The Minister approved this conservation advice and included this species in the Vulnerable category, effective from 17/11/2015

Conservation Advice

Eucalyptus aggregata

Black gum

Taxonomy

Conventionally accepted as *Eucalyptus aggregata* Deane & Maiden (Deane & Maiden, 1900).

Summary of assessment

Conservation status

Vulnerable: Criterion 2 B2,(a),(b)(iii)(iv)(v)

Eucalyptus aggregata has been found to be eligible for listing under the following listing categories:

Criterion 2: B2,(a),(b)(iii)(iv)(v): Vulnerable

The highest category for which *Eucalyptus aggregata* is eligible to be listed is vulnerable.

Species can be listed as threatened under state and territory legislation. For information on the listing status of this species under relevant state or territory legislation, see http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

Reason for conservation assessment by the Threatened Species Scientific Committee

This advice follows assessment of information provided in a public nomination to list *Eucalyptus aggregata*.

Public Consultation

Notice of the proposed amendment and a consultation document was made available for public comment for 34 business days between 2 October 2014 and 18 November 2014. Any comments received that were relevant to the survival of the species were considered by the Committee as part of the assessment process.

Species Information

Description

Eucalyptus aggregata, black gum, is a small to medium sized woodland tree that grows 18–20 m tall (Benson and McDougall, 1998; Hill, 2002), although the Victorian Department of Sustainability and Environment (DSE) (2004) states that it grows to 25 m. The bark on the trunk and main branches is dark grey to black, deeply fibrous or flaky, which does not shed annually (Hill, 2002). The smaller branches (<8 cm diameter) are covered in smooth white, cream or grey bark which does shed yearly (Brooker *et al.,* 2002; Hill, 2002). The adult leaves are slightly curved and round-ended, approximately 5–12 cm long and 1–2 cm wide. They are a glossy dark green, have the same colour on each surface and contain leaf oils with a distinctive, clove-like odour (Brooker *et al.,* 2002; DSE, 2004; NSW OEH, 2013). Juvenile leaves are narrow or oval-shaped, are arranged opposite each other and are a dull green in colour (Hill, 2002), although they may vary considerably in a single seedlot (Brooker *et al.,* 2002). The buds, flowers and fruits occur in tight clusters of seven on stalks 3–4 mm long. The buds are egg-shaped, 3–5 mm long and 2–3 mm wide (Hill, 2002; NSW OEH, 2013). The flowers are white or cream and are

followed by capsules which are cone or cup shaped, 2–4 mm long and 3–5 mm wide (Brooker *et al.,* 2002; Hill, 2002).

Distribution

Black gum is endemic to south-eastern Australia and is found in the ACT, NSW and in a small isolated sub-population in Victoria (Brooker *et al.,* 2002; Hill, 2002). It is likely that these regions were connected in a colder palaeoclimate (DSE, 2004). The species occurs mainly in the wetter, cooler and higher parts of the tablelands (NSW OEH, 2013), and is found at altitudes of 600–1200 m and in areas with annual rainfall of 600–900 mm (Benson and McDougall, 1998; Douglas, *pers. comm.,* 2014b), although at least one sub-population is known to occur in an area of higher rainfall (~1800 mm per year) (NSW Scientific Committee, 2013). This species is likely to occur within at least one threatened ecological community, the Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion, which was listed as endangered in 2011.

ACT and NSW:

In the ACT the species occurs to a very minor extent, with only 16 known mature trees in the wild in 2014. Older records identify a further two mature trees by the Kings Highway, but these have subsequently been removed (Environment and Planning Division (EPD), *pers. comm.,* 2014). There are an additional 20 trees planted in the Canberra suburb of Garran and more in Yarralumla that were cultivated by the CSIRO Division of Forestry (EPD, *pers. comm.,* 2014). The stand in the ACT is stable but its ability to increase in the future is very limited as a result of the threats facing the species. Only two seedlings are known to authorities and these are located in the Kings Highway corridor and face an uncertain future (EPD, *pers. comm.,* 2014). The plants found in the ACT occur on the western edge of the species' distribution in NSW.

