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 Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions as an ENDANGERED ECOLOGICAL COMMUNITY in Part 3 of Schedule 1 of the Act and, as a consequence, to omit reference to Lower Hunter Spotted Gum – Ironbark Forest 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 Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast 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 Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions (hereafter referred to as the Lower Hunter Spotted Gum Ironbark Forest) is characterised by the assemblage of species listed below.

Acacia falcata
Acacia ulicifolia
Aristida ramosa
Astrotricha obovata
Brunoniella australis
Bursaria spinosa subsp. *spinosa*
Cassytha glabella f. glabella
Corymbia maculata
Daviesia ulicifolia subsp. *ulicifolia*
Dianella revoluta var. *revoluta*
Dillwynia retorta
Eragrostis brownii
Eucalyptus fergusonii
Eucalyptus moluccana
Eucalyptus punctata
Glycine clandestina
Grevillea montana
Hakea sericea
Imperata cylindrica
Lepidosperma laterale
Acacia parvipinnula
Anisopogon avenaceus
Aristida vagans
Billardiera scandens
Bursaria longisepala
Callistemon linearis
Cheilanthes sieberi subsp. *sieberi*
Cymbopogon refractus
Desmodium rhytidophyllum
Dianella tasmanica
Entolasia stricta
Eucalyptus crebra
Eucalyptus fibrosa
Eucalyptus paniculata
Eucalyptus umbra
Goodenia rotundifolia
Grevillea parviflora subsp. *parviflora*
Hardenbergia violacea
Joycea pallida
Leptospermum parvifolium

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Leucopogon juniperinus
Lomandra confertifolia subsp. *pallida*
Lomandra filiformis subsp. *coriacea*
Lomandra multiflora subsp. *multiflora*
Melaleuca decora
Microlaena stipoides var. *stipoides*
Panicum simile
Paspalidium distans
Phyllanthus hirtellus
Pratia purpurascens
Pultenaea spinosa
Syncarpia glomulifera
Vernonia cinerea var. *cinerea*
Lissanthe strigosa subsp. *subulata*
Lomandra cylindrica
Lomandra longifolia
Maytenus silvestris
Melaleuca nodosa
Opercularia diphylla
Parsonsia straminea
Persoonia linearis
Pomax umbellata
Ptilothrix deusta
Pultenaea villosa
Themeda australis

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 Lower Hunter Spotted Gum Ironbark Forest occurs within Sydney Basin and NSW North Coast 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

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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.

Part 3. Eligibility for listing

3.1 Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion was listed as an Endangered Ecological Community under the Act in 2005. 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.

3.1.1 The geographic distribution of Lower Hunter Spotted Gum Ironbark Forest is highly restricted. The extent of occurrence is 1,252 km^2, 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) is 736 km^2, based on occupancy of 2 x 2 km grid cells, the scale recommended for assessing AOO by IUCN (2014).

3.1.2 Lower Hunter Spotted Gum Ironbark Forest has undergone a large reduction in geographic distribution. Bell and Driscoll (2007) estimated 48% of the pre-European extent of Lower Hunter Spotted Gum Ironbark Forest remained in the core part of its distribution in the Cessnock area. House (2003) estimated 41–48% of Lower Hunter Spotted Gum Ironbark Forest remained across the entire distribution, although his assessment includes a broader range of compositional variation than that of Bell and Driscoll (2007). While there is a consensus with respect to the extent of the reduction in distribution, there is some uncertainty regarding both the pre-European and current extent of Lower Hunter Spotted Gum Ironbark Forest. House (2003) estimated a pre-European extent of approximately 65,000 ha however more recent analysis suggests this figure overestimates the pre-European distribution by at least 26,000 ha (Bell and Driscoll 2007). The current extent of the community is difficult to estimate because a high proportion of remnants have suffered significant modification of either the tree or understorey layers and are hard to assign to community type using remote imagery. RACAC (1995), for example, estimated that only 3% of Lower Hunter Spotted Gum Ironbark Forest occurring on public land retained a mature tree canopy (old growth) while some 75% was in a state of recovery from logging or wildfire. No quantitative estimates of the area of the community that retains a substantially unmodified understorey exist. Qualitative data suggest extensive areas have been subject to disturbance.

