

# NSW SCIENTIFIC COMMITTEE

## Final Determination

The Scientific Committee, established by the *Threatened Species Conservation Act 1995* (the Act), has made a Final Determination under Section 23 of the Act to list Robertson Basalt Tall Open-forest in the Sydney Basin and South Eastern Highlands Bioregions as a CRITICALLY ENDANGERED ECOLOGICAL COMMUNITY in Part 2 of Schedule 1A of the Act and, as a consequence, to omit reference to the Robertson Basalt Tall Open-forest in the Sydney Basin Bioregion from Part 3 of Schedule 1 (Endangered Ecological Communities) 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 Robertson Basalt Tall Open-forest in the Sydney Basin and South Eastern Highlands bioregions 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 Robertson Basalt Tall Open-forest in the Sydney Basin and South Eastern Highlands Bioregions, hereafter referred to as the Robertson Basalt Tall Open-forest, is characterised by the assemblage of species listed below.

<i>Acacia melanoxydon</i>	<i>Acaena novae-zelandiae</i>
<i>Adiantum aethiopicum</i>	<i>Arrhenechthites mixta</i>
<i>Asperula conferta</i>	<i>Austrostipa rudis</i>
<i>Clematis aristata</i>	<i>Coprosma quadrifida</i>
<i>Dianella caerulea</i>	<i>Dianella longifolia</i>
<i>Dichelachne inaequiglumis</i>	<i>Dichondra repens</i>
<i>Doodia aspera</i>	<i>Echinopogon ovatus</i>
<i>Eucalyptus cypellocarpa</i>	<i>Eucalyptus elata</i>
<i>Eucalyptus fastigata</i>	<i>Eucalyptus obliqua</i>
<i>Eucalyptus piperita</i>	<i>Eucalyptus radiata</i> subsp. <i>radiata</i>
<i>Eucalyptus viminalis</i>	<i>Eustrephus latifolius</i>
<i>Galium propinquum</i>	<i>Geranium potentilloides</i>
<i>Glycine clandestina</i>	<i>Gonocarpus tetragynus</i>
<i>Hardenbergia violacea</i>	<i>Hedycarya angustifolia</i>
<i>Helichrysum scorpioides</i>	<i>Hibbertia scandens</i>
<i>Hydrocotyle peduncularis</i>	<i>Hymenanthera dentata</i>
<i>Hypericum gramineum</i>	<i>Lagenifera stipitata</i>
<i>Leucopogon lanceolatus</i> var. <i>lanceolatus</i>	<i>Lomandra longifolia</i>
<i>Microlaena stipoides</i>	<i>Pittosporum multiflorum</i>
<i>Plantago debilis</i>	<i>Poa labillardierei</i> var. <i>labillardierei</i>

# NSW SCIENTIFIC COMMITTEE

*Poranthera microphylla*  
*Schelhammera undulata*  
*Smilax australis*  
*Stellaria pungens*  
*Veronica plebeia*

*Pteridium esculentum*  
*Senecio diaschides*  
*Stellaria flaccida*  
*Tylophora barbata*  
*Viola hederacea*

- 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 (*e.g.* fire, logging, grazing) and weather (*e.g.* 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.

The species listed above are vascular plants, however the community also includes micro-organisms, fungi and cryptogamic plants as well as 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 Robertson Basalt Tall Open-forest occurs within the Sydney Basin and South East Highlands Bioregions. These Bioregions are 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 these bioregions be covered by this Determination.

