Draft NSW & National

Recovery Plan

Olearia flocktoniae
(Dorrigo Daisy Bush)

December 2004

Department of
Environment and Conservation (NSW)

Natural Heritage Trust
Helping Communities Helping Australia
A Commonwealth Government Initiative

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Draft Recovery Plan for *Olearia flocktoniae* (Dorrigo Daisy Bush)

Foreword

The New South Wales Government established a new environment agency on 24 September 2003, the Department of Environment and Conservation (NSW) (DEC), which incorporates the NSW National Parks and Wildlife Service. Responsibility for the preparation of Recovery Plans now rests with this new department.

This document constitutes a draft of the formal National and NSW State Recovery Plan for the *Olearia flocktoniae* (Dorrigo Daisy Bush) and, as such, considers the conservation requirements of the species across its known range. It identifies the actions to be taken to ensure the long-term viability of the Dorrigo Daisy Bush in nature and the parties who will undertake these actions.

The Dorrigo Daisy Bush is listed as Endangered on the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 and the NSW *Threatened Species Conservation Act* 1995. The Dorrigo Daisy Bush is a short-lived, semi-herbaceous shrub that grows to 2.5 m high and produces a mass of white and yellow flowers from January to May. The species is a pioneer which colonises disturbed locations such as roadsides or timber plantations adjacent to wet sclerophyll forest or rainforest. It occurs on the northern fall of the Dorrigo Plateau in northern NSW and has been recorded in Bellingen Shire Council, Clarence Valley Council and Coffs Harbour City Council local government areas. A number of both extant and seedbank populations are located in the DEC reserve system. However, these populations are disappearing due to the lack of disturbance to the sites.

The future recovery actions detailed in this draft Plan include: (i) habitat and threat management; (ii) targeted surveys; (iii) research into the ecology and biology of the species; (iii) *ex-situ* conservation measures; and (iv) community education.

It is intended that the Recovery Plan will be implemented over a five year period. Actions will be undertaken by the DEC and Forests NSW (formerly State Forests of NSW).

This draft Recovery Plan will be on public exhibition for a period of six weeks. Following consideration of comments the Plan will be finalised by the DEC and made publicly available.

LISA CORBYN

Director General

Acknowledgments

The research into *Olearia flocktoniae* (Dorrigo Daisy Bush) and its management has been a joint effort by the DEC, Forests New South Wales and the University of New England. Preparation of this Recovery Plan has involved the combined effort of a number of people who have contributed to the survey and research on the species. The DEC would like to thank these people:

Dr Caroline Gross (University of New England) and David Mackay (consultant) who carried out the field surveys and ecological research on the species, and assisted in the preparation of the plan.

Paul Meek (Forests NSW) who prepared the Dorrigo Daisy Bush Action Plan, coordinated disturbance trials for the species in state forests and contributed to the development of the plan.

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The former Dorrigo Daisy Bush Recovery Team for overseeing aspects of the project.

Department of Environment and Heritage, formerly Environment Australia, for funding provided for the implementation of the original Recovery Plan, resulting in a considerable improvement in the knowledge of the ecology of Dorrigo Daisy Bush and for funding the production of this draft Recovery Plan.

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1 Introduction

Olearia flocktoniae Maiden & E. Betche (Dorrigo Daisy Bush) occurs only in New South Wales (NSW), and is restricted to the northern fall of the Dorrigo Plateau. It is a highly dynamic disturbance species with the size and location of populations varying significantly between years.

The Dorrigo Daisy Bush was first collected in 1909, but was later presumed extinct, with logging and clearing for agriculture in the late 1800s and early 1900s suggested as causal factors (Leigh *et al.* 1984). In 1984 Mr J. B. Williams of the University of New England rediscovered the species near Coopernook Creek (Murray 1990, 1991).

This document constitutes the formal National and State Recovery Plan for the Dorrigo Daisy Bush and, as such, considers the requirements of the species across its known range. It identifies the actions to be taken to ensure the long-term viability of the Dorrigo Daisy Bush in nature and the parties who will undertake these actions. The attainment of the objectives of this Recovery Plan are subject to budgetary and other constraints affecting the parties involved. The information in this Recovery Plan is accurate to November 2004.

This plan has been prepared by the Department of Environment and Conservation (NSW) (DEC) in consultation with Forests NSW (FNSW) (formerly State Forests of New South Wales (SFNSW)), the University of New England (UNE), Clarence Valley Council and Coffs Harbour City Council.

2 Legislative Context

2.1 Legal status

The Dorrigo Daisy Bush is listed as Endangered on the NSW *Threatened Species Conservation Act* 1995 (TSC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 *(*EPBC Act). The species also has a conservation status of Critically Endangered under the International Union for Conservation of Nature and Natural Resources Red List 2000 (IUCN 2000).

2.2 Responsibilities under the *Threatened Species Conservation Act* 1995

Recovery Plan preparation, exhibition and implementation

The TSC Act and the NSW *Threatened Species Conservation Amendment Act* 2002 (hereafter referred to jointly as the TSC Act) provides a legislative framework to protect and encourage the recovery of Endangered and Vulnerable Species, Endangered Populations and Endangered Ecological Communities in NSW. Under this legislation the Director-General of the DEC has a responsibility to prepare Recovery Plans for all species, populations and ecological communities listed as Endangered or Vulnerable on the TSC Act schedules. The TSC Act includes specific requirements for both the matters to be addressed by Recovery Plans and the process for preparing Recovery Plans. This Recovery Plan satisfies these provisions.

This draft Recovery Plan will be placed on public exhibition and submissions invited from the public. To make your submission as effective as possible, please:

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

Submissions may be made as letters or other documents, or on the DEC form 'Submission: Draft Recovery Plan'. This is available in Appendix 1 of the plan, at DEC offices, or on the website www.environment.nsw.gov.au.

The DEC will consider all submissions to this Recovery Plan received during the exhibition period and must provide a summary of those submissions to the NSW Minister for the Environment prior to final approval of the plan. Submissions on this draft plan may contain information that is defined as 'personal information' under the NSW *Privacy and Personal Information Act* 1998, which identifies the person providing the submission. Following adoption of the Recovery Plan by the Minister copies of all submissions, including personal details, will be available for public inspection. If any person wishing to prepare a submission does not want personal details to become public, the submission needs to be clearly marked that personal details are to remain confidential. All submissions are stored in the DEC records system.

The TSC Act requires that a government agency must not undertake actions inconsistent with a Recovery Plan. The actions identified in this plan for the recovery of Dorrigo Daisy Bush in NSW are the responsibility of the DEC and FNSW. Other public authorities may have statutory responsibilities relevant to the conservation and protection of Dorrigo Daisy Bush.