In NSW, the species occurs predominantly in the South Eastern Highlands IBRA bioregion with the most eastern part of the distribution being located just within the Sydney Basin IBRA bioregion (NSW Scientific Committee, 2010). Following a survey in 2002 / 2003 there were believed to be approximately 110 stands in NSW, of which approximately 56% consist of scattered trees on grazed privately owned land or as linear clusters along road edges (Field, 2008). Although a few new locations have been recorded since this survey, all are very small and have not expanded the known range or habitat of the species, nor significantly altered the understanding of its abundance or conservation status (Douglas, *pers. comm*., 2014a). In their 2010 assessment of this species the NSW Scientific Committee considered there to be 130–150 stands in NSW (NSW Scientific Committee, 2010).

Compilation of available survey data indicates that 6300–8100 mature trees occur in NSW (NSW Scientific Committee, 2010). Field (2008) estimated in his study that only 9% of stands had more than 200 mature trees and occurred in continuous woodland vegetation habitat likely to represent habitat conditions prior to European land clearing. He also found that 56% of stands surveyed consisted of fewer than 40 trees. The largest black gum stands in NSW contain around 700–1000 mature trees, which is small compared to the characteristic largest stands of other *Eucalyptus* species (Field, 2008). The largest stands include Black Springs, Wallerawang, south of Braidwood near the Shoalhaven River, and the Bendoura Travelling Stock Reserve (Field, *pers. comm*., 2014). A stand was recently discovered near Sunny Corner, NSW, where there had previously been no records since 1925. This site was thought to contain at least hundreds of individual trees with lots of regeneration (Mjadwesch, *pers. comm.,* 2014).
Five small stands are located in the NSW reserve system, including Tallaganda, Morton, Yanununbeyan, and Blue Mountains National Parks, and Turallo Nature Reserve (Field, 2008: NSW Scientific Committee, 2010). Douglas (2009) states that trees in reserves are small, and these are often located on the periphery of conservation estates where threats to habitat quality and viability may be more significant in number and intensity than within core areas. .

In 2013 the NSW Scientific Committee determined that three stands of black gum located in the Wingecarribee local government area form a distinct sub-population given their disjunction from other stands of black gum. This was based on estimates of pollen and seed dispersal that mean they are unlikely to interact with other black gum (NSW Scientific Committee, 2013). This sub-population was determined to be an endangered population in Part 2 of Schedule 1 of the *Threatened Species Conservation Act 1995* and was also deemed to be highly fragmented (NSW Scientific Committee, 2013). No research has been conducted to determine whether gene flow is occurring between other stands in NSW, however given the fragmented nature of the stands across NSW and using the precautionary principle, it is likely that that there are several more distinct sub-populations across NSW.

Victoria:

The Victorian stands are considered a sub-population given they are located several hundred kilometres from the closest stands in NSW (DSE, 2004). It has been suggested that this sub-population is the result of accidental introduction (Gullan, 2014), however the predominant view is that it is natural (DSE, 2004). A specimen was collected from Daylesford, approximately 30 km away in 1965. This was later confirmed as black gum however the site has not been relocated since but if it were to be it would be a site of high significance (DSE, 2004; Murphy, *pers. comm.,* 2015). No range extensions have been recorded since the original listing of the species as threatened in Victoria (SAC, *pers. comm.,* 2014).

All known stands are located within four kilometres of the town of Woodend, occurring primarily along roadsides and streamlines (Gullan, 2014; SAC, *pers. comm.,* 2014). The species is considered to be severely fragmented as a result of extensive land clearing (SAC, 1993; DSE, 2004; SAC, *pers. comm.,* 2014). Trees are largely restricted to small, isolated stands in the highly modified agricultural and urban environments around Woodend, where little native vegetation remains (Murphy, *pers. comm.,* 2014). A majority of the known stands in Victoria, including the majority of mature trees, are found on private property. One study found that 64% of stands occurred on private land with the remainder on public land that is not managed primarily for flora and fauna conservation (DSE, 2004; Gullan, 2014). The species is not well represented in the Victorian reserve system (DSE, 2004).

