

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 to list Eastern Suburbs Banksia Scrub 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 Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion from Part 3 of Schedule 1 (Endangered Ecological Community) 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 Eastern Suburbs Banksia Scrub 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 Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion (hereafter referred to as the Eastern Suburbs Banksia Scrub) is characterised by the assemblage of species listed below.

<i>Acacia longifolia</i>	<i>Acacia suaveolens</i>
<i>Actinotus helianthi</i>	<i>Actinotus minor</i>
<i>Allocasuarina distyla</i>	<i>Angophora costata</i>
<i>Aotus ericoides</i>	<i>Astroloma pinifolium</i>
<i>Austrostipa pubescens</i>	<i>Banksia aemula</i>
<i>Banksia ericifolia</i> subsp. <i>ericifolia</i>	<i>Banksia marginata</i>
<i>Banksia serrata</i>	<i>Billardiera scandens</i>
<i>Bossiaea ensata</i>	<i>Bossiaea heterophylla</i>
<i>Bossiaea scolopendria</i>	<i>Brachyloma daphnoides</i>
<i>Cassytha glabella</i>	<i>Cassytha pubescens</i>
<i>Caustis pentandra</i>	<i>Chordifex fastigiatus</i>
<i>Corymbia gummifera</i>	<i>Dampiera stricta</i>
<i>Darwinia fascicularis</i>	<i>Dianella revoluta</i> var <i>revoluta</i>
<i>Dillwynia retorta</i>	<i>Elaeocarpus reticulatus</i>
<i>Entolasia stricta</i>	<i>Gompholobium glabratum</i>
<i>Gonocarpus teucroides</i>	<i>Grevillea buxifolia</i>
<i>Grevillea sphacelata</i>	<i>Haemodorum planifolium</i>
<i>Hakea dactyloides</i>	<i>Hibbertia fasciculata</i>
<i>Hibbertia linearis</i>	<i>Hypolaena fastigiata</i>

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<i>Isopogon anemonifolius</i>	<i>Kunzea ambigua</i>
<i>Lambertia formosa</i>	<i>Lepidosperma concavum</i>
<i>Lepidosperma laterale</i>	<i>Leptospermum laevigatum</i>
<i>Lepyrodia scariosa</i>	<i>Leucopogon ericoides</i>
<i>Lomandra glauca</i>	<i>Lomandra longifolia</i>
<i>Melaleuca nodosa</i>	<i>Monotoca elliptica</i>
<i>Monotoca scoparia</i>	<i>Patersonia glabrata</i>
<i>Persoonia lanceolata</i>	<i>Philothea buxifolia</i>
<i>Philothea salsolifolia</i>	<i>Phyllota phyllicoides</i>
<i>Pimelea linifolia</i> subsp. <i>linifolia</i>	<i>Pittosporum undulatum</i>
<i>Platysace linearifolia</i>	<i>Pteridium esculentum</i>
<i>Ricinocarpos pinifolius</i>	<i>Schoenus ericetorum</i>
<i>Themeda australis</i>	<i>Woollsia pungens</i>
<i>Xanthorrhoea media</i>	<i>Xanthorrhoea resinosa</i>
<i>Xanthosia pilosa</i> subsp. <i>pilosa</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 (*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.

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Part 2. Particular area occupied by the ecological community

- 2.1 The assemblage of species listed in Part 1.1 above which characterises the Eastern Suburbs Banksia Scrub 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 Eastern Suburbs Banksia Scrub was listed as an Endangered Ecological Community under the Act in 1997 (NSW Government Gazette number 62, 13th June 1997). At the time of listing the Critically Endangered category did not exist. 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 Eastern Suburbs Banksia Scrub has undergone a very large reduction in distribution. Both Tozer *et al.* (2010) and OEH (2013b) estimated that the pre-European distribution of Eastern Suburbs Banksia Scrub covered at least 2,500 ha and that <10% of the original distribution of Eastern Suburbs Banksia Scrub remains. OEH (2013b) estimated that the total extant area of Eastern Suburbs Banksia Scrub is 461 ha. Assuming the original distribution of the community was constrained by soil type, this represents a 92% reduction from an original area of 5,782 ha, based on the distribution of suitable soil types in the east of Sydney (The Tuggerah, North Head and Kurnell soil landscapes of Chapman and Murphy (1989) and Hazelton and Tille (1990)). OEH (2013b) estimated that between 364 and 408 ha (79–89%) of the extant area occurs within conservation reserves (Kamay Botany Bay National Park, Royal National Park and Sydney Harbour National Park). The distribution of Eastern Suburbs Banksia Scrub has been transformed from extensive areas associated with sand sheets to small fragments ranging in size from 0.02 to 69 ha (DECC 2009, Tozer *et al.* 2010).
- 3.1.3 The distribution of Eastern Suburbs Banksia Scrub is very highly restricted. The extent of occurrence of Eastern Suburbs Banksia Scrub is 156 km² based on a minimum convex polygon enclosing all occurrences of the community mapped by Tozer *et al.* (2010) and OEH (2013b), the method of assessment recommended by IUCN (2016). Some 65 km² of this area comprises coastal open waters. The estimated area of occupancy (AOO) of Eastern Suburbs Banksia Scrub is 600 km² based on 10 x 10 km grid cells, the scale recommended for assessing AOO by IUCN (Bland *et al.* 2016).

