSW may simply be the result of the range of the species extending into NSW. Accordingly, there may be no requirement for any ‘recovery’ actions for *Bertya* sp. Cobar-Coolabah.

This alternative approach is not considered appropriate even if the species is subsequently identified as *B. opponens* as the TSC Act has as a stated objective the conservation of biodiversity and the recovery of threatened species within NSW.

11.2 Option 2. Establish *Ex-situ* Populations

The investigation of the establishment of *ex-situ* populations should be carried out if there is the possibility that one of the populations is suffering a dramatic decline in numbers. The *ex-situ* collection could involve the long-term storage of genetic material such as cuttings and seeds.

The NPWS considers that the establishment of a broad-scale *ex-situ* conservation program for *Bertya* sp. Cobar-Coolabah is not a necessary or priority action at this stage.

11.3 Option 3. Targeted Survey at Jacks Creek State Forest

While a survey for further individuals/populations in potential habitat adjacent to Jacks Creek State Forest will provide increased certainty of the total population size and distribution in this area, this action is not of high priority because the population is large (over 5 million plants) and there are currently no known threats to the viability of this population.

12 Implementation

Estimated costs of implementing the actions identified in this Recovery Plan are provided in Table 1. Total estimated cost is \$26,500.

This recovery plan and the conservation status of the species will be reviewed within five years of the date of publication.

Table 1: 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				
10.1	Establish exclosure at Coolabah	1	\$10,000					\$10,000	NPWS		\$10,000
10.2	Survey	1	\$10,000					\$10,000	NPWS		\$10,000
10.3	Viability, dormancy, germination studies	1	\$15,000					\$15,000	NPWS		\$15,000
10.4	Management strategies	1						ϕ	NPWS	ϕ	ϕ
10.5	Community liaison and awareness	1	\$750			\$750		\$1500	NPWS		\$1500
Total			\$25,750			\$750		\$26,500			\$26,500

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.

ϕ cost not known

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Appendix 1: Information sheet for *Bertya* sp. Cobar-Coolabah



HAVE YOU SEEN THIS THREATENED PLANT?



Bertya sp. A is a threatened plant that is listed as “Vulnerable” within NSW as well as nationally. It is yet to be given a full scientific name and is known in New South Wales from just four populations. *Bertya* sp. A has recently been discovered along roadside verges and surrounding properties near Narrabri. It is a slender shrub or small tree to four metres high that consists of either multiple stems or a single trunk with “olive-like” foliage. *Bertya* sp. A is protected under the *Threatened Species Conservation Act* 1995. If your proposed development is likely to impact on this species please contact the NPWS for advice.



**For further information please
contact Robyn Molsher
(Threatened Species Officer) at the
Dubbo NPWS office on 02 688
35342.**

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**NSW
NATIONAL
PARKS AND
WILDLIFE
SERVICE**

43 Bridge Street
Hurstville 2220
(02) 9585 6444