Conservation Assessment of *Eucalyptus tetrapleura* L.A.S.Johnson (Myrtaceae)

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Eucalyptus tetrapleura L.A.S.Johnson (Myrtaceae)

Distribution: Endemic to NSW
Current EPBC Act Status: Vulnerable
Current NSW BC Act Status: Vulnerable

Proposed listing on NSW BC Act: Endangered

Reason for change: Non-genuine change due to the assessment being undertaken using IUCN Criteria.

Summary of Conservation Assessment

Eucalyptus tetrapleura was found to be Endangered under IUCN Criterion B1ab(iii,v)+2ab(iii,v).

The reasons for the species being eligible for listing are: (1) it has a highly restricted geographic distribution with an extent of occurrence of 1,873 km^2 and an area of occupancy of 416 km^2; (2) it occurs in a single threat-defined location; and (3) continuing decline in the number of mature individuals and the area, extent and quality of habitat is estimated due to habitat clearing, fragmentation and degradation and inferred due to genetic swamping from interspecific hybridisation as a consequence of increased habitat fragmentation and adverse fire regimes (particularly high frequency fire and high severity fire).

Characteristic square fruit of *Eucalyptus tetrapleura* in Lanitza, NSW. Photo: Gavin Phillips/DCCEEW.

Description and Taxonomy

Eucalyptus tetrapleura L.A.S.Johnson, the square-fruited ironbark (OEH 2023), is a conventionally accepted species in the family Myrtaceae (CHAH 2025; PlantNet 2025). *Eucalyptus tetrapleura* is described as a "tree to 30 m high; bark persistent throughout, grey-black to grey-brown, 'ironbark'. Juvenile leaves disjunct, broad-lanceolate to ovate, dull green. Adult leaves disjunct, lanceolate to broad-lanceolate, 12–20 cm long, 1.5–3 cm wide, green, dull, concolorous. Conflorescence compound; umbellasters 7-flowered; peduncle narrowly flattened or angular, 15–30 mm long; pedicels 4-angled, 8–12 mm long. Buds fusiform, 10–13 mm long, 4–5 mm diam., scar present; calyptra conical, shorter and narrower than the 4-angled hypanthium. Outer stamens infertile; anthers cuboid. Fruit conical or pyriform, 4–5-locular, 4-angled, 8–10 mm long, 6–8 mm diam.; disc depressed; valves enclosed" (Hill 1991).

Brooker (2000) placed *Eucalyptus tetrapleura* in subgenus *Symphyomyrtus* section *Adnataria* series *Rhodoxyla* subseries *Concolores*. The most closely related species to *E. tetrapleura* is *E. fusiformis* (Nicolle 2024), which can be distinguished from *E. tetrapleura* by having rounded fruit (Slee *et al*. 2020). Within subseries *Concolores*, *E. tetrapleura* and *E. caleyi* subsp. *ovendenii* are the only members with distinctly four-sided buds and fruit, with the other species in the group having buds and fruit that are rounded in cross-section (Slee *et al*. 2020). *Eucalyptus caleyi* subsp. *ovendenii* can be distinguished by having glaucous to grey green adult leaves and glaucous buds and fruit (Slee *et al*. 2020). *Eucalyptus tetrapleura* may be confused with other ironbarks within its distribution: *E. crebra*, *E. fibrosa* subsp. *fibrosa*, *E. ophitica*, and *E. siderophloia*, all of which differ in having buds with stamens all fertile and irregularly flexed and buds and fruit rounded in cross-section (Slee *et al*. 2020).

Distribution and Abundance

Eucalyptus tetrapleura is endemic to a small area around Grafton on the North Coast of New South Wales (NSW) (Rutherford *et al.* 2019), which is within the South Eastern Queensland bioregion (Fig. A1; Commonwealth DCCEEW 2012). It is bounded roughly by the Clarence River in the north, Bookam in the east, Chambigne in the west, and Kremnos in the south. The distribution of *E. tetrapleura* occurs on the traditional lands of the Gumbaynggirr and Yaegl peoples (AIATSIS 1996; Native Land Digital 2024; Clarence Valley Council 2025).

Eucalyptus tetrapleura occurs in a single known subpopulation, as per the IUCN (2024) definition. Genetic analysis has shown that *E. tetrapleura* has extensive gene flow across its distribution, resulting in an absence of distinct provenances (ReCER 2017).

