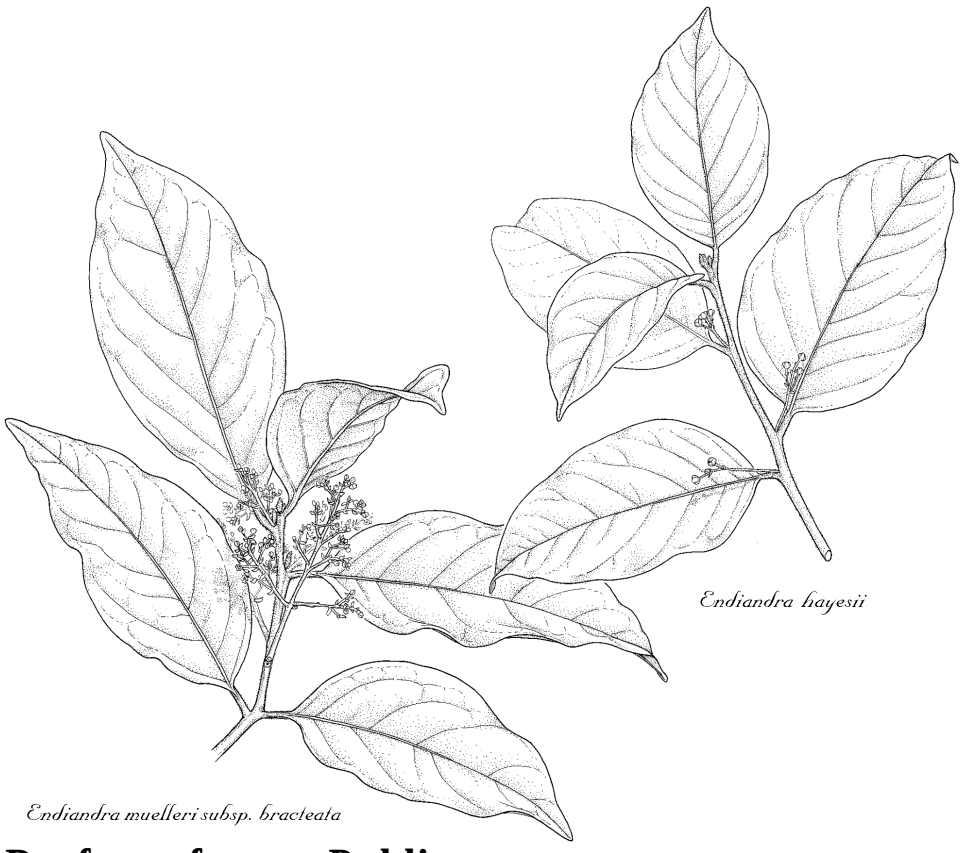
Recovery Plan for *Endiandra muelleri* subsp. *bracteata* (Green-leaved Rose Walnut) and *Endiandra hayesii* (Rusty Rose Walnut)



Draft for Public Comment

February 2004

NSW NATIONAL PARKS AND WILDLIFE SERVICE

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Recovery Plan for *Endiandra muelleri* subsp. *bracteata* (Green-leaved Rose Walnut) and *E. hayesii* (Rusty Rose Walnut)

Foreword

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

This document constitutes the formal New South Wales State Recovery Plan for *Endiandra muelleri* subsp. *bracteata* (Green-leaved Rose Walnut) and *Endiandra hayesii* (Rusty Rose Walnut), and as such considers the conservation requirements of the species across their known ranges. It identifies the actions to be taken to ensure the long-term viability of the Green-leaved Rose Walnut and the Rusty Rose Walnut in nature and the parties who will undertake these actions.

The Green-leaved Rose Walnut is included as Endangered on the New South Wales *Threatened Species Conservation Act* 1995, and the Rusty Rose Walnut is included as Vulnerable on the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999, and Vulnerable on the New South Wales *Threatened Species Conservation Act* 1995. Both are medium-sized rainforest trees in the laurel family. The Green-leaved Rose Walnut is believed to occur from Central Queensland south to Maclean, New South Wales, while the Rusty Rose Walnut has a more restricted distribution in north-east New South Wales and south-east Queensland. Otherwise, taxonomic confusion makes it difficult to generalise about these taxa as individuals.

The future recovery actions detailed in this Recovery Plan include: (i) the resolution of taxonomic confusion surrounding the taxa; ii) surveys to improve base knowledge for the taxa; (iii) habitat management to alleviate threats; and (iv) research into ecology, reproduction and genetics.

It is intended that this Recovery Plan will be implemented over a five year period. Actions will be undertaken by the Department of Environment and Conservation (NSW).

TONY FLEMING

Acting Director-General

Acknowledgments

The Department of Environment and Conservation (NSW) would like to thank the following for their valuable input to the Recovery Plan: Andrew Benwell, Hank Bower, Lance Fitzgerald, Alex Floyd, Glenn Holmes, Jenny Holmes, John Hunter, Rob Kooyman, Bob Koveny, Bill McDonald, Annette McKinley, John Williams, David Milledge, Andrew Murray, Hugh Nicholson and Nan Nicolson. Credit is due to Peter Borrelli, Greg Collins, John O'Donnell and others from the NSW Roads and Traffic Authority for their contributions to the plan and ongoing support and commitment to the management and protection of the species.

The draft Recovery Plan was prepared by Barbara Stewart and funded by the NSW Roads and Traffic Authority as part of a Department of Environment and Conservation Concurrence Condition for the Pacific Highway Upgrade from Brunswick Heads to Yelgun.

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1 Introduction

Two taxa in the group of rainforest trees known as Rose Walnuts are listed as threatened in New South Wales (NSW).

Endiandra muelleri subsp. *bracteata* B. Hyland (Green-leaved Rose Walnut) occurs only in NSW and Queensland. Two subspecies of *E. muellerii* were described by Hyland (1989), the other being named as *E. muelleri* subsp. *muelleri.* The common name of Green-leaved Rose Walnut is applied to both subspecies. The taxon now known as *E. muelleri* subsp. *bracteata* was described in the Flora of Australia in 1870 as *E. pubens* var. *glabriflora.* Other taxonomic changes followed. In the years immediately preceding its description and separation as a subspecies of *E. muelleri,* it has been treated as a hairy form of that taxon.

For the purpose of this Recovery Plan the common name of Green-leaved Rose Walnut refers to the subspecies *Endiandra muelleri* subsp. *Bracteata*.

Endiandra hayesii Kosterm (Rusty Rose Walnut) is also confined to NSW and Queensland. The Rusty Rose Walnut was described in 1970 from a specimen collected from Minyon Falls (now within Nightcap National Park) in 1957.

The Green-leaved Rose Walnut and the Rusty Rose Walnut are rarely encountered in fruit and only occasionally in flower. Hence most field identification and many herbarium determinations are based on vegetative features. Leaves of the two taxa are variable in their venation and extent of hairiness, and can be difficult to distinguish. Botanists have recently revised some of their herbarium determinations, and agree that further scrutiny of existing specimens is warranted. In addition, many field identifications are not supported by specimens.

The compilation of background information for this Recovery Plan revealed greater confusion than has previously been suspected, hence it is currently not possible to confidently characterise the abundance, distribution and habitat of, and assess the threats to, the two taxa separately. This two-taxon plan recommends the resolution of taxonomic difficulties within and between the Green-leaved Rose Walnut and the Rusty Rose Walnut, and in relation to other closely related taxa (with which hybridisation is possible). Thus, recommended recovery actions will be adaptive depending on the results of taxonomic investigation.

Some references to the taxa in the literature and database records are questionable. For the purposes of this plan, the two taxa are frequently treated collectively. Where a taxon is named, as in a specified source, the qualifier "nominal" is added, except where there is good reason to accept a stated name.