Surveys in the mid-1990s estimated the total number of trees as 9000–10 000, with approximately 1000 mature and 8000 immature trees (DSE, 2004). The current status of this subpopulation is unknown. The Victorian Scientific Advisory Committee (*pers. comm..* 2014) states that the majority of individuals are juveniles (seedlings or saplings) with fewer than 1000 mature trees. Few Victorian stands would be considered to be self-sustaining and many mature trees appear in poor health (Murphy, *pers. comm.,* 2014). The Victorian environment department undertook surveys in 2012 but this work was not completed. The preliminary data suggest the total number of plants (mature and juvenile) is now just less than 9000 (Murphy, *pers. comm.,* 2015). Community engagement in the Woodend area has seen the species included in restoration projects on public land since 2004. The survival rate is thought to have exceeded 80%, which has helped to boost the sub-population (Murphy, *pers. comm.,* 2014; SAC, *pers. comm.,* 2014; Yates, *pers. comm.*, 2015).

Area of Occupancy and Extent of Occurrence:

The area of occupancy (AOO) for black gum is estimated by the Department of the Environment (the Department) to be 808 km^2 in NSW and 56 km^2 in Victoria (total 864 km^2) (Department of the Environment, unpublished data, 2015). The extent of occurrence is estimated by the Department to be 113 000 km^2 for the species (Department of the Environment, unpublished data, 2015). In their 2010 assessment of the species in NSW the NSW Scientific Committee stated that the AOO, based on 2 x 2 km grids, is 520–580 km^2 and the extent of occurrence (EOO) is 28 000 km^2 (NSW Scientific Committee, 2010).

The Department figure for AOO differ from those of the NSW Scientific Committee as they include more recent data and data not in the possession of NSW OEH at the time of their assessment. The Department figure for EOO differ from the NSW one as they cover the national range of the species. Although the IUCN Red List Categories and Criteria state that EOO may exclude disjunctions within the overall distribution of the taxa, this is strongly discouraged for assessments of criterion 2 and therefore the area between the NSW and Victorian subpopulations has not been excluded from this calculation. The Department's figures have been used in this assessment. There are no published measures of either AOO or EOO for the Victorian sub-population. The AOO in the ACT is one hectare (<1 km^2) (EPD, *pers. comm.,* 2014).

Relevant Biology/Ecology

Black gum grows on alluvial soils in, poorly-drained flats and hollows adjacent to swamps, creeks and small rivers and up adjoining slopes (up to eight metres above waterline) onto Ordovician Sandstones and shales (DSE, 2004; NSW OEH, 2013). It is usually found in open woodland with a grassy understory dominated by river tussock (*Poa labillardierei*) or kangaroo grass (*Themeda triandra*) and with few shrubs present (DSE, 2004; NSW OEH, 2013). Black gum is often found with other eucalypts including snow gum (*Eucalyptus. pauciflora*), manna or ribbon gum (*E. viminalis*), candlebark (*E. rubida*), black sallee (*E. stellutata*) and swamp gum (*E. ovata*) (Brooker *et al*., 2002; Field, 2008; NSW OEH, 2013).

Black gum flowers from November through to May (Benson and McDougall, 1998) and DSE (2004) suggest that pollination is likely to occur by a range of insects, birds and mammals. Field *et al*. (2008) states the pollination system is probably entomophilous (insect mediated) due to floral foraging by a diversity of insect species including the honeybee *Apis mellifera* and native bees such as *Leioproctus* (Colletidae). Seed is dispersed locally by wind, water and gravity and there is no dormancy phase. Maximum seed fall is thought to be between late summer and early autumn (Benson and McDougall, 1998).

Black gum forms a lignotuber and resprouts from epicormic buds (Benson and McDougall, 1998; Brooker *et al*., 2002). The effects of fire on black gum are unknown. DSE (2004) state it is not thought to be a significant pressure on the species, however it has been suggested that frequent burn regimes may increase mortality of juveniles (Murphy, *pers. comm.,* 2014). The species is thought to live for more than 100 years (Benson and McDougall, 1998). The exact reproductive age of black gum is unknown but observations of some naturally recruited trees in the ACT suggest that the species attains reproductive maturity in fewer than 20 years (EPD, *pers. comm.,* 2014). The generation length of black gum is not known.

