Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)
DRAFT Conservation Advice (incorporating listing advice) for the
Tasmanian Forests and Woodlands dominated by black gum or Brookers gum (_Eucalyptus ovata_ / _E. brookeriana_)

1. The Threatened Species Scientific Committee (the Committee) was established under the EPBC Act and has obligations to present advice to the Minister for the Environment (the Minister) in relation to the listing and conservation of threatened ecological communities, including under sections 189, 194N and 266B of the EPBC Act.

2. The Committee provided its advice on the *Tasmanian Forests and Woodlands dominated by black gum or Brookers gum (Eucalyptus ovata / E. brookeriana)* ecological community to the Minister as a draft of this conservation advice in 201x. The Committee recommended that:
   - the ecological community merits listing as <**critically endangered**> under the EPBC Act; and
   - a recovery plan <is / is not> required for the ecological community at this time.

3. In 201x, the Minister <accepted/rejected> the Committee's advice, and adopted this document as the approved conservation advice. <If accepted> The Minister amended the list of threatened ecological communities under section 184 of the EPBC Act to include the *Tasmanian Forests and Woodlands dominated by black gum or Brookers gum (Eucalyptus ovata / E. brookeriana)* ecological community in the critically endangered category.

4. Tasmania also lists components of this ecological community as threatened under State legislation.

5. A draft conservation advice for this ecological community was made available for expert and public comment for a minimum of 30 business days. The Committee and Minister had regard to all public and expert comment that was relevant to the consideration of the ecological community.

6. This <approved> conservation advice was based on the best available information <at the time it was approved>; this includes scientific literature, advice from consultations, and existing plans, records or management prescriptions for this ecological community.

Shrubby woodland with Eucalyptus ovata *at Sandfly Recreation Area.*
Photo credits: Department of the Environment and Energy, Canberra

Seedling E. ovata

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CONSERVATION OBJECTIVE

The objective of this conservation advice is to mitigate the risk of extinction of the *Tasmanian Forests and Woodlands dominated by black gum or Brookers gum (Eucalyptus ovata / E. brookeriana)* ecological community, and help recover its biodiversity and function, through:

- protecting it under the *Environment Protection and Biodiversity Conservation Act 1999*, particularly to avoid further vegetation clearance; and
- implementing priority conservation and research actions set out in Section 4.

This conservation advice contains information relevant to the conservation objective by.

- describing what the ecological community is, where it can be found and what vegetation classifications correspond to it (Section 1; Appendices A and B);
- providing guidance on when the EPBC Act is likely to apply to the ecological community, through key diagnostic features, condition thresholds and supplementary information (Section 1);
- identifying what other existing protection measures apply (Appendix B);
- identifying the key threats to the ecological community (Appendix C);
- presenting evidence (listing advice) for why the ecological community merits listing as nationally threatened under the EPBC Act (Appendix D); and
- outlining the priority conservation and research actions that could appropriately be done to stop decline and support recovery of the ecological community (see Section 4).

The information used in this Conservation Advice was relevant as at the time this assessment was completed (October 2016).

1. DESCRIPTION OF THE ECOLOGICAL COMMUNITY

The ecological community described and assessed in this conservation advice is a type of eucalypt forest to woodland that is restricted to Tasmania and is associated with sites that are typically damp and/or poorly draining. The national ecological community has several variants, notably a major component dominated by *Eucalyptus ovata* (black gum) and another dominated by *E. brookeriana* (Brookers gum).

1.1. The ecological community

1.1.1. Name

Tasmanian Forests and Woodlands dominated by black gum or Brookers gum (*Eucalyptus ovata* / *E. brookeriana*)

This advice follows the assessment of a public nomination to list the '*Eucalyptus ovata* forest and woodland in Tasmania' as a threatened ecological community under the EPBC Act. The description of the national ecological community was extended to include forests and woodlands dominated by *Eucalyptus brookeriana* since this species is closely related to, and sometimes confused with, *Eucalyptus ovata*. Brookers gum also is associated with moist sites, occurring on the margins of swampy flats and in well-drained gullies. The revised name properly represents the general vegetation structure, dominant tree species and location of the ecological community. The name of the ecological community is hereafter abbreviated to 'Black gum – Brookers gum forest/woodland' or 'the ecological community'. The national ecological community includes components listed as threatened native vegetation communities under Tasmanian legislation.

1.1.2. Location and physical environment

The Black gum – Brookers gum forest/woodland is limited to Tasmania. The range of the ecological community mirrors the distribution of the dominant canopy tree species, *Eucalyptus ovata* (black gum, swamp gum) and *E. brookeriana* (Brookers gum) (Williams and Potts, 1996). Most known remnants of the *E. ovata*-dominated component occur east of a line between Burnie and Dover, with minor occurrences scattered along the north-west coast, far south coast, western Tasmania including the Tasmanian Wilderness World Heritage Area, and the Bass Strait islands. It is generally absent to uncommon in the central and south-western areas associated with higher rainfall and elevation. The *E. brookeriana* component is most prevalent in the north-western corner of Tasmania, including King Island, with scattered occurrences elsewhere.

The IBRA bioregions and subregions[1] in which the ecological community occurs, and the extent and proportions in each bioregion are outlined in Table 1. Almost half of the mapped extent of the *E. ovata* component occurs in the Tasmanian South East and Tasmanian Northern Slopes IBRA bioregions with a moderate extent (about 28%) in the Ben Lomond and Tasmanian Southern Ranges bioregions. There are only very minor occurrences in the Tasmanian West and Tasmanian Central Highlands bioregions. The majority, about 80%, of the *E. brookeriana* component occurs in the King bioregion of north-west Tasmania.

There is a pattern of winter to spring dominated rain at most, but not all, key centres associated with the ecological community (BoM, 2015). The drier Midlands region has no clear seasonal peak in rainfall.

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[1] IBRA refers to the Interim Biogeographical Regionalisation of Australia. IBRA regions are large geographically distinct areas of similar climate, geology and landform with corresponding similarities in their vegetation and animal communities. The version current at the time of this advice is IBRA v7 (DoE, 2013), which divides Australia into 89 bioregions and 419 subregions, including offshore islands.

Table 1. Estimated bioregional distribution of the Black gum – Brookers gum forest/woodland ecological community in Tasmania, based on three key TASVEG units in which *E. ovata* or *E. brookeriana* are the dominant tree canopy species

IBRA Bioregion/Subregion	Key *E. ovata* - dominated units (DOV, DOW[1])		Key *E. brookeriana* - dominated unit (WBR[1])		Total for all key units		% of subregion with no native vegetation [2]	% of native vegetation in reserves [2]
	Extent (ha)	% of total extent	Extent (ha)	% of total extent	Extent (ha)	% of total extent		
Ben Lomond (BEL01)	2 609.1	17.3	94.7	1.3	2 703.8	12.1	31.7	50.8
Furneaux – Flinders (FUR02)	1 107.0	7.3	0.0	0.0	1 107.0	4.9	39.3	50.4
King (KIN01)	1 141.9	7.6	5 863.1	80.6	7 005.0	31.3	43.3	42.0
Tasmanian Central Highlands (TCH01)	30.7	0.2	333.1	4.6	363.8	1.6	14.1	74.5
Tasmanian Northern Midlands (TNM01)	972.7	6.4	0.0	0.0	972.7	4.3	66.2	20.9
Tasmanian Northern Slopes (TNS01)	3 675.2	24.3	51.9	0.7	3 727.1	16.7	46.2	50.4
Tasmanian South East (TSE01)	3 529.6	23.4	104.3	1.4	3 633.9	16.2	37.5	33.2
Tasmanian Southern Ranges (TSR01)	1 694.8	11.2	315.7	4.3	2 010.5	9.0	12.7	69.0
Tasmanian West (TWE01)	348.5	2.3	515.7	7.1	864.2	3.9	5.9	94.5
Total	**15 109.5**	**100.0**	**7 278.3**	**100.0**	**22 387.8**	**100.0**	**17.0**	**61.5**

Source: DPIPWE (2015).

[1] Codes in brackets refer to the three key TASVEG communities most equivalent to the ecological community (see section 3 for further detail).

[2] Percentages of subregions without native vegetation are based on the total area of each subregion (IBRA v7) minus the estimated total current extent of native vegetation per subregion from DPIPWE (2015). The native vegetation extent estimates include all TASVEG units except those coded as F (Modified lands) and O (Other natural environments).

The agro-climatic classification system of Hutchinson et al. (2005) has been applied to IBRA bioregions across Australia. The Black gum – Brookers gum forest/woodland occurs in two of the three agro-climate categories that apply to Tasmania:

- Category D5: "Moisture availability high in winter-spring, moderate in summer, most plant growth in spring." Most occurrences of the ecological community fall into this category. It covers the Tasmanian lowlands (northern and eastern coasts, midlands and the Bass Strait islands). The main land uses are: forestry, cropping, horticulture, and improved and native pastures.
- Category B2: "Less severe winters and longer moist summers, suitable for some crops." This covers the wetter highlands of western and southern Tasmania, where there are scattered occurrences of the ecological community. The main land uses are water harvesting, hydroelectricity, tourism and nature conservation.

The Black gum – Brookers gum forest/woodland is associated with lowland landscapes, often with poorly draining soils and sites that are wet or seasonally waterlogged. *Eucalyptus ovata* mostly occurs on elevations below 400 metres above sea level (ASL) with some occurrences associated with impeded drainage up to 700 metres ASL (Williams and Potts, 1996). Typical sites are drainage flats, fertile flats or valley bottoms often with moderately to poorly draining soils (Kitchener and Harris, 2013). A variant of *E. ovata* woodland with a dense heath understorey generally occurs in coastal to near-coastal sites with very infertile soils.

The altitudinal range of *E. brookeriana* differs between eastern and western populations (Williams and Potts, 1996). In the north-west and west, where Brookers gum typically occurs, Brookers gum is generally found below 100 metres ASL but can occur to 200 m ASL. The eastern populations occur at higher elevations, from about 200 to 700 metres ASL. The Brookers gum component of the ecological community is usually located on well-drained rocky soils of dolerite slopes and ridges, or alluvial deposits near streams or the margins of *Acacia melanoxylon* (blackwood) swamps. It also occurs in well-drained gullies and gully headwaters in eastern Tasmania (Williams and Potts, 1996; Kitchener and Harris, 2013).

Much of the region where the ecological community occurs is now subject to modified land uses, notably grazing on modified pastures, irrigated agriculture, and production and plantation forestry (DoE, 2015). The Northern Midlands, Northern Slopes and King bioregions have been particularly affected by declines in the extent of native vegetation (Table 1).

1.1.3. Vegetative components

The Black gum – Brookers gum forest/woodland is a suite of related assemblages dominated by Black Gum or Brookers Gum that is usually associated with locally moist sites in low to moderate rainfall areas of Tasmania. The structure ranges from forest to open woodland. The understorey is often dominated by shrubs and/or sedges, with the mix of species present depending on several factors, notably the moisture regime at the site and soil fertility. Variants that have a heathy or a mostly grassy understorey also occur, generally in response to changes in soil fertility, the type of substrate and/or past disturbance at a site. These variants are minor in extent. A list of characteristic plant species has been collated at Appendix A.

Canopy layer

The tree canopy of the ecological community is dominated or co-dominated[2] by *Eucalyptus ovata* (black gum) or *E. brookeriana* (Brookers gum). These two species are closely related, have a similar appearance and may hybridise, which can lead to some confusion about which species is present at some sites (Williams and Potts, 1996). The common presence of one or both of these characteristic tree species helps to define the ecological community.

The canopy typically has a height of 10 to 25 metres and a tree canopy cover (foliage and branches) of 20 to 40%, but these parameters can vary depending on site factors, notably soil fertility and moisture. Black gum can have a shorter height (about five to ten metres), almost mallee form and a more open woodland canopy (to about 10% tree canopy cover) on more infertile sandy soils, for instance in near-coastal to coastal sites. The tree canopy can be taller and denser, particularly on sites that have more fertile alluvial soils and higher moisture, as in the case of Brookers gum wet sclerophyll forest in gullies, which may attain heights of up to 60 metres.

Other eucalypt species may be present in the tree canopy though are less abundant and not dominant across a patch. The other eucalypt species that are most likely to co-occur with black gum or Brookers gum include: *E. viminalis* (white gum), *E. amygdalina* (black peppermint), *E. pauciflora* (cabbage gum or snow gum), *E. pulchella* (white peppermint), *E. rodwayi* (swamp peppermint), *E. delegatensis* (gumtopped stringybark), *E. obliqua* (stringybark), *E. regnans* (giant ash) or *E. globulus* (Tasmanian blue gum). Where these other species do become dominant over a wider area, it indicates a change in vegetation type to a different ecological community.

Hybrids of *E. ovata* and *E. brookeriana* are known to occur. The two species can cross with each other and other eucalypt species, for instance *E. ovata* crosses with *E. barberi* (Barbers gum), *E. globulus* or *E. viminalis* (Duncan, 1989). These hybrids are considered to be part of the ecological community, if they are present in the tree canopy and contribute to the dominance of the key tree species in the canopy.

Understorey (mid and ground) layers

Much of the ecological community is characterised by an understorey of shrubs and/or sedges associated with poorly draining sites. However, there is some variability in understorey composition, with heathy or grassy forms occurring at sandier or drier sites, while ferns become more common at some of the wetter sites.

Non-eucalypt species of small trees or large shrubs, and juvenile eucalypts, may be present and contribute to a lower tree canopy or tall shrub layer. Trees/shrubs present include various medium to tall species of *Acacia* (wattles), *Leptospermum* (tea-trees), *Melaleuca* (paperbarks), *Bursaria spinosa* (prickly box) and in some locations, *Callitris oblonga*. *Bedfordia salicina* (Tasmanian blanketleaf), *Pomaderris apetala* (common dogwood) and *Olearia argophylla* (musk daisybush) are tall shrubs associated with wetter sites. Some wetter sites in northwestern Tasmania may include a presence of *Phyllocladus aspleniifolius* (celerytop pine) and *Dicksonia*

[2] **Dominant** generally refers to a species that is most prevalent within an ecological community and influences the biotic conditions of the community, while **co-dominant** generally refers to a situation where more than one species are of equivalent prevalence and influence in a community. The Tasmanian Forest Practices Authority has a practical definition of dominant as: “a species (or other vegetation unit) that provides the greatest cover in a given layer or area” (FPA, 2005; Module 1 p22). They further note in regard to the overstorey layer, that “in most situations, one species is clearly dominant while the others are subdominant or minor ..... Two species occasionally occur as co-dominants, having about equal cover in the community” (FPA, 2005; Module 2 p8).

antarctica (soft treefern), that represent intrusions of rainforest or wet sclerophyll elements into a wet eucalypt forest component of the ecological community.

Sedges and related graminoids that might be present in the ground layer include *Carex* species, *Gahnia* species, *Juncus* species, *Lepidosperma* species and *Lomandra longifolia* (sagg). The nature of the ground layer is influenced by the density of the tree and shrub layers; if they are dense then the cover of graminoids is likely to be sparse, due to restrictions in how much light reaches the ground plus competition for water and other resources.

Some components vary from the shrubby and/or sedgy understorey typical for much of the ecological community. These are regarded as variants associated with particular substrates that are minor in their extent.

- A dense, heathy understorey of diverse low shrubs may develop below *E. ovata* on very infertile, sandy soils, especially in coastal to near-coastal sites. The tree canopy here is more open and shorter. The mix of shrubs in the heathy woodland is distinctive from the species present in the typical shrubby expression of the ecological community with, for instance, *Banksia marginata* (silver banksia), *Allocasuarina monilifera* (necklace sheoak), *Leptospermum glaucescens* (blue-green tea-tree), *Melaleuca gibbosa* (slwender honey-myrtle), *Sprengelia incarnata* (pink swampheath) and *Epacris lanuginosa* (swamp heath). *Isopogon ceratophyllus* (horny conebush) is common on the Furneaux Island occurrences. The ground layer includes diverse graminoids, such as *Baumea* species (twig sedges), *Baloskion* species (cordrushes) and *Lepidosperma* species (sword sedges), and ferns, e.g. *Gleichenia* species (coralfern).
- A grassy understorey can occur below *E. ovata* on lowland sites with a fertile dolerite or basalt substrate. The tree canopy is a very open woodland that is sometimes also has *E. viminalis* or *E. pauciflora* as a dominant or co-dominant canopy component. The grasses usually present include *Themeda triandra* (kangaroo grass), *Poa rodwayi* (velvet tussock-grass) and *Austrostipa* species (spear grasses). A variety of grassland forb species may also be present (Table A1 in Appendix A).

1.1.4. Faunal components

The ecological community is essential habitat for a diverse range of generalist and specialist fauna species including larger mammalian herbivores (e.g. kangaroo, wombat), smaller ground-dwelling mammals (e.g. antechinus, bandicoot, dunnart, quoll), arboreal mammals (e.g. possum), bats, forest birds, reptiles, amphibians, monotreme species (platypus, echidna) and invertebrates. Table A2 of Appendix A lists terrestrial vertebrate species that may occur in the ecological community. Bryant and Jackson (1999) provide overviews of the biology, habitat and distribution for fauna listed as threatened in Tasmania at that time, (noting that updated information is available online, e.g. through DPIPWE (2015c) and DoEE (2016)).

The ecological community supports various wide-ranging macropods, such as *Macropus giganteus* (Forester kangaroo; eastern grey kangaroo) and *Macropus rufogriseus* (red-necked wallaby). The Forester kangaroo prefers to feed in open, grassy forests while red-necked wallabies can be found in a range of vegetation structures (Wildlife Management Branch, 2011). Some other species, such as *Thylogale billardierii* (Tasmanian pademelon), have more specialised requirements, preferring wetter areas with dense undergrowth, as occurs in some variants of the ecological community, during the day then move to more open habitats at dusk to forage (Wildlife Management Branch, 2011).

Potorous tridactylus (long-nosed potoroo) use various habitats including wet and dry eucalypt forests preferring areas of dense understorey for shelter, and more open areas to forage. The potoroo generally forages at night or on overcast days by digging small holes searching primarily

for fungi and supplementing its diet with roots, tubers, insects, larvae and seeds. The fungi that potoroos feed on are often mycorrhizal fungi[3] and their activities help to spread the fungal spores and hyphae. Potoroos, therefore, have a critical function in forest ecological communities.

Cercartetus lepidus (little pygmy possum) is a small, mostly nocturnal and arboreal possum from a variety of habitats. The species preferentially forages for nectar, insects and pollen and is a possible pollinator of various proteaceous and myrtaceous species. In the ecological community, the possum forages and nests in the understorey rather than the higher branches of trees where it would be vulnerable to attack by predatory species such as quolls, tiger snakes and birds e.g. owls and kookaburras. The species generally builds a dome-shaped nest of bark fibres in the hollows of old trees, stumps, logs or underneath mounds of grass. The possum can enter a state of torpor during unfavourable conditions.

Dasyurus species (quolls) and *Sarcophilus harrisii* (Tasmanian devil) are the key native predator and scavenger species. Quolls and Tasmanian devils are generalists that are able to utilise a range of habitats, including those that have been modified to some extent, for instance mixtures of grazing land and wooded remnant vegetation. This means patches of the ecological community that adjoin or are near to agricultural land can still provide useful habitat for these species. *Dasyurus viverrinus* (eastern quoll) is a medium-sized carnivore considered extinct on the mainland. The species is solitary but is not territorial. It is mainly nocturnal, scavenging and hunting at night, mostly feeding on insects and occasionally small mammals, birds and fruit. Feral cats directly compete for the same prey as quolls. *Dasyurus maculatus* (spotted-tail quoll) is considered an apex predator, hunting on the ground and in trees for birds and medium-sized mammals, such as possums and bandicoots, reptiles and invertebrates. It will shelter and breed in various sites including hollows in logs, tree stumps or standing trees, clumps of vegetation and underground burrows. Spotted-tailed quolls have large territories, exceeding 500ha, so large forest remnants are most likely to provide adequate resources for food and shelter. The eastern quoll and Tasmanian devil are both listed as nationally endangered while the Tasmanian population of the spotted-tailed quoll is listed as nationally vulnerable

The ecological community maintains several soil engineer species. Some of the functions supplied by these digging and soil foraging animals include: increased soil water infiltration; nutrient cycling; and distribution of fungi and seeds, all of which promote soil fertility, moderate fuel loads and contribute to the health of the ecological community. Soil engineer species include, *Bettongia gaimardi* (Tasmanian bettong), *Isoodon obesulus* (southern brown bandicoot), *Perameles gunnii gunnii* ((eastern barred-bandicoot (Tasmanian)), *Potorous tridactylus* (long-nosed potoroo), *Sminthopsis leucopus* (white-footed dunnart), *Tachyglossus aculeatus* (short-beaked echidna) and *Vombatus ursunus* (wombat). The only other living monotreme, *Ornithorhynchus anatinus* (platypus), may occur in streams which flow through patches of the ecological community.

Many insectivorous bat species commonly use wet eucalypt forests and woodlands such as the Brookers gum component of the ecological community, for example, *Chalinolobus gouldii* (Gould’s wattled bat), *Nyctophilus geoffroyi* (lesser long-eared bat), *Vespadelus baverstocki* (inland forest bat) and *Vespadelus darlingtoni* (large forest bat). The microchiroptera bats that have been observed to roost in old growth trees with hollows include: *Chalinolobus morio* (chocolate wattled bat) which forages almost exclusively for moths below the tree canopy, *Vespadelus regulus* (southern forest bat) which forages in gaps between the understorey and mid-storey and the cryptic species *Nyctophilus sherrini* (Tasmanian long-eared bat) which

[3] Mycorrhizal fungi are symbiotic fungi that attach to the roots of may plant species, including eucalypts. The fungus enhances the plants' ability to take up nutrients and are critical for the establishment of tree seedlings.

predominantly forages for non-flying invertebrates such as, caterpillars, in the understorey and on the ground.

Many bird species inhabit the ecological community. Among the most notable bird species likely to be present are two migratory parrots, *Lathamus discolor* (swift parrot) and *Neophema chrysogaster* (orange-bellied parrot), both listed as nationally critically endangered species. Both species breed in Tasmania and migrate to the mainland in winter. Orange-bellied parrots breed mostly in south-western Tasmania and pass through King Island on their northward migration to the mainland (DoE, 2016). They nest in the hollows of mature eucalypts, often in *E. nitida* (Smithton peppermint) (Williams and Potts, 1996) and may also use black gum trees, where these occur near to their preferred habitat of buttongrass moorlands and sedgelands.

Swift parrots are more reliant on black gum trees. Their breeding sites occur along northern and eastern Tasmania, where the ecological community also is present. Swift parrots can nest in the hollows of several eucalypt species, including black gum, but are selective in preferring hollows that are high in the tree, and deep but with a narrow entrance (FPA, 2014a). Their main diet is nectar that they mainly obtain from eucalypt blossoms (DoE, 2016). The blossoms of *E. globulus* (Tasmanian blue gum) are the principal food resource during the breeding season, but their flowering is variable and unpredictable (FPA, 2014a). The blossoms of black gums provide an important secondary nectar source, especially in seasons when Tasmanian blue gums are not flowering or in years when they flower poorly. Consequently, the ecological community provides an important resource for the swift parrot population. Swift parrots prefer to breed in suitable hollows that must be within ten kilometres of their food resources. The national conservation status for swift parrots was upgraded from endangered to critically endangered on 5 May 2016, based upon the results of population viability analysis that showed the birds are likely to undergo a very severe reduction in population size of over 80% in the future (TSSC, 2016).

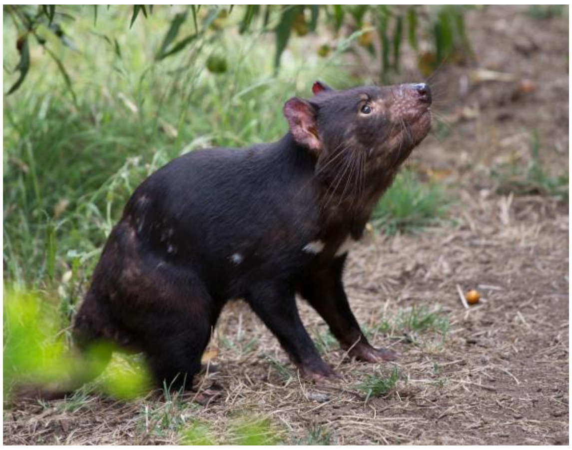
Other bird species likely to be present in the ecological community include:

- Small, canopy-foraging species such as *Pardalotus striatus* (striated pardalote) and *Pardalotus punctatus* (spotted pardalote), and bark-foraging species such as *Cormobates leucophaea* (white-throated treecreeper) and *Melithreptus validirostris* (strong-billed honeyeater).
- *Acanthiza ewingii* (Tasmanian thornbill), a Tasmanian endemic species that is primarily insectivorous and forages at all levels in the forest, including the ground. It nests low in dense vegetation, such as bracken and dense shrubs.
- *Acanthornis magna* (scrubtit) prefers dense undergrowth in wet forests, particularly gullies. The species forages individually or in groups near the ground, for insects and other invertebrates among bark, litter and foliage. Scrubtits build small woven dome nests a few metres above ground.
- *Anthochaera paradoxa* (yellow wattlebird), forages at all levels of the canopy, feeding mainly on the nectar of eucalypts and banksias, but also on fruit and insects.
- *Nesoptilotis flavicollis* (yellow-throated honeyeater) forages on foliage, bark and flowers for insects and nectar and occasionally on fruit and seeds. The species builds the small, cup-shaped nest close to the ground in dense shrubs, or in tussocks of *Lomandra* or grasses.
- *Melithreptus validirostris* (strong-billed honeyeater) mostly feeds on insects and occasionally nectar and fruit, usually foraging in trees, often climbing up the trunks and probing crevices in the bark.
- *Platycercus caledonicus* (green rosella) which feeds both on the ground and in trees on seeds of grasses, shrubs and trees, fruits, buds and flowers, nectar, insects and larvae. The species usually nests in hollows in the trunk or limb of eucalypt trees.

Reptiles that may be present in the ecological community include: *Notechis ater* (tiger snake), *Austrelaps superbus* (copperhead snake), which prefers damp habitats, *Drysdalia coronoides* (white-lipped snake), which feeds almost exclusively on skinks, *Niveoscincus metallicus* (metallic cool-skink), *Tiliqua nigrolutea* (blotched blue-tongue) and *Rankinia diemensis* (mountain dragon). Skink species endemic to Tasmania and which are likely to occur in the ecological community include *Cyclodomorphus casuarinae* (Tasmanian she-oak skink) and *Niveoscincus pretiosus* (agile cool-skink) which prefers tall forest, sheltering under bark in mature trees.

The ecological community also includes amphibian species with a range of habitat requirements. These include appropriate substrates and microclimates for the burrowing *Limnodynastes dumerilii* (eastern banjo frog), damp terrestrial sites and vegetative shelter for species such as *Geocrinia laevis* (Tasmanian smooth frog), and *Pseudophryne semimarmorata* (southern toadlet), standing vegetation, e.g. tree hollows, for arboreal species such as *Litoria burrowsae* (Tasmanian tree frog) and *Litoria ewingi* (brown tree frog) and very wet sites for *Limnodynastes tasmaniensis* (spotted marsh frog).

The ecological community provides habitat for numerous invertebrates which provide a crucial role in ecosystem function, such as nutrient cycling, pollination, seed dispersal, predation and herbivory, as well as providing an important food source for many animals. Invertebrates occur in all layers of the ecological community and include worms such as *Tasmanipatus anophthalamus* (blind velvet worm), *Tasmanipatus barrette* (giant velvet worm), snails and stag beetles (*Hoplogonus* and *Lissotes* species). These stag beetles are wet forest species which prefer flat and cool forested sites subject to low disturbance. Flightless stag beetles such as *Hoplogonus bornemisszai* (Bornemisszas stag beetle), *Hoplogonus simsoni* (Simsons stag beetle) and *Hoplogonus vanderschoori* (Vanderschoors stag beetle) have small ranges, with larvae feeding on organic material in the soil for up to two years. The species prefer to spend winter underground and emerge in spring and summer to inhabit logs and deep leaf-litter within lowland, mature damp and wet eucalypt forest with adults living for up to a further two years. Some stag beetles are nationally threatened, with their primary threat being habitat loss. Thinning and removal of the tree canopy allows the understorey and litter layer to dry out, leading to desiccation and death of exposed stag beetle larvae (DoE, 2016).



Tasmanian devil *(Sarcophilus harrissii)*

Eastern quoll *(Dasyurus viverrinus)*

Photo credits – Leanne Chow

1.2. Relevant vegetation / mapping units

This section focuses on the most recent and relevant vegetation classification currently used in Tasmania. More detail on the units presented here plus other classification systems that cross-refer to the ecological community are noted at Appendix B.

1.2.1. Caveat

Ecological communities are complex to classify. Each State/Territory jurisdiction applies its own system to classify ecological communities and vegetation types. This can cause challenges when cross-referring amongst systems. Reference to vegetation and mapping units as equivalent to a national ecological community, at the time of listing, should be taken as indicative rather than definitive. A unit that is generally equivalent may include elements that do not meet the description. Conversely, areas mapped or described as units other than those referred to may sometimes meet the description. Judgement of whether an EPBC-protected ecological community is present at a particular site should focus on how an area meets the description, particularly the key diagnostic characteristics and condition thresholds for the national ecological community.

1.2.2. TASVEG vegetation units

Tasmania has a comprehensive state-wide vegetation classification system. The vegetation community descriptions for the system are outlined in Kitchener and Harris (2013), and these units are mapped, generally at a scale of 1:25 000, for the Tasmanian vegetation map known as TASVEG. TASVEG groups vegetation into about nine broad categories, each of which is divided into several separate ecological communities. It includes a modified lands category that identifies those areas converted to agricultural production, forestry, urban and similar land uses. Many of the eucalypt forest and woodland communities are identified primarily by what eucalypt species is dominant in the tree canopy, supplemented by the general structure of the understorey.

Relationships among the various TASVEG units corresponding to the ecological community are summarised in Figure 1. The Black gum – Brookers gum forest/woodland ecological community corresponds closest to three eucalypt forest/woodland TASVEG communities that account for most (>80%) of the national ecological community's current extent. Two of these are classified within the broad 'Dry eucalypt forest and woodland' category and have *E. ovata* as the dominant canopy tree: DOV and DOW; the third unit falls within the 'Wet eucalypt forest and woodland' category and has a tree canopy dominated by *E. brookeriana*: WBR.

In addition to the key TASVEG units, there are other TASVEG forest and woodland units that may include occurrences consistent with the description of the ecological community. Some of these associated units are "mosaics" where *E. ovata* or *E. brookeriana* are known to be dominant within some patches but not for all occurrences of the TASVEG unit. Patches dominated by other species of eucalypt also are included in these mosaic units. The degree to which black gum or Brookers gum is likely to be dominant varies with the TASVEG unit. Patches equivalent to the Black gum – Brookers gum forest/ woodland ecological community refer to areas where *E. ovata* or *E. brookeriana* is dominant and may involve some larger patches, as well as small areas where these tree species are locally dominant. There are three "associated mosaic" TASVEG units (Figure 1):

<u>Figure 1</u>. Inter-relationships among TASVEG units that have components of the Black gum – Brookers gum forest/ woodland ecological community. The key units are dominated by *E. ovata* or *E. brookeriana* and are indicated by solid boxes with illustrations. Associated units include only a component that is dominated by *E. ovata* or *E. brookeriana*, but also components dominated by other eucalypt species. They are indicated by dashed boxes.
Source for images and descriptions : Kitchener and Harris (2013).

On sites with sandy, lower fertility soils, often coastal to near coastal.

DOW – *E. ovata* Heathy Woodland
Woodland of smaller, stunted trees over a diverse heath.
Minor, less than 5% of current extent.

DOV – *E. ovata* Forest and Woodland
Forest typically with a sclerophyll shrub & sedge understorey. Sites with poor drainage.
Major unit, more than 50% of current extent.

On wetter, sheltered sites, e.g. gullies, swamp margins.

WBR – *E. brookeriana* Wet Forest
Tall forest with wet sclerophyll, sometimes rainforest elements.
Major unit, more than 25% of current extent.

On lowland sites that are drier, open, on fertile dolerite and basalt substrates.

DMW – Midlands Woodland Complex
Open woodland with a grassy/forb understorey, often disturbed. Dominated by *E. ovata*, *E. pauciflora* or *E. viminalis*.
Minor, less than 5% of current extent.

On wetter sites within units that intergrade with DOV.

DAZ – *Eucalyptus amygdalina* inland forest and woodland on Cainozoic deposits; and **DSC - *Eucalyptus amygdalina* – *Eucalyptus obliqua* damp sclerophyll forest**
Typically dominated by several other eucalypts. Very minor, only small pockets dominated by *E. ovata* may occur within these units.

On damper sites on King Island.

WGK – *E. globulus* King Island Forest; and **DKW – King Island Eucalypt Woodland**
Dominated by *E. globulus*, *E. viminalis*, sometimes *E. brookeriana*.
Minor, less than 5% of current extent.