This document constitutes the formal State Recovery Plan for the Green-leaved Rose Walnut and the Rusty Rose Walnut and, as such, considers the requirements of the taxa across their known ranges. It identifies the actions to be taken to ensure the long-term viability the Green-leaved Rose Walnut and the Rusty Rose Walnut 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 March 2003.

This plan has been prepared by the Department of Environment and Conservation (NSW) (DEC) (formerly National Parks and Wildlife Service). Funding was provided to prepare this plan by the NSW Roads and Traffic Authority as part of the DEC Concurrence Conditions for the Pacific Highway Upgrade from Brunswick Heads to Yelgun.

2 Legislative Context

2.1 Legal Status

The Green-leaved Rose Walnut is listed as Endangered on the NSW *Threatened Species Conservation Act* 1995 (TSC Act). The taxon is not currently listed on the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act), nor on the Queensland *Nature Conservation (Wildlife) Regulation* 1994 (NC Regulation). This Regulation comes under the Queensland *Nature Conservation Act* 1992.

The Rusty Rose Walnut is listed as Vulnerable on the NSW TSC Act, as Vulnerable on the Commonwealth EPBC Act, and as Vulnerable on the NC Regulation.

2.2 Responsibilities under the *Threatened Species Conservation Act* 1995

Recovery plan preparation, exhibition and implementation

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.nationalparks.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 the Green-leaved Rose Walnut and the Rusty Rose Walnut in NSW are the responsibility of the DEC. Other public authorities may have statutory responsibilities relevant to the conservation and protection of the Green-leaved Rose Walnut and the Rusty Rose Walnut. Public authorities with core legislative responsibilities relevant to the protection and management of the Green-leaved Rose Walnut and the Rusty Rose Walnut and their habitat are listed in Appendix 2.

Consultation with indigenous people

Local Land Councils, Elders and other groups representing indigenous people in the areas where the Green-leaved Rose Walnut and the Rusty Rose Walnut occur have been identified and a copy of the Recovery Plan will be sent to them. Their comments on this draft have been 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 Green-leaved Rose Walnut and the Rusty Rose Walnut under the TSC Act. The need for declaration of Critical Habitat in NSW for these taxa will be assessed when taxonomy, abundance, distribution and threats are better understood.

Key Threatening Processes

As of February 2004 there are 22 Key Threatening Processes listed on the TSC Act. Of these, anthropogenic climate change, the clearing of native vegetation and high frequency fire are relevant to the Green-leaved Rose Walnut and the Rusty Rose Walnut. In addition to these Key Threatening Processes, a range of other processes are recognised as threatening the survival of the species in NSW.

Licensing

Any activity not requiring development consent under the NSW *Environmental Planning and Assessment Act* 1979 (EP&A Act) or the NSW *Native Vegetation Conservation Act* 1997 (NVC Act), which is likely to include the picking of the Green-leaved Rose Walnut and the Rusty Rose Walnut, or to damage their habitat, requires a licence from the DEC under the provisions of the TSC 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 Green-leaved Rose Walnut and the Rusty Rose Walnut and their 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. The Act also seeks to impose the obligation (arising from the listing) for responsible agencies (particularly the 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.

As the Rusty Rose Walnut 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 Commonwealth 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 Green-leaved Rose Walnut and the Rusty Rose Walnut in NSW includes the following:

- *National Parks and Wildlife Act* 1974;
- *Environmental Planning and Assessment Act* 1979;
- *Local Government Act* 1993;
- *Native Vegetation Conservation Act* 1997;
- *Forestry and National Park Estate Act* 1998;
- *Rural Fires Act* 1997; and
- *Rural Fires and Environmental Assessment Legislation Amendment Act* 2002.

The interaction of the above legislation with the TSC Act with respect to the Green-leaved Rose Walnut and the Rusty Rose Walnut is varied. The most significant implications are described below.

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

The NSW *National Parks and Wildlife Act* 1974 (NPW Act) is administered by the DEC. Under this Act it is an offence to 'harm', 'pick' or knowingly 'damage the habitat of' the Green-leaved Rose Walnut and the Rusty Rose Walnut. Certain circumstances may provide a defence from prosecution, including where actions are approved under the EP&A Act or NVC 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. A number of national parks and nature reserves in north-east NSW provide important habitat for the Green-leaved Rose Walnut and the Rusty Rose Walnut.

Owners of private properties with significant habitat values for the Green-leaved Rose Walnut and the Rusty Rose Walnut may enter into Voluntary Conservation Agreements under the NPW Act whereby the DEC can provide assistance in the protection and management of these values on the property. Properties under Voluntary Conservation Agreements may qualify for rate exemptions.

Environmental Planning and Assessment Act 1979

This Act provides for the consideration of the Green-leaved Rose Walnut and the Rusty Rose Walnut in land use planning issues. Areas providing important habitat for the Green-leaved Rose Walnut and the Rusty Rose Walnut can be protected under appropriate environmental zoning in Local Environmental Plans prepared under Part 3 of the EP&A Act. Certain State Environmental Planning Policy Policies (SEPPs) [26 and 71] (Part 3 EP&A Act) also afford a level of protection to some areas of the Green-leaved Rose Walnut and the Rusty Rose Walnut habitat.

SEPP 26 – Littoral rainforest applies to mapped core areas of littoral rainforest, and buffer areas within 100 m of the edge of a core area. Such areas have been mapped within the range of the Green-leaved Rose Walnut and the Rusty Rose Walnut. The policy requires anyone proposing to carry out defined developments in the core to make a development application to the local council. An Environmental Impact Statement (EIS) must accompany the development application where it applies to a core, but not a buffer area.

SEPP 71 – Coastal protection applies to mapped areas of the coastal zone, which broadly occupy the area within 1 km of the coastline. The SEPP identifies State significant developments for which measures to conserve threatened species, within the meaning of the TSC Act, and their habitat must be considered.

Consent and determining authorities are required to consider potential impacts to the Green-leaved Rose Walnut and the Rusty Rose Walnut and their habitat when considering an activity or development proposal under Part 4 or Part 5 of the EP&A Act. An action included in this Recovery Plan is the preparation and dissemination of environmental impact assessment guidelines for the Green-leaved Rose Walnut and the Rusty Rose Walnut, to assist consent and determining authorities and environmental consultants in undertaking tests of significance under Section 5a of the EP&A Act.

Where a consent or determining authority considers that a proposed development or activity may result in a significant effect on the Green-leaved Rose Walnut and the Rusty Rose Walnut or their habitat, a SIS is required to be provided and approval cannot be granted without the concurrence of the DEC.

Local Government Act 1993

The NSW *Local Government Act* 1993 (LG Act) requires councils to have regard for the principles of ecologically sustainable development. Section 8(1) of the LG Act requires a council to manage, develop, protect, restore, enhance and conserve the environment of the area for which it is responsible, in a manner that is consistent with and promotes the principles of sustainable development. This includes the integration of biodiversity considerations into the decision-making process. The LG Act also requires that Recovery Plans be taken into account when preparing management plans for community land.

Native Vegetation Conservation Act 1997

The clearing of native vegetation in NSW is subject to consent from the Department of Infrastructure, Planning and Natural Resources (DIPNR) in accordance with the NVC Act. This Act is integrated with the EP&A Act, and requires that threatened species such as the Green-leaved Rose Walnut and the Rusty Rose Walnut are taken into account by the DIPNR when considering clearing applications under Part 4 of the EP&A Act.

Where an activity or development that may impact upon the Green-leaved Rose Walnut and the Rusty Rose Walnut or its habitat is not subject to approval under the EP&A Act, an approval may nevertheless be required under the NVC Act or the TSC Act. These approvals should also take this Recovery Plan into consideration.