Consultation with Indigenous People

Local Aboriginal Land Councils, Elders and other groups representing indigenous people in the areas where the Dorrigo Daisy Bush occurs have been identified and a copy of the draft Recovery Plan will

be sent to them. Their comments on this draft will be sought and will be considered in the preparation of the final Recovery Plan. It is also the intention of the DEC to consider the role and interests of these indigenous communities in the implementation of the actions identified in this plan.

Critical Habitat

The TSC Act makes provision for the identification and declaration of Critical Habitat for species, populations and ecological communities listed as Endangered. Once declared, it becomes an offence to damage Critical Habitat (unless the action is specifically exempted by the TSC Act) and a Species Impact Statement (SIS) is mandatory for all developments and activities proposed within Critical Habitat.

To date, Critical Habitat has not been declared for the Dorrigo Daisy Bush under the TSC Act.

Key Threatening Processes

As of December 2004 there are 24 Key Threatening Processes listed on the TSC Act. Of these, 'Clearing of native vegetation' is relevant to the Dorrigo Daisy Bush. In addition to this Key Threatening Processs, a range of other processes are recognised as threatening the survival of the species in NSW, these are outlined in Section 4.

Licensing

Any development or activity not requiring consent or approval under the NSW *Environmental Planning and Assessment Act* 1979 (EP&A Act) or the NSW *Native Vegetation Act* 2003 (NV Act), which is likely to pick the Dorrigo Daisy Bush or damage its habitat, requires a licence from the DEC under the provisions of the TSC Act or NSW *National Parks and Wildlife Act* 1974 (NPW Act) as a defence against prosecution. If the impact is likely to be significant, a SIS is required.

Other conservation measures

The TSC Act includes provision for other measures that may be taken to conserve the Dorrigo Daisy Bush and its habitat, including the making of a Stop Work Order or Joint Management Agreement.

2.3 *Environment Protection and Biodiversity Conservation Act* 1999

The EPBC Act provides a legislative framework for the protection of threatened species across Australia. An important role of the EPBC Act is to facilitate the preparation and implementation of Recovery Plans for species listed under the Act in co-operation with the States and Territories in which populations of listed species occur. In preparing a Commonwealth Recovery Plan, consideration must be given to the role and interests of indigenous people in the conservation of Australia's biodiversity. The Act also seeks to impose the obligation (arising from the listing) for responsible agencies (particularly Commonwealth) to adopt protective measures. This Recovery Plan will be submitted to the Commonwealth for approval under the EPBC Act.

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

This Recovery Plan does not specifically identify habitat that is critical to the survival of the Dorrigo Daisy Bush. However, the distribution, habitat and ecological information included in this plan (Section 3) would assist the Commonwealth Minister for the Environment and Heritage in identifying habitat that is critical to the survival of this species. The DEC does not consider it appropriate that this Recovery Plan identifies or maps the occurrence of this species in the detail that would be required to define Critical Habitat.

As the Dorrigo Daisy Bush 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 and Heritage for consideration. The Minister will then decide whether the action requires EPBC Act approval. This is in addition to any State or Local Government approval required.

Administrative guidelines are available from the Department of Environment and Heritage to assist proponents in determining whether their action is likely to have a significant impact.

2.4 Relationship to other legislation

Additional legislation relevant to the conservation and recovery of the Dorrigo Daisy Bush includes the following:

- *National Parks and Wildlife Act* 1974;
- *Environmental Planning and Assessment Act* 1979;

- *Local Government Act* 1993;
- *Rural Fires Act* 1997;
- *Forestry and National Park Estate Act* 1998;
- *Rural Lands Protection Act* 1998;
- *Plantations and Reafforestation Act* 1999;
- *Rural Fires and Environmental Assessment Legislation Amendment Act* 2002; and
- *Native Vegetation Act* 2003.

The interaction of the above legislation with the TSC Act with respect to the Dorrigo Daisy Bush is varied. The most significant implications are described below.

***National Parks and Wildlife Act* 1974**

The NPW Act is administered by the DEC. Under this Act it is an offence to 'pick' or knowingly 'damage the habitat of' the Dorrigo Daisy Bush. Certain circumstances may provide a defence from prosecution, including where actions are approved under the EP&A Act or NV Act or licensed by the DEC under the NPW Act or TSC Act.

The NPW Act allows for the reservation of areas as national parks, nature reserves and other categories of protected area under the management of the DEC. Only one national park in NSW is known to contain extant populations of the Dorrigo Daisy Bush.

***Forestry and National Park Estate Act* 1998**

In NSW, an Integrated Forestry Operations Approval (IFOA) granted under part 4 of the NSW *Forestry and National Park Estate Act* 1998 (FNPE Act) regulates the carrying out of certain forestry operations, including logging, in the public forests of a region. The terms of the Threatened Species Licence of the IFOA outline the minimum protection measures required to limit the impact of forestry activities on threatened species and their habitats and forms the basis for DEC regulation of those activities. The Threatened Species Licence for the Upper and Lower North East Regions include measures for the protection of Dorrigo Daisy Bush in north-east NSW. These measures are described in Section 5 of the draft Recovery Plan.

***Plantations and Reafforestation Act* 1999**

The NSW *Plantations and Reafforestation Act* 1999 supports plantation development and reforestation that provides for improved environmental, social and economic outcomes. Under this Act, the owner or manager of an authorised plantation must carry out operations in accordance with the *Plantations and Reafforestation (Code) Regulation* 2001.

***Rural Lands Protection Act* 1998**

The NSW *Rural Lands Protection Act* 1998 makes provision for the preparation of draft Function Management Plans for all Travelling Stock Reserves. These plans must have regard to the conservation of wildlife, including threatened species, populations and ecological communities and their habitat.

3 Species Information

3.1 Description and taxonomy

Olearia is a genus in the family Asteraceae. The genus is found in Australia, New Zealand and New Guinea and comprises almost 200 species, of which 130 are distributed throughout Australia (Lander 1991; Bremer 1994). Almost all *Olearia* species are shrubs (rarely trees) and they are found in a variety of habitats including mallee, heath and sclerophyll woodlands.

The Dorrigo Daisy Bush is a single or multi-stemmed semi-herbaceous shrub which grows 1–2.5 m high and has alternate, crowded leaves which are more or less attached to the stem. The leaves are linear, 20–90 mm long, 1–5 mm wide, with a blunt but pointed tip. The margins are revolute and entire or occasionally with a few small scattered teeth. Both surfaces are hairless with indistinct lateral venation. Inflorescences are terminal in simple corymbs ranging from 19–25 mm in diameter. Ray florets number 30–48, are white in colour and often tinged with violet. The yellow disc florets number 39–50. Achenes are silky and the pappus has 36–50 bristles in one series. The peduncle reaches 52 mm long. (Lander 1991; Gross unpub. data).

