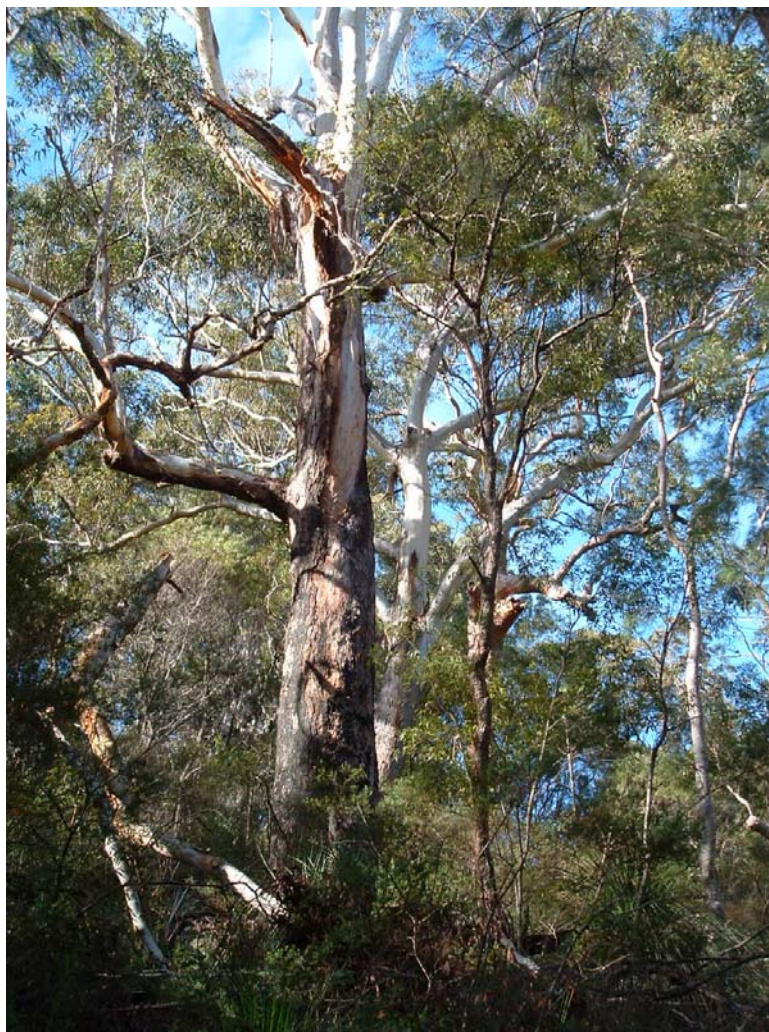


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Native Vegetation Communities of Hornsby Shire



Report prepared for Hornsby Shire Council

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Summary

In 1990-1993 we identified and mapped the native vegetation communities of Hornsby Shire. The present study updates the classification and mapping of the communities. The updated mapping has been provided in a digital version for inclusion in Council's geographic information system. The present report provides details of our methodology and community classification, together with descriptions and photos of the individual communities, and a discussion of their conservation significance.

The survey area included all of the Hornsby Local Government Area, from Eastwood to Brooklyn and Wisemans Ferry, except for Marramarra National Park, Muogamarra Nature Reserve, Long Island Nature Reserve, and Ku-ring-gai Chase National Park east of the Sydney-Newcastle Freeway. Department of Environment and Climate Change lands that have been included in the mapping include Berowra Valley Regional Park, Lane Cove River National Park, Maroota Historic Site, Mount Kuring-gai Aboriginal Area, and the fragments of Ku-ring-gai Chase National Park west of the Sydney-Newcastle Freeway.

A total of 30 native vegetation communities have been distinguished and mapped in the survey area. An additional community not included in the mapping is Seagrass Meadow, referring to submerged aquatic vegetation dominated by seagrasses, which occurs in Cowan Creek and Berowra Creek.

