Morrisbys gum

Eucalyptus morrisbyi

Flora Recovery Plan 2006 - 2010

Australian Government

Tasmania

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This plan was prepared by David Rankin and Wendy Potts (TSS) with advice from Brad Potts, Rob Wiltshire and René Vaillancourt (School of Plant Science, University of Tasmania), Paul Black (TSS) and Adrian Pyrke (Fire Management Section, PWS). Maps produced by Kristy Goddard (TSS). This plan was edited and amended by Justine Shaw (TSS). Cover produced by Gina Donelly (Graphic Services, ILS, DPIW). This plan draws on the previous *Eucalyptus morrisbyi* Recovery Plan by Blackhall and Lynch (1992), the Morrisby's gum *Eucalyptus morrisbyi* Listing Statement (TSU 2001), and the *Calverts Hill Nature Reserve Management Strategy* (2003). Much of our knowledge and understanding of this species comes from research conducted at the School of Plant Science, University of Tasmania. This Plan was prepared with support from the Commonwealth Department of Environment and Heritage.

Cover photos by Rob Wiltshire

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Abbreviations:

DEH	Commonwealth Department of Environment and Heritage
DPIW	Department of Primary Industries and Water, Tasmania (formerly DPIWE - Department of Primary Industries, Water and Environment)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
NRM Region	Natural Resource Management Region
NW	North Western NRM Region
S	Southern NRM Region
PFRP	Private Forest Reserves Program, DPIW
PWS	Parks and Wildlife Service, DTAE
TSP Act	*Threatened Species Protection Act 1995*
TSS	Threatened Species Section, DPIW (formerly TSU - Threatened Species Unit, DPIWE)

Taxonomy follows Buchanan (2005) except where otherwise noted.

The listing status of the threatened species referred to in this recovery plan was correct at the time of publication.

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SUMMARY

Current Species Status

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*..... Endangered
Tasmanian *Threatened Species Protection Act 1995*..... endangered

Eucalyptus morrisbyi Brett (1939), commonly known as Morrisby's gum, is a eucalypt endemic to southeastern Tasmania, and is known from only two natural populations. The largest population is from Calverts Hill near Cremorne, and includes two small remnant stands nearby at Lumeah Point and along Honeywood Drive. The second, smaller population is found 21 kilometres away in the Government Hills near Risdon. In total, the species occupies an area of approximately 12.5 hectares and numbers approximately 2000 individuals.

A continuing decline is inferred because of small population sizes, inappropriate firing, drought, browsing of seedlings and competition from understorey species.

Habitat Requirements, Threats and Limiting Factors

Both core populations of *Eucalyptus morrisbyi* occur in coastal, dry sclerophyll woodland on gentle to hilly slopes with poor drainage. This species tends to be restricted to gullies that offer some relief in this drought prone, low rainfall area. The species is relatively susceptible to drought and the Risdon population in particular appears to be succumbing to the effects of long term climate change with the trend for warmer, drier summers in more recent times.

Recruitment of *Eucalyptus morrisbyi* is primarily through canopy stored seed, particularly following fire or disturbance, though there is some vegetative reproduction through regeneration from lignotubers when stems die back following fire, stress or other disturbance. Many seedlings are lost through frequent fire or grazing by native animals, rabbits, and until recently, by livestock at Calverts Hill. Competition with understorey species also plays a limiting factor in the establishment and survival of seedlings and health of mature plants, particularly in times of drought. Under stress, the species is susceptible to defoliation through insect damage and this can reduce flowering in subsequent years, resulting in reduced recruitment potential with less seed held in the canopy.

Overall Recovery Objective

To prevent *Eucalyptus morrisbyi* from declining further over the 5 years of this Recovery Plan. This will require maintaining wild and *ex situ* populations and managing wild populations in such a way as to maximise the recruitment of seedlings.

Specific Objectives

1. To prevent further decline of wild populations.
2. To encourage the recruitment of seedlings in wild populations.
3. To maintain genetic diversity within the species.
4. To develop mechanisms to manage and better protect wild and *ex situ* populations in the long term.

Performance Criteria

1. No decline in the area occupied by the species, or the number of mature plants over the duration of the plan (determined by monitoring).

2. Improve the potential for seedling recruitment in wild populations over the duration of the plan.

3. Maintenance of *ex situ* plantings that represent the genetic diversity of the species.

4. Establishment of a Recovery Team when funding is procured to implement this plan or parts thereof.

5. Update listing statement and spatial population data as required and circulate this information to the wider botanical community and general public in the appropriate form i.e. update TSS databases, circulate updated information to the Tasmanian Flora Network and update the DPIW threatened species websites as necessary, provide data to relevant State and Commonwealth agencies, and include threatened species sites on the LIST (Land Information Systems Tasmania) by the end of year 1.

6. Annual requests made to research organisations and volunteer networks (e.g. Wildcare, Threatened Species Network etc.) to encourage active involvement in the recovery process.

7. Updated Recovery Plan by the end of 2010.

Actions Needed

1. Census and monitoring of populations.

2. Survey for new individuals and populations.

3. Habitat management *in situ.*

4. Management of *ex situ* populations.

5. Long term management.

Estimated Cost of Recovery

Actions	Cost estimate	Timeframe	NRM region
1. Census and monitoring	10,000	Year 1-5	S, (NW)
2. Survey for new individuals and populations	7,000	Year 1-5	S
3. Habitat management *in situ*	15,000	Year 1-5	S
4. Management of *ex situ* populations	15,000	Year 1-5	S, (NW)
5. Long term management	13,000	Year 1-5	State
Total	$60,000	Year 1-5	

BACKGROUND INFORMATION

Description

Eucalyptus morrisbyi, commonly known as Morrisby's gum, is a small tree growing to a height of approximately 6 to 12 m. Plants of mallee appearance are found where a number of stems have re-sprouted from lignotubers following frequent or intense fire. Peak flowering occurs from February to May.

