

Recovery Plan for the “lost” threatened flora of south-eastern NSW

Baeuerlen’s Gentian (*Gentiana baeuerlenii*),

Elusive Bush-pea (*Pultenaea parrisiae* subsp. *elusa*),

Elusive Cress (*Irenepharsus magicus*),

Formbe Peppergrass (*Lepidium pseudopapillosum*),

Hidden Violet (*Viola cleistogamoides*),

Mueller’s Eyebright (*Euphrasia collina* subsp. *muelleri*),

Rosella Spider Orchid (*Caladenia rosella*), and

Swamp Groundsel (*Senecio squarrosus*)



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Cover photo: *Euphrasia collina* subsp. *paludosa*, a species similar
in appearance to Mueller's Eyebright
Photographer: Colin Totterdell

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**Baeuerlen’s Gentian (*Gentiana baeuerlenii*),
Elusive Bush-pea (*Pultenaea parrisiae* subsp. *elusa*),
Elusive Cress (*Irenepharsus magicus*),
Formbe Peppercress (*Lepidium pseudopapillosum*),
Hidden Violet (*Viola cleistogamoides*),
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Rosella Spider Orchid (*Caladenia rosella*), and
Swamp Groundsel (*Senecio squarrosus*)**

Executive Summary

This document constitutes the approved New South Wales State Recovery Plan for a group of eight plant species that are not known from extant populations in NSW: Baeuerlen’s Gentian (*Gentiana baeuerlenii*), Elusive Bush-pea (*Pultenaea parrisiae* subsp. *elusa*), Elusive Cress (*Irenepharsus magicus*), Formbe Peppercress (*Lepidium pseudopapillosum*), Hidden Violet (*Viola cleistogamoides*), Mueller’s Eyebright (*Euphrasia collina* subsp. *muelleri*), Rosella Spider Orchid (*Caladenia rosella*), and Swamp Groundsel (*Senecio squarrosus*). All of these species are listed as Endangered (Schedule 1, Part 1) in New South Wales under the *Threatened Species Conservation Act 1995*. They are referred to in this plan as the “lost” threatened flora of south-eastern NSW.

The recovery actions detailed in this recovery plan are (i) systematic and dedicated searches by trained botanists for those species that have a good chance of being found, (ii) provision of information, where appropriate, to communities and interested groups in the areas where the species were last located to encourage community participation in field searches, and (iii) the encouragement of targeted surveys for seven of the species in the conduct of environmental impact assessments for proposed developments and activities in suitable habitat.

It is intended that this recovery plan will be implemented over a four year period. The cost of actions identified in the Plan is \$10,500. These costs will be met using the existing resources of NPWS.



Brian Gilligan
Director-General



Bob Debus
Minister for the Environment

Acknowledgments

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Geoff Carr (Ecology Australia)

Fiona Coates (Department of Natural Resources and Environment, Victoria)

Anne Duncan (volunteer, Kosciuszko National Park)

Joy Everett (National Herbarium of New South Wales)

David Keith (NSW National Parks and Wildlife Service)

Roy Shiels (State Forests of NSW, Eden)

Neville Walsh (National Herbarium of Victoria)

1 Introduction

NSW National Parks and Wildlife Service have a requirement under the *Threatened Species Conservation Act 1995* (TSC Act) to produce recovery plans for all endangered and vulnerable species. In most cases, this will involve site-specific recommendations that are designed to improve the conservation status of a species, and ultimately enable the removal of the species from the Schedules of the TSC Act. In some cases, not enough is known about the location of a species to permit site-specific recommendations. Eight species reported as occurring in south-eastern New South Wales and listed under the TSC Act have vague location details that do not allow site-specific recovery actions to be identified.

All of these species (Baeuerlen's Gentian (*Gentiana baeuerlenii*), Elusive Bush-pea (*Pultenaea parrisiae* subsp. *elusa*), Elusive Cress (*Irenepharsus magicus*), Formbe Bittercress (*Lepidium pseudopapillosum*), Hidden Violet (*Viola cleistogamoides*), Mueller's Eyebright (*Euphrasia collina* subsp. *muelleri*), Rosella Spider Orchid (*Caladenia rosella*), and Swamp Groundsel (*Senecio squarrosus*)) are listed as endangered in Schedule 1, Part 1 under the TSC Act. All of the species are known in NSW by only one or two collections and / or very old collections (Table 1).

This document constitutes the formal New South Wales Recovery Plan for the eight species and as such considers the necessary actions to clarify their distributional status. It is intended that such actions will then allow identification of any necessary site-specific recovery actions.

2 Legislative Context

2.1 Legal Status

The species in this recovery plan are listed as endangered in New South Wales in Schedule 1, Part 1 of the *Threatened Species Conservation Act 1995*.

Table 1. NSW collections of the species in this plan.

Species	Collections in NSW (no.)	Last collection
Baeuerlen's Gentian	1	1887
Elusive Bush-pea	2	1938
Elusive Cress	1	1954
Formbe Peppercress	1	1902
Hidden Violet	1	1954
Mueller's Eyebright*	5	1904
Rosella Spider Orchid	1	pre-1896
Swamp Groundsel	1	1818 or 1819

* Some collections for this species are undated but were certainly made last Century.

Baeuerlen's Gentian, Elusive Bush-pea, Mueller's Eyebright, and Rosella Spider Orchid are also listed as nationally endangered under the *Environmental Planning and Biodiversity Conservation Act 1999* (EPBC Act). Formbe Peppercress is listed as vulnerable under the EPBC Act.

