

NSW SCIENTIFIC COMMITTEE

Preliminary Determination

The Scientific Committee, established by the *Threatened Species Conservation Act 1995* (**the Act**), has made a Preliminary Determination under Section 22 of the Act to support a proposal for the inclusion of the Shale Sandstone Transition Forest in the Sydney Basin Bioregion as a Critically Endangered Ecological Community in Part 2 of Schedule 1A of the Act and as a consequence, to omit reference to Shale/Sandstone Transition Forest from the list of Endangered Ecological Communities in Part 3 of Section 1 of the Act.

This determination contains the following information:

- Parts 1 & 2:** Section 4 of the Act defines an ecological community as “an assemblage of species occupying a particular area”. These features of Shale Sandstone Transition Forest in the Sydney Basin Bioregion are described in Parts 1 and 2 of this Determination, respectively.
- Part 3:** Part 3 of this Determination describes the eligibility for listing of this ecological community in Part 2 of Schedule 1A of the Act according to criteria as prescribed by the *Threatened Species Conservation Regulation 2010*.
- Part 4:** Part 4 of this Determination provides additional information intended to aid recognition of this community in the field.

Part 1. Assemblage of species

1.1 Shale Sandstone Transition Forest in the Sydney Basin Bioregion (hereafter referred to as Shale Sandstone Transition Forest) is characterised by the assemblage of species listed below.

<i>Acacia decurrens</i>	<i>Exocarpos cupressiformis</i>
<i>Acacia implexa</i>	<i>Gahnia aspera</i>
<i>Acacia parramattensis</i>	<i>Glycine clandestina</i>
<i>Allocasuarina littoralis</i>	<i>Glycine tabacina</i>
<i>Aristida vagans</i>	<i>Gonocarpus tetragynus</i>
<i>Astroloma humifusum</i>	<i>Goodenia hederacea</i> subsp. <i>hederacea</i>
<i>Austrodanthonia fulva</i>	<i>Hardenbergia violacea</i>
<i>Austrostipa pubescens</i>	<i>Hibbertia aspera</i> subsp. <i>aspera</i>
<i>Billardiera scandens</i>	<i>Hibbertia diffusa</i>
<i>Bossiaea prostrata</i>	<i>Jacksonia scoparia</i>
<i>Breynia oblongifolia</i>	<i>Kunzea ambigua</i>
<i>Brunoniella australis</i>	<i>Lagenophora gracilis</i>
<i>Brunoniella pumilio</i>	<i>Laxmannia gracilis</i>
<i>Bursaria spinosa</i>	<i>Lepidosperma laterale</i>
<i>Calotis dentex</i>	<i>Leucopogon juniperinus</i>
<i>Cheilanthes sieberi</i>	<i>Lissanthe strigosa</i>
<i>Corymbia gummifera</i>	<i>Lomandra filiformis</i> subsp. <i>coriacea</i>

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<i>Cymbopogon refractus</i>	<i>Lomandra longifolia</i>
<i>Desmodium varians</i>	<i>Lomandra multiflora</i> subsp. <i>multiflora</i>
<i>Dianella caerulea</i>	<i>Microlaena stipoides</i>
<i>Dianella revoluta</i> var. <i>revoluta</i>	<i>Notelaea longifolia</i> f. <i>longifolia</i>
<i>Dichelachne micrantha</i>	<i>Oxalis perennans</i>
<i>Dichondra repens</i>	<i>Ozothamnus diosmifolius</i>
<i>Digitaria parviflora</i>	<i>Panicum simile</i>
<i>Digitaria ramularis</i>	<i>Paspalidium distans</i>
<i>Dodonaea triquetra</i>	<i>Persoonia linearis</i>
<i>Echinopogon caespitosus</i> var. <i>caespitosus</i>	<i>Phyllanthus hirtellus</i>
<i>Echinopogon ovatus</i>	<i>Pimelea linifolia</i> subsp. <i>linifolia</i>
<i>Entolasia marginata</i>	<i>Poa labillardierei</i> var. <i>labillardierei</i>
<i>Entolasia stricta</i>	<i>Pomax umbellata</i>
<i>Eragrostis brownii</i>	<i>Poranthera microphylla</i>
<i>Eucalyptus crebra</i>	<i>Pratia purpurascens</i>
<i>Eucalyptus eugenioides</i>	<i>Solanum prinophyllum</i>
<i>Eucalyptus fibrosa</i>	<i>Stypandra glauca</i>
<i>Eucalyptus globoidea</i>	<i>Syncarpia glomulifera</i>
<i>Eucalyptus punctata</i>	<i>Themeda australis</i>
<i>Eucalyptus tereticornis</i>	<i>Vernonia cinerea</i> var. <i>cinerea</i>
<i>Euchiton sphaericus</i>	<i>Veronica plebela</i>

- 1.2 The total species list of the community across all occurrences is likely to be considerably larger than that given above. Due to variation across the range of the community, not all of the above species are present at every site and many sites may also contain species not listed above.