While *Eucalyptus morrisbyi* generally has a stocking of rough bark at the base of the trunk, the upper trunk and branches have smooth bark that is brown, white-grey or pink-grey in colour. The bluish-green juvenile leaves are glaucous (covered with a whitish, waxy bloom), unstalked and rounded, 2 to 3 cm long and 2 to 4 cm wide. They are arranged in opposite pairs. The adult leaves are stalked, less glaucous, and arranged alternately. They are 5 to 10 cm long and 1.5 to 4 cm wide. The flower buds have a pointed operculum (flower cap) and are glaucous and shortly stalked. They arise in clusters of three from the leaf axils. The woody capsules are cylindrical and glaucous, measuring from 9 to 11 mm long, and 6 mm wide. (see Figure 1)

Eucalyptus morrisbyi is known to hybridise with white gum *Eucalyptus viminalis* and naturally occurring hybrids have been recognised. These trees typically resemble *Eucalyptus viminalis* but have somewhat glaucous, diamond shaped buds and glaucous to sub-glaucous fruit with partly sunken valves.

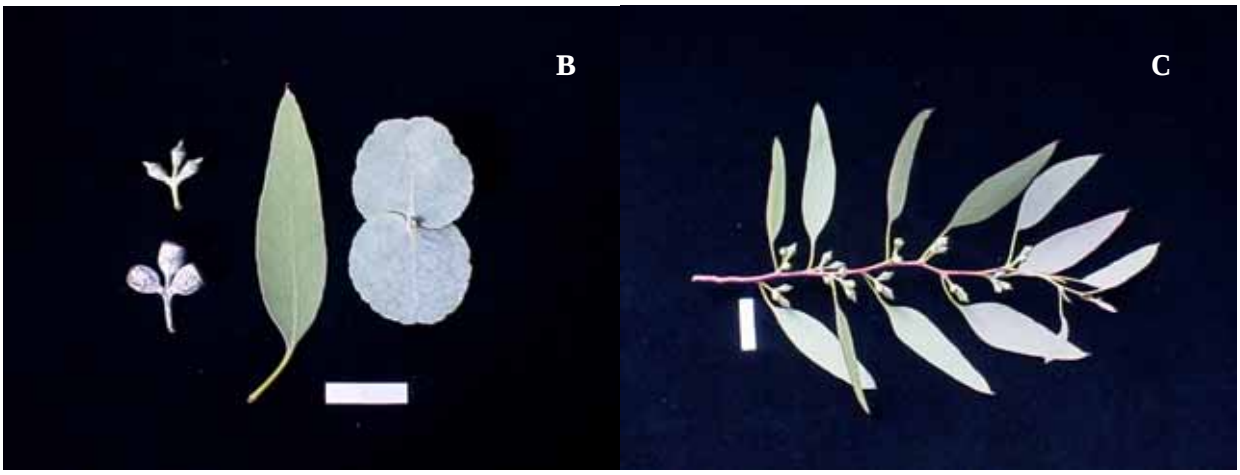

Figure 1. A. Flowers (photo: A. Mann), B. Adult and juvenile leaf morphology, woody capsule and flower buds (photo B. M. Potts), C. Adult leaves with flower buds (photo B. M. Potts),

Taxonomic Status

Eucalyptus represents the largest genus in the Family Myrtaceae, with approximately 800 currently recognised species, all but two of which are found in Australia. Twenty-nine species are found in Tasmania, of which 18 taxa (17 species and one subspecies) are endemic.

Eucalyptus morrisbyi is a member of the eucalyptus sub-genus *Symphyomyrtus*, and is placed in the alpine white gum subgroup of the Series *Viminales* with the closely related Tasmanian endemic eucalypts, cider gum *Eucalyptus gunnii*, alpine cider gum *Eucalyptus archeri*, heart-leaved silver gum *Eucalyptus cordata*, and urn gum *Eucalyptus urnigera*. These species, along with spinning gum *Eucalyptus perriniana* (found in Tasmania and southeastern mainland Australia), and the southeastern mainland Australian species bogong gum *Eucalyptus chapmaniana*, tingiringi gum *Eucalyptus glaucescens*, silver-leaved mountain gum *Eucalyptus pulverulenta* and Suggan Buggan mallee *Eucalyptus saxatilis*, are placed by Brooker and Kleinig (1999) in the series *Orbiculares*, a group of mostly alpine or sub-alpine species.

Eucalyptus morrisbyi was described by Brett in 1939 from specimens planted in an avenue near Cremorne after being drawn to his attention by the landowner, Mr. A. Morrisby, after whose family the species is named. Prior to its description, populations now recognised as *Eucalyptus morrisbyi* were considered to represent lowland forms of *Eucalyptus urnigera* or *Eucalyptus gunnii*.

Distribution

Eucalyptus morrisbyi is endemic to Tasmania, being known from only two natural populations on the eastern shore of the River Derwent near Hobart in southeastern Tasmania. The largest population is from Calverts Hill near Cremorne and includes two small remnant stands nearby at Lumeah Point and along Honeywood Drive. The second, smaller population, is 21 kilometres away in the Government Hills near Risdon . In total, the species occupies an area of approximately 12.5 hectares. Both populations fall within the South Eastern Bioregion and the Southern NRM Region (see Population Table and Figure 2).

A number of representative conservation plantings have been made at other sites and, once established and self-perpetuating, these will extend the range of the species (see Population Table). *Eucalyptus morrisbyi* has also been widely planted as a specimen tree and ornamental.

Distribution Map

Figure 2. Map of stands of *Eucalyptus morrisbyi*

Population Estimate

The total number of adult plants of *Eucalyptus morrisbyi* (excluding plantings) is approximately 2,024. By far the largest natural stand is at Calverts Hill with 1,915 adult plants (1991 count). The nearby Lumeah Point and Honeywood Drive remnant stands consist of 16 (1991 count) and 12 (1991 count) adult plants (plants with adult foliage) respectively. Eighty-one plants with adult foliage were recorded during a recent (2002) count in the Risdon population. In addition, 153 plants with juvenile foliage, mostly representing regeneration from lignotubers, were present at Risdon. While a number of seedlings have recently been observed in the Calverts Hill population, none were found during this recent survey of the Risdon population.