Elusive Cress is regarded as rare in Victoria (Gullan *et al* 1990) and rare nationally (2RC- in Briggs and Leigh 1996). Hidden Violet is not regarded as rare or threatened in other States in which it occurs. It occurs in many parts of southern Victoria, including the border region near New South Wales. The New South Wales population recorded represents the north-eastern limit of its distribution. The rareness of the species in New South Wales appears to be an artefact of the State boundary. Formbe Peppercress is regarded as endangered in Victoria (Gullan *et al* 1990).

Among the consequences of listing as a threatened species on the TSC Act are:

- that a Recovery Plan must be prepared;
- that consideration be given to the species in assessing the impacts of developments and activities with the aim of minimising adverse impacts; and
- that other actions that are likely to result in the harming or picking of that species or damage to its habitat are licensed.

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 National Parks and Wildlife (NPW) 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.

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. At present, the only body relevant to the plan is NPWS.

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

2.4 Critical Habitat

The TSC Act makes provision for the identification and declaration of 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.

To date, critical habitat has not been declared under the TSC Act for the species in this plan. The identification of critical habitat may become a priority if and when they are relocated.

There are also provisions under the EPBC Act for registering Critical Habitat. This may become a priority for nationally listed species in this plan if extant populations are found. 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.

2.5 Environmental Assessment

The TSC Act amendments to the environmental assessment provisions of the *Environmental Planning and Assessment Act 1979* (EP&A Act) require that consent and determining authorities consider relevant recovery plans when exercising a decision making function under Parts 4 & 5 of the EP&A Act. Consent and determining authorities, when considering an

activity in an area of potential habitat or known historical record of these plants which may affect the species, must consider the conservation strategy outlined in this plan.

3 Species Information

3.1 Baeuerlen's Gentian *Gentiana baeuerlenii* L.Adams

DESCRIPTION

Baeuerlen's Gentian (*Gentiana baeuerlenii* L. Adams) is an annual herb (family Gentianaceae), which grows to about 4 cm high. Plants have 2 pairs of basal leaves and 3-4 pairs of stem leaves. The leaves are 4-6 mm long. There are 1-3 flowers per plant. Corollas are 5-8 mm long, greenish on the outside and whitish blue on the inside (Harden 1992). Harden (1992) notes that flowers have been observed in October. However, the only New South Wales collection was made in March and a recent population located in Namadgi National Park in the A.C.T. is also apparently autumn-flowering (John Briggs, NPWS, per. comm.).

DISTRIBUTION / NSW RECORDS

The species is known from two sites, one in the ACT (Namadgi National Park) and the other near Bombala in New South Wales. The single NSW collection is dated March 1887 and was collected by Baeuerlen at Quidong. There is a property on the Delegate River, west of Bombala near Tombong, called Quidong and the name was used for a mine in the vicinity (John Briggs, NPWS, pers. comm.). Quidong is also the name of a hill and a Parish in that area.

ECOLOGY, HABITAT AND THREATS

In Namadgi National Park, the species grows as an inter-tussock herb of grassland / sedgeland in a moist area on the lower slope of a broad valley (ACT Government 1997).

Threats to NSW populations, if extant, might include grazing by domestic and native animals, pasture improvement, invasion by weeds such as Serrated Tussock, and herbicide use.

PREVIOUS SEARCH EFFORTS

A brief spring-time search was made in the Quidong farm area by Laurie Adams (Australian National Herbarium), before the autumn-flowering nature of the species was realised (John Briggs, NPWS, pers. comm.). John Briggs suggests that searches near the old mine, which is on private property might be more fruitful.

RECOMMENDATIONS

Given that the species has been found recently in the A.C.T., that it is likely to be easily overlooked because of its small size, and that it flowers in autumn when few botanical surveys are done, there is a good chance that populations will eventually be located in New South Wales. Further dedicated searches are required. NPWS will also encourage survey for Baeuerlen's Gentian in the conduct of environmental impact assessments for proposed developments and activities in suitable habitat.

3.2 Elusive Bush-pea *Pultenaea parrisiae* subsp. *elusa* J.D.Briggs & Crisp

DESCRIPTION

The Elusive Bush-pea (*Pultenaea parrisiae* subsp. *elusa* J. D. Briggs & Crisp) is a subshrub of the family Fabaceae, with trailing stems to 60 cm long. Its sparse leaves are alternate and recurved, to 17 mm long and 3 mm wide. Its flowers are 5 - 7 mm long. The inner surface of the standard is yellow with a faint reddish-orange ring near the base; the outer surface is reddish-orange grading to yellow on the margins. The wings are yellow with a reddish-orange line along the lower edge. Keel petals are dark reddish brown to reddish orange, grading abruptly to pale greenish at the base (Briggs and Crisp 1994). Although first collected 60 years ago, this taxon was not described until 1994. *P. parrisiae* has greatest affinity to *P. paleacea*, differing in its smaller pedicellate flowers, shorter bracteoles and procumbent habit. The subspecies *elusa* differs from subspecies *parrisiae* in having shorter calyx lobes, shorter pedicels, longer floral bracts, which terminate in two lobes with conspicuously villous central awns (Briggs and Crisp 1994). Flowering has been recorded in September and October.

DISTRIBUTION / NSW RECORDS

The Elusive Bush-pea has only been recorded twice, at "Penrose" and "Wingello" on the Southern Tablelands. The two collections were made in successive months (September and October) in 1938 by the same collector, W. F. Blakely.