Characteristic species may be abundant or rare and comprise only a subset of the complete list of species recorded in known examples of the community. Some characteristic species show a high fidelity (are relatively restricted) to the community, but may also occur in other communities, while others are more typically found in a range of communities.

The number and identity of species recorded at a site is a function of sampling scale and effort. In general, the number of species recorded is likely to increase with the size of the site and there is a greater possibility of recording species that are rare in the landscape.

Species presence and relative abundance (dominance) will vary from site to site as a function of environmental factors such as soil properties (chemical composition, texture, depth, drainage), topography, climate, and through time as a function of disturbance (eg fire, logging, grazing) and weather (eg flooding, drought, extreme heat or cold).

At any one time, above ground individuals of some species may be absent, but the species may be represented below ground in the soil seed bank or as dormant structures such as bulbs, corms, rhizomes, rootstocks or lignotubers.

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The species listed above are vascular plants, however the community also includes micro-organisms, fungi, cryptogamic plants and vertebrate and invertebrate fauna. These components of the community are less well documented.

Part 2. Particular area occupied by the ecological community

2.1 The assemblage of species listed in Part 1.1 above which characterises the Shale Sandstone Transition Forest occurs within the Sydney Basin Bioregion. This Bioregion is defined by SEWPaC (2012) Interim Biogeographic Regionalisation for Australia, Version 7. Department of Sustainability, Environment, Water, Population and Communities.

<http://www.environment.gov.au/parks/nrs/science/bioregion-framework/ibra/maps.html>

2.2 It is the intent of the Scientific Committee that all occurrences of the ecological community (both recorded and as yet unrecorded, and independent of their condition) that occur within this bioregion be covered by this Determination.

Part 3. Eligibility for listing

3.1 Reasons for determining eligibility for listing

3.1.1 Shale/Sandstone Transition Forest in the Sydney Basin Bioregion was listed as an Endangered Ecological Community under the Act in 1998 (NSW Scientific Committee 1998). Since this time new data and analyses have become available and the Committee is of the opinion that the determination of this community should be revised.

3.1.2 The estimated current distribution of the community primarily comprises the larger remnants depicted in the maps of Tozer *et al.* (2010). The mapped area of Shale Sandstone Transition Forest is 9700 ha, representing 20-40% of its original extent (Tozer *et al.* 2010). Thus the community has undergone a very large reduction in distribution since European settlement. Approximately 260 ha is currently represented in conservation reserves, representing <2% of its original extent.

3.1.3 Shale Sandstone Transition Forest occurs or has occurred primarily on relatively accessible terrain. A large proportion of the area where Shale Sandstone Transition Forest occurred has been cleared for agriculture and urban development. Shale Sandstone Transition Forest occurs in an area where a high proportion of remnants (90%) are mostly very small (<10 ha) and scattered, and often adjoin cleared and/or degraded land (Tozer 2003). Shale Sandstone Transition Forest is among the most fragmented of vegetation types occurring in the Sydney region, with an estimated 1115 km of interface with cleared or degraded land (Tozer, pers. comm. 2013). Identified threats include: clearing associated with urban development, inappropriate fire regimes, anthropogenic climate change, removal of wood, physical damage from recreational activities, rubbish dumping, grazing, mowing and weed

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invasion. Invasion by *Olea europea* subsp. *cuspidata* (African Olive) and *Asparagus asparagoides* (Bridal Creeper) affects an estimated 20% and 25% of remnants, respectively (M. Tozer, unpublished data). These weeds have the potential to cause significant structural and compositional changes in Shale Sandstone Transition Forest, resulting in ecosystem collapse. Current rates of clearing have not been estimated for Shale Sandstone Transition Forest, however rates of clearing of adjacent Cumberland Plain Woodland remnants ($5.2 \pm 0.6\%$ between 1998 and 2007), primarily for housing and road developments, are indicative (NSW Scientific Committee and Simpson 2008). 'Clearing of native vegetation', 'High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition', 'Anthropogenic Climate Change', 'Removal of dead wood and dead trees', 'Invasion of native plant communities by exotic perennial grasses', 'Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants' and 'Invasion and establishment of exotic vines and scramblers' are listed as Key Threatening Processes under the Act.