- DMW – Midlands woodland complex. This unit represents a woodland expression of forests where *E. ovata*, *E. viminalis* or *E. pauciflora* are variously dominant, have less than 20% solid crown cover and occur at altitudes of less than 300 m on dolerite and basalt substrates in the Midlands region. This expression of the ecological community represents its driest form with a more open tree canopy over a largely grassland understorey.
- DKW – King Island eucalypt woodland and WGK – *Eucalyptus globulus* King Island forest. These two units refer to woodland and forest communities limited to King Island that are dominated by *E. globulus*, *E. brookeriana* and/or *E. viminalis*. Components where *E. brookeriana* is dominant or co-dominant tend to develop on wetter sites such as drainage lines and depressions. The canopy is taller and more closed in the forest than the woodland form. The woodland form dominated by *E. brookeriana* may be a result of disturbance regimes, such as high frequency fires or partial clearing, followed by tree regeneration.

Other associated TASVEG units are characteristically dominated by different eucalypt species and, if *E. ovata* is present, it typically occurs as a minor canopy component. However, these TASVEG units allow for small, local variations where *E. ovata* may become locally dominant. There are two "associated local variant" TASVEG units (Figure 1):

- DSC - *Eucalyptus amygdalina – Eucalyptus obliqua* damp sclerophyll forest. This unit represents a fine-scale mosaic where no clear dominant species is evident and the main tree species change over short distances. The trees that typically dominate are *E. amygdalina* (black peppermint) and *E. obliqua* (stringybark) but *E. viminalis* (white gum) and *E. ovata* (black gum) may also be present and can be locally dominant in small pockets. This unit occurs on generally fertile sites in northern and north-eastern Tasmania. The understorey is shrubby with a variable species mix depending on differences in microclimate and soils.
- DAZ – *Eucalyptus amygdalina* inland forest and woodland on Cainozoic deposits. This unit is usually dominated by *E. amygdalina* (black peppermint), *E. viminalis* (white gum) or *E. pauciflora* (cabbage gum). *Eucalyptus ovata* co-occurs with these other eucalypts and occasionally is locally dominant on sites with impeded drainage, such as poorly drained flats and the margins of lagoons. DAZ typically occurs on substrates of Tertiary iron gravels and Recent sand and alluvium deposits. It is associated with flat to undulating landscapes, mostly below 300 metres above sea level, in the northern Midlands and Fingal Valley of northeastern Tasmania. The understorey is variable, comprising of shrubs, sedges and bracken.

In the case of DAZ and DSC, patches equivalent to the Black gum – Brookers gum forest/ woodland ecological community refer only to very localised areas where *E. ovata* may be dominant. However, given the nature of variability within these TASVEG units, it is likely that most of these patches may be too small to meet the minimum patch size criteria prescribed in the condition thresholds, below. The description for DAZ acknowledges that:

> "As drainage becomes progressively more impeded, forest and woodland dominated by *E. amygdalina*, *E. viminalis* or *E. pauciflora*, usually with co-occurring *E. ovata* grade into *E. ovata* forest and woodland (DOV) or sedgeland and wetland communities in swamps and lagoons. Localised patches of *E. ovata* forest and woodland in this mosaic can be allocated to DAZ, but larger areas should be identified as DOV." Kitchener and Harris (2013; p 18)

In summary, whole patches of DAZ and DSC are likely to fall outside the definition of the ecological community. Only those local variations, not otherwise classified as DOV, that meet both the key diagnostic characteristics and condition thresholds for the ecological community would be included.

All the associated units collectively account for a low proportion of the ecological community's total extent. The current extent of units DMW, DKW and WGK is about 3315 ha, or about 13% of the total extent of the ecological community if these units are included in their entirety. However, as they include an unknown proportion dominated by other eucalypt species, e.g. *E. globulus* on King Island, it is reasonable to suggest these units would actually account for less than ten percent of the ecological community's current extent.

1.2.3. Tasmanian threatened native vegetation communities

Tasmania recognises and lists threatened native vegetation communities under Schedule 3A of the Tasmanian Government's *Nature Conservation Act 2002* (DPIPWE, 2015a). There are 39 items on this list, as of September 2016. Two listed native vegetation communities correspond closely to components of the Black gum – Brookers gum forest/woodland:

- Schedule ID 16: *Eucalyptus brookeriana* wet forest.
  This item covers those elements of the ecological community dominated by *E. brookeriana*. It corresponds to TASVEG unit WBR.
- Schedule ID 20: *Eucalyptus ovata* forest and woodland.
  This item covers those elements of the ecological community dominated by *E. ovata*. It corresponds to TASVEG units DOV and DOW plus the component of DMW dominated by *E. ovata*.

A third listed native vegetation community corresponds only partly to the Black gum – Brookers gum forest/woodland:

- Schedule ID 18 *Eucalyptus globulus* King Island forest.
  This item appears to correspond to TASVEG units WGK and DKW. It includes a component of the ecological community that is locally dominated by *E. brookeriana* and limited to King Island. However, much of this item is not part of the Black gum – Brookers gum forest/woodland, being dominated by other eucalypt species, *E. globulus* and/or *E. viminalis*.

The protections that apply to State-listed vegetation communities are outlined in section 5.2. *Existing protection under State and Local Government laws*, below.

1.3. Guidance for determining when the ecological community protected under the EPBC Act is present

1.3.1. Introduction

National listings complement State vegetation laws by enhancing the protection of those components of Australia's biodiversity most at risk of extinction. With regards to ecological communities, national listings focus legal protection on patches that remain in relatively good condition, and retain their natural composition and ecological function to a large degree.

The Black gum – Brookers gum forest/woodland exhibits a degree of variation in its natural structure and composition, as well as varying degrees of disturbance and degradation that have influenced the quality of a patch. Notably, much of the ecological community occurs in the more heavily cleared and modified parts of Tasmania. Both the natural variation and influence of degradation have been taken into account in developing the key diagnostic characteristics and condition thresholds for the Black gum – Brookers gum forest/woodland.

The key diagnostic characteristics summarise the main features that characterise the Black gum – Brookers gum forest/woodland and are intended to help people identify when the ecological community is likely to be present, noting that a broader description is provided above.

Condition categories recognise that patches of an ecological community can differ in their quality, and that some patches have undergone substantial degradation. Condition thresholds provide guidance on when a patch of an ecological community retains sufficient conservation values to be considered a 'Matter of National Environmental Significance', as defined under the EPBC Act. Patches that do not meet the minimum condition thresholds, therefore, are excluded from full national protection, and this effectively means that the referral, assessment and compliance provisions of the EPBC Act are focussed on the most valuable elements of the ecological community.

Although degraded or modified patches of an ecological community are not protected under the EPBC Act if they do not meet the condition thresholds, it is recognised that some patches can still meet the diagnostic characteristics for the community and retain some important natural values that may be crucial for certain species or habitats. Such patches may also be protected through State and local laws or schemes. Therefore, these patches should not be excluded from recovery and other management actions. Suitable recovery and management actions may improve some of these patches to the point that they may be regarded as part of the ecological community fully protected under the EPBC Act. Management actions should, where feasible, also aim to restore patches to meet high quality condition thresholds.

For EPBC Act referral, assessment and compliance purposes, the national ecological community is limited to patches that meet the key diagnostic characteristics PLUS the condition thresholds that are outlined below. The additional factors noted in section 4.4. and critical areas noted in section 4.5. also should be taken into consideration.

1.3.2. Key diagnostic characteristics for the Black gum – Brookers gum forest/woodland.

- Distribution limited to Tasmania, including Bass Strait islands.
- Associated with sites of typically impeded drainage on flats, lower slopes, undulating plains, headwater valleys, gullies and seepage slopes.
- Vegetation structure varies from open woodland to dry sclerophyll to wet sclerophyll forest. A tree canopy is present in which the minimum solid crown cover is 5% or more and the dominant trees have a minimum height of 5 metres or more.

  Note: Recent disturbances, such as fire may cause the loss of a mature tree canopy and a shift to a different, regenerative state for a woodland. Under these circumstances, the loss of a tree canopy is likely to be a temporary phenomenon, if natural regeneration is not interrupted. There should be evidence that: (1) the dominant eucalypt species typical of the ecological community were formerly present at a site by the presence of stumps, logs, photos, past surveys/knowledge; and (2) that the tree canopy will regenerate from seedlings, saplings or epicormic regrowth. This temporary regenerative state is included as part of the ecological community when the other diagnostic features and condition thresholds are met. *Eucalyptus ovata* germinates easily from seed and natural regeneration is usually evident in the field (Florabank, 2006).
- The tree canopy is dominated to co-dominated by *Eucalyptus ovata* (black gum) and/or *E. brookeriana* (Brookers gum) or hybrids of *E. ovata* and/or *E. brookeriana*. Other tree species may be present in the canopy but are never dominant in their own right.

  Note: This means one or a combination of both key tree species mentioned have a greater cover than any other species in the tree canopy. Refer to footnote 2, p8 for further guidance on the concept of dominance.
- The understorey retains a significant component of native plant species but is variable in the structure and composition. The understorey below *E. ovata* typically comprises shrubs and/or sedges but includes variants where the understorey is a low heath or is grassy. The understorey below *E. brookeriana* includes some rainforest elements and also comprises shrubs and ferns.

1.3.3. Condition thresholds for the Black gum – Brookers gum forest/woodland

The condition thresholds for this ecological community are designed to identify the best patches for national protection. As the ecological community has been cleared and degraded, many of the remnants are small and in proximity to modified land uses. Any remnants that remain largely intact, include mature trees, or are connected to other native vegetation and form a large patch are a high priority for protection and management.

Where native vegetation meets the above description, including key diagnostic characteristics, of the Black gum – Brookers gum forest/woodland ecological community, the condition thresholds in Table 2 apply for the ecological community to be considered a 'Matter of National Environmental Significance'.

- **Category A describes patches of the ecological community in the best condition, in terms of native understorey vegetation cover. These are the highest priorities for protection and provide examples to guide restoration of lower condition patches.**
- **Categories B, C, D and E represent the minimum for a patch of the ecological community to be subject to the referral, environment assessment and compliance provisions of the EPBC Act. They retain important conservation values and are a priority for rehabilitation.**

Table 2. Condition thresholds for the Black gum – Brookers gum forest/woodland ecological community.

Category	Native cover thresholds	AND Habitat value thresholds	AND Minimum patch size thresholds
A. The patch has an **extensive** native understorey that remains intact.	≥70% of the perennial understorey vegetation cover[1] is made up of native species.	N/A	0.5 ha
B. The patch has a **mostly native** understorey remaining **AND** has **high** plant species diversity.	≥50 - 70% of the perennial understorey vegetation cover[1] is made up of native species.	≥15 native understorey species per 0.5 ha OR ≥ 8 native understorey species per 0.5 ha for patches dominated by *E. brookeriana* and not on King Island.	0.5 ha
C. Patch has a **mostly native** understorey remaining **AND** has **connectivity** to another patch of native vegetation.	≥50 - 70% of the perennial understorey vegetation cover[1] is made up of native species.	The patch is contiguous with a native vegetation remnant, where the total size of the native vegetation remnant is 2 ha or more[2].	0.5 ha
D. Patch has a **mostly native** understorey remaining **AND** the patch is **larger.**	≥50 - 70% of the perennial understorey vegetation cover[1] is made up of native species.	N/A	2.0 ha
E. Patch has a **reasonable native** understorey remaining **AND** has **several trees** that are **mature**[#] **or have hollows** present.	≥30 - 50% of the perennial understorey vegetation cover[1] is made up of native species.	The patch has at least 4 locally indigenous trees per 1 ha that either: have hollows OR are large (>60cm dbh[3]) OR are in either of these categories.	2.0 ha

Legend on next page.

Legend to Table 2.

[1] *Perennial understorey vegetation cover* includes vascular plant species of the ground and mid layers with a lifecycle of more than two growing seasons. The ground layer includes herbs (i.e. graminoids, forbs, and low shrubs [woody plants ≤0.5m high]). Measurements of perennial understorey vegetation cover exclude annuals, leaf litter or exposed soil. The mid layer is typically comprised of shrubs and small trees and may include juvenile canopy trees.

[2] *Contiguous* means a patch of the ecological community is continuous with or close to (periphery within 50 m) another area of native vegetation. The *native vegetation remnant* that is contiguous includes any native vegetation where the cover in each layer present is dominated by native plant species. The minimum total area of native vegetation (i.e. patch of the ecological community plus contiguous remnant) is 2 ha.

[3] *dbh* is diameter at breast height. The dbh is used as a surrogate measure to determine whether mature trees are present. The requirement for locally indigenous trees refers to any large eucalypt trees naturally present in the patch, though the patch must be dominated by *E. ovata* and/or *E. brookeriana*.

Small, isolated patches subject to disturbance do not contribute so greatly to the conservation of the ecological community so may not meet the condition thresholds for national protection. It is intended that the condition thresholds will exclude degraded patches from any requirement for protection, for instance: isolated paddock trees on farms; small and/or narrow stands of trees, that serve as windbreaks or shelterbelts on farms and other properties; or other woodland/forest remnants that are too small, or where the understorey has lost most elements of its native structure and diversity or lacks important habitat values.

In developing the condition thresholds for the ecological community it is acknowledged that much of the ecological community is not protected in formal conservation reserves, and that older, mature trees are particularly important for the greater variety of habitats and resources that large trees provide to species in the ecological community. Note that 'maturity' is a separate concept to 'old growth'. Old growth forests are defined as forests in the late to over-mature growth stages that have been subject to negligible unnatural disturbances (FPA, 2012).

1.3.4. Further information to assist in determining the presence of the ecological community and significant impacts

The following information should also be taken into consideration when applying the key diagnostic characteristics and condition thresholds to assess a site that may include the ecological community and determine the potential impacts on a patch.

Landuse history will influence the state in which a patch of the ecological community is expressed. The surrounding vegetation will also influence how important a patch of the ecological community is in the broader landscape.

Defining a patch. A patch is a discrete and mostly continuous area of the ecological community. A patch may include small-scale (<30 m) variations, gaps and disturbances, such as tracks, paths or breaks (including exposed soil, leaf litter, cryptogams and watercourses/drainage lines), or localised variations in vegetation that do not significantly alter the overall functionality of the ecological community. Such breaks are generally included in patch size calculations. Where there is a break in native vegetation cover, from the edge of the tree canopy of 50 m or more (e.g. due to permanent artificial structures, wide roads or other barriers; or due to water bodies typically more than 30m wide) then the gap typically indicates that separate patches are present.

Variation in canopy cover, quality or condition of vegetation across a patch should not initially be considered to be evidence of multiple patches. Patches can be spatially variable and are often characterised by one or more areas within a patch that meet the key diagnostic characteristics and condition threshold criteria amongst areas of lower condition. Average canopy cover and quality

across the broadest area that meets the general description of the ecological community should be used initially in determining overall canopy cover and vegetation condition. Also note any areas that are either significantly higher or lower in quality, gaps in canopy cover and the condition categories that would apply across different parts of the site respectively. Where the average canopy cover or quality falls below the minimum thresholds, the next largest area or areas that meet key diagnostics (including minimum canopy cover requirements) and minimum condition thresholds should be specified and protected. This may result in multiple patches of the ecological community being identified within the overall area first considered.

Buffer zone A buffer zone is a contiguous area adjacent to a patch that is important for protecting the integrity of the ecological community. As the risk of damage to an ecological community is usually greater where actions occur close to a patch, the purpose of the buffer zone is to minimise this risk by guiding land managers to be aware that the ecological community is nearby and take extra care. For instance, the buffer zone will help protect the root zone of edge trees and other components of the ecological community from spray drift (fertiliser, pesticide or herbicide sprayed in adjacent land), weed invasion, water runoff and other damage.

The buffer zone is not part of the ecological community, so while having a buffer zone is strongly recommended, it is not formally protected as a Matter of National Environmental Significance. For EPBC Act approval, changes in use of the land that falls within the buffer zone must not have a significant impact on the ecological community, but there are exemptions for continuing use (e.g. cropping, grazing or maintaining existing fire breaks). If the use of an area that directly adjoins a patch of the ecological community will be intensified, approval under the EPBC Act may also be required to avoid adverse impacts. The buffer zone may also be a suitable focus for revegetation or other restoration initiatives.

The recommended minimum buffer zone is 30 m from the outer edge of the patch (as defined by the edge of the tree canopy) as this distance accounts for likely influences upon the root zone. A larger buffer zone (e.g. 50m) should be applied, where practical, to protect patches that are of very high conservation value or if patches are located below drainage lines or a source of nutrient enrichment or groundwater drawdown.

Revegetated areas Revegetated or replanted sites or areas of regrowth are not excluded from the listed ecological community so long as the patch meets the key diagnostic characteristics and condition thresholds above. It is recognised that reconstruction/revegetation often requires long term effort and commitment and results are uncertain. Reconstructing a woodland or forest ecological community to a state that resembles appropriate reference sites can, at best, be extremely slow and ultimately prove unsuccessful (Wilkins et al, 2003).

Sampling protocols Thorough and representative on-ground surveys are essential to accurately assess the extent and condition of the ecological community. Sampling should begin with a quick reconnaissance to determine the key variations in vegetation, landscape qualities and management history (where possible) across the site. The site should then be thoroughly sampled on a representative basis for vegetation cover and plant species diversity. Sampling based upon an area of at least 10m x 10m, or an equivalently sized shape (i.e. 100 m^2 = 0.01 ha) would be suitable. Larger and more variable areas of vegetation will need more samples or quadrats to assess a site accurately. Recording the sampling effort (identifying the number of person hours spent per plot across the patch, along with the surveyors' level of expertise) is recommended for referral.

Timing of surveys Whilst identifying the ecological community and its condition is possible at most times of the year, consideration must be given to the role that season, antecedent rainfall and disturbance history may play in an assessment. For example, some native herbaceous

species may not be evident in summer, autumn, or particularly dry winter and spring seasons, and active growth will indicate population sizes of annual weeds. Immediately after a fire one or more vegetation layers, or groups of species (e.g. obligate seeders), may not be evident for a time. Timing of surveys should allow for a reasonable interval after a disturbance (natural or human-induced) to allow for regeneration of species to become evident, and be timed to enable diagnostic species to be identified. At a minimum, it is important to note climate conditions and what kind of disturbance may have happened within a patch, and when that disturbance occurred, as far as possible. Timing of surveys may be more critical for some components of the ecological community than others, e.g. for TASVEG unit DMW that has a strong herbaceous component.

Surrounding environment, landscape context and other significance considerations The condition thresholds outlined above, including the highest condition category (A), do not necessarily represent the ideal state of the ecological community. Patches that are larger, more species rich and less disturbed are likely to provide greater biodiversity value. Additionally, patches that are spatially linked, whether ecologically or by proximity, are particularly important as wildlife habitat and to the viability of those patches of the ecological community into the future.

Therefore, in the context of actions that may have 'significant impacts' and require approval under the EPBC Act, it is important to consider the environment surrounding patches that meet the condition thresholds. Some patches that meet the condition thresholds occur in isolation and require protection, as well as priority actions, to link them with other patches. Other patches that are interconnected to other native vegetation associations that may not, in their current state, meet the condition thresholds have additional conservation value. In these instances, the following indicators should be considered when assessing the impacts of actions or proposed actions under the EPBC Act, or when considering priorities for recovery, management and funding.

- Large size and/or a large area to boundary ratio – patches with larger area/boundary ratios are less exposed and more resilient to edge effect disturbances such as weed invasion and human impacts.
- Patches within a larger native vegetation remnant and that contribute to a mosaic of vegetation types within a remnant. Areas of mosaic native vegetation provide a wider range of habitats that benefits flora and fauna diversity.
- Patches that occur in areas where the ecological community has been most heavily cleared and degraded, or that are at the natural edge of its range, particularly due to genetic significance or absence of some threats.
- Good faunal habitat as indicated by patches containing diversity of landscape, diversity of plant species and vegetation structure, diversity of post-disturbance age class, mature trees (particularly those with hollows), contribution to movement corridors, logs, natural rock outcrops, watercourses, etc.;
- High species richness, as shown by the variety of native understorey plant species, or high number of native fauna species.
- Presence of national or Tasmanian listed threatened species.
- Areas of minimal weeds and feral animals or where these can be managed efficiently.

- Evidence of recruitment of key native plant species (including through successful assisted regeneration or management of sites). It is acknowledged, however, that the recruitment of many species may not occur unless there is some disturbance, such as a fire or flood.
- Patches that meet, or are closest to, any benchmarks of ecological quality. These may be based on on-site observations or known past management history.
- Connectivity to other native vegetation patches or restoration works (e.g. native plantings). In particular, a patch in an important position between (or linking) other patches in the landscape.
- Unique variants of the ecological community, e.g. with a unique flora and/or fauna composition, or a patch that contains flora or fauna that have largely declined in the broader ecological community or region.
- Linear road reserves often contain remnant native vegetation in at least moderate condition, with a range of canopy, sub-canopy and understorey species. These areas can also act as important links to larger patches of nearby vegetation. In many locations linear road reserves are the only remnant native vegetation.

1.3.5. Area critical to the persistence of the ecological community

The areas considered critical to the survival of the Black gum – Brookers gum forest/woodland ecological community covers all patches that meet the key diagnostic characteristics and minimum condition thresholds for the ecological community, plus the buffer zones, particularly where this comprises surrounding native vegetation. This is because some elements of this ecological community occur in landscapes that have been cleared and modified.

Additional areas that do not meet the condition thresholds may still be important for the survival of the ecological community because they could retain some biodiversity or habitat values, or have the potential to be restored to a level where they meet these thresholds. It is also important to consider the surrounding environment and landscape context, as noted above in Section 1.3.4.

2. NATIONAL CONTEXT

The Black gum – Brookers gum forest/woodland ecological community mostly occurs across northern and eastern Tasmania and the larger Bass Strait islands. TASVEG units WBR (*E. brookeriana* wet forest), DOV (*E. ovata* forest), WGK (*E. globulus* King Island Forest) and DKW (King Island Eucalypt Woodland) are all mapped as occurring on King Island. WBR also occurs on Robbins Island and DOV on Three Hummock Island off northwestern Tasmania. Unit DOW (*E. ovata* heathy woodland) is present on Flinders Island.

A majority of the ecological community occurs within the Tasman Temperate Forests Conservation Management Zone (DoE, 2015), that covers northern and eastern Tasmania, the Bass St islands plus the Otway Ranges and Wilsons Promontory in southern Victoria. This zone has the following characteristics:

- The main land uses are: conservation and natural environments (45%); grazing modified pastures (19%); production forestry - native vegetation (15%); plantation forestry (7%); and grazing native vegetation (5%). The high proportion of conservation land use reflects the presence of large reserves such as Wilsons Promontory and Great Otway national parks in Victoria and the intrusion of the Tasmanian Wilderness World Heritage Area into this Conservation Management Zone.
- Land tenure is mostly split between private - freehold and Crown land - public.

The northern and eastern parts of Tasmania include the most heavily cleared landscapes of the State. The Northern Midlands bioregion has lost native vegetation across 66% of its extent, while the Northern Slopes and King bioregions each have over 40% of their total area without native vegetation (Table 1 on p6, above). The ecological community is largely absent, except for minor, scattered remnants, in the wetter, higher elevation Central Highlands and Tasmanian West bioregions of Tasmania that are uncleared and can effectively be considered as intact to near-intact landscapes.

2.1. Extent of the ecological community protected in existing reserves

Tasmania, overall, has a high level of protection in reserves. About 41% of its total land area lies within conservation tenures recognised by the CAPAD database (DoE, 2014), and about 61.5% of Tasmania's existing native vegetation occurs within the conservation estate (DPIPWE, 2015).

DPIPWE (2015) provides information for how much of the Black gum – Brookers gum forest/woodland ecological community directly occurs within conservation tenure, as at June 2015 (Table 3). About seven thousand hectares or 32% of the estimated current extent for the three key TASVEG components are protected within some form of conservation tenure, but only 7% is within dedicated formal public reserves. Some components are better represented in reserves. For instance 20% of DOW – *E. ovata* heathy woodland is currently protected in dedicated formal public reserves. However, DMW – Midlands woodland complex is very poorly represented in reserves, with none in dedicated formal public reserves and less than one percent of its entire remaining extent afforded some form of protection (Table 3).

Reserved patches of the ecological community appear to be scattered across its range. Apart from the few sites that occur in the World Heritage Area of the southwest, there is some aggregation of conserved areas in the northwest and the northern slopes west of Launceston (Figure 3).

<u>Table 3.</u> Extent (ha) of the Black gum – Brookers gum forest/woodland ecological community protected under various kinds of conservation tenure in Tasmania, by component TASVEG units.

Reserve type	**Key TASVEG units**				**Associated TASVEG units**				**Total – all units**
	DOV	**DOW**	**WBR**	**Sub-total**	**DMW**	**DKW**	**WGK**	**Sub-total**	
PUBLIC LAND									
Dedicated formal reserves	737.8	108.1	808.9	1 654.8	0	90.5	46.3	136.8	1 791.6
Other formal reserves	1 122.4	208.0	944.7	2 275.1	1.8	246.2	68.6	316.6	2 591.7
Informal reserves - public land	801.3	0.6	568.3	1 370.2	1.8	0	258.4	260.2	1 630.4
Total – public land	*2 661.5*	*316.7*	*2321.9*	*5 300.1*	*3.6*	*336.7*	*373.3*	*713.6*	*6 013.7*
PRIVATE LAND									
Private sanctuary	38.8	0	35.8	74.6	0	0	0	0	74.6
Conservation covenant (NC Act) – perpetual term	1 116.2	7.7	149.0	1 272.9	5.4	87.8	352.2	445.4	1 718.3
Conservation covenant (NC Act) – variable term	10.0	0	0	10.0	0	0	0	0	10.0
Indigenous protected area	1.6	0	0	1.6	0	0	0	0	1.6
Stewardship & management agreements	4.5	0	9.2	13.7	2.1	0	0	2.1	15.8
Other private property reserves	235.4	4.7	311.9	552.0	0	0	0	0	552.0
Total – private land	*1 406.5*	*12.4*	*505.9*	*1 924.8*	*7.5*	*87.8*	*352.2*	*447.5*	*2 372.3*
Total – all reserve tenures	**4 068.0**	**329.1**	**2827.8**	**7 224.9**	**11.1**	**424.5**	**725.5**	**1 161.1**	**8 386.0**
Estimated extent remaining	**14 611.1**	**528.7**	**7279.3**	**22 419.1**	**1 353.6**	**580.5**	**1 381.2**	**3 315.3**	**25 734.4**
Proportion protected (%)	**27.8**	**62.2**	**38.8**	**32.2**	**0.8**	**73.1**	**52.5**	**35.0**	**32.6**

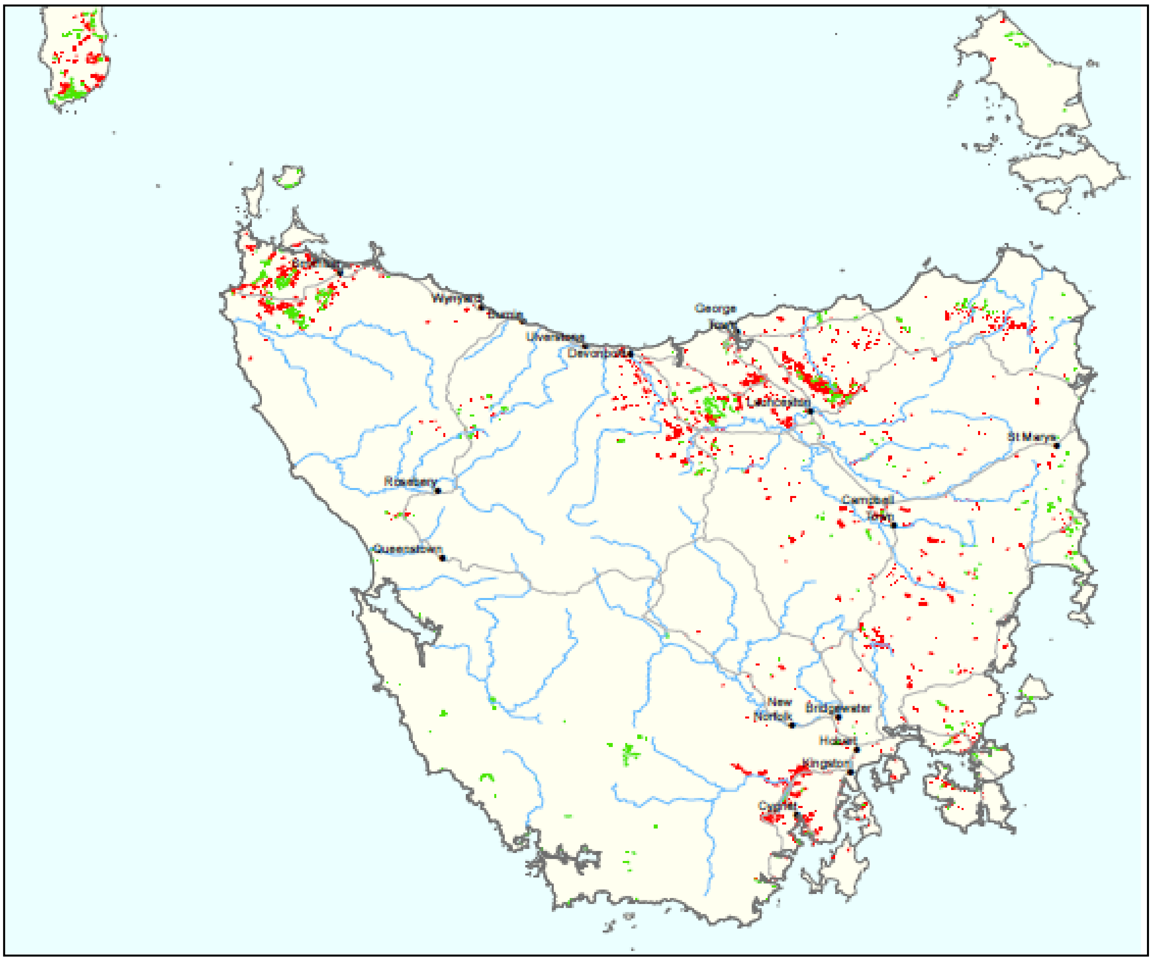
Source: DPIPWE (2015).

Legend: NC Act refers to the Tasmanian *Nature Conservation Act 2002*.

Vegetation units as identified under TASVEG v3.0
- DOV = *Eucalyptus ovata* forest and woodland;
- DOW = *Eucalyptus ovata* heathy woodland;
- WBR = *Eucalyptus brookeriana* wet forest;
- DMW = Midlands woodland complex;
- DKW = King Island eucalypt woodland; and
- WGK = *Eucalyptus globulus* King Island forest.

Note: The key TASVEG units are almost entirely dominated by *E. ovata* or *E. brookeriana*. The associated units DMW, DKW and WGK include components dominated by other eucalypt species that are not part of the national ecological community. Values for these units may therefore overestimate the extent reserved and remaining, but are taken to be indicative of patterns for the ecological community.

Figure 3. Patches of the Black gum – Brookers gum forest/woodland ecological community that are included in conservation tenure (green polygons) or not reserved (red polygons).



Source: TASVEG v3.0 for the six vegetation units identified in Table 6; and Department of the Environment's CAPAD database on conservation tenure. Map prepared by the Environmental Resources Information Network, Department of the Environment using data collated by the Tasmanian and Australian Governments, and current as at October 2016.

Note: Entire polygons are highlighted as being reserved if they occur wholly or only partly in conservation tenure. The three associated TASVEG units (DMW, DKW and WGK) also include elements that are not dominated by *E. ovata* or *E. brookeriana* – such elements are not part of the ecological community. DMW is scattered in the Midlands from around Launceston south to Hobart, while DKW and WGK are limited to King Island.

2.2. Relationship to the vulnerable Eucalyptus ovata - Callitris oblonga *Forest*

The description of the Black gum – Brookers gum forest/woodland overlaps with an existing EPBC-listed ecological community: the *Eucalyptus ovata - Callitris oblonga* Forest, listed as nationally vulnerable on 1 September 2004. A recovery plan for the ecological community was published in 2011 (Threatened Species Section [Tasmanian DPIPWE], 2011). This ecological community likely corresponds to TASVEG unit DOV, in part.

The Commonwealth listing advice describes the ecological community as follows:

> "The ecological community is characterised by the association of *Eucalyptus ovata* and *Callitris oblonga*, and occurs in riparian (riverine) habitats. On alluvial flats the ecological community generally forms shrubby woodland, often in association with *Melaleuca gibbosa*. On rocky slopes this ecological community may lose its *Eucalyptus* overstorey due to topographical and soil factors, and form tall open shrubland with *Callistemon pallidus*. On rocky slopes, *C. oblonga* may therefore be the sole dominant, or co-dominant with eucalypts. *Callitris oblonga* is likely to be less dominant or co-dominant on the alluvial flats, where eucalypts, particularly *E. ovata*, become more dominant ...... *E. ovata - C. oblonga* Forest has a disjunct distribution on the St. Pauls, Apsley, South Esk, Swan, Brushy, Cygnet and Wye Rivers and in associated habitats in the Midlands and East Coast of regions of Tasmania. An outlying patch occurs at Cataract Gorge in Trevallyn near Launceston and an atypical patch occurs south of Cranbrook on the East Coast on ironstone gravels, away from any watercourses."
>
> TSSC (2004; pp. 1-2)

The recovery plan notes that, while *E. ovata* is the typical eucalypt species present in the ecological community, some patches may have *E. viminalis* or *E. amygdalina* in the canopy.

