

Eucalyptus ovata – Callitris oblonga Forest

Flora Recovery Plan



Australian Government



ACKNOWLEDGMENTS

Some of the ecological information in this Plan has been reproduced verbatim and without repeated citation from the *Eucalyptus ovata* – *Callitris oblonga* Forest Recovery Plan 2000–2004 (Zacharek 2000). The preparation of this Plan was funded by the Australian Government Department of Sustainability, Environment, Water, Population and Communities.

Citation: Threatened Species Section (2011). *Recovery Plan: Eucalyptus ovata* – *Callitris oblonga* Forest. Department of Primary Industries, Parks, Water and Environment, Hobart.

© Threatened Species Section, DPIPWE

This work is **copyright**. It may be reproduced for study, research or training purposes subject to an acknowledgment of the sources and no commercial usage or sale. Requests and enquires concerning reproduction and rights should be addressed to the Section Head, Threatened Species Section, Biodiversity Conservation Branch, Department of Primary Industries, Parks, Water and Environment, Hobart.

Disclaimer

Eucalyptus ovata – *Callitris oblonga* Forest is an ecological community listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. Parts of the *Eucalyptus ovata* – *Callitris oblonga* Forest community are considered to be facies of *Eucalyptus ovata* forest and woodland, a vegetation community listed as threatened under Schedule 3A of the Tasmanian *Nature Conservation Act 2002*, but the former is not listed specifically under Tasmanian legislation. This Recovery Plan has therefore been prepared under the provisions of the EPBC Act. The taxon *Callitris oblonga* subsp. *oblonga* is listed as threatened under both State and Commonwealth legislation and this Recovery Plan provides for the protection and conservation of the taxon through the recovery actions that protect its habitat.

The information provided in this Plan was accurate at the time of preparation. The attainment of objectives outlined in this Plan may be subject to budgetary and other constraints. Recommended recovery actions may be subject to modification due to changes in knowledge or conservation status.

ISBN: 978-0-7246-6597-6 (web) 978-0-7246-6605-8 (book)

Abbreviations

DPIPWE	Tasmanian Department of Primary Industries, Parks, Water and Environment ¹
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
FT	Forestry Tasmania
IBRA	Interim Biogeographic Regionalisation for Australia
NC Act	Tasmanian <i>Nature Conservation Act 2002</i>
NHT	Natural Heritage Trust
NRM	Natural Resource Management
PWS	Tasmanian Parks and Wildlife Service (DPIPWE)
RTBG	Royal Tasmanian Botanical Gardens (DPIPWE)
TSP Act	Tasmanian <i>Threatened Species Protection Act 1995</i>
TSS	Threatened Species Section, Biodiversity Conservation Branch (DPIPWE)

Taxonomy follows Buchanan (2009); common names are consistent with Wapstra *et al.* (2005).

¹ Formerly the Department of Primary Industries and Water (DPIW) and the Department of Primary Industries, Water and Environment (DPIWE).

CONTENTS

BACKGROUND.....	1
Current status & reasons for listing.....	1
Description	1
Life history and ecology	1
Distribution	2
Habitat.....	2
Threats, limiting factors and management issues.....	4
Reservation status.....	4
Important locations.....	5
Existing conservation measures	6
RECOVERY & MANAGEMENT.....	8
Recovery strategy and progress evaluation.....	8
Objectives of the EPBC Act	8
International obligations.....	8
Affected interests.....	8
Social and economic impacts.....	8
Role and interests of indigenous people.....	9
Biodiversity benefits.....	9
Specific recovery objectives	10
Performance criteria.....	10
Recovery actions.....	11
1. Protect by on-ground management	11
2. Protect by conservation covenant and management agreement.....	12
3. Survey.....	13
4. Monitor.....	13
5. Provide extension services and education.....	13
6. Provide long term management and coordination	14
Duration of Recovery Plan and estimated costs	15
MANAGEMENT PRACTICES.....	16
BIBLIOGRAPHY.....	17
Figure 1. Extent of <i>Eucalyptus ovata</i> – <i>Callitris oblonga</i> Forest in Tasmania.....	3
Table 1. Important locations for <i>Eucalyptus ovata</i> – <i>Callitris oblonga</i> Forest.....	5
Table 2. Threatened flora and fauna associated with <i>Eucalyptus ovata</i> – <i>Callitris oblonga</i> Forest.....	10
Table 3. Estimated costs of recovery actions.....	15

BACKGROUND

Current status & reasons for listing

Eucalyptus ovata – *Callitris oblonga* Forest is listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) because:

- its geographic distribution is restricted and is coupled with ongoing demonstrable threat;
- it faces the loss or significant decline of a key species in the ecological community;
- its integrity is being substantially reduced across most of its geographic range.

Description

Eucalyptus ovata – *Callitris oblonga* Forest occurs on alluvial flats and in habitats in and adjacent to riparian zones in Tasmania's Midlands and East. The most extensive stands occur on the St. Pauls and Apsley Rivers.

The community is characterised by:

- an overstorey of eucalypts, typically black gum (*Eucalyptus ovata*), but also with white gum (*E. viminalis*) or black peppermint (*E. amygdalina*) in some patches;
- a midstorey of south esk pine (*Callitris oblonga* subsp. *oblonga*); and
- a shrubby understorey, where prickly box (*Bursaria spinosa*), slender honeymyrtle (*Melaleuca gibbosa*) and silver wattle (*Acacia dealbata*) are common.

The Tasmanian endemic *Callitris oblonga* subsp. *oblonga* is one of only two conifers found in the drier regions of Tasmania, the other being *Callitris rhomboidea* (oyster bay pine). It grows to a height of 10 m, has a compact canopy of green, glaucous foliage, and female seed-bearing cones with oblong scales.

Eucalyptus ovata – *Callitris oblonga* Forest includes riparian forest dominated by eucalypts (usually *Eucalyptus ovata*, but also *E. amygdalina* and *E. viminalis*), riparian scrub, forest with grassy understoreys on poorly drained sites and forest on well-drained and rocky sites. This variation in the community reflects the heterogeneity of the near-stream environment. Harris and Kirkpatrick (1991a) have described a number of floristic communities that feature *Callitris oblonga* subsp. *oblonga*, including *Eucalyptus ovata* – *Callitris oblonga* – *Melaleuca gibbosa* shrubby woodland, a community of alluvial river flats, and *Callitris oblonga* – *Callistemon pallidus* tall open shrubland, a community of rocky (dolerite) riparian sites. The variation between community subtypes is often continuous.