ECOLOGY, HABITAT AND THREATS

Both collections of the Elusive Bush-pea record the habitat only as swamp. There are a number of swamps in the vicinity (e.g. Hanging Rock Swamp, Stingray Swamp). The vegetation of these swamps commonly comprises scattered trees with a heath / sedge understorey. The moss, *Sphagnum* has been recorded. Associated species in and around these swamps are: TREES - *Eucalyptus aquatica*, *E. macarthurii*; SHRUBS - *Baeckea utilis*, *Epacris paludosa*, *Hakea*

teretifolia, *Leptospermum flavescens*, *L. lanigerum*, *Pultenaea divaricata*; HERBS ETC. - *Gleichenia dicarpa*, *Gymnoschoenus sphaerocephalus*, *Isachne globosa*, *Restio australis*, *R. longipes*.

Many swamps in the Penrose - Wingello area are on private land and grazed. Some swamps may have been drained to maximise arable private land. Sand mining occurs in the vicinity and may have an effect on the hydrology of swamps. Monitoring of the effects on vegetation is occurring on a recent sand mining development. Some swamps are on State Forest land. It is not clear if there are threats to swamps on this land. One State Forest swamp (Stingray Swamp) is reserved for the protection of flora.

PREVIOUS SEARCH EFFORTS

A brief search for the species (of about 1 day) has been made of swamps in the Penrose area by John Briggs and Mike Crisp. Because of the small stature of the plant it could be easily overlooked, especially if not in flower (John Briggs, NPWS, pers. comm.). A swamp on Barbers Creek (Wingello) and another between Penrose and Bundanoon at the headwaters of Paddys River were searched in late September 1998 by K. McDougall (NPWS).

RECOMMENDATIONS

Although many small wetlands in the Penrose - Wingello area have been drained and many have been well surveyed botanically, there are wetlands in that area in good condition that have not been searched (on private and public land). Further dedicated searches are necessary. In particular, any surveys conducted for assessments of the impact of proposed developments or activities in the area should target this species.

3.3 Elusive Cress *Irenepharsus magicus* Hewson

DESCRIPTION

The genus *Irenepharsus* was described only recently (Hewson 1982a). It is distinguished from other genera in the family Brassicaceae found in south-eastern New South Wales by having siliqua fruit without a beak, simple hairs, and seeds with an incumbent radicle. All three species in the genus are Australian endemics. Elusive Cress (*Irenepharsus magicus* Hewson) is an erect annual or biennial herb, which grows to almost 1 m tall. Its basal leaves are not persistent and its stem leaves reduce in size and number up the stem. The inflorescence is an elongated raceme. Petals are small and white. It is distinguished from the other *Irenepharsus* species in New South Wales (*I. trypherus*) by having sparsely hairy leaves, siliqua more than 1 mm wide and seeds with a half wing on the

cotyledonary margin (Hewson 1982b). Illustrations of Elusive Cress can be found in Walsh and Entwisle (1996). Flowering collections across the range of the species have been made between December and April, the single New South Wales collection being made in April.

DISTRIBUTION / NSW RECORDS

Elusive Cress has been recorded in East Gippsland in Victoria and in the Australian Alps (on both sides of the State border).

Although one New South Wales collection of this species is held at the National Herbarium of Victoria (MEL) and one at the National Herbarium of New South Wales (NSW), and the two collections have different latitude / longitude information, both collections were made on the same day and with the same note “upper Geehi Valley”. They can probably be regarded as a single collection as they were for the original species description (Hewson 1982a). The MEL collection is the holotype and the NSW collection is an isotype for the species.

The New South Wales record is almost certainly within Kosciuszko National Park. The MEL collection has the note “3,000ft asl”. The latitude / longitude of neither collection corresponds with the Geehi valley at this altitude. The 3000' contour crosses the Geehi valley just below Geehi Reservoir. The collection of the species in this area might be expected because the collector was an employee of the Snowy Mountains Authority (Roger Good, NPWS, pers. comm.).

ECOLOGY, HABITAT AND THREATS

There are few collections of this species in herbaria and, in general, little habitat information provided with the collections. Two collections in Victoria have been made in or on the edge of recently logged (*Eucalyptus obliqua*) forest. One of these sites had been burnt. The MEL record of the species in New South Wales includes the habitat note “growing on mineral soil of embankment”.

The short-lived nature of Elusive Cress and its occurrence in open, recently-disturbed areas suggests that it is an opportunist, disturbance-loving species. Although it might be argued that the removal of disturbance activities such as logging and grazing in Kosciuszko National Park has limited opportunities for the species to establish, there are ample road batters, hydro-electricity works and periodic wildfires to create suitable habitat. A possible reason for the apparent rarity of this species is that it has been overlooked. Many native plants of the family Brassicaceae look like weeds. If it were growing on a road batter, it might not

be collected by the average collector of native plants, especially if it commonly flowers in autumn.

PREVIOUS SEARCH EFFORTS

A search was made of the area between Schlink's Pass and the Geehi Dam on the 24th and 25th of March, 1997 (Anne Duncan, pers. comm.). A further search below Geehi Dam, concentrating on earth works in the vicinity of the 3000' contour, which may have produced "mineral soil embankments", was made on the 6th of April 1998 by Keith McDougall and Genevieve Wright (NPWS). A large borrow pit / experimental catchment was discovered. Although the species was not relocated, the site contains extensive embankments of mineral soil and may be worth more thorough surveys in wetter years.

A request was sent to the Records Manager of the Snowy Mountains Authority for any information held by the Authority about the collections of the species made by Max Mueller. No records of the collection could be found in SMA archives (Heather Elliot, Snowy Mountains Authority, pers. comm.).