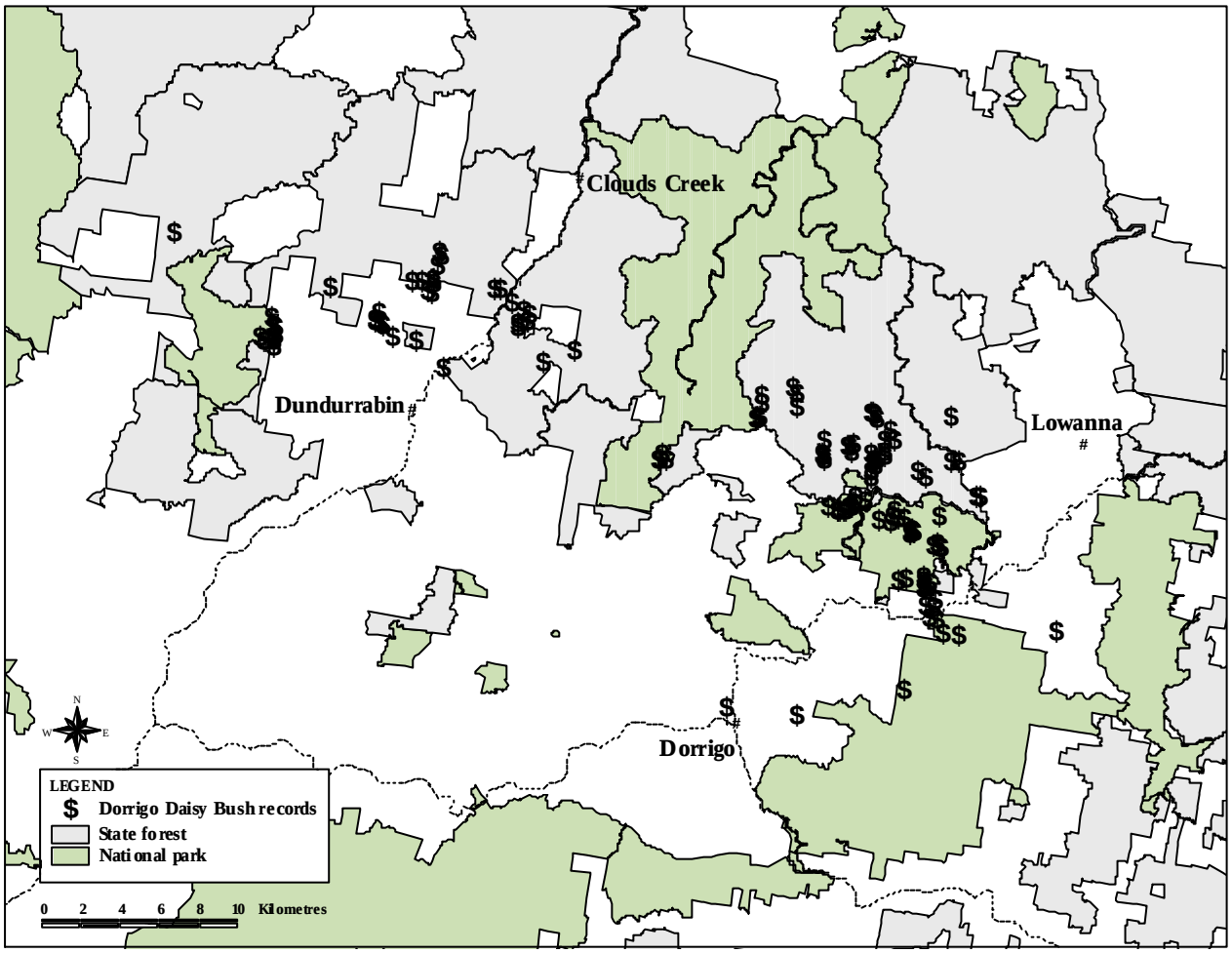

Figure 1. Dorrigo Daisy Bush records

3.2 Distribution

The Dorrigo Daisy Bush occurs only on the northern fall of the Dorrigo Plateau in northern NSW (Figure 1). The type collection was made in 1909 about 3 km east of Dorrigo (Maiden & Betche 1909). The species was collected at one other location in Dorrigo prior to it being presumed extinct. Since rediscovery of the species in 1984 it has been recorded at approximately 150 sites extending over a range of 25 km north-south by 50 km east-west, however, many of these populations are no longer extant above the ground and soil seed banks may have died.

3.3 Land tenure

The Dorrigo Daisy Bush occurs in the Bellingen, Clarence Valley and Coffs Harbour local government areas. The majority of populations have been recorded along road verges on land managed by FNSW.

Changes in land tenure in early 1999 as a result of the FNPE Act have resulted in populations being represented in the DEC reserve system. These reserves are Cascade National Park, Nymboi-Binderay National Park, Dorrigo National Park and Mt Hyland Nature Reserve. Populations in most of these reserves have disappeared due to lack of disturbance with only two populations persisting in Mt Hyland Nature Reserve.

3.4 Habitat

The Dorrigo Daisy Bush is generally found in disturbed locations such as roadsides, timber plantations, quarries and transmission line easements adjacent to wet sclerophyll forest or rainforest. Dominant canopy species include one or more of Coachwood *(Ceratopetalum apetalum*), Sassafras *(Doryphora sassafras*), Tallowwood *(Eucalyptus microcorys*), Sydney Blue Gum *(E. saligna*), Blackbutt *(E. pilularis*), White Mahogany *(E. acmenoides*), Brush Box *(Lophostemon confertus*) and Crabapple *(Schizomeria ovata*).

Other species found in association with the Dorrigo Daisy Bush include *Acacia binervata, A. melanoxylon, A. longissima, Allocasuarina torulosa, Callicoma serratifolia, Cissus antarctica, C. hypoglauca, Conyza*

bonarensis, *Craspedia* sp., *Duboisia myoporoides*, *Entolasia marginata, Eucalyptus grandis*, *Gahnia aspera, Gonocarpus oreophilus, Helichrysum rutidolepis*, *Microlaena stipoides*, *Ozothamnus diosmifolius, Rubus moluccanus, Solanum mauritianum,* and *Zieria southwellii.*

The majority of locations are situated on the sedimentary rocks of the Brooklana Beds. A few locations, including the disjunct Chaelundi-Oboloe populations, are located on the sedimentary rocks of the older Moombil Beds. One population was situated on tertiary basalt (Leitch *et al.* 1971). Soils common over these sedimentary rocks in the Dorrigo area include Red and Yellow Podzolics (McArthur 1964).

The altitudinal range of the species is 480–1070 m above sea level. Populations occur on slopes ranging from 1–45° on all aspects.

3.5 Climate

The Dorrigo plateau experiences a warm to cool temperate climate which is influenced by altitude. Temperatures recorded at the nearby Clouds Creek weather station (600 m above sea level) records mean daily maximum temperature range from 15.9°C in the winter months to 26.4°C in the summer months. A mean daily minimum temperature range from 0.2°C in the winter months to 14.5°C in the summer months is recorded (Commonwealth of Australia 2003).