Eucalyptus ovata forest and woodland are themselves of very high conservation value in Tasmania, being listed as threatened under the Tasmanian *Nature Conservation Act 2002* (NC Act). *Eucalyptus ovata* typically grows in wetter areas, such as poorly-drained flats and along rivers. Underlying soils are often fertile and this has contributed to the significant decline in this forest community as land clearing and drainage has taken place.

Life history and ecology

The key diagnostic species of *Eucalyptus ovata* – *Callitris oblonga* Forest, *Callitris oblonga* subsp. *oblonga*, has a regeneration strategy that relies on disturbance that usually kills the parent plant but causes the release of seed stored in cones in the canopy. These events are usually fire or flood. Dispersal of seed or seed-bearing cones for any distance is by water, often during flood events. This dispersal method together with the protection offered by the community's riparian habitat, appear to confine the species to its current habitat (Zacharek 2000). Germination does not appear to require any special treatment. Vegetative reproduction is possible but probably not important in the wild (Harris 1989).

Species in or near riparian habitats rely in some way on flood to create disturbance for seed germination, dispersal or reduction of competition. The generally wetter conditions in these sites favour many of the species. Away from riparian sites water is obviously not so great an influence, although the extent and

volume of water at peak flood times means that quite large areas of alluvial flats are affected.

Fire plays a part in the ecology in most flora species in the community with some exceptions. For example, the vulnerable *Acacia axillaris* (midlands wattle) appears to require cold stratification rather than heat to break seed dormancy (Lynch 1993). The frequency of fire is, however, a critical factor, although not specifically necessary for the regeneration of the key species *Callitris oblonga* subsp. *oblonga* (which can germinate prolifically after fire leading to the production of even-aged stands). The species appears to require 5 to 10 years before it produces seed, and in consequence a fire frequency that kills the species before it reaches maturity may eliminate it from a site. The most suitable fire regime for the species is one that is infrequent and small scale (Harris & Kirkpatrick 1991b).

Underlying geology does not appear to be a limiting factor for *Eucalyptus ovata* – *Callitris oblonga* Forest.

Distribution

Eucalyptus ovata – *Callitris oblonga* Forest, as described above and as defined under the EPBC Act, occurs only in Tasmania. The community has a disjunct distribution on the St. Pauls, Apsley, South Esk, Swan and Cygnet Rivers in eastern Tasmania, with an outlying stand near Launceston at Cataract Gorge (Figure 1). The most extensive examples of the community occur along a 30 km stretch of the St. Pauls River upstream of Avoca and along the lower reaches of the Apsley River. The linear range of the community is about 110 km, with an area of occupancy of several hundred hectares. The *Callitris oblonga* stand near Launceston is over 50 km from any of the other locations.

The discontinuous distribution of *Callitris oblonga* subsp. *oblonga* and *Eucalyptus ovata* – *Callitris oblonga* Forest reflects a history of land clearance, past disturbance regimes, topography and edaphic conditions (Zacharek 2000). The community is largely absent from the lower reaches of the South Esk and other river systems despite suitable climatic and edaphic conditions. This suggests that in the past the species could have been much more widely distributed (Harris 1989). The putative past distribution probably reflects the location of glacial refugia for *Callitris oblonga* subsp. *oblonga* in eastern Tasmania. The lower reaches of the South Esk have been extensively cleared for agriculture and have been subject to adverse fire regimes since European settlement. It is highly likely that significant areas of *Eucalyptus ovata* – *Callitris oblonga* Forest once existed between Avoca and the disjunct occurrence near Launceston. The area occupied by the forest community has probably declined by 20–50% in the last 200 years (Zacharek 2000).

The extent of *Eucalyptus ovata* – *Callitris oblonga* Forest in eastern Tasmania has been mapped from records of *Callitris oblonga* subsp. *oblonga* in DPIWE's Natural Values Atlas database (Figure 1). The total population was estimated to be about 4000 mature individuals in 1996 (Barker & Johnson 1998). Further survey is required to verify and add to this data.

Eucalyptus ovata – *Callitris oblonga* Forest occurs in the Northern Midlands and South East Tasmanian IBRA regions (Environment Australia 2000) and in the Northern and Southern Natural Resource Management regions.

Habitat

Eucalyptus ovata – *Callitris oblonga* Forest usually occupies alluvial flats but it may also be found on rocky outcrops above flood level. One significant non-riparian stand of *Callitris oblonga* subsp. *oblonga* occurs on ironstone gravels on Tasmania's east coast near Cranbrook, where it grows within a dry shrubby *Eucalyptus amygdalina* woodland with *Allocasuarina littoralis* (black sheoak) prominent — this stand may be a remnant of a once more extensive distribution in this lowland habitat, which has been now mostly cleared for agriculture (Harris & Kirkpatrick 1991b).

Important environmental parameters of the community's riparian habitat are moist conditions, periodic flooding, infrequent fire and low light intensities at ground level. *Callitris oblonga* subsp. *oblonga* is not generally found less than 1 to 2 metres above normal low river levels in the riparian zone. It requires a solid substrate in which to anchor roots and withstand high river flows — in this situation it is relatively flood tolerant (Zacharek 2000).

Average mean temperatures across the forest community's range are 12°C in winter and 22.8°C in summer, with an annual mean rainfall of 617 mm (Harris 1989). Relatively low rainfall over the summer months can be offset by depressions off the east coast of Tasmania that can produce intense rainfall over short periods.

The substrate of most sites is composed of modern floodplain sediments. Valley bottom sites with restricted drainage are common for *Eucalyptus ovata* (Williams & Potts 1996). *Callitris oblonga* subsp. *oblonga* similarly tolerates wetter sites, including riparian areas, but may also be found on drier sites (Harris & Kirkpatrick 1991a). Jurassic dolerite, Devonian granites and meta-sediments of predominantly Ordovician age comprise the majority of rock types at other sites.



Figure 1. Extent of *Eucalyptus ovata* – *Callitris oblonga* Forest in Tasmania
(This is an indicative map only and is not intended for fine-scale assessment.)