Landholders may enter into Property Agreements with the DIPNR whereby government assistance can be provided to protect significant native vegetation.

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 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 North East (UNE) Region and Lower North East (LNE) Region (1999) include measures for the protection of the Green-leaved Rose Walnut and the Rusty Rose Walnut in north-east NSW.

***Rural Fires Act* 1997**

The NSW *Rural Fires Act* 1997 requires that all parties involved in fire suppression and prevention must have regard to the principles of ecologically sustainable development when exercising their functions and when preparing Plans of Operations and Bush Fire Risk Management Plans. Consideration of the principles of ecologically sustainable development must include the conservation of biological diversity and ecological integrity. Within this, consideration must be given to the impact on threatened species and their habitats, including the Green-leaved Rose Walnut and the Rusty Rose Walnut.

***Rural Fires and Environmental Assessment Legislation Amendment Act* 2002**

The *Rural Fires and Environmental Assessment Legislation Amendment Act* 2002 amends the *Rural Fires Act* 1997 and several environmental assessment-related Acts. This Act provides for development of a Bush Fire Environmental Code that allows for an alternative assessment process for hazard reduction works in some circumstances. Threatened species are considered under the Code and, in certain circumstances, ameliorative measures have been developed for species adversely affected by hazard reduction activities.

3 Species Information

3.1 Description

The Green-leaved Rose Walnut and the Rusty Rose Walnut are medium-sized rainforest trees in the family Lauraceae. Both taxa grow to 20 m tall, with the larger trunks usually buttressed in larger size classes.

Individual descriptions are from Hyland (1989).

The Green-leaved Rose Walnut

The fluted twigs are covered in straight and tortuous[1], erect, pale-brown hairs which are appressed[2]. These hairs also cover the green underside of the leaf where domatia are usually present. The leaf is elliptical, 6–11 cm long with 4–8 pairs of primary veins. Inconspicuous cream, green or yellowish-green flowers occur in small clusters. The petals and sepals are similar and together form a cylinder up to 2.6 mm long. This tube-like structure is hairless outside, but usually with hairs on the inner surface. The fruits are black, up to 30 x 15 mm, with a thin fleshy layer surrounding a single seed.

The Rusty Rose Walnut

The twigs are cylindrical or fluted and are covered in straight and tortuous, erect, pale-brown hairs, as is the green underside of the leaf. The leaf is elliptical or lance-shaped, 8.5–15.5 cm long with 5–9 pairs of primary veins. Inconspicuous cream to pale-green flowers occur in small clusters. The petals and sepals are similar and together form a sheath up to 3.2 mm long with hairs on both the inner and the outer surfaces. The fruits are black, slightly waxy, up to 30 mm long, with a single seed.

Harden (2000) provides additional description of these taxa.

3.2 Taxonomy

Where flowers are not present, the literature suggests that examination (high magnification hand lens or stereomicroscope) of the hairs on the twigs and leaves provides the most reliable method of separating the taxa, as other characteristics are variable or overlapping. Close examination of the hairs is also useful to the Green-leaved Rose Walnut and *E. muelleri* subsp. *muelleri*, though other leaf characteristics separate them more readily.

As flowers are rarely available, many identifications have been based on leaf and branchlet samples. However, some herbarium identifications have not been based on this character, and have recently been re-determined (A. Floyd, B McDonald pers. comm.). Many field identifications are not supported by specimens, so that no checks are possible. There is also some doubt as to the reliability of vegetative characters for

[1] tortuous = twisted, winding or crooked

[2] appressed = pressed closely against another organ (leaf or twig)

separation of the taxa. Some botanists feel that insufficient specimens have been examined for certainty that the leaf and twig characters are well correlated with the floral characteristics described for each taxon. Many agree that molecular techniques could usefully be employed in a taxonomic study of the Green-leaved Rose Walnut, the Rusty Rose Walnut and closely related taxa.

Other sources of confusion arise in distinguishing between taxa within the genus. In particular, individuals occur with leaves of intermediate appearance between the following (A. Benwell pers. comm.):

- the Green-leaved Rose Walnut and *E. muelleri* subsp *muelleri*;
- the Green-leaved Rose Walnut and the Rusty Rose Walnut; and
- the Rusty Rose Walnut and *E. pubens.*

In addition, leaf characters of seedlings and saplings of these species may be very different from those of mature trees (J. Holmes pers.comm.).

Accordingly, all records purported to be the Green-leaved Rose Walnut and the Rusty Rose Walnut compiled as background for this report, have been pooled. Identification is certain only for the type specimens and some other herbarium specimens. A small number of field identifications have also been derived from careful examination of the hairs on twigs and leaves (L. Fitzgerald pers. comm.), and are likely to be found reliable.

3.3 Distribution

According to the literature the Green-leaved Rose Walnut is known from north-eastern NSW, north from the Clarence River (where a specimen from Maclean was employed in Hyland's 1989 description) to southern and central Queensland (Hyland 1989). The taxon is not considered threatened in Queensland, and is apparently moderately common. In NSW, records nominally of this taxon are concentrated on the Tweed and Byron coasts, but also extend inland to the hinterland ranges, and south to Tuckean, Bungawalbin and Maclean.

The literature states that the Rusty Rose Walnut has a restricted distribution in northern NSW and southern Queensland (Hyland 1989). The type specimen is from Minyon Falls in Nightcap National Park. Records nominally of this species are clustered in the Border Ranges, Nightcap Ranges and surrounds, and at a few scattered near-coastal locations. Harden (2002) gives the Clarence River as the southern limit. In Queensland, the species is apparently very rare, with locations reported by Barry and Thomas (1994) only at Burleigh Heads, Tallebudgera and Springbrook.

In total, 83 locations for the Green-leaved Rose Walnut and the Rusty Rose Walnut are documented. Abundance data are available for only a small proportion of sites. Forestry assessments provide some frequency data and general description. For instance, the Rusty Rose Walnut (nominally) was recorded in six out of 108 vegetation plots scattered through varying habitat types in State Forests of NSW former Murwillumbah Management Area (MMA) (W.B.M. Oceanics 1996). This taxon is described as locally abundant in suitable habitat within the MMA. No data for the Green-leaved Rose Walnut is available from the same source, as the Green-leaved Rose Walnut and *E. muelleri* subsp. *muelleri* have not been distinguished (some of the plot data compiled predates the 1989 separation).

Some of the near-coastal locations are known to consist only of a small number of stems, while regrowth forest in the Sleepy Hollow and Brunswick Heads areas is known to include moderate numbers of stems mainly in the medium and small size classes.

Counts or estimates will be required from a larger sample of locations to enable population sizes to be estimated for either or both taxa.

3.4 Land tenure

Records of the Green-leaved Rose Walnut and the Rusty Rose Walnut are known from:

- DEC estate: the Nature Reserves of Billinudgel, Broken Head, Brunswick Heads, Inner Pocket, Limpinwood, Numinbah and Snows Gully, with the National Parks of Border Ranges, Goonengerry, Mebbin, Mooball, Mount Jerusalem, Mount Warning, and Nightcap;
- roadside reserves managed by Tweed and Byron Shire Councils;
- within areas impacted by both the Pacific Highway upgrade between Brunswick Heads to Yelgun and the Yelgun to Chinderah Freeway within the Byron and Tweed local government areas; and
- freehold land, owned and managed by various private landholders.

3.5 Habitat

Records for the combined taxa are usually from the poorer soils derived from sedimentary, metamorphic or acid volcanic rocks. Vegetation includes subtropical and warm temperate rainforests and Brush Box forests, including regrowth and highly modified forms of these habitats. The altitude varies from near sea-level to 800 m. The accurate characterisation of the habitat of the individual taxa must await resolution of the taxonomic problems that confound existing data.

