**Conservation Assessment of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland**

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NSW Threatened Species Scientific Committee

Name: White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland
Short Name: Box – Gum Grassy Woodland and Derived Grassland
Distribution: Victoria, New South Wales, Queensland and Australian Capital Territory
Bioregions: NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes Bioregions, South East Queensland and Victorian Midlands Bioregions
Current EPBC Act Status: Critically Endangered
Current NSW BC Act Status: Endangered

Proposed listing on NSW BC Act and EPBC Act: Critically Endangered

**Summary of Conservation Assessment**

White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland was found to be eligible for listing as Critically Endangered under Criteria A3 and D3. The main reasons for this Ecological Community being eligible are that it has undergone a very large historical reduction in geographic distribution (since approximately 1750) and has experienced disruption of biotic processes of relative severity >90% over more than 90% of its distribution since 1750.

**Description**

White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland comprises an aggregation of Grassy Woodlands (*sensu* Keith 2004) occurring on the tablelands and western slopes of the Great Diving Range from the Darling Downs in southern Queensland south to central Victoria. In NSW, the community corresponds broadly with Keith's (2004) Western Slopes Grassy Woodlands, Southern Tableland Grassy Woodlands and New England Grassy Woodlands classes. In Queensland the community comprises parts of Neldner *et al.'s* (2015) Temperate eucalypt woodlands Broad Vegetation Group. In Victoria, the community forms parts of the Dry Forests, Plains Woodlands or Forests and Lower Slopes or Hills Woodlands Ecological Vegetation Class Groupings (Victorian DELWP 2005). Nationally, White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland falls within the Temperate Eucalypt Woodland formation of Keith (2017).

White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is characterised by widely-spaced trees and projected foliage cover generally less than 30% (Prober *et al.* 2017). Tree height ranges from approximately 15 – 30m and declines with increasing aridity from east to west (Keith 2004, Prober *et al.* 2017). Canopy cover may be higher in remnants exhibiting *Eucalyptus* regrowth following fire, logging, clearing, dieback or tree death due to natural causes. In such cases, canopy cover may exceed 30% and may be continuous, while tree heights may tend toward the lower end of the range. Conversely, the canopy may be completely absent in areas of derived native grassland where tree removal has occurred, and in such areas higher abundance of groundcover species may be present. Understorey shrubs are typically sparse or absent (Prober *et al.* 2017). The groundcover is dominated by perennial tussock grasses interspersed with a diverse range of forb species with the families Asteraceae and Fabaceae, and the orders Liliales and Asparagales well represented (Prober *et al.* 2017).

White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is characteristically dominated by one or more of the species *Eucalyptus albens* (White Box), *E. melliodora* (Yellow Box) and *E. blakelyi* (Blakely's Red Gum). *Eucalyptus moluccana* may be co-dominant in the Nandewar Bioregion (TSSC 2006) and in the north-western corner of the Sydney Basin Bioregion in the upper Hunter Valley. Hybrids or intergrades between these species are considered to be part of the characteristic assemblage of species. A number of understorey species are typically found throughout almost the entire range of the community, with the exception of the extreme north of its distribution and areas where they have been excluded by grazing. These include: "the dominant tussock grasses *Themeda triandra* and *Poa sieberiana* and a range of other forbs and grasses such as *Chrysocephalum apiculatum, Hypericum gramineum, Geranium solanderi, Glycine clandestina, Dianella revoluta, D. longifolia, Asperula conferta, Leptorhynchos squamatus, Goodenia pinnatifida, Pimelea curviflora, Stackhousia monogyna, Cheilanthes sieberi, Austrostipa scabra, Bulbine bulbosa, Lomandra filiformis* and *Oxalis perennans* occupying the inter-tussock spaces" (Prober 1996).

In the western parts of its range (generally the western slopes below 700 m ASL (Keith 2004)), White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is typically dominated by *Eucalyptus albens*, although *E. melliodora* and *E. blakelyi* may be co-dominant or dominant in localised areas such as along non-permanent water courses and in deeper soils associated with valley floors (Prober 1996). Other co-dominant tree species occurring on the western slopes include *Brachychiton populneus* subsp. *populneus* (Kurrajong) and *Callitris glaucophylla* (White Cypress Pine) (Keith 2004). *Eucalyptus melanophloia* (Silver Ironbark) and *E. pilligaensis* (Narrow-Leaved Grey Box) may also occur in the north-west of the distribution (Keith 2004) and *E. microcarpa* (Grey Box) at the western limits of the distribution (Prober and Thiele 2004), however these three species of *Eucalyptus* are not characteristic of the community and they are only occasionally present. Shrub and sub-shrub species such as *Bursaria spinosa* (Blackthorn), *Cassinia arcuata* (Sifton Bush), *Eremophila debilis* (Winter Apple), *Notelaea microcarpa* (Native Olive), *Pimelea curviflora* (Curved Rice Flower) and *Templetonia stenophylla* (Leafy Templetonia) may be observed in the western parts of the range, although generally with low cover and abundance (Keith 2004).

In the eastern parts of its range (generally the tablelands above 600m ASL), White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is typically dominated by *E. melliodora* (Yellow Box) and E. blakelyi (Blakely's Red Gum) (Keith 2004). Other tree species are sometimes associated with the community either as occasional occurrences or infrequent sub-dominants, but rarely as co-dominant species. In the south-east these include *E. bridgesiana* (Apple Box), *E. goniocalyx* (Bundy) and occasionally *E. nortonii* (Large-Flowered Bundy). In the north-east, species include *Angophora floribunda* (Rough-Barked Apple), *E. bridgesiana* (Apple Box) and occasionally *E. caliginosa* (Broad-Leaved Stringybark) or *E. youmanii* (Youman's Stringybark) Keith 2004). *Bursaria spinosa* (Blackthorn), *Hibbertia obtusifolia* (Hoary Guinea Flower) and *Lissanthe strigosa* (Peach Heath) also occur in the eastern parts of the range, along with *Cassinia longifolia* and *Exocarpos cupressiformis* (Native Cherry) in the south-east, and *Acacia filicifolia* (Fern-Leaved Wattle), *A. implexa* (Hickory Wattle), *Cassinia quinquefaria* and *Jacksonia scoparia* (Dogwood) in the north-east (Keith 2004).

White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland may occur in the upper Hunter Valley where the Great Dividing Range is low enough, and the climate suitable for, the incursion of species from the west of the divide (Ollier 1982). In this area the community is typically dominated by *Eucalyptus 'albemol'* (a presumed intergrade between *E. albens* and *E. moluccana* (McRae & Cooper 1985)), although *E. melliodora* and *E. blakelyi* may be co-dominant or dominant in localised areas along non-permanent creeks. Further east, White Box –

Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is replaced by communities representing Keith's (2004) Coastal Valley Grassy Woodlands vegetation class such as Central Hunter Grey Box-Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions and Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the NSW North Coast and Sydney Basin Bioregions, both listed as Endangered under the *Biodiversity Conservation Act 2016*. The transition between these communities is gradual and the boundary is therefore vague, in part because *E. moluccana* is distributed discontinuously throughout the region, often occurring in localised stands in depressions and other low points in the landscape, while *Corymbia maculata* co-dominates with *E. 'albemol'* on low hills in some areas (Peake 2005). White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland does not occur east from the Singleton district.

Floristic composition and abundance may vary significantly in the derived native grassland component of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland across its geographical range, particularly following periods of good rainfall. With the removal of canopy trees, access to additional light, nutrients and soil water allows increased abundance of some species over others, such that grassland areas may be dominated by only a few of the characteristic species.

Patterns in the composition of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland are correlated with climatic and topographic gradients across the range of its distribution. Longitudinal gradients in elevation, topographic variability, annual rainfall (Prober and Thiele 2004) and average temperature (Prober *et al.* 2017) are primarily reflected in the composition of the overstorey and shrub stratum as described above, while the composition of the groundcover is less variable from the western to the eastern parts of the range (Keith 2004). Latitudinal gradients in rainfall seasonality (summer dominant in the north vs winter dominant in the south) and temperature are more strongly reflected in the composition of the understorey (Prober 1996). Species such as *Rostellularia adscendens, Chloris ventricosa, Rytidosperma racemosum, Brunoniella australis, Cymbopogon refractus, Swainsona galegifolia, Notelaea microcarpa, Stackhousia viminea, Olearia elliptica, Jasminum suavissimum, Plantago gaudichaudii, Dichanthium sericeum, Plantago debilis* and *Wahlenbergia communis* are restricted to more northern areas (Prober 1996). Fewer species are restricted to southern areas, but include *Gonocarpus elatus, Austrostipa blackii, Aristida behriana, Xerochrysum viscosum, Rytidosperma auriculatum* and *Austrostipa nodosa,* and this may contribute to the observed decline in species richness with increasing latitude (Prober 1996). More obviously, the decrease in species richness and accompanying turnover of native herbs and forbs from north to south is accompanied by an increase in the richness and abundance of exotic species (Prober 1996).