Population Table

Wild Pop.	Locality Tenure	NRM region	1:25 000 mapsheet	Year of last census	Area (ha)	Number of adults	Specific threats / requirements
1	**Calverts Hill** Calverts Hill Nature Reserve / Private land	S	Cremorne	1991	11.5	1915	Requires appropriate grazing and fire management to allow population recovery and recruitment.
	Lumeah Point Coastal Reserve with recreation lease	S	Cremorne	1991	0.15	16	Threatened by recreational activity, urban pressure, hybridisation impacts and lack of recruitment. Requires planting to replace dying trees.
	Honeywood Drive Roadside reserve / Private land	S	Cremorne	1991	0.15	12	Threatened by roadworks, agricultural activity and lack of recruitment. Requires planting to replace dying trees.
2	**Government Hills, Risdon** East Risdon State Reserve	S	Hobart	2002	0.7	81	Threatened by climate change (warmer, drier summers resulting in reduced competitive ability and increased susceptibility to insect attack) and lack of recruitment potential. At risk from deliberately lit fires. Adults need to be mapped and labelled. *Ex situ* plantings required to preserve genetic variation.

Ex situ	Locality Tenure	NRM region	1:25 000 mapsheet	Trees planted (year)	Trees alive (year)	Origin of seed	Requirements and comments
1	**Oigles Road, Geeveston** State Forest	S	Geeveston	284 284 (1999)	266 273 (2003)	Risdon Calverts Hill	Removal of wattles in understorey, ongoing monitoring and protection from fire and browsing. Some flower buds present.
2	**Derwent Park Road, Lutana** Private land	S	Hobart	264 321 (1999)	129 160 (2003)	Risdon Calverts Hill	Irrigation, weed control, ongoing monitoring and protection from rabbit and possum browsing. Early losses from drought and browsing.
3	**Boyer** Private land	S	New Norfolk	611 (1990)	438 (2002)	Calverts Hill	Requires ongoing monitoring. 56 flowering in 2002.
4	**Meunna** State Forest	NW	Milabena	931 (1990)	~420 (1991)	Calverts Hill	Requires census and monitoring. Other requirements unknown. Early losses due to frost. Reported to be doing well in 2004.

Habitat

The two core populations of *Eucalyptus morrisbyi* are found in moister aspects on infertile soils on the low rainfall eastern shore of the River Derwent, near Hobart, in southeastern Tasmania. The population in the Government Hills near Risdon (part of the Meehan Range) occurs on Permian mudstones, while the population from Calverts Hill occurs on Jurassic Dolerite and the nearby remnants on Quaternary sands overlying either Dolerite along Honeywood Drive or Permian mudstones at Lumeah Point.

The Calverts Hill population forms an open woodland on recently reserved farmland, but prior to clearing presumably had a shrubby understorey of prickly box *Bursaria spinosa*, she-oak *Allocasuarina verticillata* and native hop *Dodonaea viscosa*. These species still occur as occasional shrubs. The ground layer is dominated by the grasses *Poa* species, *Austrodanthonia* species and *Austrostipa* species, as well as by sagg *Lomandra longifolia*. A variety of annual and perennial herbs would also have contributed to this ground layer. At Calverts Hill, *Eucalyptus morrisbyi* tends to occur in relatively pure stands with white gum *Eucalyptus viminalis* and silver peppermint *Eucalyptus tenuiramis* growing nearby.

The Risdon population occurs as part of a relatively intact grassy woodland dominated by black peppermint *Eucalyptus amygdalina*. Although partially cleared to reduce competition, the understorey consists of prickly moses *Acacia verticillata*, silver wattle *Acacia dealbata*, blackwood *Acacia melanoxylon*, native daphne *Pultenaea daphnoides* var. *obcordata* and dolly bush *Cassinia aculeata*, with a lower shrub layer of common heath *Epacris impressa*, golden bush-pea *Pultenaea gunnii* and spreading wattle *Acacia genistifolia*. *Poa* spp. dominate the ground layer and various annual and perennial herbs are also present. *Eucalyptus viminalis*, and less commonly blue gum *Eucalyptus globulus*, also form part of this community. On more exposed sites adjacent to this population the rare local endemic, Risdon peppermint *Eucalyptus risdonii*, forms a pure stand.

Both core populations of *Eucalyptus morrisbyi* occur in coastal, dry sclerophyll woodland on gentle to hilly slopes with poor drainage. This species tends to be restricted to gullies that offer some relief in this drought prone, low rainfall area. The mean annual rainfall is approximately 520-580 mm, the eastern shore of the River Derwent being in the rain shadow of Mt Wellington.

Life History and Ecology

Eucalyptus morrisbyi is a small tree or mallee that flowers from February to May. Flowers are insect and bird pollinated. Recruitment is from canopy held seed that is released after fire and other disturbance. As in most eucalypts, seed dispersal is limited, few seedlings being found beyond twice the canopy height of a parent. Although a large proportion of the seed produced is viable, recruitment can be severely limited by grazing, drought, competition and frequent fire. Trees can resprout from lignotubers and epicormic buds following fire or other damage. At Risdon, stems sampled from over 3 metres apart have been found to belong to the same individual, demonstrating that the population consists of fewer individuals (genotypes) than indicated by stem counts. The largest clonal patch sampled was estimated to be over 1,000 years old (Jones *et al.* 2004).

Both the Calverts Hill and Risdon populations have equally high levels of genetic diversity despite the small size of the Risdon population (Jones *et al.* 2004). The high level of genetic diversity in the small Risdon population is believed to be maintained by longevity of genotypes through vegetative regeneration from lignotubers and high outcrossing rates as a result of the relatively high degree of self incompatibility displayed by the species. Naturally occurring hybrids with *Eucalyptus viminalis* have been identified though there is no evidence that interspecific hybridisation has contributed to the high level of genetic diversity in the small Risdon population. Genetic studies have not shown appreciable levels of pollen flow between the Calverts Hill and Risdon populations and these populations have been shown to be genetically distant. The studies also support the premise that the Lumeah Point and Honeywood Drive stands are remnants of the once more widespread Calverts Hill population, though genetic differences between these stands warrant their maintenance in order to conserve the genetic diversity within the species.