Threats, limiting factors and management issues

The main threats to *Eucalyptus ovata* – *Callitris oblonga* Forest are:

- **Weed invasion.** Habitat degradation via weed invasion is a major threat to the community. More than half the locations at which *Callitris oblonga* subsp. *oblonga* occurs are known to be infested to varying degrees by one or more of the following weeds: gorse (*Ulex europaeus*), hawthorn (*Crataegus monogyna*), willow (*Salix* spp.), sweet briar (*Rosa rubiginosa*) and blackberry (*Rubus fruticosus* aggregate). These weeds have the ability to invade habitat to the exclusion of native species. Gorse thickets are a serious fire hazard, burning readily due to the large amount of dry material they accumulate, while willow infestation alters river hydrology causing waterlogging, sediment build-up and problems for the dispersal of native species.
- **Fire.** Fires at repeated intervals of less than 5–10 years will eventually eliminate *Callitris oblonga* subsp. *oblonga* from the *Eucalyptus ovata* – *Callitris oblonga* Forest community by destroying new plants before they become reproductive. Fire fosters weeds and ultimately changes the forest community structure with undesirable effects on biodiversity. Fire is often used as a control measure for gorse, but fire increases the abundance of gorse, causing more habitat alienation and an increased risk of fire. The regeneration success of *Callitris oblonga* subsp. *oblonga* is further reduced by the increased competition.
- **Dam construction & alteration to flooding cycles.** *Eucalyptus ovata* – *Callitris oblonga* Forest occurs predominantly in scattered stands within the flood zone of rivers, and hence the risk of destruction or damage to either the plants or the substrate is great (though also providing opportunities for recruitment). Floodwaters may erode riverbanks and flood-borne debris is capable of wreaking significant damage. Fencing, which is a necessary part of managing the forest community, is also vulnerable to damage from floods. Water storage dams have the potential to destroy significant stands if constructed in or near occurrences. Damage can be from construction and the resultant impoundment, as well as from downstream impacts caused by limiting water availability and altering flows.
- **Stock grazing and trampling.** This constitutes a direct physical threat to seedlings and new plants, as well as to other components of the habitat. Heavy grazing removes seedlings and young plants. Stock accessing water erodes riverbanks. Nutrifaction of soils occurs where stock congregate and weeds are spread by various means including being carried in mud on hooves and coats or sticking to wool.
- **Vegetation clearance.** The current distribution of *Eucalyptus ovata* – *Callitris oblonga* Forest in Tasmania is likely to have been much reduced from a wider distribution. Land clearance over many years and consequent fragmentation of habitat has contributed to the decline of *Callitris oblonga* subsp. *oblonga* and its forest community. The discontinuous nature of habitat is apparent along the South Esk, St Pauls and Apsley Rivers where clearing has reduced the forest community to scattered remnants. As fragmented habitat decreases in size it becomes increasingly more vulnerable to weed invasion, fire, flood or other disturbance. While prevention of the clearance of threatened vegetation communities is Government policy, with land clearance listed as a key threatening process under the EPBC Act, a risk still remains, particularly for small stands.
- **Climate change.** Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases is an EPBC Act listed Key Threatening Process that poses a risk to *Eucalyptus ovata* – *Callitris oblonga* Forest. Temperature rise and changes to rainfall patterns associated with climate change may affect the environmental range of the community, as well as increase the risk of weed invasion and stochastic events such as fire and flood.

The *Eucalyptus ovata* – *Callitris oblonga* Forest sites affected by each threat is shown in Table 1.

Reservation status

Small stands of *Eucalyptus ovata* – *Callitris oblonga* Forest are reserved within Dickies Ridge Forest Reserve, Douglas-Apsley National Park and Trevallyn Nature Recreation Area near Launceston.

Four private properties that support *Eucalyptus ovata* – *Callitris oblonga* Forest have conservation covenant and management agreements in place under the Tasmanian *Nature Conservation Act 2002*, including important locations along the St Pauls and Apsley Rivers (Table 1). A small stand at the ‘First Basin’ near Launceston is on land managed by Launceston Council.

Important locations

The following table lists those sites with significant stands of *Eucalyptus ovata* – *Callitris oblonga* Forest or a facies thereof. The very small stands along the lower reaches of the South Esk River near Launceston, which support about 20 mature *Callitris oblonga*, are considered to be significant due to their disjunct status. Any new sites in which the ecological community is found in viable stands would be considered important.

Table 1. Important locations for *Eucalyptus ovata* – *Callitris oblonga* Forest

	Locality	Dominant eucalypt	Tenure	NRM region	Threats
1	South Esk River (Launceston)	– (riparian scrub)	Launceston Council & Trevallyn Nature Recreation Area	North	Weed invasion & altered flow regimes
2	South Esk River (Hanleth)	<i>E. viminalis</i>	Private	North	Weed invasion, clearance, fire, grazing, climate change
3	St Pauls River (Milford Bridge – China Cup Hills)	<i>E. ovata</i> (& <i>E. viminalis</i>)	Private	North	Weed invasion, clearance, altered flow regimes fire, grazing, climate change
4	St Pauls River (Glenair)	<i>E. ovata</i> (& <i>E. amygdalina</i>)	Private	North	Weed invasion, clearance, altered flow regimes fire, grazing, climate change
5	St Pauls River (Royal George)	<i>E. ovata</i> (& <i>E. amygdalina</i> & <i>E. rodwayi</i>)	Crown & Private *	North	Weed invasion, fire, altered flow regimes, climate change
6	St Pauls River (Lewis Hill)	<i>E. ovata</i> (& <i>E. amygdalina</i>)	Private *	North	Weed invasion, fire, altered flow regimes, climate change
7	St Pauls River (Rosemount Flat – Dickies Ridge – Nowhere Else)	<i>E. amygdalina</i> & <i>E. rodwayi</i> (& <i>E. ovata</i>)	Private & Forest Reserve	North	Weed invasion, clearance, altered flow regimes fire, grazing, climate change
8	Apsley River	<i>E. ovata</i> (& riparian scrub)	Douglas-Apsley National Park	North	Fire, climate change
9	Apsley River (Lilla Villa bridge)	<i>E. ovata</i>	Private	South	Weed invasion, clearance, fire, grazing, climate change
10	Apsley River (near Coles Bay Road)	<i>E. ovata</i> (& <i>E. amygdalina</i>)	Private *	South	Weed invasion, fire, climate change
11	Grange Road (near Cranbrook)	<i>E. amygdalina</i>	Private *	South	Weed invasion, fire, climate change

* = Partially or wholly covered by a conservation covenant under the Tasmanian *Nature Conservation Act 2002*

Existing conservation measures

Eucalyptus ovata – *Callitris oblonga* Forest was listed as a Vulnerable ecological community on the EPBC Act in September 2004. Vulnerable communities do not trigger the referral, assessment or approval requirements of the EPBC Act. Listing as Vulnerable acknowledges that the ecological community is under threat, and is dependent upon positive conservation measures for its long-term survival. While the referral, assessment or approval requirements of the EPBC Act do not apply to ecological communities listed as Vulnerable, these provisions still apply to the threatened species listed under the EPBC Act that occur within the *Eucalyptus ovata* – *Callitris oblonga* Forest community.