Abiotic Environment

White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland occurs on hilly to undulating landscapes in areas with soils of moderate fertility derived from a range of lithologies, including alkaline and acid volcanics, granites, sediments, serpentinites and metamorphics (Prober and Thiele 2004). While there are apparently no clear relationships between lithology and understorey composition across the range of the community, its western limits correspond to a transition to soils of Tertiary or Quaternary alluvial origin, which is associated with the replacement of *Eucalyptus albens* (White Box), *E. melliodora* (Yellow Box) and *E. blakelyi* (Blakely's Red Gum) with *E. microcarpa* (Grey Box) and *E. populnea* (Poplar Box or Bimble Box) as overstorey dominants and the replacement of *Themeda triandra* (Kangaroo Grass) and *Poa sieberiana* (Snow Grass) with other grass species (Prober and Thiele 2004).

The distribution of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland spans a range in elevation from approximately 170 m ASL on the western slopes of the Great Dividing Range to approximately 1200 m on the Northern Tablelands of NSW (Beadle 1981),

although occurrences on the ranges are typically at lower elevations (Prober *et al.* 2017). The topography on which the community occurs ranges from flat in the west of its range to hilly and undulating in the east (Prober and Thiele 2004). Annual rainfall across the distribution of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland increases from west to east and is generally within the range 500 – 800 mm (Prober 1996; Keith 2004), although the community may occur in areas receiving as little as 400 mm/annum on the western slopes (Beadle 1981, Prober *et al.* 2017) and in some areas of the Southern Tablelands of NSW rainfall may be as high as 900mm/annum (Keith 2004). Rainfall season varies from summer dominant in the north to weakly winter dominant in the south (Prober 1996, Keith 2004). Average annual temperature increases from east to west (Prober *et al.* 2017) and from south to north (Keith 2004) across the range of its distribution.

**Distribution and Abundance**

The Commonwealth Threatened Species Scientific Committee (TSSC) has advised in relation to this Ecological Community (TSSC 2006):

"The Box – Gum Grassy Woodland and Derived Grassland ecological community occurs in an arc along the western slopes and tablelands of the Great Dividing Range from Southern Queensland through NSW to central Victoria (Beadle 1981). It occurs in the Brigalow Belt South, Nandewar, New England Tableland, South Eastern Queensland, Sydney Basin, NSW North Coast, South Eastern Highlands, South East Corner, NSW South Western Slopes, Victorian Midlands and Riverina Bioregions (Environment Australia 2000).

"This ecological community is listed under New South Wales (NSW) legislation as an endangered ecological community, White Box Yellow Box Blakely's Red Gum Woodland (Box-Gum Woodland).

"In the Australian Capital Territory (ACT), Yellow Box – Red Gum Grassy Woodland, a component of the ecological community, is listed as endangered.

"In Queensland the ecological community is a primary component of the following Regional Ecosystems: 11.8.2a, 11.8.8, 11.9.9a, 13.3.1, 13.11.8, 13.12.8 and 13.12.9. It can also be a smaller component of the following regional ecosystems: 11.3.23, 12.8.16 (only at the far western edge of the bioregion), 13.3.4, 13.11.3 and 13.11.4. These regional ecosystems range in conservation status from 'not of concern at present' to 'endangered'.

"In Victoria, the ecological community can be a component of the following Ecological Vegetation Classes in the Highlands – Northern Fall, Northern Inland Slopes, Riverina and Goldfields Bioregions: 47 – Valley Grassy Forest, 55 – Plains Grassy Woodland, 175 – Grassy Woodland."

In NSW, White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland may form a component of Benson's (2008) Vegetation Community IDs 266, 267, 274, 275, 276, 277, 278, 279, 282, 312 and 347. Map Units described in local and regional scale classifications and maps attributed to the community by TSSC (2006) are listed in Table 2a below. White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland may also comprise parts of Tozer *et al*. (2010) Map Units (GWp24, DSF p35, GWp420) and Armstrong *et al*. (2013) (p24, u19, u178 (all); p23, u20 (part)). The degree to which the vegetation units listed in this paragraph and those in Table 2a correspond to White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is uncertain and site-by-site assessment is required.

**Threats**

**Vegetation clearing**

The Commonwealth TSSC (2006) has stated that:

"This ecological community has been heavily cleared across most of its range. The remaining extent of the ecological community is highly fragmented, occurring in small isolated patches within a cleared environment, or within a landscape of other disturbed woodlands.

"The available data show that over 90% of the original extent of this ecological community has been cleared (Table 5). Of the remaining area, a large proportion of it has been modified and occurs as trees over a predominantly exotic understorey. The Committee judge that less than 5% of the original extent of the ecological community remains of sufficient condition and size* to be included in the listed ecological community, having undergone a decline of 95% or more.

[* The Commonwealth TSSC (2006) specifies remnant condition and size criteria which must be met in order for a remnant to be considered White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland under the EPBC Act. These criteria do not apply under the NSW Biodiversity Conservation (BC) Act (2016). As such, the area of the community remaining which meets the definition of the community under the BC Act may be higher than is the case under the EPBC Act. The NSW TSSC considers, however, that estimates of the current extent of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland derived from remote imagery are unlikely to have excluded remnants based on diversity criteria and that the exclusion of remnants of size less than 0.1 ha is unlikely to significantly affect estimates of decline.].

"The ecological community has been most severely reduced on the Western Slopes of NSW and across Central Victoria. The level of clearance has been least in Northern NSW and Southern Queensland, particularly in the rugged gorge country, and in the ACT. This is largely related to past management history, which is in turn influenced by soil types and topography."

In reaching this conclusion, TSSC (2006) noted that there is no single map of fine thematic scale that encompasses either the present or pre-1750 extent across the entire distribution of the community. Conversely, existing broad scale maps are based on tree cover and are likely to overestimate the extent of the ecological community because they include remnants with no substantive native understorey (TSSC 2006).

The very large historical decline in geographic distribution is corroborated by other sources (Benson 2008, Tozer *et al.* 2010, Armstrong *et al.* 2013), although there is uncertainty surrounding both the current extent of Box –Gum Grassy Woodland and Derived Grassland and the extent of its pre-1750 distribution. For example, in NSW Benson (2008) estimated the pre-1750 extent in NSW of Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South-western Slopes Bioregion; (vegetation community ID 277) (one component of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland) was 500,000 ha (±30%), of which he estimated 30,000 (±30%) ha remains. The extent remaining was therefore estimated to be 6% and inferred to be in the range 3 – 11%. Similar uncertainty surrounds the extent of reduction of Benson's (2008) other vegetation communities that are considered part of the ecological community: ID 276 (estimated pre-1750 extent 40,000 ha, 10% extant, range 3 – 30%), ID 278 (estimated pre-1750 extent 30,000 ha, 20% extant, range 7 – 60%), ID 282 (estimated pre-1750 extent 70,000 ha, 7% extant, range 2 – 21%), ID 312 (estimated pre-1750 extent 40,000 ha, 7.5% extant, range 4 – 14%), ID 266 (estimated pre-1750 extent 800,000 ha, 6% extant, range 3 – 12%), ID 267 (estimated pre-1750 extent 70,000 ha, 11% extant, range 4 – 34%), ID 274 (estimated pre-1750 extent 8,000 ha, 12.5% extant, range 8.5 – 20%), ID 275 (estimated pre-1750 extent 6,000 ha, 17% extant, range 5.5 – 50%), ID 347 (estimated pre-1750 extent 12,000 ha, 37.5% extant, range 12.5 – 100%), ID 279 (estimated pre-1750 extent 12,000 ha, 33% extant, range 11 – 100%). Despite these uncertainties, the plausible range estimated

for the extent of reduction includes values greater than 90% for almost all of the variants of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland described by Benson (2008). Furthermore, the plausible ranges for those variants estimated to have been most extensively distributed in NSW (ID 266 and ID 277) suggest that these have almost certainly been reduced to less than 10% of their pre-1750 distribution.

There is evidence that clearing of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is ongoing and has increased in recent years. Approximately three quarters of the distribution of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland occurs in NSW (TSSC 2006). During the period 2009 – 2016 an average of 395 ha of Grassy Woodland (sensu Keith 2004, of which White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is a major component) was lost annually across NSW to agriculture-related activities (cropping, conversion to pasture and thinning) and a further 155 ha/annum due to infrastructure developments (NSW DPIE 2019). Losses due to forestry activities and fire have also been catalogued but are not discussed here as their impact on the conservation risk for White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is less certain. Losses due to agriculture rose during the period 2016-2017 to 654 ha (166% of the average over the preceding seven years) and to 1,344 ha (340%) for the period 2017-2018, while losses attributable to infrastructure rose to 216 ha (138% of the 2009-2016 average) and 589 ha (378% of the 2009-2016 average), respectively (NSW DPIE 2019).

The average areas cleared annually attributable to either agriculture or infrastructure in the bioregions in which White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland occurs over the period 2009-2018 are (NSW only): Brigalow Belt South 2630 ha, Nandewar 659 ha, New England Tableland 934 ha, South Eastern Queensland 760 ha, Sydney Basin 1320 ha, NSW North Coast 1273 ha, South Eastern Highlands 440 ha, South East Corner 151 ha, Riverina 143, NSW South Western Slopes 746 ha (NSW DPIE 2019). Clearing of vegetation in Queensland annually averaged for the same period was 2322 ha in the New England Tableland Bioregion and 129,678 ha in the Brigalow Belt Bioregion (Qld DES 2018).