The escarpment influences local rainfall patterns with the heaviest annual rainfall occurring along the eastern fringe of the plateau where ascending moist coastal air rapidly cools. Rainfall decreases with increasing distance inland from the escarpment.

3.6 Life history and ecology

Habit, growth rate and longevity

The Dorrigo Daisy Bush is a short-lived semi-herbaceous shrub. It can be single or multi-stemmed near the base, and can re-shoot from damaged stems. Individuals can reach one metre tall within the first two years and be reproductively mature in the second year. It seems that under ideal conditions the species may not be short lived, but that it is commonly so in nature because it is out-competed by other species (C. Gross pers. comm. 2003).

Reproductive biology

Records of flowering in the Dorrigo Daisy Bush extend from January to May. Fruit are fully developed about 3–4 weeks after flowering. The inflorescence often produce 80–100 seeds, which represents 90–100% seed production per inflorescence (Gross *et al.* 1998).

Research into the reproductive biology of the Dorrigo Daisy Bush (Gross *et al.* 1998) has found that most plants are self-compatible (that is, they are able to pollinate themselves to produce viable seed) and do not rely on the use of a pollen vector. However, some individuals appear to be unable to set viable seed even when hand pollination from other plants occurs. Although pollen vectors are not a requirement of the Dorrigo Daisy Bush to set seed (Gross *et al.* 1998), some insect visitors to flowers may augment seed-set.

The seed of many Asteraceae are wind dispersed and the fluffy pappus on seed of the Dorrigo Daisy Bush suggests a wind dispersal mechanism for this species. However, recruitment, particularly in forestry plantations, usually occurs in discrete, widely separated cohorts of less than 10 individuals. Wind dispersed seed would not be expected to manifest itself in a clumped distribution like this, but rather in a more even spread of individuals across the landscape. The clumped patterning suggests that seeds are being recruited to such locations by other mechanisms such as mechanical disturbance, and many plants appear in clumps where heavy machinery has previously operated (e.g. log dumps, graded road edges). It is likely that road graders and trucks are dispersing the seed. Within much of the species' range, forestry practices would facilitate the movement of the seeds of the Dorrigo Daisy Bush (C. Gross pers. comm. 2003).

Seed productivity and viability

Fresh seed of the Dorrigo Daisy Bush can germinate within 10 days of being sown under glasshouse conditions (Gross *et al.* 1998). Seed viability in fresh seed (<1 month old) varies greatly among populations and ranges from 12–96% (Gross *et al.* 1998). Seed collected in 1990 was germinated by Mount Annan Botanic Garden in 2003 and achieved an 80% germination rate (P. Cuneo pers. comm. 2003).

Seed bank investigations (Gross *et al.* 1998) indicate that viable seed is contained in the seed bank of extant populations of Dorrigo Daisy Bush. Seedlings have been recovered from a seed bank where the species has been extinct above ground for two years; however, this seed is not as viable as seed stored under sterile conditions.

Population structure

The Dorrigo Daisy Bush is a disturbance reliant species and, as such, the population size and structure is dynamic (Tables 1 & 2). Populations which have been left undisturbed may begin to die after about four to five years and unless the site is disturbed the population may become extinct above the ground (C. Gross pers. comm. 2003). Where the species has colonised a new site or where disturbance

has occurred the population may consist entirely of seedlings.

Table 1. Results of Dorrigo Daisy Bush annual surveys showing fluctuations in population numbers

Year	No. of plants	No. of extant populations	No. of sites surveyed
1989	850 +	24	26
1991	800 +	13	29
1994	1 675 +	46	61
1995	1 237 +	33	approx. 59
1997	2 635	33	81
1998	2 086	36	84
1999	1 906	40	75
2000	1 576	37	57
2001	989	46	83
2002	721	38	88
2003	2 380	31	91

In 1997 reproductive plants dominated populations with juveniles representing only approximately 7% of a population on average (Table 2). Since this time there has been a general trend towards a decrease in the number of reproductive plants. The increase in juvenile numbers in 2003 is almost entirely accounted for at one site where 982 seedlings were recorded.

Disturbance

Many *Olearia* species are pioneer plants of unstable environments, with both common (Nelson 1993) and rare species (Williams & Courtney 1995) of the genus occupying disturbed niches. Whilst undertaking the first collection of Dorrigo Daisy Bush J.L. Boorman (cited in Maiden & Betche 1909) noted that the species occurred in large numbers in a clearing in virgin forest. Boorman's observations are consistent with those of recent years where Dorrigo Daisy Bush has suddenly appeared in large numbers in clearings created during the logging of forests which have not been disturbed for a number of decades.

The behaviour of Dorrigo Daisy Bush is consistent with that of the first colonisers of heavily disturbed rainforest, which typically are herbs or soft-wooded shrubs up to 2 m in height. The disappearance over time of these species from the margins of rainforest and wet sclerophyll communities correlates with an increase in ground level shade and an increase in the density of other species.

Table 2. The mean percent of Dorrigo Daisy Bush individuals in each size class
Adults (reproductive plants), intermediates (plants ≥20 cm tall but not yet reproductive) and juveniles (plants <20 cm tall, not reproductive).

Year of Survey Size Class	1997 mean %	1998 mean %	1999 mean %	2000 mean %	2001 mean %	2002 mean %	2003 mean %
Adults	75.83	82.18	53.89	70.01	62.99	40.08	23.11
Intermediates	18.46	11.36	37.81	24.10	12.03	38.83	27.81
Juveniles	5.65	6.45	8.31	5.88	24.67	21.08	48.65

Competition

In the field it can be seen that thick carpets of grass and a variety of shrub species soon colonise the pioneer environment and seedling bed of Dorrigo Daisy Bush. A confluent mat of grass could prevent seedling emergence and thus be a factor associated with the decline of the species (Gross *et al.* 1998).

Competition experiments in the glasshouse revealed that seedling establishment in Dorrigo Daisy Bush is not significantly affected by the simultaneous germination of a grass species (*Microlaena stipoides*). However, in another trial the presence of an established grass layer significantly reduced seedling emergence from pre-buried Dorrigo Daisy Bush seeds. In a third trial few Dorrigo Daisy Bush seedlings emerged when seeds were sown at depths of 5 or 10 cm irrespective of a grass layer being present (Gross *et al.* 1998).

Other pioneer shrubs and vines are observed to rapidly out compete the Dorrigo Daisy Bush within a few years. The establishment of these species results in the rapid decline of numbers of Dorrigo Daisy Bush.