Extent of occurrence and area of occupancy

The area of occupancy (AOO) is estimated to be 416 km^2 and was calculated using 2 x 2 km grid cells, the scale recommended by IUCN (2024). The extent of occurrence (EOO) was calculated at 1,873 km^2 and is based on a minimum convex polygon enclosing cleaned mapped occurrences of the species, the method of assessment recommended by IUCN (2024). Both EOO and AOO exclude records north of the Clarence River, consistent with a recent study that found all stands north of the Clarence River were entirely of hybrid origin (Rutherford *et al.* 2019). If records north of the Clarence River are included, the EOO would be 2,903 km^2 and the AOO 496 km^2. Both EOO and AOO were calculated using ArcGIS (Esri 2015).

The current distribution estimate is based on 1,302 unique and cleaned records compiled from NSW BioNet Atlas, Atlas of Living Australia, and herbarium specimens (ANHSIR 2024; RBGDT 2024; ALA 2025; BioNet 2025). Ninety-one records were excluded from the assessment: seven records were of cultivated specimens, 23 had inadequate data to spatially validate, 19 were specified to be hybrids, and 41 were inferred to be hybrids due to being north of the Clarence River, consistent with Rutherford *et al.* (2019).

Population size

Rutherford *et al.* (2019) undertook sampling at 22 sites from across the known distribution of *Eucalyptus tetrapleura* for genomic analyses. Of 169 samples that were collected in the field as *E. tetrapleura*, 104 samples were found to be 'pure' *E. tetrapleura* with the remainder mostly being hybrids *with E. siderophloia* and *E. fibrosa* (Rutherford *et al.* 2019). All samples collected as *E. tetrapleura* from an area stretching along the Pacific Highway between Glenugie and Dirty Creek south of Grafton were assigned as pure *E. tetrapleura* in these genetic analyses (Rutherford *et al.* 2019). In this area alone, which includes large areas of Glenugie State Forest (SF) and Newfoundland SF, it is estimated that there are no fewer than 10,000 mature individuals of *E. tetrapleura* present (G. Phillips pers. comm. February 2025). Previous estimates based on morphology and predictive mapping have put the population as high as 170,000–250,000 individuals (Woolgoolga to Ballina Planning Alliance 2012), although it is noted that this figure is likely to include hybrids (A. Carty *in litt.* January 2025).

Ecology

Habitat

Eucalyptus tetrapleura typically occurs in open forest or woodland, on moderately fertile sandstone to clay soils, often in topographically lower areas (Hill 1991; OEH 2023).

Commonly co-occurring species may include *Eucalyptus tereticornis*, *E. siderophloia*, *E. fibrosa*, *E. bancroftii*, *E. tindaliae*, *E. umbra*, *Corymbia henryi*, *C. variegata*, *C. gummifera*, *Alphitonia excelsa*, *Allocasuarina littoralis*, and *Acacia leiocalyx* (RBGDT 2024; BioNet 2025).

Fire and disturbance ecology

The fire response of *Eucalyptus tetrapleura* has not been documented. The species produces a lignotuber (Slee *et al.* 2020) but is thought to be predominantly a seed-based regenerator with some capacity for resprouting (R. Kooyman *in litt.* January 2025). Based on Nicolle (2006) the species is classified as a combination sprouter, resprouting after fire both basally from a lignotuber and epicormically. Many eucalypts are post-disturbance recruiters with most species classified as facultative resprouters – species which resprout after crown-scorching fire, and with seedling recruitment also maximised following a disturbance such as fire (Vivian *et al.* 2008). Being a combination sprouter, it is inferred that *E. tetrapleura* displays this response.

Reproductive and seed ecology

Eucalyptus tetrapleura has been observed flowering from June to August (Slee *et al*. 2020). Eucalypts are commonly self-compatible (Wilson 2002) but often have a mixed mating system with preferential outcrossing (Breed *et al*. 2015). The specific

pollinators of *E. tetrapleura* are unknown. Pollinators of eucalypt species include insects, birds, and mammals (Potts and Gore 1995; Wilson 2002; Griffin *et al*. 2009). As gene flow in *Eucalyptus tetrapleura* appears to be unrestricted (ReCER 2017), it is likely longer-distance pollen vectors, such as birds and bats, are involved in the pollination of the species.