- 3.2 Shale Sandstone Transition Forest in the Sydney Basin Bioregion is eligible to be listed as a Critically Endangered Ecological Community in accordance with Section 12 of the Act as, in the opinion of the Scientific Committee, it is facing an extremely high risk of extinction in New South Wales in the immediate future, as determined in accordance with the following criteria as prescribed by the *Threatened Species Conservation Regulation* 2010:

Clause 17 Reduction in geographic distribution of the ecological community

The ecological community has undergone, is observed, estimated, inferred or reasonably suspected to have undergone or is likely to undergo within a time span appropriate to the life cycle and habitat characteristics of its component species:

- (a) a very large reduction in geographic distribution.

Clause 19 Reduction in ecological function of the ecological community

The ecological community has undergone, is observed, estimated, inferred or reasonably suspected to have undergone or is likely to undergo within a time span appropriate to the life cycle and habitat characteristics of its component species:

- (a) a very large reduction in ecological function,
as indicated by any of the following:
 - (d) change in community structure,
 - (e) change in species composition,
 - (f) disruption of ecological processes,
 - (g) invasion and establishment of exotic species,
 - (h) degradation of habitat,
 - (i) fragmentation of habitat.

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Associate Professor Michelle Leishman
Chairperson
NSW Scientific Committee

Exhibition period: 21/02/14 – 18/04/14

Proposed Gazettal date: 21/02/14

Part 4. Additional information about the ecological community

- 4.1 The following information is additional to that required to meet the definition of an ecological community under the Act, but is provided to assist in the recognition of Shale Sandstone Transition Forest in the field. Given natural variability, along with disturbance history, Shale Sandstone Transition Forest in the Sydney Basin Bioregion may sometimes occur outside the typical range of variation in the features described below.
- 4.2 ‘Shale Sandstone Transition Forest’ is listed under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* as Shale/Sandstone Transition Forest.
- 4.3 Shale Sandstone Transition Forest corresponds to Cumberland Shale Sandstone Transition Forest (map unit p2) in Tozer *et al.* (2010), Shale Sandstone Transition Forest (Low sandstone influence) (map unit 1) and Shale Sandstone Transition Forest (High sandstone influence) (map unit 2) in Tozer (2003), and to the western form of Shale/Sandstone Transition Forest described in NPWS (1997). Shale Sandstone Transition Forest in the Sydney Basin Bioregion also includes Cumberland Shale-Sandstone Ironbark Forest (map unit S_GW04) in DECCW (2009).
- 4.4 Shale Sandstone Transition Forest is recognised as a distinct assemblage with a variable species composition that occurs on soils overlying the transition between shale and sandstone lithologies. Variation in species composition depends on the composition of adjoining communities and the relative influence of the underlying sandstone and shale lithologies. Although Shale Sandstone Transition Forest is strongly ecotonal in its assemblage, it nevertheless contains species not recorded in adjoining communities, thus justifying its recognition as a distinct community (Tozer *et al.* 2010). Turpentine Ironbark Margin Forest (map unit 43 described in Tozer 2003) also occurs on soils transitional between shale and sandstone, however this community is floristically most similar to Turpentine Ironbark Forest (map unit 15 described in Tozer 2003) and together they comprise the endangered ecological community known as Sydney Turpentine Ironbark Forest (Tozer 2003).
- 4.5 The structure of Shale Sandstone Transition Forest varies from grassy woodland to forest. When the community occurs in areas of less sandstone influence it is dominated by *Eucalyptus tereticornis*, with *E. eugenioides*, *E. crebra*, *E. fibrosa* and *E. punctata* occurring less frequently. A small tree stratum may be present consisting of *Eucalyptus* spp., with *Allocasuarina*

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Contact Address: C/o PO Box 1967 Hurstville BC NSW 1481 Telephone: (02) 9585 6940 Facsimile: (02) 9585 6606