3.6 Life history and ecology

Life cycle

As the two taxa are morphologically similar, it is likely, though not certain, that aspects of their life cycles will also prove similar. Both have small, inconspicuous flowers, and, if similar to other Lauraceous species that have been studied in detail (House 1989), are likely to be insect pollinated. Flowering records, combined for both taxa, are in January, March, May, October (most commonly) and November (Floyd 1989, Hyland 1989 and herbarium records). The trees are rarely observed in fruit, possibly because they are high in the canopy, because many observations are of immature regrowth trees, or they may, like many laurels, fruit only at long or irregular inter-annual intervals (Innes 1989, Wheelwright 1986). The fruits are likely to be dispersed by birds, though there have been no direct observations. Similar sized fruits of other local native laurels are eaten by rainforest pigeons, bower birds and the Green Catbird (Floyd 1990, Holmes 1987). Fruits (records combined for both taxa) have been recorded in March, May, October and November (Floyd 1989, Hyland 1989).

There are no observations of seedling emergence in the field, probably because seedlings are often unnoticed and may be similar to those of other laurel species. Nursery observations are limited since fruit is rarely observed. L. Fitzgerald (pers. comm.) has collected fruit of the Green-leaved Rose Walnut from central Queensland (beyond the currently understood range of the Rusty Rose Walnut and found it to germinate readily. G.McDonald (quoted in Barry & Thomas 1994) has found that cleaned fresh seed of (nominally) the Rusty Rose Walnut germinates readily within 8 weeks.

Population structure

In regrowth forests on the Tweed and Byron coasts, many plants recorded are small saplings and immature trees, suggesting that good regeneration, which may be episodic, is taking place. Saplings and immature trees have also been recorded in association with mature trees in hinterland locations. Observations are limited, however, and it is not possible to generalise for either or both taxa.

Disturbance and competition

The Green-leaved Rose Walnut and/or the Rusty Rose Walnut occur in formerly logged areas of the Border Ranges, Nightcap Range, Koonyum Range and coastal lowlands. Many other locations have formerly been cleared for grazing or agriculture. One consequence of logging disturbance and clearing is to favour forest invasion by Lantana (*Lantana camara*), which alters the structure of the habitat, and may smother seedlings and small trees. The exotic tree Camphor Laurel (*Cinnamomum camphora*) also competes with the Green-leaved Rose Walnut and/or the Rusty Rose Walnut at least one other previously logged site.

Most formerly logged areas of public land (State forests now transferred to National Parks) are located in the State Forests of NSW former MMA. In their flora report provided as a supporting document for the MMA forestry and management proposal EIS, W.B.M. Oceanics (1996) note that little information is available in the MMA on the relationship between silvicultural practices and the status of rare or threatened species. No timber harvesting has been undertaken in rainforest, where many such species are concentrated, since 1982. However, wet sclerophyll forests, which also provide habitat for the Green-leaved Rose Walnut and the Rusty Rose Walnut, have been logged in more recent times with varying levels of survey and protection for threatened species. In addition, W.B.M. Oceanics (1996) note numerous observed instances of accidental or deliberate damage to rainforest habitats during logging operations, and that the impact of such disturbances would be exacerbated by the alteration to the microclimate, together with weed growth in heavily disturbed logged areas adjacent.

Logging is no longer conducted in public forests with known records of the Green-leaved Rose Walnut and/or the Rusty Rose Walnut. The flow on effects on threatened species from historical logging disturbance are not understood, and a lack of detailed baseline data will make such assessments difficult.

No information is available about the effect of fire on these two taxa. Like most rainforest species, they are likely to be adversely affected, especially by intense or high frequency fires. A precautionary approach involving protection of

the Green-leaved Rose Walnut and the Rusty Rose Walnut from fire is indicated until more information is available.

Several occurrences are on roadsides where the habitat of the Green-leaved Rose Walnut and the Rusty Rose Walnut may be subject to ongoing disturbance.

3.7 Ability of taxa to recover

Habitat clearing and fragmentation are believed to be the primary causes of past decline in the Green-leaved Rose Walnut and the Rusty Rose Walnut. Reforestation initiatives currently underway through government, community and private endeavours will create and reconnect suitable habitat for the taxa. Seeds are apparently readily dispersed by birds, and active regeneration is apparent at many locations, despite probable irregular fruit set. Colonisation of new sites can be expected. If currently known sites in good quality habitat are protected, and weeds and other threats in regrowth vegetation can be managed, recovery prospects may be good in the long term. Whether this prediction can be expected to hold for one or both taxa will not be clear until taxonomic problems are resolved.

4 Threats and Management Issues

Habitat clearing and fragmentation

Clearing and fragmentation of known and potential habitat for agriculture, development and infrastructure remains an ongoing threat to the Green-leaved Rose Walnut and the Rusty Rose Walnut.

Though disturbed by past logging, relatively large areas of continuous forest habitat remain in hinterland forests and coastal ranges. The relative representation of the two taxa in large habitat blocks is currently unknown. In the foothills and lowlands, clearing has resulted in the loss of individuals of the two taxa, and their habitats. Habitat patches are often left isolated in a matrix of agricultural or developed land. There are a number of probable consequences, including edge effects and long term genetic problems. Many ecosystem processes require large areas for natural functioning, for instance, regeneration may depend on dynamic natural disturbance mosaics. Suitable conditions for seedling and sapling development may be formed by chance events such as tree or branch falls (in a small area this may not happen) or other threats may accompany their formation. Fauna including pollinators or seed dispersers may not be able to persist in small fragments, nor to move between patches across a hostile matrix.

Clearing and fragmentation have continued in recent times. The Pacific Highway Upgrading Program has resulted in works being undertaken between Brunswick Heads and Chinderah. Works between Brunswick Heads and Yelgun are in the advanced planning stage, while works between Yelgun and Chinderah have been finalised. Activities undertaken or proposed to be undertaken include the translocation of individuals of the Green-leaved Rose Walnut and the Rusty Rose Walnut, removal and/or bisection of habitat at Christies Creek, Sleepy Hollow, the Burringbar Range, Marshalls Ridges and various locations to the north of Brunswick Heads.

Trees are also known from development sites where some individuals have been left on the edge of clearings.

Low numbers

The abundance of each taxon individually cannot be gauged from existing information. It can be assumed that one or both taxa will be confirmed as rare, and will be present in low numbers in at least some parts of their ranges. Low numbers of individuals, and particularly of mature trees, result in vulnerability to the effects of chance catastrophic events, and numbers may drop below thresholds necessary for demographic processes to operate.

Weeds

Weed competition threatens the Green-leaved Rose Walnut and/or the Rusty Rose Walnut at previously logged, cleared and otherwise disturbed sites. Lantana is present at a number of sites including Cedar Creek, Mount Warning National Park and Mooball National Park. Camphor Laurel is a threat at the latter site. As detailed site data is not available for many locations, it is likely that weed competition will be found to be a threat in many more instances.

Weed control activities may result in accidental and unknowing damage to the Green-leaved Rose Walnut and the Rusty Rose Walnut, and unskilled clearing of weeds can also damage their habitats.

Genetic issues

Reduced and fragmented populations are likely to suffer loss of genetic variation as a result of the loss of individuals containing unique genetic variants, inbreeding and genetic drift (Ellstrand & Elam 1993). In the long term, loss of genetic variation may threaten the evolutionary potential of the Green-leaved Rose

Walnut and the Rusty Rose Walnut and reduce their ability to respond to alterations in their environments, including climate change. Further studies are required to measure the extent and spatial distribution of genetic variation, to relate such variation to fitness and reproductive success, and to understand determinants of the flow of genes within the population (pollination and seed dispersal systems).