3.7 Ability of species to recover

Successful recovery of declining populations of this species will depend upon the viability of seeds in the soil seed bank, the level of colonisation of new sites and the availability of suitable pioneer conditions. The recovery of the species will at the very least require an actively implemented disturbance regime at known populations and possibly the creation of suitable habitat at other locations. Disturbance management will need to be an ongoing process.

4 Threats and Management Issues

4.1 Current threats

The Dorrigo Daisy Bush was probably never a widespread species but, rather, one that was naturally restricted to the Dorrigo Plateau. Since the rediscovery of the species in 1984, population surveys have shown that a number of factors may be associated with decline of populations.

Lack of disturbance

Encroachment of native and exotic vegetation

Many native and exotic plants rapidly colonise disturbed ground in the wet sclerophyll forest and rainforest margins with which the Dorrigo Daisy Bush associates and competition for space appears to be intense.

There are many examples where populations have declined or disappeared following encroachment by native vegetation (e.g. *Ozothamnus diosmifolius, Rubus moluccanus*, *Callicoma serratifolia* and *Acacia melanoxylon*). Five of the six known populations along Ben Bullen Road which had greater than 30 individuals in 1989 had disappeared by 1997, presumably as a result of competition from other species. Extant populations displaced by encroaching native and introduced species would only emerge after a new disturbance event, provided that the seed bank is still viable.

Changing land tenure

A shift in forest management away from practices which create disturbance, for example the cessation of timber harvesting or the closure of forest roads, threatens the Dorrigo Daisy Bush. Populations which were previously located in state forests but which are now gazetted as national park have mostly disappeared due to lack of disturbance. This is the result of changes to forest management practices associated with the reclassification of the land tenure.

Inappropriate maintenance of roadside verges

Ill-timed maintenance

Slashing, grading or spraying of known Dorrigo Daisy Bush sites along roadside verges before individuals have set seed can result in a loss of reproductive potential of populations by reducing the seed set. Nearby disturbed sites would not be able to be colonised if seed set is unable to occur. This may be particularly significant where disturbance and a large recruitment event has recently occurred, as the existing seed bank may be depleted.

Removal of topsoil during roadside maintenance

Removal of topsoil during roadside maintenance can result in the removal of a suitable seedbed for the Dorrigo Daisy Bush. At two locations (Coopernook Creek Rd and Briggsvale Rd) topsoil had been removed exposing the B-horizon (a clay substrate) and, although reproductively mature Dorrigo Daisy Bush adults have persisted for a number of years, these sites have not been colonised by Dorrigo Daisy Bush seedlings. The soil was not colonised by many other pioneer species and remained mostly bare for several years.

The removal of topsoil from a site could also result in the removal of the soil seed bank of the Dorrigo Daisy Bush and stockpiling could reduce the potential for seedling emergence.

Pasture establishment

Clearing and subsequent pasture establishment along Schultz Road in 1996 resulted in the loss of Dorrigo Daisy Bush populations. There is the potential for this to re-occur if landholders are

unaware of the conservation significance of the species.

Lack of knowledge

Transient species can be a management problem because often the factors that facilitate continued population existence are poorly understood.

Naturally induced fluctuations in Dorrigo Daisy Bush populations probably occur but, at this stage, they cannot be separated from those induced by human activities. Without a sound understanding of the biology and ecology of the species, it is difficult to target management actions to ensure survival of the species and effectively utilise resources for recovery actions.

4.2 Potential threats

Inappropriate fire regimes

Fire is known to kill Dorrigo Daisy Bush plants, particularly during extended dry periods where the species is under drought stress (C. Gross pers. comm. 2003). The response of the seedbank following fire is not currently known, but the species does not require fire to germinate. Fire may play a role in the ecology of the species by opening up habitat to allow seedling recruitment. However, there is the potential that fire may threaten the species if the frequency or intensity is too great, as this may interfere with seed set or germination potential.

Introduced bees

Gross and Mackay (1998) have shown how honeybees in a pioneer environment can perturb the native plant-native bee relationship and reduce plant fitness. Common and Waterhouse (1982) found that honeybees appear to disturb the behaviour of native pollinators of the Dorrigo Daisy Bush. However, the effects of the activities of honeybees in populations of Dorrigo Daisy Bush would be difficult to elucidate because of the ability of the flowers to self-pollinate. It is unknown whether honeybees pose a significant threat to the species.

Lack of genetic diversity

The genetic diversity of the Dorrigo Daisy Bush is unknown. However, due to the dynamic nature of the species it is possible that genetic bottle-necking occurs when there are no disturbance events to stimulate seedling recruitment and existing populations die out.

5 Previous Recovery Actions

5.1 Habitat protection and management

SFNSW Dorrigo Daisy Bush Action Plan

An Action Plan was developed by SFNSW (now FNSW) in consultation with the DEC and UNE (SFNSW 2002). The Action Plan aims to overcome management issues with road maintenance in state forest areas in the known distribution of the Dorrigo Daisy Bush. Previously, populations of Dorrigo Daisy Bush were avoided during road maintenance works, often resulting in the populations becoming out competed by other species. The action plan incorporates actions from this draft Recovery Plan and focuses on the need for the implementation of road maintenance disturbance trials.

As part of the implementation of the action plan, FNSW identifies populations of the Dorrigo Daisy Bush on roadside areas by marking the extent of the populations in the field and training staff in the recognition of the marking system.

Development of road maintenance protocol

To facilitate effective management of Dorrigo Daisy Bush populations, appropriate disturbance regimes need to be implemented. The DEC and FNSW, in consultation with UNE, have developed specifications for disturbance and road maintenance, based on the results of disturbance trials (Appendix 2).

Licensing

Measures for the conservation of the Dorrigo Daisy Bush in wood production areas of State Forest are detailed in the Threatened Species Licence under the IFOA for the upper and lower north east regions of NSW. FNSW is required to implement the conditions set out in each IFOA, whilst the DEC is required to monitor and enforce compliance with conditions. These conditions specify that:

- pre-logging and pre-roading surveys must be conducted in compartments where known or potential habitat occurs; and
- where there is a record of the Dorrigo Daisy Bush within the compartment a minimum of 90% of individuals must be protected from specified forestry activities.

As an alternative to these conditions, FNSW may, with written approvals from the DEC, prepare a species management plan for the Dorrigo Daisy Bush. Species management plans are aimed at specific taxa or groups where it is considered that they can be more appropriately managed by specific conditions not listed in the IFOA. A species management plan has not been prepared for the Dorrigo Daisy Bush.

Habitat modelling

Habitat modelling to identify the potential distribution of the Dorrigo Daisy Bush has been undertaken (Griffith 1992). Records of sightings prior to March 1997 have been collated and used to update Griffith's (1992) model of potential habitat.