<if approved> Given there is substantial overlap in descriptions between the Black gum-Brookers gum forest/woodland and the *Eucalyptus ovata - Callitris oblonga* Forest, the latter was removed from the national list. National protection was subsumed and strengthened into alternative forms, as follows:

- Patches of the *Eucalyptus ovata - Callitris oblonga* Forest with a distinct tree canopy dominated by *E. ovata* are consistent with the description of the Black gum – Brookers gum forest/woodland and are subsumed into, and protected as part of the latter ecological community, if listed.
- Patches of the *Eucalyptus ovata - Callitris oblonga* Forest where *C. oblonga* occurs and the tree canopy is absent, sparse, or not dominated by *E. ovata* are protected as populations of the nationally endangered species, *C. oblonga*. Tasmania also lists this taxon as a vulnerable species.

Patch of *Eucalyptus ovata – Callitris oblonga* forest beside the St Pauls River. As this patch has a eucalypt canopy dominated by *E. ovata*, over a mostly native understorey, it is consistent with the Black gum-Brookers gum forest/woodland ecological community.

Photo credit – M Ilowski & W Potts, Tasmanian Dept of Primary Industries, Parks, Water & Environment

2.3. Nationally threatened species likely to occur in the ecological community

There are 26 animal and 45 plant taxa listed as nationally threatened that are terrestrial species either known to, or likely to occur in the Black gum – Brookers gum forest/woodland ecological community. These are listed in Table 4 and include iconic Tasmanian animals such as the eastern quoll and the Tasmanian devil. Other high profile species likely to occur in the ecological community include the critically endangered swift parrot (*Lathamus discolor*) and orange-bellied parrot (*Neophema chrysogaster*) (see Section 1.1.4. *Faunal components*, above, for a more detailed discussion of habitat relationships).

Five large crustacean species endemic to Tasmania also are listed as nationally threatened [four species of *Engaeus* (burrowing crayfish) plus *Astacopsis gouldi* (Tasmanian giant freshwater crayfish)]. These occur in streams and rivers that pass through a range of eucalypt forests and woodlands. Some species may burrow into stream banks below these forests. Given the ecological community is associated with wetter sites, it is possible that populations of these crustaceans can occur below a canopy of *E. ovata* or *E. brookeriana*. As they are not primarily terrestrial species, they are not listed in Table 4 but their potential presence should be considered where suitable stream and bank habitats intersect with patches of the ecological community.

Table 4. Terrestrial threatened species listed under the EPBC Act that are known to occur in, or potentially use the Black gum – Brookers gum forest/woodland as habitat.

Fauna

Scientific name	**Common name**	**EPBC status**
Acanthiza pusilla archibaldi	brown thornbill (King Island)	Endangered
Acanthornis magna greeniana	scrubtit (King Island)	Critically endangered
Antipodia chaostola leucophaea	Tasmanian chaostola skipper, heath-sand skipper	Endangered
Aquila audax fleayi	wedge-tailed eagle (Tasmanian)	Endangered
Ceyx azureus diemenensis	Tasmanian azure kingfisher	Endangered
Dasyurus maculatus maculatus (Tasmanian population)	spotted-tail quoll, tiger quoll (Tasmanian population)	Vulnerable
Dasyurus viverrinus	eastern quoll	Endangered
Discocharopa vigens	a charopid land snail	Critically endangered
Hoplogonus bornemisszai	Bornemissza's stag beetle	Critically endangered
Hoplogonus simsoni	Simson's stag beetle	Vulnerable
Hoplogonus vanderschoori	Vanderschoor's stag beetle	Vulnerable
Lathamus discolor	swift parrot	Critically endangered
Lissotes latidens	broad-toothed stag beetle, Wielangta stag beetle	Endangered
Litoria raniformis	growling grass frog, southern bell frog, green and golden frog	Vulnerable
Neophema chrysogaster	orange-bellied parrot	Critically endangered
Oreisplanus munionga larana	Marrawah skipper, alpine sedge skipper	Vulnerable
Oreixenica ptunarra	Ptunarra brown butterfly, Ptunarra xenica	Endangered
Pardalotus quadragintus	forty-spotted pardalote	Endangered
Perameles gunnii gunnii	eastern barred bandicoot (Tasmanian)	Vulnerable
Platycercus caledonicus brownii	green rosella (King Island)	Vulnerable
Pseudomys novaehollandiae	New Holland mouse, pookila	Vulnerable

Scientific name	Common name	EPBC status
Sarcophilus harrisii	Tasmanian devil	Endangered
Strepera fuliginosa colei	black currawong (King Island)	Vulnerable
Tasmanipatus anophthalmus	blind velvet worm	Endangered
Tyto novaehollandiae castanops (Tasmanian population)	masked owl (Tasmanian)	Vulnerable
Vombatus ursinus ursinus (Bass Strait population)	common wombat (Bass Strait)	Vulnerable

Flora

Scientific name	Common name	EPBC status
Acacia axillaris	Midlands wattle	Vulnerable
Asplenium hookerianum	maidenhair spleenwort	Vulnerable
Barbarea australis	native wintercress, riverbed wintercress	Endangered
Bertya tasmanica subsp. *tasmanica*	Tasmanian bertya	Endangered
Boronia gunnii	Gunn's boronia, Cataract Gorge boronia	Vulnerable
Boronia hemichiton	Mt Arthur boronia	Vulnerable
Caladenia anthracina	black-tipped spider-orchid	Critically endangered
Caladenia caudata	tailed spider-orchid	Vulnerable
Caladenia lindleyana	Lindley's spider-orchid	Critically endangered
Caladenia pallida	rosy spider-orchid, pale spider-orchid, summer spider-orchid	Critically endangered
Caladenia saggicola	sagg spider-orchid	Critically endangered
Caladenia sylvicola	forest fingers	Critically endangered
Caladenia tonellii	robust fingers	Critically endangered
Callitris oblonga	pygmy cypress-pine, dwarf cypress-pine	Vulnerable
Callitris oblonga subsp. *oblonga*	South Esk pine	Endangered
Carex tasmanica	curly sedge	Vulnerable
Cassinia rugata	wrinkled cassinia	Vulnerable
Colobanthus curtisiae	Curtis’ colobanth	Vulnerable
Conospermum hookeri	variable smoke-bush	Vulnerable
Dianella amoena	matted flax-lily	Endangered
Epacris apsleyensis	Apsley heath	Endangered
Epacris barbata	bearded heath, Freycinet heath	Endangered
Epacris exserta	South Esk heath	Endangered
Epacris glabella	funnel heath, smooth heath	Endangered
Epacris grandis	grand heath, tall heath	Endangered
Epacris graniticola	Mt Cameron heath, granite heath	Critically endangered
Epacris limbata	border heath	Critically endangered
Epacris stuartii	Stuart's heath	Critically endangered
Epacris virgata	pretty heath, Dan Hill heath	Endangered
Eucalyptus morrisbyi	Morrisbys gum	Endangered
Euphrasia fragosa	shy eyebright, Southport eyebright	Critically endangered
Euphrasia semipicta	peninsula eyebright	Endangered
Glycine latrobeana	clover glycine, purple clover	Vulnerable

Scientific name	Common name	EPBC status
Lepidium hyssopifolium	basalt pepper-cress, rubble peppercress	Endangered
Leucochrysum albicans var. *tricolor*	hoary sunray, grassland paper-daisy	Endangered
Prasophyllum apoxychilum	tapered leek-orchid	Endangered
Prasophyllum incorrectum	golfers leek-orchid	Critically endangered
Pterostylis wapstrarum	fleshy greenhood	Critically endangered
Pterostylis ziegeleri	grassland greenhood, Cape Portland greenhood	Vulnerable
Spyridium lawrencei	small-leaf spyridium	Endangered
Spyridium obcordatum	creeping dusty miller	Vulnerable
Stenanthemum pimeleoides	spreading stenanthemum, propellor plant	Vulnerable
Stonesiella selaginoides	clubmoss bush-pea	Endangered
Tetratheca gunnii	shy susan	Critically endangered
Xanthorrhoea arenaria	sand grasstree	Vulnerable

Source: DoEE (2016)

2.4. Existing protection under State and Local Government laws

As the ecological community corresponds to some vegetation communities listed as threatened under Tasmanian legislation (see Section 1.2.3, above), there are State and local government protections that also apply. Protection under the EPBC Act is separate to the State and local government measures outlined below.

State land clearing controls are administered by the Forest Practices Authority under the *Forest Practices Act 1985* and *Forest Practices Regulations 2007* (FPA, 2016a; Local Government Forestry Consultative Committee, 2016). These provide the legislative basis for a Forest Practices Code that sets standards for the reasonable protection of the cultural and natural values of Tasmania's forests. It applies to the clearing of all forest (i.e. woody) vegetation, as well as non-forest native vegetation that is listed as threatened - e.g. Highland *Poa* grassland, and covers all public and private land tenures.

A Forest Practices Plan (FPP) is required to authorise most land clearing (FPA, 2016a; Local Government Forestry Consultative Committee, 2016). FPPs must be certified by a Forest Practices Officer, appointed through the Forest Practices Authority prior to any action. They provide details of any significant areas that may be present, the protection measures to be applied, and how the clearing actions will be undertaken. The presence of species or vegetation communities listed as threatened in Tasmania restricts what forest practices may be undertaken through an FPP and approvals generally are limited to exceptional circumstances.

There are certain exemptions where no FPP is required for land clearing, as follows.

- The action involves small-scale clearing with the landowner's consent. Small-scale is either less than 100 tonnes of trees or timber removed per year, or less than one hectare cleared per property per year. This exemption does NOT apply to land designated as vulnerable. Vulnerable lands are those that: comprise or contain a Tasmanian-listed native vegetation community; are inhabited by a threatened species; are in streamside reserves; are steep or very erodible; contains karst (limestone or dolomite) soils; or contain areas of reserved forest.
- Clearing of trees on any land is for the purposes of: construction and maintenance of: authorised dam works; easements and access tracks for the construction and maintenance of electricity infrastructure; and the construction and maintenance of gas pipelines and public roads. This also applies to lands where a Tasmanian-listed threatened vegetation community is present.

- Clearing involves regrowth on previously cleared or converted lands.
- Clearing involves a buffer around existing infrastructure for the purposes of maintenance or public safety.
- Establishment of trees on land that has not contained trees or a threatened vegetation community for the immediately preceding five year period.
- Clearance in accordance with other existing authorisations, e.g. conservation covenants, mining exploration licences, authorised buildings and developments, railways.

Further details about FPPs and exemptions are given in the guide by the Local Government Forestry Consultative Committee (2016).

In addition, Tasmania's Permanent Native Forest Estate Policy specifies that the clearing and conversion of native forest on private land cannot exceed 40 hectares per property per 12 consecutive month period. The aim of this policy is to maintain an extensive and permanent native forest estate on both private and public land. Broadscale clearing and conversion of native forest has already ceased on public lands.

Additional clearing approvals may also be required from some local governments. The *Land Use Planning and Approval Act 1993* allows local governments to develop planning schemes, which use land zonation to regulate development and land use activities. All FPP applications must consult with local governments, under certain situations, to ensure they are consistent with council planning schemes (Local Government Forestry Consultative Committee 2016). For instance, FPP applicants must consult with a local council if: the council's planning scheme specifies landscape protection provisions; any forest practices potentially affect water quality for a town water supply catchment; the action occurs within 2 kilometres of a town water supply intake; or the proposed actions alters access to local council roads.

The protection measures referred to here were valid at the time of writing (October 2016). It is advisable to check the websites or contact relevant government agencies (notably the Forest Practices Authority and relevant local councils) for any updated information.

Further details about the ecological community can be found at Appendix B – Additional information about the ecological community.

3. SUMMARY OF KEY THREATS

The key threats to the Black gum – Brookers gum forest/woodland ecological community are outlined below.

- Clearance of native vegetation. This includes clearing of entire remnants as well as incremental damage from tree removal or lopping, or removal of native understorey vegetation. The consequences of clearing include:
  - fragmentation into smaller, more isolated patches;
  - loss of habitat for native species; and
  - patches and populations becoming more susceptible to further degradation.
- Impacts from invasive species. This includes:
  - weed invasion, notably from perennial weeds such as blackberry, gorse and Spanish heath; and
  - damage and predation from pest animals, e.g. deer, feral cats.
- Altered hydrology and water quality at sites. This includes:
  - modifications to the landscape that have disrupted natural water flows;
  - increased dryland salinity; and
  - excessive groundwater extraction and eutrophication from urban runoff, intensive agriculture, irrigation and irrigated cropping, or other sources.
- Grazing pressure, including inappropriate grazing regimes by domestic stock and grazing of regrowth by native fauna.
- Inappropriate application of chemicals, including inorganic fertilisers for improved pastures or pesticide/herbicide spray drift from lands adjacent to a patch.
- Altered fire regimes, notably altered fire frequency, but also changes to fire intensity and season, such as occurs during prescribed burning. It covers both wildfires and prescribed burning.
- Potential impact of plant diseases such as *Phytophthora* sp. on species diversity and structure.
- Potential impacts of climate change, including altered fire and flooding regimes, decline in tree health due to prolonged drought and heat stress, and poor regeneration and recruitment.

Further information about the threats to the ecological community can be found at Appendix C – Description of threats.

4. RECOMMENDATIONS BY THE THREATENED SPECIES SCIENTIFIC COMMITTEE

4.1. Recommendation on eligibility for listing against the EPBC Act criteria.

On the basis of available scientific information, it is recommended that the Black gum – Brookers gum forest/woodland ecological community is **eligible** for listing as **critically endangered**, as this is the highest conservation category triggered at the time of this assessment.

Detailed assessments against each of the EPBC Act listing criteria are at Appendix D - *Detailed assessment of eligibility for listing against the EPBC Act criteria*. The key conclusions are summarised here.

Criterion 1 - Decline in geographic distribution

The Committee notes that the Black gum – Brookers gum forest/woodland ecological community has undergone a decline in extent of about 90% based on available estimates of extent. This is consistent with a very severe decline in geographic distribution. Therefore, the ecological community has been demonstrated to have met the relevant elements of Criterion 1 to make it **eligible** for listing as **critically endangered**.

Criterion 2 - Restricted geographic distribution coupled with demonstrable threat

The Committee notes that the Black gum – Brookers gum forest/woodland ecological community was likely to have been naturally fragmented and currently has a limited area of occupancy. There are ongoing threats to the ecological community but the timeframe for potential loss is within the medium–term future. Therefore, the ecological community has been demonstrated to have met the relevant elements of Criterion 2 to make it **eligible** for listing as **vulnerable.**

Criterion 3 - Loss or decline of functionally important species

The Committee notes that the decline in the extent of old growth forest within the ecological community is substantial, in the order of twenty percent since 1996, a period of twenty years. The extensive time of at least 150 years required to develop hollow-bearing trees confirms that functional old growth forests cannot be restored within the medium-term future. Therefore, the ecological community has been demonstrated to have met the relevant elements of Criterion 3 to make it **eligible** for listing as **vulnerable.**

Criterion 4 - Reduction in community integrity

The Committee considers that the change in integrity experienced by the ecological community, for instance through fragmentation and the influence of modified landscapes on smaller patches, the degree of weed invasion and impacts from recent fires, is severe and that regeneration across the extent of the ecological community is unlikely in the medium-term future. Therefore, the ecological community is **eligible** for listing as **endangered** under this criterion.

Criterion 5 - Rate of continuing detrimental change

The available information indicates that, despite some recent loss of the ecological community, the extent of the loss is below the minimum threshold value for this criterion. There is insufficient information on the likely future changes due to clearing or on impacts due to other threatening processes. The ecological community is therefore **not eligible** for listing under any category for this criterion.

Criterion 6 - Quantitative analysis showing probability of extinction

There are no quantitative data available to assess this ecological community under this criterion. Therefore, it is **not eligible** for listing under this criterion.

4.2. *Recommendation on whether to have a Recovery plan*

A Recovery Plan is **not recommended** at this time because the Conservation Advice sufficiently outlines the Priority Research and Conservation Actions needed for this ecological community. There are also a number of existing documents outlining conservation and threat abatement measures, including an existing recovery plan for one component of the ecological community previously identified as nationally vulnerable. Taking into account the benefits of listing the ecological community and implementation of the recovery and threat abatement priorities and actions specified in the conservation advice, a recovery plan for the ecological community is not required at this time.

5. PRIORITY RESEARCH AND CONSERVATION ACTIONS

5.1. Principles and standards

The Conservation Objective provides the goal and rationale for the priority actions identified here:

> **To mitigate the risk of extinction of the *Tasmanian Forests and Woodlands dominated by black gum or Brookers gum (Eucalyptus ovata / E. brookeriana)* ecological community, and help recover its biodiversity and function, through:**
>
> - **protecting it using the *Environment Protection and Biodiversity Conservation Act 1999*, particularly to avoid further clearance; and**
> - **implementing priority conservation and research actions.**

With regard to undertaking priority restoration actions to meet the conservation objective, there are National Standards for the Practice of Ecological Restoration in Australia. The standards are available online from the Standards Reference Group SERA (2016). They outline nineteen principles to convey the main ecological, biological, technical, social and ethical underpinnings of ecological restoration practice. One principle most relevant to the Conservation Objective is:

> **"Ecological restoration is not a substitute for sustainably managing and protecting ecosystems in the first instance.**
> The promise of restoration cannot be invoked as a justification for destroying or damaging existing ecosystems because functional natural ecosystems are not transportable or easily rebuilt once damaged and the success of ecological restoration cannot be assured. Many projects that aspire to restoration fall short of reinstating reference ecosystem attributes for a range of reasons including scale and degree of damage and technical, ecological and resource limitations."
>
> *Standards Reference Group SERA (2016) – Appendix 2.*

In short, this principle says it is preferable to keep existing intact and high quality remnants. There are good, practical reasons to do so. It is often more cost-effective to retain an intact remnant than to allow degradation and then attempt to rehabilitate it or another area. The more disturbed and modified a patch of the ecological community, the greater the recovery effort that is required. Also, intact remnants are likely retain a fuller suite of native plant and animal species, and ecological functions. Certain species may not be easily to recover in practice, if lost from a site. Retention of intact patches is particularly important for systems characterised by high richness and/or local endemism of native species, as happens in biodiversity hotspots, e.g. the Midlands of Tasmania as one of fifteen national biodiversity hotspots in Australia (DoE, undated).

The principle serves to dissuade 'trade-offs' where intact remnants are removed with an undertaking to set aside and/or restore other sites. The destruction of intact sites actually represents a net loss of the functional ecological community because there is no guarantee all the species and ecological functions of the intact site can be replicated elsewhere.

The Standards Reference Group also identify six principles as 'key principles of ecological restoration practice', the details of which are provided by SERA (2016):

1. Ecological restoration practice is based on an appropriate local indigenous reference ecosystem.
2. Restoration inputs will be dictated by level of resilience and degradation.
3. Recovery of ecosystem attributes is facilitated by identifying clear targets, goals and objectives.

4. Full recovery is the goal of ecological restoration but outcomes may take long timeframes.
5. Science is essential to good practice but the two processes are synergistic.
6. Social aspects are critical to successful ecological restoration.

5.2. Priority actions

Priority actions are recommended for the abatement of threats and supporting recovery of the ecological community. Actions inconsistent with these recommendations that are likely to significantly affect the ecological community should not be undertaken. In assessment of activities that may have a significant impact on the ecological community, incorporate relevant actions listed below when determining recommendations including conditions of approval. Applications to Australian Government funding programs should also consider prioritising these restoration activities. Also take into consideration the information outlined above in Section 1.3, especially 1.3.4. 'Further information to assist in determining the presence of the ecological community and significant impacts'.

The four key approaches to achieve the conservation objective are:

PROTECT the ecological community to prevent further loss of extent and condition;

RESTORE the ecological community within its original range by active abatement of threats, revegetation and other conservation initiatives;

COMMUNICATE WITH AND SUPPORT people to increase understanding of the value and function of the ecological community and encourage their efforts in its protection and recovery; and

RESEARCH AND MONITORING to improve our understanding of the ecological community and methods for restoration and protection over the long-term.

These approaches are overlapping in practice and form part of an iterative approach to management that should include research, planning, management, monitoring and review. Key groups to communicate with include: landholders, land managers, land use planners, researchers, community members, and the Indigenous community.

PROTECT

Preventing vegetation clearance and direct habitat damage

Highest priorities

- Prevent further clearance, fragmentation or detrimental modification of remnants of the ecological community and of surrounding native vegetation, for example, due to infrastructure developments. High conservation value, unmodified and older growth areas are particularly important for retention and management.
  - Overall, efforts should be made to increase the remaining extent, condition and landscape scale connectivity (including with other adjacent native forest types).
  - Identify high quality remnants and areas that form important landscape connections (e.g. corridors) in advance of re-zoning and development planning decisions to avoid clearing or damaging them
  - Avoid clearing patches that meet condition thresholds, including removal of any vegetation layers. In particular: avoid further reducing patches into smaller sizes, especially below the minimum patch sizes specified in the condition thresholds; and avoid further fragmentation and buffering of patches by removing adjacent native vegetation.
  - Apply recommended buffers of at least 30 m around patches of the ecological community, although wider buffers may be required where there is larger scale landscape change, for

example hydrological modifications. In urban areas, consider planning roads and parks next to remnants rather than houses and other buildings.
   - Protect mature trees, particularly with hollows, even if they are dead. Large and old trees may have numerous fissures that provide shelter; support diverse insects and their predators; and act as ‘stepping stones’ for fauna moving between remnants in an otherwise cleared landscape. This applies to mature trees within remnant patches, as well as isolated trees that can retain important habitat and connectivity values for fauna.
   - Prevent firewood collection and fencing that leads to loss and damage of trees and logs.
   - Manage access to remnants to prevent, for example, disturbance and spread of plant pathogens and weeds.
   - New walking, bike or other paths and tracks should pass around the outside, rather than through, patches of the ecological community. Consider raised tracks to minimise understorey damage and hydrological impacts.
   - In urban areas retain patches that are parts of corridors or remnants that are very isolated or at the outer limits.

- Ensure that areas that form important landscape connections, such as wildlife corridors or other patches of particularly high quality or regional importance are considered for inclusion in formal reserve tenure or other conservation related tenure for protection and management in perpetuity.

- Avoid offsetting.
   - It represents ongoing net loss of the ecological community. See Section 5.3. ‘Offsets’ for further information.
   - Where offsets are to be considered, the general principle is they be ‘like for like’.
      - Do not offset losses of this ecological community with a different vegetation type.
      - The national ecological community groups related but distinct components recognised in Tasmania as separate TASVEG, RFA or State-listed entities. Avoid offseting losses of a particular component of the national ecological community with a different component, e.g. loss of TASVEG unit DOV should be offset with patches that are also unit DOV.

Other priorities

- Prevent impacts to native vegetation, native fauna, hydrology or soil structure from any developments and activities adjacent to or near patches of the ecological community by planning for and appropriately mitigating off-site effects. For instance, apply buffer zones and avoid activities that could cause significant hydrological change or eutrophication.

- Retain habitat features for fauna, noting species requirements (for example, large rocks, logs embedded in the soil or hollows), or particular vegetation structure (for example, variability in the understorey species and life forms). If necessary, supplement, (but do not replace) habitat by placing artificial hollows (e.g. various sized nest boxes) in, or near to, the ecological community. Maintain the boxes and monitor outcomes.

- Prior to removal of any trees, or use of heavy machinery that may also damage the understorey, ensure comprehensive flora and fauna surveys have identified threatened species on site and their potential shelter and nesting sites, for example hollows, burrows, rocks and tree crevices, as well as visible nests. Damage to these should be avoided altogether, but if approved for removal, care should be taken to appropriately relocate fauna.

- Protect the soil seed bank by minimising soil disturbance and removal.

Preventing weeds, feral animals, tree dieback and other diseases

Highest priorities

- Prevent weed invasion by minimising soil disturbance.
- Do not plant (or spread) known, or potential, environmental weeds within or near the ecological community:
    - prevent activities such as planting potentially invasive species in gardens or other landscaping near the ecological community; or dumping garden waste in or near patches of the ecological community.
    - control runoff, for example, urban runoff to prevent movement of weed material into natural areas.
- Detect and control weeds early to prevent major infestations. Small infestations should be a priority for removal.
    - This applies to weeds already present in Tasmania but new to a site, for example, spread of gorse, brooms, or blackberry. It also applies to weeds not yet present within Tasmania but likely to become an environmental problem if introduced.
- Prevent further introduction or spread of feral animals, and manage early for local eradication.
- Monitor for signs of new disease such as myrtle rust.

Other priorities

- Ensure domestic animals do not carry weeds into patches of the ecological community (for example, hold stock in other weed-free paddocks for an appropriate time prior to introduction).
- Use appropriate hygiene to minimise the introduction or spread of weeds and diseases at susceptible sites. For example, keep vehicles and machinery to dedicated roads and out of remnants wherever possible. If vehicles must be taken into remnants ensure vehicles are washed first to remove soil, potential fungal pathogens and weed seeds.
- Implement strategic responses to rural tree dieback, in particular, implement preventative measures.

Fire

- Seed collection, propagation and other ex-situ recovery action.
    - Ex situ seed banks provide an important capacity for medium to long-term storage of diaspores of threatened plant species. Where storable diaspores (seeds, spores, dispersal units) are available seed banking should be undertaken in consultation with relevant seed storage professional advice as to appropriate conditions (collection and post-harvest treatment; pre-storage drying; storage temperature; curation and auditing) to ensure diaspore viability is retained.
    - Seed should be appropriately sourced and stored in a seed bank facility using best practice seed storage guidelines and procedures to maximise seed viability and germinability
- Use a landscape-scale approach and available knowledge on fire histories and age of stands, to identify appropriate fire regimes. Fires must be managed to ensure that where possible, prevailing fire regimes do not disrupt the life cycles of the component species of the ecological community, that they support rather than degrade the habitat necessary to the ecological community, that they do not promote invasion of exotic species, and that they do not increase impacts of other disturbances such as grazing or predation by feral predators.

Faunal populations in isolated patches may be vulnerable to permanent extinction following intense fires.

- Fire sensitivity ratings, appropriate fire intervals and brief fire management recommendations have been compiled for all TASVEG units (Pyrke and Marsden-Smedley, 2005; see Appendix C Threats – Inappropriate fire regimes). The components of the ecological community vary in their sensitivity and recommended fire intervals. Any planned fire actions need to take into account the information that is specific to all the TASVEG unit(s) that are present.
    - Therefore, take into the fire requirements for other vegetation types that may be adjacent or nearby ecological communities, particularly if they are very sensitive to fire, such as rainforests or wetlands.

- Implement appropriate fire management regimes for the ecological community taking into account results from research. These may include some of the following actions:
    - burning to control weeds that can be managed by fire, as part of integrated pest management;
    - damage to the habitat and individuals of any threatened species must be taken into consideration during and after fire operations. In particular, do not burn during the reproductive seasons of threatened or functionally important or characteristic flora and fauna species, and avoid burning roost sites and tree hollows that are critical threatened species habitats;
    - before burning, consider soil moisture and weather conditions, for example, do not burn if soil moisture is very low, or dry conditions are predicted for the coming season, as this can limit post-fire recovery;
    - use mosaic burning for large patches, where different parts are burnt in rotation, rather than the whole area in any one season. This results in a patchwork of frequently, lightly and unburnt areas that may provide refuge for species with different fire and habitat requirements that also serve as source populations for recovery;
    - monitor the outcomes of fire, manage any consequences (for example, risk of weeds and feral predators spreading), and take results into account when implementing future fire regimes.

Preventing grazing damage

- Persistent grazing can negatively affect understorey species composition. Strategically manage total herbivore grazing (by native and domestic animals), for instance by:
    - temporary or permanent fencing of regrowth, revegetation areas, or sites with threatened, regionally important or diverse understorey species;
    - ensuring that stock do not introduce weed seeds to the patch; and
    - managing populations of feral animals that damage native vegetation, such as deer and rabbits.

RESTORE

Re-vegetation

Highest priorities

- Implement optimal regeneration, revegetation and restoration strategies for the ecological community, across the landscape.
    - Use locally collected seed where available to create an appropriate canopy and diverse understorey, however, choosing sources of seed closer to the margins of their range may increase resilience to climate change. Also encourage appropriate use of local native species in developments and revegetation projects through local government and industry initiatives.
    - Consider the needs of species of conservation concern or known to be of functional importance for the ecological community. For example, restoration of *Eucalyptus ovata* and *E. globulus* is recommended to support populations of swift parrots into the future.
- Restore wildlife corridors and linkages (where appropriate) between remnants of the ecological community and other areas of native vegetation or reconstructed habitat, to reduce fragmentation and isolation.
- Implement effective adaptive management regimes using information from relevant research.

Control invasive species and diseases

Highest priorities

- Map weed occurrence and prioritise management of weeds in high quality patches or where threatened or regionally significant species are known to occur.
- Implement effective control and management techniques for weeds currently affecting the ecological community, such as blackberries and gorse, integrating this with alternative habitat provision and predator control.

Other priorities

- Where feasible, control introduced pest animals through consolidated landscape-scale programs.
- Manage weeds before and after fire, and during revegetation works to maximise success of restoration.
- Manage weeds at the sides of new roads and housing and industrial developments near to the ecological community by regular monitoring, and control by targeted herbicide spraying or manual removal for several years after the works are complete.
- Ensure actions to control invasive or other pest species avoid impacts on non-target species and do not have any long-term adverse impacts upon the ecological community:
    - ensure workers are appropriately trained in the use of relevant herbicides and pesticides, best methods (for example, spot spraying, wiping, stem injection) and what to target;
    - avoid chemical spray drift and off-target damage within or near to the ecological community, having regard to minimum buffer zones.

COMMUNICATION AND SUPPORT

Education, information and local regulation

- Develop a communication strategy, education programs, information products and signage to help local communities, planners and managers recognise:
  - the presence and importance of the ecological community;
  - the appropriate management of patches of the ecological community;
  - responsibilities under state and local regulations and the EPBC Act.
- Promote knowledge about local weeds, means to control these and appropriate alternative species to plant.
- Develop education programs to discourage damaging activities such as the removal of dead timber, the dumping of rubbish (particularly garden waste), creation of informal paths and the use of off-road vehicles in patches of the ecological community.
- Provide land managers with information about managing fire for the benefit of the ecological community.
- Encourage local participation in recovery efforts, removing threats and actively restoring existing patches, as well as supplementing these. This may be achieved by setting up recovery teams with appropriate expert and local participants; adoption of patches by local conservation groups; or encouraging short term involvement through field days and planting projects, with appropriate follow-up.
  - Ensure planners and participants are aware of appropriate species to plant across the range of the ecological community, the best opportunities to restore landscape connectivity and encourage natural regeneration and the best known techniques for the site conditions and species being planted.
  - Ensure commitment to follow-up after planting, such as care of newly planted vegetation by watering, mulching, weeding and removal of tree guards.
- Promote awareness and protection of the ecological community with relevant agencies and industries. For example with:
  - state and local government planning authorities, to ensure that planning takes the protection of remnants into account, with due regard to principles for long-term conservation;
  - land owners and developers, to minimise threats associated with land conversion and development;
  - local councils and state authorities, to ensure infrastructure or development works involving substrate or vegetation disturbance do not adversely impact the ecological community. This includes avoiding the introduction or spread of weeds;
- Where patches of the ecological community occur close to peri-urban or urban areas, include measures to limit additional impacts from domestic animals and potential weeds. These may include:
  - public education, including the use of signs to both identify good examples of the ecological community and explain beneficial and detrimental activities.
  - cat exclusion areas;
  - requirements for dogs to remain on leash on walking paths through natural areas;
  - lists of suitable species for gardens to provide habitat and complement natural areas;
  - lists of invasive plant species to avoid planting in gardens (for local nurseries and residents).

- Liaise with local fire management authorities and agencies and engage their support in fire management of the ecological community. Request these agencies to use suitable maps and install field markers to avoid damage to the ecological community.

Incentives and support

- Support opportunities for traditional owners or other members of the Indigenous community to manage the ecological community.
- Implement formal conservation agreements (for example, covenants) for sites containing the ecological community.
- Develop coordinated incentive projects to encourage conservation and stewardship on private land, and link with other programs and activities, especially those managed by regional catchment groups or NRM bodies.

RESEARCH AND MONITORING

Relevant and well-targeted research and other information gathering activities are important in informing the protection and management of the ecological community. Coordination with individuals and groups with responsibilities for planning and on ground management is important to ensure that research questions and methods are well chosen, and that the information gathered can be applied to the benefit of the ecological community. Research and ongoing management activities can often be integrated to achieve the best results in the face of ongoing change. High priority research and monitoring activities to inform protection, management and restoration of the Black gum and Brookers gum forest/woodland ecological community include the following:

- It is important that any monitoring is planned before management commences and considers what data are required to address research questions. Monitoring must also be resourced for the duration of the management activities, especially for those using a novel approach.
    - Monitor changes in condition, including response to all types of management actions and use this information to increase understanding of the ecological community and inform recommendations for future management.
- Improve and update maps of the ecological community across its range:
    - support field survey and interpretation of other data such as aerial photographs and satellite images to more accurately document current extent, condition, threats, function, presence and use by regionally significant or threatened species.
    - support and enhance existing programs to model the pre-1750 extent across the entire range of the ecological community to inform restoration;
    - identify the most intact, high conservation value remnants and gain a better understanding of variation across the ecological community.
- Determine priority areas for restoration to enhance connectivity and landscape resilience.
- Conduct research leading to the development of effective landscape-scale restoration techniques for the ecological community. Investigate the interaction between disturbance types, such as fire and invasion by weeds and feral animals, to determine how an integrated approach to threat management can be implemented.
- Research the effects of fire on floristics and structure of vegetation, native fauna and invasive species in patches and across the broader landscape:
- Undertake or support ongoing research aimed at managing feral animals and major weeds.