Threats, Limiting Factors and Management Issues

Eucalyptus morrisbyi is at risk because of its very restricted distribution. The distribution, particularly that from Calverts Hill and nearby is presumed to represent the remnant of a previously larger range, much of which has been cleared over the past 200 years. Genetic studies indicate that the two main populations were not joined at the time of European settlement (Jones *et al.* 2004). It is likely, however, that the two main populations represent remnants of a previously wider distribution along what is now the bed of the River Derwent during times of lowered sea levels (Wiltshire *et al.* 1991). Past records indicate a decline of at least 50% in the area occupied by the species in the Cremorne area (Calverts Hill and nearby remnants) since European settlement. This decline has been largely due to clearing for agriculture and urban development. Given that the remaining trees are in a narrow coastal strip adjacent to a housing subdivision, much of the original Lumeah Point stand is likely to have been cleared.

The precarious health of the Risdon population following a series of droughts, and evidence of drought stress in the lower margin of the Calverts Hill population suggest that *Eucalyptus morrisbyi* is relatively susceptible to drought. It appears that its range has been contracting to wetter gullies since the last glaciation. The Risdon population appears to be in a decline spiral and may well become extinct in the wild in the near future. The mortality rate, particularly of juvenile trees and seedlings, is high following drought stress and the trees appear to become more susceptible to defoliation caused mainly by the autumn gum moth *Mnesampela privata*. Surviving trees are weakened and flowering is compromised in following seasons. The health and seed output of the Risdon population was markedly improved following an unusually wet spring and summer in 1995/96 although subsequent drought conditions have caused a severe deterioration in the health and survival prospects of the population. The above average winter and early spring rainfalls in 2003 have provided some respite for this population following this series of below average rainfall and drought years. A gravity fed watering system has been installed above the Risdon population but has not yet been used.

The poor health of the Risdon population has reduced its competitive ability. In the late 1970s, a native parasitic vine downy dodder-laurel *Cassytha pubescens*, a species that is often abundant following fire, threatened to smother and kill many of the trees. This has since been removed and the understorey of silver wattle *Acacia dealbata*, blackwood *Acacia melanoxylon* and prickly moses *Acacia verticillata* was thinned in October 2001 in order to further reduce competition stress on the trees.

Eucalyptus morrisbyi is more or less well adapted to fire, which stimulates the release of seed from capsules retained in the canopy. However, frequent fires will cause a decline in populations. While larger trees can resprout from lignotubers and epicormic buds, smaller trees and seedlings will be killed. If the store of seed held in the canopy is not replenished in the interval between fires, recruitment from seedlings will not replace the individuals killed. Seedlings of *Eucalyptus morrisbyi* take approximately 10 years to produce flowers, a relatively long time for eucalypts. The small Risdon population is particularly at risk from fire as the mortality rate would be high given the poor health of the individuals, and its recruitment potential is poor as very little seed is being produced. Maintenance of effective fire breaks is essential as fires are frequently lit by arsonists in the area. They have the potential to rapidly burn up the gully from the west, potentially destroying the population.

In addition to clearing, seedling regeneration on what was, until recently, private land at Calverts Hill has been limited by sheep and possibly rabbit grazing. The stands have also suffered from woodcutting. The land with the majority of the Calverts Hill stand was purchased in 2002 by the Tasmanian Government through the 1999 Regional Forest Agreement (RFA) Private Forest Reserve Program. This will reduce the above-mentioned threats, and recruitment of seedlings has already been observed at this site following the removal of sheep in 2000. The stand along Honeywood Drive is at risk from road maintenance activities and from future realignments of the road for access or safety concerns. It is, however, being marked and managed as a priority site of roadside vegetation by Department of Infrastructure, Energy and Resources.

Although *Eucalyptus morrisbyi* hybridises with *Eucalyptus viminalis*, studies have not revealed significant contamination of its gene pool in the main stand at Calverts Hill and at Risdon (Wiltshire *et al*. 1991, Jones *et al.* 2004). However, the Lumeah Point stand is at risk of contamination through hybridisation. Some mature trees from the Lumeah Point stand appear to be naturally occurring hybrids with *Eucalyptus viminalis.* While a

significant proportion of hybrids can be detected in nursery grown *Eucalyptus morrisbyi* seed collected from wild populations, very few hybrids generally survive to maturity *in situ.* However, when a population becomes as small as the one at Lumeah Point, the proportion of hybrid seed produced increases due to pollen swamping, increasing the chance of hybrids establishing in the wild. The risk posed by hybridisation may also increase with the planting of ornamental eucalypts in the adjacent residential area. Past plantings at Lumeah Point were undertaken to supplement numbers in the stand though it appears that many of the planted trees were hybrids. It would appear that they were raised from seed collected from hybrid trees at the stand. It may be prudent to consider replacing these planted hybrids with non-hybrids.

Studies (Wiltshire *et al.* 1991, Jones *et al.* 2004) have demonstrated that there is significant genetic variation between the Risdon and Calverts Hill populations and both populations need to be maintained to conserve the genetic diversity of the species. While closely related to the larger stand at Calverts Hill, the remnant stands at Lumeah Point and Honeywood Drive show significant genetic differences warranting their maintenance in order to conserve the genetic diversity within the species. The high level of genetic diversity in the small Risdon population is believed to be maintained by longevity of genotypes through vegetative regeneration from lignotubers and high outcrossing rates as a result of the relatively high degree of self incompatibility displayed by the species. Naturally occurring hybrids with *Eucalyptus viminalis* have been identified though there is no evidence that interspecific hybridisation has contributed to the high level of genetic diversity in the small Risdon population. It is especially important that the genetic variation found in the Risdon population is preserved *ex situ,* given that the survival in the wild of this population is far from guaranteed. Despite the small size of the Risdon population, variation remains high and it is not showing signs of inbreeding problems. This perhaps reflects the relatively high level of self-incompatibility displayed by the species and the longevity of genotypes through vegetative reproduction from lignotubers.