5.2 Surveys and monitoring

Annual surveys and monitoring have been undertaken since 1994 (Roberts 1994, 1995; Steed 1996; Mackay & Gross 1997, 1998, 1999, 2001, 2002, 2003; Earl & Hunter 2000). The most recent survey was undertaken from March to May 2003 (Mackay & Gross 2003). Eighty-eight known populations were monitored and one new site was found. The surveys identified a marked decline in the number of populations in the eastern range of the species since the previous year.

5.3 Research

Disturbance trials and monitoring

Disturbance trials to investigate the response of the Dorrigo Daisy Bush to a variety of disturbance regimes including slashing and grading were set up in 2002 by UNE following preparation of the SFNSW Dorrigo Daisy Bush Action Plan. Initial results have shown that grading sites containing senescing populations or populations which have recently disappeared generally results in high levels of recruitment. Slashing has generally only resulted in recruitment where there has also been some level of soil disturbance resulting from the activity.

Disturbance histories for Dorrigo Daisy Bush populations have been maintained largely by FNSW and DEC, however, only limited information has been recorded. A more rigorous and accessible recording system is required to improve data management and ensure that useful information can be obtained.

Ecological studies

The reproductive biology of Dorrigo Daisy Bush has been investigated at four locations and germination trials, including assessment of seedling recruitment and mortality rates, have been conducted (Gross *et al.* 1998). A study into interspecific competition of the Dorrigo Daisy Bush has also been undertaken in conjunction with the seedling recruitment and mortality rates study.

A 10 year study to determine at what rate seed viability decreases over time for seed stored under dry conditions has been initiated (C. Gross pers. comm. 2003). Seed germination rates from seed stored at the North Coast Regional Botanic Garden were significantly lower than those stored at UNE, seeds were stored under different conditions indicating that the method of seed storage may significantly affect the longevity of collected seeds.

Research into the potential for Dorrigo Daisy Bush seed dispersal by machinery is also being undertaken by UNE (C. Gross pers. comm. 2003).

5.4 *Ex-Situ* programs

Dorrigo Daisy Bush propagation and cultivation has been attempted at the North Coast Regional Botanic Garden (Coffs Harbour), Brisbane Botanic Garden (Mt Coot-tha), Mt Annan Botanic Garden (Sydney), Australian National Botanic Gardens (Canberra) and Black Hill Flora Centre (Adelaide). The UNE has collected seed for seed viability trials, storage and future distribution to selected botanic gardens.

Dorrigo Daisy Bush has also been reproduced by vegetative propagation at Mt Annan Botanic Garden and Australian National Botanic Gardens. Plants are still in cultivation at the Black Hill Flora Centre.

5.5 Community awareness

A Recovery Team for the Dorrigo Daisy Bush was initiated in 1994, this team has since disbanded. The Recovery Team assisted landholders and councils with information regarding management of the species.

The species and its recovery program have been promoted in *Danthonia* (newsletter of the Australian Network for Plant Conservation), and in local media.

6 Proposed Recovery Objectives, Actions and Performance Criteria

The overall objective of this Recovery Plan is to manage populations of the Dorrigo Daisy Bush in order to reverse the current geographic decline of the species. With current knowledge of the species biology and ecology it is thought that at least 30 extant populations are required to ensure the species survival in the wild.

Specific objectives of the Recovery Plan for the species are listed below. For each of these objectives a number of recovery actions have been developed each with a performance criterion.

6.1 Coordination and implementation of the Recovery Plan

Specific objective 1: To ensure a coordinated and efficient approach to implementation of the Recovery Plan

Action 1.1:

Maintain regular communication within the DEC and with other relevant parties to ensure a coordinated approach the implementation of the Recovery Plan.

The DEC and FNSW are responsible for the implementation of this Recovery Plan. Most populations of Dorrigo Daisy Bush occur within state forest and the recovery of the species will rely on a coordinated approach to the implementation of recovery actions between the DEC and FNSW as well as private landholders and other relevant parties.

Performance criterion: Regular communication occurs within the DEC and between the DEC, FNSW and other relevant parties throughout the life of the plan.

6.2 Habitat and threat management

Specific objective 2: To minimise the risk of the Dorrigo Daisy Bush declining by the implementation of *in-situ* habitat protection measures

Action 2.1:

The DEC will coordinate an annual population census of all Dorrigo Daisy Bush populations.

An annual population census of Dorrigo Daisy Bush was initiated in 1994 to monitor population sizes, threats, response to disturbance, identify declining populations and locate any new populations.

Any immediate restorative actions identified in the annual census will be discussed with the relevant land manger.

Performance criterion: An annual report identifying threatening processes, response to disturbance and population trends over time is produced. This monitoring program will continue for the life of the plan.

Action 2.2:

All populations of Dorrigo Daisy Bush occurring on roadsides will be marked in the field.

The transient nature of the Dorrigo Daisy Bush can make re-locating populations difficult. Roadside populations are easily disturbed by road works at inappropriate stages of the species' life cycle. Plant operators require roadside signage to identify the populations so that they know which sections of road require specific management actions.

SFNSW initiated a roadside marking system in 2000 to identify populations of the Dorrigo Daisy Bush. The DEC will adopt the SFNSW threatened plant marking system for the Dorrigo Daisy Bush. Population marking will be conducted in conjunction with annual surveys to provide consistency and efficiency and will be carried out for both extant and seed bank populations. The DEC will investigate the use of a state wide standardised roadside vegetation marking system to identify locations of the Dorrigo Daisy Bush and other significant species and communities.

Performance criteria: Populations of the Dorrigo Daisy Bush are marked using the SFNSW roadside marking system. Signage is visible to plant operators and able to be readily re-located.

Action 2.3:

The DEC and FNSW will ensure employees and contractors responsible for road maintenance, park management and forestry operations are aware of the marking regime used to identify populations of the Dorrigo Daisy Bush.

Personnel involved in maintenance of roads and easements, park management and forestry operations in the range of Dorrigo Daisy Bush should be trained in the identification of the Dorrigo Daisy Bush and the interpretation of signs delimiting populations of the species. The DEC will develop and disseminate an information sheet for relevant field and road maintenance staff from the DEC, FNSW, local government, Transgrid and Country Energy. The DEC and FNSW will ensure that staff are familiar with the Dorrigo Daisy Bush and marking system used to identify populations. The DEC will encourage local government, Transgrid and Country Energy to ensure their operational staff and contractors working in the range of the Dorrigo Daisy Bush are also familiar with the species and marking system used.

Performance criterion: Relevant staff involved in activities which may affect the species within the range of Dorrigo Daisy Bush are trained in the identification and interpretation of the Dorrigo Daisy Bush populations marking regime.

Action 2:4:

The DEC and FNSW will implement the specification outlined in the maintenance protocol for road maintenance disturbance techniques and regimes for the Dorrigo Daisy Bush.