- Assess the vulnerability of the ecological community to climate change and investigate ways to improve resilience through other threat abatement and management actions.
- Investigate key ecological interactions, such as the role of fauna in pollination, seed dispersal and nutrient cycling.
- Investigate the most cost-effective options for restoring landscape function, including:
    - re-vegetation or assisted regeneration of priority areas, potentially buffering, connecting and protecting existing remnants.
    - predator control options such as trapping and baiting, urban containment, exclusion fencing;
    - re-introduction of key fauna.

5.3. Offsets

Offsets are defined as measures that compensate for the residual adverse impacts of an action on the environment. Further clearance and damage to this ecological community should not occur. Therefore, offsetting is a last resort. It should only be proposed as an attempt to compensate for damage to the ecological community that is deemed unavoidable.

The ecological outcomes of offsetting activities are generally uncertain: for instance, when replanting areas there is no guarantee that reconstruction of all layers of the ecological community will be successful and that diversity of flora and fauna, and adequate ecological function can be restored. Further, much of the functionality of a replanted woodland or forest site is unlikely to be achieved within time frames of 15 – 20 years. Areas that already meet the condition thresholds are protected by this listing, so are not to be used as an offset unless there is a substantial net conservation benefit such as a perpetual change in land tenure for conservation purposes, with ongoing threat abatement measures and monitoring put in place. With regard to any proposals involving offsets for this ecological community, which has been greatly reduced in spatial extent and condition, the aims are to:

- enable options to avoid the need to offset;
- retain remaining areas with mature trees and other high quality patches rather than offset;
- ensure that any offsets are consistent with the wording and intent of the EPBC Act Environmental Offsets Policy (Commonwealth of Australia, 2012), including:
    - 'like-for-like' principles based on meeting the overall definition of the ecological community and considering the particular species composition, maturity of trees, vegetation structure and other habitat and landscape features at a particular site (e.g. do not use offsets distant from the site of impact, as there is local variation of the ecological community);
    - how proposed offsets will address key priority actions outlined in this Conservation Advice and any other relevant recovery plans, threat abatement plans and any other Commonwealth management plans.
- maintain (or increase) the overall area, quality and ecological function of the remaining extent of the ecological community and improve the formal protection of high quality areas through a combination of the following measures:
    - protecting and managing offset sites in perpetuity in areas dedicated under legislation for conservation purposes; that is, do not allow reduction in their size, condition and ecological function in the future through ongoing threat abatement measures and adaptive management based on monitoring; and/or

- o increasing the area occupied by the ecological community and improving its ecological function,for example by enhancing landscape connectivity, habitat diversity and condition; and/or
- o restoring lower condition patches to achieve higher condition (see the condition thresholds, above), particularly to ensure that any offset sites add additional value to the remaining extent.

Restoration activities may include patches that do not meet the key diagnostics and/or condition thresholds for national protection outlined in Section 1.3, above, but which formerly were the ecological community. These may have valuable landscape attributes and a high likelihood of restoration to a better, more intact condition (hence restoration will add area to the remaining extent of the ecological community that meets the definition for EPBC Act protection in this Conservation Advice). This particular measure should not be undertaken unless in combination with one or more of the other three measures in the dot point above.

5.4. Existing plans/management prescriptions relevant to the ecological community

There is no approved state recovery plan for the entire ecological community, as defined in this listing. A national recovery plan has been prepared for the component of the ecological community that was listed as nationally vulnerable, the *Eucalyptus ovata – Callitris oblonga* Forest (Threatened Species Section (2011). The objectives and management actions outlined in this recovery plan remain valid for components of this ecological community that include *Callitris oblonga*, and are likely to be broadly applicable to other situations, e,g, where *E. ovata* dominates in similar damp landscapes but lacks *Callitris* in the understorey.

Management prescriptions exist in the form of plans and guidelines for managing bushland and threatened species habitats relevant to the ecological community. These include:

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APPENDICES

APPENDIX A –LISTS OF KEY SPECIES FROM THE ECOLOGICAL COMMUNITY

Table A1. Native vascular plant species considered to be characteristic of the Black gum – Brookers gum forest/woodland ecological community, with regard to the specific TASVEG benchmarks indicated. Species are grouped by lifeform. The species listed may not necessarily be present in a given patch of the ecological community and/or other species not listed may be present. Scientific names were nationally accepted at October 2016.

Source: Vegetation condition benchmarks for TASVEG units corresponding to the ecological community (DPIPWE, 2015b). The TASVEG unit identifies the vegetation type/s for which a plant species is designated as a typical species for benchmarking purposes.

Three TASVEG units (DOV, DOW and WBR) are considered key units that best correspond to the ecological community, as they are typically dominated by black gum or Brookers gum. Note there are separate benchmarks for the forest and woodland expressions of DOV that differ in structural thresholds only, not species composition. They are, therefore, considered together here as unit DOV.

The three ‘associated TASVEG units (DMW, DKW and WGK) comprise a mix of dominant eucalypt species that includes black gum or Brookers gum but also other tree species. Only a part of these units would correspond to the ecological community.

‘Surveys’ identifies those plant species not listed in any of the six TASVEG benchmarks but were noted as frequent in survey plots of *E. ovata* forest/woodland undertaken by North Barker ecological consultants. Native species are included if they had a frequency of 10% or more in a sample of 118 plots surveyed between 2005 and 2015.

Large trees

Benchmark species noted in the three key TASVEG units.

Scientific name	Common Name	Key TASVEG units	Other units
Eucalyptus amygdalina	black peppermint	DOV	
Eucalyptus brookeriana	Brookers gum	WBR	DKW, WGK
Eucalyptus delegatensis	gumtopped stringybark	WBR	
Eucalyptus obliqua	stringybark	WBR	
Eucalyptus ovata	black gum	DOV, DOW	DMW
Eucalyptus pauciflora	cabbage gum	DOV	DMW
Eucalyptus pulchella	white peppermint	DOV	
Eucalyptus regnans	giant ash	WBR	
Eucalyptus rodwayi	swamp peppermint	DOV	
Eucalyptus viminalis	white gum	DOV	DMW, DKW, WGK

Bold indicates the characteristic dominant tree species for the ecological community.

Benchmark species also noted in associated TASVEG units only.

Scientific name	Common Name	Other units
Allocasuarina littoralis	black sheoak	Surveys
Eucalyptus globulus	Tasmanian blue gum	DKW, WGK
Exocarpos cupressiformis	common native-cherry	Surveys

Small trees to large shrubs, including tree ferns
Benchmark lifeform codes = T, TF

Benchmark species noted in the key TASVEG units

Scientific name	Common Name	Key TASVEG units	Other units
Acacia dealbata	silver wattle	DOV, WBR	DMW
Acacia melanoxylon	blackwood	DOV, WBR[1]	WGK
Acacia verticillata	prickly moses	DOW	WGK
Banksia marginata	silver banksia	DOW	DMW, DKW
Bedfordia salicina	Tasmanian blanketleaf	DOV, WBR	
Bursaria spinosa	prickly box	DOV	DMW
Cassinia aculeata	dollybush	DOV, WBR	
Callitris oblonga subsp. *oblonga* [2]	South Esk pine	DOV	
Dicksonia antarctica	soft treefern	WBR	WGK
Leptospermum lanigerum	woolly teatree	DOW	
Leptospermum scoparium	common teatree	DOW	DKW, WGK
Leptospermum species	teatree	DOV, WBR	
Melaleuca ericifolia	coast paperbark	WBR	WGK
Melaleuca species	paperbark	DOV	
Monotoca glauca	golden wood	WBR	DKW, WGK
Olearia argophylla	musk daisybush	WBR	
Olearia species	daisybush	DOV	
Phyllocladus aspleniifolius	celerytop pine	WBR	
Pomaderris apetala	common dogwood	DOV, WBR	WGK

[1] *Acacia melanoxylon* can also be present as a large tree in TASVEG unit WBR.

[2] *Callitris oblonga* is not listed as TASVEG benchmark species. It has a localised distribution limited to some riparian areas of north-eastern Tasmania. It is included here because it was a distinctive component of the Vulnerable-listed national ecological community "*Eucalyptus ovata – Callitris oblonga* forest" that is now largely subsumed within the black gum-Brookers gum forest/woodland ecological community.

Benchmark species also noted in associated TASVEG units only.

Scientific name	Common Name	Other units
Acacia longifolia subsp. *sophorae*	coast wattle	DKW
Acacia mearnsii	black wattle	DMW
Acacia mucronata	caterpillar wattle	DKW, WGK
Allocasuarina monilifera	necklace sheoak	DKW
Cyathea australis	rough treefern	WGK
Hedycarya angustifolia	australian mulberry	WGK
Leptospermum laevigatum	coast teatree	DKW
Melaleuca squarrosa	scented paperbark	WGK
Nematolepis squamea	satinwood	WGK
Olearia lirata	forest daisybush	Surveys
Pittosporum bicolor	cheesewood	WGK

Medium to small (including prostrate) shrubs
Benchmark lifeform codes = S, PS

Benchmark species noted in the key TASVEG units

Scientific name	Common Name	Key TASVEG units	Other units
Acacia suaveolens	sweet wattle	DOW	
Allocasuarina paludosa	scrub sheoak	DOW	
Almaleea subumbellata	wiry bushpea	DOW	
Astroloma humifusum	native cranberry	DOW	DMW, DKW
Bossiaea prostrata	prostrate bossia	DOW	DMW
Callistemon viridiflorus	prickly bottlebrush	DOW	
Epacris gunnii	coral heath	DOV	
Epacris lanuginosa	swamp heath	DOV, DOW	
Hakea microcarpa	smallfruit needlebush	DOW	
Hakea nodosa	yellow needlebush	DOV	
Isopogon ceratophyllus	horny conebush	DOW	
Melaleuca gibbosa	slender honeymyrtle	DOW	
Sprengelia incarnata	pink swampheath	DOV	DKW

Benchmark species also noted in associated TASVEG units only.

Scientific name	Common Name	Other units
Acrotriche serrulata	ants delight	DMW, DKW
Amperea xiphoclada	broom spurge	DKW
Aristotelia peduncularis	heartberry	WGK
Boronia anemonifolia	stinky boronia	DKW
Coprosma quadrifida	native currant	WGK
Dilwynnia glaberrima	smooth parrotpea	DKW
Epacris impressa	common heath	DKW
Hibbertia procumbens	spreading guineaflower	DKW
Hibbertia prostrata	prostrate guineaflower	DMW
Hibbertia species	guineaflower	DMW
Leucopogon australis	spike beardheath	DKW
Leucopogon ericoides	pink beardheath	DKW
Leucopogon virgatus	twiggy beardheath	DMW
Lissanthe strigosa	peachberry heath	DMW
Olearia glutinosa	sticky daisybush	DKW
Olearia ramulosa	twiggy daisybush	DKW
Pimelea humilis	dwarf riceflower	DMW
Pimelea species	riceflowers	WGK
Pultenaea juniperina	prickly beauty	DKW
Xanthosia dissecta	cutleaf crossherb	DKW

Graminoids, including grasses, edges, rushes, sagg and lilies
Benchmark lifeform codes = G, LSR, MSR

Benchmark species noted in the key TASVEG units

Scientific name	Common Name	Key TASVEG units	Other units
Baloskion australe	southern cordrush	DOW	
Baloskion species	cordrush	DOV	
Baumea juncea	bare twigsedge	DOW	
Ehrharta species	ricegrass	DOW	
Gahnia grandis	cutting grass	DOV, DOW, WBR	DKW, WGK
Gahnia trifida	coast sawsedge	DOW	
Juncus species	rush	DOV	WGK
Lepidosperma concavum	sand swordsedge	DOW	DKW
Lepidosperma filiforme	common rapiersedge	DOW	
Lepidosperma longitudinale	spreading swordsedge	DOW	
Lepidosperma species	swordsedge	DOV, WBR	DMW, WGK
Leptocarpus tenax	slender twinerush	DOW	DKW
Lomandra longifolia	sagg	DOW	DMW
Luzula species	woodrush	DOW	
Patersonia fragilis	short purple flag	DOV	
Poa labillardierei	silver tussockgrass	DOV	
Poa species	tussockgrass	DOW	DMW
Rytidosperma species	wallabygrass	DOW	DMW, DKW, WGK
Schoenus species	bogsedge	DOW	WGK

Benchmark species also noted in associated TASVEG units only.

Scientific name	Common Name	Other units
Agrostis species	bent	DMW
Austrostipa species	speargrass	DMW
Baloskion tetraphyllum	tassel cordrush	DKW
Carex appressa	tall sedge	WGK
Carex breviculmis	shortstem sedge	DMW
Centrolepis species	bristlewort	DMW
Deyeuxia species	bentgrass	DMW
Dianella revoluta	spreading flaxlily	DMW
Dianella tasmanica	forest flaxlily	DKW
Dichelachne species	plumegrass	DMW
Diplarrena moraea	white flag-iris	Surveys
Ehrharta distichophylla	hairy ricegrass	DKW
Ehrharta stipoides	weeping grass	DMW, DKW, WGK
Elymus scaber	rough wheatgrass	DMW
Empodisma minus	spreading roperush	DKW
Isolepis spp.	clubsedge	WGK
Juncus pallidus	rush	Surveys
Lepidosperma ensiforme	swordsedge	Surveys
Lepidosperma laterale	variable swordsedge	Surveys
Schoenus apogon	common bogsedge	DMW
Themeda triandra	kangaroo grass	DMW

Other herbs, including wildflowers, orchids and ground ferns
Benchmark lifeform codes = H, GF

Benchmark species noted in the key TASVEG units

Scientific name	Common Name	Key TASVEG units	Other units
Acaena novae-zelandiae	common buzzy	DOV	WGK
Asplenium species	spleenwort	DOW	
Blechnum nudum	soft waterfern	DOW	
Blechnum species	waterfern	DOV, WBR	WGK
Blechnum wattsii	hard waterfern	DOW	
Burchardia umbellata	milkmaids	DOW	
Dichondra repens	kidneyweed	DOW	DKW, WGK
Geranium species	geranium	DOV	
Gonocarpus micranthus	creeping raspwort	DOV	
Histiopteris incisa	batswing fern	WBR	WGK
Hydrocotyle species	pennywort	DOV	
Hypericum species	native st johns-wort	DOV	
Orchidaceae	orchids	DOW	DKW
Polystichum proliferum	mother shieldfern	DOV, WBR	WGK
Pteridium esculentum	bracken	DOV, DOW	DKW, WGK
Ranunculus species	buttercup	DOV	
Veronica gracilis	slender speedwell	DOV	
Viola hederacea	ivyleaf violet	DOV	DMW
Viola species	violet	DOW	

Benchmark species also noted in associated TASVEG units only.

Scientific name	Common Name	Other units
Acaena echinata	spiny sheepsburr	DMW
Arthropodium milleflorum	pale vanilla-lily	DMW
Brachyscome species	daisy	WGK
Chrysocephalum apiculatum	common everlasting	DKW
Convolvulus angustissimus	blushing bindweed	DMW
Craspedia glauca	common billybuttons	DKW
Drymophila cyanocarpa	turquoise berry	WGK
Euchiton collinus	common cottonleaf	DMW
Geranium potentilloides	mountain cranesbill	WGK
Gleichenia dicarpa	coralfern	Surveys
Gonocarpus tetragynus	common raspwort	DMW
Gonocarpus species	raspworts	DKW
Hydrocotyle hirta	hairy pennywort	WGK
Hypolepis rugosula	ruddy groundfern	WGK
Hypoxis glabella	tiny yellowstar	DMW
Lagenophora stipitata	blue bottledaisy	DMW, WGK
Leptorhynchos squamatus	scaly buttons	DMW
Lycopodium deuterodensum	conifer clubmoss	DKW
Mazus pumilio	swamp mazus	WGK
Oxalis perennans	grassland woodsorrel	DMW
Pelargonium australe	southern storksbill	WGK
Plantago species	plantain	DMW
Solenogyne species	flat-herb	DMW
Wahlenbergia species	bluebell	DMW

Scramblers, climbers and epiphytes
Benchmark lifeform code = SCE

Benchmark species noted in the key TASVEG units

Scientific name	**Common Name**	**Key TASVEG units**	**Other units**
Bauera rubioides	wiry bauera	DOW	
Billardiera longiflora	purple appleberry	DOW	
Billardiera species	appleberry	DOV, WBR	
Cassytha species	dodderlaurel	DOW	DKW
Clematis aristata	mountain clematis	DOV, WBR	DKW, WGK
Comesperma volubile	blue lovecreeper	DOW	DKW

Benchmark species also noted in associated TASVEG units only.

Scientific name	**Common Name**	**Other units**
Hibbertia empetrifolia	scrambling guineaflower	WGK
Muehlenbeckia gunnii	forest lignum	DKW, WGK
Parsonsia brownii	twining silkpod	WGK

Table A2. Terrestrial vertebrate species that are known to occur in Tasmanian forests and are either known to or may occur in the ecological community.

"Tasmanian status" refers to whether a species is regarded as threatened under Tasmanian legislation as at March 2016. Nationally threatened species are identified in Section 2.3.of the conservation advice, above.

Sources: Forest Practices Authority (2012) - Appendix 1.2.a Forest dwelling species. The threatened status was checked and updated using DPIPWE (2015c) and is current as at March 2016.

Amphibians

Scientific name	**Common name(s)**	**Tasmanian status**
Crinia signifera	brown froglet	
Crinia tasmaniensis	Tasmanian froglet	
Geocrinia laevis	Tasmanian smooth frog	
Limnodynastes peroni	Perons marsh frog	Endangered
Limnodynastes tasmaniensis	spotted grass frog	
Litoria burrowsae	Tasmanian tree frog	
Litoria ewingi	brown tree frog	
Litoria raniformis	green and golden frog	Vulnerable
Pseudophryne semimarmorata	southern toadlet	

Reptiles

Scientific name	**Common name (s)**	**Tasmanian status**
Austrelaps superbus	copperhead snake	
Bassiana duperryi	three-lined skink	
Cyclodomorphus casuarinae	she-oak skink	
Drysdalia coronoides	white-lipped snake	
Egernia whitei	White's skink	
Lampropholis delicata	delicate grass skink	
Niveoscincus metallicus	metallic skink	
Niveoscincus ocellatus	ocellated skink	
Niveoscincus pretiosus	Tasmanian tree skink	
Notechis ater	tiger snake	
Pseudemoia entrecasteauxii	southern grass skink	
Pseudemoia pagenstecheri	tussock skink	Vulnerable
Pseudemoia rawlinsoni	glossy grass skink	Rare
Tiliqua nigrolutea	blotched blue-tongue	
Tympanocryptis diemensis	mountain dragon	

Birds

Scientific name	Common name (s)	Tasmanian status
Aaegotheles cristatus	Australian owlet-nightjar	
Acanthiza ewingii	Tasmanian thornbill	
Acanthiza pusilla	brown thornbill	
Acanthiza pusilla archibaldi	King Island thornbill	Endangered
Acanthorhynchus tenuirostris	eastern spinebill	
Acanthornis magna	scrubtit	
Acanthornis magna greeniana	King Island scrubtit	Endangered
Accipiter cirrhocephalus	collared sparrowhawk	
Accipiter fasciatus	brown goshawk	
Accipiter novaehollandiae	grey goshawk	Endangered
Anthochaera chrysoptera	little wattlebird	
Anthochaera paradoxa	yellow wattlebird	
Anthus novaeseelandiae	Richards pipit	
Aquila audax fleayi	wedge-tailed eagle (Tasmanian)	Endangered
Artamus cyanopterus	dusky woodswallow	
Cacatua galerita	sulphur-crested cockatoo	
Cacomantis flabelliformis	fan-tailed cuckoo	
Calyptorhynchus funereus	yellow-tailed black cockatoo	
Ceyx azureus diemenensis	Tasmanian azure kingfisher	Endangered
Chrysococcyx basalis	Horsefield's bronze cuckoo	
Chrysococcyx lucidus	shining bronze cuckoo	
Cinclosoma punctatum	spotted quail-thrush	
Colluricincla harmonica	grey shrike thrush	
Coracina novaehollandiae	black faced cuckoo shrike	
Corvus tasmanicus	forest raven	
Coturnix ypsilophorus	brown quail	
Cracticus torquatus	grey butcherbird	
Cuculus pallidus	pallid cuckoo	
Falco berigora	brown falcon	
Falco peregrinus	peregrine falcon	
Glossopsitta concinna	musk lorikeet	
Haliaeetus leucogaster	white-bellied sea eagle	Vulnerable
Hirundo nigricans	tree martin	
Lathamus discolor	swift parrot	Endangered
Lichenostomus flavicollis	yellow-throated honeyeater	
Malurus cyaneus	superb fairy-wren	
Melanodryas vittata	dusky robin	
Melithreptus affinis	black-headed honeyeater	
Melithreptus validirostris	strong-billed honeyeater	
Myiagra cyanoleuca	satin flycatcher	
Neophema chrysogaster	orange-bellied parrot	Endangered
Neophema chrysostoma	blue-winged parrot	
Ninox novaeseelandiae	southern boobook	
Pachycephala olivacea	olive whistler	
Pachycephala pectoralis	golden whistler	
Pardalotus punctatus	spotted pardalote	
Pardalotus quadragintus	forty-spotted pardalote	Endangered
Pardalotus striatus	striated pardalote	
Petroica multicolor	scarlet robin	
Petroica phoenicea	flame robin	
Petroica rodinogaster	pink robin	
Pezoporus wallicus	ground parrot	
Phaps chalcoptera	common bronzewing	
Phaps elegans	brush bronzewing	
Phylidonryis novaehollandiae	New Holland honeyeater	

Scientific name	Common name (s)	Tasmanian status
Phylidonyris pyrrhoptera	crescent honeyeater	
Platycercus caledonicus	green rosella	
Platycercus caledonicus brownii	King Island green rosella	Vulnerable
Platycercus eximius	eastern rosella	
Podargus strigoides	tawny frogmouth	
Rhipidura fuliginosa	grey fantail	
Sericornis frontalis	white-browed scrubwren	
Stagonopleura bella	beautiful firetail	
Strepera fuliginosa colei	black currawong (King Island)	
Strepera versicolor	grey currawong	
Turnix varia	painted button-quail	
Tyto novaehollandiae castanops	masked owl (Tasmanian)	Endangered
Zoothera lunulata	Bassian thrush	
Zosterops lateralis	silvereye	

Mammals

Scientific name	Common name (s)	Tasmanian status
Antechinus minimus	swamp antechinus	
Antechinus swainsonii	dusky antechinus	
Bettongia gaimardi	Tasmanian bettong	
Cercartetus lepidus	little pygmy-possum	
Cercartetus nanus	eastern pygmy-possum	
Chalinolobus gouldii	Gould's wattled bat	
Chalinolobus morio	chocolate wattled bat	
Dasyurus maculatus maculatus	spotted-tailed quoll (Tasmanian)	Rare
Dasyurus viverrinus	eastern quoll	
Falsistrellus tasmaniensis	Tasmanian pipistrelle	
Isoodon obesulus	southern brown bandicoot	
Macropus giganteus	Forester kangaroo	
Macropus rufogriseus	Bennett's wallaby	
Nyctophilus geoffroyi	lesser long-eared bat	
Nyctophilus sherrini	Tasmanian long-eared bat	
Ornithorhynchus anatinus	platypus	
Perameles gunnii gunnii	eastern barred-bandicoot (Tasmanian)	
Petaurus breviceps	sugar glider	
Potorous tridactylus	long-nosed potoroo	
Pseudocheirus peregrinus	common ringtail possum	
Pseudomys higginsi	long-tailed mouse	
Pseudomys novaehollandiae	New Holland mouse	Endangered
Rattus lutreolus	swamp rat	
Sarcophilus harrisii	Tasmanian devil	Endangered
Sminthopsis leucopus	white-footed dunnart	
Tachyglossus aculeatus	echidna	
Thylogale billardierii	Tasmanian pademelon	
Trichosurus vulpecula	common brush-tail possum	
Vespadelus darlingtoni	large forest vespadelus	
Vespadelus regulus	King River vespadelus	
Vespadelus vulturnus	small forest vespadelus	
Vombatus ursinus	common wombat	
Vombatus ursinus ursinus	common wombat (Bass Strait)	

APPENDIX B: ADDITIONAL INFORMATION ABOUT THE ECOLOGICAL COMMUNITY

B1. Relationships to other listed Matters of National Environmental Significance under the EPBC Act (RAMSAR wetlands and Heritage properties)

As at October 2016, there are ten Ramsar wetlands recognised within Tasmania including the Bass St islands. These typically comprise wetland, saltmarsh and scrub vegetation types and generally do not include eucalypt woodland vegetation. However, small patches of the Black gum – Brookers gum forest/woodland ecological community were noted to be present in the ecological character descriptions for two of the Ramsar wetlands.

The Lavinia wetland site is located on the northeastern corner of King Island and has small pockets of the TASVEG forest units: WBR –*E. brookeriana* wet forest, DOV – *E. ovata* forest and woodland and DKW/WGK – King Island *E. globulus* forest (Newall and Lloyd, 2012). The woodlands occur on the margins of the scrub complex that covers much of the wetland site, so are on the edge, or outside, of the Ramsar wetland boundary.

The Apsley Marshes wetland site is located in eastern Tasmania near Bicheno, along a stretch of the Apsley River. Much of the site comprises the TASVEG wetland units: AHF - Freshwater aquatic herbland and ASF - Freshwater aquatic sedgeland and rushland. A strip of riparian vegetation in the north of the site includes the eucalypt woodland DOV – *E. ovata* forest and woodland (Hale and Butcher, 2011). *Eucalyptus ovata* forms a sparse canopy with occasional crack willows (*Salix fragilis*) along the banks of the river. The understorey includes *Cyperus lucidus* (leafy flat sedge), *Isachne globosa* (millet grass) and *Persicaria praetermissa* (bristly knotweed).

The only World and national heritage site relevant to the Black gum – Brookers gum forest/woodland ecological community is the Tasmanian Wilderness World Heritage Area (DoE, 2016). Only a small proportion of the ecological community occurs within the heritage area as most of its current extent is spread across northern and eastern Tasmania, outside of the World Heritage Area boundary. About five percent (or 1200 hectares) of the current extent lies in the Tasmanian Central Highlands and Tasmanian West IBRA bioregions, which overlaps with most of the World Heritage Area.

Tasmania also has several other national historic and indigenous heritage sites but they do not coincide with the distribution of the ecological community.

B2. Regional Forest Agreements

A Regional Forest Agreement (RFA) applies to all of Tasmania, including the Bass Strait islands (Department of Agriculture, 2015). The RFA identified the forest types that required protection from further clearing and areas to be reserved. The outcomes from the RFA contributed to the development of a standard classification system for the vegetation communities across Tasmania and a State list of threatened vegetation communities.

Under the EPBC Act, any forestry operations undertaken in accordance with an RFA are exempt and do not need to be referred for approval. However, actions that are either not forestry operations or otherwise are outside of the RFA will need to take any EPBC Act Matters of National Environmental Significance into account.

B3. Corresponding vegetation / mapping units

A caveat to the use of corresponding vegetation units and cross-references to major systems currently in use (TASVEG and the list of Threatened Native Vegetation Communities in Tasmania) is presented at Section 1.2.1 of the main conservation advice, above. This section provides further details of these corresponding units, along with cross-references to earlier, relevant vegetation classification systems.

B3.1. National Vegetation Information System (NVIS)

The National Vegetation Information System (NVIS) is an hierarchical system used to classify vegetation in a consistent manner across the Australian continent. NVIS includes very broadly defined Major Vegetation Groups that identify continental-scale vegetation patterns. The Black gum – Brookers gum forest/woodland corresponds to three Major Vegetation Groups, depending on the nature of the canopy in the TASVEG component:

MVG 2 – Eucalypt Tall Open Forests (WBR).
MVG 3 – Eucalypt Open Forests (DOV); and
MVG 5 - Eucalypt Woodlands (DOW, DMW);

Outside of the broad Major Vegetation Groups, NVIS uses up to six levels to classify native vegetation in progressively more detail, from broad class and structural formation (levels 1-2) to floristic associations and sub-associations (levels 5-6) that identify the dominant taxa within each vegetation layer. Detailed NVIS level 5/6 descriptions have been applied to the TASVEG classification and are shown in Table B1 for the three key TASVEG units. They corroborate the tree canopy is more open and lies over a heathy understorey in the NVIS sub-association that corresponds to TASVEG unit DOW. Canopy cover is less open and lies over a shrubby and generally sedgy understorey in the NVIS sub-association that corresponds to the main Black gum unit, DOV. The canopy is taller, more closed and with distinctively wet understorey species, such as ferns, in the Brookers gum dominated unit, WBR.

B3.2. Other vegetation classification systems in Tasmania

The TASVEG vegetation system and units that correspond to the ecological community are noted in Section 1.2.2 and Figure 1 of the main conservation advice, above. Further details about corresponding TASVEG units, including descriptions and benchmark measures are given in Table B2.

<u>Table B1.</u> Description of the Black gum – Brookers gum forest/woodlands under the National Vegetation Information System (NVIS), as at October 2016. The NVIS sub-associations correspond to three key TASVEG units identified for the ecological community.

TASVEG Unit	**Sub-association (NVIS level 6)**
DOV - *Eucalyptus ovata* forest and woodland	U1+ ^*Eucalyptus ovata* +/- *Eucalyptus brookeriana* +/- *Eucalyptus amygdalina* +/- *Eucalyptus viminalis* +/- *Eucalyptus pulchella* \^tree \7 \c M1 ^*Leptospermum* spp., ^*Melaleuca* spp. \^shrub \4 \c G1 ^^*Gahnia grandis*, *Austrofestuca* spp., *Isolepis* spp. \^sedge +/- tussock grass \2 \c
DOW - *Eucalyptus ovata* heathy woodland	U1+ ^*Eucalyptus ovata* \^tree \7 \i G1 ^^*Banksia marginata* +/- *Acacia* sp. +/- *Epacris lanuginosa*, *Leptospermum* sp. +/- *Melaleuca gibbosa* \^shrub, heath shrub \2 \d G2 +/- *Baloskion australe* +/- *Gahnia grandis* +/- *Lepidosperma filiforme* +/- *Lepidosperma longitudinale* +/- *Baumea juncea* \sedge
WBR – *Eucalyptus brookeriana* wet forest	U1+ ^*Eucalyptus brookeriana* +/- *Eucalyptus obliqua* +/- *Eucalyptus delegatensis* +/- *Acacia melanoxylon* +/- *Eucalyptus regnans* \^tree \8 \c U2 +/- *Nothofagus cunninghamii* +/- *Atherosperma moschatum* +/- *Phyllocladus aspleniifolius* +/- *Nematolepis squamea* +/- *Eucryphia lucida* \tree, shrub \7 \unknown G1 ^*Dicksonia antarctica*, *Gahnia grandis* \^fern, sedge \4 \unknown

Source: TASVEG v2.0 information translated into the NVIS format by Tasmanian DPIPWE for the Department of the Environment and Energy.

Legend to symbols in NVIS descriptions for <u>Table B3</u>.

Vegetation layer codes refer to different vegetation strata. Separate taller and lower layers may be identified within each stratum, e.g. U1, U2, in the more detailed NVIS Level 6.

U = Upper layer, i.e. the tree canopy in the case of forest and woodland communities.
M = Mid layer, i.e. low trees and shrubs below the canopy.
G = Ground layer, or herbs, graminoids and low shrubs close to the ground.

\+ identifies the dominant vegetation layer among Upper, Mid and Ground layers. In the case of the *E. ovata* forest/woodland, the Upper or tree canopy layer contains the dominant vegetation that characterises the ecological community.

^ identifies the dominant species and growth form in each vegetation layer. ^^ identifies that there are mixed dominants (i.e. more than 2 co-dominant species).

\Numbers refer to height class codes for each stratum.

\8 = a height of >30 metres, indicative of a tall Upper (or tree) layer
\7 = a height of 10-30 metres, indicative of a mid-height Upper (or tree) layer.
\4 = a height of >2 metres, indicative of a tall Mid (or shrub) layer, when present.
\2 = a height of 0.5-1 metre, indicative of a low Mid (or shrub) layer (if present) or a mid-height Ground layer.

\Letters refer to cover characteristics for each stratum. As each layer varies from \d to \r, it indicates that the layer(s) progressively vary from closed to increasingly sparse cover.

\d = foliage cover of 70-100%. When applied to the Upper layer, this refers to a structure of closed forest.
\c = foliage cover of 30-70%. When applied to the Upper layer, this refers to a structure of open forest.
\i = foliage cover of 10-30%. When applied to the Upper layer, this refers to a structure of woodland.
\r\ = foliage cover of <10%. When applied to the Upper layer, this refers to a structure of open woodland.

