Southern Brown Bandicoot *Isoodon obesulus*

Shaw 1797

Other common names: Short-nosed Bandicoot, Southern Short-nosed Bandicoot, Brown Bandicoot

The following information is provided to assist persons (e.g. authors of Species Impact Statements, development and activity proponents, and determining and consent authorities) who are required to prepare or review assessments of likely impacts on threatened species pursuant to the provisions of the *Environmental Planning and Assessment Act* 1979. These guidelines should be read in conjunction with the NPWS *Information Circular No. 2: Threatened Species Assessment under the EP&A Act: The '8 Part Test' of Significance* (November 1996).

Introduction

The Southern Brown Bandicoot, *Isoodon obesulus*, may occur in areas where there is potential for conflict between development and conservation objectives. These guidelines have been prepared in order to improve the assessment process by providing advice on specific biological factors which should be considered if *I. obesulus* is or likely to be present at a particular site. If *I. obesulus* is present, development planning should attempt to avoid direct and indirect impacts on the species in the first instance, minimise any unavoidable impacts, and then set up processes which establish long-term conservation of the species at the site.

Survey

The occurrence of *I. obesulus* at a site may be indirectly inferred from the presence of distinctive conical-shaped excavations in the soil (Figure 1). These excavations, which represent the forage-diggings of animals, vary in size but typically range from 5-10 cm deep and 3-10 cm wide. Since apparently identical forage-diggings can be left by the common and widely distributed Long-nosed Bandicoot (*Perameles nasuta*), further survey work will be necessary to identify which species is/are present. Both species are known to occur in sympatry.

Figure 1. Distinctive conical shaped forage-digging left in the soil profile by the Southern Brown Bandicoot (*Isoodon obesulus*). Source: Andrew W. Claridge.

Live-trapping using wire mesh 'bandicoot' traps (200mm wide x 170mm tall x 500 mm long; Figure 2) is the preferred survey method for detecting *I. obesulus* (manufactured by R.E. Walters Pty. Ltd., Sunshine, VIC). This method will allow for unequivocal identification of animals, provided the person undertaking the trapping work is experienced in identifying bandicoots. If this is not the case, then any captured animals should be photographed, measured and have hair-samples taken for later analysis (see below). Subsequent identification of the animal in question can then be made by an appropriate expert.

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The type of bait used to lure animals into traps may vary, but is usually based on a mixture of peanut butter and rolled oats. Various additives can be incorporated into this mixture, such as honey, golden syrup, pistachio essence (Keith Harris and Co. Ltd., Thornleigh, New South Wales), or sardines. Where possible, a range of such bait types should be used, alternated between traps with equal effort.

Figure 2. Wire mesh cage trap designed to capture the Southern Brown Bandicoot (*Isoodon obesulus*). Source: Andrew W. Claridge.

Ideally, live-trapping survey for *I. obesulus* should be carried out during the warmer months, from early September through to late April. Outside of this period trapping should only be conducted during fine weather. Regardless of time of year, periods of inclement weather (ie. heavy rainfall) should be totally avoided.

The number of traps set at a site will vary according to the extent of suitable habitat, the area over which characteristic forage-diggings are present, and the scale of the proposed development or activity. Traps should ideally be arranged in lines or transects through likely habitat types, or as indicated by the presence of forage-diggings. Traps should be spaced between 20 and 50 metres apart. As a general rule a minimum of 10 traps per ha should be set.

Traps should be set for a minimum period of 4-5 consecutive nights. This duration of time is usually sufficient to determine the identity of the animals present at a site. On each day traps should be set at dusk and checked the following morning. Where possible, traps should not be left open during daylight hours.

Handling of captured animals should be kept to a minimum, since bandicoots are prone to stress. Adult female animals may lose pouch young upon capture and handling. Any handling that needs to be undertaken should be done on animals restrained within the confines of an opaque bag. Thick cotton, as used in the manufacture of tracksuit pants, is an ideal material for this purpose.