In addition to the figures cited above, an unknown area of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland has been subjected to clearing of understorey species, probably in addition to the sowing of exotic pasture, or the clearing of *Eucalyptus* regrowth in derived grassland (P. Spark *in litt.* Feb 2020). The rates of clearing or modification of areas of derived grassland are also unknown and difficult to measure (Friends of Grassland in litt Jan 2020). As a result, all of the estimates of the rate of clearing cited above are likely to underestimate the current rate of decline in distribution.

Clearing is likely to continue at least in the short term in NSW under the current regulatory framework. The most recent data on clearing rates (see above) indicates that the latest legislation changes have been accompanied by a tripling of agricultural clearing of Grassy Woodlands. The Audit Office of NSW (2019) has reported: "The clearing of native vegetation on rural land is not effectively regulated and managed [in NSW] because the processes in place to support the regulatory framework are weak. There is no evidence-based assurance that clearing of native vegetation is being carried out in accordance with approvals. Responses to incidents of unlawful clearing are slow, with few tangible outcomes. Enforcement action is rarely taken against landholders who unlawfully clear native vegetation. There are processes in place for approving land clearing but there is limited follow-up to ensure approvals are complied with."

Indicative estimates of the historical decline in geographic distribution have been compiled by the Commonwealth TSSC (2006) for state jurisdictions from sub-jurisdictional vegetation maps. These are as follows (note that there is some overlap in the distributions of individual studies):

***Australian Capital Territory***

Commonwealth TSSC (2006) states [in reference to Table 1a]:

"The Australian Capital Territory (ACT) contains the largest remaining remnants in good condition, reflecting significantly lower levels of stock grazing than the rest of the range of the ecological community. In terms of size, connectivity, diversity and condition, the ACT remnants are exceptional, especially the presence of larger patches (over 100 ha) in good condition (ACT Government 2004). It is likely that the woodland of the ACT is in better condition overall than in adjacent regions due to the system of leasehold title in the ACT, which meant that short-lease rural lands were unlikely to have been subject to intensive pasture improvement (ACT Government 2004)."

**Table 1a. Extant and pre-clearing extent of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland communities in the ACT (reproduced from TSSC 2006)**

| Vegetation type | Current Area (ha) | Pre-1750 Area (ha) | % cleared |
|---|---|---|---|
| **Australian Capital Territory from ACT Government** | | | |
| 2004 Yellow Box- Red Gum Grassy Woodland | 10,865 | 32,000 | 66 |

The Draft ACT Native Woodland Conservation Strategy (ACT Government 2019) includes a revised estimate of the extent of the community (Table 1a). The revised assessment indicates that there is up to 21,974ha (47% of pre-1750 distribution) of potential Endangered Yellow Box-Red Gum Woodland in the ACT. This incorporates woodland between 625 and 800 metres above sea level, with a canopy dominated by Yellow Box and/or Blakely's Red Gum (and associated trees) and/or a groundcover dominated by native grasses (native grasslands derived from the clearing of Yellow Box-Red Gum Woodlands). Field inspection is required to confirm the true distribution of Endangered Yellow Box-Red Gum Woodland within this range.

The figure of 21, 974ha of potential Yellow Box-Red Gum Woodland is derived from extant vegetation mapping (ACT Government 2018). The distribution of mapped Yellow Box-Red Gum Woodland is broader than the modelled pre-1750 distribution of this vegetation class defined by Gellie (2005). Gellie's modelling predicted the Southern Tablelands Yellow Box-Apple Box Grassy Woodlands vegetation class (which comprises four widespread lowland woodland communities in the ACT) covered an area of approximately 47 000 ha in the ACT prior to 1750. Approximately 11 568 ha or 25% of this area retains native vegetation in varying condition. The full extent of the pre-1750 distribution of the community (of which 21, 974ha remains as woodland or derived grassland) is unknown.

**Table 1a. Revised estimates of present and pre-1750 extent of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland communities in the ACT (ACT Government 2019)**

| Vegetation type | Current Area (ha) | Pre-1750 Area (ha) | % cleared |
|---|---|---|---|
| **Australian Capital Territory from ACT Government** | | | |
| 2019 Yellow Box-Red Gum Grassy Woodland (area | 11,568 | 47,000 | 75 |

| | | | |
|---|---|---|---|
| corresponding to Gellie (2005)<br>2019 Yellow Box-Red Gum Grassy Woodland (pre-1750 distribution not recognized by Gellie (2005) | 10,379 | Unknown | - |
| **TOTAL** | **21,974** | **-** | **-** |

***New South Wales***

Commonwealth TSSC (2006) states [in reference to Table 2a]:

"Austin *et al.* (2000) found that this ecological community had been reduced to less than 1% of its pre-1750 extent in the Central Lachlan region. Thomas *et al.* (2000) estimated <4% remaining in the NSW South Western Slopes and Southern Tablelands. Gibbons and Boak (2002) estimated 7.4% of Yellow Box/Blakely's Red Gum woodland remaining in 30,000 hectares on the NSW South West Slopes, which is reduced to 3.4% when isolated trees, remnants of less than one hectare and small, modified patches were excluded.

"The ecological community has been less severely impacted in parts of the western fall of northern NSW due to the use of native pastures rather than improved pastures, and less cropping. However, the extensive grazing in the north has still resulted in an overall decline in the condition of the ecological community, particularly the understorey. As a result, the ecological community generally occurs as small patches of woodland in good condition, surrounded by modified woodlands that are degraded. Given that the ecological community occurs on the most fertile soils, it has been preferentially cleared and grazed. The New England Tablelands Bioregion Draft Regional Vegetation Management Plan classifies this ecological community as endangered (less than 10% of pre-1750 extent remaining or 10-30% of pre-1750 extent remaining and <10,000 ha extent remaining) (Voller *et al.* 2003). This assessment was not based on condition, but on the clearance of overstorey trees, so it is likely that the ecological community as defined has an even smaller extent."

**Table 2a. Extant and pre-clearing extent of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland communities in NSW (reproduced from TSSC 2006)**

| **Vegetation type** | **Current Area (ha)** | **Pre-1750 Area (ha)** | **% cleared** |
|---|---|---|---|
| **Upper North East NSW CRA Region (CRA Unit 1999)** | | | |
| 99. New England Stringybark – Blakley's Red Gum | 10,786 | 14,496 | 26 |
| 163. Yellow Box - Blakely's Red Gum | 7,245 | 39,525 | 82 |
| 179. Yellow Box - Broad-leaved Stringybark | 3,859 | 11,549 | 67 |
| 190. Yellow Box - Grey Box - Red Gum | 21,273 | 60,630 | 65 |
| **SUB-TOTAL** | **43,163** | **126,200** | **66** |
| **Lower North East NSW CRA Region (CRA Unit 1999)** | | | |
| 99. New England Stringybark – Blakley's Red Gum | 28,245 | 116,133 | 76 |
| 163. Yellow Box - Blakely's Red Gum | 2,696 | 28,088 | 90 |
| 179. Yellow Box - Broad-leaved Stringybark | 273 | 1,026 | 73 |

| | | | |
|---|---|---|---|
| 190. Yellow Box - Grey Box - Red Gum | 7,724 | 35,934 | 79 |
| **SUB-TOTAL** | **38,938** | **181,181** | **79** |
| **Nandewar Bioregion from NPWS 2000 [see updated figures in Table 2b]** | | | |
| Yellow Box / Blakley's Red Gum / Rough-barked Apple | 9,044 | 151,121 | 94 |
| Yellow Box /Blakley's Red Gum / Grey Box | 1 | 77 | 99 |
| **SUB-TOTAL** | **9,045** | **151,198** | **94** |
| **Little River Catchment from Seddon *et al.* 2002** | | | |
| Yellow Box - Blakely's Red Gum | 5,154 | 87,246 | 94 |
| White Box | 1,082 | 37,297 | 97 |
| **SUB-TOTAL** | **6,236** | **124,543** | **95** |
| **Central Lachlan from Austin et al 2000** | | | |
| 1. *E. melliodora / E. microcarpa* | 4,600 | 155,200 | 97 |
| 2. *E. melliodora* | 200 | 2,200 | 91 |
| 6. *E. goniocalyx / E. blakelyi / E. melliodora* | 6,800 | 75,500 | 91 |
| 7. *E. bridgesiana / E. blakelyi / E. melliodora* | 1,300 | 17,200 | 92 |
| 15. *Callitris glaucophylla / E. albens* | 100 | 6,700 | 99 |
| 28. *E. blakelyi / Callitris endlicheri* | 2,000 | 38,100 | 95 |
| 75. *E. albens / E. microcarpa* | 5,900 | 102,700 | 94 |
| **SUB-TOTAL** | **20,900** | **397,600** | **95** |
| **Boroowa Shire from Priday *et al.* 2002** | | | |
| Blakely's Red Gum Grassy Woodland | 1,570 | 29,577 | 95 |
| Blakely's Red Gum-Yellow Box Poa-Themeda woodland | 2,176 | 11,371 | 81 |
| Northern Tablelands and Slopes Blakely's Red Gum – Yellow Box - Long Leaved Box Woodland | 105 | 3,095 | 97 |
| Blakely's Red Gum - Yellow Box - Apple Box – Bothriochloa Grassy Woodland | 248 | 6,028 | 96 |
| Kangaroo Grass - Red Leg grassland/open woodland | 418 | 24,269 | 98 |
| NW White Box grassy woodland | 1,974 | 30,556 | 94 |
| White Box - Blakely's Red Gum - Bothriochloa grassy woodland | 230 | 9,144 | 97 |
| **SUB-TOTAL** | **6,721** | **114,040** | **94** |
| **Wagga Wagga Shire from Priday & Mulvaney 2004** | | | |
| White Box Woodland | 1,495 | 68,156 | 98 |
| Yellow Box Woodland | 2,806 | 93,683 | 97 |
| White Cypress Pine - Yellow Box - Grey Box Woodland | 6,054 | 138,034 | 96 |