<u>Table B2.</u> TASVEG units that correspond entirely or partly with the Black gum – Brookers gum forest/woodland ecological community. Benchmark measures identified for each unit also are shown. The dbh in the benchmark measures refers to 'diameter at breast height' of canopy trees.

B2a) Key TASVEG units. These have *E. ovata* or *E. brookeriana* as the dominant tree species.

TASVEG Unit	Description of the community	Benchmark measures
Dry Eucalypt Forest and Woodland - DOV *Eucalyptus ovata* forest and woodland	Dominated by *Eucalyptus ovata.* On fertile soils trees grow to > 20m and are moderately dense. The understorey is typically shrubby. Mainly on poorly drained flats <600m above sea level. Substrate often alluvium but can be variable. Many patches in the West Tamar region but small patches occur state-wide where conditions are suitable. *Note:* most of DOV is dominated by *E. ovata* but some local variants may be dominated by *E. viminalis*. Where these variants are small, they are included in the ecological community as natural localised variation. If these variants have more than 50% canopy cover of *E. viminalis* over a larger area, then they are not part of the national ecological community but represent *E. viminalis* forest/woodland.	Tree height: about 20 m; Tree canopy cover: 20-40%; dbh: 80cm; No. trees/ha: 15-20. No understorey spp: 22
Dry Eucalypt Forest and Woodland – DOW *Eucalyptus ovata* heathy woodland	Dominated by *Eucalyptus ovata*. Woodland with a dense and species-diverse, heathy understorey. Most common in coastal areas in association with heath communities, but also grows in other situations. Trees are well-spaced, short or mallee form (5–10 m). Solid crown canopy cover is <20%. Generally on very infertile substrates. Also on sites subject to a high fire frequency and can be present over wet heath. Predominantly coastal in the north, east and south coasts. Small inland patches occur in valley bottoms.	Tree height: about 8 m; Tree canopy cover: 15%; dbh: 40cm; No. trees/ha: 5. No understorey spp: 31
Wet Eucalypt Forest and Woodland - WBR *Eucalyptus brookeriana* wet forest	Dominated by *Eucalyptus brookeriana.* Wet forest ranging in canopy height from 10-40 m. Understorey often made up of two layers, a tall, dense mid layer, and a layer of variable density below the mid layer. Usually on well-drained rocky soils of dolerite slopes and ridges, and on alluvial deposits adjacent to streams. Margins of swamp forests or in well-drained gullies and gully headwaters. Mostly in the wetter, northwestern region with some occurrences in eastern Tasmania.	Tree height: about 25 m; Tree canopy cover: 30%; dbh: 80cm; No. trees/ha: 20. No understorey spp: 9

B2b) Associated mosaic TASVEG units most likely to contain patches of the ecological community. These are dominated by more than one eucalypt species, with only a component dominated by *E. ovata* or *E. brookeriana*, not the entire unit.

TASVEG Unit	**Description of the community**	**Benchmark measures**
Dry Eucalypt Forest and Woodland – DMW Midlands woodland complex	Comprises the woodland facies of units DOV, DVG and DPD where these occur at altitudes of less than 300 m on dolerite and basalt and have <20% solid crown cover. These are dominated by *E. ovata*, *E. viminalis* and *E. pauciflora* respectively. Grassy woodlands of the river flats and lower slopes on some of the most fertile soils of the Midlands. Associated with areas that experience some of the coldest winters, hottest summers and the lowest rainfall levels in the state. Mostly in the Tasmanian northern midlands, also the eastern northern slopes and lowland areas of the south-east. *Note:* DVG and DPD are vegetation units not dominated by *E. ovata* and fall outside the description of the national ecological community.	Tree height: about 20 m; Tree canopy cover: 10%; dbh: 80cm; No. trees/ha: 5. No understorey spp: 33
Dry Eucalypt Forest and Woodland – DKW King Island eucalypt woodland	Comprises the woodland form of unit WGK. Dominated by *E. globulus*, *E. brookeriana* and/or *E. viminalis*. The understorey is highly variable and apparently dependent on recent fire history. Tree height may be lower in areas that are more frequently burnt or exposed to strong coastal winds. Mainly grows on lighter and sandier well-drained soils. *Eucalyptus viminalis* dominates in areas of greatest soil infertility and drainage. *Eucalyptus brookeriana* and *E. globulus* generally dominate the highly organic soils that have developed over sands and often occur on areas with impeded drainage Limited to King Island, generally the eastern and southern parts of the island. *Note:* Areas not dominated or co-dominated by *E. brookeriana* fall outside the description of the national ecological community.	Tree height: about 16 m; Tree canopy cover: 25%; dbh: 50cm; No. trees/ha: 10. No understorey spp: 32
Wet Eucalypt Forest and Woodland - WGK *Eucalyptus globulus* King Island forest	Comprises the forest form of unit DKW A wet forest dominated by *E. globulus* or *E. brookeriana*. *Eucalyptus brookeriana* is a common subdominant, occasional co-dominant, or may dominate the overstorey. Where *E. brookeriana* dominates, the canopy is mostly even-aged, to 25 m occasionally more in long unburnt forests. The understorey is shrubby with a sparse ground layer of sedges and ferns. The *E. brookeriana* component is associated with drainage lines and slight depressions on comparatively shallow deposits of recent and overlying sediments. The *E. globulus* dominated component is confined to Cambrian volcanics and Precambrian sediments and meta-sediments on the plateau country, extending to the centre where more fertile soils occur. Limited to King Island, on the south-west extending to the centre of the island. *Note:* Areas not dominated or co-dominated by *E. brookeriana* fall outside the description of the national ecological community.	Tree height: about 25 m; Tree canopy cover: 30%; dbh: 70cm; No. trees/ha: 20. No understorey spp: 43

Sources: Kitchener and Harris (2013); TASVEG vegetation condition benchmarks (as at October 2016).

The TASVEG system built upon earlier vegetation studies and classifications, as detailed by Kitchener and Harris (2013). The most relevant previous system, in terms of practical application for forestry purposes, is that prepared for the Tasmanian Regional Forest Agreement (RFA) in the mid-1990s. Under the RFA classification, there are three broad units, each with a number of component floristic communities, that correspond to the Black gum-Brookers gum forest/woodland.

- OV – Shrubby *E. ovata – E. viminalis* forest. This unit comprises two wet sclerophyll and five dry sclerophyll floristic communities that equate to the *E. ovata*-dominated component of the ecological community. OV collectively represents an amalgam of TASVEG units DOV and DOW plus the part of DMW that is dominated by *E. ovata* over a grassy understorey.
  Note: a third wet sclerophyll floristic community, WET-VIM2, is included within OV but represents a component where *E. viminalis* is locally dominant. Since it can be recognised as a distinct floristic community, WET-VIM2 is likely to be more extensive than expected for localised variation of canopy species, so is not part of the national ecological community.
- BA – *E. brookeriana* wet forest. This is dominated by *E. brookeriana*, so corresponds to TASVEG unit WBR outside of King Island. It comprises two mixed forest and three wet sclerophyll floristic communities. The mixed forest elements of BA may represent sites where wet eucalypt forest is intergrading towards rainforest and swamp forests, based on the presence of *Nothofagus* and *Phyllocladus*.
- KG - King Island *E. globulus - E. brookeriana - E. viminalis* forest. This unit represents those occurrences of floristic communities WET-BR2 and WET-BR10 (also part of RFA unit BA) that occur on King Island. It broadly corresponds to the TASVEG units WGK and DKW.
  Note: Unit KG also includes two wet sclerophyll and four dry sclerophyll floristic communities that are dominated by *E. globulus* or *E. viminalis*, so are not part of the national ecological community. The excluded components of unit KG are:
  - WET-GLOB001 *E. globulus - Dicksonia antarctica - Ctenopteris heterophylla* wet sclerophyll forest,
  - WET-GLOB101 *E. globulus - Acacia dealbata- Acacia melanoxylon - Cassinia aculeata* wet sclerophyll forest,
  - DRY-hGLOB Heathy *E. globulus* forest ,
  - DRY-shGLOB Shrubby *E. globulus* forest,
  - DRY-hVIM Heathy *E. viminalis* forest and DRY-shVIM Shrubby *E. viminalis* forest.

  The dry sclerophyll components all occur on sandy coastal areas of King Island while the wet *E. globulus* communities occur in humid gullies or on fertile substrates.

Further information about these RFA units and floristic community components are detailed in Table B3.

<u>Table B3.</u> Vegetation classifications identified through the Regional Forest Agreement process that correspond to the Black gum – Brookers gum forest/woodland. The classification comprises broader RFA Forest Types that encompass several finer-scaled Floristic Communities.

FOREST TYPE & FLORISTIC COMMUNITY CODE / NAME[1]	**BIOREGIONAL[3] DISTRIBUTION**	**NOTES ON LANDSCAPE**
RFA Type[2] BA - *E. brookeriana* wet forest		
Mixed forest communities -WET-BR00 / *E. brookeriana - Phyllocladus aspleniifolius - Hymenophyllum cupressiforme* mixed forest	West-Southwest, Woolnorth	Associated with swamp forest on infertile sites.
Mixed forest communities - WET-BR01 / *E. brookeriana - Nothofagus cunninghamii - Lepidosperma elatius* mixed forest	West-Southwest, Woolnorth	Associated with swamp forest on more fertile sites, including areas on carbonate rocks.
Wet sclerophyll forest - WET-BR2 / *E. brookeriana - Leptospermum* species - *Lepidosperma elatius* wsf	Ben Lomond, Freycinet, Midlands, West-Southwest, Woolnorth (not on King Island)	Localised occurrences associated with poorly drained flats
Wet sclerophyll forest - WET-BR10 / *E. brookeriana - Monotoca glauca - Cyathea australis* wsf	Woolnorth (uncommon; not on King Island)	On wet sites, usually close to the coast, or on better drained sites adjacent to swamp forests.
Wet sclerophyll forest - WET-BR11 / *E. brookeriana - E. obliqua -Bedfordia salicina* wsf	Ben Lomond (uncommon), Freycinet, Midlands, D'Entrecasteaux, Central Highlands, West-Southwest, Woolnorth (uncommon)	Damp but well drained gullies and slopes or well drained gully headwaters and on flats.
RFA Type[2] KG - King Island *E. globulus - E. brookeriana - E. viminalis* forest [similar to RFA Community BA but occurs on King Island][4]		
Wet sclerophyll forest - WET-BR2 / *E. brookeriana - Leptospermum* species - *Lepidosperma elatius* wsf	Woolnorth – component of BR2 on King Island	Local in remnant forest on more fertile substrate, on sites with poorer drainage than WET-BR11.
Wet sclerophyll forest - WET-BR10 / *E. brookeriana - Monotoca glauca - Cyathea australis* wsf	Woolnorth – component of BR10 on King Island	Local in remnant forest on more fertile substrate.

FOREST TYPE - FLORISTIC COMMUNITY CODE / NAME[1]	**BIOREGIONAL[3] DISTRIBUTION**	**NOTES ON LANDSCAPE**
RFA Type[2] OV - Shrubby *E. ovata - E. viminalis* forest[5]		
Wet sclerophyll forest - WET-OV00 / *E. ovata* - *Leptospermum* species - *Melaleuca* species wsf [in Ben Lomond and Woolnorth] *E. ovata* - *Leptospermum lanigerum* wsf [in other bioregions]	Ben Lomond, Central Highlands, D'Entrecasteaux, Freycinet, Midlands, West-Southwest, Woolnorth	Poorly drained lowland flats, which have escaped fire for a long period.
Wet sclerophyll forest - WET-OV01 / *E. ovata* - *Acacia dealbata* - *Pomaderris apetala* wsf	Ben Lomond, Central Highlands, D'Entrecasteaux, Freycinet, Midlands, West-Southwest, Woolnorth	Local on shaded or fertile lowland flats, drainage less impeded than most *E. ovata*-dominated communities.
Dry sclerophyll forest - DRY-gOV / Grassy *E. ovata* forest/woodland	Ben Lomond, Central Highlands, D'Entrecasteaux, Freycinet, Midlands, Woolnorth (uncommon)	Dry, fertile or lower altitude flats with impeded drainage, frequently fired in some regions.
Dry sclerophyll forest - DRY-hOV / Heathy *E. ovata* forest/woodland	Ben Lomond, D'Entrecasteaux, Freycinet, Woolnorth	Poorly drained flats, mainly in coastal areas.
Dry sclerophyll forest - DRY-sdOV / Sedgy *E. ovata* forest/woodland	Ben Lomond, Central Highlands, D'Entrecasteaux, Freycinet, Midlands, West-Southwest, Woolnorth	Poorly drained flats and drainage lines, particularly in lowland areas.
Dry sclerophyll forest - DRY-scOV / Scrubby *E. ovata* forest/woodland	Ben Lomond, Central Highlands, D'Entrecasteaux, Freycinet, Midlands, West-Southwest, Woolnorth	Poorly drained flats and drainage lines, particularly in lowland areas.
Dry sclerophyll forest - DRY-shOV / Shrubby *E. ovata* forest	Ben Lomond, Central Highlands, D'Entrecasteaux, Freycinet, Woolnorth	Sites intermediate between DRY-scOV and wet sclerophyll forest.

Source: Forest Practices Authority (2005).

Notes: [1] All Floristic Communities noted here were accorded conservation priority A, i.e. the community may be inadequately reserved in Tasmania, and/or may have a very high conservation priority in the region. It was noted that these communities are highly susceptible to *Phytophthora cinnamomi* in some regions and that specialist advice may be needed.

[2] All RFA Forest Types noted here were accorded conservation priority Y, i.e. the RFA had identified that additional Statewide conservation is required for the community (oldgrowth and non-oldgrowth). The communities also were identified as Rare, Vulnerable or Endangered at a Statewide level through RFA processes.

[3] Names and boundaries refer to IBRA v4 bioregions, current when the manual was published.

[4] RFA type KG includes six other floristic communities that are not dominated by *E. brookeriana* and not part of the ecological community. These excluded floristic communities are dominated by either *E. globulus* or *E. viminalis*.

[5] RFA type OV includes an eighth floristic community that is not part of the ecological community because it is dominated by *E. viminalis*: WET-VIM2 / *E. viminalis - Leptospermum lanigerum - Melaleuca squarrosa* wet sclerophyll forest. It occurs in the Central Highlands, D'Entrecasteaux, Freycinet and Midlands regions, on lowland areas on better drained sites adjacent to flats with *E. ovata* forest.

B4. Similar vegetation types to the ecological community

Patches of the Black gum-Brookers gum forest/woodland ecological community are generally adjacent, or in close proximity, to forests and woodlands dominated by other kinds of eucalypt species. The most common types of adjoining forests and woodlands are those dominated by *Eucalyptus obliqua* (stringybark; messmate) or by *E. amygdalina* (black peppermint). Stringybark is common throughout Tasmania and is also widespread in cool, wet forests and coastal locations on the mainland, from South Australia into south-eastern Queensland. Black peppermint, however, is endemic to Tasmania, where it mainly occurs in the eastern coastal regions and inland tiers and plateaux, on a range of substrates. Other types of native forests that may also be adjacent to the ecological community, though to a less common extent, include forests and woodlands dominated by *E. viminalis* (white gum), *E. nitida* (western peppermint), *E. globulus* (Tasmanian blue gum), *E. pulchella* (white peppermint) or *E. delegatensis* (gum-topped stringybark). Patches of rainforests dominated by *Nothofagus* (myrtle beech) may also be nearby at some wetter sites.

All of these adjacent vegetation types are distinguished from the Black gum-Brookers gum forest/woodland ecological community by the dominant presence of eucalypt species or genera other than *E. ovata* or *E. brookeriana* in the tree canopy. When these additional tree species do occur in the ecological community, they are not a dominant component of the tree canopy.

The black gum-Brookers gum forest/woodland ecological community is limited to Tasmania, where vegetation types dominated by either species have a distinctive identity. Both *E. ovata* and *E. brookeriana* also occur on mainland Australia. Brookers gum is limited to Victoria, where it is considered rare, mostly occurring in cool, humid areas of the Otway Ranges and central plateaux around Daylesford-Trentham (Boland et al., 1984; Royal Botanic Gardens Victoria, 2016). Black gum is more widespread, extending from South Australia (Fleurieu Peninsula and Kangaroo Island) through southern Victoria into the southern and central tablelands of NSW (Boland et al., 1984). Mainland communities with black gum are less well-defined, often occuring in a mix of other eucalypt species, several of which are naturally absent from, or uncommon in, Tasmania, e.g. *E. camaldulensis* (river red gum), *E. cephalocarpa* (silver-leaf stringybark), *E. radiata* (narrow-leaved peppermint).

B5. Indigenous knowledge

The Indigenous peoples of Tasmania understood and managed their natural landscapes sustainably for millenia. They established diverse and dynamic cultures and used a wide variety of plant and animal resources for food and materials. For instance, the food resources were documented by Noetling (1910) and cultural history summarised by Cameron (2006).

Although there is little information specific to the Black gum-Brookers gum forest/woodland ecological community, knowledge exists about the Indigenous uses of various plant and animal species that occur in the ecological community. The key Indigenous uses of plants present in the ecological community are summarised in Table B4.

Key animal resouces likely to occur in the ecological community that were used for food, hides and other resources include kangaroos, wallabies, wombats, possums and various birds resident in the forests, plus freshwater crustaceans and molluscs that inhabit streams which may flow through the ecological community.

<u>Table B4.</u> Known Indigenous uses of plant species that occur in the Black gum-Brookers gum forest/woodland ecological community.

Species	**Indigenous uses in Tasmania**
Acacia species, notably: *A. dealbata* (silver wattle) *A. mearnsii* (black wattle) *A. melanoxylon* (blackwood) *A. verticillata* (prickly moses)	**Food** - seeds ground to make flour and eaten; the sticky gum which weeps from the tree when insects attack was eaten. **Medicines** - bark and leaves used to relieve toothache or apply to wounds or burns (black wattle); bark soaked in water for an infusion to treat arthritic joint pain (blackwood); blossom hung near sleeping areas to help induce sleep. **Tools** – timber or root balls (blackwood) used to make waddies (clubs) and digging sticks to dig up roots and tubers.
Banksia marginata (silver banksia)	**Food** – the nectar from young banksia flowers provided a sweet drink.
Bursaria spinosa (prickly box)	**Food** - nectar was sucked from its flowers. **Tools** - timber used to make good waddies (clubs).
Dianella species (flaxlililies), notably *D. revoluta* and *D. tasmanica*	**Food** - leaves used to produce a nourishing tea; the roots and berry-like fruits were eaten. **Medicines** – berries used to treat ulcers. **Tools** - the blue berries provided a dye, e.g. for woven baskets.
Eucalyptus ovata (black gum)	**Tools** - timber used to make waddies (clubs) and digging sticks
Exocarpos cupressiformis (common native-cherry)	**Food** – one of the many edible fruits for Tasmanian Aboriginal people. **Medicines** - foliage applied as a treatment for sores and cuts; sap used for cases of snakebite; smoke from burning leaves used as an effective insect repellent.
Lissanthe strigosa (peachberry heath)	**Food** - the tiny succulent fruits, which resemble tiny peaches, were eaten.
Lomandra longifolia (sagg)	**Food** – the flowers made a tasty nectar drink; seeds ground into flour and eaten; the tender leaf bases were eaten; as the large tussocks provide shelter for small fauna, they indicate good places to find small animals to eat. **Medicines** - roots used for treating insect stings. **Tools** - leaves used to make baskets, necklaces and arm bands.
Pelargonium australe (southern storksbill)	**Food** – the slender tap roots were roasted and eaten.
Poa labillardierei (silver tussock-grass)	**Tools -** leaves used for fine weaving to make baskets, bags and mats.

Source: Taroona Environment Network (2016).

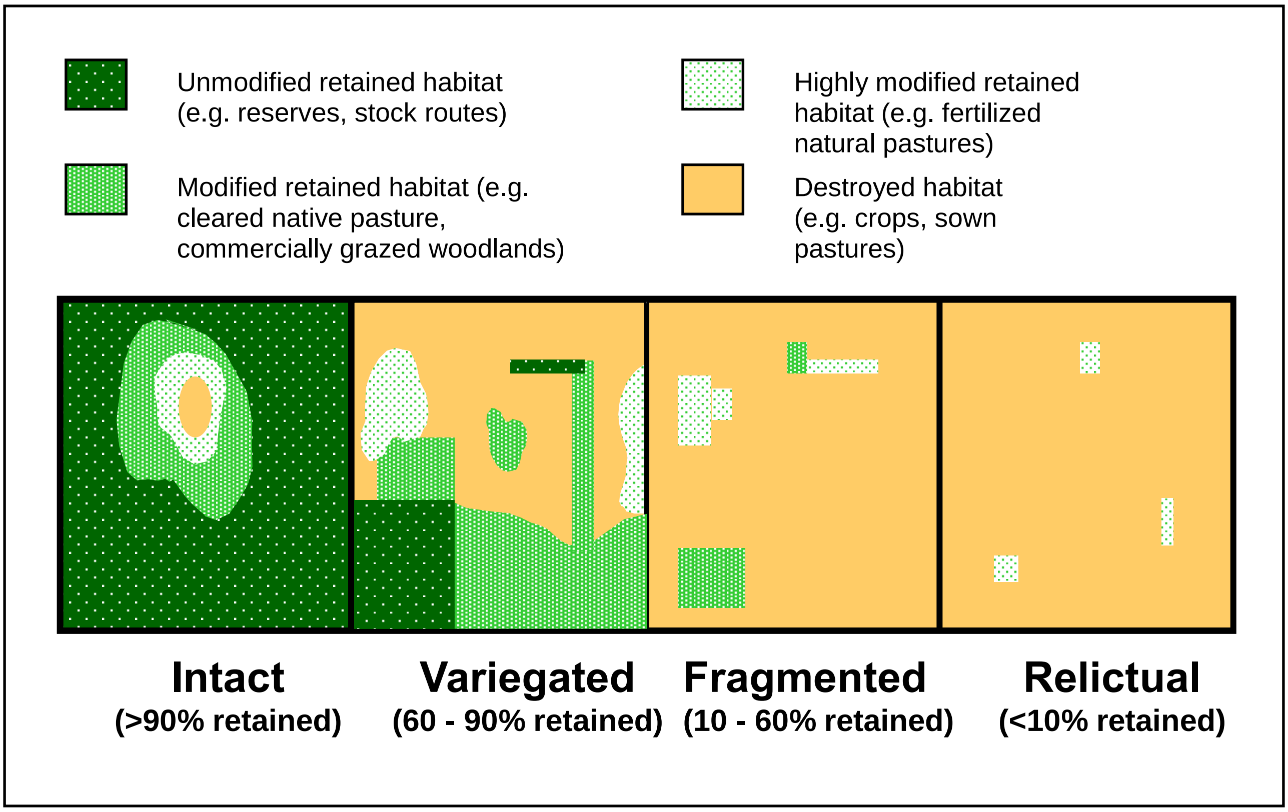
APPENDIX C: DESCRIPTION OF KEY THREATS.

This appendix provides relevant information about known and potential threats to the Black gum – Brookers gum forest/woodland ecological community. This information helps to explain why this ecological community merits listing as threatened and supports the detailed assessment against criteria at Appendix D.

C1. Land clearing and impacts associated with fragmentation

Clearing reduces the extent and quality of the ecological community. Where vegetation is totally removed, e.g. for the purposes of intensive agriculture, infrastructure or development, this results in a net loss of extent. However, clearing may be limited to some vegetation layers, for instance only trees or only the understorey leaving trees as a shelterbelt, and this could be regarded as either a decline in quality or decline in extent depending on how it disrupts the persistence of a patch. The loss of one or more vegetation layers leads to a loss of biological diversity, reduction in the availability and diversity of habitats, and reduced resources available to species.

Figure C1. Altered natural landscapes associated with rural lands, defined by the extent of habitat destruction and amount of native habitat remaining.



Source: Figure by S. McIntyre, redrawn from McIvor & McIntyre (2002).
Although the focus of the source was on grassy systems, the concept can apply to other natural systems in landscapes modified by intensive land use.

With respect to the landscape alteration patterns shown in Figure C1, a spatial analysis of native vegetation cover by Michaels et al. (2010) considered the Tasmanian landscape to be in a medium variegated state overall. At a bioregional scale, the state of individual bioregions are: two intact, four variegated and three fragmented. The landscape states relevant to the Black gum – Brookers gum forest/woodland ecological community could be regarded as primarily

Variegated to Fragmented. The ecological community generally occurs in regions of more intensive land use and the state depends on the extent of modification within particular bioregions (see Table 1, above). Variegated landscapes apply where patches of the ecological community remain connected, or near to, remnants of other native vegetation, so are in the vicinity of less cleared or disturbed areas. Fragmented landscapes represent the more isolated patches of the ecological community in regions that have undergone a more severe landscape modification..

As well as identifying different types of native vegetation, TASVEG also includes codes for agricultural, urban and exotic vegetation (Group F – Modified land, as described by Kitchener and Harris, 2013). This makes it possible to determine the extent of different modifications of the natural vegetation, and map where these occur.

Table C1. Estimated extent of modified land uses across Tasmania

Modified land use	**TASVEG codes**	**Estimated extent (ha)**
Agriculture	FAG – Agricultural lands	1,108,000
Forestry	FPL – Plantations for silviculture; and FPU – Unverified plantations for silviculture	364,000
Regenerating / modified native	FRG – Regenerating cleared land; FPF – *Pteridium esculentum* fernland; and FPE – Permanent easements	77,000
Urban & Infrastructure	FUR – Urban areas, and FUM – Extra-urban miscellaneous	60,000
Weeds / Exotic species	FWU – Weed infestations; FSM – *Spartina* marshland; and FMG – Marram grassland	16,000
TOTAL MODIFIED	**(All of the above)**	**1,625,000**

Source: TASVEG v3.0 dataset from Tasmanian DPIPWE, as supplied to the Department of the Environment and Energy. Estimates of extent are rounded to the nearest 1000 hectares. Descriptions of the TASVEG F-codes are given in the 'Modified land' chapter of Kitchener and Harris (2013).

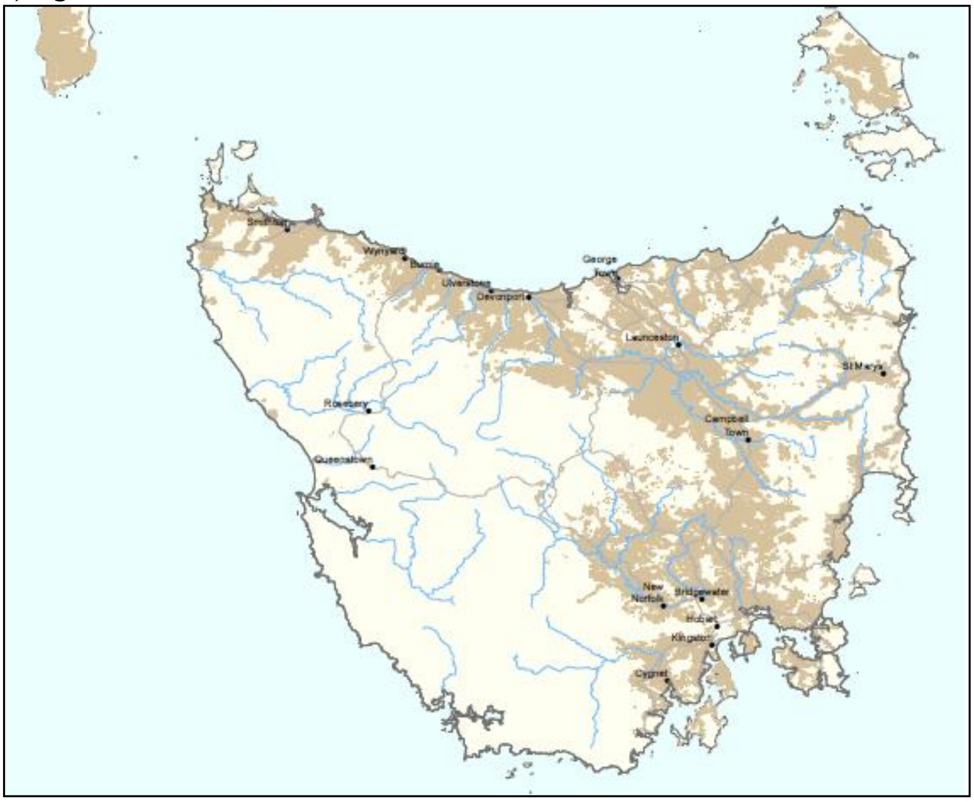
A substantial extent of Tasmania's natural vegetation has been modified, currently estimated to be about 1.6 million hectares or 24% of the total area of Tasmania (Table C1). Most of this (about 1.5 million ha) is due to agriculture and forestry, which are the major land uses across the north and into the south-east of the State (Figure C2). Agriculture is also a major land use in the Midlands region, between Launceston and Hobart. The majority of land cleared for agriculture is for dryland grazing to support the dairy, meat and wool industries (DPIW, 2007; DoE, 2015). The distribution of agricultural and forestry land uses broadly coincides with that of the Black gum – Brookers gum forest woodland ecological community, especially the more heavily cleared *E. ovata* component.

The available information about clearing of native vegetation in Tasmania over the past fifty years shows the following trends.

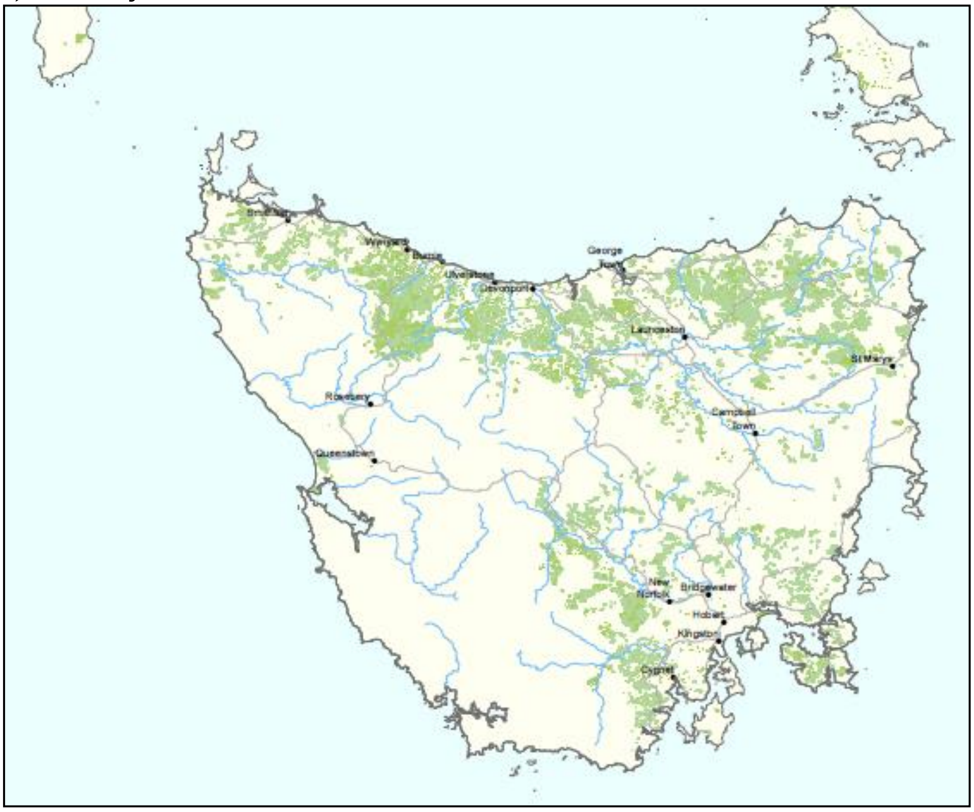
- About a quarter of a million hectares of native vegetation were estimated to have been cleared across Tasmania between 1972 and 1999 (Tasmanian Planning Commission, 1999).
- During 1972 to 1980, the average rate of natural vegetation loss was about 15 000 hectares per year (Kirkpatrick, 1991). This was due to losses from agriculture and plantations plus inundation from new hydroelectric dam projects.

<u>Figure C2.</u> Maps showing the distribution of agricultural and forestry land uses in Tasmania.

a) Agriculture



b) Forestry



Source: TASVEG v3.0 from Tasmanian DPIPWE, as supplied to the Department of the Environment and Energy. Maps prepared by the Environmental Resources Information Network, Department of the Environment and Energy. a) Code FAG - Agricultural land. b) Codes FPL - Plantations for silviculture; and FPU - Unverified plantations for silviculture..

- Between 1980 and 1988, the average rate of native vegetation loss had declined to about 6000 hectares per year (Kirkpatrick, 1991). Inundation from new hydroelectric projects had effectively ceased during this time, though clearing for agriculture and forestry were ongoing. Most of the losses during the 1980s occurred in northern and eastern Tasmania with some extensive regional clearing events especially in the Midlands.
- The 1996 Regional Forest Agreement (RFA) provided some guidance over what forest and woodland types and stands could be cleared, along with regular monitoring of losses to the forest estate using the 1996 RFA estimates as a baseline. About 157,000 hectares of native forest and woodlands were cleared between 1996 to 2015 (Table C2a). This equates to an average clearing rate of about 8000 hectares per year over this 19 year period. The rate only applies to forest communities but would be higher if non-forest native vegetation was taken into account. However, no equivalent data for clearing of non-forest vegetation are available.