Other survey techniques such as hair-sampling tubes (as per Scotts and Craig 1988; Figure 3) can also be used to detect *I. obesulus*, but these should always be viewed of as a secondary option to live-trapping with wire mesh cage traps. If used, hair-sampling tubes should be set with the same attractant baits as indicated above, for a period of at least 7 and up to 10 days. As with live trapping, the spatial configuration and intensity of sampling will vary according to the particular situation. A person specialising in mammalian hair analysis should identify all hair samples collected during survey.

Further specific guidance in relation to survey for *I. obesulus* should be sought from NPWS via the contact addresses listed below.

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Figure 3. Hair-sampling tube designed to capture hairs of the Southern Brown Bandicoot. Source: Andrew W. Claridge.

Life Cycle of the Species

The biology or life cycle of *I. obesulus* is described in the draft recovery plan and summarised in the attached profile.

Threatening Processes

Three threatening processes listed under the TSC Act have been identified as potentially affecting *I. obesulus:* (i) Predation by the European Red Fox (*Vulpes vulpes*), (ii) predation by the feral cat (*Felis catus*), and (iii) High frequency fire affecting key life cycle processes in plants and animals and loss of vegetation structure and composition.

Local Population Viability

In the absence of more comprehensive information about the reproductive biology of *I. obesulus*, the minimum size of a viable local population of the species is unknown. It should be assumed, therefore, that a particular population is viable until further assessment indicates otherwise, regardless of its size.

Significant Area of Habitat

Given the apparent rarity of *I. obesulus* in New South Wales, any site where the species is detected is likely to represent a significant area of habitat.

Isolation and Fragmentation

The paucity of records of *I. obesulus* and the patchy distribution of these makes it difficult to assess where populations of the species begin and end. Based on current knowledge, it is impossible to determine how many populations of *I. obesulus* exist, and, moreover, whether these populations are linked. The modern-day pattern of distribution of locality records for the species indicate that populations are likely to be disjunct. Where continuity of apparently suitable habitat exists around populations, this should be maintained and enhanced as far as is practicable.

Limit of Known Distribution

The known distribution of *I. obesulus* is bounded to the east by the New South Wales coastline and to the south by the Victorian State border. The northernmost extent of the species appears to be the southern shoreline of the Hawkesbury River, north of Sydney, although this boundary may change with further survey work. The western limit of the distribution of the species is also poorly defined, but is likely to be bounded by the eastern fall of the Great Dividing Range.

Adequacy of Representation in Conservation Reserves or Other Similar Protected Areas

Based on current information it is not possible to identify whether *I. obesulus* is adequately represented in any conservation reserve in New South Wales. This situation may change in the future as ongoing monitoring programs better define the extent of populations in Ku-ring-gai Chase and Garigal National Parks in the Northern Sydney Metropolitan Area, and Ben Boyd National Park and Nadgee Nature Reserve in

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the far south-eastern corner of the State.

Critical Habitat

Critical habitat has not yet been ascertained for *I. obesulus*.

Should the Species be Considered in My '8-Part Test' of Significance?

The first step in the environmental assessment process is to consider whether *I. obesulus* should be addressed in applying the '8 Part Test' of Significance. This test is defined in the NPWS Information Circular No. 2: Threatened Species Assessment under the EP&A Act 1979: The '8 Part Test' of Significance (November 1996). To assist you in this process, refer initially to the questionnaire in Appendix 1, which is attached to these guidelines. Appendices 2-4 include information that will assist you in answering those questions. If the final outcome to any of the questions is 'Yes', then the species should be considered in applying the '8 Part Test' of Significance. If the final outcome is 'No' to all of the questions, then the species need not be included in your assessment.