Threats

The direct threats facing black gum include mortality, suppression of gene flow, lack of recruitment and hybridisation. These threats were and are caused by a range of indirect drivers. Climate change is likely to exacerbate some of these threats in the future.

Increased rate of mortality:

The loss of mature trees results from both natural and human mediated causes. Natural causes include senescence, wind storms, fire and disease, while most human mediated mortality results from land clearing. This can be for farming and urban development and is considered to be a past, current and future threat. The extent of landscape-scale clearing of known and likely habitat for black gum across its range suggests that mortality of mature trees has had a significant impact on the species. In NSW black gum habitat has been cleared or modified for urbanisation, agriculture, the plantation industry and the mining industry, and areas of suitable habitat between remnant stands no longer support black gum and show evidence of tree removal and thinning (Douglas, 2009; NSW Scientific Committee, 2010). In Victoria, habitat has

been subjected to extensive clearing for urban development and grazing as it occurs in a region that is becoming increasingly urbanised (DSE, 2004; Murphy, *pers. comm.,* 2014; SAC, *pers. comm.,* 2014). Although many stands are incorporated into the Vegetation Protection Overlays in the Victorian Planning Provisions, specific protection is only afforded in the instance that a planning permit is required. Thus, small-scale native vegetation clearance on private land, typical in urban environments, continues (Murphy, *pers. comm.,* 2014). The demand to subdivide farming properties for rural-residential use is increasing across both NSW and Victoria, meaning small scale clearing poses a considerable threat (Douglas, 2009; NSW OEH, 2013).

Additional causes of mortality, which are often associated with land clearing and urbanisation, include road maintenance, soil erosion and modification of the water table. The loss of individuals from road maintenance and widening activities is a significant threat across the species' range, particularly as many stands are restricted to road verges. This is a significant short term threat to the stand in the ACT (EPD, *pers. comm.,* 2014). The restricted presence of individuals on roadside verges can also result in physiological stress and an increased susceptibility to diseases and insect attack (SAC, 1993). Soil erosion can cause mature trees to die as a result of being undermined and destabilised (Murphy, *pers. comm.,* 2014).
The modification of the water table as a result of mining activities is a cause of localised mortality, where discharges of highly saline mine water may artificially raise the water table, while subsidence due to underground mining may alter aquifers and lower the water table, however this is not a significant threat at the national scale (Lithgow Environment Group, *pers. comm.,* 2014; Douglas, *pers. comm.,* 2015). Earthworks that reconfigure surface drainage and prolonged flooding could also cause localised mortality, particularly in urbanised and heavily cleared rural catchments (Murphy, *pers. comm.,* 2014; Douglas, *pers. comm.,* 2015; Field, *pers. comm.,* 2015). Diseases are potential threats to the species. These include *Phytophthora cinnamomi* (cinnamon fungus) and *Puccinia psidii s.l* (myrtle rust). Both are found in NSW and Victoria but their impact on this species is currently unknown (Murphy, *pers. comm.,* 2014).

Suppression of gene flow:

The clearing of land for industry, farming and urban development has led to the fragmentation of black gum across its entire range (DSE, 2004; NSW Scientific Committee, 2010). Pollen movement for black gum is less than one kilometre and seed dispersal can be up to 300 m (NSW Scientific Committee, 2013), although it is generally much less (Broadhurst, *pers. comm.,* 2014). Given these figures it is likely that black gum is severely fragmented across its range. The Victorian and Wingecarribee sub-populations have been assessed as severely fragmented (DSE, 2004; NSW Scientific Committee, 2013; SAC, *pers. comm.,* 2014). This fragmentation may have led to the suppression of gene flow between individuals. In their study of *Eucalyptus benthamii*, Butcher *et al*. (2005) found fragmentation and the isolation of trees resulted in higher levels of selfing and bi-parental inbreeding. Genetic studies have not been carried out on black gum to determine the level of gene flow in relation to fragmentation and assess the level of risk that this poses.