Twenty-five of the communities are significant at national, State, regional or local level, including:

- two critically endangered ecological communities listed in Australian legislation, Turpentine-Ironbark Forest and Blue Gum Shale Forest (listed as 'Blue Gum High Forest'),
- one endangered ecological community listed in Australian legislation, Shale/Sandstone Transition Forest,
- one critically endangered ecological community listed in NSW legislation, Blue Gum Diatreme Forest (forms part of 'Blue Gum High Forest' as listed in NSW legislation, but not 'Blue Gum High Forest' as listed in Australian legislation),
- seven endangered ecological communities listed in NSW legislation, Duffys Forest, River-flat Eucalypt Forest, Swamp Oak Floodplain Forest, Coastal Saltmarsh, Swamp Mahogany Forest, Floodplain Paperbark Scrub and Floodplain Reedland (the last three are all forms of a single listed community, 'Swamp Sclerophyll Forest on Coastal Floodplains', but are recognised here as separate communities because of their distinct structural and floristic differences),
- ten regionally significant communities (Sydney region), Coachwood Rainforest, Grey Myrtle Rainforest, Blue-leaved Stringybark Diatreme Forest, Rough-barked Apple-Forest Oak Forest, Blackbutt-Rough-barked Apple Forest, Narrow-leaved Apple Slopes Forest, Narrow-leaved Apple Gully Forest, Rock Platform Heath, Sandstone Swamp and the unmapped Seagrass Meadow,
- four locally significant communities (Hornsby Shire), Blackbutt Gully Forest, Silvertop Ash-Scribbly Gum Woodland, Angophora Woodland and Mangrove Swamp.

The other six communities of lesser conservation significance are Peppermint-Angophora Forest, Bloodwood-Scribbly Gum Woodland, Narrow-leaved Scribbly Gum Woodland, Grey Gum-Scribbly Gum Woodland, Yellow Bloodwood Woodland and Scribbly Gum Open-woodland/Heath. Together, these six communities make up 83% of the native vegetation of the survey area (12 858 of 15 517 ha). The significant communities (apart from Seagrass Meadow) make up only 17% (2659 ha).

The three communities of greatest conservation significance, the critically endangered Turpentine-Ironbark Forest, Blue Gum Shale Forest and Blue Gum Diatreme Forest, all occur on easy topography on relatively fertile soils, and have been severely depleted and fragmented by clearing for urban and rural development. Over 95% of their original extent on the Cumberland Plain has been cleared. Hornsby Shire has about a quarter of the remaining area of both Turpentine-Ironbark Forest (301 of 1183 ha) and Blue Gum Shale Forest (42 of 168 ha), and possibly all of the remaining area of Blue Gum Diatreme Forest (14 ha). Very little of these communities is conserved in the local Department of Environment and Climate Change reserves. Hornsby Shire Council has a major role to play in the conservation of the three communities.

Among the regionally and locally significant communities, two face particular threats. Coachwood Rainforest, which occurs along creeks, is highly prone to weed invasion from water-borne and bird-spread propagules, especially Small-leaved Privet (*Ligustrum sinense*), which has become a major component of many stands of this community around Sydney. Silvertop Ash-Scribbly Gum Woodland, which occurs on ridges and plateaus in the eastern part of Hornsby Shire, mainly outside Berowra Valley Regional Park, is threatened by the continual spread and intensification of urban development within its distribution. A number of stands of this community have been cleared or reduced since our 1990 survey. Others are currently threatened with clearing.

The list of significant vegetation communities in the Hornsby Shire Biodiversity Conservation Strategy needs to be updated. It should take account of:

- recent community listings in the Australian *Environment Protection and Biodiversity Conservation Act 1999*,
- recent community listings in the NSW *Threatened Species Conservation Act 1995*,
- the revised classification and nomenclature of Hornsby vegetation communities in this report,
- recommended changes in this report to the regionally and locally significant community rankings (summarised in Table 2 and discussed in the community descriptions), and
- addition of Seagrass Meadow as a regionally significant community.

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1. Introduction

In 1990-1993, in a series of previous studies for Hornsby Shire Council, we identified and mapped the native vegetation communities of the entire Hornsby Shire except for National Parks and Wildlife Service lands, based on air photo interpretation and extensive field checking (Smith and Smith 1990a, 1990b, 1993). Vegetation maps were prepared at a scale of 1:25 000. These have since been digitised by others and incorporated in Council's geographic information system.