Assessing the likelihood of impact of any given activity or development on *I. obesulus*, when applying the '8-Part Test' of Significance, may be problematic. This is particularly the case since information on the distribution, ecology and impact of disturbance on the species are all poorly known. As a general guideline, activities or developments that will lead to either permanent loss and/or long-term degradation of understorey (0-2m high) vegetation may be detrimental to the species, depending on the scale of loss/degradation and surrounding geographic context. Where such effects are likely please contact the NPWS Threatened Species Unit at either of the addresses listed below for more specific advice.

Mitigating Impacts

Where activities or developments are proposed on or in the immediate vicinity of habitat occupied by *I. obesulus*, the following mitigating measures should be adopted, where practicable:

1. Maintenance and/or promotion of dense and contiguous understorey vegetation. This has two potential benefits to *I. obesulus*. Firstly, it provides cover for animals to forage, and secondly it provides nesting material for animals to shelter. Existing suitable habitat can be maintained by way of prevention of clearing. New habitat can be established by planting local native species in conjunction with the removal of weeds. Advice from the NPWS Threatened Species Unit should be sought where appropriate;

2. Negation or reduction of predator impact. Feral predators such as cats, dogs and foxes pose a significant threat to *I. obesulus*. Control of these feral predators should be carried out where necessary. Similarly, domestic pets such as cats and dogs also have the potential to impact on bandicoots, at the interface between native vegetation and developed areas. Responsible pet ownership in such areas, and in some cases restrictions on pet ownership, may reduce potential for conflict;

3. In areas where *I. obesulus* occurs, community education with the aim of raising the profile of the species may also be an effective way helping conserve the species. Educational efforts may take the form of interpretive signs, displays or forums relating to *I. obesulus*.

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For further information, please contact the Southern Brown Bandicoot (*Isoodon obesulus*) Recovery Planning Officer at either:

Threatened Species Unit, Central Directorate, NSW NPWS, PO Box 1967, Hurstville NSW 2220. Phone (02) 9585 6678, or;

Threatened Species Unit, Southern Directorate, NSW NPWS, PO Box 2115, Queanbeyan NSW 2620. Phone (02) 6298 9727, or;

Website: www.npws.nsw.gov.au.

Reference

Scotts, D. J. and Craig, S. A. (1988). Improved hair-sampling tube for the detection of rare mammals. *Australian Wildlife Research* **15**, 469-472.

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Appendix 1: Questionnaire for assessing whether or not to include the Southern Brown Bandicoot when applying the '8-Part Test' of Significance, as required under the EP&A Act 1979.

If the answer to any of the following questions is 'Yes' then you need to consider the Southern Brown Bandicoot in applying the '8-Part Test' of Significance. If in doubt about answering any of the below questions please contact the relevant NPWS Threatened Species Unit.

1. **Are you within the geographic boundaries indicated in Appendix 2 below and are bandicoot forage-diggings present on-site?**

2. **Does the vegetation on-site correspond to any of the vegetation types listed in Appendix 3, or the range of plant genera indicated in Appendix 4?**

3. **Are there any records of the Southern Brown Bandicoot within one kilometre of the site <u>and</u> within the last 30 years?**