A road maintenance protocol was developed by the DEC, FNSW and UNE which outlines the way in which disturbance works such as roadside maintenance should be carried out in known Dorrigo Daisy Bush locations (Appendix 2). The specifications outlined in this protocol are based on preliminary results from research into appropriate

disturbance regimes for the species (C. Gross pers. comm. 2003). Road maintenance in state forests and national parks will be carried out in accordance with the maintenance protocol. Sites on DEC estate will be actively disturbed in accordance with the recommended disturbance timeframes in the guideline. The DEC will encourage other land managers responsible for road maintenance to carry out this activity in accordance with the maintenance protocol.

In plantations managed by FNSW, populations of the Dorrigo Daisy Bush will be managed according to the disturbance prescriptions in the road maintenance protocol. These prescriptions may also be applied to other field operations that may impact on the species.

A training day to practically demonstrate the grading specification will be conducted. The DEC will review the protocol to reflect any new information on the disturbance requirements of the species.

Performance criterion: The maintenance protocol for the specification of disturbance regimes for the Dorrigo Daisy Bush is implemented so that a dynamic state involving a minimum of 30 populations is achieved throughout the life of the plan.

Action 2.5:

The DEC will coordinate a disturbance recording and monitoring register for the Dorrigo Daisy Bush.

Dorrigo Daisy Bush occurs in areas that are subject to disturbances such as grading, slashing, logging, quarrying and burning. In order to manage disturbance and monitor the species' response to different types of disturbance, it is important to maintain a record of such activities.

To facilitate disturbance management the following actions will be undertaken:

- The DEC will develop a disturbance register to monitor and record disturbance to Dorrigo Daisy Bush populations. This will consist of an online bulletin board containing a disturbance register that can be accessed by relevant DEC, FNSW, local council, Country Energy and Transgrid staff to view or update.
- The disturbance register will be referenced to determine whether or not populations of Dorrigo Daisy Bush should be disturbed or protected from disturbance.
- Any accidental disturbance to extant Dorrigo Daisy Bush plants should also be recorded on the register.

Performance criterion: Disturbance activities are recorded and this information is used to manage populations of Dorrigo Daisy Bush throughout the life of the plan.

Action 2.6:

The DEC will liaise with private landholders to convey the significance of populations of the Dorrigo Daisy Bush occurring on or adjacent to their property.

A number of populations of the Dorrigo Daisy Bush occur on privately owned lands. The DEC will liaise with private landholders to convey the conservation significance of populations of the Dorrigo Daisy Bush occurring on or adjacent to their property.

Performance criterion: Increased landholder awareness of the location and conservation requirements of the Dorrigo Daisy Bush has occurred within the first year of implementation of the Recovery Plan.

6.3 Ecological Research

Specific objective 3: To improve the management of the Dorrigo Daisy Bush based on an increased understanding of its biology and ecology

An increased understanding of the biology and ecology of the Dorrigo Daisy Bush will allow land managers to make more informed judgements regarding the conservation requirements of the species and the population viability.

Action 3.1:

In-situ *research into appropriate disturbance regimes is continued.*

A disturbance regime is essential to achieve a dynamic system of at least 30 viable populations of the Dorrigo Daisy Bush. In 2002 a trial involving *in-situ* replicated treatments of slashing, selective removal of competing species, soil disturbance and selective herbicide application was established in accordance with the SFNSW Dorrigo Daisy Bush Action Plan (SFNSW 2002). Trials are being carried out on populations that are declining, where gap closure appears to be a limiting factor and in locations where the species has recently disappeared. Road maintenance activities at locations where Dorrigo Daisy Bush is known to occur, but not extant above ground, will be integrated into the research strategy.

The initial results of the disturbance trials have been used to generate the road maintenance specification for disturbance regimes for the Dorrigo Daisy Bush (Appendix 2).

Performance criterion: The roadside maintenance specifications for the Dorrigo Daisy Bush and other relevant recovery actions are improved based on an increased understanding of the disturbance ecology of the species.

Action 3.2:

The DEC will coordinate a genetic census into Dorrigo Daisy Bush populations.

Little is known about the genetic composition of Dorrigo Daisy Bush populations. It is possible that due to genetic bottle necking the existing populations are comprised of individuals of low genetic variation. This may be a reason why some individuals are not able to set seed. The DEC will coordinate a genetic census of Dorrigo Daisy Bush populations to investigate the genetic variability of the species. This information will also be used to look at the genetic distribution of Dorrigo Daisy Bush and may help to explain dispersal mechanisms employed by the species.

Performance criterion: A genetic census of the Dorrigo Daisy Bush is undertaken in the first and fifth years of implementation of the Recovery Plan.

Action 3.3:

The DEC will coordinate and encourage research into potential threats to the Dorrigo Daisy Bush.

There are a number of potential impacts on the Dorrigo Daisy Bush that may be affecting the viability of the species. Both inappropriate fire regimes and pollination disturbance from introduced bees may threaten the recovery potential of the species. The DEC will coordinate and encourage research into potential impacts on the Dorrigo Daisy Bush.

Performance criterion: Research into potential impacts on the Dorrigo Daisy Bush is carried out over the life of the plan.

6.4 *Ex-situ* conservation

Specific objective 4: To safeguard populations of the Dorrigo Daisy Bush against extinction in the wild

Action 4.1:

The DEC will coordinate a program for the continued collection of seed of the Dorrigo Daisy Bush to maintain a genetically representative seed stock.

The longevity of Dorrigo Daisy Bush seed banks in the wild is unknown. If populations above ground decline and conditions are not favourable for recruitment then populations may become extinct, reducing the genetic potential of the species. Seeds from a representative sample of Dorrigo Daisy Bush locations should be collected and stored in appropriate conditions to safe guard against extinctions in the wild. This collection should be supplemented regularly to ensure that a range of seed ages are available and seed should be harvested from populations of plants that are known to produce viable seed.

Annual collection of seed (approximately 100 seed heads) from at least 20 locations covering the range of the species will be carried out during the annual population census. Seed will be stored at an existing seed bank under appropriate conditions.

Performance criterion: An *ex-situ* seed bank is maintained which holds a representative and viable collection of Dorrigo Daisy Bush seed.

6.5 Community education and awareness

Specific objective 5: To raise awareness of the conservation significance of the Dorrigo Daisy Bush

Action 5.1:

The DEC will develop a species information profile for the Dorrigo Daisy Bush and distribute the profile to relevant land managers and consent authorities.

The DEC will produce and disseminate a species profile to provide information about the conservation status and management issues affecting the Dorrigo Daisy Bush and its habitat. The dissemination of this information to relevant land managers will facilitate understanding of the ecological requirements of the species and management actions required for its ongoing survival.

Performance criterion: A species profile is prepared and distributed within the first two years of the plan.

Action 5.2:

The DEC and FNSW will promote awareness of the Dorrigo Daisy Bush in local media.

The promotion of the conservation significance and habitat requirements of the Dorrigo Daisy Bush may result in the identification of new populations and an increased understanding of the management requirements for early successional species.