As well as conserving genetic diversity, *ex situ* populations will help to prevent collecting pressures on wild populations by providing an alternative source of seed for forestry and horticultural purposes. However, the success of *ex situ* plantings of *Eucalyptus morrisbyi* is dependent on adequate representation of the gene pool and avoiding hybridisation by culling hybrid seedlings before planting and avoiding pollen contamination from compatible species with similar flowering times. Several *ex situ* plantings of *Eucalyptus morrisbyi* have been established. Seed used in the early plantings was collected solely from the Cremorne area. However, the seed collected was from a small number of individuals and was not representative of the genetic pool available. A number of representative *ex situ* plantings were instigated by the School of Plant Science and the Cooperative Research Centre for Sustainable Production Forestry at the University of Tasmania (see Population Table). Seedlings representing the Risdon and Calverts Hill population were planted in 1999 at Lutana (on land owned by Zinifex) and at Geeveston (on land managed by Forestry Tasmania). Should the Risdon population become extinct, the *ex situ* plantings at Lutana and Geeveston will have the plants originating from the Calverts Hill population removed, to provide self perpetuating *ex situ* populations representing the Risdon population. Seedlings representing the Calverts Hill population were planted in 1990 at Boyer (on land owned by Norske Skog Paper Mills Australia) and at Meunna (on land managed by Forestry Tasmania).

Ex situ plantings of *Eucalyptus morrisbyi* require adequate irrigation, weeding and protection from browsing until well established. The species is relatively susceptible to drought stress and browsing by native animals, rabbits and insects. Plants originating from the Calverts Hill population are particularly susceptible to browsing and are preferentially browsed when grown with seedlings from the Risdon population. Irrigation is an ongoing management issue for the Lutana planting due to low summer rainfall. The Geeveston planting has suffered from some browsing and will require removal of wattles in the understorey in future years. The planting at Boyer is starting to produce seed. The Meunna planting has not been checked for many years and requires monitoring. The *ex situ* stands require protection from fire.

The *ex situ* plantings are also an important educational resource. They are being used for research by staff and students from the School of Plant Science at the University of Tasmania. This research will continue to improve our understanding of this species, thereby providing an improved basis for recovery and management actions.

Reservation Status

The majority of the Calverts Hill population will be reserved in the proposed 65 hectare Calverts Hill Nature Reserve. The Risdon population has been reserved since 1971 in the 88 hectare East Risdon State Reserve. Both form part of Tasmania's Comprehensive, Adequate and Representative Reserve System, and are managed by the Tasmanian Government for their nature conservation values.

Reasons for Listing and Habitat Critical

Eucalyptus morrisbyi meets the criteria for the Endangered (EN) category under the **Commonwealth *Environment Protection and Biodiversity Conservation Act 1999***.

Eucalyptus morrisbyi meets the criteria for listing as endangered (e) on the **Tasmanian *Threatened Species Protection Act 1995*** because:

Rule B Extent of occurrence estimated to be less than 5000km^2 or area of occupancy estimated to be less than 500km^2 and
1. Known to exist at no more than five locations
2. Continuing decline inferred, observed or projected in:
   (a) extent of occurrence
   (b) area of occupancy
   (d) number of locations
   (e) number of mature individuals

A **continuing decline** is inferred because of small population sizes, inappropriate firing, drought, browsing of seedlings and competition from understorey species.

Both the ***TSPA 1995*** and ***EPBC 1999*** Acts are informed by version 3.1 IUCN (World Conservation Union) Red List guidelines (2001). *Eucalyptus morrisbyi* meets the following IUCN criteria:

Rule B In geographic range
1. Extent of occurrence estimated to be less than 5000km^2 and
   a. known to exist at no more than five locations
   b. continuing decline observed, inferred or projected in:
      (i) extent of occurrence
      (ii) area of occupancy
      (iv) number of locations
      (v) number of mature individuals
2. Area of occupancy estimated to be less than 500km^2 and
   a. known to exist at no more than five locations
   b. continuing decline observed, inferred or projected in:
      (i) extent of occurrence
      (iii) area of occupancy
      (iv) number of locations
      (v) number of mature individuals

Rule C Population size estimated to number fewer than 2500 mature individuals and
2. A continuing decline observed, projected or inferred in numbers of mature individuals and
   a. (ii) at least 95% of mature individuals in one population

Habitat considered critical to the survival of the species comprises

- the Calverts Hill population (including remnant stands at Lumeah Point and Honeywood Drive) and the Risdon population, essential in order to maintain genetic diversity
- *ex situ* populations at Lutana and Geeveston containing seedlings from the Risdon population, essential in order to maintain genetic diversity in the event of the loss of the Risdon population

Existing Conservation Measures

A Management Phase Recovery Plan for *Eucalyptus morrisbyi* was prepared in 1992 (Blackhall and Lynch 1992) and partially implemented. A Management Strategy for the Calverts Hill Nature Reserve was prepared in 2003. The land encompassing the majority of the Calverts Hill population was purchased under the Private Forest Reserve Program and declared as the Calverts Hill Nature Reserve. The Risdon population is protected within the East Risdon State Reserve. Both form part of Tasmania's Comprehensive, Adequate and Representative Reserve System, and are managed by the Tasmanian Government for their nature conservation values.

Grazing will be allowed in the paddock on the eastern side of Calverts Hill and may be allowed within the stand of *Eucalyptus morrisbyi* to reduce the fire hazard. The Parks and Wildlife Service (Southern District) carry out fuel reduction burns within the East Risdon State Reserve in consultation with the Threatened Species Section (DPIW) and the Fire Management Section (Parks and Wildlife Service) with the aim of preventing wild fires from spreading up the gully from the west.

Trees in the roadside reserve along Honeywood Drive are being managed as a priority site of roadside vegetation by Department of Infrastructure, Energy and Resources. This involves participation in Enviromark, Greening Australia's roadside marking system for priority vegetation, and preparation of management prescriptions.

Several representative *ex situ* plantings are being maintained to preserve the genetic variability within the species and to provide an alternative source of seed to minimise collection pressure from wild stands (see Population Table).