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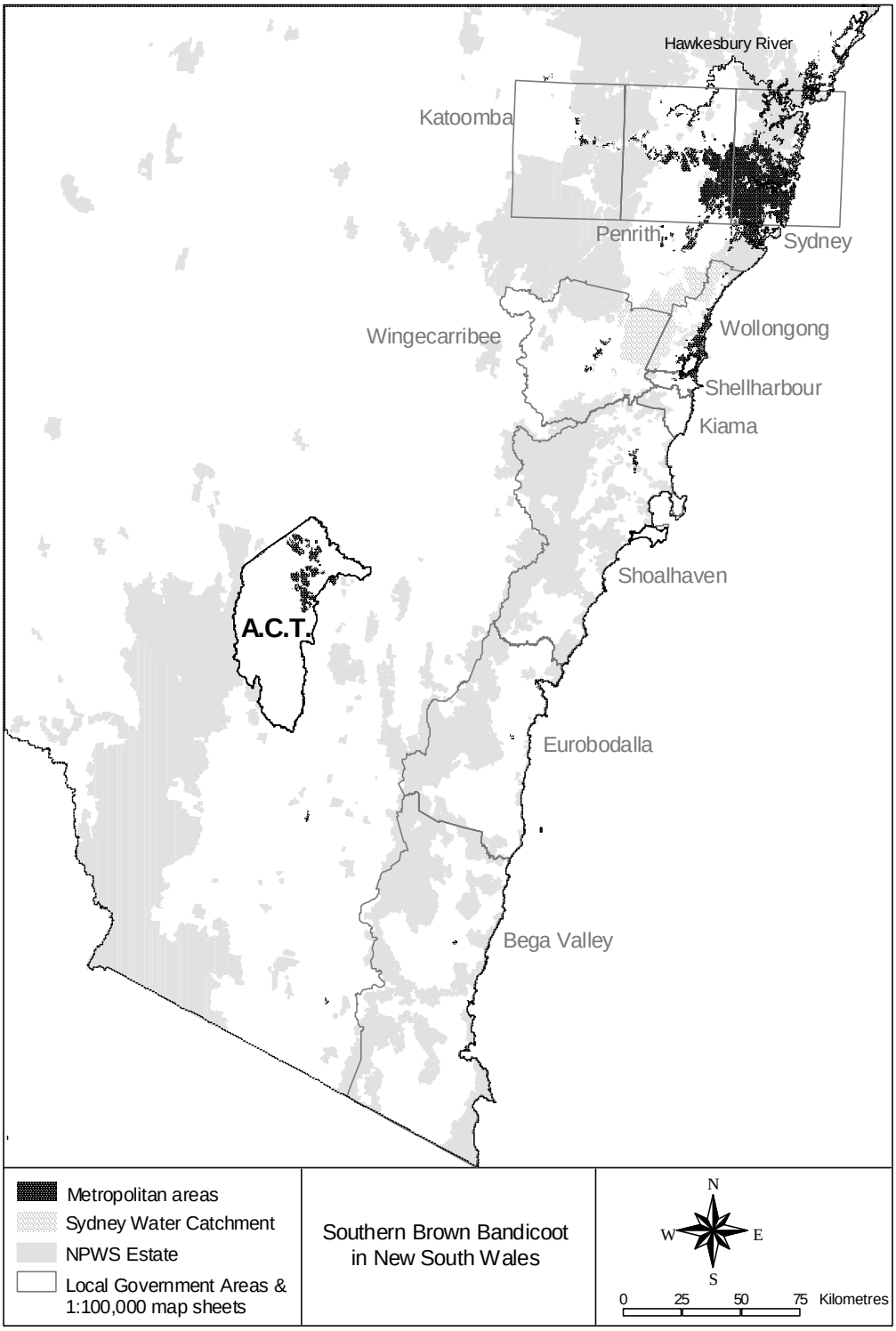
Appendix 2: Geographic context for assessment of probable Southern Brown Bandicoot habitat in south-eastern New South Wales. Relevant Local Government Areas (LGA's) and/or 1:100,000 topographic maps are outlined in grey, NSW NPWS estate is depicted as light shaded regions, Sydney Water Catchment as diagonal hatched areas and heavily populated areas are depicted as dark shaded regions.



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Appendix 3a: Reference sources for appropriate vegetation type mapping, for geographic areas identified in Appendix 2 as being within the State-wide distribution of the Southern Brown Bandicoot. Vegetation types that may potentially form habitat for the species are indicated in Appendix 3b. Where the appropriate vegetation type mapping is unavailable refer to Appendix 4 for list of key plant genera considered indicative of potential Southern Brown Bandicoot habitat. Please note that all of these lists are by no means definitive and will likely be altered as new information becomes available.