Lack of Recruitment:

Lack of recruitment is a serious threat, particularly as mature trees are still being removed from the population by both natural events and as the result of habitat loss, habitat degradation and inappropriate management activities (NSW OEH, 2013). The ACT Government identifies this as a threat to its ongoing survival as 25% of the stand is becoming senescent and recruitment is extremely low (only two known saplings) (EPD, *pers. comm.,* 2014). Lack of recruitment is driven by livestock grazing, competition from weeds and inappropriate management activities (SAC, 1993; NSW Scientific Committee, 2010). Grazing by livestock decreases levels of

recruitment dramatically (NSW OEH, 2013), which is seen in Victoria where grazed farms have no regeneration below existing black gum (DSE, 2004). Large areas of black gum habitat in NSW are used for agriculture, including grazing (NSW Scientific Committee, 2010). At many sites in NSW Field (*pers. comm.,* 2015) found cattle and sheep frequently graze or damage juvenile black gums reducing recruitment.

Weeds suppress recruitment through competition. The presence of weeds can result from elevated soil fertility as a result of fertilisation of pastures, either by fertilisers or the presence of livestock. The moderately fertile and seasonally moist habitat of black gum is particularly prone to weed invasion (Douglas, 2009). Clearing of native vegetation also provides favourable conditions for the establishment of exotics and the extent and intensity of weed invasion in the often unmanaged or poorly managed lands is a significant threat (Douglas, 2009). Almost all understorey vegetation in Victoria in black gum habitat is introduced (DSE, 2004). Weeds that suppress recruitment include blackberry (*Rubus* spp.), harding grass (*Phalaris aquatica*), canary grass (*Phalaris canariensis*), cocksfoot (*Dactylis glomerata*), willows (*Salix* spp.) and scotch broom (*Cytisus scoparius*) (Field, 2008; Douglas, 2009).

Lack of recruitment is also caused by inappropriate management activities, particularly in highly managed urban and semi-urban areas, such as slashing, mowing and herbicide use (DSE, 2004; NSW OEH, 2013). In Victoria many plants occur in residential gardens and urban parklands that are highly disturbed and frequently subject to mowing, meaning there is little suitable habitat for these stands to recruit and expand (Murphy, *pers. comm.,* 2014). Seedlings on roadsides are at risk from roadside maintenance work. Approximately 56% of black gum stands in NSW and 83% in Victoria occur on private land or roadsides, which are not managed primarily for conservation, and therefore lack of recruitment as a result of inappropriate land management is a threat (Field, 2008).

Other potential threats to recruitment include soil erosion and increased fire frequency (Murphy *pers. comm*., 2014*).* The potential impacts of the escalation of fuel reduction burning in Victoria are currently unknown for this species. However, too frequent burn regimes would most likely cause an increase in the mortality of juvenile plants, negatively influencing recruitment (Murphy, *pers. comm.,* 2014). Genetic hybridisation can also lead to a lack of recruitment.

Hybridisation:

Genetic hybridisation is a natural process for Eucalypts, and Black gum is known to naturally hybridise with manna gum and candlebark, which co-occur across much of black gum's range (Griffin *et al*.*,* 1988). Anecdotal evidence suggests that the species can also hybridise with *E. macarthurii,* although they rarely co-occur (Douglas, *pers. comm.,* 2014b). Although a natural process, high rates of hybridisation may lead to the extinction of populations, particularly if one taxon is rare. Hybridisation contributes to species decline in two ways, via demographic swamping and/or introgression, which often work in synergy (Wolf *et al*.*,* 2001). In some taxa the decline in numbers of genetically pure individuals due to hybridisation has been shown to act very fast (extinction within five generations for some species) and this decline can accelerate due to the feedback effect (Wolf *et al*.*,* 2001). Field (2008) demonstrated that small, fragmented stands of black gum are at particular risk from hybridisation, particularly where they are out-numbered by compatible species. In these areas in NSW he found a particular risk from increased hybrid production and reduced seed production, germination and survivorship of seed cohort (Field, 2008). As many as 35% of seed crops in small remnant stands in were hybrids (Field, 2008). In Victoria the species is also known to hybridise with swamp gum, however the extent of hybridisation is unknown and hybrids are considered rare (DSE, 2004). However, this rarity could be the result of the low level of natural regeneration in which hybrid traits can be observed, rather than a lower level of hybridisation.