RECOVERY PLAN

Recovery Objectives, Performance Criteria and Actions Needed

The **overall objective** of the Recovery Plan is to prevent *Eucalyptus morrisbyi* from declining further. This will require maintaining wild and *ex situ* populations and managing wild populations in such a way as to maximise the recruitment of seedlings.

Specific objectives are:

1. To prevent further decline of wild populations.
2. To encourage the recruitment of seedlings in wild populations.
3. To maintain genetic diversity within the species.
4. To develop mechanisms to manage and better protect wild and *ex situ* populations in the long term.

The **criteria** for achieving the objectives constitute a quantifiable decrease in the risk of extinction over 5 years of Recovery Plan implementation. They are:

1. No decline in the area occupied by the species, or the number of mature plants over the duration of the plan (determined by monitoring). ***Specific objectives 1, 3.***
2. Improve the potential for seedling recruitment in wild populations over the duration of the plan. ***Specific objectives 2, 3.***
3. Maintenance of *ex situ* plantings that represent the genetic diversity of the species. ***Specific objective 3.***
4. Establishment of a Recovery Team when funding is procured to implement this plan or parts thereof. ***Specific objective 4.***
5. Update listing statement and spatial population data as required and circulate this information to the wider botanical community and general public in the appropriate form i.e. update TSS databases, circulate updated information to the Tasmanian Flora Network and update the DPIW threatened species websites as necessary, provide data to relevant State and Commonwealth agencies, and include threatened species sites on the LIST (Land Information Systems Tasmania) by end of Year 1. ***Specific objective 4.***
6. Annual requests made to research organisations and volunteer networks (e.g. Wildcare, Threatened Species Network etc.) to encourage active involvement in the recovery process. ***Specific objective 4.***
7. Updated Recovery Plan by the end of 2010. ***Specific objective 4.***

The **actions** required for achieving the objectives are:

1. Census and monitoring of populations. ***Specific objective 1, 2. Performance criteria 1, 2.***
2. Survey for new individuals and populations. ***Specific objective 1, 3. Performance criterion 1.***
3. Habitat management *in situ*. ***Specific objective 1, 2. Performance criteria 1, 2.***
4. Management of *ex situ* populations. ***Specific objectives 1, 3. Performance criterion 3.***

5. Long term management. ***Specific objectives 1, 2, 3, 4. Performance criteria 4, 5, 6, 7.***

Strategy for Recovery and Progress Evaluation

The *Eucalyptus morrisbyi* Recovery Plan will run for 5 years and is based on strategies to prevent the loss or degradation of known populations, to encourage an increase in recruitment of seedlings, to preserve genetic variation within the species through the maintenance of established *ex situ* populations and to develop mechanisms to manage and better protect populations in the long term. This plan does not focus on the protection of populations from a detrimental change in land use as the majority of the known occurrence of the species is on reserved land maintained for its natural values and much of the remainder is on public land.

This plan has been prepared in consultation with various representatives of the Threatened Species Section and the Resource Management and Conservation Division of the Department of Primary Industries and Water, the School of Plant Science at the University of Tasmania, and various eucalypt experts. It incorporates management issues and strategies outlined in the *Calverts Hill Nature Reserve Management Strategy* (2003). The Natural Resource Management program will play a leading role in enabling the implementation of this plan.

A Recovery Team will be established once funding to implement this plan or parts of the plan is secured. Each year following establishment, the Recovery Team will monitor and evaluate progress against recovery criteria outlined in this plan and report to relevant sponsor organisations. Significant developments will be communicated to the general public through Listing Statement updates, websites, relevant newsletters and reports.

This plan is consistent with the aims of the *Threatened Species Strategy for Tasmania* (2000) and *Tasmania's Nature Conservation Strategy* (2002).

Affected Interests and Social and Economic Impacts

Eucalyptus morrisbyi has legal protection as a listed threatened species at the State and Commonwealth level and as a threatened forest community listed under the Forest Practices Regulations 1997. The majority of the known occurrence of the species is on reserved land maintained for its natural values.

The implementation of this Recovery Plan is unlikely to cause significant adverse social and economic impacts. Continued access to populations for research and educational purposes will provide long term benefits.

The Aboriginal community is currently being consulted to determine whether there are any Aboriginal issues or interests identified in this Recovery Plan. If no role is identified for indigenous communities in the recovery of this species, opportunities may exist through cultural interpretation and awareness of this species.

Biodiversity Benefits

As well as preventing this species from becoming extinct, biodiversity benefits include the maintenance of a rare and endangered forest community that is threatened with further reduction in size and diversity. The Meehan Range, of which the East Risdon State Reserve is a part, is home to other threatened species. In addition to *Eucalyptus morrisbyi*, the Risdon peppermint *Eucalyptus risdonii* (rare, TSP Act) and the recently described reflexed everlasting *Ozothamnus reflexifolius* (vulnerable, TSP Act and Vulnerable, EPBC Act) are also confined to this range on the outskirts of Hobart. *Eucalyptus morrisbyi* plays an important part in contributing to this unique biodiversity of the Hobart region. Ongoing research into the conservation biology of this species is of relevance to the conservation and management of this species and other threatened flora species.

RECOVERY ACTIONS

1. Census and monitoring of populations

Before the success or failure of this Recovery Plan can be judged, an accurate census must be carried out to provide a base line with which to compare population sizes at the commencement and conclusion of the Recovery Plan. The most recent census of *Eucalyptus morrisbyi* populations in the Cremorne area (Calverts Hill, Lumeah Point and Honeywood Drive) was carried out in 1991. A new census of adult plants (plants with adult foliage) should be undertaken to provide a base line with which to monitor increase or decline in community size over the life of this Recovery Plan. The most recent census at Risdon was carried out in 2002 by the Australian Plant Society under the supervision of the Threatened Species Section. All adult trees, including coppice regrowth, are individually tagged in this population.