Seed dispersal in eucalypts is typically localised, with dispersal distance influenced by factors such as tree height, canopy width, seed weight, and wind strength (Booth 2017). Eucalypts form a canopy seedbank from which seed may be released continuously over time or *en masse* following disturbance (*e.g*., after fire) (Yates 1994). High rates of seed predation by ants often result in the complete removal of seed, preventing the establishment of a soil seedbank (O'Dowd and Gill 1984; Yates *et al* 1994; Setterfield and Anderson 2018). Most eucalypts produce non-dormant seeds (Baskin and Baskin 2014). Seeds which escape predation appear to be short-lived and are unlikely to form a persistent soil seedbank (Yates 1994). The synchronised mass release of seed following disturbance results in predator (ant) satiation, allowing for a soil seedbank to establish long enough to enable the emergence of seedlings (O'Dowd and Gill 1984). This process also occurs after other large-scale disturbances, such as floods, severe storms, and droughts (Yates 1994). Seedling establishment and survival is influenced by availability of soil moisture, nutrients and light; invertebrate predator intensity, and competition for resources (Tozer and Bradstock 1997; Vivian *et al.* 2008).

Lifespan and generation length

Eucalyptus tetrapleura is estimated to live for >500 years (F. Forest *in litt.* February 2021). This is within the estimated range for other coastal ironbark species, such as *E. fibrosa* and *E. crebra*, which have been estimated to live up to ~460 and 820 years, respectively (Wormington *et al.* 2003). The primary juvenile period of resprouting eucalypt species has been found to be 3.5–8 years, with a mean of ~5 years (Nicolle 2006).

The generation length of *Eucalyptus tetrapleura*, which is likely to rely on a combination of resprouting and seedling recruitment after disturbance, can be estimated using the age of first reproduction + (*z* * length of reproductive period), where *z* is a number between 0 and 1 calculated on the relationship between survivorship and the relative fecundity of young versus old individuals in the population (IUCN 2024). Using a maximum lifespan of 500 years, a primary juvenile period of 5 years, and a value for *z* of 0.33 as calculated for other long-lived plant species (Fung and Waples 2017), the generation length of *E. tetrapleura* is estimated at approximately 168 years.

Cultural significance

It is unknown whether *Eucalyptus tetrapleura* has cultural significance to Aboriginal peoples, although other ironbark species are known to have been culturally significant. For example, the bark of *E. paniculata*, which occurs in coastal NSW and Queensland, was used for the creation of canoes, shelters, shields and containers, such as coolamons (National Trusts of Australia 2025). In Victoria, ironbarks were used for a range of purposes by local Aboriginal groups, with flowers used to make sweet beverages and wood used to make canoes, boomerangs, shields, spears, and throwing sticks (Environment Conservation Council 1997).

This assessment is not intended to be comprehensive of the traditional ecological knowledge that exists for *E. tetrapleura*, or to speak for Aboriginal people. Aboriginal people have a long history of biocultural knowledge, which comes from observing and being on Country, and evolves as it is tested, validated, and passed through generations (Woodward *et al*. 2020). Aboriginal peoples have cared for Country for tens of thousands of years (Bowler *et al*. 2003; Clarkson *et al*. 2017). There is traditional ecological knowledge for all plants, animals and fungi connected within the kinship system (Woodward *et al*. 2020). Traditional ecological knowledge referenced in this assessment belongs to the relevant knowledge custodian and has been referenced in line with the principals of the NSW Indigenous Cultural and Intellectual Property protocol (ICIP) (Janke and Company 2023).

Threats

Eucalyptus tetrapleura is threatened by habitat clearing, fragmentation, and degradation, adverse fire regimes (particularly high frequency and high severity fire), and genetic swamping from interspecific hybridisation as a consequence of increased habitat fragmentation.

Habitat clearing, fragmentation, and degradation

Across its range, *Eucalyptus tetrapleura* is threatened by habitat clearing, fragmentation, and degradation. Of the 1,301 records used in this assessment, only 44 occur on NPWS estate. Another 305 occur in state forests, where the species may be subject to timber harvesting and associated activities. The remainder occur on non-reserved lands, defined here as private land, council land, and Crown land. These records are vulnerable to clearing for agriculture, rural or industrial developments, and the establishment and maintenance of roads and other infrastructure.