That component of *Eucalyptus ovata* – *Callitris oblonga* Forest in which *Eucalyptus ovata* is the dominant overstorey tree is considered a facies of *Eucalyptus ovata* forest and woodland (Harris & Kitchener 2005), a vegetation community listed as threatened under Schedule 3A of the *Tasmanian Nature Conservation Act 2002*. The clearance and conversion of threatened vegetation communities is regulated under either the *Forest Practices Act 1985* or the *Land Use Planning and Approvals Act 1993* depending on the activity.

Recovery Plans for *Eucalyptus ovata* – *Callitris oblonga* Forest were prepared by Askey-Doran (1994) and Zacharek (2000). Australian Government funded projects managed by DPIPWE operated from 1998 to 2002 to protect the forest community and its associated threatened species in areas where positive management results were deemed to be achievable. The basic aims of these projects were to foster an understanding of management issues with landowners and to undertake on-ground works, including weed removal and fencing. Funding specific to the recovery of *Eucalyptus ovata* – *Callitris oblonga* Forest ceased in 2003, and in consequence some of the recovery actions outlined in Zacharek (2000) have not been fully realised.

The following measures have been undertaken or are ongoing:

- A recovery team was convened in 1998 comprising conservation botanists and a weed management officer from DPIW (now DPIPWE), Greening Australia, regional community land management groups, and Australian Trust for Conservation Volunteers. Local government and landowners were involved where appropriate.
- Liaison with landowners and land managers regarding the management of *Callitris oblonga* subsp. *oblonga*, the *Eucalyptus ovata* – *Callitris oblonga* Forest community and biodiversity issues generally.
- Weeds along the St Pauls River and Apsley Rivers were mapped in 1998.
- Gorse and other woody weeds along the middle reaches of the St Pauls and Apsley Rivers have been the focus of Australian Government funded projects since the late 1990s, along with some fencing. The project 'Extending the Protection of Threatened Community Habitat, St Pauls and Apsley Rivers, Tasmania: Stages 1 and 2' involved weed control at ten key sites during the period 2000–2002, with about 80 ha of the Forest community and adjacent pasture treated. The work was carried out by DPIPWE field staff and volunteers, and monitoring of the efficacy of the weeding was determined by transects and photo-points at each site. Several field days were also held, the target audience including local landowners, Parks and Wildlife Service (PWS) and council staff, and local schools. Volunteers organised by the Threatened Species Network and Wildcare's Threatened Plants Tasmania have undertaken follow-up weed work at some of the sites in the interim, and in 2008 the Northern NRM region funded willow removal along the St Pauls River upstream of the Milford Bridge site.
- Stands of the *Eucalyptus ovata* – *Callitris oblonga* Forest community on four private properties are now covered by conservation covenants and associated management plans under the *Tasmanian Nature Conservation Act 2002* (Table 1). Management plans for these properties address the following issues: vegetation clearance, weed control, stock management, fencing, fire and changes to hydrology. Monitoring of these covenants is the responsibility of DPIPWE's Private Land Conservation Program.

- The Policy and Conservation Assessment Branch (DPIPWE) and the Forest Practices Authority (Tasmanian Department of Infrastructure, Energy & Resources) are required to consider the impacts of proposed developments on any species listed under the TSP Act.
- Proposed activities within reserves in Tasmania are subject to the *Tasmanian Reserve Management Code of Practice* (PWS, FT & DPIWE 2003). Management guidelines, including for threatened flora, have been prepared for Trevallyn Nature Recreation Area near Launceston (North Barker & Associates 2001) and Douglas-Apsley National Park (Parks & Wildlife Service 1998). A fuel-reduction burn of vegetation adjacent to the Douglas-Apsley site was undertaken in the mid 2000s by PWS and Forestry Tasmania — the site itself was identified as a fire-exclusion zone and was not impacted by the fire.
- Seed of *Callitris oblonga* subsp. *oblonga* has been collected for long-term storage as part of the Tasmanian Seed Safe project set up under the Millennium Seed Bank project being conducted under the auspices of the Royal Botanic Gardens Kew (joint partners in Tasmania include DPIPWE, the Royal Tasmanian Botanical Gardens and the Tasmanian Herbarium).

RECOVERY & MANAGEMENT

Recovery strategy and progress evaluation

The Recovery Plan will run for five years and is based on strategies to (1) prevent the loss or degradation of *Eucalyptus ovata* – *Callitris oblonga* Forest and (2) develop mechanisms to manage and better protect the community in the long term. The status of all *Callitris oblonga* subsp. *oblonga* occurrences was last assessed in 1996 (Barker & Johnson 1997). Surveys of these areas will update population locations and numbers, and identify sites where active management is required. Management agreements are a necessary part of the recovery process as they spell out appropriate protection mechanisms and the responsibilities of the parties concerned, and lead to the protection and conservation of the threatened forest community.

This Recovery Plan has been prepared in consultation with representatives of the Resource Management and Conservation Division of the Tasmanian Department of Primary Industries, Parks, Water and Environment. The Plan is consistent with the aims of the *Threatened Species Strategy for Tasmania* (Parks & Wildlife Service 2000) and *Tasmania's Nature Conservation Strategy* (Parks & Wildlife Service 2002).

Evaluation of the success or failure of the Recovery Plan will be based upon performance criteria. The Recovery Team will monitor and evaluate progress annually and report to relevant sponsor organisations. The Recovery Plan will be reviewed formally within five years of adoption under the EPBC Act.

Objectives of the EPBC Act

The Recovery Plan for *Eucalyptus ovata* – *Callitris oblonga* Forest satisfies the objectives of the EPBC Act in that it seeks to:

- protect a nationally threatened community;
- protect nationally listed threatened species;
- promote the conservation of biodiversity by maintaining the species' high conservation value ecosystem;
- promote a co-operative approach among stakeholders for the protection of the species and community.