The historical significance of hybridisation in black gum is unknown. The current and future level of threat is dependent on the size of the stand, level of fragmentation and presence of compatible Eucalyptus species. Hybridisation is more likely to be a threat in small, isolated stands of black gum that are outnumbered by compatible species, but is less likely to be a concern in larger stands. Given that the distribution of black gum is severely fragmented and the majority of black gum stands are small (56% in NSW contain fewer than 40 individuals), hybridisation is a particular concern. Under the NSW 'Saving Our Species' program for this species management actions include augmenting extant wild stands with ex-situ material to mitigate the effects of hybridisation (NSW OEH, 2014). This threat is complicated by the apparent difficulty for non-experts to distinguish between hybrid and black gum juveniles (Murphy, *pers. comm.,* 2015). An additional potential cause of hybridisation, and threat to the species, is the fact that black gum has been planted with manna gum, candlebark and swamp gum during revegetation work in Woodend (DELWP, 2014; Yates, *pers. comm.*, 2015), and possibly throughout the rest of its range, potentially creating conditions for the proliferation of F1 hybrids.

Climate change:

Climate change is likely to influence many of the threats to black gum. As black gum's range includes frost hollows and areas with annual rainfall of 600–900 mm, under conditions of increased average temperatures and lower effective rainfall, the viability of the population could be reduced (Hennessy *et al.,* 2004; NSW Scientific Committee, 2010). Climate change is also likely to decrease the survival of black gum as it may lead to more frequent, severe and protracted droughts, increased storm events and more frequent and intense fires, all of which will increase mortality. It also may influence the lack of recruitment by intensifying the threat from weeds and increasing the competition from native Eucalypts that invade new habitats (Douglas, 2009; NSW OEH, 2013).

How judged by the Committee in relation to the EPBC Act Criteria and Regulations

Criterion 1. Population size reduction (reduction in total numbers) Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4			
	Critically Endangered Very severe reduction	**Endangered Severe reduction**	**Vulnerable Substantial reduction**
A1	**≥ 90%**	**≥ 70%**	**≥ 50%**
A2, A3, A4	**≥ 80%**	**≥ 50%**	**≥ 30%**

A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.

A2 Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction may not have ceased OR may not be understood OR may not be reversible.

A3 Population reduction, projected or suspected to be met in the future (up to a maximum of 100 years) [(*a) cannot be used for A3*]

A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.

based on any of the following:

(a) direct observation [*except A3*]

(b) an index of abundance appropriate to the taxon

(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat

(d) actual or potential levels of exploitation

(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites

Evidence:

Insufficient data to determine eligibility

There is insufficient evidence to estimate the population trend or rate of population change over the past three generations. The Committee considers that there is insufficient information to determine the eligibility of the species for listing in any category under this criterion.

Criterion 2. Geographic distribution is precarious for either extent of occurrence AND/OR area of occupancy			
	Critically Endangered Very restricted	**Endangered Restricted**	**Vulnerable Limited**
B1. Extent of occurrence (EOO)	**< 100 km²**	**< 5,000 km²**	**< 20,000 km²**
B2. Area of occupancy (AOO)	**< 10 km²**	**< 500 km²**	**< 2,000 km²**
AND at least 2 of the following 3 conditions:			
(a) Severely fragmented OR Number of locations	**= 1**	**≤ 5**	**≤ 10**
(b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals			
(c) Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (number of mature individuals			

Evidence:

Eligible under Criterion 2 B2,(a),(b)(iii)(iv)(v) for listing as vulnerable.