# NSW SCIENTIFIC COMMITTEE

## Part 3. Eligibility for listing

### 3.1 Reasons for determining eligibility for listing

- 3.1.1 Robertson Basalt Tall Open-forest was listed as an Endangered Ecological Community under the Act in 2001 (NSW Scientific Committee 2011). Since this original listing new data have become available and the Scientific Committee has undertaken a review of the conservation status of the ecological community to inform the current listing status under the Act.
- 3.1.2 Robertson Basalt Tall Open-forest has undergone a very large reduction in geographic distribution. Tozer *et al.* (2010) estimated that Southern Highlands Basalt Forest (which includes Robertson Basalt Tall Open-forest) has undergone a reduction of 65–80% from its estimated pre-European distribution. Subsequent analysis of remnant vegetation attributable to Robertson Basalt Tall Open-forest suggests that the pre-European distribution of the ecological community was approximately 67 km<sup>2</sup>, of which only 13.9 km<sup>2</sup> remains (C. Simpson *in litt.* February 2016). The remaining Robertson Basalt Tall Open-forest comprises approximately 300 patches, primarily isolated in cleared land and with a mean patch size of 0.04 km<sup>2</sup> (Tozer *et al.* 2010).
- 3.1.3 The geographic distribution of Robertson Basalt Tall Open-forest is highly restricted. The extent of occurrence is 1,204 km<sup>2</sup>, based on a minimum convex polygon enclosing all mapped occurrences of the community, the method of assessment recommended by IUCN (2014). The area of occupancy (AOO) of Robertson Basalt Tall Open-forest is 352 km<sup>2</sup>, based on occupancy of 2 x 2 km grid cells, the scale recommended for AOO by IUCN (2014).
- 3.1.4 Major threats to Robertson Basalt Tall Open-forest include the impacts of farming, grazing and residential development, inappropriate fire regimes, invasion by weeds and feral animals and climate change (TSSC 2011). Much of the clearing of this community occurred in the hundred years after the opening of the Southern Railway Line in the Southern Highlands in 1867. Robertson Basalt Tall Open-forest was felled for timber and to facilitate the exploitation of the fertile basalt soils for grazing and other farming practices. Future clearing is likely to be associated with rural-residential development. Much of the remaining forest occurs on private land and unfenced remnants are subject to the impacts of grazing by domestic stock, including selective herbivory, trampling, soil compaction, soil erosion, nutrient enrichment and weed invasion. Invasive species include *Asparagus asparagoides* (Bridal Creeper), *Berberis vulgaris* (Barberry), *Genista* spp (Broom), *Hedera helix* (English Ivy), *Ilex aquifolium* (English Holly), *Ligustrum lucidum* (Large-leaved Privet), *Ligustrum. sinense* (Small-leaved Privet), *Lonicera japonica* (Japanese Honeysuckle), *Passiflora mollissima* (Banana Passionfruit), *Prunus laurocerasus* (Cherry Laurel), *Pyracantha* spp. (Firethorn), *Rubus anglocandicans*, *Rubus leightonii* and *Rubus ulmifolius* (Blackberry) (TSSC 2011). ‘Clearing of native vegetation’ and ‘Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants’ are listed as Key Threatening Processes under the Act.
- 3.1.5 Robertson Basalt Tall Open-forest is included within the Southern Escarpment Wet Sclerophyll Forest class of Keith (2004). Wet sclerophyll forests occur in areas receiving high rainfall and are characterised by high levels of fuel accumulation and fire regimes driven by the rarity of conditions under which low fuel moisture and high fire danger coincide. As a consequence, average fire-return intervals in Robertson Basalt Tall Open-forest are likely to be in the range 50–100 years (Bradstock 2010). Sclerophyll species may be progressively replaced by mesic species in the long-term absence of fire, for example, in remnants isolated from other vegetation in agricultural land. Conversely, frequent burning may eliminate shrub species and promote a grass and forb-

# NSW SCIENTIFIC COMMITTEE

dominated understorey (Keith 1996). Thus both inappropriately high frequency fires and inappropriately low frequency fires are threats to this ecological community. 'High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition' is listed as a Key Threatening Process under the Act.

## 3.2 Criteria for listing

Robertson Basalt Tall Open-forest in the Sydney Basin and South East Highlands Bioregions 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.

Dr Mark Eldridge  
Chairperson  
NSW Scientific Committee

Exhibition period: 16/12/16 – 10/02/17

Proposed Gazettal date: 16/12/16

### **Part 4. Additional information about the ecological community**

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 Robertson Basalt Tall Open-forest in the field. Given natural variability, along with disturbance history, Robertson Basalt Tall Open-forest may sometimes occur outside the typical range of variation in the features described below.