RECOMMENDATIONS

Elusive Cress is probably easily overlooked. It is short-lived. It flowers in autumn, a time when there are few botanical surveys. It has a weedy appearance and may not be collected by native plant enthusiasts. These factors and the apparent opportunistic nature of the species suggest that it may not be extinct. Further dedicated survey is recommended. NPWS will also encourage survey for Elusive Cress in the conduct of environmental impact assessments for proposed developments and activities in suitable habitat.

3.4 Formbe Peppercress *Lepidium pseudopapillosum* Thell.

DESCRIPTION

Lepidium pseudopapillosum Thell. is a small perennial herb of the family Brassicaceae, which grows to about 15 cm tall. Its basal leaves are pinnately lobed whilst its stem leaves are narrow but not lobed. Inflorescences are long and narrow at the end of stems. Flowers have four small (0.75 mm) sepals but no petals. The fruits (siliculas) are broad (about 5 mm long and 4 mm wide) with lateral wings that broaden from the base forming a small notch at the apex (Hewson 1982b).

DISTRIBUTION / NSW RECORDS

L. pseudopapillosum has been recorded from central and north-western Victoria and the Flinders Ranges of South Australia. Retter and Harden (1990) in the Flora of New South Wales indicate that the species is "recorded from Canberra" but from nowhere in NSW. They note that the specimen is "somewhat atypical". Plants in the Canberra population are now considered to be a distinct taxon, which is soon to be named *L.*

ginniderrense (Neville Scarlett, La Trobe University, pers. comm.). Hewson (1982b), in the Flora of Australia, did not regard *L. pseudopapillosum* in the strict sense as occurring in New South Wales. Despite this, the Type specimen for the species is labelled "Formbe, N.S.W., October 1902, E. Smith". No location of this name is listed in the Australian Gazetteer.

ECOLOGY, HABITAT AND THREATS

Victorian collections, where the species is considered to be rare, have been made in Buloke / Black Box woodland and open forest of Grey Box.

PREVIOUS SEARCH EFFORTS

No dedicated searches have been made for this species because the location of Formbe has not been determined. This name is not listed in the Australian Gazetteer. District staff of NPWS in western NSW, where the species might be expected to grow, and the Lands Office of the Department of Land and Water Conservation in Dubbo were asked for information about Formbe but no leads were obtained.

RECOMMENDATIONS

Considering the age of the only NSW collection, the inability to find where the collection was made, and the immense amount of potential habitat in central western NSW, there is little chance that the species will be located as a result of dedicated survey. The TSC Act states that "a species is eligible to be listed as a species that is presumed extinct at a particular time if, to the knowledge of the Scientific Committee, it has not been definitely located in nature during the preceding 50 years despite searching of known and likely habitats during that period". It could be argued that there have been vegetation surveys of known habitat in NSW during the past 50 years that have not located this species (eg. Leigh and Mulham 1977, Mulham and Jones 1981, Porteners 1993), although such surveys were not dedicated to a search for *L. pseudopapillosum*. A nomination will be made by NPWS to the Scientific Committee to list *L. pseudopapillosum* as presumed extinct on Schedule 1, Part 4 of the TSC Act. Regardless of the success of the nomination, NPWS will encourage survey for Formbe Peppercress in the conduct of environmental impact assessments for proposed developments and activities in suitable habitat.

3.5 Hidden Violet *Viola cleistogamoides* (L.Adams) Seppelt

DESCRIPTION

Until recently the Hidden Violet (*Viola cleistogamoides* (L. Adams) Seppelt) was regarded as a

subspecies of *V. hederacea* (family Violaceae). It is a stoloniferous, perennial herb with short stems. Leaves are tufted and ovate - rhomboid in shape. The flower scapes are shorter than the leaves. The corolla is inconspicuous (up to 4 mm long) and uniformly cream coloured. The anterior petals are about 1 mm wide and the lateral petals are bearded. Flowers are scentless (unlike some other species of the genus) (Adams 1982a). An illustration of Hidden Violet can be found in Walsh and Entwisle (1996). Most flowering collections across the range of the species have been made in spring.

The common name, Hidden Violet, which has been used for this species in Victoria, probably derives from the meaning of the root *cleistogam-* (cleistogamous referring to flowers that remain closed and are self-pollinated - the flowering parts are therefore "hidden"). Although the specific name *cleistogamoides*, in this case, derives from its normally-functioning flowers that have the appearance of the cleistogamous flowers of other *Viola* spp. (Adams 1982b), the common name may be unwittingly appropriate to the species in New South Wales.

DISTRIBUTION / NSW RECORDS

The Hidden Violet has been recorded in south-eastern South Australia, Victoria, and Tasmania. Herbarium records in these States indicate that it is locally common. It is not listed as rare or threatened in Victoria (Gullan *et al.* 1990) or nationally (Briggs and Leigh 1996). There is only one record for the species in New South Wales, near the Victorian border in the far south-east of the State ("Wonboyn, E.F. Constable, 13 October 1954").

ECOLOGY, HABITAT AND THREATS

The Hidden Violet has been recorded in a range of habitats. Many of the records are near coastal, in heathland with sandy soil. However, the species is known to occur in heathland, heathy woodland and grassy forest some distance from the coast such as near Naracoorte in South Australia, the Grampians in western Victoria, and the Gippsland plain in eastern Victoria. There is even a record for the goldfields area of central Victoria on clay loam soils near a creek. Some records are for disturbed sites such as tracks, firebreaks and lawn. The only habitat note accompanying the New South Wales collection from Wonboyn is "black peaty soils".