| | | | |
|---|---|---|---|
| White Box - White Cypress Pine - Grey Box Woodland | 105 | 6,174 | 98 |
| **SUB-TOTAL** | **10,460** | **306,047** | **97** |
| **South-Eastern NSW from Thomas *et al.* 2000 [see updated figures in Table 2b]** | | | |
| 92. Tablelands Acacia/Grass/Herb Dry Forest - *E. bridgesiana / E. melliodora / Acacia mearnsii / Microlaena stipoides* | 7,417 | 42,726 | 83 |
| 116. Western Slopes Herb / Grass Woodland - *E. blakelyi / Microlaena stipoides / Hydrocotyle laxiflora* | 4,670 | 82,110 | 94 |
| 117. Western Slopes Dry Grass Woodland - *E. albens / Microleana stipoides / Bothriochloa macra* | 7,053 | 86,724 | 92 |
| 118. Western Slopes Dry Grass Forest - *E. sideroxylon / E. blakelyi / E. goniocalyx / Elymus scaber [Anthosachne scabra]* | 486 | 4,673 | 90 |
| 120. Western Slopes Shrub/Herb/Grass Dry Forest - *E. macrorhyncha / E. albens / Hydrocotyle laxiflora / Microlaena stipoides* | 11,139 | 82,545 | 87 |
| 154. Tableland Dry Grassy Woodland - *E. bridgesiana / Themeda australis* | 12,713 | 262,205 | 95 |
| 159. Northern Slopes Dry Grass Woodland - *E. blakelyi / E. bridgesiana / E. melliodora / Aristida ramosa* | 591 | 17,183 | 97 |
| 160. Northern Slopes Dry Grass Woodland - *E. blakelyi / E. melliodora / Rytidosperma racemosum / Austrostipa scabra* subsp*. falcata* | 12,902 | 335,030 | 96 |
| 161. Tablelands and Slopes Dry Herb/Grass Woodland - *E. melliodora/ Rytidosperma racemosum* | 1,918 | 88,499 | 98 |
| 162. Western Slopes Moist Herb/Sedge/Grass Woodland - *E. blakelyi/ Carex appressa* | 173 | 2,929 | 94 |
| 163. Central North Slopes Dry Grass Woodland - *E. blakelyi / Rytidosperma racemosum / Cheilanthes sieberi* | 406 | 7,428 | 95 |
| **SUB-TOTAL** | **59,468** | **1,012,052** | **94** |
| **South West Slopes (Upper Slopes Province) from Priday (in prep.)** | | | |
| 10. South West Slopes Box Gum Woodland (Woody vegetation) | 39,413 | 902,173 | 96 |
| 11. Alluvial Flats Grassy Woodland (Woody vegetation) | 16,385 | 402,332 | 96 |
| **SUB-TOTAL** | **55,798** | **1,304,505** | **96** |
| **TOTAL** | **250,729** | **3,717,366** | **93** |

The clearing estimates of Thomas *et al.* (2000) have been revised by Gellie (2005). The revised data altered the allocation of remnant vegetation among units with the result that the extent to which individual vegetation units are estimated to have been cleared has changed (Table 2b). Even so, Gellie's (2005) data do not significantly alter the extent to which White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is estimated to have been cleared (Table 2a estimated extent cleared 94% *cf* 93% in Table 2b). The clearing estimates of NPWS (2000) in the Nandewar Bioregion have been revised by DEC (2004). DEC (2004) has identified a larger number of vegetation communities which may contain the community. Collectively, these cover a substantially larger area (134,202 ha) than was reported by TSSC (2006) (9045 ha) and in addition, DEC (2004) reported a higher proportion remaining (82% cleared vs 94% cleared). If the full extent of each of these communities represents Box – Gum Grassy Woodland and Derived Grassland, and the estimated pre-1750 extents are accurate, then the estimated proportion of the community cleared in NSW reduces from 93% to 91.3%.

**Table 2b. Extant and pre-clearing extent of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland communities in NSW as reported by Gellie (2005) and DEC (2004).**

| **Vegetation type** | **Current Area (ha)** | Pre-**1750 Area (ha)** | % **cleared** |
|---|---|---|---|
| **South-Eastern NSW from Thomas *et al.* 2000** | | | |
| 92. Tablelands Acacia/Grass/Herb Dry Forest - *E. bridgesiana / E. melliodora / Acacia mearnsii / Microlaena stipoides* | 1,300 | 4,200 | 69 |
| 116. Western Slopes Herb/Grass Woodland - *E. blakelyi / Microlaena stipoides / Hydrocotyle laxiflora* | 6,500 | 83,000 | 92 |
| 117. Western Slopes Dry Grass Woodland - *E. albens / Microleana stipoides / Bothriochloa macra* | 8,400 | 107,200` | 92 |
| 118. Western Slopes Dry Grass Forest - *E. sideroxylon / E. blakelyi / E. goniocalyx / Elymus scaber[Anthosachne scabra]* | 3,100 | 6,900 | 55 |
| 120. Western Slopes Shrub/Herb/Grass Dry Forest - *E. macrorhyncha / E. albens / Hydrocotyle laxiflora / Microlaena stipoides* | 20,200 | 131,300 | 84 |
| 154. Tableland Dry Grassy Woodland - *E. bridgesiana / Themeda australis* | 12,200 | 223,300 | 95 |
| 159. Northern Slopes Dry Grass Woodland - *E. blakelyi / E. bridgesiana / E. melliodora / Aristida ramosa* | 1,900 | 17,700 | 89 |
| 160. Northern Slopes Dry Grass Woodland - *E. blakelyi / E. melliodora/ Rytidosperma racemosum / Austrostipa scabra* subsp. *falcata* | 7,000 | 247,500 | 97 |
| 161. Tablelands and Slopes Dry Herb/Grass Woodland - *E. melliodora/ Rytidosperma racemosum* | 3,800 | 87,100 | 96 |

| | | | |
|---|---|---|---|
| 162. Western Slopes Moist Herb/Sedge/Grass Woodland - *E. blakelyi* / *Carex appressa* | 410 | 1,900 | 78 |
| 163. Central North Slopes Dry Grass Woodland - *E. blakelyi/ Rytidosperma racemosum* / *Cheilanthes sieberi* | 260 | 7,400 | 78 |
| **SUB-TOTAL** | **65,070** | **917,500** | **93** |
| **Nandewar Bioregion from DEC (2004)** | | | |
| 36. White Pine/White Box Shrub/Grass Open Forest; central | 16,556 | 50,795 | 67.4 |
| 38. White Pine/White Box Grass/Forb Open Forest; widespread | 32,134 | 142,381 | 87.4 |
| 44. White Box Grassy Open Forest; widespread (mainly southern) | 19,595 | 124,020 | 84.2 |
| 56. Blakely's Red Gum/White Pine/Rough-barked Apple Grassy Open Forest; northern drainage lines | 4,256 | 8,870 | 52.0 |
| 57. Yellow Box/Blakely's Red Gum Grassy Woodland; widespread | 18,042 | 109,624 | 83.5 |
| 60. Blakely's Red Gum/Yellow Box Grassy Open E Forest/Woodland; tablelands | 15,185 | 69,270 | 88.1 |
| 61. White Box Grassy Open Forest; northern | 17,461 | 137,975 | 87.3 |
| 87. White Box Shrub/Grass Open Forest; north-west | 2,101 | 21,800 | 90.4 |
| 99. Grey Box/Blakely's Red Gum/Yellow Box Grassy E Open Forest; widespread | 8,872 | 85,126 | 89.6 |
| **SUB-TOTAL** | **134,202** | **749,861** | 82.1 |

***Victoria***

Commonwealth TSSC (2006) states [in reference to Table 3]:

"Data from Victoria show that Ecological Vegetation Classes containing this ecological community have been heavily depleted, with only 6% of the original, pre-1750 distribution remaining. As this ecological community tends to occur on fertile soils, it has been preferentially cleared, and is highly modified through grazing where it remains. The extant ecological community in Victoria is likely to be considerably less than 6%."