It is likely that distinctive genetic combinations and variants have developed in various parts of the ranges of the taxa. Introducing genetic material from outside the populations may result in displacement of local genotypes. This risk is currently assessed as low since both taxa appear to be rarely propagated. In the long term, particularly if inbreeding depression is detected, the introduction of new genetic material to populations may be considered.

Collection of propagation material

The extent of current fruit collection from wild populations for the nursery industry is unknown and, if it is taking place, the regeneration potential of the Green-leaved Rose Walnut and the Rusty Rose Walnut may be adversely affected.

Lack of information about threats

Many locations of the Green-leaved Rose Walnut and the Rusty Rose Walnut have not been assessed for threats to the taxa. Further surveys are required.

5 Previous Recovery Actions

5.1 Surveys

Taxon specific surveys of the Green-leaved Rose Walnut and the Rusty Rose Walnut have rarely been conducted, though surveys for conservation and impact assessment purposes are commonly conducted throughout the range of the taxa, and target all threatened species of potential occurrence. Surveys conducted during the Comprehensive Regional Assessment, and surveys associated Environmental Impact assessments for the Pacific Highway Upgrades between Brunswick Heads and Chinderah with route selection for the Pacific Highway upgrade and duplication (Chinderah to Brunswick sections) are examples. As individuals nominally of both taxa, and their habitats, have been/will be impacted by the various chosen routes, targeted surveys were carried out. This included surveys to ensure representation of the affected taxa in compensatory habitat associated with the Yelgun to Chinderah Upgrade (Stewart 1999, 2000) and surveys as part of the Pacific Highway Upgrade from Brunswick Heads to Yelgun (Sinclear Knight Merz 1998, Connell Wagner 2002).

5.2 Management plans

The Plan of Management for the Byron Coast Reserves (NSW NPWS 1997) covers Brunswick Heads and Broken Head Nature Reserves. The plan's objectives include the conservation of plant communities; its actions include implementation of a strategy for the control of weeds in the habitat of rare and Endangered species; and a fire management policy aims to protect specific communities, including rainforest, from fire.

The Plan of Management for Billinudgel Nature Reserve (NSW NPWS 2000) includes management strategies to protect sensitive vegetation communities and threatened species and to manage pests. The plan also aims to manage fire to prevent the loss of threatened species.

The draft Plan of Management (NSW NPWS 2001) for the Parks and Reserves of the Tweed Caldera (includes Mount Warning, Border Ranges, Mebbin, Nightcap, Mount Jerusalem and Goonengerry National Parks and Limpinwood, Numinbah and Snows Gully Nature Reserves) is currently with the DEC Advisory Council for consideration following a public exhibition period. The draft plan includes a desired biodiversity outcome to conserve populations of threatened species and their habitat, and aims to exclude fire from rainforest and wet sclerophyll communities.

Plans for the management of pest species are in place in many national parks and nature reserves in north-east NSW under the umbrella of DEC Northern Rivers Region Pest Management Plan.

5.3 Habitat protection and management

If the Green-leaved Rose Walnut is ever found in State Forest, or within 50 m of the boundary, condition 6.22 of the UNE IFOA will apply:

1. An exclusion zone of at least 50 m radius must be implemented around all individuals.
2. An exclusion zone of at least 50 m wide must be implemented around all groups of individuals. A group is defined as more than one individual located less than 20 m apart.

If the Rusty Rose Walnut is found in State Forest, or within 50 m of the boundary, condition 6.24 of the UNE IFOA will apply:

1. An exclusion zone or exclusion zones of at least 50 m wide must be implemented around 90% of individuals.
2. The exclusion zone or exclusion zones must include areas where the density of individuals is greatest.

Specific on ground management of the habitat for the Green-leaved Rose Walnut and the Rusty Rose Walnut has not been conducted, apart from the translocation for salvage of plants affected by the Pacific Highway upgrade for the Yelgun to Chinderah Freeway.

However, general weed management has been undertaken at Brunswick Heads Nature Reserve. Similar actions by private landowners may have assisted the rehabilitation of the Green-leaved Rose Walnut and the Rusty Rose Walnut, though no such actions have been documented to date.

5.4 *Ex situ* plantings

The Rusty Rose Walnut may be unrepresented in *ex situ* plantings in public botanic gardens (Barry & Thomas 1994). Trees planted at the North Coast Regional Botanic Gardens are believed to be the Green-leaved Rose Walnut (A. Floyd pers. comm.).

6 Proposed Recovery Objectives, Actions and Performance Criteria

The overall objective of this Recovery Plan is to prevent the decline of populations of the Green-leaved Rose Walnut and the Rusty Rose Walnut in the wild, to ensure ongoing viability of wild populations, and to maintain the evolutionary potential of the taxa.

In order to do so, further investigation is required to resolve taxonomic difficulties currently confounding available background data for the two taxa. Reassessment of the distribution and abundance, reservation status and nature and extent of threats to each taxon will then be necessary, and actions adapted accordingly (Objectives 1–3). Objectives 4–9 will be applied to each taxon where separate requirements have been identified, or to both taxa.

Specific objectives of this Recovery Plan are listed below. Recovery actions, each with performance criteria, have been developed for the nine objectives.

Objective 1: To coordinate the recovery of the Green-leaved Rose Walnut and the Rusty Rose Walnut.

Action 1.1:

The DEC will coordinate the implementation of the actions outlined in this Recovery Plan.

The resolution of taxonomic uncertainties and re assessments will require administration and liaison with botanists, geneticists and managers. Overseeing the recovery actions for the two taxa will be a complex task, requiring a co-ordinated approach.

Performance criterion: Administrative arrangements are in place within the first year of this Recovery Plan, and are ongoing during the life of the plan.

Action 1.2:

The DEC will develop a record keeping system on all known populations to facilitate co-ordination of this Recovery Plan.

Details of all known populations must be available and accessible for coordination and management, and to identify knowledge gaps. A site index, and all available census data, habitat description, threat assessments, recovery actions and opportunistic observations should be compiled.

Performance criterion: A record keeping system will be developed during the first year of this Recovery Plan, and maintained and updated during the life of the plan.

Objective 2: To resolve taxonomic difficulties in the separation of the Green-leaved Rose Walnut and the Rusty Rose Walnut, and other closely related taxa and conduct field surveys where necessary to fill information gaps.

Action 2.1:

The DEC will initiate a program of taxonomic study, using traditional taxonomic methods plus molecular techniques, to establish the status of the Green-leaved Rose Walnut and the Rusty Rose Walnut and other closely related taxa, and to develop reliable methods of separation suitable for field and herbarium use with fertile and vegetative material.

The effective assessment of the status and requirements for recovery depends on accurate identification of all known specimens. Currently the identity of trees at many locations is uncertain, and botanists use a variety of methods for separation.

Performance criteria: i) The taxonomic study is complete within the first year of the plan. ii)

Details of methods for separation of the taxa are communicated to relevant botanists and managers within the same timeframe.

Action 2.2:

The DEC will coordinate surveys for known Green-leaved Rose Walnut and Rusty Rose Walnut sites where identity remains unknown, and/or where basic site data is not available.

Certainty of taxonomic identity and basic population and site data are essential background information for management. Many records of the Green-leaved Rose Walnut and the Rusty Rose Walnut lack either the means for establishing the identity of the taxon present (a herbarium specimen) and/or basic site data (abundance, population structure, habitat and threats). Detailed census data is desirable for at least a sample of the sites.

Performance criterion: Surveys are conducted in years 1 and 2 of the plan.