To determine whether any recruitment of seedlings is occurring, and hence determine the long term viability of the populations, monitoring of recruitment should be undertaken. An annual survey of seedlings is being carried out in the Calverts Hill population as part of an undergraduate course at the School of Plant Science at the University of Tasmania. This transect based study, while not providing an absolute quantitative count, will indicate if recruitment is taking place against the pressures of herbivory. The most recent survey of the Risdon population in 2002 found no recruitment, and very little flowering has been observed within this population for a number of years. The seed crop should be monitored to determine future potential for recruitment in this population. The health of these individuals should also be closely monitored. A survey of recruitment should be carried out within the Risdon population towards the conclusion of this Recovery Plan.

Should sufficient seed be produced in the Risdon population during the term of this plan, some should be collected to use to expand *ex situ* plantings of this population in future years (see Action 4). While many of the stems in the Risdon population have been labelled, they need to be mapped and labelling maintained such that the source of seed collected for further plantings can be identified. This is necessary to avoid using seed collected at different times from the same plants or to avoid collecting from clonal stems arising from the same lignotuber and to design *ex situ* plantings that will be representative of the genetic variation in the populations.

Because of the location and use of areas occupied by remnant stands at Lumeah Point and Honeywood Drive, recruitment at these sites is likely to be limited and a survey of seedlings is not a high priority. The health of the adult plants at these sites should be monitored however, as a number are dying and the replacement of individuals should be considered to maintain these stands. This will require the mapping and labelling of adult trees in these stands. This will also allow the origin of any seed collected for replanting to be tracked.

Towards the conclusion of this Recovery Plan, a further census of adult plants should be carried out in all wild and *ex situ* stands. Interested parties that have previously carried out a census of *Eucalyptus morrisbyi* populations include the School of Plant Science at the University of Tasmania and the Australian Plant Society.

Census and monitoring is also required to determine the timing and type of management required at all sites. To this end, the proportion of the Calverts Hill stand on private land adjacent to the Calverts Hill Nature Reserve needs to be identified and mapped, and proposed ecological burns should not be undertaken in this stand unless there is adequate seed held in the canopy for recruitment following fire. Monitoring of representative *ex situ* plantings is required to determine survival rates and management requirements such as protection from browsing and removal of competition in the understorey.

Cost estimate	Timeframe
$10,000	Year 1-5

2. Survey for new individuals or populations

Although all known populations of *Eucalyptus morrisbyi* are close to Hobart, there still remains a chance that small populations, remnant stands or individuals may yet be discovered on private property. The most appropriate course of action is to be aware of this possibility during flora surveys in the Meehan Range and Cremorne areas. Opportunities for flora surveys on private land include those undertaken as part of the covenanting process for the Private Forest Reserves Program (PFRP) and the Protected Areas on Private Land Program (PAPL) and surveys conducted as part of the forestry activity and development approval process. A new population of the rare eucalypt Risdon peppermint, *Eucalyptus risdonii*, was recently located to the north of Risdon during such a survey and the land subsequently covenanted. Further populations of *Eucalyptus risdonii*, as well as the recently described reflexed everlasting, *Ozothamnus reflexifolius*, have recently been found in the Meehan Range, highlighting that much vegetation survey is still to be carried out in Tasmania, especially on private land. Historical records and early mapping of *Eucalyptus morrisbyi* may provide a basis for the focus of such survey.

Cost estimate	Timeframe
$7,000	Year 1-5

3. Habitat management *in situ*

Calverts Hill: The most important factors threatening the long term survival of the Calverts Hill population have been possible changes in land use, and the limited recruitment of seedlings. With the purchase of Calverts Hill by the PFRP in 2002, the management of the land for conservation values has been secured. The two most important factors limiting recruitment of seedlings in this population have been fire and grazing. Grazing by sheep ceased in 2000 and recruitment has already being observed. Grazing by native herbivores and rabbits may still occur.

The proposed fire management strategy for Calverts Hill centres on the reduction of fuel loads in adjacent paddocks. Grazing by sheep in the non-forested, easterly part of the Reserve is recommended to reduce fuel loads, at least during the early stages of this Recovery Plan. Long term it is hoped that the woodland will expand into the adjacent paddocks and University of Tasmania student trials are in progress to determine the best way of encouraging expansion of *Eucalyptus morrisbyi* in this area. Within the woodland, fuel reduction via grazing is not compatible with the recruitment of seedlings and should not take place until they are of sufficient size to avoid damage. A mosaic of grazing and exclusion areas may be a long-term solution although fuel reduction burning, once a suitable amount of seedlings have reached sufficient size to avoid damage, would be preferable. This is more compatible with the long term aim of the recovery of associated understorey and ground cover species.

Government Hills, Risdon: The management of the population at Risdon is more sensitive than that of Calverts Hill, as it is a small declining population. Very little seed has been set in recent years and no recruitment has been observed. The Calverts Hill and Risdon populations are genetically distinct, and the survival of this population is essential to maintain the genetic diversity within the species.

The prime management concern at Risdon is allowing the remaining mature plants and coppice regrowth to reach a stage where they produce seed. Irrigation may be required in drought years to encourage flowering and seed set. Drought stressed plants are less likely to flower and are more susceptible to insect attack. Manual clearing of the undergrowth will reduce competition for soil moisture, reduce the fuel load within the woodland, and provide openings for the recruitment of seedlings. A water holding tank has been put into place to allow the population to be watered if necessary.

Fire should be excluded from the population until seedlings have reached sufficient size to avoid damage and sufficient seed is held in the canopy for post fire recruitment. The firebreak surrounding the population should be maintained, especially along the westerly boundary, and fuel reduction burns carried out between the River Derwent and this firebreak. This will provide a buffer between the population of *Eucalyptus morrisbyi* and fires that are frequently set by arsonists and have the potential to rapidly burn up the gully from the west, potentially destroying the population.

Lumeah Point and Honeywood Drive: Because of the location and use of areas occupied by these remnant stands, recruitment at these sites is likely to be limited. As older trees senesce, as some are doing presently, non-hybrid seedlings grown from seed collected from these trees should be planted to maintain these small but important stands. Collection and storage of seed from these stands is required for this purpose. The collection of seed from wild populations will require a permit issued under provisions of the TSP Act. The replacement of planted hybrids in the Lumeah Point stand with non-hybrids should be considered. Ongoing consideration of roadside management activities is required for trees in the road reserve along Honeywood Drive. Community involvement and awareness provides the best opportunity for maintaining these remnant stands.