3.1.3 Clearing and other disturbances have resulted in a high degree of fragmentation of Lower Hunter Spotted Gum Ironbark Forest. House (2003) estimated that prior to European settlement some 75% of its distribution comprised a core area in the Cessnock area with the remaining 25% distributed within a mosaic of other communities. The present distribution comprises more than 4,800 fragments, of which more than 4,500 are less than 10 ha (House 2003). Clearing pressures from rural residential and residential subdivisions, industrial developments and new cropping enterprises (e.g. vineyards) continue to threaten the community particularly in the Cessnock local government area where the core of this community occurs. Substantial pressures for the rezoning of land for housing exist (Progress Economics 2004). An estimated 69,000 new greenfield lots will be required to accommodate a projected increase of 160,000 in the population of the Lower Hunter Region between 2006 and 2031 (NSW Department of Planning 2005). Loss of remnants of Lower Hunter Spotted Gum – Ironbark Forest have been associated with the Cessnock LEP Amendment No 60 - Hunter Economic Zone, Donaldson and Bloomfield coalmine sites at Thornton/Killingworth and the M15 to Branxton National Highway link (Ecotone Ecological Consultants 1999, 2000; Connell Wagner 1997). In the Maitland

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local government area, Hill (2003) assessed Lower Hunter Spotted Gum – Ironbark Forest as exposed to high levels of threat from development, tree dieback and grazing, and under moderate levels of threat from fragmentation, weeds and fire. 'Clearing of native vegetation' is listed as a Key Threatening Process under the Act.

3.1.4 Much of the remaining Lower Hunter Spotted Gum Ironbark Forest shows evidence of disturbance. Logging, mining, expansion of unplanned tracks and trails, rubbish dumping, off-road vehicle use, arson and weed invasion affect remnants even within conservation reserves (Bell 2004). Past logging practices and fire regimes have heavily modified some parts of the community, resulting in a simplified structure and floristics. Frequent fires (<3 years) have dramatically simplified understorey vegetation (Bell 2004). Grazing, uncontrolled human access and associated dumping of solid and garden waste, as well as weed invasion (notably by *Lantana camara* (Lantana) and *Solanum mauritianum* (Wild Tobacco)) have degraded the more accessible remnants of the community, while transport corridors and power and communication easements have further fragmented them (Bell 2004). 'High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition' and 'Invasion, establishment and spread of Lantana (*Lantana camara* L. *sens. lat*)' are listed as Key Threatening Processed under the Act.

3.1.6 Lower Hunter Spotted Gum Ironbark Forest occurs within Werakata National Park (1,818 ha), Werakata State Conservation area (1,161 ha), Columbey National Park (475 ha) and Wallaroo National Park (~300 ha) (Bell 2013). The combined area under formal reservation is approximately 3,754 ha, or between 6% and 9% of the community's pre-European distribution. Areas under reservation are predominantly structurally immature and dominated by young trees (Bell 2004).

3.2 Criteria for listing

Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions is eligible to be listed as an Endangered Ecological Community in accordance with Section 12 of the Act as, in the opinion of the Scientific Committee, it is facing a very high risk of extinction in New South Wales in the near 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:

(b) a 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:

(b) 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.

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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:

(b) a 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.

Dr Mark Eldridge
Chairperson
NSW Scientific Committee

Exhibition period: 22/04/16 – 17/06/16 Proposed Gazettal date: 22/04/16

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 Lower Hunter Spotted Gum Ironbark Forest in the field. Given natural variability, along with disturbance history, Lower Hunter Spotted Gum Ironbark Forest may sometimes occur outside the typical range of variation in the features described below.