The Coastal Integrated Forestry Operations Approval (CIFOA) has no specific prescriptions applied for the retention, protection or identification of *Eucalyptus tetrapleura* during forestry operations (NSW EPA 2018, NSW EPA 2023), instead considering the species to be adequately protected by the approval (NSW EPA 2023). Consequently, where *E. tetrapleura* occurs in state forests subject to timber harvesting, it is at high risk of being harvested. Forest (2021) documented the loss of several *E. tetrapleura* in Pine Brush SF in 2005 after road widening activities were undertaken for forestry operations. The species has also been harvested in Newfoundland SF (Forest 2021). There are currently planned forestry operations in Glenugie SF, where a high number of records occurs, with two harvesting plans set to commence within the next 6–18 months (FCNSW 2025). Less than 20% (216 ha) of plan number 200006529 and 33% (174 ha) of plan number 200001085 have been mapped for permanent protection (FCNSW 2025). It is inferred that *E. tetrapleura* individuals are at risk of being harvested in these compartments. However, across the entire State Forest estate over 40% is protected in conservation reserves (Slade and Law, 2018).

Road upgrades have also resulted in the loss of *Eucalyptus tetrapleura* and the clearing and fragmentation of habitat. The Pacific Highway – Woolgoolga to Ballina Upgrade resulted in the removal of ~50 ha of mapped habitat and an estimated 7,274 individuals (Woolgoolga to Ballina Planning Alliance 2012). The genetics study by Rutherford *et al*. (2019) found most of the stands that consisted entirely of 'pure' *E. tetrapleura* were in the vicinity of the Pacific Highway realignment. Works

associated with the Shannon Creek Dam project resulted in the destruction of 23 individuals, when a road associated with the dam was established (Edwards 2008).

In 1998–1999, approximately 180 ha of *Eucalyptus tetrapleura* habitat was cleared on a private property, resulting in the destruction of high numbers of *E. tetrapleura* (Forest 2021). A further five individuals were destroyed in 1999 on Kangaroo Creek Road, Coutts Crossing (Forest 2021).

'Clearing of native vegetation' is listed as a Key Threatening Process under the NSW *Biodiversity Conservation Act 2016*. 'Land clearance' is listed as a Key Threatening Process under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Genetic swamping from interspecific hybridisation as a consequence of increased habitat fragmentation

Eucalyptus tetrapleura is likely to be threatened by genetic swamping through hybridisation with co-occurring ironbark species (*Eucalyptus fibrosa* and *E. siderophloia*) (Rutherford *et al.* 2019). Hybridisation can be a natural evolutionary process or a consequence of anthropogenic disturbance (Allendorf *et al.* 2001). Small, fragmented, or isolated patches may be at higher risk of being genetically swamped by more common species as gene flow rates increase as the recipient population size decreases (Ellstrand and Elam 1993). Furthermore, disturbed habitats may favour the establishment of hybrids over 'pure' forms (Pryor 1953) and hybrids may have greater fertility than parent plants (Ellis 1991). Rutherford *et al.* (2019) found that sites comprised of isolated trees were either entirely of hybrid origin or consisted of both pure and hybrid individuals. Of 22 sites sampled, only seven were found to be comprised of 'pure' *E. tetrapleura* (Rutherford *et al.* 2019). The Pacific Highway realignment has resulted in increased fragmentation of remnant patches and isolated trees (Rutherford *et al.* 2019), which may further increase the extent of hybridisation. Given the extensive historical land clearing in the Grafton area, the more recent removal of stands of *E. tetrapleura* for Pacific Highway realignment, and the extensive hybridisation detected between co-occurring ironbark species, it is highly likely that *E. tetrapleura* is at risk of genetic swamping (Rutherford *et al.* 2019).

Adverse fire regimes

Eucalyptus tetrapleura is inferred to be threatened by adverse fire regimes (particularly high frequency fire and high severity fire). As a combination sprouter (*sensu* Nicolle 2006), the species has specific traits that enable vegetative recovery after fire. In eucalypts, fire often facilitates seedling recruitment (Vivian *et al*. 2008) but short inter-fire intervals may result in the disproportionate loss of juveniles in resprouting species (Bradstock and Myerscough 1988), potentially leading to long-term demographic shifts. Repeated short interval fires can also lead to reduced or failed resprouting in resprouting species (Enright *et al.* 2011; Karavani *et al.* 2018; Fairman *et al.* 2019).

Eucalyptus tetrapleura is most likely to have been affected by recurrent fire in four main areas: Chambigne–Shannondale, Glenugie SF, Newfoundland SF, and Pine Brush SF (Table 1; NPWS 2024).

Table 1. Fire history in select areas of the *Eucalyptus tetrapleura* distribution.