We have now been engaged by Hornsby Shire Council to update the original vegetation classification and mapping. This has involved:

- correction of errors in the original mapping,
- correction of errors in the digitisation of the original maps,
- updating of vegetation boundaries to incorporate changes that have occurred since the previous mapping (mainly clearing, but also some regrowth of vegetation),
- revision of the original community classification, particularly for inclusion of endangered ecological communities recognised in legislation, and
- revision of the original mapping to reflect the revised community classification.

The updated vegetation mapping has been provided in a digital version for inclusion in Council's geographic information system. The present report provides details of our methodology and community classification, together with descriptions and photos of the individual communities, and a discussion of their conservation significance.

2. Methods

2.1 Survey Area

The mapped area includes all of the Hornsby Local Government Area, from Eastwood to Brooklyn and Wisemans Ferry, except for Marramarra National Park, Muogamarra Nature Reserve, Long Island Nature Reserve, and Ku-ring-gai Chase National Park east of the Sydney-Newcastle Freeway. Department of Environment and Climate Change lands that have been included in the mapping include Berowra Valley Regional Park, Lane Cove River National Park, Maroota Historic Site, Mount Kuring-gai Aboriginal Area, and the fragments of Ku-ring-gai Chase National Park west of the Sydney-Newcastle Freeway.

2.2 Other Studies Consulted

Previous vegetation studies and mapping that have been consulted for this study include:

- our 1990-1993 vegetation maps and reports (Smith and Smith 1990a-b, 1993),
- other vegetation studies that we have carried out in Hornsby Shire (Smith 1997a-b, 2002, 2003a-b, 2005, 2006, Smith and Smith 1994, 1995, 1996a-b, 1997a-c, 2000, 2003),
- Hornsby Shire threatened community surveys (ESP Ecological Surveys and Planning 1999, Lembit 2005),
- NSW National Parks and Wildlife Service western Sydney vegetation studies (NSW National Parks and Wildlife Service 2002, Tozer 2003), and
- other relevant vegetation studies (West *et al.* 1985, Thomas and Benson 1985a-b, Benson 1986, 1992, Benson and Howell 1994, Ryan *et al.* 1996, Keith 2004, Smith and Smith 2005).

2.3 Vegetation Community Classification

In our initial study (Smith and Smith 1990a), we classified the native vegetation of Hornsby into plant communities on the basis of the floristic composition of the tallest vegetation layer (usually the tree species composition). The assessment was subjective, but was based on species data from a total of 404 sample sites. We have now refined the classification to include eight endangered ecological communities listed in either the NSW *Threatened Species Conservation Act 1995* or the Australian *Environment Protection and Biodiversity Conservation Act 1999* (Table 2). Six of these have been included in the classification as single communities, using the names under which they were listed. Blue Gum High Forest is recognised here as two separate communities (Blue Gum Shale Forest and Blue Gum Diatrema Forest) because of their different geologies, and because Blue Gum Diatrema Forest is only classified as Blue Gum High Forest in the NSW legislation, not the Australian legislation. The two communities have been given the symbols BG1 and BG2 to indicate that they are forms of one endangered ecological community (at least in NSW legislation).

The other endangered ecological community, Swamp Sclerophyll Forest on Coastal Floodplains, is broadly defined and includes a variety of vegetation forms (forest, scrub, fernland, reedland and sedgeland; NSW Scientific Committee 2004). Because they are so different in vegetation structure and floristic composition, the three forms that occur in Hornsby Shire are recognised here as three separate communities (Swamp Mahogany Forest, Floodplain Paperbark Scrub and Floodplain Reedland), symbols SF1, SF2 and SF3.

We have also made some other changes to the original vegetation community classification. We initially recognised only a single rainforest community, Community O. This has now been divided into two separate communities, O1 and O2, which occur on different geologies and have different dominant tree species. We have also recognised the distinctive vegetation of Dangar Island as a separate community, and given it the symbol Q2 because it occupies a similar habitat to the original Community Q, which has been renamed Q1.