4.1 Lower Hunter Spotted Gum Ironbark Forest is currently known to occur in the Lower Hunter Valley in an area centred on the Cessnock-Beresfield area and approximately bounded by the towns of Paxton, Branxton, Clarence Town, Beresfield, Mt Vincent and the northern boundary of Watagans National Park. The northern and southern parts of its distribution are interrupted by the floodplain of the Hunter River. Remnants occur within the Cessnock, Maitland, Singleton, Lake Macquarie, Dungog and Port Stephens local government areas but may also occur elsewhere within the Bioregions.

4.2 Lower Hunter Spotted Gum Ironbark Forest is known to occur principally on Permian and Carboniferous geology in the central to lower Hunter Valley. The Permian substrates most commonly supporting the community belong to the Dalwood Group, the Maitland Group and the Greta and Tomago Coal Measures (NSW Department of Mines 1966, 1969). In the area of Paterson, Seaham and Clarence Town the community occurs on Carboniferous sediments including Wallaringa, Mt Johnstone and Seaham formations. The community is strongly associated with, though not restricted to, the yellow podsolic and solodic soils of the Lower Hunter soil landscapes of Aberdare, Branxton and Neath (Kovac and Lawrie 1991). These substrates are said to produce 'moderately fertile' soils (Kovac and Lawrie 1991). Lower Hunter Spotted Gum Ironbark Forest occurs in areas receiving between 700 and 1,100 mm in annual rainfall although isolated examples may be found in areas with lower (<700 mm) or higher (1,100–1,200 mm) rainfall.

4.3 Lower Hunter Spotted Gum Ironbark Forest is dominated by *Corymbia maculata*, (Spotted Gum) and *Eucalyptus fibrosa* (Broad-leaved Ironbark), with *E. punctata* (Grey Gum) occurring less frequently. A variety of other eucalypts occur occasionally, including *E. crebra* (Grey Ironbark), *E. fergusonii*, *E. umbra* (Bastard White Mahogany), *E. paniculata* (Grey Ironbark) and *E. moluccana* (Grey Box) (Bell

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2007; 2013). *Eucalyptus canaliculata* intergrades extensively in the area with *E. punctata*. *Acacia parvipinnula* is frequently present and forms a tall shrub/small tree layer. The understorey composition varies as a function of patterns in drainage, disturbance history and edaphic factors. Species frequently observed in the diverse ground layer include *Cymbopogon refractus*, *Dianella revoluta*, *Glycine clandestina*, *Pratia purpurascens*, *Themeda australis* and *Phyllanthus hirtellus* (NPWS 2000; Hill 2003; Bell 2004). Bell (2013) recognised three broad categories comprising sites with: i) a shrub stratum dominated by paperbarks (*Melaleuca nodosa*, *M. decora*) with *Bursaria spinosa*, *B. lasiopetala*, and *Maytenus sylvestris* also prominent in the shrub layer, and a groundcover dominated by *Entolasia stricta*, *Aristida vagans*, *Lepidosperma laterale*, *Microlaena stipoides* and *Lomandra multiflora*; ii) a shrub stratum dominated by *Daviesia ulicifolia*, *Bursaria spinosa*, *Lissanthe strigosa*, *Persoonia linearis* and *Acacia falcata* with *Entolasia stricta*, *Aristida vagans*, *Cheilanthes sieberi*, *Microlaena stipoides* and *Lomandra filiformis* dominant in the ground layer; and iii) a shrub stratum dominated by *Leptospermun parvifolium*, *Melaleuca nodosa*, *Persoonia linearis*, *Grevillea parviflora* and *Daviesia ulicifolia* with a ground cover dominated by *Entolasia stricta*, *Imperata cylindrica*, *Pomax umbellata*, *Joycea pallida* and *Lepidosperma laterale*. In an undisturbed condition, the structure of the community is typically open forest. If thinning has occurred, it may take the form of woodland or a dense thicket of either shrubs or saplings, depending on post-disturbance regeneration.