Objective 3: To reassess background information for the newly resolved taxa.

Action 3.1:

The DEC will revise accounts of basic taxon background, including abundance, population structure, distribution, reservation status and threats, and will subsequently adapt and reprioritise recovery actions as appropriate.

This assessment is essential as background information for managers and landowners, to refine and prioritise recovery actions.

Performance criterion: Actions under objectives 4–9 are revised on the basis of new assessments of the recovery requirements of the Green-leaved Rose Walnut and the Rusty Rose Walnut by the end of Year 2 of the plan.

Action 3.2:

The DEC will assess the need for horticultural trials (including vegetative propagation) and the augmentation of existing ex-situ conservation plantings of the Green-leaved Rose Walnut and the Rusty Rose Walnut in public collections.

The Green-leaved Rose Walnut and the Rusty Rose Walnut are poorly or unrepresented in public *ex situ* collections. In the event of a catastrophic event affecting one or a number of wild Green-leaved Rose Walnut and Rusty Rose Walnut populations, the genetic material in *ex situ* plants may be valuable. As fruit are rarely observed, their collection will not usually be possible or advisable, and vegetative propagation may be the preferred method of collection and plant production. The need for *ex situ* plantings and the adequacy of existing horticultural knowledge of the taxa requires assessment.

Performance criterion: The adequacy of existing horticultural knowledge of the taxa and the adequacy of their *ex situ* representation is assessed within the life of this Recovery Plan.

Action 3.3:

The DEC will review the need for critical habitat for the Green-leaved Rose Walnut and the Rusty Rose Walnut.

Some areas of habitat may be critical to the survival of the Green-leaved Rose Walnut and the Rusty Rose Walnut. Depending on other options for their protection, the DEC may initiate processes leading to its listing under the TSC Act as Critical Habitat.

Performance criteria: i) The need for critical habitat is reviewed during Year 3 of this Recovery Plan. ii) Subsequent listing processes will be initiated if appropriate.

Action 3.4:

The DEC will use the results of initial taxonomic, genetic and survey assessments to determine the immediate need for further assessment and genetic management.

When populations become depleted and fragmented, genetic variation is lost through a decrease in the number of individuals, through genetic drift and inbreeding depression. Current relative abundance, distribution and extent of fragmentation is not understood for the two taxa. Indirect indications of genetic problems may also come from observations of regeneration success. As genetic investigations, consequent management actions and monitoring are resource consuming, an assessment of need following preliminary investigations is appropriate.

Performance criterion: The DEC will assess the need for further genetic investigations in Year 2 of this Recovery Plan.

Action 3.5

Representative genetic material from as many populations as is practical will be collected and stored at an appropriate institution.

Genetic material is stored as a record of the genetic make-up of the species as a security against the destruction of populations through development or catastrophic stochastic events.

Performance criterion: That genetic material from as many populations as is practical is collected and held at an appropriate research institution within the life of the plan.

Objective 4: To improve the consideration of the Green-leaved Rose Walnut and the Rusty Rose Walnut in environmental impact assessments for developments and activities.

Action 4.1:

The DEC will develop and distribute standard survey and environmental assessment guidelines for the Green-leaved Rose Walnut and the Rusty Rose Walnut to all relevant government and non-government agencies, consent authorities and consultants.

A standard minimum survey effort should be undertaken when determining if the Green-leaved Rose Walnut and the Rusty Rose Walnut are present in or near the area of a potential development or activity. The presence of either taxon should require implementation of effective mitigation measures to reduce the impact of any proposed development or activity. The guidelines will address:

- Maintenance and protection of roadside populations, and their habitats.
- Protection of plants and their habitats where located close to developments.
- Measures to protect plants and their habits from the indirect effects of proximity to human activity (rubbish and garden refuse dumping, trampling, clearing of understorey vegetation).

Developments or activities frequently include an environmental repair component. Guidelines will address aspects of habitat restoration and rehabilitation including:

- Possible detrimental effects of misidentification of the taxa during bush regeneration works.
- Adverse effects on microclimate conditions in regeneration sites during weed removal.
- Planting of inappropriate species during habitat reconstruction.
- Use of planting material of inappropriate genetic origin.

Performance criterion: Standard survey and environmental assessment guidelines are developed and distributed within the life of the plan.

Specific objective 5: To manage and protect the Green-leaved Rose Walnut and the Rusty Rose Walnut and associated habitat from threatening processes.

Action 5.1

The DEC will notify all relevant landholders/managers that the Green-leaved Rose Walnut and/or the Rusty Rose Walnut is present on their land, and ensure they have access to information relevant to the conservation of the taxa. The DEC will liaise with relevant landholders/managers to ensure that they are aware of the long-term voluntary protection measures and incentive programs available.

Accidental damage the Green-leaved Rose Walnut and/or the Rusty Rose Walnut and their habitat is possible where landowners/managers do not know the taxa are present, and do not have access to management advice.

Performance criteria: i) All landowners/managers of known locations of the Green-leaved Rose Walnut and the Rusty Rose Walnut are notified of the presence of the taxa within the third year of the plan. ii) Where appropriate, options for long term voluntary protection measures and incentive programs are explained, habitat management guidelines provided and sources of assistance are explained.

Action 5.2:

To assess the need for detailed site specific management planning and supply guidelines and assistance as required.

Planning for habitat management is highly desirable to ensure that objectives are understood, management is effective and efficient, and that progress towards objectives is monitored. Objectives should include the removal or amelioration of specific local threats, and may include habitat expansion and rehabilitation, fire management, erosion control, and protection from livestock. Works should not have adverse impacts on the target species, its habitat or other threatened species or ecological communities present or the environment generally.

Management planning may be expensive and divert resources away from on ground works. The extent of need for formal and detailed planning varies, and in some circumstances, adherence to habitat management guidelines may suffice.

Guidelines to determine the level of management planning required, and recommendations for habitat management and project evaluation will be supplied by DEC.

Performance criteria: i) The site specific management planning needs of all locations of the Green-leaved Rose Walnut and the Rusty

Rose Walnut on DEC estate are assessed during the first year of the project. ii) Site specific management plans are prepared or management guidelines are tailored to requirements, during Year 1 of the plan. Implementation of these plans will be ongoing until objectives are met. iii) Where possible, similar assessments and planning will be undertaken at locations of the Green-leaved Rose Walnut and the Rusty Rose Walnut on other land tenures.

Action 5.3:

To control exotic weeds in the habitat of the Green-leaved Rose Walnut and the Rusty Rose Walnut.

Exotic weeds are serious threats to the Green-leaved Rose Walnut and the Rusty Rose Walnut and their habitat at several locations. Lantana at Mooball Nature Reserve, Camphor Laurel at Cedar Creek, Mount Warning and other locations as detected in surveys early in the life of the plan will require management.

Performance criterion: Exotic weeds are managed (primary treatment in Year 2 of the plan, reassessed in Years 3–5).

Action 5.4:

To protect roadside populations of the Green-leaved Rose Walnut and the Rusty Rose Walnut.

Roadside populations require protection from roadworks, slashing and herbicide. Continuous disturbance is inevitable on many roadsides, and encourages weed competition.

For roadside populations to be protected, several issues will require addressing. These include:

- Identification of roadside populations so routine maintenance works avoid damage to the species.
- Assessment of need for physical protection (barriers).
- Provision of advice to ensure pruning, earthworks and other management is conducted with minimal damage.
- Development of contingency strategies for situations where individuals have been harmed or future harm is unavoidable.

Planning and assessment measures necessary to protect roadside populations will be included in the environmental assessment guidelines (Action 4.1) and habitat management guidelines (Action 5.2).