- 4.1 Robertson Basalt Tall Open-forest is restricted to moist, elevated areas on fertile soils associated with Tertiary volcanics on the Robertson Plateau and at Sassafras located at the northern end of the Morton Plateau. It is known to occur between 650 and 850 m a.s.l. where mean annual rainfall is in the range 1000–1,450 mm. Robertson Basalt Tall Open-forest is currently known to occur in Wingecarribee, Shoalhaven, Palerang and Wollongong local government areas but may occur elsewhere in the bioregions.
- 4.2 Robertson Basalt Tall Open-forest is dominated by *Eucalyptus* species up to, or exceeding, 30 m in height with an open shrub layer and a moist herbaceous groundcover (Tozer *et al.* 2010). The community is characterised by a tall open-forest structure in its climax state, however its original distribution has been highly fragmented by clearing and some remnants now resemble open forest or woodland. The canopy composition is variable but usually dominated by one or more of the species *Eucalyptus fastigata*, *E. cypellocarpa* or *E. radiata* subsp. *radiata*. Other canopy species which may be locally common or dominant include *E. piperita*, *E. elata*, *E. viminalis* and *E. obliqua* (Tozer *et al.* 2010). A eucalypt canopy may be absent from previously cleared or otherwise highly disturbed stands. *Acacia melanoxylon* frequently forms a sub-canopy layer below the *Eucalyptus* spp. or may be the dominant species in heavily disturbed remnants. A sparse shrub layer is usually present but not highly diverse and may include *Leucopogon lanceolatus* var. *lanceolatus*, *Hedycarya angustifolia*, *Hymenanthera dentata*, *Pittosporum multiflorum* and *Coprosma quadrifida*. The ground cover is typically dense and contains a diverse range of ferns,

# NSW SCIENTIFIC COMMITTEE

forbs and grasses including *Lomandra longifolia*, *Pteridium esculentum*, *Viola hederacea*, *Dichondra* spp., *Microlaena stipoides*, *Poa labillardierei*, *Dianella caerulea*, *Hydrocotyle peduncularis*, *Poranthera microphylla*, *Echinopogon ovatus*, *Geranium potentilloides*, *Helichrysum scorpioides*, *Schelhammera undulata*, *Stellaria pungens*, *Veronica plebeia*, *Adiantum aethiopicum*, *Austrostipa rudis*, *Galium propinquum* and *Stellaria flaccida*. Grasses such as *P. labillardierei* are often dominant in drier sites at the western end of the range but the understory becomes progressively more mesic with increasing rainfall to the east.

- 4.3 Robertson Basalt Tall Open-forest includes vegetation described under Map Unit 6k (Robertson Basalt Tall Forest) by Benson and Howell (1994) and Fisher *et al.* (1995). Tozer *et al.* (2010) combined Robertson Basalt Tall Open-forest and Mount Gibraltar Forest (listed separately as an Endangered Ecological Community) in a single map unit (WSF p266; Southern Highlands Basalt Forest).
- 4.4 Robertson Basalt Tall Open-forest grades into High Range Sheltered Forest (WSF p66, Tozer *et al.* 2010) on soils of lower fertility. High Range Sheltered Forest is more common in areas receiving less than 1000 mm in annual rainfall on the tablelands and Great Dividing Range to the west of the Wingecarribee Plateau and differs from Robertson Basalt Tall Open-forest in the more frequent occurrence of species such as *Eucalyptus elata*, *Olearia viscidula*, *Acacia falciformis*, *Galium binifolium*, *E. viminalis*, *Lagenifera gracilis* and *E. dalrympleana* subsp. *dalrympleana*. Species that occur more frequently in Robertson Basalt Tall Open-forest than High Range Sheltered Forest include *A. melanoxylon*, *Tylophora barbata*, *E. fastigata*, *Hibbertia scandens*, *Poa labillardierei* var. *labillardierei*, *Hardenbergia violacea*, *Schelhammera undulata*, *Stellaria flaccida*, *Asperula conferta* and *Smilax australis*.
- 4.5 Robertson Basalt Tall Open-forest grades into Tableland Basalt Forest (GW p20, Tozer *et al.* 2010) with decreasing rainfall and average minimum temperature. Robertson Basalt Tall Open-forest rarely occurs in areas receiving less than 1000 mm of annual rainfall while the converse is true for Tableland Basalt Forest. Species common in Robertson Basalt Tall Open-forest but rare or absent from Tableland Basalt Forest include *Tylophora barbata*, *Eustrephus latifolius*, *Hibbertia scandens*, *Stellaria flaccida*, *Schelhammera undulata*, *Eucalyptus cypellocarpa*, *Arrhenechthites mixta*, *Smilax australis*, *Hedycarya angustifolia*, *Doodia aspera* and *Eucalyptus piperita*. Species such as *Viola hederacea*, *Coprosma quadrifida*, *Lomandra longifolia*, *Hardenbergia violacea*, *Eucalyptus fastigata*, *Dianella longifolia*, *Dianella caerulea* and *Geranium potentilloides* occur in both communities but occur more frequently in Robertson Basalt Tall Open-forest. Species common in Tableland Basalt Forest but rare or absent from Robertson Basalt Tall Open-forest include *Cymbonotus lawsonianus*, *Acacia dealbata*, *Eucalyptus pauciflora*, *Plantago varia*, *Wahlenbergia luteola* and *Cynoglossum australe*. Species such as *Eucalyptus viminalis*, *Hydrocotyle laxiflora*, *Acaena novae-zelandiae* and *Viola betonicifolia* occur in both communities but are more common in Tableland Basalt Forest.
- 4.6 Small areas of Robertson Basalt Tall Open-forest may occur in Morton National Park in the vicinity of The Vines, however the community grades into temperate rainforest with decreasing elevation in this area (Tozer *et al.* 2010).
- 4.7 Robertson Basalt Tall Open-forest is included within the Endangered ecological community listed under the *Environment Protection and Biodiversity Conservation Act 1999* as 'Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion'. However the Commonwealth listing advice excludes some patches, here regarded as Robertson Basalt Tall Open-forest, on the basis of condition or structure thresholds (including patch size, ground cover and tree density).