International obligations

Eucalyptus ovata – *Callitris oblonga* Forest is not listed under any international agreement and the Recovery Plan does not affect Australia's international responsibilities.

Affected interests

Potential stakeholders and affected interests include: Department of Primary Industries, Parks, Water and Environment (including PWS, Royal Tasmanian Botanical Gardens (RTBG) and the Resource Management & Conservation Division), Forestry Tasmania, Forest Practices Authority, Australian Bush Heritage Fund, NRM North and South, Launceston City Council, Green Corps, Threatened Species Network, Australian Trust for Conservation Volunteers, Greening Australia, Landcare groups, and the Tasmanian Herbarium.

Social and economic impacts

Recovery actions for *Eucalyptus ovata* – *Callitris oblonga* Forest are unlikely to have additional adverse social and economic impacts to those caused by existing measures. Parts of the *Eucalyptus ovata* – *Callitris oblonga* Forest community fall within vegetation communities that are listed as threatened under the NC Act, namely, '*Eucalyptus ovata* forest and woodland' and 'Riparian scrub'. Development proposals that are likely to impact on these vegetation communities and their associated threatened species, such as dam construction, undertake impact assessment processes as required under State legislation. *Eucalyptus ovata* – *Callitris oblonga* Forest is located in flood-prone riparian areas, with little potential for agricultural

development. Protection of remnants in such areas can be achieved with little disruption to activities such as stock watering. Protection of riparian vegetation, including weed removal, reduces erosion and other impacts of floods and helps to maintain water quality.

A number of private landowners have property with stands of *Eucalyptus ovata* – *Callitris oblonga* Forest. The listing of the forest community as Vulnerable under the EPBC Act does not impose additional restrictions to the disturbance or destruction of the forest community to those already in place for flora and fauna species listed under the EPBC Act and for the broader threatened vegetation communities listed under the NC Act.

Eucalyptus ovata – *Callitris oblonga* Forest is strongly associated with the riparian strip. Protection of such areas is generally seen to be advantageous for farm and water management. Restrictions to clearing and burning these areas will be part of management agreements or conditions of development proposals. The implementation of recovery actions with potential economic implications for private landholders (e.g., changing agricultural practices), will be undertaken in consultation with landholders, with advice and assistance provided where appropriate.

Role and interests of indigenous people

In the preparation of this Plan the important role Tasmanian Aboriginal people have played in land management was recognised, and the impact of European settlement on this role acknowledged.

The following Aboriginal organisations have been consulted on the significance of the *Eucalyptus ovata* – *Callitris oblonga* Forest community in Aboriginal cultural tradition, and on their knowledge, role and interest in its management: Aboriginal Land Council of Tasmania, Tasmanian Aboriginal Centre, and Tasmanian Aboriginal Land and Sea Council.

Implementation of this Plan will involve:

- knowledge sharing;
- participation in education and training relevant to threatened species management; and
- engagement in recovery actions where relevant to Aboriginal land management and communities.

If, during any recovery activity, suspected evidence of Aboriginal heritage significance is found, this will be reported to Aboriginal Heritage Tasmania, and, if the evidence is to be disturbed, the activity will be suspended pending appropriate follow-up.

Biodiversity benefits

Protecting *Eucalyptus ovata* – *Callitris oblonga* Forest involves looking after riparian ecosystems, which are a high conservation priority in Tasmania. Riparian vegetation protects the health of river ecosystems by:

- limiting sunlight and keeping temperatures stable in the riparian and aquatic ecosystems;
- providing inputs of organic material, nutrients and habitat;
- reducing over-nutrication and the flow of sediments and other contaminants by slowing runoff into rivers;
- reducing riverbank erosion.

Riparian vegetation also provides habitat and in many cases a refuge for threatened flora and fauna (Askey-Doran *et al.* 1999).

A number of threatened flora and fauna species are known to be associated with *Eucalyptus ovata* – *Callitris oblonga* Forest (Table 2), though note that not all species are present at all locations.

Table 2. Threatened flora and fauna associated with *Eucalyptus ovata* – *Callitris oblonga* Forest

Species	Common name	TSP Act	EPBC Act
Flora			
<i>Acacia axillaris</i>	midlands wattle	vulnerable	Vulnerable
<i>Bertya tasmanica</i> subsp. <i>tasmanica</i>	tasmanian bertya	endangered	Endangered
<i>Boronia gunnii</i>	river boronia	vulnerable	Vulnerable
<i>Callitris oblonga</i> subsp. <i>oblonga</i>	south esk pine	vulnerable	Endangered
<i>Epacris apsleyensis</i>	apsley heath	endangered	Endangered
<i>Epacris moscaliana</i>	seepage heath	rare	–
<i>Spyridium lawrencei</i>	small-leaf dustymiller	vulnerable	Endangered
<i>Stenanthemum pimeleoides</i>	propeller plant	vulnerable	Vulnerable
<i>Stonesiella selaginoides</i>	clubmoss bushpea	endangered	Endangered
Fauna			
<i>Aquila audax fleayi</i> (nest)	Wedge-tailed Eagle	endangered	Endangered
<i>Beddomeia kerybetes</i>	St Pauls Hydrobiid Snail	vulnerable	not listed
<i>Dasyurus maculatus maculatus</i> (Tasmanian population)	Spotted-tail Quoll	vulnerable	Vulnerable
<i>Galaxias fontanus</i>	Swan Galaxias	endangered	Endangered
<i>Prototroctes maraena</i>	Australian Grayling	vulnerable	Vulnerable

Specific recovery objectives

1. Increase the condition of all occurrences of *Eucalyptus ovata* – *Callitris oblonga* Forest through ongoing management of sites where necessary.
2. Improve protection of sites where tenure is not reserved.
3. Increase knowledge of *Eucalyptus ovata* – *Callitris oblonga* Forest to update the number of occurrences, area occupied and condition.
4. Minimise the impacts of weeds and deleterious fires in *Eucalyptus ovata* – *Callitris oblonga* Forest.
5. Protect potential habitat through the promotion of Rivercare issues generally and the protection of remaining areas of natural riparian vegetation, particularly where *Eucalyptus ovata* – *Callitris oblonga* Forest is likely to be found.
6. Ensure long term management by involving the Northern and Southern Natural Resource Management Committees, community, landowners and public authorities in management of the occurrences in the long term and develop enabling mechanisms.
7. Increase landowners and land manager knowledge and appreciation of management issues.