**Table 3. Extant and pre-clearing extent of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland communities in Victoria (reproduced from TSSC 2006)**

| **Vegetation type** | **Current Area (ha)** | **Pre-1750 Area (ha)** | **% cleared** |
|---|---|---|---|
| **Dataset provided by Vic. Department of Sustainability and Environment** | | | |

| | | | |
|---|---|---|---|
| Victorian Riverina - Valley Grassy Forest | 70 | 2,144 | 97 |
| Victorian Riverina - Plains Grassy Woodland | 2,926 | 207,516 | 99 |
| Victorian Riverina - Grassy Woodland | 1,276 | 41,937 | 97 |
| Goldfield - Valley Grassy Forest | 5,147 | 21,428 | 76 |
| Goldfield - Plains Grassy Woodland | 1,140 | 33,445 | 97 |
| Goldfield - Grassy Woodland | 27,427 | 411,427 | 93 |
| Northern Inland Slopes - Valley Grassy Forest | 10,310 | 132,961 | 92 |
| Northern Inland Slopes - Plains Grassy Woodland | 92 | 8,166 | 99 |
| Northern Inland Slopes - Grassy Woodland | 7,152 | 104,315 | 93 |
| Highlands - Northern Fall - Valley Grassy Forest | 1,896 | 7,676 | 75 |
| Highlands - Northern Fall - Plains Grassy Woodland | 24 | 222 | 89 |
| Highlands - Northern Fall - Grassy Woodland | 3,900 | 5,390 | 28 |
| **TOTAL** | **61,360** | **976,627** | **94** |

***Queensland***

Commonwealth TSSC (2006) states [in reference to Table 4a]:

"Data from Queensland show that Regional Ecosystems containing this ecological community have been cleared by almost 70%, with a proportion of these regional ecosystems likely to be shrubby woodlands, rather than grassy woodlands. As grassy areas are likely to exist on more fertile soils and have been cleared preferentially, it is likely that the degree of clearing is greater than 70%. As the areas remaining have been modified through grazing, it is likely that only a small proportion of these would be in sufficient condition to be the ecological community as defined."

**Table 4a. Extant and pre-clearing extent of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland communities in Queensland (reproduced from TSSC 2006)**

| **Vegetation type** | **Current Area (ha)** | **Pre-1750 Area (ha)** | **% cleared** |
|---|---|---|---|
| **Queensland Regional Ecosystems (Environment Protection Agency 2003) [see revised figures in Table 4b]**<br>**NB: The ecological community is likely to make up less than 20% of those regional ecosystems that are underlined. These have been excluded from the calculations.** | | | |
| *11.3.23. Eucalyptus conica, E. tereticornis, Angophora floribunda ± E. melliodora ± E. nobilis grassy woodland* | *980* | *2,181* | *55* |
| 11.8.2a. *Eucalyptus tereticornis* and *E. melliodora* occurring on low hills | 10,267 | 25,932 | 60 |
| 11.8.8. *Eucalyptus albens* ± *E. crebra* ± *E. tereticornis* ± | 37,015 | 79,337 | 53 |

| | | | |
|---|---|---|---|
| *Callitris baileyi* grassy woodland | | | |
| 11.9.9a *Eucalyptus albens* ± *E. crebra* ± *E. tereticornis* ± *Callitris baileyi* woodland | 19,312 | 34,392 | 44 |
| 12.8.16 (only at the far western edge of the bioregion). *Eucalyptus crebra*, generally with *E. tereticornis* and *E. melliodora ± E. albens* grassy woodland | *25,660* | *78,130* | *67* |
| 13.3.4. *Eucalyptus conica, E. microcarpa* or *E. moluccana, E. melliodora* grassy woodland | *1,993* | *37,623* | *95* |
| 13.3.1. *Eucalyptus blakelyi* grassy woodland or open forest +/- *E. bridgesiana* +/- *E. melliodora* on Cainozoic alluvial plains | 2,269 | 7,299 | 69 |
| 13.11.3. *Eucalyptus crebra, E. dealbata, E. albens* grassy woodland | *85,490* | *310,702* | *72* |
| 13.11.4. *Eucalyptus melanophloia, E. dealbata, E. albens ± Callitris glaucophylla* grassy woodland | *48,997* | *117,387* | *58* |
| 13.11.8. Woodland of *E. melliodora* and/or *E. microcarpa/moluccana* on rolling hills, depressions and lower slopes around drainage lines | 17,754 | 91,043 | 80 |
| 13.12.8. Woodland of *E. melliodora* and/or E. *microcarpa/ moluccana* +/- *conica*, on undulating plains and lower slopes in granite basins | 776 | 14,963 | 95 |
| 13.12.9. Woodland to open forest of *E. blakelyi* and/or *E. calignosa* or *E. mckieana* on plains and rolling hills in granite basins | 5,978 | 32,696 | 82 |
| **TOTAL** | **93,371** | **285,662** | **67** |

Clearing estimates for Queensland presented by TSSC (2006) have been revised by the Queensland Government (QES 2019). The revised data altered the allocation of remnant vegetation among units with the result that the extent to which individual vegetation units are estimated to have been cleared has changed (Table 4b). Even so, the revised data do no not significantly alter the extent to which White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is estimated to have been cleared (Table 4a estimated extent cleared 67% cf 68% in Table 4b).

**Table 4b. Extant and pre-clearing extent of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland communities in Queensland (Data updated 16/4/19 QES 2019)**

| **Vegetation type** | **Current Area (ha)** | **Pre-1750 Area (ha)** | **% cleared** |
|---|---|---|---|
| **Queensland Regional Ecosystems (Environment Protection Agency 2003)** | | | |
| *11.3.23. Eucalyptus conica, E. tereticornis, Angophora floribunda ± E. melliodora ± E. nobilis* grassy woodland | *700* | *2,000* | *65* |

| | | | |
|---|---|---|---|
| 11.8.2a. *Eucalyptus tereticornis* and *E. melliodora* occurring on low hills | 36,000 | 53,000 | 32 |
| 11.8.8. *Eucalyptus albens ± E. crebra ± E. tereticornis ± Callitris baileyi* grassy woodland | 36,000 | 80,000 | 55 |
| 11.9.9a *Eucalyptus albens ± E. crebra ± E. tereticornis ± Callitris baileyi* woodland | 127,000 | 256,000 | 50 |
| 12.8.16 (only at the far western edge of the bioregion). *Eucalyptus crebra,* generally with *E. tereticornis* and *E. melliodora ± E. albens* grassy woodland | *33,000* | *113,000* | *71* |
| 13.3.4. *Eucalyptus conica, E. microcarpa* or *E. moluccana, E. melliodora* grassy woodland | *3,000* | *37,000* | *92* |
| 13.3.1. *Eucalyptus blakelyi* grassy woodland or open forest +/- *E. bridgesiana +/- E. melliodora* on Cainozoic alluvial plains | 3,000 | 7,000 | 57 |
| *13.11.3. Eucalyptus crebra, E. dealbata, E. albens* grassy woodland | *92,000* | *305,000* | *70* |
| *13.11.4. Eucalyptus melanophloia, E. dealbata, E. albens ± Callitris glaucophylla* grassy woodland | *51,000* | *113,000* | *55* |
| 13.11.8. Woodland of *E. melliodora* and/or *E. microcarpa / moluccana* on rolling hills, depressions and lower slopes around drainage lines | 26,000 | 97,000 | 73 |
| 13.12.8. Woodland of E. melliodora and/or E. microcarpa / moluccana +/- conica, on undulating plains and lower slopes in granite basins | 4000 | 25,000 | 84 |
| 13.12.9. Woodland to open forest of E. blakelyi and/or E. calignosa or E. mckieana on plains and rolling hills in granite basins | 5,000 | 24,000 | 79 |
| **NB: The ecological community is likely to make up less than 20% of those regional ecosystems that are underlined. These have been excluded from the calculations.** | | | |
| **Data unavailable for ecosystem sub-variants highlighted in grey. Data are for the parent ecosystem (11.8.2 & 11.9.9) and excluded from calculations** | | | |
| **TOTAL** | **253,700** | **803,000** | **68** |

**Table 5 – Overall Extant and Pre-Clearing extents of Box - Gum Grassy Woodland and Derived Grassland Communities (reproduced from TSSC 2006)**

| State | Current Area (ha) | Pre-1750 Area (ha) | % cleared |
|---|---|---|---|
| Queensland | 253,700 | 803,000 | 68 |

| | | | |
|---|---|---|---|
| New South Wales | 250,729 | 3,717,366 | 93 |
| Australian Capital Territory | 21,974 | 47,040 | 53 |
| Victoria | 61,360 | 976,627 | 94 |
| **TOTAL** | **576,654**[2] | **5,528,993** | **90**[3] |

2 Note this estimate includes areas in poor condition and therefore covers a much larger area than the listed ecological community.

3 Due to the estimate of current extent being greater than the listed ecological community this figure is an under-estimate of decline.

**Grazing, pasture improvement and cropping**

The Commonwealth TSSC (2006) found that:

"Kangaroo Grass (*Themeda triandra*, also known as *Themeda australis*) and Snow Grass (*Poa sieberiana*) were originally the dominant grasses across a large part of the ecological community's range, and are particularly sensitive to grazing pressure (Cole *et al.* 2004). Grazing tends to cause the loss of these grasses, along with other grazing-intolerant forbs, grasses, sedges and shrubs. These grazing-intolerant forbs include tall perennial herbs such as daisies (e.g. Yam Daisy (*Microseris lanceolata*)), lilies (e.g. Milkmaids (*Burchardia umbellata*)), pea plants (e.g. Australian Trefoil (*Lotus australis*)) and orchids (e.g. Purple Diuris (*Diuris punctata*)). Grazing can also have indirect effects upon other ground layer species through soil disturbance and physical changes to the soil such as compaction, nutrient enrichment, reduced water infiltration and erosion. These changes to the soil can facilitate and maintain weed invasions and make soil conditions unsuitable for native species regeneration (Prober *et al.* 2002a & 2002b; Yates & Hobbs 1997).