# NSW SCIENTIFIC COMMITTEE

4.8 Robertson Basalt Tall Open-forest is likely to contain a number of threatened animal species, listed in the table below.

Species	Common name	TSC Act*	EPBC Act <sup>+</sup>
<b>Birds</b>			
<i>Anthochaera phrygia</i>	Regent Honeyeater	Critically Endangered	Critically Endangered
<i>Lathamus discolor</i>	Swift Parrot	Endangered	Critically Endangered
<i>Calyptorhynchus lathami</i>	Glossy Black Cockatoo	Vulnerable	
<i>Lophoictinia isura</i>	Square-tailed Kite	Vulnerable	
<i>Ninox connivens</i>	Barking Owl	Vulnerable	
<i>Ninox strenua</i>	Powerful Owl	Vulnerable	
<i>Pachycephala olivacea</i>	Olive Whistler	Vulnerable	
<b>Mammals</b>			
<i>Dasyurus maculatus</i>	Tiger Quoll	Vulnerable	Endangered
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	Vulnerable	
<i>Petaurus australis</i>	Yellow-bellied Glider	Vulnerable	
<i>Phascolarctos cinereus</i>	Koala	Vulnerable	Vulnerable
<i>Potorous tridactylus</i>	Long-nosed Potoroo	Vulnerable	Vulnerable
<b>Amphibians</b>			
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	Vulnerable	Vulnerable

\* Threatened Species Conservation Act 1995

<sup>+</sup> Environment Protection and Biodiversity Conservation Act 1999

## References

- Benson DH, Howell J (1994) Hawkesbury–Nepean Catchment vegetation mapping: explanatory notes for the Moss Vale - Kiama 1: 100 000 map sheets. Unpublished Report (Royal Botanic Gardens: Sydney)
- Bradstock RA (2010) A biogeographic model of fire regimes in Australia: current and future implications. *Global Ecology and Biogeography* **19**, 145–158.
- Fisher M, Ryan K, Lembit R (1995) The natural vegetation of the Burratorang 1: 100 000 map sheet. *Cunninghamia* **4**, 143–215.
- Keith DA (1996) Fire-driven extinction of plant populations: a synthesis of theory and review of evidence from Australian vegetation. *Proceedings of the Linnean Society of New South Wales* **116**, 37–78.
- Keith DA (2004) Ocean shores to desert dunes: the native vegetation of NSW and the ACT. Department of Environment and Conservation (NSW).

# NSW SCIENTIFIC COMMITTEE

NSW Scientific Committee (2011) Robertson Basalt Tall Open-forest in the Sydney Basin Bioregion. Minor amendment Determination - endangered ecological community. NSW Scientific Committee, Sydney. <http://www.environment.nsw.gov.au/determinations/index.htm>

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

TSSC (Threatened Species Scientific Committee) (2011) Commonwealth Listing Advice on Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion <http://www.environment.gov.au/cgi-bin/sprat/public/publiclookupcommunities.pl> (accessed 26 November 2015)