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3.1.4 Major threats to Eastern Suburbs Banksia Scrub throughout its range include clearing and fragmentation, weed invasion, inappropriate fire regimes (both high and low fire frequency), grazing by rabbits and soil erosion (DEC 2004; DECC 2009; NSW Scientific Committee 2011; Lambert *et al.* 2015). Individual remnants may also be threatened by mowing, slashing, altered drainage/runoff, inappropriate plantings, damage caused by pedestrians, bicycles, motorcycles and horses and the dumping of construction materials and green waste (DEC 2004; NSW Scientific Committee 2011). Other potential threats, or threats of unknown extent, include infection by *Phytophthora cinnamomi*, unauthorised seed and wildflower collection, stormwater pollution and inappropriate use of herbicides (DECC 2009). Invasive weeds impacting on this community include *Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush), *Lantana camara* (Lantana) and *Eragrostis curvula* (African Love grass) (DECC 2009). ‘Clearing of native vegetation’, ‘Competition and grazing by the feral European rabbit *Oryctolagus cuniculus* (L.)’, ‘High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition’, ‘Infection of native plants by *Phytophthora cinnamomi*’, ‘Invasion, establishment and spread of Lantana (*Lantana camara* L. *sens. lat.*)’, ‘Invasion of native communities by *Chrysanthemoides monilifera*’ 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.

3.2 Criteria for listing

Eastern Suburbs Banksia Scrub 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 18 Restricted geographic distribution of the ecological community

The ecological community’s geographic distribution is estimated or inferred to be:

- (a) very highly restricted,

and the nature of its distribution makes it likely that the action of a threatening process could cause it to decline or degrade in extent or ecological function over a time span appropriate to the life cycle and habitat characteristics of the ecological community’s component species.

Dr Mark Eldridge
Chairperson
NSW Scientific Committee

Exhibition period: 28/04/17 - 23/06/17

Proposed Gazettal date: 28/04/17

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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 Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion (hereafter referred to as the Eastern Suburbs Banksia Scrub) in the field. Given natural variability, along with disturbance history, Eastern Suburbs Banksia Scrub may sometimes occur outside the typical range of variation in the features described below.

- 4.1 Eastern Suburbs Banksia Scrub is an open to closed heath or, occasionally, a low woodland with a sparse canopy of multi-stemmed eucalypts (Adam *et al.* 1990; OEH 2013a,b). It falls within the Wallum Sand Heaths vegetation class of Keith (2004). Eastern Suburbs Banksia Scrub includes vegetation described under Coastal Sand Mantle Heath and Coastal Sandplain Heath (Map Units HL03 and HL04) by OEH (2013b). It has been previously defined as Map Unit HL p563 in Tozer *et al.* (2010) and as Map Unit 21b (i) in Benson and Howell (1994).
- 4.2 Eastern Suburbs Banksia Scrub is found on Quaternary podsolised sand mantles of marine or aeolian origin (OEH 2013b, David Keith *in litt.* June 2016). Podsolised soils are extremely nutrient poor because they have been exposed to long periods of weathering and leaching (Keith 2004; OEH 2013b). Dunefields in the eastern suburbs of Sydney comprise mosaics of dunes originating in the Holocene and Pleistocene epochs, which often present as complex, reworked deposits of a mixture of sand ages (Chapman and Murphy 1989). Eastern Suburbs Banksia Scrub is found primarily on Pleistocene dunes but also occurs on mixed Pleistocene/Holocene dunes retaining the characteristics of podsolised soils. The composition and structure of Eastern Suburbs Banksia Scrub varies as a function of soil age and the degree of podsolisation. Older dunes generally support heath of lower stature and are dominated by *Banksia aemula*. Younger dunes are more often dominated by *B. serrata* (Adam *et al.* 1990, Benson and Howell 1994, David Keith *in litt.* June 2016). Eastern Suburbs Banksia Scrub occasionally contains localised patches of low-growing multi-stemmed eucalypts such as *Angophora costata* (Smooth-barked Apple) and *Corymbia gummifera* (Red Bloodwood) (OEH 2013b). In the first few years after fire, Eastern Suburbs Banksia Scrub is an open and diverse ecological community (Lambert *et al.* 2015). Floristic diversity decreases as the canopy closes over time and the community may become dominated by a few large shrubs such as *Leptospermum laevigatum*, *Banksia ericifolia* and *Monotoca elliptica* (Benson and Howell 1994; Lambert *et al.* 2015). Eastern Suburbs Banksia Scrub may become less structurally and floristically diverse with increasing time since fire and support a greater representation of mesic species such as *Pittosporum undulatum* and *Eleocharpus reticulatus* (DECC 2009). However many species not present as aboveground vegetation cover may still exist as seedbank propagules in the soil (Lambert *et al.* 2015).
- 4.3 As well as varying in age, coastal sand masses vary in soil moisture and drainage characteristics, which are also reflected in the vegetation mosaic. Dunes, their slopes and some of the more extensive sand flats tend to be freely draining with white, pale grey or pale yellow upper soil horizons and open ground-layer vegetation (D. Keith *in litt.* June 2016). These may support a dense cover of ferns (OEH 2013b). More spatially restricted swales between, or adjacent to, steeper dunes tend to be poorly drained with dark grey or black humic upper soil horizons with a dense ground-layer vegetation of sedges (Cyperaceae) and cord rushes (Restionaceae). In some of the deepest depressions on the sand deposits, the water table is above the soil surface, forming permanent or semi-permanent lagoons. These are listed as Sydney Freshwater Wetlands under the Act (D. Keith *in litt.* June 2016).