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littoralis and *Acacia decurrens* sometimes present. A shrub layer dominated by *Bursaria spinosa* is usually present. The ground layer is diverse and is dominated by grasses and herbs including *Microlaena stipoides* var. *stipoides*, *Cheilanthes sieberi* subsp. *sieberi*, *Dichondra repens*, *Themeda australis*, *Echinopogon ovatus*, *Entolasia marginata*, *Pratia purpurascens*, *Solanum prinophyllum* and *Oxalis perennans* (Tozer 2003). When the community occurs in areas of greater sandstone influence it is dominated by *Eucalyptus punctata* and *E. crebra*, with *E. fibrosa*, *Corymbia gummifera* and *Syncarpia glomulifera* occurring less frequently. A small tree stratum may be present and is most often dominated by *Allocasuarina littoralis*, *Syncarpia glomulifera*, *Persoonia linearis* and *Acacia decurrens*. The shrub layer is well-developed and diverse, dominated by *Kunzea ambigua*, *Persoonia linearis* and *Bursaria spinosa*, while the ground layer is dominated by *Austrostipa pubescens*, *Entolasia stricta*, *Themeda australis*, *Lepidosperma laterale*, *Aristida vagans* and *Pomax umbellata* (Tozer 2003). On the margins of its distribution the community may contain, or be dominated by, tree species atypical of its broader distribution such as *Angophora floribunda*, *Corymbia gummifera*, *C. maculata*, *E. pilularis*, *E. moluccana*, *E. tereticornis*, and *Syncarpia glomulifera*.

- 4.6 Shale Sandstone Transition Forest generally occurs in areas receiving less than 950 mm annual rainfall around the margins of the Cumberland Plain on soils derived from Wianamatta Shale in close proximity to the transition in parent geology from Wianamatta Shale to sedimentary substrates such as the Hawkesbury and Narrabeen Group sandstones, as well as fine to medium grain quartz of the Mittagong formation (Tozer 2003). Typically it occurs at elevations less than 200 m asl, although it may occur up to 350 m asl in parts of the Lower Blue Mountains and Woronora Plateau associated with the rainshadow extending south-west of the Cumberland Plain (M. Tozer, pers. comm.). It can also occur where water courses have eroded the overlying shale stratum down to the sandstone stratum below, and is found on high-quartz sandstone-derived soils where there is a strong colluvial shale influence (eg the upper slopes of sandstone gullies adjoining shale soils), and on outcrops of pure shale soils derived from the Mittagong Formation. The less sandstone dominated assemblages are typically found on the mid-upper slopes of gently undulating terrain and grade into Shale Hills Woodland (map unit 9 in Tozer 2003) or Shale Plains Woodland (map unit 10 in Tozer 2003).
- 4.7 The Shale Sandstone Transition Forest has been recorded from the local government areas of Bankstown, Baulkham Hills, Blue Mountains, Campbelltown, Hawkesbury, Hornsby, Liverpool, Parramatta, Penrith, Baulkham Hills, Wingecarribee and Wollondilly (within the Sydney Basin Bioregion) and may occur elsewhere in the Bioregion.
- 4.8 Small areas of Shale Sandstone Transition Forest are presently included in Bargo State Conservation Area, Blue Mountains National Park, Cattai National Park, Georges River National Park, Nattai National Park, Parramatta

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Regional Park, Scheyville National Park, Gulguer Nature Reserve, and Upper Nepean State Conservation Area.

- 4.9 The Shale Sandstone Transition Forest contains a number of threatened plant and animal species, listed in the table below.

Plants	
<i>Pimelea curviflora</i> var. <i>curviflora</i>	Vulnerable
Birds	
Brown Treecreeper (<i>Climacteris picumnus victoriae</i>)	Vulnerable
Black-chinned Honeyeater (<i>Melithreptus gularis gularis</i>)	Vulnerable
Turquoise Parrot (<i>Neophema pulchella</i>)	Vulnerable
Mammals	
Koala (<i>Phascolarctus cinereus</i>)	Vulnerable
Eastern Freetail Bat (<i>Mormopterus norfolkensis</i>)	Vulnerable
Greater Broad-nosed Bat (<i>Scoteanax ruepelli</i>)	Vulnerable

- 4.10 It is likely that some of the canopy components of Shale Sandstone Transition Forest provide a significant food source because they are winter-flowering, which is important for nectivorous migratory birds such as Regent Honeyeater (*Anthochaera phrygia*) and Swift Parrot (*Lathamus discolor*). Such trees may also provide significant food resources for the endangered Grey-headed Flying Fox (*Pteropus poliocephalus*) (S. Douglas, *in litt.* 2010).

References:

DECCW (2009) 'The Native Vegetation of the Sydney Metropolitan Catchment Management Authority Area.' Unpublished report funded by the Australian Government and the Sydney Metro Catchment Management Authority. Department of Environment, Climate Change & Water, Hurstville.

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Tozer, M. 2003 The native vegetation of the Cumberland Plain, western Sydney: systematic classification and field identification of communities. *Cunninghamia* **8**, 1–75.

Tozer MG, Turner K, Keith DA, Tindall D, Pennay C, Simpson C, MacKenzie B, Beukers P and Cox S. 2010 Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands. *Cunninghamia* **11**, 359–406.