"In general, the diversity of understorey flora species has decreased across the range of the ecological community, primarily as a result of grazing and pasture improvement. Clearing the understorey for cropping and cultivated pasture eliminates the native species, including any soil-stored seed, preventing the re-establishment of a native understorey without assistance. As a result of this, very few patches with a predominantly native understorey remain, particularly in the central and southern part of the range, where cultivation for crops and pasture improvement has been more prevalent."

**Fragmentation**

The Commonwealth TSSC (2006) found that:

"Understorey species diversity has also been lost, and continues to be lost, through the effects of the severe fragmentation. If population sizes are too small, the local extinction of species from a patch can occur at random. Small areas are also more susceptible to weed invasion. In addition, many of the remaining areas in best condition occur on linear reserves such as travelling stock routes and road reserves. While these linear remnants are important for conservation, they are particularly prone to invasion by weeds, such as Coolatai Grass (*Hyparrhenia hirta*) (McArdle *et al.* 2004).

"With the combination of these factors, the integrity of the understorey has generally been reduced to the extent that regeneration is unlikely, even with immediate intervention."

**Salinity**

The Commonwealth TSSC (2006) found that:

"Rising saline water tables are threatening the persistence of remnant woodland patches (Yates & Hobbs 1997). The natural range of this ecological community contains some of the most extensive areas of dry land salinity in the country. For example, the mapping of Littleboy *et al.* (2001) showed a total of 93,000 ha of land in the south west slopes of NSW affected by salinity. Impacts are particularly severe on the Yellow Box – Red Gum component of the ecological community as it occupies lower topographical positions where the water table intersects the ground surface and salinisation occurs.

"Salinity affects both the understorey and overstorey in remnant woodland. It causes dieback in the overstorey eucalypts, resulting in feedback, in which the death of these trees further disrupts groundwater hydrology, causing further salinity, which in turn contributes to more tree deaths (Briggs & Taws 2003). In a study of remnant woodland in the wider Yass region, Briggs and Taws (2003) found that salinised remnants had 50% more exotic species and over twice the cover of exotic plants than non-salinised sites of the same vegetation type. Most (90%) salinised patches of woodland surveyed in this study were dominated by Yellow Box and/or Blakely's Red Gum (Briggs & Taws 2003; Taws 2003). Salinity and rising groundwater threaten many of the remaining patches of this ecological community, particularly those dominated by Yellow Box and Blakely's Red Gum, even those currently in good condition. While efforts are underway to control salinity, altering these processes at the landscape level is unlikely to be possible within the immediate future."

**Weed invasion**

The Commonwealth TSSC (2006) found that:

"Weed invasion is, and continues to be, one of the key mechanisms and indicators of degradation of this ecological community. Direct threats such as grazing, soil disturbance and nutrient enrichment also facilitate weed invasion. Environmental weeds impacting upon this ecological community include both agricultural weeds, such as Coolatai Grass and introduced exotic pasture grasses, such as *Phalaris*.

"Weeds have invaded most of the remaining areas of the original pre-1750 extent of this ecological community. Austin *et al.* (2000) found that only 8% of Yellow Box – Red Gum Woodland sites had greater than 50% cover of native species.

"Increased nutrient content of soils, due to inputs such as fertiliser, manure and decomposing annual weeds, increases the competitive advantage of weeds over native grass species. Prober *et al.* (2004b) have had some success in re-establishing native grasses and reducing annual weeds by reducing the nitrogen content of the soil through hot spring burns or adding sugar to the soil. These processes, while successful, are resource intensive and unlikely to be applicable on a broad scale.

"Patches that have been heavily invaded by annual weeds may still have a substantially native understorey outside of spring and annual weeds can be controlled to a certain extent through appropriate grazing techniques or fire regimes (Prober *et al.* 2004a). Perennial weeds are a more intractable problem.

"Coolatai Grass is a weed that has been recognised as having a direct impact on rare or threatened native plant species (Groves *et al.* 2003). This weed now dominates the ground layer of many of the White Box and Grey Box woodlands on roadside reserves between Manilla and the Queensland border (Nadolny undated). It is found extensively on the north west slopes and northern tablelands

of NSW, and also occurs on the central and southern slopes and central and north coast areas (McArdle *et al.* 2004). Coolatai Grass spreads rapidly and has invaded many areas of previously high-quality woodland (Nadolny undated). It forms dense swards that smother most native plants (Nadolny undated). It is able to gain a foothold by rapidly colonising disturbed sites, but it can also invade adjacent undisturbed native vegetation (Nadolny undated). This perennial grass is a serious threat to the future of the ecological community."

**Inappropriate fire regimes**

The Commonwealth TSSC (2006) found that:

"A further threat to the integrity of the ecological community is altered fire regimes. While the pre 1750 fire regime is largely unknown, there can be little doubt that the pattern and frequency of fire has changed considerably.

"The general exclusion of fire from small fragments increases the likelihood that species which existed under a more frequent fire regime may be lost. Kangaroo Grass is known to benefit from a frequent fire regime, and weeds seem to be less prevalent in frequently burnt patches. Whereas fires most likely burnt in a mosaic in the past, as a result of fragmentation, unmanaged fires now tend to burn an entire patch at once, leaving no refuge for fire sensitive plants and animals to survive and subsequently recolonise."

**Recruitment failure in tree species**

White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is threatened by processes which prevent the recruitment of tree species. Mature trees provide critical habitat and provide essential ecosystem services and are declining in agricultural landscapes world-wide (Gibbons *et* al. 2008). Ozolins *et al*. (2001) found that the density of trees outside of remnant patches declined by approximately 20% between the 1960s and 1990s. Fischer *et al.* (2009) have predicted that large areas of southeastern Australia are likely to become treeless over decadal time scales under grazing regimes which allow for few rest periods and involve frequent fertilizer additions.

**Assessment against IUCN Red List criteria**

For this assessment it is considered that the survey of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland has been adequate and there is sufficient scientific evidence to support the listing outcome.

*Criterion A Reduction in Geographic Distribution*

Assessment Outcome: Critically Endangered under Criterion A3.

Justification: White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland has undergone a very large reduction in geographic distribution. The Community has been extensively cleared throughout its range and remnants are typically small, isolated, highly fragmented and occur in predominantly cleared landscapes and exhibit highly modified understoreys (TSSC 2006). Based on a compilation of available maps depicting the current extent of the community, TSSC (2006) estimated that less than 5% of the original distribution of the Ecological Community remained at that time. This very large historical decline in geographic distribution is corroborated by other sources (e.g. Benson 2008, Tozer *et al.* 2010, Armstrong *et al.* 2013, QLD DES

2018, NSW DPIE 2019). There is circumstantial evidence which suggests that clearing of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is ongoing and has increased in recent years, at least in NSW which accounts for three quarters of the distribution of the Ecological Community. Clearing is likely to continue at least in the short term in NSW under the current regulatory framework.

*Criterion B Geographic range*

Assessment Outcome: Least Concern under Criteria B1, B2, B3

Justification: The geographic distribution of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is not restricted. The best estimate of the extent of occurrence (EOO) is 702,800 $km^2$, based on a minimum convex polygon enclosing likely occurrences of the community, the method of assessment recommended by IUCN (Bland *et al*. 2017). This EOO is above the threshold required for the category of Vulnerable under Criterion B1. The best estimate of the area of occupancy (AOO) is 151,100 $km^2$ based on 10 x 10 km grid cells (with a minimum of 1% occupied by the Community), the scale recommended for assessing AOO by IUCN (Bland *et al.* 2017). This AOO is above the threshold required for the category of Vulnerable under Criterion B2. The best estimates of EOO and AOO derive from a compilation of maps from multiple sources. Not all of the areas occupied by White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland are covered by maps of appropriate scale and accuracy. Therefore, the values for EOO and AOO quoted may underestimate the true values. The Community cannot be characterised as occurring at a very small number of locations (generally fewer than 5) AND prone to the effects of human activities or stochastic events within a very short time period in an uncertain future, and thus capable of Collapse or becoming Critically Endangered (CR) within a very short time period as required under Criterion B3.

*Criterion C Environmental Degradation*

**C1.** The past 50 years, based on change in an abiotic variable affecting a fraction of the extent of the ecosystem and with relative severity.

**C2a.** The next 50 years, based on change in an abiotic variable affecting a fraction of the extent of the ecosystem and with relative severity **OR C2b.** Any 50-year period including the past, present and future, based on change in an abiotic variable affecting a fraction of the extent of the ecosystem and with relative severity.

**C3.** Since 1750, based on change in a biotic variable affecting a fraction of the extent of the ecosystem and with relative severity.

Assessment Outcome: The status of the ecosystem under all criteria C1, C2 and C3 is Data Deficient.