Geographic Region	References for the Appropriate Vegetation Type
Katoomba 1:100 000 Mapsheet	Keith and Benson (1998)
Penrith 1:100 000 Mapsheet	Benson (1992)
Sydney 1:100 000 Mapsheet	Benson and Howell (1994)
Wingecarribee LGA	Thomas *et al*. (2000 a, b) Otherwise see Appendix 4
Wollongong LGA	None currently available see Appendix 4
Shellharbour LGA	None currently available see Appendix 4
Kiama LGA	None currently available see Appendix 4
Shoalhaven LGA	Mills 1993 Mills 1998 Mills and Associates Pty Ltd (1996) Thomas *et al*. (2000 a, b)
Eurobodalla LGA	Thomas et al. (2000 a, b)
Bega Valley LGA	Keith and Bedward (1999) Thomas *et al.* (2000 a, b)

Appendix 3b: Vegetation types considered potential habitat for the Southern Brown Bandicoot, with relevant source reference indicated. Please note that these lists are by no means definitive and will likely be altered as new information becomes available.

Reference	Vegetation Types Considered to be Potential Habitat	Map Unit/Code
Benson, D.H. and Howell, J. (1994) The natural vegetation of the Sydney 1:100 000 map sheet. *Cunninghamia* **3**(4): 677-787.	Narrabeen Slopes Forest	9H
	Duffys Forest	9SF
	Sydney Sandstone Ridgetop Woodland	10AR
	Coastal Clay Heath	21A
	Coastal Dune Heath	21B
	Coastal Sandstone Heath	21G
	Coastal Swamp Forest Complex	27A
Benson, D.H. (1992) The natural vegetation of the Penrith 1:100 000 map sheet. *Cunninghamia* **2**(4): 541-596.	Agnes Banks Woodland	14B
	Castlereagh Scribbly Gum Forest	14A
	Sydney Sandstone Ridgetop Woodland	14AR
Keith, D.A. and Benson, D.H. (1998) The natural vegetation of the Katoomba 1:100 000 map sheet. *Cunninghamia* **2**(1): 107-143.	Escarpment Complex	6H
	Blue Mountains Sandstone Plateau Forest	9I
	Megalong Forest	9M
	Sydney Sandstone Complex	10A
	Sydney Sandstone Ridgetop Woodland	10AR
	Residual Sandstone Woodland	10R
	Open Heath	21C & 21F
	Montane Heath	21C
	Pagoda Rock Complex	21D
	Lower Blue Mountains Heath	21F
Thomas, V., Gellie, N. and Harrison, T. (2000a) Forest Ecosystem Classification and Mapping for Southern Region. Volumes I. Project undertaken for the Joint Commonwealth New South Wales Regional Forest Agreement Steering Committee as part of the New South Wales Comprehensive Regional Assessments. March 2000. *and* Thomas, V., Gellie, N. and Harrison, T. (2000b) Forest Ecosystem Classification and Mapping for Southern Region. Volumes 2 – Appendices. Project undertaken for the Joint Commonwealth New South Wales Regional Forest Agreement Steering Committee as part of the New South Wales Comprehensive Regional Assessments. March 2000.	Southern Coastal Foothills Dry Shrub Forest	1
	Shoalhaven Gorge Dry Heathy Shrub Forest	4
	Far Southern Coastal Shrub Dry Forest	8
	Kowmung Dry Shrub Forest	17
	Coastal Wet Heath Swamp Forest	24
	South Coast Swamp Forest Complex	25
	Ecotonal Coastal Swamp Forest	27
	Coastal Sands Shrub/Fern Forest	28
	Northern Coastal Sands Shrub/Fern Forest	29
	Deua Ecotonal Shrub Forest	34
	Southern Blue Mountains Mallee Heath	42
	Eastern Tableland and Escarpment Shrub/Fern Dry Forest	59
	Southern Blue Mountains Dry Shrub Forest	60
	Southern Escarpment Edge Moist Heath Forest	65
	Northern Plateau and Escarpment Heath Shrub Dry Forest	138
	Northern Coastal Hinterland Heath Shrub Dry Forest	139
	Northern Coastal Tall Wet Heath	140
	Northern Coast (and Escarpment) Wet Heath/Sedge	141
	Northern Plateau Mallee Heath	145
	Jenolan River Heath Forest on Granite	184
	Coastal Headland Heathlands	187
	Southern Coastal Hind Dune/Headland Scrub	22
	Southern Coastal Dune Scrub Complex	23
	Southern Coastal Dune Scrub Complex	23
	Coastal Dune Herb/Grassland	26
Keith, D.A. and Bedward, M. (1999) Native Vegetation of the South East Forests region , Eden, New South Wales. *Cunninghamia*. 6(1): 1-218.	Wallagaraugh Dry Grass Forest	30
	Coastal Foothills Dry Shrub Forest	32
	Coastal Range Dry Shrub Forest	33
	Coastal Gully Shrub Forest	34
	Dune Dry Shrub Forest	36
	Lowland Gully Shrub Forest	37
	Southern Riparian Scrub	38
	Northern Riparian Scrub	39
	Mountain Intermediate Shrub Forest	41
	Inland Intermediate Shrub Forest	42
	Mountain Sandstone Shrub Forest	43
	Foothills Dry Shrub Forest	44
	Mountain Dry Shrub Forest	45
	Timbillica Dry Shrub Forest	46A
	Lowland Dry Shrub Forest	46B
	Eden Dry Shrub Forest	47
	Mumbulla Dry Shrub Forest	48
	Coastal Dry Shrub Forest	49
	Rhyolite Rock Scrub	51
	Coastal Lowland Heath	55
	Hinterland Heath	56
	Lowland Swamp	57
	Swamp Forest	58
	Coastal Scrub	61
	Estuarine Wetland Scrub	63