Performance criteria

1. No decline in the area occupied by the forest community (to be determined by monitoring) over the life of the Plan.
2. Measured improvement in the condition of important stands in the life of the Plan
3. At least one conservation covenant and management agreement in place by Year 3 and such agreements being monitored by year 5.

4. Known and potential sites surveyed, with updated information on the number of occurrences, area occupied, condition and abundance of threatened flora and fauna species within 2 years.
5. A mechanism established and operating for the management of *Eucalyptus ovata* – *Callitris oblonga* Forest through the Northern and Southern Natural Resource Management Committees, community and/or public authorities by Year 1.
6. Information on Rivercare issues developed and distributed to private landowners and public authorities by Year 3.
7. Recovery Team of varied stakeholders successfully coordinating implementation of actions and budget spending within 1 year, and annually monitoring success of recovery effort and adjusting implementation as necessary for the life of the Plan.

Recovery actions

1. Protect by on-ground management.
 - 1.1. Develop & negotiate management agreements with key stakeholders
 - 1.2. Manage weeds in *Eucalyptus ovata* – *Callitris oblonga* Forest
 - 1.3. Manage weeds in areas adjacent to *Eucalyptus ovata* – *Callitris oblonga* Forest
 - 1.4. Manage stock
 - 1.5. Manage fire regimes
 - 1.6. Manage hydrological processes.
 - 1.7. Inclusion of recovery actions in reserve management plans
2. Protect by conservation covenant and management agreement
3. Survey
4. Monitor
5. Provide extension services and education
6. Provide long term management and coordination

Estimated costings for these actions are summarised in Table 3.

1. Protect by on-ground management

Weed eradication requires an ongoing commitment if it is to be successful, while fences and other infrastructure near rivers are at risk of continuing damage from flood. In consequence, on-ground management at a given site needs to be considered over a timeframe of at least the duration of this Plan.

Liaison with landowners, survey for treatment and monitoring sites (including previously treated sites to identify appropriate methods) will also be necessary parts of this action. A previous project utilised Green Corps personnel for weed control tasks where the employment of contractors would not have been efficient or was not affordable. Similar efficiencies should be sought for future work. Supervision of the tasks is necessary.

1.1 Develop & negotiate management agreements with key stakeholders

Develop and negotiate management plans with stakeholders for all important locations which do not have current management agreements. The management plans should address the following issues: weeds, stock, fire and hydrological regimes (as outlined in sections 1.2 to 1.6 below)

1.2 Manage weeds in *Eucalyptus ovata* – *Callitris oblonga* Forest

Weed removal work along the St Pauls and Apsley Rivers should be continued. In consultation with landowners and managers, on-ground management of major weeds within forest patches will be

undertaken. This work needs to be continued where started and work in new areas begun. Weeds will be treated with herbicide. In the riparian area this will include the cut-and-paint method and limited spot spraying.

1.3 Manage weeds in areas adjacent to *Eucalyptus ovata* – *Callitris oblonga* Forest

Weed infestation of areas adjoining *Eucalyptus ovata* – *Callitris oblonga* Forest provides a seed source for re-invasion. Weeds in these areas should be removed in conjunction with weed control within forest patches. Larger scale spraying or the cut-and-mulch method may be used, both of which will require the employment of contractors. Control of this kind will also be of direct benefit to the landowner.

1.4 Manage stock

Stock management in *Eucalyptus ovata* – *Callitris oblonga* Forest is considered a priority to protect the community from grazing, trampling and damage to riverbanks where stock access water. Fencing of stands will be undertaken in consultation with landowners. In some cases remote watering points will also be needed.

1.5 Manage fire regimes

Given the importance of regulating both wildfire and deliberate burning of *Eucalyptus ovata* – *Callitris oblonga* Forest, fire planning will be developed in consultation with landowners. This will involve the construction and maintenance of fire breaks in critical locations. Extension information provided to land managers (Action 5) will include permit requirements under the TSP Act for planned burns which are likely to result in the injury or death of a threatened species.

1.6 Manage hydrological regimes

Maintaining natural flow regimes is considered critical to the survival of *Eucalyptus ovata* – *Callitris oblonga* Forest. Extension information provided to land managers (Action 5) will stress the need to ensure that there are no changes to the hydrology of the Forest community's local catchment, nor irrigating or allowing effluent runoff.

1.7 Inclusion of recovery actions in reserve management plans

Inclusion of recovery actions for *Eucalyptus ovata* – *Callitris oblonga* Forest in the management plans for Douglas Apsley National Park, Dickies Ridge Forest Reserve and Trevallyn Nature Recreation Area, and implementation of these plans

Costs for Action 1 include salary and travel for a project officer; they do not include provision of extension advice, which is included under Action 5. It will be more effective to use specialist contractors for tasks such as large-scale weed control and the construction of fire breaks. Equipment and materials are also required.

2. Protect by conservation covenant and management agreement

Private landowners who have important *Eucalyptus ovata* – *Callitris oblonga* Forest remnants on their property will be approached with a view to negotiating conservation covenants or management agreements, where this type of protection is deemed necessary and currently not in place. The highest priority sites are locations 2, 3, 4, 7, 9 in Table 1. An alternative is to negotiate for a private reserve to be established on the property. A conservation covenant on a property title will alert a new owner to the issues and help prevent the inadvertent destruction of threatened species. Management agreements are a necessary part of this process as they spell out management prescriptions for the community and the responsibilities of the parties concerned.

Management agreements specify a number of on-ground activities to protect habitat, such as weed removal, fire management, stock exclusion and fencing. Work under Action 1 will support management agreements put in place under this action, as well as existing management agreements.

Funds are required for a Project Officer or contract negotiator. A Project Officer will be required to supervise and coordinate actions. Costs include the promotion and facilitation of voluntary conservation agreements between the Tasmanian Government and owners of land with *Eucalyptus ovata* – *Callitris*

oblonga Forest. Costs for this action include salary, travel and legal and title processing costs. Coordination costs are additional.

3. Survey

The status of *Eucalyptus ovata* – *Callitris oblonga* Forest, and *Callitris oblonga* subsp. *oblonga* populations specifically, was last assessed in 1996 (Barker & Johnson 1997). In the intervening period, weeds or other threats may have contributed to the degradation of some sites. Surveys will support Action 1 in identifying sites where active management is required, by recording the area of occupancy, species present, threatened species present, threats and vegetation condition. All patches will be surveyed within the first year of operation of the Recovery Plan.