Area	Extent (sector)	Year
Chambigne–Shannondale	Partial (north)	2000–2001
	Partial (north)	2001–2002
	Partial (east)	2008–2009
	Partial (centre and south)	2011–2012
	Partial (east and north)	2013–2014
	Partial (east and south)	2015–2016
	Partial (east)	2019–2020
	Partial (north and centre)	2021–2022
	Partial (centre)	2022–2023
	Partial (centre and north)	2023–2024
Glenugie SF	Partial (south)	1966–1967
	Partial (north and south)	1994–1995
	Partial (north and centre)	2000–2001
	Partial (south)	2001–2002
	Partial (east)	2004–2005
	Partial (south and centre)	2014–2015
	Partial (centre)	2020–2021
Newfoundland SF	Partial (south)	1974–1975
	Partial (south)	1977–1978
	Partial (south)	1993–1994
	All sectors	2000–2001
	Partial (south)	2019–2020
Pine Brush SF	Partial (south)	1968–1969
	Partial (north)	1978–1979
	Partial (south)	2000–2001
	Partial (south)	2002–2003
	Partial (south)	2009–2010
	Partial (south)	2013–2014

For a combination sprouting species such as *Eucalyptus tetrapleura*, too frequent high severity fire can lead to a reliance on basal resprouting, due to the death of stems at

higher fire severities (Zimmer *et al.* 2021). Individuals with smaller stems are more likely to resprout from their bases only, resulting in a loss of height dominance (Zimmer *et al.* 2021). Frequent high severity fire would therefore be likely to shift stands to long-term reliance on basal resprouting due to the continual death of smaller stems. However, as *E. tetrapleura* relies predominantly on seedling recruitment to regenerate (R. Kooyman *in litt.* January 2025), a push to basal coppicing alone following fire is likely to be of little consequence overall, with seedling loss being of much greater consequence (G. Phillips *in litt.* February 2025).

It is evident that *Eucalyptus tetrapleura* persists in areas with a history of relatively frequent fire (Table 1). However, climate change projections indicate a future trend of increased frequency of severe fire weather and more frequent fires (Abatzoglou *et al*. 2019; Dowdy *et al*. 2019; Jones *et al*. 2022). The North Coast region is projected to become hotter, have more days over 35°C, have more dangerous fire weather days, and have a longer fire season by 2079 (BOM and CSIRO 2024; AdaptNSW 2025). Regionally, it is projected with high confidence that climate change will result in a harsher fire-weather climate in the future (CSIRO 2025). It is plausible that these changes will lead to more frequent, intense, and severe fires, which will in turn adversely affect the *Eucalyptus tetrapleura* population in the future.

'High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition', is listed as a Key Threatening Processes under the *Biodiversity Conservation Act 2016*. 'Fire regimes that cause declines in biodiversity' is listed as a Key Threatening Processes under the *Environment Protection and Biodiversity Conservation Act 1999*.

Number of locations

Eucalyptus tetrapleura occurs at a single estimated threat-defined location, as per the IUCN (2024) definition. The most serious plausible threat resulting in the lowest number of locations for the species is genetic swamping from interspecific hybridisation due to increased habitat fragmentation. Hybridisation has been found to be occurring across the majority of the species' range (Rutherford *et al*. 2019).

Assessment against IUCN Red List criteria

For this assessment it is considered that the survey of *Eucalyptus tetrapleura* has been adequate and there is sufficient scientific evidence to support the listing outcome.

Criterion A *Population size reduction*

A. Population size reduction. Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4

	Critically Endangered	Endangered	Vulnerable
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3 & A4	≥ 80%	≥ 50%	≥ 30%

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

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

A3 Population reduction projected, inferred 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 (AOO), extent of occurrence (EOO) and/or habitat quality

(d) actual or potential levels of exploitation

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

Outcome

Eucalyptus tetrapleura is Data Deficient under Criterion A.

Population reductions

There are insufficient data to estimate, infer, or project the magnitude of past or future reductions in the population size of *Eucalyptus tetrapleura*.

Conclusion

Eucalyptus tetrapleura is Data Deficient under Criterion A as because there are insufficient data to estimate, infer, or project the magnitude of past or future reductions of its population size.

Criterion B *Geographic range*

B. Geographic range in the form of either B1 (extent of occurrence) AND/OR B2 (area of occupancy)			
	Critically Endangered	Endangered	Vulnerable
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; (iv) number of mature individuals			

Outcome

Eucalyptus tetrapleura is Endangered under Criterion B1ab(iii,v)+2ab(iii,v).

