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 the Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South Western Slopes and South Eastern Highlands Bioregions as an ENDANGERED ECOLOGICAL COMMUNITY in Part 3 of Schedule 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 Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South Western Slopes 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 3 of Schedule 1 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.

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Part 1. Assemblage of species

1.1 Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South Western Slopes and South Eastern Highlands Bioregions (hereafter referred to as Coolac-Tumut Serpentinite Shrubby Woodland) is characterised by the assemblage of species listed below.

Abutilon oxycarpum
Acacia decora
Acacia implexa
Acacia penninervis var. *penninervis*
Acaena novae-zelandiae
Allocasuarina verticillata
Aristida ramosa var. *ramosa*
Austrostipa densiflora
Austrostipa rudis
Austrostipa scabra
Banksia marginata
Bothriochloa macra
Brachychiton populneus subsp. *populneus*
Bursaria spinosa subsp. *lasiophylla*
Carex breviculmis
Cheilanthes sieberi subsp. *sieberi*
Clematis microphylla
Convolvulus angustissimus
Crassula sieberiana
Daucus glochidiatus
Dianella revoluta var. *revoluta*
Dichanthium sericeum
Dichondra repens
Dodonaea viscosa subsp. *spatulata*
Elymus scaber
Eucalyptus albens
Eucalyptus bridgesiana
Eucalyptus melliodora
Eucalyptus nortonii
Euchiton gymnocephalus
Exocarpos cupressiformis
Geranium solanderi var. solanderi
Gonocarpus tetragynus
Goodenia spp.
Hibbertia calycina
Hovea linearis
Hydrocotyle laxiflora
Hypericum gramineum
Leptospermum brevipes
Lomandra filiformis subsp. *coriacea*
Lomandra filiformis subsp. *filiformis*
Oxalis exilis
Oxalis perennans
Panicum effusum
Pleurosorus rutifolius
Poa sieberiana
Ptilotus nobilis subsp. semilanats
Ptilotus spathulatus
Ptilotus spp.
Ricinocarpos bowmanii
Rumex brownii
Rytidosperma caespitosum
Rytidosperma laeve
Rytidosperma monticola
Rytidosperma pilosum
Rytidosperma racemosum
Rytidosperma setaceum
Schoenus apogon
Scutellaria humilis
Senecio bathurstianus
Senecio quadridentatus
Spyridium parvifolium
Stellaria pungens
Themeda australis
Thysanotus patersonii
Tricoryne elatior
Viola betonicifolia
Wahlenbergia communis
Wahlenbergia gracilenta
Wahlenbergia luteola
Xanthorrhoea glauca subsp. *angustifolia*

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

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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.

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 Coolac-Tumut Serpentinite Shrubby Woodland occurs within the NSW South Western Slopes and South Eastern 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.

2.3 Coolac-Tumut Serpentinite Shrubby Woodland is associated with serpentinite geology formations (Lyons *et al*. 1974; Benson *et al.* 2010; Mackenzie 2014).

Part 3. Eligibility for listing

3.1 Reasons for determining eligibility for listing

3.1.1 The geographic distribution of Coolac-Tumut Serpentinite Shrubby Woodland is highly restricted. Using serpentinite mapped in the Coolac/Gundagai/Tumut area in the NSW Statewide Geological Database Geology 250k (2001) layer as a surrogate for the distribution of the community, the extent of occurrence is estimated at 1721 km^2. The extent of occurrence is based on a minimum convex polygon enclosing all mapped occurrences of the ecological community, the method of assessment recommended by IUCN (2014). The upper bound for Area of Occupancy (AOO) is estimated at 460 km^2 based on 115 2 x 2 km grid cells, the scale recommended for assessing area of occupancy by IUCN (2014). Due to extensive clearing throughout the community's range, the AOO is likely to be much less than this, but it is not

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likely to be < 10 km^2. The community is not protected within any conservation reserves and reductions due to the action of threatening processes are likely to continue.

3.1.2 The Coolac-Tumut Serpentinite Shrubby Woodland has been extensively cleared and heavily impacted by weed invasion and grazing. This has led to changes in community structure and composition, degradation and fragmentation of habitat, and invasion and establishment of exotic species. Collectively, these threats indicate a large reduction in ecological function. Benson *et al*. (2010) cite major alteration to species composition and geographic distribution due to weed invasion, grazing and clearing. Benson *et al*. (2010) note that some areas of potential habitat have recently been converted to pine plantations, while Mackenzie (2014) found the Coolac Serpentinite outcrop and surrounding landscapes have been extensively cleared for grazing and agriculture. The community is highly fragmented with most remaining stands small and with high edge to area ratios (average polygon size of 4.8 ha, OEH *in litt*. 2012). Armstrong *et al.* (2013) note the adverse effects of grazing by domestic livestock and introduced animals such as rabbits, hares, horses, deer, pigs and goats on the structure and floristic composition of plant communities in the upper Murrumbidgee catchment. Mineral prospecting and mining may have local impacts; past mining took place at Tumut Gold Mine and McAlpine Mine and significant areas of serpentinite are covered by current mineral exploration licences (Armstrong *et al*. 2013). Weed species affecting heavily grazed locations include Saffron Thistle (*Carthamus lanatus*), St John's Wort (*Hypericum perforatum*), *Avena barbata*, *Petrorhagia nanteulii*, *Briza maxima*, *Hypochaeris radicata* and, in gullies, Blackberry (*Rubus* spp.) (Benson *et al*. 2010). Armstrong *et al*. (2013) recorded the following exotic taxa in 30% or more of plots assigned to the community: *Acetosella vulgaris*, *Avena barbata*, *Briza maxima*, *Bromus diandrus*, *Bromus hordeaceus*, *Carthamus lanatus*, *Hypericum perforatum*, *Hypochaeris glabra*, *Petrorhagia nanteuilii*, *Rosa rubiginosa*, *Rostraria cristata*, *Sonchus oleraceus*, *Trifolium angustifolium*, *Trifolium arvense*, *Trifolium campestre*, *Trifolium dubium* and *Trifolium glomeratum*. '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. Due to the small patch size of remnant areas the Coolac-Tumut Serpentinite Shrubby Woodland is likely to be subject to stochastic changes in its immediate environment.