Habitat modelling and survey for potential locations may have the positive result of increasing the range of the forest community. Mapping and survey of all potential locations will occur within the first 2 years of operation of the Plan. Any additional locations will have the appropriate recovery actions implemented, depending on the status, tenure and threats operating for the identified site. The location of potential habitat will also be used to help target extension services (Action 5).

Updated mapping will be submitted to DPIPW's Tasmanian Vegetation Mapping Program and new threatened species records entered into DPIPW's Natural Values Atlas.

Costs for this action include salary, travel, survey and verification costs.

4. Monitor

Monitoring of *Eucalyptus ovata* – *Callitris oblonga* Forest is required to determine changes in condition and consequent management requirements. Monitoring is also required to determine the efficacy of weed treatment, both on new work and where previous work has been undertaken. If numbers of threatened species decline or habitat is damaged, management intervention may be required. Monitoring will need to determine possible causes of decline, such as competition from other species or weeds, flood or fire. Monitoring results will be interpreted to determine the degree of decline, which will trigger management intervention. Monitoring is also needed to ensure compliance with the requirements of any management agreements and Acts.

All important stands, including any new locations found under action 3, will be monitored at two-yearly intervals in late spring to early summer. Stands covered by conservation covenants under the Tasmanian NC Act will be monitored by DPIPW's Private Land Conservation Program. Monitoring data to be recorded will include: area of occupancy, indices of condition, and the abundance and health of flora and fauna species.

Costs for this action include salary, travel, data collection and handling costs, as well as coordination costs.

5. Provide extension services and education

This action involves providing advice to landowners on management matters, including information on incentives for management works, the obligations and restrictions under the EPBC Act, TSP Act, NC Act and the Tasmanian *Weed Management Act 1999*, and on Rivercare and riparian management issues. A significant part of previous *Eucalyptus ovata* – *Callitris oblonga* Forest protection projects has been education and the provision of management advice. This function will be maintained. Technical and ecological advice will be provided on matters pertaining to the conservation of *Eucalyptus ovata* – *Callitris oblonga* Forest, including protection from the threats listed above.

Advice will be provided through field days, on-site visits, and the maintenance of communication networks and community groups.

Costs for this action include salary, travel and coordination costs.

6. Provide long term management and coordination

This action involves coordinating the recovery effort, encouraging community involvement, and collating, interpreting and disseminating data relating to *Eucalyptus ovata* – *Callitris oblonga* Forest issues. This is necessary to base management advice, allocate resources and assess the impact of development proposals on the best available information at any time. Significant developments will be communicated to the general public relevant newsletters and reports and, for threatened species within the community, through listing statement updates.

Ongoing data and interpretation requirements as new information becomes available:

- Entry of spatial information into DPIPWE GIS systems.
- Collation of additional information required to assess the conservation status such as distribution, condition and threat data and inclusion into DPIPWE GIS systems.
- Regular reassessment of conservation status and preparation of nominations for a change in the conservation status for State and Commonwealth legislation as required.
- Entry into DPIPWE's *Natural Values Atlas* of observations of threatened species within the community.
- Lodgement of specimens of each subpopulation of threatened flora species found in the forest community with the Tasmanian Herbarium in case of future taxonomic treatments.

Requirements for the dissemination of information are:

- Prepare (for new locations), update (for existing locations), and provide written management advice on occurrences to landowners/managers as necessary.
- Circulate spatial information to users in the appropriate form, i.e., include polygon or point data as appropriate in DPIPWE GIS systems, include observations of threatened flora species found in the community in DPIPWE's *Natural Values Atlas*, provide data to relevant State and Commonwealth agencies, include polygon or point data as appropriate on the LIST (Land Information Systems Tasmania).

Mechanisms to facilitate community participation and ownership are:

- Convene a Recovery Team once funding to implement this Plan or parts of the Plan is secured. The team will include representatives of regional NRM groups and relevant public authorities, to encourage their inclusion of *Eucalyptus ovata* – *Callitris oblonga* Forest recovery management in existing land management programs. Each year the Recovery Team will monitor and evaluate progress against the performance criteria outlined in this Plan and report to the relevant sponsor organisations.
- Communicate significant developments to the general public through listing statement updates, websites, relevant newsletters and reports. Additional public education activities will promote Rivercare and riparian management issues.
- Make requests to volunteer networks (e.g., Wildcare's Threatened Plants Tasmania, Landcare, Threatened Species Network, Australian Plant Society) to participate in specific recovery actions at least six weeks in advance.
- Request participation in recovery actions by the wider botanical community through the Tasmanian Flora Network.
- Where applicable, organise permission from landowners/managers to access occurrences, as well as permits from the TSS for the collection of propagation material or herbarium specimens of threatened flora species that are found in stands.

Costs for this action include salary, those associated with maintenance of databases and websites, updates and circulation of literature, requests for participation in the Recovery Team and recovery actions including provision of training and supervision when necessary and other coordination costs.

Duration of Recovery Plan and estimated costs

The *Eucalyptus ovata – Callitris oblonga* Forest Recovery Plan will run for 5 years following its adoption. The Plan may be supported by, and benefit from other activities supported by a number of other programs:

- National Reserve System Land Acquisition Program;
- Voluntary reserve programs;
- Private Land Conservation Program (DPIPWE);
- Australian Bush Heritage Fund;
- Tasmanian Farmers and Graziers Association;
- Tasmanian Land Conservancy;
- Tasmanian Parks and Wildlife Service;
- Forestry Tasmania;
- Local government incentive schemes such as rate rebates for conservation.
- Other Local and State Government authorities (e.g., Northern Midlands, Break O'Day and Launceston City Council, Department of Primary Industries, Parks, Water and Environment);
- NRM Cross-regional programs; and
- Catchment, Regional and National weed management programs.