Performance criteria: i) Authorities are notified of known locations of the Green-leaved Rose Walnut and the Rusty Rose Walnut on roadsides. ii) Planning and management strategies and physical protection are in place within Year 2 of the plan.

Action 5.5:

The DEC will not grant a licence under the TSC or the NPW Acts to collect propagation material from the Green-leaved Rose Walnut and the Rusty Rose Walnut unless collection is part of the Recovery Program.

Actions that do not require a consent or approval under the EP&A Act may require a licence under the TSC or the NPW Acts, for example, collection of threatened plants for identification purposes. Fruiting of the Green-leaved Rose Walnut and the Rusty Rose Walnut has rarely been reported. Therefore, licences will not be issued for the collection of propagation material, beyond the requirements of any recovery actions in this plan, until further information is available.

Performance criterion: No licences are granted under the TSC or the NPW Acts for collection of propagation material from the Green-leaved Rose Walnut and the Rusty Rose Walnut unless collection is part of the Recovery Program.

Action 5.6:

As a precautionary measure, landowners/managers will be advised not to plant the Green-leaved Rose Walnut and the Rusty Rose Walnut unless it is part of an action under the Recovery Program.

Introduction of genetic material from outside the population may displace local genotypes and genetic combinations, reducing the genetic diversity within the taxon.

Performance criterion: Landowners/managers will be advised of their obligations during the life of the plan.

Objective 6: Fire planning and management.

Action 6.1:

The DEC will provide information on the ecological requirements of the Green-leaved Rose Walnut and the Rusty Rose Walnut to the appropriate Bushfire Management Committees and DEC bushfire management planners.

The Rural Fires Act requires that the ecological requirements of threatened species are considered by Bushfire Management Committees (BMCs) in preparing Bushfire

Management Plans (BMPs) for local government areas. The DEC prepares Fire Management Plans that complement the local BMPs, for areas under its control.

Performance criterion: The DEC has provided information on the ecological requirements of the Green-leaved Rose Walnut and the Rusty Rose Walnut to the appropriate BMCs and DEC bushfire management planners within the life of the plan.

Objective 7: To improve knowledge of distribution, regeneration and genetics.

Action 7.1:

The DEC will ensure that all the Green-leaved Rose Walnut and the Rusty Rose Walnut records generated by research commissioned by the DEC are entered on the Atlas of NSW Wildlife.

It is important that the Atlas of NSW Wildlife database contains accurate records of the Green-leaved Rose Walnut and the Rusty Rose Walnut as it is a primary resource for government and non-government agencies, researchers, developers, environmental consultants and land managers.

Performance criterion: Consultants and staff undertaking research, surveys or management commissioned by DEC within the life of the plan will provide details of new Green-leaved Rose Walnut and Rusty Rose Walnut records in a form suitable for entry on the database to the DEC Wildlife Data Team on completion of the work.

Action 7.2:

The DEC will initiate a program of repeated census data collection and flowering and fruiting records from representative sites.

Factors limiting regeneration and development of the Green-leaved Rose Walnut and the Rusty Rose Walnut are poorly understood. Regeneration and development within wild populations is likely to take place over long time frames and may be episodic. Data collected can be expected to provide some preliminary guidance for future investigation. To link to other monitoring programs, consideration will be given to representation of National Parks and World Heritage areas in the sites selected for study.

Performance criteria: i) A review of available site data will be undertaken to determine appropriate sites for a sample for data collection, and a program of data collection will be designed during Year 2 of the plan. ii) Baseline data to be collected in Year 2, and repeat data collection to be undertaken in Years 3–5.

Action 7.3:

The DEC will encourage research into genetics and the reproductive biology of the Green-leaved Rose Walnut and the Rusty Rose Walnut.

Information on genetics and the reproductive biology of the Green-leaved Rose Walnut and the Rusty Rose Walnut will assist the DEC to refine management actions for these species. Knowledge of fertility, pollination and dispersal vectors, germination rates and environmental constraints to germination and seedling recruitment and persistence will improve the basis of management in the future.

Research into genetics may demonstrate the presence of inbreeding depression, the range of genetic variation and the extent of differentiation across the populations. The results will provide a guide to enable future genetic management, conserving genetic variation and local adaptations, preventing inbreeding depression and permitting future evolutionary development. In conjunction with knowledge of movements of pollinators and seed dispersers, genetic information will refine the estimation of a buffer zone around wild populations required to prevent genetic pollution.

Performance criterion: The DEC will liaise with researchers and research organisations to discuss and encourage research into genetics and reproductive biology within the life of the plan.

Objective 8: To integrate the recovery of the Green-leaved Rose Walnut and the Rusty Rose Walnut with the recovery of other biota.

Action 8.1:

Where practical, the DEC will integrate recovery actions for the Green-leaved Rose Walnut and the Rusty Rose Walnut with those of other threatened species, populations or ecological communities occurring in similar habitats.

A number of other threatened species, populations or ecological communities are known or likely to occur in similar habitats to the Green-leaved Rose Walnut and the Rusty Rose Walnut. By integrating the recovery actions of other threatened biota with those of the Green-leaved Rose Walnut and the Rusty Rose Walnut, limited resources can be used more effectively.

Performance criterion: Where practical, recovery actions have been integrated with those of other threatened species, populations or ecological communities during the life of the plan.

Objective 9 To involve the community in the recovery of the Green-leaved Rose Walnut and the Rusty Rose Walnut

Action 9.1:

The DEC will provide copies of the species profile for the Green-leaved Rose Walnut *and the* Rusty Rose Walnut *to relevant government and non-government agencies, as well as landowners, landcare groups and other interested community members within the known range of the Green-leaved Rose Walnut and the Rusty Rose Walnut.*

Education of the community about the Green-leaved Rose Walnut and the Rusty Rose Walnut will increase the probability of finding and protecting new populations. When conservation principles are understood, other benefits for biodiversity will follow.

Performance criterion: Copies of the species profile for the Green-leaved Rose Walnut and the Rusty Rose Walnut to be distributed to landowners, landcare groups and community members known to have specific interest in these species during Year 1 of the plan, and to be available on request throughout the life of the plan.

7 Implementation

Table 1 outlines the implementation of recovery actions specified in this Recovery Plan to relevant government agencies and/or parties for the period of five years from publication.

8 Social and economic consequences

The total cost of implementing the recovery actions will be $273,150.00 over the five year period covered by this plan. As a number of populations of both species occur within national parks and nature reserves, the taxa has a significant level of formal protection. Management of these areas will be in accordance with the requirements of the NPW Act and any costs incurred will be met by the DEC.

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

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

- provision and maintenance of a range of ecosystem processes;
- contributing to increased ecological knowledge of species, habitats and broader ecosystems; and
- cultural, aesthetic and spiritual biodiversity values.

The appropriate ecological management of the habitat of the Green-leaved Rose Walnut and the Rusty Rose Walnut will contribute to the conservation of a large number of other threatened species, and other flora species of conservation significance, which have been recorded within, and adjacent to, known populations. The distribution of the two taxa takes in parts of the forested areas of the Tweed caldera, one of the most biodiverse regions in Australia. The national parks and nature reserves of the caldera include 35 threatened plant species and 55 threatened animal species (NSW NPWS 2001). The Nightcap Oak *Eidothea hardeniana* and the Minyon Quandong *Elaeocarpus* sp. "Rocky Creek" are amongst the very rare and restricted rainforest trees sharing habitat with the Green-leaved Rose Walnut and/or the Rusty Rose Walnut.