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Appendix 3b: (continued)

Reference	Vegetation Types Considered to be Potential Habitat	Map Unit/Code
Mills, K. (1993). The Natural Vegetation of the Jervis Bay Region of New South Wales. Report to the National Estates Grant Scheme and the NSW Heritage assistance Program.	*Acacia sophorae* shrubland	1.2
	Banksia integrifolia/*Leptospermum laevigatum* shrubland	1.3
	Eucalyptus botryoides open forest/woodland	1.4
	Eucalyptus botryoides/*Banksia serrata* low woodland	1.5
	Eucalyptus gummifera/*Banksia serrata* woodland/heathland	1.6
	Eucalyptus robusta forest/woodland	3.2
	Eucalyptus longifolia - *Melaleuca* forest/woodland	3.3
	Eucalyptus pilularis forest	3.4
	Eucalyptus paniculata/*Eucalyptus longifolia*/*Angophora floribunda* forest	3.6
	Eucalyptus gummifera low woodland	3.7
	Callistemon linearis shrubland – heathland	3.8
	Eucalyptus sclerophylla/*Eucalyptus gummifera* woodland/open woodland	4.2
	Mallee/Heathland	4.3
	Sedgeland/Heathland	4.4
	Leptospermum epacridoideum	4.6
	Eucalyptus pilularis forest	5.3
	Eucalyptus sclerophylla/*Eucalyptus gummifera* forest	5.4
	Eucalyptus tereticornis forest	5.5
	Mangrove woodland - shrubland	2.2
	Casuarina glauca forest - woodland	2.3
	Littoral Rainforest	3.1
Kevin Mills and Associates Pty Ltd (1996). Flora and Fauna assessment Milton-Ulladulla. Structure Plan, Final Report.	Tall Forest - Black Butt	PIL-SYN
	Forest - Bangalay	BOT-BAN
	Forest - Swamp Mahogany/Woollybutt	ROB-LON
	Forest - Wattle	ACA-MEA
	Forest - Silvertop Ash/Bloodwood	SIE-GUM
	Forest - Scribbly Gum	SCL-FOR
	Mallee/Heathland - Bloodwood	GUM-MAL
	Shrubland - She-oak	ALL-VER
	Coastal Complex	SPI-BAN
	Shrubland - Paperbark	MEL-ERI
	Shrubland - Teatree	LEP-MEL
	Forest - Swamp Oak	CAS-GLA
Mills, K. (1998). Illawarra Vegetation Studies. Vegetation survey methods and natural vegetation types in the coastal parts of the city of Shoalhaven, New South Wales. Paper No. 7. Occasional Papers on the Vegetation of the Illawarra Region.	Forest - Blackbutt/Banksia	PIL-BAN
	Forest - Blackbutt/Bloodwood	PIL-GUM