Associated species that have been recorded across the range of the species include: TREES - *Eucalyptus baxteri*, *Eucalyptus ovata*; SHRUBS - *Acacia mearnsii*, *Acacia melanoxydon*, *Allocasuarina paludosa*, *Allocasuarina paradoxa*, *Banksia marginata*, *Bossiaea cinerea*, *Brachyloma*

daphnoides, *Grevillea alpina*, *Leptospermum continentale*, *Leptospermum myrsinoides*, *Pultenaea hispidula*; HERBS - *Burchardia umbellata*, *Comesperma ericinum*, *Dampiera stricta*, *Gonocarpus tetragynus*, *Gonocarpus teucroides*, *Microlaena stipoides*, *Poa sieberiana*, *Stipa muelleri*, *Tricoryne elatior*, *Viola hederacea*.

No threats are known that are likely to have impacted on this species, although there has been some tourist development in the Wonboyn area. It is possible that the Wonboyn population is at the extreme northern limit of the distribution of the species. The rareness attributed to it may be an artefact of the State boundary as there are records in Croajingolong National Park near the border in Victoria.

PREVIOUS SEARCH EFFORTS

A search of about half a day was made in the Wonboyn area in early November 1999. There has probably been considerable development in the tourist village area since 1954 and habitat has undoubtedly been destroyed. However, sites with black peaty soils were observed in coastal shrubland near Wonboyn and along the Merrica River in Nadgee Nature Reserve.

RECOMMENDATIONS

There is still suitable habitat in the vicinity of Wonboyn for the Hidden Violet. Since the species is not threatened in Victoria and it occurs in a wide range of habitat there including lawn, there is a good chance that it survives in New South Wales. Further survey is recommended. Given the proximity of the Wonboyn area to secure populations in Victoria, such survey should not be accorded a high priority. However, any surveys conducted for assessments of the impact of proposed development or activities in or near suitable habitat in the Wonboyn area need to target this species.

3.6 Mueller's Eyebright

Euphrasia collina subsp. *muelleri*
(Wettst.) W. R. Barker

DESCRIPTION

Mueller's Eyebright (*Euphrasia collina* subsp. *muelleri* (Wettst.) W. R. Barker) is a perennial, parasitic herb or subshrub (family Scrophulariaceae), which grows to about 50 cm tall. The flowering stems, which die back annually, branch near ground level (unlike some other species of *Euphrasia*). Leaves are variable in shape on individual plants but are stalkless and toothed to some extent (usually 2-3 opposite pairs with an apical tooth). Inflorescences are spike-like at the ends of branches. Flowers comprise a 4-lobed green calyx and a 5-lobed, tubular, purple corolla. The outer

surface of the calyx is hairy overall unlike some other subspecies of *Euphrasia collina* (Barker 1982, 1992). Flowering has generally been recorded in spring and early summer, although one flowering collection from Dorrigo in 1904 was made in July.

DISTRIBUTION / NSW RECORDS

Mueller's Eyebright has been collected on five occasions in NSW. Four of these have some location detail: Boorman s.n. 1904 Dorrigo; Butler s.n. 1887 Upper McIntyre River; French s.n. 1886 Upper Murray River; Garland 66 1887 Cootamundra. Barker (1982) lists a number of NSW collections that have affinities to Mueller's Eyebright but which require fresh and complete material for confirmation. These are: Anon s.n. s.dat Murrumbidgee; Bull s.n. s.dat Tumberumba; Crouch s.n. 1873 Brookong, Wagga Wagga; Curran, s.n. 188(2) Upper Macquarie River; Rawes 34 1888 Upper Murray River; Rodd 886 and Coveny 11 Dec 1969 Cave Creek, 1 mile below Blue Waterholes, 11 miles NE of Rules Point.

The species once occurred widely in mainland south-eastern Australia (from the Mt Lofty Ranges near Adelaide through lowland Victoria and up the east coast to near the Queensland border). It is now probably extinct through most of that range and was suspected of being extinct in the 1982 revision of the genus (Barker 1982). A small number of localised populations were discovered on the Mornington Peninsula south-east of Melbourne in the 1980s, although they have not been found again in the last few years. A population near Jamieson in the highlands of Gippsland (Victoria) may be the only extant population of the species (Neville Walsh, National Herbarium of Victoria, pers. comm.).

Species of the genus *Euphrasia* were once widespread and often collected in south-eastern Australia. Many taxa are now considered threatened and at least two are extinct in the wild. Barker (1982) rated 18 of 42 Australian *Euphrasia* taxa as threatened (vulnerable, endangered or extinct) and only 10 as not at risk.

ECOLOGY, HABITAT AND THREATS

Mueller's Eyebright is a semi-parasitic plant. The host range of the species is unknown but may be broad, as in some European species (Barker 1982). Stems die back annually to a perennial rootstock.

Nothing is known of the habitat of the species in NSW. Early records from other States indicate that it grows in "open meadows" and possibly damp places (Barker 1982). The populations on the Mornington Peninsula occur in woodland with a heathy understorey.

Given the possible diversity of habitat for the species, threats could be many and various. If the species occurred in damp, open places in NSW, trampling by livestock and draining of wetlands may have contributed to its decline. Flowering and seed production would occur at times when soils are moist and when most damage might be done by domestic grazing animals.

PREVIOUS SEARCH EFFORTS

The Cave Creek area below Blue Waterholes in Kosciuszko National Park (where a collection had been made in 1969 with affinities to Mueller's Eyebright) was searched in December 1998 by K. McDougall (NPWS) and N. Walsh (National Herbarium of Victoria). No *Euphrasia* species were located. Much of the creek edge in the Cave Creek gorge, however, was found to be dominated by herbaceous weeds. *Euphrasia collina* subsp. *paludosa* was plentiful in damp parts of the Long Plain area near Blue Waterholes.