Justification: White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is subject to a number of threatening processes that are likely to cause continuing decline in environmental quality within the near future, however there are insufficient data to quantify the extent and relative severity of the threats. Extensive areas of the habitat of the community are subject to dryland salinity arising as a consequence of rising water tables (Yates and Hobbs 1997). For example, Littleboy *et al.* (2001) estimated a total of 93,000 ha of land on the south-west slopes of NSW was affected by salinity. The impacts of salinity are particularly pronounced where the species *Eucalyptus melliodora* and *E. blakelyi* were previously dominant because these species occur in lower topographic positions where the water table is close to the surface (TSSC 2006). Elevated soil salinity has been associated with *Eucalyptus* dieback and the death of understorey species as

well as invasion by exotic species (Briggs and Taws 2003, Taws 2003). No quantitative estimate of severity or impact is available for the entire distribution of the Community.

Extensive areas of the habitat of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland are subject to elevated soil nitrogen as a result of the application of chemical fertilizers (Benson 2008). Elevated nitrogen has been associated with the invasion of weeds and eventual conversion from native to exotic pasture (Prober *et al.* 2004a,b). Elevated soil nutrients are thought to transfer to the foliage of *Eucalyptus* species making them more attractive to insects and thus promoting tree dieback associated with insect attack (Keith 2004). The effects of dieback are extremely severe in localised areas however no estimate of severity or impact of elevated nutrients is available across the entire distribution of the community.

The structure and composition of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland are influenced by fire regimes. Fire mediates competitive interactions among understory species and prolonged absence of fire may result in declines in species diversity as less competitive species are excluded. Fire promotes the regeneration of shrub species, particularly those with seed dormancy broken by heat, and the dynamics of such species are sensitive to the length of the fire interval (Prober *et al.* 2017). For example, successive fires separated by intermediate to long intervals can result in shrub encroachment whereas short to intermediate intervals maintain open grassy understoreys (Prober *et al.* 2017). No quantitative estimate of severity or impact of changes due to altered fire regimes is available.

Criterion D *Disruption of biotic processes or interactions*

Disruption of biotic processes or interactions over ANY of the following time periods:

**D1.** The past 50 years, based on change in a biotic variable affecting a fraction of the extent of the ecosystem and with relative severity.

**D2a.** The next 50 years, based on change in a biotic variable affecting a fraction of the extent of the ecosystem and with relative severity **OR D2b.** Any 50-year period including the past, present and future, based on change in a biotic variable affecting a fraction of the extent of the ecosystem and with relative severity.

**D3.** Since 1750, based on change in a biotic variable affecting a fraction of the extent of the ecosystem and with relative severity.

Assessment Outcome: Critically Endangered under D3

Justification: White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is subject to a number of threatening processes that have caused severe disruption to biotic processes and interactions throughout its range and are likely to cause continuing decline in the future. Multiple sources attest to an almost complete conversion of the community to agricultural production (Prober 1996, Prober and Thiele 2004, Keith 2004, Benson 2008), although the impacts of this disruption vary over its range. The grazing of domestic stock, in woodland remnants and in areas in which the tree canopy has been removed or thinned, has been the most widespread activity. The impacts of grazing vary depending on the historical grazing regime (timing, intensity, continuity), methods employed to improve pasture (fertilizer application, augmentation with exotic species) and the extent of associated impacts on soil structure and biota (soil erosion, compaction) (Prober 1996). Less than 10% of the original distribution of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is likely to have avoided the long-term impacts of pastoralism in areas confined to cemeteries and railway easements (Prober and Thiele 2004) and Traveling Stock Routes (TSRs). Even in these areas, compositional changes associated with differential management practises have been recorded (Prober and Thiele 2004) and

such remnants are still exposed to grazing by the introduced European rabbit (*Oryctolagus cuniculus*) which also exacerbates the effects of grazing by domestic stock throughout the distribution of the community (Keith 2004). Historically, since their establishment in the European era, grazing regimes in TSRs were characterised by short periods of heavy grazing separated by long periods of rest, which allowed the persistence of species sensitive to grazing. Recent changes in the administration of TSRs in the New England Tableland, Nandewar and Brigalow Belt South Bioregions have resulted in increases in the duration of grazing in TSRs and reductions in the period of rest. These changes in management have resulted in increased degradation of remnants (David Carr *in litt*. Feb. 2020).

The impacts of grazing following the removal of the tree canopy (i.e. grazing carried out on native grasslands derived from White Box – Yellow Box – Blakely's Red Gum Grassy Woodland) are likely to be less than those associated with grazing combined with pasture improvement (Prober 1996). Nevertheless, grazing has been shown to lead to a reduction in understorey species diversity and richness due to the suppression or loss of native species that are both highly palatable and intolerant of grazing by domestic stock (Keith 2004). Many previously widespread species such as *Dianella revoluta, Diuris dendrobioides, Microseris lanceolata, Pimelea curviflora and Templetonia stenophylla* are now confined to the least-disturbed remnants (Prober & Thiele 1995). Shifts in the dominance of pasture species from *Themeda triandra, Austrostipa aristiglumis* and Poa spp. to *Austrostipa falcata*, *Rytidosperma* spp. and *Bothriochloa macra* have also been observed as grazing intensity increases and are attributed to differential palatability and resilience to grazing among species (Moore 1953). Grazing coupled with burning may lead to the dominance of *Aristida ramosa* (Lodge & Whalley 1989). The reduction of native plant cover by grazing presents opportunities for the invasion of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland by exotic plant species. Coolatai Grass (*Hyparrhenia hirta*) and African Love Grass (*Eragrostis curvula*) are recognised are among the most prominent and invasive of these. Populations of these species have been observed to colonise rapidly following heavy grazing or fire and their propagules are spread widely by vehicles, stock movements and roadside slashing (David Carr *in litt*. Feb. 2020). Many of these impacts may be difficult to reverse and certain species may be permanently lost. Nevertheless, areas of Derived Native Grassland subject to grazing usually retain some native species and functioning ecological processes, and it is possible that the habitat value of these grasslands can be at least partially restored following a cessation of grazing and with the regeneration of tree species. For example, there is evidence that species such as *Themeda triandra* and *Sorghum leiocladum* can return to dominance when grazing is excluded (S. Bell unpubl. data)

Historically, pasture improvement practices have proven to be most economically viable in a cooler, winter rain-dominated climate and pasture improvement has therefore been more extensively applied in southern parts of the distribution White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland compared with the northern parts (Prober 1996). The associated impacts are evidenced by trends of increasing cover and abundance of exotic plant species from the north to the south of its range, and agricultural practices may also be partially responsible for the decrease in species diversity from north to south (Prober 1996). Pasture improvement is intermediate on a spectrum of impact between grazing of Derived Native Grassland and conversion to cropping. The restoration of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland following conversion to cropping is unlikely, however remnant paddock trees retain important habitat functions in such landscapes, particularly old trees with many hollows. The relative proportions of land given over to grazing on native or improved pasture and cropping are unknown.

Cumulatively, the disruption of biotic processes and interactions caused by the implementation of management for agricultural production is very severe and the impacts are estimated to apply over more than 90% of the pre-1750 distribution of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

*Criterion E Quantitative Analysis*

Assessment Outcome: Data Deficient

Justification: No quantitative analysis of ecosystem collapse has been carried out for White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

**Assessment against EPBC Act criteria**

*Decline in Geographic Distribution*

Assessment Outcome: The ecological community is **eligible for listing as critically endangered** under this criterion.

Justification: Commonwealth TSSC (2006) has stated: "This ecological community has been heavily cleared across most of its range. The remaining extent of the ecological community is highly fragmented, occurring in small isolated patches within a cleared environment, or within a landscape of other disturbed woodlands.

"The available data show that over 90% of the original extent of this ecological community has been cleared (Table 5). Of the remaining area, a large proportion of it has been modified and occurs as trees over a predominantly exotic understorey. The Committee judge that less than 5% of the original extent of the ecological remains of sufficient condition and size to be included in the listed ecological community, having undergone a decline of 95% or more."

*Limited geographic distribution coupled with demonstrable threat*

Assessment Outcome: Not eligible for listing under this criterion.

Justification: Commonwealth TSSC (2006) has stated: "The extent of occurrence of this ecological community is very large, notwithstanding that it has undergone a severe decline in area of occupancy due to both clearing and degradation. It is difficult to ascertain the current area of the ecological community as defined. The figures used to address Criterion 1 are indicative of relative decline and cannot be used to determine actual extent.

"There is no doubt that this ecological community is subject to ongoing threats across its range. These include further clearing, deterioration of remnant condition and degradation of the landscape in which remnants occur (NSW Scientific Committee 2002).

"Of particular concern is the threat posed to some of the highest quality remnants, on Travelling Stock Routes and Reserves, through the increasing trend of converting intermittent grazing regimes to more intensive or set stocking regimes (Prober & Thiele 1995).

"While this ecological community is subject to demonstrable, ongoing threats, there are insufficient data to determine the current degree of these threats across the dispersed remnants of this ecological community. There are also insufficient data to accurately determine its current area."

*Loss or decline of functionally important species*

Assessment Outcome: Not eligible for listing under this criterion.