According to the Department of the Environment the AOO of black gum across its range, based on 2 x 2 km grids, is 864 km^2. Therefore the area of occupancy of black gum is considered *limited* .The EOO of black gum across its range is 113 000km^2. Therefore the extent of occurrence of black gum is outside the range required for listing.

In Victoria the sub-population is considered severely fragmented. The Wingecarribee sub-population is disjunct from the rest of the NSW stands and is severely fragmented.

Approximately 56% of the NSW locations consist of scattered trees on heavily grazed privately owned land or as linear clusters on road edges. Therefore the entire distribution of black gum is considered to be severely fragmented.

Given the threats that affect black gum there is a projected continuing decline in the area, extent and quality of its habitat and the number of locations. Given the lack of recruitment into the population at many sites, there is also a projected decline in the number of mature individuals as mature individuals are lost and are not replaced.

Extreme fluctuations in the extent of occurrence, area of occupancy, number of locations or the sub-populations are not known to have occurred. Therefore the species is not eligible for B2 (c).

The Committee considers that the species' area of occupancy is limited, the geographic distribution severely fragmented and a decline in the area, extent and quality of its habitats, the number of locations and the number of mature individuals may be inferred or projected.

Criterion 3. Small population size and decline			
	Critically Endangered Very low	**Endangered Low**	**Vulnerable Limited**
Estimated number of mature individuals	**< 250**	**< 2,500**	**< 10,000**
AND either (C1) or (C2) is true			
C1 An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future	**Very high rate 25% in 3 years or 1 generation (whichever is longer)**	**High rate 20% in 5 years or 2 generation (whichever is longer)**	**Substantial rate 10% in 10 years or 3 generations (whichever is longer)**
C2 An observed, estimated, projected or inferred continuing decline AND its geographic distribution is precarious for its survival based on at least 1 of the following 3 conditions:			
(a) (i) Number of mature individuals in each subpopulation	**≤ 50**	**≤ 250**	**≤ 1,000**
(a) (ii) % of mature individuals in one subpopulation =	**90 – 100%**	**95 – 100%**	**100%**
(b) Extreme fluctuations in the number of mature individuals			

Evidence:

Insufficient data to determine eligibility

Although this species has a limited number of mature individuals (< 10 000), there is insufficient evidence to assess the number or percentage of mature individuals in each sub-population or predict the rate of decline. The Committee considers that there is insufficient information to determine the eligibility of the species for listing in any category under this criterion.

Criterion 4. Very small population			
	Critically Endangered Extremely low	**Endangered Very Low**	**Vulnerable Low**
Number of mature individuals	**< 50**	**< 250**	**< 1,000**

Evidence:

Not eligible

The total number of mature individuals is at least 6300 in NSW and fewer than 1000 in Victoria, therefore the total is not considered extremely low, very low or low. Therefore, the species has not been demonstrated to have met this required element of this criterion.

Criterion 5. Quantitative Analysis			
	Critically Endangered Immediate future	**Endangered Near future**	**Vulnerable Medium-term future**
Indicating the probability of extinction in the wild to be:	**≥ 50% in 10 years or 3 generations, whichever is longer (100 years max.)**	**≥ 20% in 20 years or 5 generations, whichever is longer (100 years max.)**	**≥ 10% in 100 years**

Evidence:

Insufficient data to determine eligibility.

Population viability analysis has not been undertaken for black gum.

Conservation Actions

Recovery Plan

Eucalyptus aggregata (black gum) does not require a recovery plan. This species is found in NSW and the ACT with a disjunct sub-population around Woodend in Victoria. There are fewer than 10 000 mature trees left, with the majority (6300 – 8000) occurring in NSW. The major threats to the species are mortality as a result of habitat clearance, suppression of gene flow due to habitat fragmentation, lack of recruitment and genetic hybridisation. The level of cross-jurisdictional co-ordination and co-ordination between managers required is low given that the species does not move between sites across its range and the actions to abate them do not require co-ordinated implementation. A high level of support by stakeholders is essential to stop the decline and support the recovery of this species. There are comprehensive mechanisms in place that enable stakeholder support and this support has already been demonstrated by many individuals/organisations. The species does not require a high level of prioritisation or adaptive management as the threats and threat abatement methods are relatively well understood and unlikely to change.