RECOMMENDATIONS

Given the amount of time that has elapsed since the last record and the degree of habitat destruction that has occurred in many of the places where it was recorded, there would seem to be little likelihood of Mueller's Eyebright being found in further dedicated surveys in New South Wales, although it might turn up by chance as it did in Victoria. Publicity of its status in the hope that it will be relocated in this manner is not recommended as it may lead to over-collection of other subspecies of *Euphrasia collina* or other threatened *Euphrasia* species. A nomination will be made to the Scientific Committee by NPWS to list this species as presumed extinct in Schedule 1, Part 4 of the TSC Act. NPWS will also encourage survey for Mueller's Eyebright in the conduct of environmental impact assessments for proposed developments and activities in suitable habitat in the Cootamundra and Dorrigo areas.

3.7 Rosella Spider Orchid *Caladenia rosella* G.W. Carr

DESCRIPTION

The Rosella Spider Orchid (*Caladenia rosella* G. W. Carr) is a deciduous, terrestrial species with a single, hairy leaf (to 80 mm x 8 mm), which has reddish spots and blotches near its base. The slender flower stems are up to 17 cm tall. The musk-scented flowers are pink in colour and borne singly. The species may be differentiated from the somewhat similar species, *Caladenia concolor*, by its deep pink striations on the flower. *C. concolor* has uniformly deep purplish red flowers (Backhouse and Jeanes 1995). The single New South Wales collection is undated; collections of

flowering material of the Rosella Spider Orchid in Victoria have been made in September. Reproductive maturity is reached after 3-5 years and is maintained for up to 5 years after (Beardsell and Muir 1992). A full description and photograph of the Rosella Spider Orchid can be found in Backhouse and Jeanes (1995).

DISTRIBUTION / NSW RECORDS

The Rosella Spider Orchid was once widespread in the goldfields of central and western Victoria. It is currently known from only five sites in Victoria and is considered endangered in that State (Backhouse and Jeanes 1995). There is a single collection for New South Wales at Albury. Given its wide distribution and occurrence in woodlands that have been subjected to a variety of soil disturbances over the past 150 years, the species was probably once widespread and common (Geoff Carr, Ecology Australia, pers. comm.).

The single collection of this species for New South Wales was made by H. Beattie and was lodged at the National Herbarium of Victoria. It is undated and only gives "Albury" as a location. According to Neville Walsh (National Herbarium of Victoria), the label is in the handwriting of Baron Ferdinand von Mueller, which places the collection pre-1896. Some doubt has been expressed about the validity of the name given to the specimen, especially since the similar species, *C. concolor*, still occurs in the Albury area. However, Geoff Carr, who described the Rosella Spider Orchid, is confident that the determination was correct (Geoff Carr, Ecology Australia, pers. comm.). David Jones (Australian National Herbarium) recently viewed the specimen and agreed with the determination made by Geoff Carr.

ECOLOGY, HABITAT AND THREATS

Caladenia species die back annually to subterranean tuberosities. Plants resprout in response to autumn rain and generally flower in spring. Flowering in the Rosella Spider Orchid may be enhanced by fire, as it is in many *Caladenia* species (Backhouse and Jeanes 1995), although Beardsell and Muir (1992) suggest that the understorey of natural stands is so sparse that fire may not be important. Beardsell and Muir (1992) report that, unlike many other orchids, reproduction in the Rosella Spider Orchid occurs primarily by seedling establishment rather than division of pseudo-bulbs.

In Victoria, the Rosella Spider Orchid has been recorded in open forests dominated by *Eucalyptus macrorhyncha* (Red Stringybark), *E. goniocalyx* (Long-leaf Box) and *E. polyanthemos* (Red Box) with a grassy understorey (of *Chionochloa pallida*). It apparently grows mainly on west-facing slopes with well drained skeletal soils (Backhouse and Jeanes 1995). The dry stony ridges that circle Albury may be suitable habitat for the species.

Backhouse and Jeanes (1995) list weed invasion, grazing by introduced herbivores, urban encroachment and foraging by White-winged Choughs as threats to extant populations.

PREVIOUS SEARCH EFFORTS

Although dedicated searches do not appear to have been made for the Rosella Spider Orchid, an experienced orchid enthusiast, Mr. Peter Branwhite, lives in Albury and has conducted extensive searches of bushland remnants in the area for orchids in general (P. Branwhite, pers. comm.). Dedicated surveys have also been made over several weeks in September 1999 and 2000 in the Albury area for the similar orchid species *Caladenia concolor* as part of the recovery plan for that species.

RECOMMENDATIONS

Given the amount of time that has elapsed since the only NSW record, the degree of habitat destruction that has occurred in the Albury area, and the level of searching of orchid taxa in the vicinity, there is little chance of the species being located by further survey. A nomination will be made to the Scientific Committee by NPWS to list this species as presumed extinct in Schedule 1, Part 4 of the TSC Act. Regardless of the success of the nomination, NPWS will encourage survey for the Rosella Spider Orchid in the conduct of environmental impact assessments for proposed developments and activities in the Albury area.