Table 3. Estimated costs of recovery actions

Actions	Cost Estimate	Timeframe	NRM Region
1. Protect by on-ground management	\$197,000	Years 1–5	North & South
2. Protect by conservation covenant and management agreement	\$126,600	Years 1–5	North & South
3. Survey	\$58,000	Years 1–2	North & South
4. Monitor	\$116,000	Years 1–5	North & South
5. Provide extension services and education	\$28,400	Years 1–5	North & South
6. Provide long term management and coordination	\$57,400	Years 1–5	North & South
Total	\$583,400		

MANAGEMENT PRACTICES

This Plan identifies the following best management practices necessary that would minimise the risk of a significant adverse impact on *Eucalyptus ovata* – *Callitris oblonga* Forest:

- Ensure that current landowners, land managers and planning authorities are aware of their responsibilities under State and Commonwealth legislation to prevent the inadvertent destruction or degradation of *Eucalyptus ovata* – *Callitris oblonga* Forest, and explore options and associated incentives to this awareness;
- Maintenance of *Eucalyptus ovata* – *Callitris oblonga* Forest, including physical protection of habitat by weeding, fencing and any other relevant on-ground management activities;
- No timber harvesting or commercial firewood collecting within the community or in riparian vegetation within the local catchment area (note that policy mechanisms are in place within the Tasmanian forest industry to avoid impacts to these values);
- No clearing of vegetation within the community or in riparian vegetation within the local catchment area (including shrubs, grasses and other understorey species) unless it is (i) part of a weed eradication program, or (ii) for establishment and/or maintenance of fences designed to protect the community (note that policy mechanisms are in place within the Tasmanian forest industry to avoid impacts to these values);
- Control or eradication (if feasible) of any weeds, feral animals or disease;
- Exclusion of livestock;
- Maintenance of all fences required to protect the community, taking into account native wildlife movement, including the movement of animals to low-lying and riparian environments during drought periods;
- Exclusion of fire from the community and maintenance of any firebreaks necessary to safeguard the community in the event of wildfire;
- Ensure machinery used for firebreak construction and wildfire/fire control is clean prior to entering the community to prevent the establishment or entrenchment of weeds or diseases;
- No introduction of foreign material, particularly soil or plant material;
- No changes to hydrology or irrigating or allowing effluent runoff within the local catchment area;
- No chemicals or herbicides to be applied (directly or aerially) within the community unless it is part of an approved weed eradication program;
- Ensure that the use of fertilisers, chemicals or herbicides on adjacent land will not have an impact on the community;
- Monitor compliance with existing conservation covenants;
- Implement fire management plans for Douglas-Apsley National Park and Trevallyn Nature Recreation Area, and ensure that fuel reduction burns are undertaken in Dickies Ridge Forest Reserve to buffer the community in the event of wildfire;
- Maintain threatened species databases.

BIBLIOGRAPHY

- Askey-Doran M.** (1994). *Callitris sp. aff. oblonga Apsley River Community Recovery Plan*. Wildlife Report 94/5, Parks and Wildlife Service, Tasmania.
- Askey-Doran M.J., Potts W., Lambourne M., & Jordan G.** (1999). *Riparian Vegetation in Tasmania: Factors Affecting Regeneration and Recruitment*. Department of Primary Industries, Water and Environment – Parks and Wildlife Service, Hobart.
- Barker P.C.J., & Johnson, K.** (1997). *Research and Recovery Requirements for the Management of Threatened Species in Tasmania's Commercial Forests*. Report to the Tasmanian RFA Environment and Heritage Technical Committee.
- Barker P.C.J., & Johnson, K.** (1998). *Recovery Plan – Selected Tasmanian Forest Associated Plants*. Forestry Tasmania, Hobart.
- Buchanan, A.M.** (2009). A Census of the Vascular Plants of Tasmania & Index to *The Student's Flora of Tasmania*. Tasmanian Museum and Art Gallery, Hobart.
(Web edition for 2009: <http://www.tmag.tas.gov.au/Herbarium/TasVascPlants.pdf>)
- Environment Australia** (2000). Revision of the Interim Biogeographic Regionalisation of Australia (IBRA) and the Development of Version 5.1. – Summary Report. Department of Environment and Heritage, Canberra.
- Harris, S.** (1989). *The Ecological Biogeography of Callitris Vent. in Tasmania*. Unpublished MSc Thesis, University of Tasmania.
- Harris, S., & Kirkpatrick, J.B.** (1991a). The phytosociology and synecology of Tasmanian vegetation with *Callitris*, in Banks, M.R. *et al.*, (Eds) *Aspects of Tasmanian Botany – A Tribute to Winifred Curtis*, Royal Society of Tasmania, Hobart, pp. 179–189.
- Harris S., & Kirkpatrick, J. B.** (1991b). The distribution, dynamics and ecological differentiation of *Callitris* species in Tasmania. *Australian Journal of Botany* 39: 187–202.
- Harris, S., & Kitchener, A.** (2005). *From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation*. Department of Primary Industries, Water and Environment, Printing Authority of Tasmania, Hobart.
- Lynch A.J.J.** (1993). *Conservation Biology and Management of Rare and Threatened Species of the Family Fabaceae in Tasmania*. Australian Nature Conservation Agency, Endangered Species Program, Project 4, Parks and Wildlife Service, Department of Environment and Land Management, Tasmania.
- North Barker & Associates** (2001). *Trevallyn State Reserve: Vegetation Management Guidelines*. A report for the Parks and Wildlife Service, Department of Primary Industries, Water and Environment, Tasmania.
- Parks and Wildlife Service** (1998). *Douglas-Apsley National Park Fire Management Plan*. Department of Environment and Land Management, Tasmania.
- Parks and Wildlife Service** (2000). *Threatened Species Strategy for Tasmania*. Department of Environment and Land Management, Tasmania.
- Parks and Wildlife Service** (2002). *Tasmania's Nature Conservation Strategy*. Department of Primary Industries, Water and Environment, Tasmania.
- PWS, FT & DPIWE - Parks & Wildlife Service, Forestry Tasmania and Department of Primary Industries, Water & Environment** (2003). *Tasmanian Reserve Management Code of Practice*. Department of Tourism, Parks, Heritage and the Arts, Hobart.
- Wapstra, H., Wapstra, A., Wapstra, M., & Gilfedder, L.** (2005). *The Little Book of Common Names for Tasmanian Plants*. Department of Primary Industries, Water and Environment, Tasmania.
- Williams, K.J., & Potts, B.M.** (1996). The natural distribution of *Eucalyptus* species in Tasmania. *Tasforests* 8: 39–165.
- Zacharek, A.** (2000). *Community Recovery Plan: Eucalyptus ovata – Callitris oblonga Forest*. Department of Primary Industries, Water and Environment, Tasmania.