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- 4.4 Eastern Suburbs Banksia Scrub is one of a complex of related communities which differ in composition in response to variation in the depth of the sand mantle and exposure to maritime influences. Eastern Suburbs Banksia Scrub grades into Coastal Headland Banksia Heath (Map Unit HL06) or Coastal Headland Cliffline Scrub (Map Unit HL07) as the perched dunes become shallower and sandstone benches and outcropping become more common (OEH 2013b). Both communities share many species with Eastern Suburbs Banksia Scrub but differ in species composition in a variety of ways including the absence of the key dominant (*Banksia aemula*), the relative rarity of key species in the Fabaceae (*Bossiaea heterophylla*, *B. scolopendria*, *Dillwynia retorta*) and in the representation of restioid species. Coastal Headland Cliffline Scrub is restricted to locations where the soil is skeletal and exposure to maritime influences is high (OEH 2013b). Species richness is lower in Coastal Headland Cliffline Scrub relative to Eastern Suburbs Banksia Scrub and it is dominated by different shrub species including *Melaleuca armillaris*, *Baeckea imbricata* and *Westringia fruticosa* (Adam *et al.* 1990, OEH 2013b).
- 4.5 Eastern Suburbs Banksia Scrub grades into dry sclerophyll forest with decreasing age of the underlying sand deposits. Dunes of Holocene age predominate nearer the coast and support the structurally and compositionally distinct Coastal Sand-Apple Bloodwood Forest or Coastal Sand Bangalay Forest (Map Units DSF03 and DSF21), (OEH 2013b).
- 4.6 Eastern Suburbs Banksia Scrub represents the southern-most example of a group of related communities associated with highly podsolised sands of Pleistocene origin, occurring adjacent to the coast in northern New South Wales and Queensland (Adam *et al.* 1990, Benson and Howell 1994, Keith 2004). These Wallum Sand Heaths vary in species composition across their geographic range as a consequence of the patterns in the distribution of individual species along the tropical-temperate climate continuum. For example, species characteristic of Eastern Suburbs Banksia Scrub, such as *Allocasuarina distyla*, *Banksia ericifolia* subsp. *ericifolia*, *Bossiaea scolopendria*, *Grevillea sphacelata*, *Philotheca buxifolia* and *Xanthorrhoea resinosa*, are restricted to southern Wallum Sand Heaths. Recent numerical analyses of floristic survey plots support the conclusion that Eastern Suburbs Banksia Heath differs in composition from sand heaths occurring on the central coast to the north of Sydney (Bouddi National Park) and to the south at Jervis Bay (NSW Office of Environment and Heritage *in litt.* September 2016). Eastern Suburbs Banksia Scrub is currently known to occur in the local government areas of Botany, Northern Beaches, Randwick, Sutherland, Waverley and Woollahra (within the Sydney Basin Bioregion) but unrecorded stands of the community may occur elsewhere in the bioregion.
- 4.7 The Eastern Suburbs Banksia Scrub is included within the Endangered Ecological Community listed under the *Environment Protection and Biodiversity Conservation Act 1999* as “Eastern Suburbs Banksia Scrub of the Sydney Region”.

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4.8 Eastern Suburbs Banksia Scrub is likely to contain a number of threatened species, listed in the table below.

Species	Common name	TSC Act*	EPBC Act ⁺
Plants			
<i>Acacia terminalis</i> subsp. <i>terminalis</i>	Sunshine Wattle	Endangered	Endangered
Mammals			
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	Vulnerable	
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bent-wing Bat	Vulnerable	
<i>Perameles nasuta</i>	Long-nosed Bandicoot (North Head population)	Endangered	
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Vulnerable	Vulnerable
Amphibians			
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	Vulnerable	Vulnerable
<i>Litoria littlejohni</i>	Littlejohn's Tree Frog	Vulnerable	Vulnerable
<i>Pseudophryne australis</i>	Red-crowned Toadlet	Vulnerable	

* Threatened Species Conservation Act 1995

⁺ Environment Protection and Biodiversity Conservation Act 1999

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