	Forest - Blackbutt/Ironbark	PIL-PAN
	Forest - Blackbutt/Grey Gum	PIL-PUN
	Forest - Blackbutt, tall	PIL-BAN
	Forest - Peppermint/Bloodwood	PIP-GUM
	Forest - Peppermint/Blackbutt	PIP-PIL
	Forest - Stringybark/Bloodwood	GLB-GUM
	Forest - Yellow Stringybark	MUL-FOR
	Forest - Scribbly Gum/Casuarina	SCL-CAS
	Forest - Scribbly Gum/Bloodwood	SCL-GMF
	Forest - Silvertop Ash/Bloodwood	SIE-GUM
	Forest - Coast Banksia	BAN-FOR
	Forest - Bangalay	BOT-BAN
	Forest - Bangalay/Rainforest	BOT-LRF
	Forest - Bloodwood/Banksia Forest/Woodland	GUM-BAN
	Forest - Swamp Oak	CAS-GLA
	Forest - Woollybutt/Paperbark	LON-MEL
	Forest - Paperbark	MEL-FOR
	Woodland - Bangalay/Banksia	BOT-WLD
	Woodland - Yertchuk/Bloodwood	CON-GUM
	Woodland & Mallee - Bloodwood	GUM-MAL
	Woodland & Open Woodland - Scribbly Gum/Bloodwood	SCL-GUM
	Open Woodland - Scribbly Gum	SCL-HAK
	Woodland - Scribbly Gum/Grey Gum	SCL-PUN
	Shrubland - Coast Wattle	ACA-SPH
	Shrubland - Banksia/Casuarina	BAN-CAS
	Shrubland - Bottlebrush	CAL-KUN
	Shrubland - Casuarina	CAS-SHR
	Shrubland - Hakea/Banksia	HAK-BAN
	Shrubland - Coast Teatree	LEP-LAV
	Shrubland - Teatree	LEP-MEL
	Shrubland - Paperbark	MEL-ERI
	Shrubland - Riparian	RIP-SHR
	Heathland - Sandstone	SST-HTH
	Forest - River Oak	CAS-CUN
	Forest - Swamp Mahogany/Paperbark	ROB-MEL
	Grassland - Kangaroo Grass	THM-GRL

Appendix 4: Key plant genera considered to be indicative of potential Southern Brown Bandicoot habitat.

Structural Group	Family	Genus/species
Understorey (0-2 m)	Cyperaceae	*Caustis*
		Ghania
	Epacridaceae	*Epacris*
		Leucopogon
		Monotoca
	Fabaceae	*Platylobium*
		Pultenaea
		Hibbertia
		Dillwynia
	Myrtaceae	*Leptospermum*
	Poaceae	*Tetrarrhena*
	Proteaceae	*Banksia*
		Hakea
		Lomatia
		Persoonia
	Rhamnaceae	*Pomaderris*
	Xanthorrhoeaceae	*Xanthorrhoea*
Midstorey (2-4 m)	Myrtaceae	*Leptospermum*
	Proteaceae	*Banksia*
		Persoonia
	Xanthorrhoeaceae	*Xanthorrhoea*
(>4 m) Overstorey	Proteaceae	*Eucalyptus botryoides*
	Myrtaceae	*Eucalyptus consideniana*
		Eucalyptus gummifera
		Eucalyptus sclerophylla
		Eucalyptus sieberi
		Banksia

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