4.4 Lower Hunter Spotted Gum Ironbark Forest belongs to a complex of ecological communities which have been described and iteratively refined following incremental additions to a regional quantitative floristic survey dataset (NPWS 2000; Peake 2006; Somerville *et al*. 2009a, 2009b; Sivertsen *et al*. 2011; Bell 2013). Repeated analyses have consistently identified Lower Hunter Spotted Gum Ironbark Forest as a distinct assemblage of species, although successive treatments differ in the compositional range attributed to the ecological community in the context of a continuum of related communities.

4.5 Lower Hunter Spotted Gum Ironbark Forest grades into Seaham Spotted Gum Ironbark Forest in areas with similar edaphic properties but receiving higher rainfall (900–1,200 mm). Seaham Spotted Gum Ironbark Forest differs from Lower Hunter Spotted Gum Ironbark Forest by the co-dominance of a range of tree species which are rarer in, or absent from, Lower Hunter Spotted Gum Ironbark Forest. These include *Eucalyptus siderophloia*, *E. crebra*, *E. tereticornis* and *E. moluccana*. Seaham Spotted Gum Ironbark Forest also differs by the rarity of a suite of sclerophyllous shrub species (*Dillwynia retorta*, *Grevillea montana*, *G. parviflora* subsp. *parviflora*, *Hakea sericea*, *Leptospermum parvifolium*, *Maytenus sylvestris*, *Melaleuca decora*, *M. nodosa*, *Pultenaea spinosa*) and is characterised by a different and richer suite of subshrubs and herbaceous species (*Brachyscome multifida* var. *multifida*, *Solanum prinophyllum*, *Arthropodium milleflorum*, *Dichondra repens*, *Lagenophora stipitata*, *Oxalis perennans*, *Pseuderanthemum variabile*, *Tricoryne simplex*, *Dichelachne micrantha*, *Digitaria ramularis*, *Echinopogon caespitosus* var. *caespitosus*, *E. ovatus*, *Entolasia marginata*) (Bell 2013).

4.6 Lower Hunter Spotted Gum Ironbark Forest grades into Hinterland Spotted Gum Ironbark Forest in areas closer to the coast with higher rainfall (900–1,200 mm) and more quartz-rich soil. Hinterland Spotted Gum Ironbark Forest differs from Lower Hunter Spotted Gum Ironbark Forest in the rarity of a suite of sclerophyllous shrub species (*Dillwynia retorta*, *Grevillea montana*, *G. parviflora* subsp. *parviflora*, *Hakea sericea*, *Leptospermum parvifolium*, *Maytenus sylvestris*, *Pultenaea spinosa*) and by the presence of different co-dominant species (*Angophora costata*, *Eucalyptus globoidea*) (Bell 2013).

4.7 In areas of lower rainfall (<700–800 mm), Lower Hunter Spotted Gum Ironbark Forest grades into Sandstone Spotted Gum Ironbark Forest, Broken Back Spotted Gum Ironbark Forest or Hunter Spotted Gum Ironbark Forest (Bell 2013). Sandstone Spotted Gum Ironbark lacks most of the herbaceous species characteristic of Lower Hunter Spotted Gum Ironbark Forest and is characterised by a different