3.8 Swamp Groundsel *Senecio squarrosus* A. Rich.

DESCRIPTION

The Swamp Groundsel (*Senecio squarrosus* A. Rich.) is a rhizomic herb to about 60 cm in height. The lower leaves are stalkless while the bases of the upper leaves protrude beyond the stem. Leaves are normally 5-12 cm long and 4 - 15 mm wide, and somewhat toothed. The inflorescence is non-radiate (i.e. it does have petal-like florets). Inflorescences have 5 - 20 heads of florets. The heads are cobwebbed near their base. Individual groups of florets are surrounded by 16 - 21 bracts. Fruits have a ring of slender hairs 6 - 9 mm long at their apex (Walsh 1999).

DISTRIBUTION / NSW RECORDS

According to Neville Walsh (National Herbarium of Victoria), the present distribution of Swamp Groundsel is south-western Victoria, south-eastern South Australia and Tasmania. Five collections at the Australian National Herbarium, which were labelled *Senecio squarrosus* were re-determined by Neville Walsh as *Senecio* sp. N (sensu Flora of New South Wales) or *Senecio* sp 1 (sensu Flora of Victoria). Two further collections labelled *Senecio squarrosus* at the Australian National Herbarium are missing. A collection at the Royal Botanic Gardens Sydney labelled *Senecio* aff. *squarrosus* (NSW 88909; The Blue Waterholes, Cave Creek, 11 miles NE of Rules Point,

A.N. Rodd 828 08 Apr 1969) was examined by Keith McDougall (NSW National Parks and Wildlife Service) using the key in the Flora of Victoria (Walsh 1999). The collection is certainly not *S. squarrosus* as the involucre has only 12 or 13 bracts. It would appear to be *S. glomeratus* (based on the hairs on the leaves and the hairs on the cypsela), although the involucre is somewhat shorter than usual.

The Swamp Groundsel is listed in Keith and Ashby (1992) as occurring in the Cape Howe area, possibly in New South Wales. A Mueller collection housed at the National Herbarium of Victoria (MEL) is cited. There is no collection of Swamp Groundsel from Cape Howe and no Mueller collections of Swamp Groundsel at MEL, however. Willis (1972) does list Cape Howe in the distribution of *Senecio squarrosus*. However, any collection of this name from Cape Howe will have been re-determined since the flora of Willis. There is therefore no herbarium record of Swamp Groundsel from the Cape Howe area.

There is one confirmed collection of Swamp Groundsel from New South Wales. This is the Type, collected by the apothecary Charles Gaudichaud-Beaupré in 1819 and labelled Port Jackson. The collection was made during the second Louis-Claude de Saulces de Freycinet expedition to Australia, which travelled from Western Australia to New South Wales via northern Australia. The Type is housed in Paris.

This expedition visited Shark Bay (WA) on the 12th of September 1818, travelled around northern Australia and spent about two months in the Port Jackson area, departing on Christmas Day 1819. From Port Jackson the expedition travelled across the Pacific Ocean to the Falkland Islands where it became shipwrecked. Therefore, it did not visit areas where *Senecio squarrosus* is currently found and there is no chance that the specimen was mis-labelled.

One explanation for the extreme disjunction would be that *Senecio squarrosus* was an early vagrant in the Port Jackson area. By 1819 there was considerable communication between the settlements in Tasmania and Sydney, and exploration of the Victorian coastline by Matthew Flinders.

ECOLOGY, HABITAT AND THREATS

In Victoria, Swamp Groundsel grows in heavy soils on swamp margins.

The habitat of *Senecio squarrosus* in New South Wales is unknown although it may have been collected in swampy areas of the Cumberland Plain. Gaudichaud-Beaupré travelled, and presumably collected plants, between Port Jackson and Bathurst. He expressed

excitement at the plains country but was less impressed with the vegetation on sandstone nearer the coast:

“Sydney Cove, all around the harbour, and the surrounding country to the distance of a few miles, but more particularly in the vicinity of the sea, exhibits nothing but sand-stone, sand, and in a few places only, sand mixed with vegetable mould. Notwithstanding this, the vegetation (sic) is active, and even vigorous in certain places. This vegetation however, though vivid enough, has upon the whole something melancholy in it, that I cannot define. The trees shoot up with difficulty, and their stunted trunks, as well as the meagreness of their branches, attest the state of continual suffering in which they exist” (Arago 1823).

PREVIOUS SEARCH EFFORTS

There have been no dedicated searches for Swamp Groundsel in New South Wales, although there has been much botanical survey in the Port Jackson area.

RECOMMENDATIONS

There is little chance that the Swamp Groundsel will be relocated in New South Wales by dedicated survey. Almost 200 years has elapsed since the only collection, the location of the collection is vague, there is no habitat information available and there has been substantial habitat modification in the Port Jackson area. NPWS will submit a nomination to the Scientific Committee for the Swamp Groundsel to be listed in Schedule 1, Part 4 of the TSC Act (presumed extinct).

4 Recovery Objectives, Actions and Performance Criteria 2000-2003

There appears to be little value in allocating resources for the relocation of four species (Formbe Peppergrass, Mueller's Eyebright, Rosella Spider Orchid and Swamp Groundsel). NPWS will attempt to obtain a more appropriate conservation listing for these species (i.e. presumed extinct in Schedule 1, Part 4). For the remaining four species, the objective of this Recovery Plan is to enable their relocation, if they still occur in New South Wales. NPWS will encourage survey for all species in the conduct of environmental impact assessments for proposed developments and activities in suitable habitat.

Specific objective 1: Relocate those species which may still be present in NSW

Action 1.1: Direct systematic and dedicated searches by trained botanists for target species.

Field searches will be undertaken by botanists of the NPWS according to the schedule set out below (which includes an estimate of the time that might be required for an adequate search). Searches might be conducted

in more than one year or in more than one time of year to account for seasonal and year to year variation in weather patterns.