EOO and AOO

The extent of occurrence (EOO) has been calculated at 1,873 km^2 and the area of occupancy (AOO) has been calculated at 416 km^2.

Number of threat-defined locations

Eucalyptus tetrapleura occurs in a single estimated threat-defined location, due to the threat of genetic swamping from interspecific hybridisation due to increased habitat fragmentation.

Severely fragmented

Eucalyptus tetrapleura is not considered to be severely fragmented as >50% of its total AOO consists of occurrences considered sufficient to support a viable population (IUCN 2024).

Continuing decline

Continuing decline in the number of mature individuals and the area, extent and quality of habitat is estimated due to habitat clearing, fragmentation and degradation and inferred due to genetic swamping from interspecific hybridisation due to increased habitat fragmentation and adverse fire regimes (particularly high frequency fire and high severity fire).

Extreme fluctuations

There is no evidence to suggest *Eucalyptus tetrapleura*, a long-lived tree, undergoes extreme population fluctuations.

Conclusion

Eucalyptus tetrapleura is eligible to be listed as Endangered as it has a highly restricted geographic distribution (an EOO of 1,873 km^2 and an AOO of 416 km^2), occurs in one threat-defined location, and is undergoing continuing decline in the number of mature individuals and the area, extent, and quality of habitat.

Criterion C Small population size and decline

C. Small population size and decline		Critically Endangered	Endangered	Vulnerable
Number of mature individuals		< 250	< 2,500	< 10,000
AND at least one of C1 or C2				
C1. An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future):		25% in 3 years or 1 generation (whichever is longer)	20% in 5 years or 2 generations (whichever is longer)	10% in 10 years or 3 generations (whichever is longer)
C2. An observed, estimated, projected or inferred continuing decline AND at least 1 of the following 3 conditions:				
(a)	(i) Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
	(ii) % of mature individuals in one subpopulation =	90–100%	95–100%	100%
(b) Extreme fluctuations in the number of mature individuals				

Outcome

Eucalyptus tetrapleura is ineligible to be listed under Criterion C.

Number of mature individuals

In the area stretching along the Pacific Highway between Glenugie and Dirty Creek south of Grafton, which includes large areas of Glenugie SF and Newfoundland SF, it is estimated that there are more than 10,000 mature individuals of *Eucalyptus tetrapleura* present (G. Phillips pers. comm. February 2025). Previous estimates based on morphology and predictive mapping have put the population as high as 170,000–250,000 individuals (Woolgoolga to Ballina Planning Alliance 2012), although it is noted that this figure is likely to include hybrids (A. Carty *in litt.* January 2025).

Continuing decline

Although continuing decline in the number of mature individuals is estimated due to habitat clearing, fragmentation and degradation, there are insufficient data to quantify the magnitude the decline.

Mature individuals in each subpopulation

Eucalyptus tetrapleura occurs in a single known subpopulation with a population size estimated to be >10,000 mature individuals.

% of mature individuals in a single subpopulation

As *Eucalyptus tetrapleura* occurs in a single subpopulation, 100% of the mature individuals occur in one subpopulation.

Extreme fluctuations

There is no evidence to suggest *Eucalyptus tetrapleura*, a long-lived tree, undergoes extreme population fluctuations.

Conclusion

Eucalyptus tetrapleura is ineligible to be listed under Criterion C as the population sized is estimated to exceed 10,000 mature individuals.

Criterion D Very small or restricted population

D. Very small or restricted population			
	Critically Endangered	Endangered	Vulnerable
D. Number of mature individuals	< 50	< 250	D1. < 1,000
D2. *Only applies to the VU category* Restricted area of occupancy or number of locations with a plausible future threat that could drive the taxon to CR or EX in a very short time.	-	-	D2. typically: AOO < 20 km² or number of locations ≤ 5

Outcome

Eucalyptus tetrapleura is ineligible to be listed under Criterion D.

Number of mature individuals

The population size of *Eucalyptus tetrapleura* is estimated to be >10,000 mature individuals. Previous estimates based on morphology and predictive mapping have put the population as high as 170,000–250,000 individuals (Woolgoolga to Ballina Planning Alliance 2012), although it is noted that this figure is likely to include hybrids (A. Carty *in litt.* January 2025).