Performance criterion: The conservation significance and habitat requirements of the Dorrigo Daisy Bush are promoted through local media.

7 Implementation

The DEC and FNSW will be responsible for the implementation of the Recovery Plan. Table 3 outlines the implementation of recovery actions specified in this Recovery Plan for the period of five years from publication.

8 Social and economic consequences

The total cost of implementing the recovery actions is estimated at $150 375 over the five-year period covered by this plan. Management of populations occurring in national parks will be in accordance

with the requirements of the NPW Act and any costs incurred will be met by the DEC.

Under current forestry practices, the IFOA applies prescriptions to harvesting operations where known individuals of the Dorrigo Daisy Bush occur. Most populations of Dorrigo Daisy Bush occurring in state forests are located along roadside verges and management of these populations will not significantly impact on harvesting operations.

Costs associated with the management of the Dorrigo Daisy Bush will primarily result from annual surveys, genetic census and disturbance monitoring.

It is anticipated that there will be no significant adverse social or economic costs associated with the implementation of this Recovery Plan and that the overall benefits to society of implementation of the Recovery Plan will outweigh any specific costs.

9 Biodiversity Benefits

It is likely that the Dorrigo Daisy Bush plays a crucial role in the ecology of the habitat in which it occurs. The species plays a role in successional changes to the vegetation at forest margins in the Dorrigo area. Other early successional species may benefit from the management of the Dorrigo Daisy Bush and the maintenance of early successional habitat throughout its range.

10 Preparation Details

Kersten Tuckey, Andrew Steed, Dr Caroline Gross and David Mackay have prepared this Recovery Plan.

11 Review Date

This Recovery Plan will be reviewed within five years of the date of its publication.

12 References

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13 Acronyms Used in this Document

DEC	Department of Environment and Conservation (NSW)
DIPNR	Department of Infrastructure, Planning and Natural Resources
EP&A Act	NSW *Environmental Planning and Assessment Act* 1979
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999
FNPE Act	NSW *Forestry and National Parks Estate Act* 1998
FNSW	Forests NSW (formerly SFNSW)
IFOA	Integrated Forestry Operations Approval
NPW Act	NSW *National Parks and Wildlife Act* 1974
NSW	New South Wales
NV Act	NSW *Native Vegetation Act* 2003
SIS	Species Impact Statement
SFNSW	State Forests NSW (now FNSW)
TSC Act	NSW *Threatened Species Conservation Act* 1995
UNE	University of New England
VCA	Voluntary Conservation Agreement

Table 3. Estimated costs of implementing the actions identified in the Recovery Plan

Action Number	Action Title	*Priority	Cost Estimate ($'s/year)					Total Cost ($)	Responsible Party/Funding sources		
			Year 1	Year 2	Year 3	Year 4	Year 5		DEC		FNSW
									#In-kind	^ Cash	#In-kind
1.1	Recovery Plan coordination	1	3 850	2 450	2 450	2 450	2 450	**13 650**	13 650		
2.1	Population census	1	7 000	7 000	7 000	7 000	7 000	**35 000**		35 000	
2.2	Mark all roadside populations	1	6 875					**6 875**		6 875	
2.3	Species identification and marking regime training	1	3 850	400	400	400	400	**5 450**	3 950		1 500
2.4	Train staff in road maintenance protocol	1	6 450					**6 450**	4 025	500	1 925
2.5	Disturbance register	1	500	300	300	300	300	**1 700**		1 700	
2.6	Liaison with private land holders	1	-	-	-	-	-				
3.1	*In-situ* research into appropriate disturbance regimes	1	2 000	3 000	3 000	3 000	3 000	**14 000**		14 000	
3.2	Genetic census	2	21 050				21 050	**42 100**	2 100	40 000	
3.3	Research potential threats	2	4 000	2 000				**6 000**		6 000	
4.1	*Ex-situ* conservation	1	2 500	2 500	2 500	2 500	2 500	**12 500**		12 500	
5.1	Species information profile	2	1 050					**1 050**	1 050		
5.2	Promotion in local media	2	1 400	1 050	1 050	1 050	1 050	**5 600**	1 400	700	3 500
Total	**Annual cost of Dorrigo Daisy Bush Recovery Program**		**60 525**	**18 700**	**16 700**	**16 700**	**37 750**	**150 375**	**26 175**	**117 275**	**6 925**

* 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

Costs do not include associated on-costs.

Appendix 1: Submission

Recovery Plan Submission

Name Individual/ Organisation: ----------

Postal Address: ----------

Postcode: ---------- Contact Number(s): ----------

Date: ----------

Draft Recovery Plan: Dorrigo Daisy Bush *(Olearia flocktoniae)* ----------

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

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

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

❒ Yes, please keep my personal details confidential to the DEC

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

The Director-General
C/- Dorrigo Daisy Bush Recovery Plan Coordinator
Department of Environment and Conservation
Conservation Programs and Planning (Northern)
Locked Bag 914
COFFS HARBOUR NSW 2450

Submission:

Appendix 2: Dorrigo Daisy Bush Roadside Maintenance Protocol

Grading Specifications

	Condition
Grading Interval	Four to seven years between grading of sites. The interval between grading will vary from site to site. Grading should be carried out approximately four and a half years from the emergence of a population and no later than two years after the last individuals have died.
Timing	Preferably after fruiting - between June and December.
Area of Grading	Only implement Dorrigo Daisy Bush grading specifications 20 metres before start of the population until 20 metres past the end of the population. Revert to standard grading specification thereafter.
***** Width	The objective is to maximise disturbance outside of the road prism. This disturbance will be up to but not exceeding 3 metres (generally one blade width).
***** Vegetation Removal	Spoil removed during the grading works should be pushed outside of the Dorrigo Daisy Bush population area. Leave only mineral earth but avoiding removal of topsoil.
***** Depth of Soil Disturbance	Road verge topsoil should be disturbed for a depth of 2–10 centimetres. Where possible harrows / tynes can be used to disturb soil.
Topsoil Placement	Topsoil should be spread evenly over the site avoiding compacting from vehicle tracks. Avoid stockpiling topsoil where possible.
***** Mitre Drains	Flatten out drains to a shallow "? " shape. Mitre drains should be 5–7 metres long where possible without disturbing trees and large shrubs.
Pipe Clearing	Spread removed soil along roadside areas in canopy gaps.

*****FNSW must adhere to Environmental Protection Licence 1999 - Schedule 5.

Slashing/Slope Mowing Specifications

Specification
Should not be conducted where plants are present.
Should not be conducted within marked population or 20 metres before–20 metres after the population.
Slope mower may be used to cut overhanging branches above 1.5 metres from the ground. Damage to existing Dorrigo Daisy Bush plants must be avoided.

Department of
Environment and
Conservation (NSW)