Table C2. Extent and loss of forest vegetation from 1996 to 2015, by bioregion.

a) All native forest types, as identified under the 1996 Regional Forest Agreement

Bioregion	1996 forest extent (ha)	Loss (ha; 1996 – 2015)	Recent loss (ha; 2013 – 2015)	Average annual loss (ha/year; 1996 – 2015)
Ben Lomond	500,654	46,934.8	1,971.8	2,470.3
Central Highlands	572,175	25,816.9	1.6	1,358.8
D'Entrecasteaux	261,593	13,869.5	106.7	730.0
Freycinet	444,127	11,676.2	121.3	614.5
Furneaux	30,405	63.0	0.0	3.3
Midlands	244,853	8,517.7	39.9	448.3
West and Southwest	776,052	5,681.2	1.8	299.0
Woolnorth	375,839	44,420.6	286.2	2,337.9
TOTAL	**3,205,698**	**156,979.9**	**2,529.3**	**8,262.1**

b) Native forest types identified as threatened in Tasmania

Bioregion	1996 threatened extent (ha)	Loss (ha; 1996 – 2015)	Recent loss (ha; 2013 – 2015)	Loss (%; 1996 – 2015)
Ben Lomond	1,964	862.3	496.9	43.9
Central Highlands	22,475	45.9	0.9	0.2
D'Entrecasteaux	5,310	74.9	0.0	1.4
Freycinet	40,312	680.7	2.0	1.7
Furneaux	266	0.0	0.0	0.0
Midlands	43,865	311.4	0.0	0.7
West and Southwest	14,798	0.0	0.0	0.0
Woolnorth	13,229	792.2	11.3	6.0
TOTAL	**142,219**	**2,767.4**	**511.1**	**1.95**

Source: FPA (2014b; 2016b). The information refers to the 1996 Regional Forest Agreement (RFA) as a baseline for extent data and vegetation classification, to ensure consistency of monitoring. The Bioregional names refer to those that applied under IBRA version 4.

- More recently, about 2,500 hectares of native forest were cleared during 2013 to 2015 (Table C2a). This represents an average annual clearing rate of 843 hectares over these three years.
- Bioregional comparisons showed that the Woolnorth (northwestern Tasmania including King Island) and Ben Lomond (plateaux of northeastern Tasmania) regions had the highest incidence and rates of native forest clearing since 1996 (Table C2a). The extent of native forest cleared in Ben Lomond during 2013-15 was much higher than for other bioregions, and accounted for 78% of the total forest cleared over that time.
- Most losses since 1996 concerned forest types that are not considered threatened or do not have a low extent remaining. However, there is some ongoing clearing of threatened forest vegetation communities. Since 1996, a further 2700 hectares of forest communities listed as threatened have been cleared, representing a loss of nearly 2% from their total 1996 extent (Table C2b). Most of this clearing has occurred in the Ben Lomond and Woolnorth bioregions, in line with the general pattern of forest vegetation clearing.

In summary, there was a high degree of past clearing during the 1970s but this has since reduced. There continues to be some ongoing clearance of native forest vegetation up to the present. Vegetation communities designated as threatened and requiring protection also remain subject to some ongoing clearing in certain regions of Tasmania. One of the main threats regarding clearance of native vegetation, now, is for peri-urban and urban clearing, and for good quality remnants to be lost in transport and development corridors. As the ecological community mainly occurs in regions that are heavily modified for agriculture, forestry and urban land uses, the general outline of vegetation clearing presented here strongly relates to impacts upon the ecological community.

C2. Altered hydrological regimes, including salinity

Altered hydrological regimes generally refers to landscape changes that shift the availability, flows and/or quality of water away from natural patterns and beyond any natural variability. Works that divert water away from the natural depressions and lower-lying areas preferred by the ecological community can result in these typically wetter areas becoming drier and less suitable for those species that prefer damp habitats. Alternatively, other actions can lead to flooding of sites, for instance by creating local dams and water storages. The resulting wetlands and water bodies also become unsuitable habitat for those species that cannot cope with long-term inundation.

Data are available about the development of non-hydro dams[4] among Tasmanian water catchments (Tasmanian Planning Commission, 2009; Table C3). While there are no data that directly relate dam development to the decline of the ecological community, the information is indicative of land use activities that alter its surrounding landscape and hydrological functions.

- The ecological community mostly occurs in northern Tasmania, with at least 65% of its current extent in the northernmost bioregions. It occupies low-lying, poorly draining landscapes that may be most suitable for dam development.
- Of the 48 water management catchments recognised across Tasmania and the Bass Strait islands, 25 (or about half) occur in northern Tasmania (DPIPWE, 2015). These northern catchments collectively account for about three-quarters of all approved non-hydro dams in Tasmania (Tasmanian Planning Commission, 2009).

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[4] Non-hydro dams refer to water storages not used for generating hydroelectricity. They serve a variety of other purposes, such as irrigation, water for stock, mining, industrial uses, etc. (Tasmanian Planning Commission, 2009). Non-hydro dams are typically small, most being under 1000 ML in capacity.

- There is a considerably higher number of dams and higher median density of non-hydro dams in north-western Tasmania than elsewhere in Tasmania. Almost half the dams approved have been in north-western Tasmania.
- Six catchments have the highest category of non-hydro dam density (>50 dams per 100 km^2). All of these occur in northern Tasmania, mostly in the north-west (Tasmanian Planning Commission, 2009). Another sixteen catchments have a moderate density of non-hydro dams (10-50 dams per 100 km^2). Most (eleven catchments) occur in the north and four are in the south-east around Hobart and the Tasman Peninsula, where patches of the ecological community also are present.

Table C3. Development of non-hydro dams across Tasmanian water catchments grouped into four regions[1].

Measure	North-west	North-east	South-east	South-west	Tasmania
No. water catchments [1]	13	12	16	7	48
Area of catchments (ha)	1,131,110	1,165,450	2,439,370	2,087,730	6,822,660
No of dams	3,793	1,940	1,953	33	7,719
% total dams	49.1	25.1	25.3	0.4	100
No catchments with >200 dams	8	4	3	0	15
No catchments with high / moderate dam density[2]	5 / 5	1 / 6	0 / 4	0 / 0	6 / 15
Median dam density[2]	44.3	11.1	5.9	0.10	7.6

Source: Tasmanian Planning Commission (2009).

[1] Regions were determined by geographic location and do not reflect water management administration regions in Tasmania. The water catchments included within each region are:
North-west – Arthur, Black-Detention, Blythe, Cam, Duck, Emu, Forth-Wilmot, Inglis, King Island, Leven, Mersey, Montagu, and Welcome.
North-east – Boobyalla-Tomahawk, Furneaux, George, Great Forester-Brid, Little Forester, Meander, Musselroe-Ansons, North Esk, Pipers, Ringarooma, Rubicon and Tamar Estuary.
South-east – Brumbys-Lake, Clyde, Derwent Estuary-Bruny, Great Lake, Huon, Jordan, Little Swanport, Lower Derwent, Macquarie, Ouse, Pitt Water-Coal, Prosser, Scamander-Douglas, South Esk, Swan-Apsley and Tasman.
South-west – Gordon-Franklin, King-Henty, Nelson Bay, Pieman, Port Davey, Upper Derwent and Wanderer-Giblin.

[2] Dam density is measured as number of non-hydro dams per 100 km^2. Dam density categories are:
high - >50 dams; moderate - 10-50 dams, low - 5-10 dams, very low/absent - 0-5 dams.

The combination of suitable landscape position of the ecological community plus a much higher incidence of dams in those water catchments where the ecological community is most prevalent indicates that dam development is likely to be a substantial pressure on the ecological community.

As well as disrupting natural water flows, there are also changes to water quality, for instance acidification or contamination with toxins or excessive nutrients of the water supply. In addition, a key water quality issue is increased salinity. Salinity affects many areas of Australia, including Tasmania. There are two kinds of salinity (Tasmanian Planning Commission, 2009). Primary salinity refers to naturally saline sites, such as coastal marshlands, saline seeps or salt pans. In Tasmania, these mostly occur in drier sites that receive less than 800 mm average annual rainfall. The salt pans of the Midlands region is one example of a naturally saline site (Tasmanian Planning Commission, 2009). The ecological community is not typically associated with naturally saline sites.

Secondary or dryland salinity is not natural but a consequence of changes in land use. It arises from the extensive clearing of perennial deep-rooted native vegetation, notably forest, and its

replacement with shallow-rooted crops and pastures (Tasmanian Planning Commission, 2009). Removal of native vegetation results in rising water tables that bring salts normally stored deeper in the soil profile closer to the soil surface. Evaporation of the surface water allows salt to be deposited and accumulate in the upper soil profile. In other woodland and valley systems, for instance southwestern Western Australia, elevated salinity has been shown to reduce plant species diversity and recruitment (Keighery, 2001). Those plant species more sensitive to elevated salinity die out, so that formerly diverse woodland communities are converted into species-poor halophytic communities. Bare salt pans may develop in the worst case scenario.

Dryland salinity is a significant threat to natural vegetation, agricultural production and infrastructure works in Tasmania that may be damaged by excess salt (DPIW, 2007). In 2003 it was estimated that about 73 800 hectares of private land was affected by salinity, based on visible symptoms, with a forecast that the extent of salinised land could potentially rise to 93 600 hectares by 2050. The observed areas of dryland salinity mostly occurred in the Midlands and northeastern regions of Tasmania and were associated with sites of lower rainfall (<750 mm annual rainfall) and low elevation (<300 meters above sea level), typically used for grazing industries (e.g. dairy, beef, wool; 90% of sites). Six water catchments, all across northern Tasmania, had estimated extents of salinity greater than 5000 hectares per catchment: Brumby-Lake, Macquarie, Tamar Estuary, South Esk, King Island and Furneaux (DPIPWE, 2007). These water catchments include a substantial amount of *E. ovata*-dominated woodlands that occur in the vicinity of Launceston and the northern Midlands.

Salinity has the potential to impact upon several biodiversity values. Freshwater wetland ecosystems and vegetation types associated with valley floors and low slopes are considered to be most at threat from salinity (Gilfedder et al., 2000). Woodlands dominated by *E. ovata* face a high risk of salinity as they are associated with lowlands and valley floors, and have a large proportion of their remaining extent in regions that are identified as suffering from a moderate to severe extent of salinity (Gilfedder, 2000; DPIPWE, 2007).

C3. Invasive species and diseases (weeds, feral animals, dieback)

Invasive plants can be widespread in variegated, fragmented or relictual landscapes that have been highly modified, and where nutrient enrichment of soils and frequent disturbance encourages the establishment of weeds over native vegetation. Established weeds compete with native plants, affecting their recruitment and survival, and can also increase flammability of the vegetation or alter the habitat quality for native fauna. Once established, weeds become a long-term and potentially costly management issue.

Numerous weed species have established across Tasmania. The most recent census of vascular plants in Tasmania (de Salas and Baker, 2016) identified 1897 plant species as native to Tasmania (including 527 endemic species), plus an additional 737 plant species of exotic origin that have become fully naturalised. Just over a quarter (28%) of the total vascular flora[5] of Tasmania, therefore, comprises naturalised non-native species.

Some of these weeds are seriously invasive, or have the potential to be so. Tasmania has a list of declared weeds considered to have significant or potentially significant adverse impacts on primary production and the environment. Property managers are required by law to control these weeds where (or when) they occur in Tasmania. The Tasmanian list of declared weeds presently includes 113 plant taxa (DPIPWE, 2016). Weeds considered to be particularly invasive and

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[5] The total vascular flora values presented here are based on native species currently known to be present plus fully naturalised exotic species <u>but excluding</u> plant species that are sparingly naturalised (i.e. known from a few populations only) or regarded as extinct or eradicated in Tasmania.

damaging are also recognised as Weeds of National Significance (WoNS). The list of WoNS curently includes 32 taxa across Australia, of which the following are known to occur in Tasmania (DoEE, 2016):

- *Anredera cordifolia* (madeira vine);
- *Asparagus* spp. (asparagus fern, bridal creeper, climbing asparagus);
- *Chrysanthemoides monilifera* (boneseed, bitou bush);
- *Cytisus scoparius* and *Genista* spp (brooms);
- *Lycium ferocissimum* (African boxthorn);
- *Nassella neesiana* and *N. trichotoma* (Chilean needle grass, serrated tussock);
- *Rubus fruticosus* spp. agg. (blackberry);
- *Salix* spp. except *S. babylonica, S.* x *calodendron & S.* x *reichardtii* (willows except weeping willow and pussy willows);
- *Ulex europaeus* (gorse).

Certain WoNS species have become widespread throughout Tasmania, with a strong presence in the modified landscapes of northern and eastern Tasmania, where the ecological community occurs (Figure C3). Some are associated with wetter sites inhabited by the ecological community, where they are likely to have substantial impacts. For instance, blackberries tend to occur in wet areas such as along stream banks, and willows are seriously invasive in riparian habitats. Both these weeds can form impenetrable thickets that choke the banks of waterways and other damp sites, and crowd out native plant species, while providing a haven for feral animals (Muyt, 2000; DPIPWE, 2016). Infestations also increase erosion and silting, reduce water availability, damage the quality of habitats for native fauna (e.g. shading by willows reduces light and temperature for aquatic fauna resident in streams and ponds) and may increase the risk of fire hazard through their dense, rampant growth.

In summary, the modified landscapes in which much of the ecological community occurs are subject to impacts from numerous weeds, some of which are seriously invasive and damaging to the ecological community.

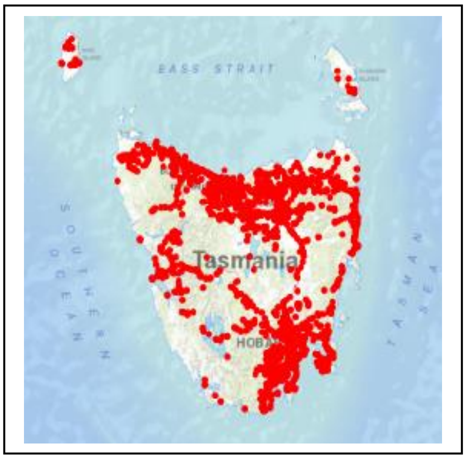
Several species of invasive animals have established in Tasmania that impact upon native vegetation and fauna in various ways (Pfennigwerth, 2008; Wildlife Management Branch, 2011). Feral herbivore species present in Tasmania include rabbits *(Oryctolagus cuniculus)*, goats *(Capra hircus)* and fallow deer *(Dama dama)*. Rabbits, especially, are widespread across Tasmania (Figure C4) and are known to reduce native vegetation cover and diversity by overgrazing understorey plants, ringbarking immature trees and shrubs, and digging and burrowing activities that disturbs the soil and facilitates erosion as well as the establishment of weeds. Their presence in larger numbers also supports populations of introduced predators, notably feral cats and potentially foxes. This becomes problematic when rabbit populations crash, whether due to management or natural factors, such as drought, because predator populations must then switch towards other, native species for their prey.

Goats and deer also are very destructive herbivores. Goats feed on a wide range of vegetation and their browsing can rip down branches, uproot native plants and graze plants down to ground level. As goats form small herds, their browsing impacts can be locally severe. Goats prefer rugged forested terrain so have the potential to impact upon remote areas of native vegetation that are difficult to access.

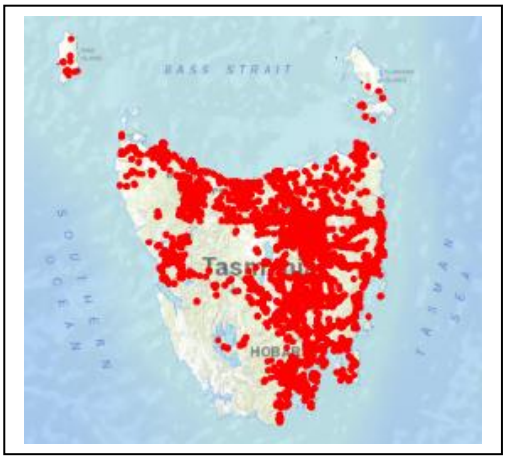
Figure C3. Distribution of key Weeds of National Significance in Tasmania likely to occur within the Black gum – Brookers gum forest/woodland ecological community.

a) Willows (*Salix* spp)

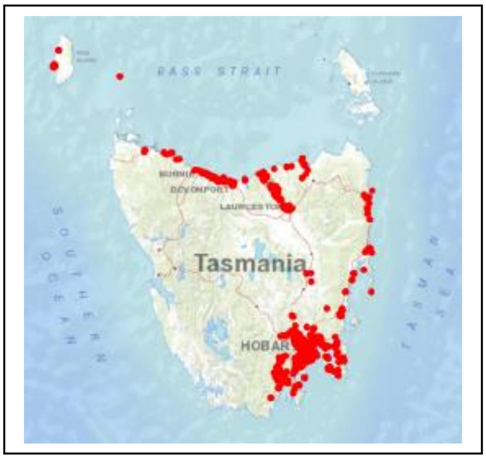
b) Blackberry (*Rubus fruticosus* spp. agg.)



c) Gorse *(Ulex europeaus)*



d) Boneseed *(Chrysanthemoides monilifera)*

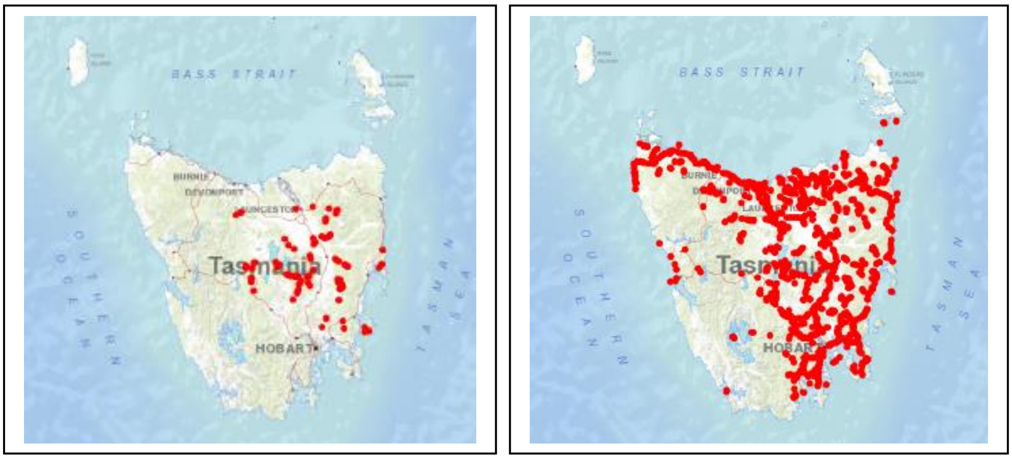


Source: Natural Values Atlas Tasmania, Tasmanian Department of Primary Industries, Parks, Water and Environment

Tasmania has the largest feral deer population in Australia, estimated to be in the order of 20 000 to 30 000 animals (Pfennigwerth, 2008; Jensz and Finley, 2013). They generally occur in eastern Tasmania, notably in the Midlands region (Figure C4). Deer may have a range of impacts upon the ecological community, both on flora and fauna components. They trample native vegetation and may damage the nests of ground-laying animals. Their browsing and thrashing activities, especially by males during rutting season, can seriously damage both native vegetation and crop plantings. They can alter the structure of the understorey by reducing the cover and density of understorey plants, making it more open. This opening up of vegetation may render sites unsuitable for fauna to nest, shelter and feed. Their browsing activities also compete against native herbivores that require similar foods, e.g. *Macropus giganteus* (Forester’s kangaroo).

Figure C4. Distribution of key feral herbivores in Tasmania likely to occur within the Black gum – Brookers gum forest/woodland ecological community.

a) Deer *(Dama dama)* b) Rabbits *(Oryctolagus cuniculus)*



Source: Natural Values Atlas Tasmania.

The main feral predator present in Tasmania is the cat (*Felis catus*), though wild dogs (*Canis familiaris*), ferrets *(Mustelo furo)* and, possibly, the European fox (*Vulpes vulpes*) also may occur. Cats are widespread across Tasmania, including within the World Heritage Areas. They are highly efficient predators that feed on a wide variety of native fauna, including threatened species such as *Perameles gunnii gunnii* (eastern barred bandicoot) (Pfennigwerth, 2008). They also compete with native predators and scavengers, such as the Tasmanian devil, for food.

Other feral animal species present in Tasmania include pigs (*Sus scrofa*) - limited to Flinders Island; bumblebees *(Bombus terrestris)* and European wasps *(Vespula germanica)* – both of which are now widespread across Tasmania. The introduced bees and wasps can affect pollination of native plants - bumblebees are known to visit black gum blossoms; compete with and disrupt native food resources for native species – including nectar feeding by swift parrots; and predate on native insects – wasp predation is a factor in the decline of the threatened Ptunarra brown butterfly (Pfennigwerth, 2008).

A number of diseases and syndromes affect, or have the potential to affect, native vegetation in Tasmania, as well as some introduced species. ‘Dieback’ is a general term that has been applied to some of these situations.

Dieback due to root rot or cinnamon fungus is a fungal disease caused by *Phytophthora cinnamomi*, a type of water mould (Oomycota). The fungus infests plant roots and causes them to rot. The loss of functional root systems prevents plants from taking up water and nutrients, causing them to die. The ecological consequences of infection include the potential modification of the structure and composition of native plant communities; a significant reduction in primary productivity; and, for dependent (including threatened) flora and fauna, habitat loss and degradation (Shearer et al., 2007).

Phytophthora cinnamomi requires warm moist soils. This limits its distribution in Tasmania to areas below about 700 m in altitude and that receive good rainfall (DPIPWE, 2015). The root rot fungus is known to occur widely around Tasmania except for the Midlands regions, because of its low rainfall, and the central plateaux, due to its higher altitude cold climate. In addition, some patches of undisturbed wet forest and rainforest communities at lower elevations are less

susceptible to *P. cinnamomi* because shading by the dense forest canopy creates cold soil conditions. Heathland, buttongrass moorland and dry sclerophyll forest, especially forests with a heathy or shrubby understorey on infertile sites, are the vegetation types most likely to be affected by root rot in Tasmania (Tasmanian Planning Commission, 2009). This is because they occur in the climate zones and contain plant species more susceptible *to P. cinnamomi*. However, root rot is not a significant disease affecting the canopy eucalypt species of Tasmania, but instead affects certain understorey plants, e.g. *Epacris* species (DPIPWE, 2015). Taken all together, the available information suggests that the impacts of *Phytohthora* to the ecological community is a serous threat to understorey species in the *E. ovata* components that lie outside of the drier Midlands region.

The term 'dieback' has also been applied to a syndrome of rural tree decline, characterised by declining health of canopy eucalypt trees within woodland remnants, especially those surrounded by highly modified agricultural and urban landscapes (Parks and Wildlife Service Tasmania, 2003), such as this ecological community. Affected trees progressively lose foliage from branches spreading over the entire tree canopy, leading to the eventual death of many trees. Rural tree decline occurs in many parts of Australia but, in Tasmania, is most evident in the Midlands region and upper Derwent Valley (Resource Planning and Development Commission, Tasmania, 2003). These represent the driest and some the most heavily modified areas of Tasmania.

It was estimated that up to 42% of private lands in Tasmania supported trees affected to some extent by rural tree dieback in the mid-90s to early 2000s (Resource Planning and Development Commission, Tasmania, 2003). About 2.5% or 52 000 ha of private land showed extreme decline of dead and dying trees, while another 8% or 161 000 ha showed severe tree decline with 40-80% of branches in the tree canopy dead.

The causes of rural tree dieback are complex and involve a combination of factors (Close and Davidson 2004; Davidson et al. 2007; Close et al. 2009). Declining rainfall and drought, and the consequent water stress faced by canopy trees, are one key factor implicated in the cause of rural tree dieback (Resource Planning and Development Commission, Tasmania, 2003), hence the widespread observations of dieback in the dry Midlands region. Land management history may also play role. Healthier sites in the Midlands were those associated with protection from livestock grazing and more frequent fires, and that retained a cover of native shrubs, herbs and litter in the understorey (Davidson et al, 2007). More recent data based on analyses of satellite imagery time series, however, concluded that ongoing land clearance rather than individual tree dieback was responsible for most of the loss in tree cover in the Midlands since the 1970s (Prior et al., 2013).

The eucalypt species most affected by rural tree dieback in Tasmania is *Eucalyptus viminalis*, with *E. ovata* and *E. amygdalina* among other eucalypt species affected (Parks and Wildlife Service Tasmania, 2003). The component of the ecological community most likely to be impacted by rural tree dieback is TASVEG unit DMW – Midlands Woodland Complex.

The disease myrtle rust, caused by the fungus *Puccinia psidii*, is now known to occur in Tasmania, though from exotic garden plants only, to date. If not quarantined, the disease has the potential to spread and affect native species of the family Myrtaceae, which includes notable bush plants such *Callistemon* (bottlebrushes), *Leptospermum* (tea-trees), *Melaleuca* (tea-trees) and *Eucalyptus* (gum trees).

C4. Land management practices (e.g. fertiliser addition, grazing by livestock)

Land management practices can have beneficial or detrimental impacts, depending on how they are implemented, whether they are applied in isolation or an integrated approach, and what outcome is intended from a management regime. A broad expectation is that management regimes may be applied in a manner that minimises impacts to native species and conservation goals yet can foster production values.

Many native species are sensitive to elevated soil nutrients. Elevated soil nutrients arise by application of artificial fertilisers to crops and pastures, some of which may drift into nearby remnants of native vegetation by wind or runoff from the soil surface. This may lead to the decline and death of sensitive native species. Conversely, many exotic weeds cope well with higher levels of soil fertility and thrive. It leads to situations where weeds competitively exclude native species, so that the understorey of a patch effectively becomes replaced by exotic species over time. The problem can persist even after paddocks have been abandoned for agriculture, because regeneration of some native plants may be impeded until such time as elevated soil nutrients have sufficiently leached out.

Grazing by livestock can adversely affect ecosystems in a variety of ways and, under some circumstances, its impacts can persist even after grazing has ceased (Lunt et al, 2007). Some key impacts of grazing on biodiversity include:

- Nutrient enrichment of topsoils. This occurs through deposits of livestock dung within native vegetation remnants and adds to any nutrient enrichment problems that occur due to fertilisers, discussed above.
- Spread of weeds into patches. Again, this is often mediated through livestock dung but can also occur when seeds contaminate hair and/or hooves. This mode of spread can be more pervasive than passive dispersal of weeds from the edges of a patch. Cattle and sheep can wander extensively throughout remnants, if they are unfenced, so can spread weeds deep into native patches.
- Degradation of soil physical properties. Trampling and grazing by hard-hoofed mammals leads to compaction of the topsoil, reduced infiltration of water deeper into the soil profile, greater topsoil erosion, and less accumulation of litter and development of soil crust. Such impacts may be paricularly severe in softer soils associated with damp and riparian habitats.
- Reduction of understorey diversity and cover by selective removal of the more palatable and sensitive plant species. In so doing, gaps in native vegetation cover may be formed that allow weeds to colonise and expand into sites. Selective browsing also can prevent recruitment of trees and shrubs due to the softer, more nutritious foliage of regenerating plants.

In some circumstances, an appropriate grazing regime could be used as a management tool to manage certain threats. An example is short-term ‘crash’ grazing during a particular season to reduce weed infestations by removing weed biomass and/or propagules, and relatively low impact to native species. This approach may be better suited to certain sites, e.g. where a significant weed threat is present and the responses of weed and native plants to grazing are reasonably well known, as is the case with grassy eucalypt woodlands in the eastern states. The application of grazing management would need to carefully consider its suitability in the context of this ecological community: that many patches have a shrubbier understorey and the different suite of weed species present in these forests.

There is evidence that inappropriate land management practices are influencing natural vegetation in Tasmania along the lines indicated above. These observations are more relevant to certain components of the ecological community, e.g. TASVEG units DMW – Midlands woodland complex and elements of DOV – *Eucalyptus ovata* forests and woodlands that have a

grassy or sedgy component and occur in or near areas of more intensive land use around the Midlands and northern Tasmania.

- Native plant species in lowland grassy systems of Tasmania generally responded poorly to fertilisation and it application results in a rapid transition from native-dominated to exotic-dominated vegetation (Kirkpatrick et al., 2005). It accelelerates the colonisation of clovers and exotic grasses into the intertussock spaces of grassy woodlands. However, many native species were able to persist under a variety of disturbance (grazing, fire) regimes other than fertilisation and ploughing. Given the variable responses of individual native species to disturbance, maintaining a variety of distubance regimes across the landscape may help conserve a full suite of native plant biodiversity in these systems.
- A survey of bushland remnants in lowland eastern Tasmania that still retained a good degree of integrity identified fire and grazing as key management variables influencing remnant condition (Gilfedder and Kirkpatrick, 1998). The richness and cover of native plant species decreased with heavy grazing. Fire increased the richness of exotic species, especially for sites burnt in spring or at more frequent intervals of under seven years. The remnants least impacted by weeds were those that had no fires and no to low grazing pressures.
- Different sheep grazing regimes were investigated on native grassy woodlands and grasslands in the northern Midlands region (Leonard and Kirkpatrick 2004). Sheep preferentially grazed in grasslands. Adopting spring or summer resting periods plus lower stocking rates resulted in better condition of the native vegetation, as indicated by lower levels of exotic weed infesatation and more native herb species present at such sites.
- Comparisons of different mammalian herbivore grazers in the treeless subalpine vegetation of the Central Plateau indicated that sheep grazing has much greater detrimental impact on vegetation cover and the structure and composition of the vegetation community than did grazing by rabbits or native herbivores (e.g. kangaroos and wallabies) (Bridle and Kirkpatrick 1999). The percentage of bare gound only increased in plots subject to sheep grazing. Rehabilitation of native vegetation was fastest on ungrazed plots.

C5. Inappropriate fire regimes

Prior to European settlement, fires occurred through lightning strikes and Indigenous burning of the landscape. Indigenous burning practices were adopted over many thousands of years and comprised a mosaic of small-scale cooler fires (Aboriginal Heritage Tasmania, 2015). The main intent of Indigenous fire regimes was to improve their food resources by promoting bush foods. Burning stimulated new plant growth that encouraged browsing mammals such as wallabies to congregate. It also stimulated the growth of fungi and tuberous plants that were harvested and eaten.

Since European settlement, fires continue to occur through lightning strikes but now also originate from prescribed burning operations (including escaped planned fires), arson or accidental ignition due to a range of sources. The nature and impacts of fire can be influenced by other threats in the landscape. Fragmentation into small remnants and the surrounding modified land use can affect the intensity and impact of fires across a patch. The type of understorey may promote or suppress fire spread. Rates of litter accumulation, the density and nature of the understorey vegetation, and the dampness of the landscape surrounding the ecological community are some factors contributing to the flammability of the ecological community. Conversely, circumstances that promote fire occasionally occur, notably, invasion by weeds that increase fuel load, allowing fire to spread more quickly through a patch or into the tree canopy.

Frequency of fire is another important consideration in addition to fire intensity and season. Too frequent fires may eliminate sensitive species, for example obligate seeder species that require fire to stimulate seed germination may die out if recurring fires kill plants before they have a chance to mature and develop new seeds. Conversely, a lack of fire or extended intervals between fire events may limit recruitment of plant species, especially those that require heat, smoke or other feature of a fire to stimulate germination and establishment of seedlings. Such species are more likely to be eliminated from the ecological community when the necessary fires are suppressed for periods longer than the life of their sedbanks. Changes to fire frequency also impacts on fauna by affecting habitat diversity. For instance, depending on the nature of the changed fire regime, there may be reduced opportunities for tree hollows and logs, or regeneration of dense thickets of trees and shrubs may be prevented, providing less shelter and food resources to many kinds of fauna.