3.2 Criteria for listing

Coolac-Tumut Serpentinite Shrubby Woodland 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 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 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: 22/05/15 – 17/07/15 Proposed Gazettal date: 22/05/15

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 Coolac-Tumut Serpentinite Shrubby Woodland in the field. Given natural variability, along with disturbance history, Coolac-Tumut Serpentinite Shrubby Woodland may sometimes occur outside the typical range of variation in the features described below.

4.1 The structure of Coolac-Tumut Serpentinite Shrubby Woodland varies between tall open heath and low sparse woodland. It is usually dominated by the small tree *Allocasuarina verticillata* and shrubs *Acacia implexa, Ricinocarpus bowmannii* and the grasstree *Xanthorrhoea glauca* subsp. *angustifolia*. Scattered taller trees include *Eucalyptus nortonii* and *E. albens*. The ground is rocky and the vegetative ground cover is sparse on exposed slopes and dense in creeklines. Ground cover species include the grasses *Themeda australis, Aristida ramosa* var. *ramosa, Rytidosperma pilosum, R. laeve, R. racemosum, Bothriochloa macra, Poa sieberiana* var. *sieberiana, Panicum effusum, Austrostipa scabra* and *Elymus scaber* (Benson *et al.* 2010; Armstrong *et al.* 2013). *Senecio quadridentatus, Cheilanthes sieberi* and *Carex breviculmis* are common components of the understorey (Armstrong *et al.* 2013). In protected gullies and footslopes where the soil is deeper *Eucalyptus bridgesiana* and *E. melliodora* can be found. *Banksia marginata* is restricted to protected gullies and occurs with *Dodonaea viscosa* subsp. *spatulata, Bursaria spinosa* subsp. *lasiophylla, Leptospermum brevipes, Abutilon oxycarpum, Acacia decora, Ricinocarpos bowmanii* and *Exocarpos cupressiformis*. In these situations the ground cover is dense to mid-dense with

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Acaena novae-zelandiae, Rumex brownii, Geranium solanderi var. *solanderi, Hypericum gramineum, Viola betonicifolia* and *Clematis microphylla* var. *leptophylla* common (Benson *et al.* 2010).

4.2 Coolac-Tumut Serpentinite Shrubby Woodland corresponds to plant community ID301 'Drooping Sheoke - *Ricinocarpus bowmannii* - grasstree tall open shrubland of the Coolac - Tumut Serpentinite Belt', and plant community ID337 'Apple Box - Silver Banksia - Drooping Sheoak open woodland - tall shrubland in protected gullies of the Coolac - Tumut serpentinite belt, confined to the NSW South-western Slopes Bioregion' in Benson *et al.* (2010). Coolac-Tumut Serpentinite Shrubby Woodland includes the following: u43 'Mealy Bundy – *Acacia implexa – Allocasuarina verticillata – Ricinocarpos bowmanii* tall grassy open woodland on serpentinite in the Coolac-Goobarragandra area primarily of the upper South Western Slopes Bioregion' of Armstrong *et al.* (2013); Biolandscape HonS29 'Western Slopes Dry Sclerophyll Forests' and Biolandscape HonS84 'Upper Riverina Dry Sclerophyll Forests' of Priday (2007); Vegetation Group 182 'Western Slopes Dry Shrub Forest on Serpentinite' of Gellie (2005); and 'Serpentine Woodland' of Mulvaney *et al.* (2005). Coolac-Tumut Serpentinite Shrubby Woodland is most closely aligned with Upper Riverina Dry Sclerophyll Forests vegetation class (VC 84) (Keith's 2004) although it has elements in common with Western Slopes Grassy Woodlands (VC 42), Southern Tableland Grassy Woodlands (VC 86) and Southern Tableland Dry Sclerophyll Forests (VC 28).

4.3 Coolac-Tumut Serpentinite Shrubby Woodland is associated with soils derived from the Coolac Serpentinite formation. These soils are relatively rich in magnesium and iron-group elements (cobalt, chromium, iron, manganese and nickel) and poor in calcium and potassium (Lyons *et al.* 1974, cited in Armstrong *et al.* 2013), inhibiting the growth of some plant species. Soils are commonly shallow to skeletal with much exposed rock (Armstrong *et al.* 2013).

4.4 Coolac-Tumut Serpentinite Shrubby Woodland has been recorded in the Gundagai and Tumut local government areas (within the NSW South Western Slopes and South Eastern Highlands Bioregions) however unrecorded stands of the ecological community may occur elsewhere in these Bioregions. It is not known to be represented in any conservation reserves.

References:

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