Justification: Commonwealth TSSC (2006) has stated: "Degradation and fragmentation of this ecological community involves, amongst other things, the loss of suites of species, such as woodland

birds, understorey plant species and soil crusts. These can sometimes be replaced, functionally, by more common or exotic species, but more often the species, and their function within the ecological community, simply disappear. For example, the loss of shrubs from the understorey may result in the loss of insectivorous woodland bird species (Barrett *et al.* 1994) and invasion by the aggressive native bird species, Noisy Miner (*Manorina melanocephala*). It has been observed that eucalypt dieback can be more severe in patches with a degraded understorey that are occupied by Noisy Miners than in areas with an intact understorey (Clarke *et al.* 1995). Another example of the decline of functional species is the loss of perennial ground cover species, which, in combination with invasion by exotic annual species, alters nutrient cycling patterns in remnants (Prober *et al.* 2002b).

"This criterion refers to native species that are functionally important in the processes that sustain or play a major role in the ecological community. It is clear that their removal has the potential to precipitate change in structure or function sufficient to lead to the eventual extinction of the ecological community.

"It is known that these woodlands and grasslands are losing suites of functionally important species, and that these losses are detrimentally impacting upon the ecological community. However, there are insufficient quantitative data available on the timing and severity of these impacts at this time."

*Reduction in community integrity*

Assessment Outcome: Eligible for listing as Critically Endangered.

Justification: Commonwealth TSSC (2006) has stated: "There has been an overall reduction in the integrity of this ecological community compared with its pre-1750 state. There are essentially no areas remaining that could be considered fully intact, as most patches have at least some degree of weed invasion. The majority of the remaining extent has lost its native understorey, lost whole suites of species, been invaded by exotic species or lost structural integrity in terms of the loss of shrub, tree or ground layers. Further invasion by exotic species and landscape-scale effects such as salinity, nutrient enrichment, soil structural decline and altered fire regimes are likely to detrimentally effect the integrity of the remaining ecological community in the future.

"The processes outlined [in the previous section] that have degraded, and continue to degrade this ecological community, are difficult to reverse and successful restoration techniques are only beginning to be developed (Yates & Hobbs 1997).

"The ecological community continues to be degraded at both the patch and landscape scale. This ongoing modification, while not necessarily leading to the total destruction of all elements of the ecological community, threatens it with extinction. The reduction in the integrity of this ecological community across most of its range has been very severe. The changes have been such that re-establishment of the ecological processes, species composition and community structure of the original ecological community is not likely to be possible, even with immediate positive human intervention."

*Rate of continuing detrimental change*

Assessment Outcome: Not eligible for listing under this criterion.

Justification: Commonwealth TSSC (2006) has stated: "This ecological community is undergoing continuing detrimental change due to weed invasion, ongoing grazing and clearing, conversion to set stocking, and the effects of fragmentation. However, there are no quantitative data indicating the rate at which these threats are causing change."

*Quantitative analysis showing probability of extinction*

Assessment Outcome: There is insufficient information to determine the eligibility of the ecological community for listing under this criterion.

Justification: Commonwealth TSSC (2006) has stated: "There is no quantitative information addressing this criterion for the Box Gum Grassy Woodland and Derived Grassland ecological community."

**Conservation and Management Actions**

Commonwealth TSSC (2006) has stated:

"The White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Grassland ecological community occurs in the Condamine, Border Rivers/Gwydir, Northern Rivers, Namoi, Central West, Hunter/Central Rivers, Lachlan, Hawkesbury Nepean, Murrumbidgee, Australian Capital Territory, Southern Rivers, Murray, Goulburn Broken, North East (Vic) East Gippsland and Port Phillip and Westernport NHT regions. It has suffered a severe decline in extent and condition, and remaining areas are generally small and highly fragmented.

"The key threats to the survival of the ecological community include clearing, grazing and weed invasion. Other threats include salinity, nutrient enrichment, altered fire regimes and the effects of fragmentation.

"The priority recovery and threat abatement actions required for the listed ecological community include:

- protection of remnants of the listed ecological community through the development of conservation agreements and covenants;
- protection of remnants from weeds, particularly Coolatai Grass, by preventing soil disturbance in and around remnants, and the speedy eradication of any new invasion;
- avoid the use of fertilisers in or near remnants
- avoid soil disturbance in or near remnants, such as ripping planting lines and road grading;
- in very small derived grassland sites, avoid planting trees as they may reduce the floral diversity through competition for light, nutrients and water;
- planting and other rehabilitation-focused disturbance should focus on the edges of patches, expanding them, rather than within the patches;
- expansion and connection of existing remnants;
- exclusion of continuous grazing from remnants is important, coupled with weed management and control;
- use strategic grazing (incorporating rest at appropriate times) in areas still containing a diverse native understorey;
- burning or slashing if native tussock grasses have built up to a high level, to open inter- tussock spaces for tree seedlings, forbs and shrubs to establish; and,
- for assistance and advice in implementing any of these suggested actions, land managers can contact the Grassy Woodlands Conservation Management Network.

"This list does not encompass all actions that may be of benefit to this ecological community, but

highlights those that are considered to be of the highest priority at the time of listing.

"A draft recovery plan for Grassy White Box Woodland, a component of this ecological community, has been released for public comment."

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**APPENDIX**

**Assessment against BC Act criteria**

Clause 4.9 – Reduction in geographic distribution of ecological community
(Equivalent to IUCN criterion A)
Assessment Outcome: Critically endangered under Clause 4.9 (a), 4.12 (a)

| **The ecological community has undergone or is likely to undergo within a time frame appropriate to the life cycle and habitat characteristics of its component species:** | | | |
|---|---|---|---|
| | (a) | for critically endangered ecological communities | a very large reduction in geographic distribution |
| | ~~(b)~~ | ~~for endangered ecological communities~~ | ~~a large reduction in geographic distribution~~ |
| | ~~(c)~~ | ~~for vulnerable ecological communities~~ | ~~a moderate reduction in geographic distribution~~ |

Clause 4.10 - Restricted geographic distribution of ecological community
(Equivalent to IUCN criterion B)
Assessment Outcome: Least Concern

| | | | | |
|---|---|---|---|---|
| **The ecological community's geographic distribution is**: | | | | |
| | ~~(a)~~ | ~~for critically endangered ecological communities~~ | | ~~very highly restricted.~~ |
| | ~~(b)~~ | ~~for endangered ecological communities~~ | | ~~highly restricted.~~ |
| | ~~(c)~~ | ~~for vulnerable ecological communities~~ | | ~~moderately restricted.~~ |
| **and at least 1 of the following conditions apply**: | | | | |
| | (d) | there is a projected or continuing decline in any of the following: | | |
| | | (i) | a measure of spatial extent appropriate to the ecological community, | |
| | | (ii) | a measure of environmental quality appropriate to characteristic biota of the ecological community, | |
| | | (iii) | a measure of disruption to biotic interactions appropriate to characteristic biota of the ecological community, | |
| | (e) | There are threatening processes that are likely to cause continuing decline in either geographic distribution, environmental quality or biotic interactions within the near future, | | |
| | ~~(f)~~ | ~~The ecological community exists at:~~ | | |
| | | ~~(i)~~ | ~~for critically endangered ecological communities~~ | ~~an extremely low number of locations.~~ |
| | | ~~(ii)~~ | ~~for endangered ecological communities~~ | ~~a very low number of locations.~~ |
| | | ~~(iii)~~ | ~~for vulnerable ecological communities~~ | ~~a low number of locations.~~ |

Clause 4.11 – Environmental degradation of ecological community
(Equivalent to IUCN criterion Clause C)
Assessment Outcome: Data Deficient under Clause 4.11 (a)

| | | | |
|---|---|---|---|
| **The ecological community has undergone or is likely to undergo within a time span appropriate to the life cycle and habitat characteristics of its component species:** | | | |
| | ~~(a)~~ | ~~for critically endangered ecological communities~~ | ~~a very large degree of environmental degradation.~~ |
| | ~~(b)~~ | ~~for endangered ecological communities~~ | ~~a large disruption of biotic processes or interactions.~~ |
| | ~~(c)~~ | ~~for vulnerable ecological communities~~ | ~~a moderate degree of environmental degradation.~~ |

Clause 4.12 – Disruption of biotic processes or interactions in ecological community
(Equivalent to IUCN criterion D)
Assessment Outcome: Critically endangered under Clause 4.12 (a)

| **The ecological community has undergone or is likely to undergo within a time frame appropriate to the life cycle and habitat characteristics of its component species:** | | | |
|---|---|---|---|
| | (a) | for critically endangered ecological communities | a very large disruption of biotic processes or interactions |
| | ~~(b)~~ | ~~for endangered ecological communities~~ | ~~a large disruption of biotic processes or interactions~~ |
| | ~~(c)~~ | ~~for vulnerable ecological communities~~ | ~~a moderately large disruption of biotic processes or interactions~~ |

Clause 4.13 – Quantitative analysis of probability of collapse of ecological community
(Equivalent to IUCN criterion E)
Assessment Outcome: Data deficient

| **The probability of collapse of the ecological community is estimated to be:** | | | |
|---|---|---|---|
| | ~~(a)~~ | ~~for critically endangered species~~ | ~~extremely high~~ |
| | ~~(b)~~ | ~~for endangered ecological communities~~ | ~~a large disruption of biotic processes or interactions~~ |
| | ~~(c)~~ | ~~for vulnerable species~~ | ~~high~~ |