On the foothills and lowlands, species co-occurring with the Green-leaved Rose Walnut and the Rusty Rose Walnut include many which have been severely depleted as a result of the extensive clearing of habitat. For instance, fourteen additional species of Threatened flora, plus the Endangered Ecological Community Lowland Rainforest on Floodplain, co-occur with the Green-leaved Rose Walnut and the Rusty Rose Walnut at Brunswick Head Nature Reserve, while four and six threatened species co-occur at Billinudgel and Broken Head Nature Reserves respectively. In the matrix between, and inland from, these small coastal reserves, the Green-leaved Rose Walnut and the Rusty Rose Walnut co-occur with poorly reserved threatened species including Davidson's Plum *Davidsonia jerseyana* and

Spiny Gardenia *Randia moorei,* in remnant and regrowth lowland rainforests and wet sclerophyll forests.

Conservation actions that retain habitat quality, or permit habitat recovery for the Green-leaved Rose Walnut and the Rusty Rose Walnut will benefit a wide range of fauna species, including some classified as threatened, particularly those preferring rainforest and wet sclerophyll forest. Threatened fauna species recorded within the range of the Green-leaved Rose Walnut and the Rusty Rose Walnut include their possible seed dispersers the rainforest pigeons Wompoo Fruit-Dove *Ptilinopus magnificus,* Rose-crowned Fruit-Dove, *Ptilinopus regina* and Superb Fruit-Dove, *Ptilinopus superbus.* In addition, frogs including Pouched Frog *Assa darlingtoni* and Loveridge's Frog *Philoria loveridgei,* reptiles including the Three-toed Snake-tooth Skink *Coeranoscinus reticulatus* and Stephen's Banded Snake *Hoplocephalus stephensii* and mammals including Common Planigale *Planigale maculata* and Long-nosed Potoroo *Potorous tridactylus* may share the habitat of the Green-leaved Rose Walnut and the Rusty Rose Walnut.

10 Preparation Details

This Recovery Plan has been prepared by Dr Barbara Stewart.

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

BMC	Bushfire Management Committee
BMP	Bushfire Management Plan
DEC	Department of Environment and Conservation (NSW)
DIPNR	Department of Infrastructure, Planning and Natural Resources
EIS	Environmental Impact Statement
EP&A Act	NSW *Environmental Planning and Assessment Act* 1979
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999
IFOA	Integrated Forestry Operations Approval
LG Act	*Local Government Act* 1993
LNE	Lower North East
MMA	Murwillumbah Management Area
NC Regulation	Queensland *Nature Conservation (Wildlife) Regulation* 1994
NPW Act	NSW *National Parks and Wildlife Act* 1974
NPWS	NSW National Parks and Wildlife Service
NSW	New South Wales
NVC Act	NSW *Native Vegetation Conservation Act* 1997
SEPP	State Environmental Planning Policy
SIS	Species Impact Statement
TSC Act	NSW *Threatened Species Conservation Act* 1995
UNE	Upper North East

Table 1. Estimated costs of implementing the actions identified in the Recovery Plan.

Action no	Action Title	*Priority	Cost Estimate ($'s/year)					Total Cost ($)	Responsible Party/Funding sources	#In-kind	^Cash
			Year 1	Year 2	Year 3	Year 4	Year 5				
1.1	Co-ordination	1	2450	1750	1750	1750	1750	**9450**	DEC	9450	
1.2	Record keeping system	1	5000	1050	1050	1050	1050	**9200**	DEC	4200	5000
2.1	Taxonomic study	1	50000					**50000**	DEC		50000
2.2	Surveys	1	38500	2000	2000	2000	2000	**46500**	DEC		46500
3.1	Reassessment	1	1750					**1750**	DEC	1750	
3.2	Assess need for horticultural trials and plantings	2		350				**350**	DEC	350	
3.3	Critical habitat	2			350			**350**	DEC	350	
3.4	Assess need for genetic management	2		350				**350**	DEC	350	
3.5	Collect genetic material	3		700				**700**	DEC	700	
4.1	EIA guidelines	1	1050	350	350	350	350	**2450**	DEC	2450	
5.1	Notify landowners/managers	1		1050	350	350	350	**2100**	DEC	2100	
5.2	Habitat management planning and guidelines	1		3500	3150	3150	3150	**12950**	DEC	12950	
5.3	Weed management	1		3150	1050	1050	1050	**6300**	DEC	6300	
5.4	Protect roadside populations	1	1050					**1050**	DEC	1050	
5.5	TSC Act licensing	2							DEC		
5.6	Restrict planting	2							DEC		
6.1	Fire planning and management	1							DEC		
7.1	Atlas records	1							DEC		
7.2	Repeated census surveys	2		5000	5000	5000	5000	**20000**	DEC		20000
7.3	Encourage research	2	20000	20000	20000	20000	20000	**100000**	DEC		100000
8.1	Integrate recovery with other biota	1		1750	1750			**3500**	DEC	3500	
9.1	Involve community	1	4750	350	350	350	350	**6150**	DEC	6150	
Total			**124550**	**41350**	**37150**	**35050**	**35050**	**273150**		**51650**	**221500**

* 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

Appendix 1 Submission

Draft Recovery Plan

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

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

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

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

Draft Recovery Plan: The Green-leaved Rose Walnut (*Endiandra muelleri* subsp. *bracteata)* and the Rusty Rose Walnut(*E. hayesii*)

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.nationalparks.nsw.gov.au

❒ Yes, please keep my personal details confidential to DEC

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

The Director-General
C/- The Green-leaved Rose Walnut and the Rusty Rose Walnut
Recovery Plan Co-ordinator
Conservation Programs and Planning (Northern)
The Department of Environment and Conservation
Locked Bag 914
Coffs Harbour NSW 2450.

Submission:

Appendix 2 Public Authority responsibilities

Public authority	Relevant responsibilities
DEC	• Assessment of Section 91 licence applications under the TSC Act. • Assessment of Section 120 licence applications under the NPW Act. • Assessment of Section 132C applications under the NPW Act. • Assessment of proposed developments on DEC estate. • Advice to determining and consent authorities, with a possible concurrence role under the EP&A Act or NVC Act. • Preparation of Recovery Plans and co-ordination of implementation. • Regulation of certain forestry operations under the Integrated Forestry Operations Approval.
Relevant local governments	• Preparation of Local Environmental Plans under Part 3 of EP&A Act. • Consent authorities for development proposals under Part 4 of EP&A Act. • Approval authorities for council works under Part 5 of EP&A Act. • Responsibilities under *Rural Fires Act* 1997. • Management of council reserves with potential habitat. • Consideration of the content of Recovery Plans when preparing plans of management for community land under *Local Government Act* 1993.
Department of Infrastructure Planning and Natural Resources	• Approval authority for native vegetation clearance applications under the NVC Act. • Administration of property plans under the NVC Act. • Management of crown land with potential habitat. • Co-ordination of Regional Vegetation Committees, Catchment Management Boards and Landcare programs. • Development of policy and strategies, including SEPPs, for land use planning and environmental assessment. • Advice and assistance on environmental planning matters. • Assessment of major development applications. • Administration of the general conditions of IFOA. • Concurrence role under the EP&A Act for certain developments and activities. • Making of SEPPs and Local Environmental Plans under Part 3 of EP&A Act. • Determining certain development proposals under Part 4 of the EP&A Act. • Approval of certain activities under Part 5 of EP&A Act.
State Forests of New South Wales	• Implementation of prescriptions detailed in IFOA terms of threatened species licence granted under Part 4 of the NSW *Forestry and National Park Estate Act* 1998.
Rural Fire Service	• Preparation of Bush Fire Risk Management Plans and Plans of Operations. • Fire management.
Other State government agencies	• Management of public lands with potential habitat. • Approval authorities for activity proposals under Part 5 of EP&A Act.

NSW
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The National Parks and Wildlife Service is part of the Department of Environment and Conservation (NSW)