Risk of future extinction in a very short amount of time (D2)

Eucalyptus tetrapleura occurs at a single threat-defined location but has an AOO estimated at 416 km^2. There are no plausible future threats that could rapidly drive the species to Critically Endangered or Extinct in a very short time.

Criterion E Quantitative Analysis

E. Quantitative Analysis			
	Critically Endangered	Endangered	Vulnerable
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

Outcome

Eucalyptus tetrapleura is considered Data Deficient under Criterion E.

Probability of extinction

No quantitative analysis has been undertaken to assess the extinction probability of *Eucalyptus tetrapleura* and there are currently insufficient data to undertake one.

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APPENDIX 1

Assessment against *Biodiversity Conservation Regulation 2017* criteria
The Clauses used for assessment are listed below for reference.

Overall Assessment Outcome:

Eucalyptus tetrapleura was found to be Endangered under Clause 4.3(b)(d)(e i,iii).

Clause 4.2 – Reduction in population size of species
(Equivalent to IUCN criterion A)
Assessment Outcome: Data Deficient.

(1) - The species has undergone or is likely to undergo within a time frame appropriate to the life cycle and habitat characteristics of the taxon:			
	(a)	for critically endangered species	a very large reduction in population size, or
	(b)	for endangered species	a large reduction in population size, or
	(c)	for vulnerable species	a moderate reduction in population size.
(2) - The determination of that criteria is to be based on any of the following:			
	(a)	direct observation,	
	(b)	an index of abundance appropriate to the taxon,	
	(c)	a decline in the geographic distribution or habitat quality,	
	(d)	the actual or potential levels of exploitation of the species,	
	(e)	the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.	

Clause 4.3 - Restricted geographic distribution of species and other conditions
(Equivalent to IUCN criterion B)
Assessment Outcome: Endangered under Clause 4.3(b)(d)(e i,iii).

The geographic distribution of the species is:			
	(a)	for critically endangered species	very highly restricted, or
	(b)	for endangered species	highly restricted, or
	(c)	for vulnerable species	moderately restricted,
and at least 2 of the following 3 conditions apply:			
	(d)	the population or habitat of the species is severely fragmented or nearly all the mature individuals of the species occur within a small number of locations,	
	(e)	there is a projected or continuing decline in any of the following:	
		(i)	an index of abundance appropriate to the taxon,
		(ii)	the geographic distribution of the species,
		(iii)	habitat area, extent or quality,
		(iv)	the number of locations in which the species occurs or of populations of the species,
	(f)	extreme fluctuations occur in any of the following:	
		(i)	an index of abundance appropriate to the taxon,
		(ii)	the geographic distribution of the species,
		(iii)	the number of locations in which the species occur or of populations of the species.

Clause 4.4 - Low numbers of mature individuals of species and other conditions
(Equivalent to IUCN criterion C)

Assessment Outcome: Not met.

The estimated total number of mature individuals of the species is:						
	(a)	for critically endangered species			very low, or	
	(b)	for endangered species			low, or	
	(c)	for vulnerable species			moderately low,	
and either of the following 2 conditions apply:						
	(d)	a continuing decline in the number of mature individuals that is (according to an index of abundance appropriate to the species):				
		(i)	for critically endangered species		very large, or	
		(ii)	for endangered species		large, or	
		(iii)	for vulnerable species		moderate,	
	(e)	both of the following apply:				
		(i)	a continuing decline in the number of mature individuals (according to an index of abundance appropriate to the species), and			
		(ii)	at least one of the following applies:			
			(A)	the number of individuals in each population of the species is:		
				(I)	for critically endangered species	extremely low, or
				(II)	for endangered species	very low, or
				(III)	for vulnerable species	low,
			(B)	all or nearly all mature individuals of the species occur within one population,		
			(C)	extreme fluctuations occur in an index of abundance appropriate to the species.		

Clause 4.5 - Low total numbers of mature individuals of species (Equivalent to IUCN criterion D)
Assessment Outcome: Not met.

The total number of mature individuals of the species is:			
	(a)	for critically endangered species	extremely low, or
	(b)	for endangered species	very low, or
	(c)	for vulnerable species	low.

Clause 4.6 - Quantitative analysis of extinction probability (Equivalent to IUCN criterion E)
Assessment Outcome: Data Deficient.

The probability of extinction of the species is estimated to be:			
	(a)	for critically endangered species	extremely high, or
	(b)	for endangered species	very high, or
	(c)	for vulnerable species	high.