- Baeuerlen's Gentian (Bombala - Delegate areas) - late summer / autumn, 4 days
- Elusive Bush-pea (Swamps near Wingello / Penrose) – spring, 4 days
- Elusive Cress (Geehi Dam area) - Kosciuszko National Park - late summer / autumn, 4 days
- Hidden Violet (Wonboyn, Nadgee NR and Ben Boyd NP) - spring, 4 days

Performance Criterion 1.1

Within four years of the publication of this plan, the targeted surveys are carried out.

Action 1.2: Where appropriate, provide information to community groups in the areas where these species were last located, and encourage community participation in field searches.

This action will potentially allow for the search to be conducted by more people over a longer period than Action 1.1. The cost of mounting extensive field searches over a large area would be great and species may still not be found if the timing of searches is wrong or climatic conditions prevent the species from appearing at the time of search. The probability of rediscovery is likely to be much greater if people who spend considerable time in the areas where the species are thought to occur (living, working or holidaying) assist in the search. Groups that might assist in the searching include schools, environmental groups, walking groups, Society for Growing Australian Plants groups and Landcare groups. Publicity might also be sought in local newspapers. The search by these groups need not be active. Rediscovery is more likely to occur in the course of other activities, if people are made aware of what the species look like and where they may be found.

Line drawings and photos of the species will be required in the preparation of publicity material. The rights to use the drawings and photos might have to be purchased. Any information provided to the public will stress that plants or plant parts are not to be removed and that instead, location details should be provided to NPWS Region staff. The relevant NPWS Region will then assess nominated populations, and collect and forward voucher specimens to the Threatened Species Unit (Southern Directorate) for determination, if the population is large enough to sustain such plant removal.

Widespread publicity and searches by the general community are not appropriate for species that could easily be confused with other species, especially other

threatened species, or where damage might be done to habitat containing threatened species. Publicity and community assistance in searches is recommended for Baeuerlen’s Gentian, which has a strong chance of being found on private property, and Elusive Cress and Hidden Violet, which are most likely to occur on Government managed land. Elusive Bush-pea may be found on private or public land. Until the species are relocated in the wild, NPWS takes responsibility for all actions.

Performance Criterion 1.2

A community information strategy is prepared and implemented within four years and there is some evidence that members of the community have been looking for the target species.

Action 1.3 Encourage targeted surveys for the eight species in the conduct of environmental impact assessments for proposed developments and activities in suitable habitat.

Information on the identification of these species and their habitat will be prepared and distributed to environmental consultants, government land management officers and council staff undertaking such assessments within the areas of suitable habitat for the species. Decision making authorities will be requested to ensure that any such assessment in suitable habitat include surveys for these species.

Performance Criterion 1.3

Information is prepared and distributed within one year of the publication of this plan. The incidence of targeted surveys for these species in environmental impact assessments is increased.

OTHER POSSIBLE RECOVERY ACTIONS

A measure that is often recommended when a threatened species has become locally extinct or is about to become locally extinct because of a development application is to reintroduce it to suitable sites from extant populations. For species considered

in this recovery plan with extant populations in other States (Elusive Cress, Formbe Pepperpress, Hidden Violet, Mueller’s Eyebright, Rosella Spider Orchid and Swamp Groundsel), this could presumably be done should the species not be relocated in New South Wales. However, so little is known about the habitat requirements of the species in New South Wales that such re-introductions could be an ill-advised and costly operation. It is not a recommended recovery action at this stage.

5 Implementation

Table 2 outlines the implementation of recovery actions specified in this plan for the period of four years from publication.

6 Social and Economic Consequences

Until the species are relocated, there are likely to be few social and economic impacts of the recovery plan. There will be a cost involved in attempts to relocate the species (especially in Environmental Impact Assessments). There may be a positive social consequence resulting from a heightened awareness of threatened species in the areas where the species were last recorded.

7 Biodiversity Benefits

The rediscovery of four of the species in this Plan would prevent the addition of more species to the presumed extinct category of the *Threatened Species Conservation Act 1995*. Since some of the species are presumed to occur on land that is not reserved and in areas where there are few conservation reserves, their rediscovery could add weight to any case for protecting remnant vegetation, which would probably include many other significant species of flora and fauna.

Table 2: Costing table: Estimated costs of implementing the actions identified in the recovery plan are provided below.

Tasks	Item	Year 1	Year 2	Year 3	Year 4	Total
Survey & Publicity	Action 1.1: Additional survey	\$1,500	\$1,500	\$1,500	\$1,500	\$6,000
	Action 1.2: Information dissemination	\$1,500	\$600	\$600	\$600	\$3,300
	Action 1.3: Enable surveys for target species in impact statements etc.	\$1,200	Uncosted	Uncosted	Uncosted	\$1200
Annual costs of implementing Recovery Plan		\$4,200	\$2,100	\$2,100	\$2,100	
Total cost of Recovery Plan						\$10,500

- (1) Costs are approximate based on 2000 figures.
- (2) NPWS is the only party responsible for the actions.
- (3) The cost of all actions will be met using the staff and resources of the NPWS Southern Directorate.
- (4) The costs of targeted surveys during environmental impact assessments cannot be estimated as the costs will depend on the number, type and location of proposal.

8 Preparation Details

This Recovery Plan was prepared by Keith McDougall, Senior Threatened Species Officer, Southern Directorate (NPWS).

9 Review Date

This Recovery Plan will be reviewed and updated four years from the date of its publication.

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