Cost estimate	Timeframe
$15,000	Year 1-5

4. Management of *ex situ* populations

The ongoing maintenance of *ex situ* populations of *Eucalyptus morrisbyi* is essential to safeguard the genetic diversity found within the species. Studies have demonstrated that there is significant genetic variation between the Risdon and Calverts Hill populations. It is especially important that the genetic variation found in the Risdon population is preserved *ex situ*, given that the survival in the wild of this population is far from guaranteed. *Ex situ* populations will also provide a future source of seed to prevent collecting pressures on wild populations.

A number of representative *ex situ* plantings were instigated by the School of Plant Science and the Cooperative Research Centre for Sustainable Production Forestry at the University of Tasmania (see Population Table). Seedlings representing the Risdon and Calverts Hill population were planted in 1999 at Lutana (on land owned by Zinifex) and at Geeveston (on land managed by Forestry Tasmania). Should the Risdon population become extinct, the *ex situ* plantings at Lutana and Geeveston will have the plants originating from the Calverts Hill population removed, to provide self perpetuating *ex situ* populations representing the Risdon population. Seedlings representing the Calverts Hill population were planted in 1990 at Boyer (on land owned by Norske Skog Paper Mills Australia) and at Meunna (on land managed by Forestry Tasmania).

As well as conserving the full range of genetic variation available, these plantings will provide an alternate source of seed for forestry and horticultural purposes. These plantings are also an important educational resource. They are being used for research by staff and students from the School of Plant Science at the University of Tasmania. This research will improve our understanding of this species, thereby providing an improved basis for recovery and management actions.

Ex situ plantings of *Eucalyptus morrisbyi* require adequate irrigation, weeding and protection from browsing until well established. The species is relatively susceptible to drought stress and browsing by native animals and insects. Plants originating from the Calverts Hill population are particularly susceptible to browsing. Irrigation is an ongoing management issue for the Lutana planting due to low summer rainfall. The Geeveston planting has suffered from some browsing and will require removal of wattles in the understorey in future years. The planting at Boyer is starting to produce seed. The Meunna planting has not been checked for many years and requires monitoring. The *ex situ* stands should also be protected against fire.

The recent protection of the majority of the Calverts Hill stand in a Nature Reserve has reduced the need to establish further *ex situ* plantings representing this stand. However, the expansion of *ex situ* plantings representing the Risdon population should be considered when this Recovery Plan is updated in 2010. Expansion cannot be considered during the term of this plan because of the lack of available seed that adequately represents this population. However, should the health of the Risdon stand improve and seed be produced during the implementation of this plan, seed should be collected from the Risdon population for the planting of further *ex situ* plantings. The collection of seed from wild populations will require a permit issued under provisions of the TSP Act. This action will require adequate mapping, labelling and monitoring of the Risdon population to enable representative seed to be collected from the population (see Action 1).

Cost estimate	Timeframe
$15,000	Year 1-5

5. Long term management

This action involves collation and interpretation of data pertaining to *Eucalyptus morrisbyi* and dissemination to stakeholders in the appropriate form. This is necessary for base management advice, allocation of resources and assessment of the impact of development proposals on the best available information at any time. This action is also required to encourage and allow community participation in and ownership of the Recovery Plan implementation process.

Ongoing data and data interpretation requirements as new information becomes available are:

- entry of spatial information from wild and *ex situ* populations into TSS and DPIW GIS systems
- collation of additional information required to assess the conservation status, such as population and threat data and inclusion in a TSS database
- Entry into TSS database (ie: new populations, population decline and threshold conditions) and regular assessment of database to determine whether management intervention is required
- maintain *ex situ* population establishment and monitoring data
- lodgement of specimens of each stand with the Tasmanian Herbarium in case of future taxonomic treatments

Requirements for the dissemination of information are:

- update Listing Statement every 5 years or as new information becomes available and circulate to libraries, the wider botanical community (including the Tasmanian Flora Network) and include on the DPIW website to give access to the general public
- update the Recovery Plan every 5 years, submit for adoption by the State and Commonwealth, and circulate to libraries, the wider botanical community (including the Tasmanian Flora Network) and include on the DPIW and DEH websites to give access to the general public
- update written management advice on populations to landowners/managers as necessary
- circulate spatial information to different users in the appropriate form i.e. include polygon or point data as appropriate in the TSS GIS system, include point records in the DPIW GIS system, provide data to relevant State and Commonwealth agencies, include polygon or point data as appropriate on the LIST (Land Information Systems Tasmania)
- inform planning authorities of occurrences and potential habitat to allow inclusion in planning schemes and NRM regional strategies
- investigation of additional processes to alert potential landowners as to possible occurrences of threatened flora species and associated responsibilities

Mechanisms to facilitate community participation and ownership are:

- establish a Recovery Team when funding is procured to implement this plan or parts thereof
- make requests to volunteer networks (e.g. Australian Plant Society, Wildcare, Threatened Species Network etc.) to participate in specific recovery actions at least 6 weeks in advance (general requests for participation usually generate little interest)
- request participation in recovery actions by the wider botanical community through the Tasmanian Flora Network
- when necessary, organise permission from landowners/managers to access populations and permits from the TSS for the collection of propagation material or herbarium specimens
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Cost estimate	Timeframe
$13,000	Year 1-5

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APPENDIX 1: Location details of wild and *ex situ* stands

Wild Stands	**Easting**	**Northing**
Calverts Hill population	542800	5245000
Lumeah Point remnant stand	542000	5242900
Honeywood Drive remnant stand	541300	5243200
Government Hills, **Risdon** population	526800	5258100

***Ex situ* Plantings**	**Easting**	**Northing**
Oigles Road, Geeveston Origin: Risdon and Calverts Hill	488600	5221400
Derwent Park Road, Lutana Origin: Risdon and Calverts Hill	525100	5257750
Boyer Origin: Calverts Hill	508700	5264000
Meunna Origin: Calverts Hill	372500	5450500

(Datum AGD 66)