Clause 4.7 - Very highly restricted geographic distribution of species– vulnerable species
(Equivalent to IUCN criterion D2)
Assessment Outcome: Not met.

For vulnerable species,	the geographic distribution of the species or the number of locations of the species is very highly restricted such that the species is prone to the effects of human activities or stochastic events within a very short time period.

APPENDIX 2 – Maps

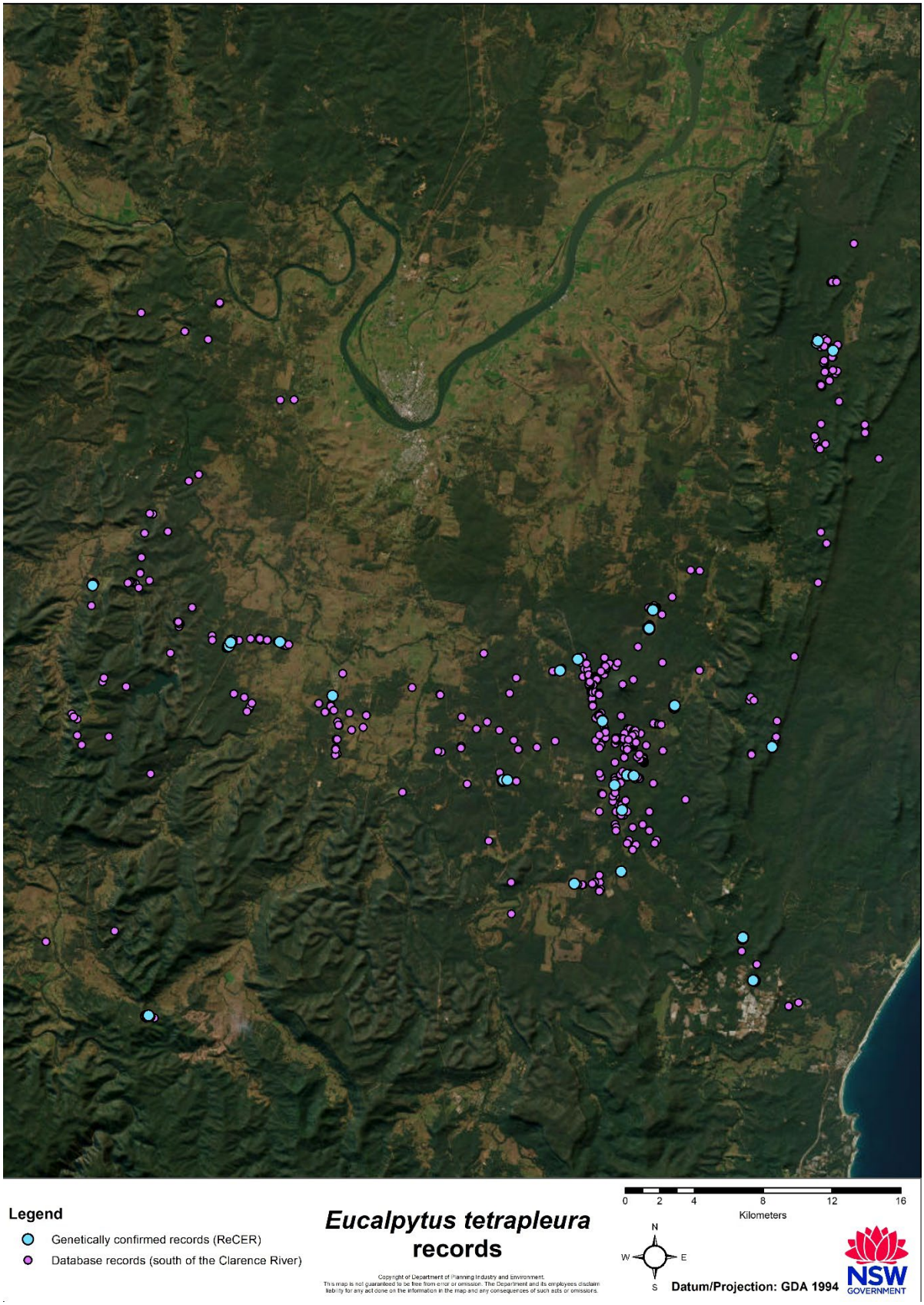

Fig. A1. Distribution of *Eucalyptus tetrapleura* south of the Clarence River.