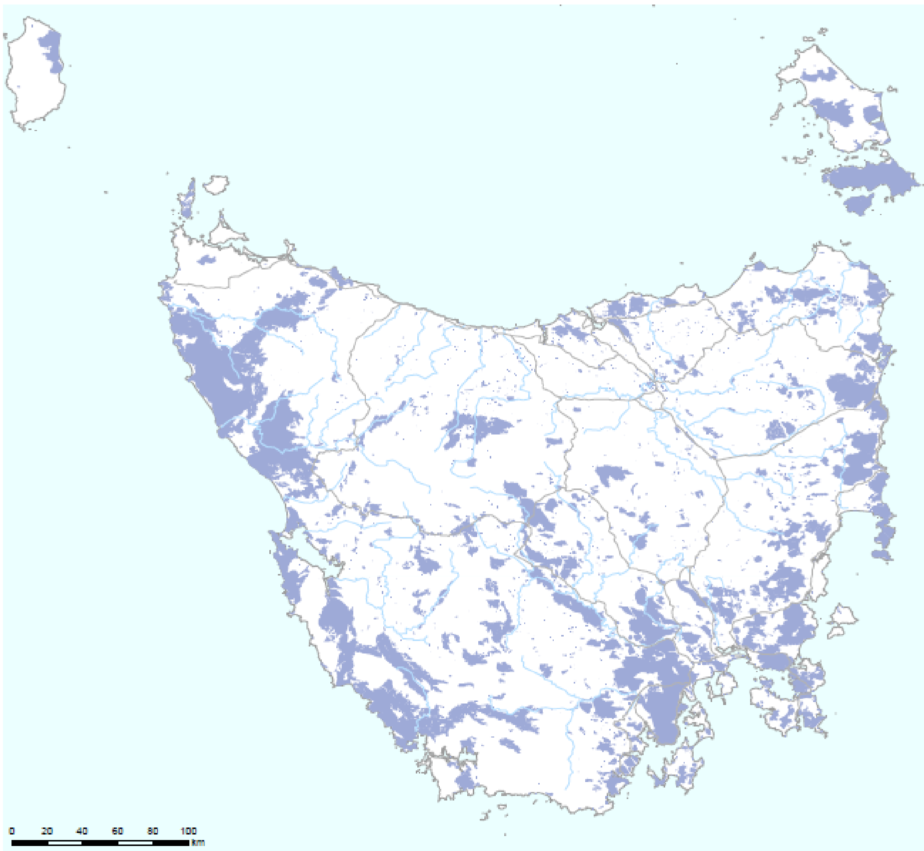
The Tasmanian Government collates records of fires due to various sources, covering both bushfires and planned burns. The fire history data includes the disasterous 1967 bushfires and is a continuous record from the mid-70s with more detailed records since the 1980s. An examination of fire origins highlights that most of the extensive fires were due to bushfires rather than planned or accidental burns. A large area of Tasmania has suffered fire in the past 50 years (Figure C5a), mostly in the south-east around Hobart and the Tasman Peninsula, the east coast around Freycinet and the west coast, especially between Arthur River and Zeehan, and the far south-west. Cape Barren Island has been almost entirely burnt while the north-eastern part of King Island around Lavinia has also been burnt. The extensive fires located on the south-east and east coast intersect with known occurrences of the ecological community. However, other regions that are strongholds for the ecological community appear to be less affected or, at least, have had less extensive fires, notably in the wetter north-west and the highly cleared northern slopes and Midlands regions. Since the 2000/01 fire season, up to the 2015/16 season, a total of about 989,000 hectares has been burnt to some degree across Tasmania, representing about 14.5% of the total area of the State.

Annual trends of the area burnt show distinct peaks by fire 'season' since 1980/81 (Figure C5b). Over one hundred thousand hectares were burnt across Tasmania in each of the seasons: 1981/82, 2003/04, 2006/07, 2012/13 and 2015/16. The four most extensive fire seasons, each burning a total of over 120,000 hectares per season have all occurred since 2000. The 2015/16 fire season was an extensive series of fire events that followed a severe drought and a devastating lightning storm. The result was significant damage to natural vegetation, particularly highly fire-sensitive vegetation in the World Heritage Area that may take decades to recover (Bowman, 2016). Patterns of increasing storm and lightning activity coupled with drier conditions is consistent with predictions under climate change scenarios.

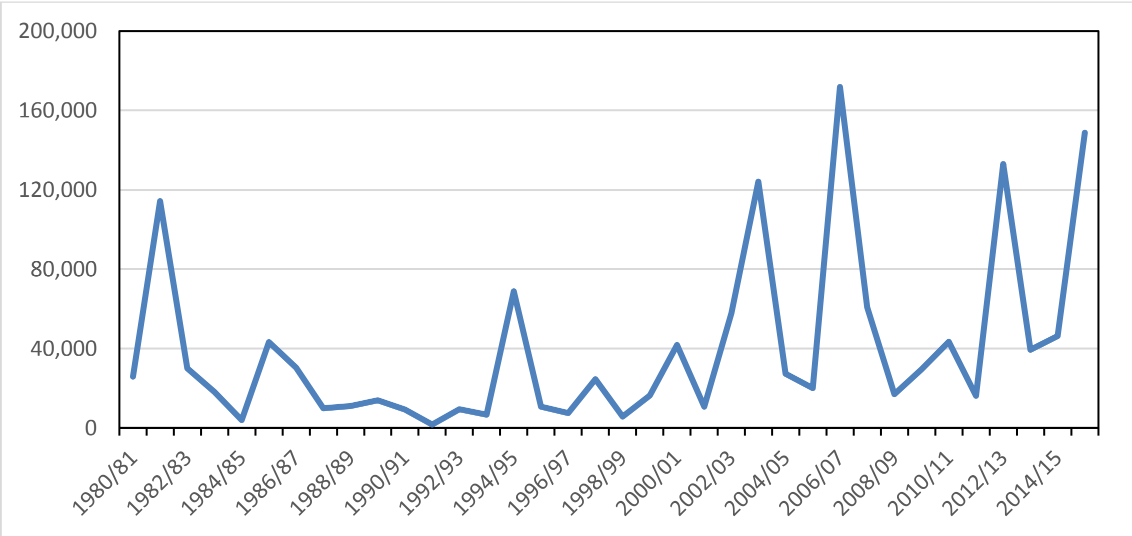
The fire sensitivities and flammability of all Tasmanian vegetation communities were rated by Pyrke and Marsden-Smedley (2005), and updated for the 2009 Tasmanian State of the Environment report. The ratings indicate the component of the ecological community most sensitive to fire is the *E. brookeriana* wet forest, rated as highly fire sensitive and moderately flammable (Table C4). This is not surprising given this facies of the ecological community can abut wet eucalypt forest and rainforest. These adjacent wet forest types are poorly adapted to fire, being rated as highly to very highly (for *Nothofagus* rainforest) fire-sensitive (Pyrke and Marsden-Smedley, 2005). A single fire has capacity to effect significant change to rainforest communities. The least fire sensitive vegetative components are the dry sclerophyll woodlands and forests dominated by black gum (Table C4). They are highly flammable throughout the year but the vegetation is resilient to most fires with the possible exception of short-interval fires repeated within a decade.

Figure C5. Data on areas across Tasmania burnt by fires within the past 50 years from all sources of ignition.

C5a) Map showing areas burnt by fires, 1967 to the 2015/16 fire season (purple polygons). Data are sporadic from 1967 to 1973, with a continuous record thereafter.



C5b) Area burnt across Tasmania from 1980/81 to 2015/16**.** The Y-axis shows the total area burnt (ha). The X-axis shows the fire 'season', calculated from 1 July to 30 June the following year, to group consecutive spring, summer and autumn months (i.e. peak fire period).



Source: Land Tasmania (2012) data on fire history. For some fires, only the year of ignition is known, but are presumed to have occurred during the peak fire season (i.e. spring to autumn). Map prepared by the Environmental Resources Information Network, Department of the Environment and Energy.

Table C4. Fire-attributes for TASVEG units that best correspond to the Black gum – Brookers gum forest/woodland ecological community.

TASVEG vegetation unit	Fire Attributes Category	Fire Sensitivity	Flammability
Key units			
Eucalyptus brookeriana wet forest (WBR)	Wet sclerophyll forest	High	Moderate
Eucalyptus ovata forest and woodland (DOV)	Dry sclerophyll forest	Low	High
Eucalyptus ovata heathy woodland (DOW)	Dry sclerophyll woodland	Low	High
Associated mosaic units			
Eucalyptus globulus King Island forest (WGK)	Mixed forest	Moderate	Moderate
King Island eucalypt woodland (DKW)	Damp sclerophyll forest	Moderate	Moderate
Midlands woodland complex (DMW)	Dry sclerophyll woodland	Low	High

Source: Pyrke and Marsden-Smedley (2005); updated by Tasmanian Planning Commission (2009). The fire sensitivity rating for some TASVEG units were adjusted for the State of the Environment Tasmania 2009 report. That for WGK - *Eucalyptus globulus* King Island forest was originally 'Very high' but downgraded because it was likely to return to vegetation matching the original TASVEG class within a 50 year period. No alternative rating was proposed but a fire senstivity of 'Moderate' has been allocated here, in line with the other TASVEG unit present on King Island, and noting that a 'High' fire senstivity rating refers to a longer fire interval of over 80 years being required to reach a mature structure.

Notes: Descriptors for fire sensitivity and flammability
High Sensitivity = A fire-adapted community requiring at least 30 years between fires to maintain the defining species. Fire intervals greater than 80 years are required to reach mature stand structure. Appropriate fire interval is 30–300 years. Management recommendation - Suppress all fire, but give higher priority to stands burnt less than 80 years ago.

Moderate Sensitivity = A fire-adapted community requiring at least 15 years between fires to maintain the defining species. Appropriate fire interval is 15–100 years. Management recommendation - Suppress fires in stands burnt less than 20 years ago.

Low Sensitivity = Highly fire-adapted or non-native vegetation. A single fire will generally not affect biodiversity although repeated short intervals (i.e. < 10 years) may cause long- term changes. Appropriate fire interval is 3–50 years. Management recommendation - Suppression is usually not an ecological priority except in specific situations, e.g. a recently burnt stand of a threatened species.

High Flammability = Will burn readily when fuels are dry enough but will be too moist to burn for lengthy periods, particularly in winter. Fuels will be dry enough to burn on most days from late spring to early autumn.

Moderate Flammability = Extended periods without rain (i.e. two weeks at least) and/or moderate or stronger winds are required for these communities to burn.

In light of the fire map at Figure C5a, most of the highly to moderately sensitive Brookers gum and King Island components occur in the north-west corner of Tasmania and King Island, regions that appear to have been relatively less extensively burnt, at least since 1967. The extensive fires in the east and south-east are most likely to concern the least sensitive dry sclreophyll black gum forests that are able to recover from single fire events or fires spaced over intervals measured in years rather than decades.

Studies support eucalypts in dry forests being more tolerant of fires than eucalypts in the wet forests of Tasmania. A study of high severity fires in dry eucalypt forests in the Tasmanian Midlands Indicated variable to severe responses (Prior et al., 2016). The whole plant mortality caused by fires was estimated at 25% for eucalypts and 33% for acacias, though some burnt plots had very few live mature stems remaining, indicating that at a site scale, some patches were more vulnerable to severe fires. Fire stimulated the germination and establishment of tree seedlings but was not necessary for establishment, as seedlings were also evident in unburnt plots.

C6. Climate change

Some trends indicating changes to key climate measures have been observed for Tasmania since the mid 20th century (Corney et al., 2010; Steffen and Hughes, 2013; Grose et al., 2015). The average annual temperature for Tasmania has risen by about 0.8^{o}C over the past century, or by about 0.1^{o}C per decade. This is a slower rate than observed for mainland Australia, which showed an increase of about 0.16^{o}C per decade. Since 1975 there also has been a decline in total annual rainfall across Tasmania, mostly in autumn rainfall. There also has been a marked increase in the variability of rainfall from year to year. This reflects similar patterns of rainfall change to mainland southern Australia.

Climate modelling forecasts a rise in temperature for Tasmania of between 1.6^{o}C (low emissions) to 2.9^{o}C (high emissions) over the next century to 2100, depending on emissions scenario (Corney et al., 2010). While the predicted changes in total annual rainfall are expected to be slight over the coming century, greater changes are anticipated to occur in terms of the regional variation and seasonal patterns of rainfall across Tasmania. For instance, rainfall is expected to increase in eastern coastal regions but to be reduced in central and in northwestern Tasmania. Patterns of seasonal rainfall are expected to vary, depending on the region. On the west coast, rainfall is eventually predicted to increase in winter but decline in summer, while on the central plateaux, rainfall is predicted to be consistently declining for each season (Corney et al. 2010). The modelling by Grose et al. (2015) further predicts a potential for increased evapotranspiration rates across Tasmania by 2090 due to changes in radiation, humidity and wind speed, and decreased soil smoisture and runoff as a consequence of the changes to rainfall and evaporation rates.

The observed and predicted changes are partly driven by shifts in the large-scale climate drivers that influence Australia. For instance, the ENSO (El Nino Southern Oscillation in the Pacific) will result in more frequent El Nino events, affecting the rainfall in northern and eastern Tasmania; and the SAM (Southern Annular Mode in the southern Ocean below Tasmania) has strengthened, affecting the climate of western Tasmania (Corney et al., 2010).

Any likely impacts due to climate change will be additional to existing stressors already facing the native plants and animals of Tasmania, notably the landscape modification and fragmentation of native vegetation across the north and east of the State. The changes in climate are also likely to foster the establishment and spread of undersirable pests and diseases that currently are not suited for the Tasmanian climate (Steffen and Hughes, 2013).

The observed climatic trends from the late 20th century plus the available climatic modelling indicate that the black gum – Brookers gum forest/woodland ecological community is likely to be impacted by future climate change. Given the ecological community is associated with moist and poorly-draining sites, the potentially hotter and drier summers along with likely harsher extreme and fire weather events, could impose limits to suitable habitat and capacity for regeneration of the ecological community within the coming century.

C7. Nationally-listed key threatening processes

The following are EPBC-listed key threatening processes, current as at October 2016, that may be relevant to the Black gum – Brookers gum forest/woodland ecological community.:

- Competition and land degradation by rabbits
- Competition and land degradation by unmanaged goats
- Dieback caused by the root-rot fungus (*Phytophthora cinnamomi*)
- Land clearance
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants
- Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases
- Novel biota and their impact on biodiversity
- Predation by European red fox
- Predation by feral cats
- Predation, habitat degradation, competition and disease transmission by feral pigs.

Any approved threat abatement plans or advice associated with these items provides information to help manage these threats and reduce their impacts to biodiversity.

APPENDIX D: DETAILED ASSESSMENT OF ELIGIBILITY FOR LISTING AGAINST THE EPBC ACT CRITERIA.

This appendix presents a detailed assessment of how the Black gum – Brookers gum forest/woodland ecological community meets each of the listing criteria. It forms the listing advice from the Threatened Species Scientific Committee to the Minister.

Criterion 1. Decline in geographic distribution			
Category	**Critically Endangered**	**Endangered**	**Vulnerable**
Its decline in geographic distribution is **either**:	very severe	severe	substantial
a) Decline relative to the longer-term (beyond 50 years ago e.g. since 1750); **or**,	≥90%	≥70%	≥50%
b) Decline relative to the shorter-term (past 50 years).	≥80%	≥50%	≥30%
A past decrease sufficient to meet the criterion is considered to be a measurable change whereby: • the ecological community has contracted to less than some threshold proportion of its former range; or • the total area occupied by the community is less than the threshold proportion of its former area; or • less than the threshold proportion of the former area of the community is in patches of a size sufficiently large or well connected with other patches for them to be likely to persist beyond the *near future*.			

Eligible under Criterion 1(a) for listing as Critically endangered

Evidence:

The Black gum – Brookers gum forest/woodland ecological community is mostly distributed across northern and eastern Tasmania, including the larger Bass Strait islands. The major regions where the ecological community occurs include the more intensively used and modifed areas of Tasmania such as the northern slopes and midlands regions.

Estimates of extent and decline for the ecological community from key studies are summarised in Table D1. All studies overestimate the extent of the ecological community to some degree in that they include certain mosaic components in which not all patches are dominated by *E. ovata* or *E. brookeriana*, so fall outside the description of the ecological community. For instance an element of RFA unit OV - Shrubby *E. ovata* – *E. viminalis* forest is dominated by *E. viminalis*, while elements of KG - *E. globulus* - *E. brookeriana* - *E. viminalis* forest on King Island are dominated by *E. globulus* and/or *E. viminalis*. However, as the majority of the component units would match the description of the Black gum – Brookers gum forest/woodland ecological community, the estimates are regarded as indicative of decline in extent.

<u>Table D1.</u> Estimates of extent and decline for the Black gum – Brookers gum forest/woodland ecological community from key studies and databases of Tasmanian vegetation.

a) Regional Forest Agreement (1996), updated by FPA (2016b)

Component of EC	Pre-European (ha)	1996 (ha)	2016 (ha)	Decline to 2016 (%)
6 - *E. brookeriana* wet forest (BA)	13 500	4 539	4 263	68.4
31 - Shrubby *E. ovata – E. viminalis* forest (OV)	232 000	7 108	6 396	97.2
Subtotal (OV + BA)	***245 500***	***11 647***	***10 659***	***95.7***
19 - *E. globulus - E. brookeriana - E. viminalis* forest on King Island (KG)	58 300	2 411	2 402	95.9
TOTAL	**303 800**	**14 058**	**13 061**	**95.7**

1996 and 2016 extent estmates based on data presented in FPA (2016b).

b) CARSAG (2004)

Component of EC	Pre-European (ha)	Current [2003] (ha)	Estimated decline (%)
Shrubby *E. ovata – E. viminalis* forest (OV)	181 844	12 959	92.9
E. brookeriana wet forest (BA)	12 474	5 324	57.3
Subtotal (OV+BA)	***194 318***	***18 283***	***90.6***
E. globulus - E. brookeriana - E. viminalis forest on King Island (KG)	16 650	2 291	86.2
E. globulus - E. brookeriana - E. viminalis woodland on King Island (Egk)	8 597	1 036	88.0
Subtotal (KG + Egk)	***25 247***	***3 327***	***86.8***
TOTAL	**219 565**	**21 610**	**90.2**

c) TASVEG (DPIPWE 2015). Note only estimates of current extent are available.

Component of EC	Current [2013] (ha)	Percentage of total extent
Key TASVEG equivalents		
DOV - *Eucalyptus ovata* forest and woodland	14 611.1	56.8
DOW - *Eucalyptus ovata* heathy woodland	528.7	2.1
WBR - *E. brookeriana* wet forest	7 279.3	28.3
Subotal (DOV + DOW + WBR)	***22 419.1***	***87.1***
'Associated mosaic' TASVEG units with a component of the EC		
DMW - Midlands woodland complex	1 353.6	5.3
DKW - King Island eucalypt woodland	580.5	2.2
WGK - *Eucalyptus globulus* King Island forest	1 381.2	5.4
Subotal (DMW + DKW + WGK)	***3 315.3***	***12.9***
TOTAL	**25 734.4**	**100**

d) Tasmanian Land Conservancy (in press)

Component of EC	Pre-European (ha)	Current [2013] (ha)	Estimated decline (%)
E. ovata forest (OV)	187 498	17 715	90.6
E. brookeriana forest (BA)	13 455	6 389	52.5
Subtotal (OV + BA)	***200 953***	***24 104***	***88.0***
E. globulus - E. brookeriana - E. viminalis forest on King Island (KG)	32 434	1 617	95.0
TOTAL	**233 387**	**25 721**	**89.0**

The following trends are apparent.

- The data based on the Regional Forest Agreement in 1996 appeared to overestimate the pre-European extent and underestimate the current extent, relative to other studies, hence more extensive decline estimates of over 95%.
- The estimates by CARSAG from 2003, TASVEG from 2015 and the Tasmanian Land Conservancy from 2016 are in reasonably close approximation. They indicate the pre-European extent was in the order of 219 000 to 234 000 hectares and that current extent is about 21 000 to 26 000 hectares. This indicates a very severe decline of about 89-90%.
- The largest component of the ecological community is that dominated by *E. ovata*, which accounted for about 80% of the pre-European extent of the ecological community. This component has undergone a very severe decline of 90–93%.
- The forest and woodland component on King Island has experienced a severe to very severe decline of 86-95%.
- The component dominated by *E. brookeriana* <u>not</u> on King Island has undergone the least decline of all component units, though still substantial, in the order of 52-57%.

Overall, the Committee considers that the total decline in geographic distribution is in the order of 90%. This indicates the ecological community has undergone a very severe decline in geographic distribution. Therefore, the ecological community has been demonstrated to have met the relevant elements of Criterion 1 to make it **eligible** for listing as **critically endangered**.

Criterion 2 - Restricted geographic distribution coupled with demonstrable threat			
Its geographic distribution is:	**Very restricted**	**Restricted**	**Limited**
2.1. Extent of occurrence (EOO)	< 100 km^2 = <10,000 ha	<1,000 km^2 = <100,000 ha	<10,000 km^2 = <1,000,000 ha
2.2. Area of occupancy (AOO)	< 10 km^2 = <1,000 ha	<100 km^2 = <10,000 ha	<1,000 km^2 = <100,000 ha
2.3. Patch size	< 0.1 km^2 = <10 ha	< 1 km^2 = <100 ha	-
AND the nature of its distribution makes it likely that the action of a threatening process could cause it to be lost in:			
the Immediate future [within10 years, or 3 generations of any long-lived or key species, whichever is the longer, up to a maximum of 60 years.]	Critically endangered	Endangered	Vulnerable
the Near future [within 20 years, or 5 generations of any long-lived or key species, whichever is the longer, up to a maximum of 100 years.]	Endangered	Endangered	Vulnerable
The Medium term future [within 50 years, or 10 generations of any long-lived or key species, whichever is the longer, up to a maximum of 100 years.]	Vulnerable	Vulnerable	Vulnerable

Criterion 2 aims to identify ecological communities that are geographically restricted to some extent. It is recognised that an ecological community with a distribution that is small and/or fragmented, either naturally or that has become so through landscape modification, has an inherently higher risk of extinction if it continues to be subject to ongoing threats that may cause it to be lost in the future. That there are demonstrable and ongoing threats to the Black gum – Brookers gum forest/woodland ecological community has been detailed in Appendix C Description of threats.

The indicative measures that apply to this criterion are:

- extent of occurrence, an estimate of the total geographic range over which the ecological community occurs;
- area of occupancy, an estimate of the area actually occupied by the ecological community, which generally equates with its present extent;
- patch size and distribution, an indicator of the vulnerability of small and/or isolated patches to particular threats; and
- an assessment of timeframes over which threats could result in further loss of the ecological community, and the capacity for the ecological community to regenerate from disturbance.

Eligible under Criterion 2 for listing as Vulnerable

Evidence:

Extent of occurrence.

The Black gum – Brookers gum forest/woodland ecological community mostly occurs in the northern and eastern parts of Tasmania but small remnants are scattered through the southern and western parts the State, as well. The extent of occurrence therefore approximates the area of Tasmania, about 6 840 000 hectares. As the extent of occurrence for the Black gum – Brookers gum forest/woodland ecological community clearly exceeds the 1 million ha indicative threshold for a limited geographic distribution, it is not considered to be limited on this basis.

Area of occupancy.

The present area of ocupancy for the ecological community is limited. It is estimated to cover about 20 000 to 26 000 hectares (Table D1), which exceeds the 10 000 hectare indicative threshold for a restricted geographic distribution but clearly falls within the 100 000 hectare indicative threshold for a **limited** geographic distribution.

Patch size distribution.

The Black gum – Brookers gum forest/woodland ecological community mostly occupies sites of impeded drainage such as depressions and gullies. Many of these sites are likely to be localised, so the original distribution of the ecological community can be reasonably considered to have been naturally fragmented, but with extensive clearance as indicated under Criterion 1, vulnerability to threats due to its distribution will have increased (e.g. more edge effects). Table D2 shows the current distribution of patch sizes grouped for TASVEG units that best correspond to the ecological community. About 81% of patches are under ten hectares in size (Table D2a). The median patch size was calculated as 2.45 hectares. The patch size data for the ecological community, taken in isolation, is indicative that its geographic distribution is potentially **very restricted**.

Table D2. Number of patches by patch size range class for the Black gum – Brookers gum forest/woodland ecological community, and in relation to thresholds for fragmentation under Criterion 2.

<table>
<tr><th colspan="2">Thresholds</th><th>Size range (ha)</th><th>No. patches</th><th>% no. patches</th><th colspan="2">Cumulative %</th></tr>
<tr><td rowspan="3">Restricted</td><td rowspan="2">Very Restricted</td><td>0.1 – 1</td><td>738</td><td>27.7</td><td rowspan="2">81.1</td><td rowspan="3">99.2</td></tr>
<tr><td>> 1 - 10</td><td>1419</td><td>53.4</td></tr>
<tr><td></td><td>> 10-100</td><td>481</td><td>18.1</td><td></td></tr>
<tr><td></td><td></td><td>> 100</td><td>22</td><td>0.8</td><td></td><td></td></tr>
<tr><td></td><td></td><td>Total</td><td>2660</td><td>100</td><td></td><td></td></tr>
</table>

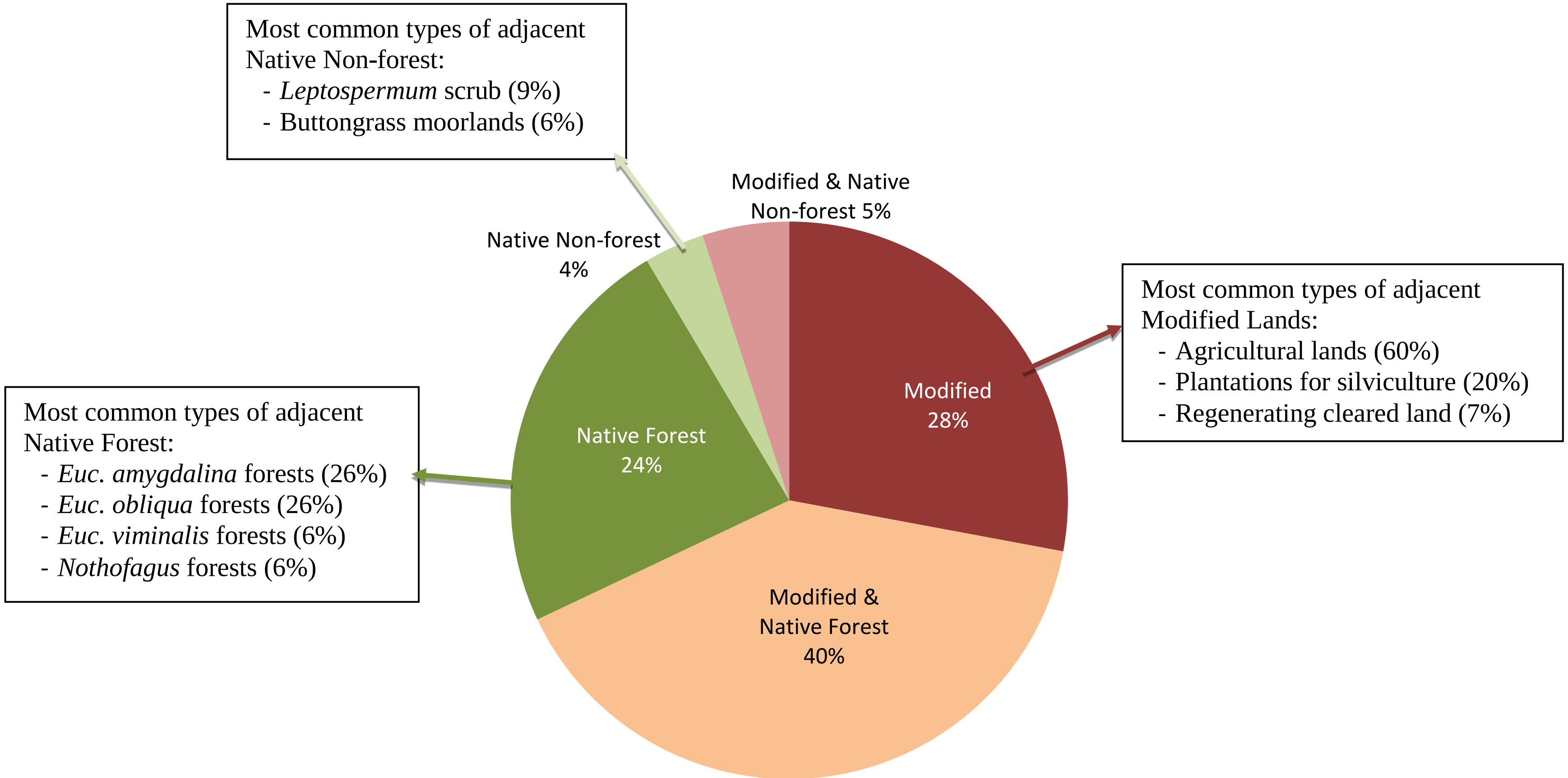
Source: Data supplied by the Tasmanian Department of Primary Industries, Parks, Water and the Environment to the National Vegetation Information System, for the three key TASVEG units dominated by *E. ovata* or *E. brookeriana* [DOV, DOW, WBR]. Mapped polygons of these units that occur within 50 metres of each other were grouped together as single patches. Any patches less than 0.1 ha in size after grouping were excluded from analyses to remove potential mapping artifacts.

However, although most patches of the ecological community are small, the ecological community does not occur in isolation. Patches adjoin or intergrade with other native forest types dominated by different eucalypt species. These larger forest remnants are often more extensive in size. The *State of the Forests Tasmania 2012* report (FPA, 2012) collated data from TASVEG to estimate the fragmentation of total forest cover. Over 47% of the total area of forest remnants occur as very large patches that are more than 50 000 hectares in size. By contrast, the smallest patch size class of 0-200 ha accounted for only about six percent of the total forested area. The pattern and degree of fragmentation did not appear to change substantially between 2006 and 2011 (FPA, 2012). Forests in Tasmania generally occur as extensive patches and retain a good degree of cover at a broad scale. Larger forest remnants that contain patches of the ecological community also can buffer it from external impacts, especially where individual patches of the ecological community are entirely surrounded by other native forest types. Nevertheless, due to extensive clearance and degradation the degree of fragmentation will have worsened. The landscape analysis by Michaels et al. (2010) estimated that only three percent of native vegetation patches across Tasmania are over fifty hectares in size and that fragmentation was unevenly distributed across the State. Most smaller patches occur in the more intensively modified bioregions.

An analysis of land uses and vegetation types in close proximity to patches of the ecological community (i.e. within 50 metres of the edge of a patch) indicates that most patches of the ecological community (45%) are in proximity to a combination of land uses – both modified plus native vegetation remnant (Figure D1). About 28% of patches are isolated, in that they are surrounded solely by modified land uses., while another 28% are only near to other native vegetation remnants. The major modified land use surrounding the ecological community is agricultural, while the main adjoining native vegetation types involve other kinds of dry eucalypt forest. It is presumed these larger forest remnants embed patches of the ecological community that lie within localised flats, depressions and drainage areas.

In conclusion, the ecological community was, and remains to some degree naturally fragmented within larger expanses of native forest. Since European settlement, the ecological community has become increasingly subject to influences from nearby modified land uses. However, only a smaller proportion of patches are fully isolated by modified land use – the majority of remnants retain a connection to a native vegetation remnant of some form. The presence of larger, often forested remants potentially mitigates the impacts of altered surrounding land use on the ecological community, to some extent. The geographic distribution of the ecological community based on both patch size and surrounding landscape data, therefore, may be more realistically assessed at a lower conservation status, either **restricted or limited**.

Figure D1. Vegetation types and land use adjacent to patches of the Black gum – Brookers gum forest/woodland ecological community. Percentages in the pie chart refer to the proportion of patches within 50 metres of each category. Percentages in text boxes refer to the proportion of patches within 50 metres of the most common vegetation types, determined by TASVEG code and dominant canopy species. Legend and sources on the following page.



Source for Figure D1: TASVEG v3 data supplied by the Tasmanian Department of Primary Industries, Parks, Water and Environment to the Australian Government.

Notes for Figure D1. Patches of the Black gum – Brookers gum forest/woodland ecological community were based on polygons for three key TASVEG units: DOV, DOW and WBR, and grouping any polygons of these units that occurred within 50 metres of each other into single patches. Resulting patches that were less than 0.1 ha in size were excluded from analyses to minimise potential errors.

Adjacent TASVEG units that occurred within 50 metres of each patch of the ecological community were identified and broadly categorised as follows:

- Modified = TASVEG group F - Modified lands only is present;
- Native forests = any combination of TASVEG units from these groups is present: D - Dry eucalypt forests and woodlands; W - Wet eucalypt forests and woodlands; N - Non-eucalypt forest and woodland; and R - Rainforest and related scrub. Adjacent areas of native non-forest vegetation may also border some patches along with native forest.
- Native non-forest = native forest units are absent and any combination of TASVEG units from these groups is present: S - Scrub, heathland and coastal complexes; M - Moorland, sedgeland, rushland and peatland; G - Native grassland; and A – Saltmarsh and wetland.

Many patches of the ecological community were adjacent to more than one type of TASVEG unit, whether modified land and native vegetation, or different kinds of native vegetation. The categories in the pie chart reflect various broad combinations of land use surrounding patches of the ecological community.

Text-boxes provide more detail about what kinds of vegetation most commonly occur near to the ecological community, and cross-refer to the following TASVEG units:

- Agricultural lands – FAG
- Plantations for silviculture – FPL/FPU
- Regenerating cleared lands – FRG
- Forests dominated by *Eucalyptus amygdalina* - DAC/DAD/DAM/DAS/DAZ
- Forests dominated by *Eucalyptus obliqua*– DOB/WOU/WOB/WOL
- Forests dominated by *Eucalyptus viminalis*– DVG/WVI
- Forests dominated by *Nothofagus*– RMS/RMT/RMU
- *Leptospermum* scrub – SLS/SLW
- Buttongrass moorlands – MBE/MBS/MBU

Timeframes for potential loss.

The relevant timeframes relate to a set period or generation length for key long-lived species in the ecological community. The key long-lived species in the Black gum – Brookers gum forest/woodland ecological community that consistently characterise the ecological community are the dominant trees, *E. ovata* and *E. brookeriana*.