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suite of sclerophyllous shrub species (*Choretrum* sp. A, *Dodonaea viscosa* subsp. *cuneata*, *Leucopogon muticus*, *Melichrus urceolatus*, *Styphelia triflora*, *Platysace ericoides*). Broken Back Spotted Gum Ironbark Forest differs primarily in the composition of the shrub layer, with several of the species characteristic of Lower Hunter Spotted Gum Ironbark Forest rarely observed (*Grevillea parviflora* subsp. *parviflora*, *Hakea sericea*, *Leptospermum parvifolium*, *Maytenus sylvestris*, *Melaleauca decora*, *M. nodosa*) but replaced by other species (*Acacia amblygona*, *A. elongata*, *Choretrum* sp. A). Lower Hunter Spotted Gum Ironbark Forest is replaced by Hunter Spotted Gum Ironbark Forest (equivalent to Peak's (2009) Central Hunter Spotted Gum Ironbark Forest) to the west and north-west of its distribution. Hunter Spotted Gum Ironbark Forest is more frequently dominated by *Eucalyptus crebra* and *E. moluccana*, has a sparser shrub layer and a more species-rich herbaceous layer dominated by species such as *Desmodium varians*, *Glycine tabacina*, *Dichondra repens*, *Brunoniella australis* and *Calotis lappulacea*.

4.8 Lower Hunter Spotted Gum Ironbark Forest shares many species with the forests dominated by *Corymbia maculata* and *Eucalyptus fibrosa* in the Nowra region (Bell 2013), however the Nowra forests are characterised by a range of different shrub species (*Acacia implexa*, *Jacksonia scoparia*, *Dillwynia sieberi*, *Exocarpus strictus*, *Macrozamia communis*, *Persoonia mollis* subsp. *leptophylla*) and herbaceous species (*Gonocarpus tetragynus*, *Goodenia hederacea* subsp. *hederacea*, *Dianella caerulea* var. *assera*, *Lomandra confertifolia* subsp. *rubiginosa*, *L. glauca*, *L. obliqua*, *Patersonia sericea*) Bell (2013).

4.9 On open depressions and drainage flats within the Cessnock-Beresfield area, Lower Hunter Spotted Gum Ironbark Forest may be replaced by Hunter Lowlands Redgum Forest, in which *Eucalyptus tereticornis*, *E. punctata*, *E. crebra* and *Angophora floribunda* occur more frequently, as do *Breynia oblongifolia*, *Leucopogon juniperinus*, *Jacksonia scoparia* and *Brunoniella australis* (NPWS 2000).

4.10 Lower Hunter Spotted Gum Ironbark Forest is likely to contain a number of threatened plant species listed in the table below.

Species	TSC Act*	EPBC Act+
Callistemon linearifolius	Vulnerable	
Grevillea parviflora subsp. *parviflora*	Vulnerable	Vulnerable
Persoonia pauciflora	Critically Endangered	Critically Endangered
Rutidosis heterogama	Vulnerable	Vulnerable

* Threatened Species Conservation Act 1995
+ Environment Protection and Biodiversity Conservation Act 1999

4.11 Lower Hunter Spotted Gum – Ironbark Forest is likely to contain a number of threatened animal species listed in the table below.

Species	Common name	TSC Act*	EPBC Act+
Birds			
Anthochaera phrygia	Regent Honeyeater	Endangered	Critically Endangered
Calyptorhynchus lathami	Glossy Black Cockatoo	Vulnerable	
Climacteris picumnus victoriae	Brown Treecreeper	Vulnerable	
Lathamus discolor	Swift Parrot	Vulnerable	
Melithreptus gularis gularis	Black-chinned Honeyeater	Vulnerable	

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Neophema pulchella	Turquoise Parrot	Vulnerable	
Ninox strenua	Powerful Owl	Vulnerable	
Mammals			
Miniopterus schreibersii	Eastern Bent-Wing Bat	Vulnerable	
Mormopterus norfolkensis.	Eastern Freetail Bat	Vulnerable	
Petaurus australis	Yellow-Bellied Glider	Vulnerable	
Petaurus norfolcensis	Squirrel Glider	Vulnerable	
Phascolarctos cinereus	Koala	Vulnerable	
Pteropus poliocephatus	Grey-headed Flying-fox	Vulnerable	Vulnerable

* Threatened Species Conservation Act 1995
[+] Environment Protection and Biodiversity Conservation Act 1999

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