Primary Conservation Objectives

1. Maintain and increase the number and size of wild populations.
2. Maintain and enhance quality existing and potential habitat.
3. Abate identified threats where possible.
4. Investigate options for linking, enhancing or establishing additional populations.
5. Raise awareness of black gum within the local community.
6. Effectively administer the recovery effort.

Important populations

Given its disjunct location, the Woodend sub-population is considered to be important, as is the Wingecarribee local government area sub- population that has been listed as an endangered population by the NSW Scientific Committee. The larger and more viable stands of black gum in NSW are important and include locations at Black Springs, Wallerawang, south of Braidwood near the Shoalhaven River, and the Bendoura Travelling Stock Reserve (Field, pers. comm., 2014). The NSW OEH 'Saving Our Species' program has identified four management sites, including a site in the Bendoura area, Back Creek Travelling Stock Reserve, Cox Rivers area and one potential translocation site (NSW OEH, 2013), all of which should be considered important stands. The ACT stand of black gum is important as it occurs on the edge of the species' distribution and may contain important genetic variability which could be of assistance to the conservation of the species in a changing climate (EPD, *pers. comm.,* 2014).

Conservation and Management Actions

1. Avoid the use of fertilisers in or around stands of black gum where weeds may flourish.
2. Advise landholders of presence, and encourage and support appropriate conservation practices.
3. Manage sites to identify, control and reduce the spread of invasive weeds.
4. If maintenance activities occur in the area (e.g. roadside maintenance, mowing, spraying, slashing etc.), ensure land owners/managers use an appropriate management regime that does not detrimentally affect this species and will allow regeneration from seedlings.
5. Manage the population to maintain genetic diversity.
6. Implement an appropriate fire management regime for protecting key habitat.
7. If livestock grazing occurs in the area, ensure land owners/managers use an appropriate management regime and density that does not detrimentally affect this species, will allow regeneration from seedlings and manage total grazing pressure at important sites through exclusion fencing or other barriers.
8. In collaboration with the Australian Seed Bank Partnership, use known protocols to establish ex-situ seed collections that capture genetic representation of the remaining populations as an insurance policy, to aid in re-establishing populations if needed in the future and to bolster stands where regeneration is not occurring.
9. Undertake translocations using the Australian Network for Plant Conservation (ANPC) guidelines to augment small stands identified as being at significant risk from hybridisation.
10. Consider the removal of hybrids in the context of maintaining evolutionary potential and reducing risk of species loss through hybridisation.
11. Work with local groups to ensure the ANPC guidelines are followed when undertaking revegetation work using Black gum.
12. Implement appropriate vehicle and footwear hygiene protocols where possible to avoid the spread of *phytophthora* and myrtle rust.

Monitoring priorities

1. Design and implement a monitoring program to monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.
2. More precisely assess population size, distribution, ecological requirements and the relative impacts of threatening processes.

Information and research priorities

3. Undertake genetic analyses to:
    - assess current gene flow (using markers and analyses capable of distinguishing population divergence on an evolutionary timescale, from that which might be due to more recent impacts); and
    - identify populations with low genetic diversity that might benefit from artificial introduction of genetic material from other populations from which they have relatively recently diverged.
    - identify stands where high levels of hybridisation is occurring that might benefit from artificial introduction of genetic material from other populations.
    - resolve whether the Victorian sub-population is natural or the result of introduction.
4. Identify optimal fire regimes for regeneration (vegetative regrowth and/or seed germination), and response to other prevailing fire regimes.
5. Conduct research to determine the susceptibility of the species to phytophthora and myrtle rust.

Recommendations

(i) The Committee recommends that the list referred to in section 178 of the EPBC Act be amended by **including** in the list in the vulnerable category:

Eucalyptus aggregata

(ii) The Committee recommends that there should not be a recovery plan for this species.

Threatened Species Scientific Committee

03/03/2015

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