One determination of generation length is based on age to reliable reproduction. There is no direct information on this for either key eucalypt species, but general information exists in the literature on silviculture of eucalypt forests and plantations. The age to first seed production may not be a reliable indicator of generation time in eucalypts since the quantity and quality of the initial seed produced may be inadequate for proper regeneration (Florence, 1996). Instead, it may be more practical to consider the age at which trees start producing sufficient quantities of good quality seed that allows seedlings to establish once they germinate. Good seedling establishment is more critical for eucalypt stand regeneration than is germination. Florence (1996) estimated production of abundant seed could occur as early as ten years for some eucalypts but for stands of many commercial species this may take twenty or more years. Black gum is known to germinate very readily from seed and shows a good capacity for regeneration, both naturally and from direct seeding in the field (Florabank, 2006). Two decades may be a reasonable minimum age by which reliable seed production is likely to have commenced.

Another determination of generation length, which may be more appropriate as it is used for threatened species assessments, is the average age of adults in unexploited wild populations. Given eucalypts are potentially long-lived species with life-spans of centuries (von Platen et al., 2011), the generation length in a healthy forest that spans old growth to regrowth trees can be expected to be well over a century. This means impacts should be apparent over the maximum timeframes specified, of 60-100 years, at least.

As detailed above, many patches of the ecological community are associated with larger native vegetation remnants. The risk of extensive loss or degradation of such entire larger remnants is unlikely to occur within a short timeframe. Also, the status of patches as State-listed threatened vegetation types ensures some degree of protection, at least from forestry activities through regulation and the Regional Forests Agreement. However, degradation remains possible over a longer timeframe, mostly through gradual processes such as weed invasion or species loss, when these are not adequately managed. There remains a possibility of catastrophic impacts due to bushfires, drought or ongoing clearance (see Criterion 5, below). The impacts from bushfire or drought would most likely be regional, rather than affect the entire range of the ecological community.

The Committee notes that the Black gum – Brookers gum forest/woodland ecological community is fragmented, with a small median patch size of about 2.5 hectares, and currently has a limited area of occupancy. There are ongoing threats to the ecological community but the timeframe for loss due to the nature of its distribution is within the medium–term future. Therefore, the ecological community has been demonstrated to have met the relevant elements of Criterion 2 to make it **eligible** for listing as **vulnerable.**

Criterion 3 - Loss or decline of functionally important species			
Category	**Critically Endangered**	**Endangered**	**Vulnerable**
For a population of a native species likely to play a major role in the community, there is a:	very severe decline	severe decline	substantial decline
3.1 Estimated decline over the last 10 years or three generations, whichever is longer of:	at least 80%	at least 50%	at least 20%
to the extent that restoration of the community is not likely to be possible in:	the immediate future	the near future	the medium-term future
3.2: *restoration* of the ecological community as a whole is *unlikely* in	10 years, or 3 generations of any long-lived or key species, whichever is the longer, up to a maximum of 60 years.	20 years, or 5 generations of any long-lived or key species, whichever is the longer, up to a maximum of 100 years.	50 years, or 10 generations of any long-lived or key species, whichever is the longer, up to a maximum of 100 years.

Eligible under Criterion 3 for listing as Vulnerable

Evidence:

There is a lack of specific information about what ecological functions most species have in the Black gum – Brookers gum forest/woodland ecological community. Similarly, the significant loss or decline of many individual species are not documented at a national or State level, with the exception of species that are listed or otherwise considered to be threatened.

The species within the ecological community which are likely to be best known and considered functionally important are the two dominant eucalypt species, *E. ovata* and *E. brookeriana*. As canopy trees, they have important roles in determining nutrient and water availability (e.g. through competition for resources with understorey species) and habitat characteristics for fauna (e.g. tree hollows for nest sites and nectar/fruits for food). Both tree species have undergone some localised declines in their cover and extent, but remain common and dominant trees across the remaining extent of the Black gum – Brookers gum forest/woodland ecological community.

However, there is a key functional component of the tree canopy that has undergone loss: the old growth forests component of the ecological community. Old growth forests are defined as

> "ecologically mature forest where the effects of disturbances are now negligible" (FPA, 2012).

They are particularly important habitat for native fauna as larger, older trees are more likely to develop hollows that provide key shelter and nest sites for many species such as parrots and possums. Hollows can take decades to form and it has been estimated that hollows suitable for animals to use can take at least 150 years to form in Tasmanian forests (Koch, 2009). Consequently, the extent and loss of old growth is an important indicator of reduction in ecological integrity and habitat diversity.

The estimated extent of old growth forest in the Black gum – Brookers gum forest/woodland ecological community is about 1000 hectares or seven percent of the total extent of the

ecological community (FPA, 2012). No old growth forests were identified to remain for the King Island *E. globulus / brookeriana / viminalis* vegetation community, which represents the national ecological community on the island where *E. brookeriana* can be dominant, in part. Since the FPA data used the 1996 RFA estimates as a baseline, the later and higher estimates of current extent from TASVEG and TLC (2016) indicate that old growth forests account for a much lower proportion of current extent, in the order of only four percent.

The estimated extent of old growth forests associated with the ecological community had declined between 1996 and 2011 (FPA, 2012). The decline for the *E. ovata* forest component was relatively minor (about 2.3%) compared to a more severe decline in old growth *E. brookeriana* forest (about 20.8%). The loss of old growth forest during this period was partly tempered by their increased representation in the reserve estate. A substantial area amounting to 500 hectares or half the total old growth component of the ecological community remains on private lands outside of any formal or informal protection. The FPA (2012) further notes that 24 native forest communities had decreased in old growth extent by more than one percent since 2005, though these were not individually identified in their report.

Based on available data, the decline in the extent of old growth forest is considered to be substantial, in the order of twenty percent since 1996. This has occurred within one generation, based on an average age of tree canopy species being well over 100 years, given the known occurrence of old growth trees to this discussion. The extensive time of at least 150 years required to develop hollow-bearing trees confirms that functional old growth forests are unlikely to be restored within the medium-term future. Therefore, the ecological community has been demonstrated to have met the relevant elements of Criterion 3 to make it **eligible** for listing as **vulnerable.**

Criterion 4 - Reduction in community integrity			
Category	**Critically Endangered**	**Endangered**	**Vulnerable**
The reduction in its integrity across most of its geographic distribution is:	very severe	severe	substantial
as indicated by degradation of the community or its habitat, or disruption of important community processes, that is:			

Reference should also be made to the indicative restoration timeframes as outlined under Criterion 3, above.

Eligible under Criterion 4 for listing as Endangered

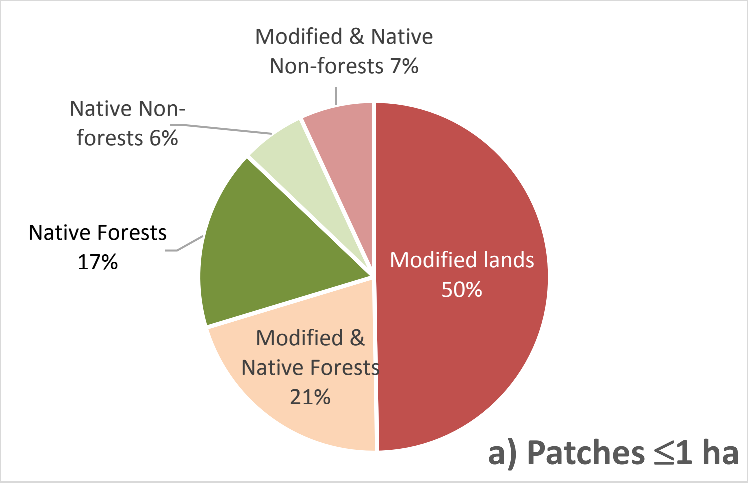
Evidence:

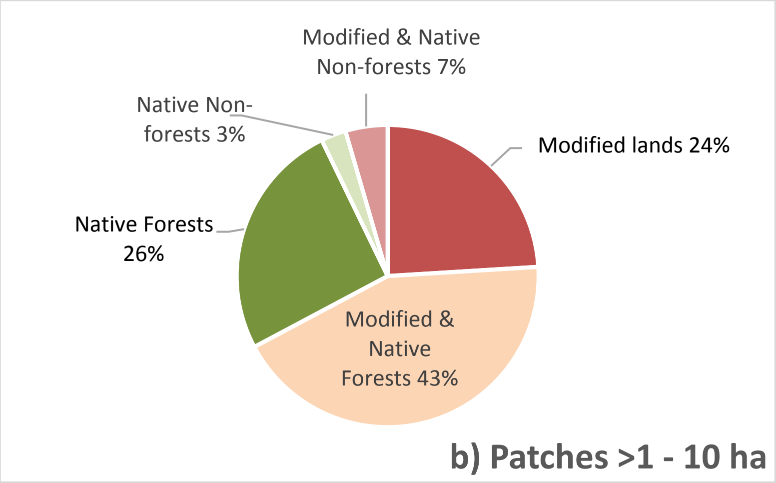
The Black gum – Brookers gum forest/woodland ecological community has experienced some reduction in its ecological integrity. A reduction in community integrity is most apparent through the impacts of fragmentation of the ecological community, changes to vegetation structure and altered species composition (in terms of loss of native species and their replacement by weeds and feral animals), and fire impacts. Changes to ecological processes, such as nutrient cycling, and recruitment capability also are likely to have occurred but are more difficult to evaluate and quantify. The combined influence of all ongoing changes, even where these are gradual and not readily apparent, could lead to the eventual loss of patches or even entire woodlands from local landscapes over time.

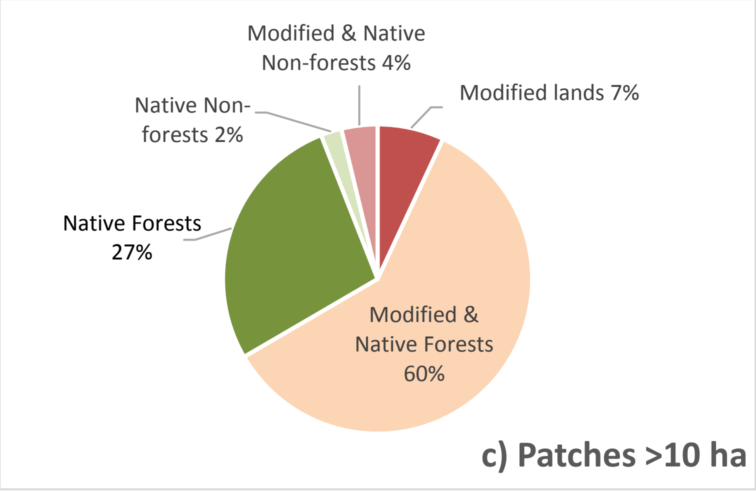
General information on the nature of fragmentation, proximity to modified land uses, and altered vegetation structure through declining old growth forests for the ecological community are presented against criteria 2 and 3, above, so are not repeated here. However, an examination of the nature of the surrounding landscape relative to patch size of the ecological community helps illuminate how fragmentation may render patches more susceptible to influences from surrounding modified landscapes that contributes to reduction in the integrity of the ecological community. The percentage of patches that are isolated and entirely surrounded by modifed landscapes varies with the size category of the patch (Figure D2).

- About half of small patches one hectare or less in size are isolated and entirely surrounded by modified land uses. This declines markedly for larger patches, with about a quarter of patches 1-10ha, and only 7% of patches greater than ten hectares being isolated within modified land uses. Smaller patches tend to be more susceptible to further degradation due to edge effects and smaller edge to core distances. They are especially vulnerable if they lack any opportunity for buffering, as is the case when a majority of such remnants lack any buffering due to connectivity with other native vegetation.
- Conversely, larger patches are only slightly more likely to occur entirely amongst native vegetation (forest plus non-forest): 23% of patches under one hectare versus 29% of patches that are 1-10 or >10 ha in size occur amongst other native vegetation.
- Larger patches are more likely to adjoin a combination of modified and natural landscapes. While this provides opportunities for adverse impacts from adjacent land uses, it also allows some buffering by proximity and connection with a larger native vegetation remnant.

Figure D2. Vegetation types and land use adjacent to the Black gum – Brookers gum forest/woodland, by patch size class of the ecological community. Percentages in each pie chart refer to the proportion of patches within 50 metres of each type/land use group. The sources and legend for Figure D1 apply.







The major means by which adjacent modified landscapes may impact upon the ecological community (and other native vegetation) is through chemical drifts and weed invasion. Inorganic fertilisers are known to be highly detrimental for native ecosystems, certainly grassy systems (e.g. Kirkpatrick et al., 2005); however there are no data about the degree to which chemical drifts from adjacent productive lands are impacting upon the ecological community, other than it is inferred small remnants are more likely to suffer fertiliser drift due to their small size and higher proportion adjoining modified landscapes.

There is an indication of the degree to which weeds impact upon the ecological community is evident from survey data from 118 plots of *E. ovata* forest and woodland (A. North, pers. comm.). The survey plots were undertaken between 2005 and 2015 across Tasmania, except for the south-west and far south-eastern regions. The survey identified a total of 139 exotic species were present to some extent. Most of these were understorey herbaceous species, some shrubs, with a few exotic trees occasionally present.

Weeds were completely absent in only 28.2% of plots surveyed. About two-thirds of exotic species were present at only one or two sites. However, 25 weed species were present in five percent or more of plots and eight occurred in ten percent or more of the sites (Table D3).

The data also provided information about the diversity of native and exotic species in plots. For about 26% of plots, weeds accounted for more than a quarter of understorey species richness. Many of the more frequent species were herbs (grasses and forbs) but eight are larger woody species. Five of the frequent species are identified as highly invasive weeds and are declared as weeds of national significance and/or under Tasmanian legislation. The most common of these serious weeds encountered is blackberry, followed by gorse. This is not surprising given that blackberries are often associated with, though not limited to, riparian and wetter sites where *E. ovata* occurs. All declared weed species have the potential to dominate the understorey and crowd out the native understorey, if infestations are left uncecked. This may also apply to some undeclared weeds, especially shrubby species such as cotoneaster and hawthorn.

There is a possibility to undertake restoration actions for weed infested sites as weed management actions for critical weeds have been developed. However, effective restoration will be largely limited to local sites and would take considerable time and co-ordination to acheive across the entire extent of the ecological community. This is due to at least two main factors.

- Firstly, the modified nature of the surrounding landscape where much of the Black gum – Brookers gum forest/woodland ecological community occurs. Many patches also are in close proximity to modified lands, especially smaller sized patches (Figures D1, D2). It means that patches face a continual threat from weeds that are likely to be present in the surrounding landscape.
- Secondly, many weeds known to be present are highly invasive and may require considerable, if not continual, management to prevent them from (re-)establishing at sites. The ability to eradicate weeds from a local patch is not suficient for longer-term protection.

Table D3. Weed species frequently present in *E. ovata* forest and woodland in Tasmania.

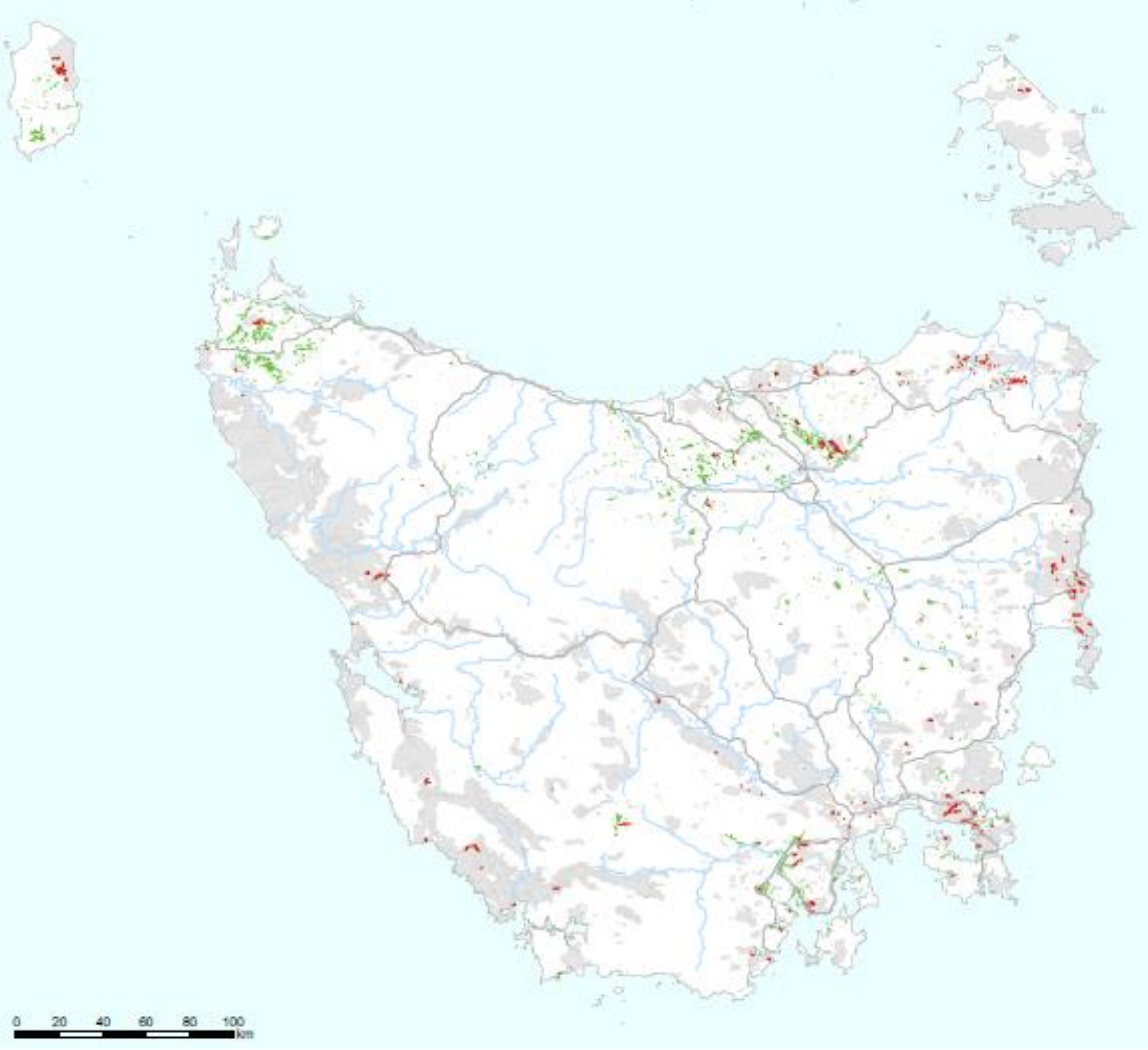
Species name	Common name	Life form	Declared weeds	Frequency
Hypochoeris radicata	cats ear	Forb		27.1
Cirsium vulgare	spear thistle	Forb		22.8
Rubus fruticosus aggregate	blackberry	Scrambler	WoNS / Tas	21.2
Dactylis glomerata	cocksfoot	Graminoid		16.1
Centaurium erythraea	common centaury	Forb		14.4
Holcus lanatus	Yorkshire fog	Graminoid		13.6
Rosa rubiginosa	sweet briar	Shrub		11.9
Ulex europaeus	gorse	Shrub	WoNS / Tas	11.9
Crataegus monogyna	hawthorn	Shrub		9.3
Plantago lanceolata	plantain	Forb		9.3
Erica lusitanica	Spanish heath	Shrub	Tas	8.5
Genista monspessulana	Montpellier broom	Shrub	WoNS / Tas	8.5
Lysimachia arvensis	scarlet pimpernel	Forb		8.5
Chrysanthemoides monilifera subsp. *monilifera*	boneseed	Shrub	WoNS / Tas	7.6
Agrostis capillaris	browntop bent	Graminoid		5.9
Anthoxanthum odoratum	sweet vernal grass	Graminoid		5.9
Cotoneaster glaucophyllus	cotoneaster	Shrub		5.9
Prunella vulgaris	heal all	Forb		5.9
Aira caryophyllea	silvery hairgrass	Graminoid		5.1
Digitalis purpurea	foxglove	Forb		5.1
Galium aparine	goosegrass	Forb		5.1
Leontodon saxatilis	hairy hawkbit	Forb		5.1
Plantago coronopus	bucks-horn plantain	Forb		5.1
Trifolium sp.	clover	Forb		5.1
Urtica incisa	nettle	Forb		5.1

Source: Survey data from 118 plots undertaken by North Barker ecological consultants between 2005 and 2015. (A. North, pers. comm.)
Legend: **Declared weeds** are those identifed as particularly invasive and undesirable, for which some control of spread is required. WoNS = Weed of National Significance. Tas = Declared agricultural and environmental weed in Tasmania (DPIPWE, 2016). **Frequency** refers to the percentage of survey plots where a weed species was present.

Data on fire impacts specific to the ecological community indicates that substantial areas of the eoclogical community have been burnt since 1980, with impacts most apparent to the dry sclerophyll black gum forests of the north east, east coast and south-east (Figure D3a). There appears to be relatively less impact of fires in north-western Tasmania, where the fire-senstive Brookers gum wet forest component mostly occurs. Some areas of the northern slopes and Midlands also have faced less impacts due to recent fires than eastern coastal regions. Annual trends in the area of the ecological community burnt showed much more extensive areas of the ecological community were burnt after 2000 than for previous decades (Figure D3b).

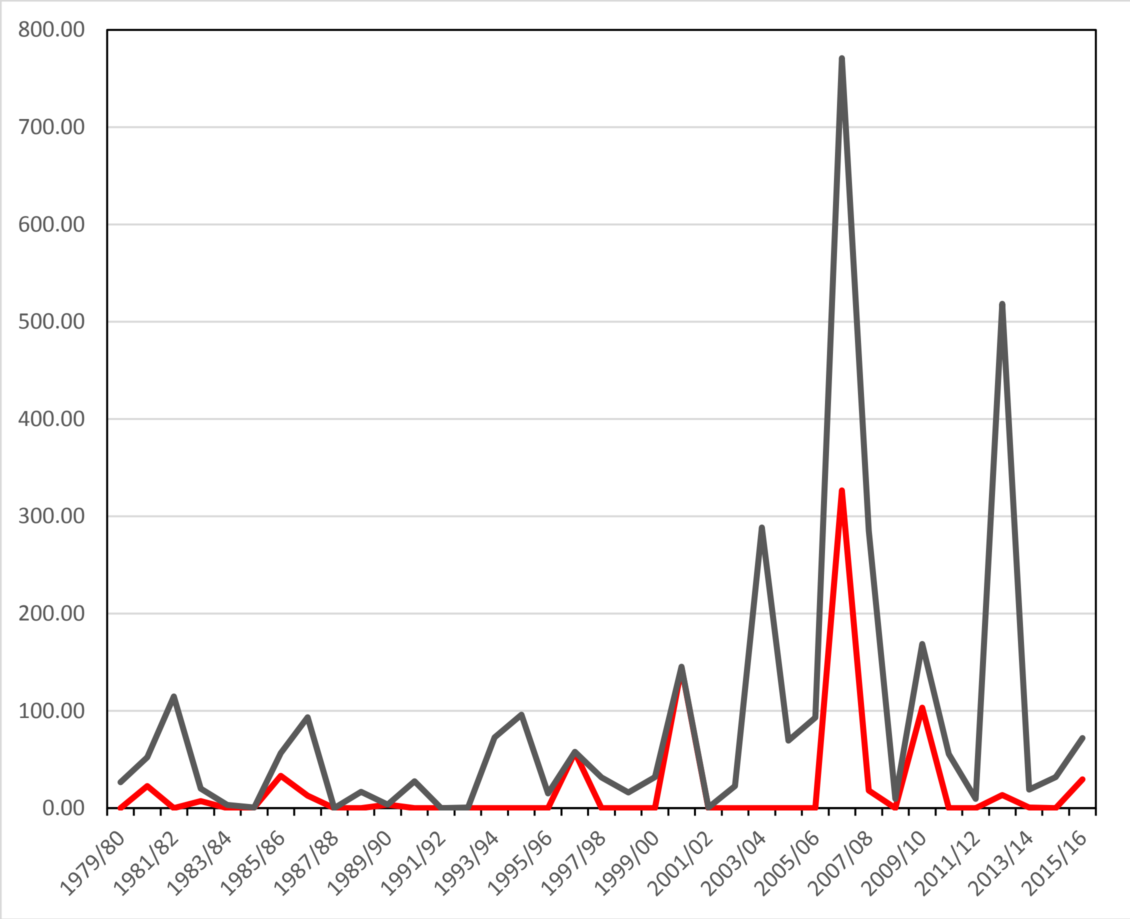
Figure D3. Patches of the ecological community across Tasmania that were burnt by fires during 1980/81 to 2014/15, from all sources of ignition.

D3a) Map showing areas burnt by fires (grey) and patches of the ecological community that were unburnt (green) and burnt (red) within the time period.



Map prepared by the Environmental Resources Information Network, Department of the Environment and Energy.

D3b) Area of the ecological community burnt by fire season from 1980/81 to 2015/16**.** The Y-axis shows the area burnt (ha). The X-axis shows the fire 'season', calculated from 1 July to 30 June the following year, to group consecutive spring, summer and autumn months.



Source: Land Tasmania (2012) data on fire history. For some fires, only the year of ignition is known, but are presumed to have occurred during the peak fire season (i.e. spring to autumn).

Black line shows the total extent of the ecological community burnt in each season, based on the six key and associated mosaic TASVEG units (listed in Table B2, Appendix B, above); and

Red line shows the extent of highly to moderately fire-sensitive TASVEG units (WBR, WGK, DKW) burnt in each season.

The difference between the black and red lines reflects the extent of low fire-sensitivity TASVEG units (DOV, DOW, DMW) burnt in each season.

Some key patterns evident from the fire data (Figure D3) are:

- During the decades of the 1980s and the 1990s, the extent of the ecological community burnt was about 350 hectares per decade. In the decade from 2000/01 to 2009/10, the extent burnt markedly increased to about 1700 hectares, while the current half decade (2010/11 to 2015/16) has registered about 700 hectares of the ecological community being burnt to the time of this assessment.
- If the highly to moderately fire sensitive wet forest units are considered separately, they show some similar peaks since 2000 to the low sensitivity drier forests (Figure D3b). but not for all intense fire seasons. Impacts clearly depend on where the fires spread. Overall, about 7% of the total extent of fire-sensitive units were burnt since 2000/01 (compared to about 12% of the total extent of low-sensitivity dry forest units being burnt over the same period).

- About 10% of the estimated current extent of the ecological community[6] has been burnt in the fifteen years since 2000. Fire-sensitive units accounted for about a quarter of the total extent of the ecological community burnt since 2000.
- With the exception of some burnt areas in the north-western Tasmania and on King Island, most of the patches burnt are dry eucalypt forests of low fire sensitivity, and adapted to more frequent fires, at least a decade apart (see notes to Table C4, above). However, a consequence of climate change is the likelihood of more severe weather events (storms, droughts), (as happened in 2016). Such events could make the fire-sensitive wet forest components more susceptible to fires, noting their recovery is likely to take decades to centuries post-fire.

In light of persistent weed invasion, the impacts of recent fires, particularly to more fire-sensitive components of the ecological community, plus the potential for increased fire events, it is likely restoration of the ecological community can take a long time.

The available information on weeds and fire, in conjunction with previously presented data on fragmentation and clearing rates, indicates that the ecological integrity of the ecological community has been severely reduced. Seriously invasive weeds such as blackberries and gorse are known to occur across the extent of the ecological community. A considerable proportion of the ecological communuity has been impacted by fire events within the past 30-40 years.

The Committee considers that the change in integrity experienced by the ecological community is **severe** and regeneration across the extent of the ecological community is unlikely in the medium-term future. Therefore, the ecological community is **eligible** for listing as **endangered** under this criterion.

[6] Etimated extent of the ecological community based on data for corresponding TASVEG units outlined in Table D1c, above, rounded to the nearest hundred hectares. It is assumed there were no to minimal repeated fires within patches since 2000/01.

Criterion 5 - Rate of continuing detrimental change			
Category	**Critically Endangered**	**Endangered**	**Vulnerable**
Its rate of continuing detrimental change is: as indicated by a) degradation of the community or its habitat, or disruption of important community processes, that is: or b) intensification, across most of its geographic distribution, in degradation, or disruption of important community processes, that is:	very severe	severe	substantial
5.1 An observed, estimated, inferred or suspected *detrimental change* over the *immediate*# past or projected for the *immediate* future of at least:	80%	50%	30%

The immediate timeframe refers to10 years, or 3 generations of any long-lived or key species believed to play a major role in sustaining the community, whichever is the longer, up to a maximum of 60 years.

Insufficient information for listing under Criterion 5

Evidence:

All the key Tasmanian vegetation components of the Black gum – Brookers gum forest/woodland ecological community are recognised under Tasmanian forest policy as communities where no further loss and conversion should occur (FPA, 2012). This is due to their formal threatened status and low remaining extent. Despite this, there have been documented declines in extent since the Regional Forests Agreement in 1996.

The available data shows that the ecological community lost almost 1000 hectares due to forestry operations in the two decades since 1996 (Table D4). This represents about seven percent of the total extent based on the RFA estimate in 1996. However, the proportional decline is considerably less, about 3.9%, if the more recent estimates of current extent from TASVEG and the Tasmanian Land Conservancy are taken into account (see Table D1, above).

The highest loss was for the *E. ovata* component of the ecological community. It is notable that half the total loss for this component of the ecological community occurred since 2014, due to some extensive clearing for *E. ovata* woodland in the Ben Lomond bioregion. Further losses of the *E. brookeriana* component were incremental since 1996 while losses of the King Island component were negligible overall. The information on loss since 1996 and since 2014 highlights that clearing of the ecological community can be an ongoing problem. Though clearing generally appears to have been at a low incidence, it is concerning that there have been recent impacts of a more devastating nature. Clearance is expected to continue for urban and peri-urban development, and associated infrastructure, such as road construction and widening, or easements. However, the likely rate of this clearing is not known.

Table D4. Loss of extent for components of the Black gum – Brookers gum forest/woodland ecological community since 1996 and for the period 2014 to 2016, based on data collated for the Regional Forests Agreement.

Component vegetation unit	**RFA extent in 1996 (ha)**	**Loss (ha) [1996 to 1/7/2016]**	**Loss (ha) [1/7/2014 to 1/7/2016]**	**Decline (%) since 1996**
Shrubby *E. ovata – E. viminalis* forest (OV)	7 108	712.4	495.0	10.02
E. brookeriana wet forest (BA)	4 539	275.8	7.4	6.08
E. globulus - E. brookeriana - E. viminalis forest on King Island (KG)	2 411	9.0	0.0	0.37
TOTAL	**14 058**	**997.2**	**502.4**	**7.09**

Source: FPA (2014b; 2016b).

As a corollary to estimates of ongoing loss, there is also evidence that the ecological community has become increasingly protected within the conservation estate during the decade from 2001 to 2010. There was a slight decline in the total area protected within formal conservation reserves (from 1350 to 1340 hectares; Table D5). However, there was a substantial increase in the area that is informally protected, from 640 to 2000 hectares, with an especially large increase in conservation agreements on private land. It is not clear what time-frames apply to these private land agreements, whether they reflect protection in perpetuity or are for a limited period only. In any case, it reflects the willingness of some current land owners to engage in the protection of threatened vegetation types. The Forest Conservation Fund and Private Forest Reserve Program that supported protection on private lands both ceased during the second half of the 2000s, though the State Government continues to provide support to landholders that entered into covenants. New conservation covenants are presently available through the Protected Areas on Private Land Program (DPIPWE, 2015d).

Table D5. Changes in the area of the ecological community protected between 2001 and 2010, by reserve class.

Component vegetation unit	**Dedicated formal reserve (ha)**		**Other formal reserve (ha)**		**Informal public reserve (ha)**		**Private CAR reserves (ha)**	
	2001	**2010**	**2001**	**2010**	**2001**	**2010**	**2001**	**2010**
Shrubby *E. ovata – E. viminalis* forest (OV)	100	60	200	200	100	100	100	600
E. brookeriana wet forest (BA)	0	0	900	900	100	500	0	200
E. globulus - E. brookeriana - E. viminalis forest on King Island (KG)	100	100	50	80	300	300	40	300
TOTAL	**200**	**160**	**1 150**	**1 180**	**500**	**900**	**140**	**1 100**

Sources: FPA (2002, 2012).

The guidelines for listing against this criterion require a detrimental change of at least 30% over the immediate past, or suspected for the immediate future (i.e. generally within ten years; TSSC, 2013). The available information indicates that, despite some recent known loss of the ecological community, the degree of recent past change due to land clearance is well below the minimum indicative value. There is insufficient information on the rate of future change for clearing, or past and future changes due to other threatening processes, so the ecological community is therefore **not eligible** for listing under any category for this criterion.

Criterion 6 - Quantitative analysis showing probability of extinction			
Category	**Critically Endangered**	**Endangered**	**Vulnerable**
A quantitative analysis shows that its probability of extinction, or extreme degradation over all of its geographic distribution, is:	at least 50% in the immediate future.	at least 20% in the near future.	at least 10% in the medium-term future.

Not eligible for listing under Criterion 6.

There are no quantitative data available to assess this ecological community under this criterion. Therefore, it is **not eligible** for listing under this criterion.

Overall conclusion

The Tasmanian Forests and Woodlands dominated by black gum or Brookers gum *(Eucalyptus ovata / E. brookeriana)* ecological community merits listing as **critically endangered**. This was the highest conservation category triggered in this assessment, as applied to Criterion 1.