We have distinguished a total of 30 native vegetation communities in the survey area (Tables 2 and 3). Their relationship to Keith's (2004) classification of New South Wales vegetation, and to the Sydney Royal Botanic Gardens classification of Sydney region vegetation (Benson 1986, 1992, Benson and Howell 1994, Ryan *et al.* 1996), is shown in Table 2. Their relationship to the vegetation classification of our previous surveys is shown in Table 4. Terms used to describe vegetation structure are defined in Table 1.

Table 1. Structural classification of vegetation (Specht 1970)

Dominant plants	Height (m)	Projective foliage cover of tallest vegetation layer (%)			
		<10 (very sparse)	10-30 (sparse)	30-70 (mid-dense)	70-100 (dense)
Trees	>30	tall open-woodland	tall woodland	tall open-forest	tall closed-forest
	10-30	open-woodland	woodland	open-forest	closed-forest
	5-10	low open-woodland	low woodland	low open-forest	low closed-forest
Shrubs	2-8	tall open-shrubland	tall shrubland	open-scrub	closed-scrub
	0-2	low open-shrubland	low shrubland	open-heath	closed-heath
Grasses	0-2		open-grassland	grassland	closed-grassland
Sedges	0-2		open-sedgeland	sedgeland	closed-sedgeland
Rushes	0-2		open-rushland	rushland	closed-rushland

Table 2. Native vegetation communities of Hornsby Shire and their relationship to other vegetation classifications

Status: A* = critically endangered community in Australia, A = endangered community in Australia, N* = critically endangered community in NSW, N = endangered community in NSW, R = regionally significant community (Sydney region), L = locally significant community (Hornsby Shire)

NSW vegetation class (Keith 2004)	Sydney vegetation map unit (Benson 1986, 1992, Benson and Howell 1994, Ryan <i>et al.</i> 1996)	Endangered ecological community (EPBC and TSC Acts)	Hornsby vegetation community	Mapped area (ha)	Map symbol	Page	Status
Northern Warm Temperate Rainforests	10ag. Sydney Sandstone Gully Forest (part)		Coachwood Rainforest	108	O1	12	R
Dry Rainforests	9h. Narrabeen Slopes Forest (part)		Grey Myrtle Rainforest	11	O2	13	R
North Coast Wet Sclerophyll Forests	6b. Blue Gum High Forest	Blue Gum High Forest (both Acts)	Blue Gum Shale Forest	42	BG1	14	A*,N*
	6c. Glen Forest (part)	Blue Gum High Forest (TSC Act only)	Blue Gum Diatreme Forest	14	BG2	16	N*
	9f. River-flat Forest	River-flat Eucalypt Forest on Coastal Floodplains	River-flat Eucalypt Forest	6	RF	15	N
Northern Hinterland Wet Sclerophyll Forests	6c. Glen Forest (part)		Blue-leaved Stringybark Diatreme Forest	8	N	17	R
	9o. Turpentine-Ironbark Forest	Sydney Turpentine-Ironbark Forest	Turpentine-Ironbark Forest	301	TI	18	A*,N
	9sf. Duffys Forest	Duffys Forest Ecological Community	Duffys Forest	15	DF	19	N
	10ag. Sydney Sandstone Gully Forest (part)		Blackbutt Gully Forest	836	L	20	L
	9h. Narrabeen Slopes Forest (part)		Rough-barked Apple-Forest Oak Forest	271	Q1	21	R
			Blackbutt-Rough-barked Apple Forest	7	Q2	22	R
Coastal Valley Grassy Woodlands	9h. Narrabeen Slopes Forest (part)		Narrow-leaved Apple Slopes Forest	282	R	23	R
	Not distinguished	Shale/Sandstone Transition Forest	Shale/Sandstone Transition Forest	5	SS	24	A,N
Sydney Coastal Dry Sclerophyll Forests	10ag. Sydney Sandstone Gully Forest (part)		Peppermint-Angophora Forest	5579	A	25	
	10ar. Sydney Sandstone Ridgetop Woodland (part)		Bloodwood-Scribbly Gum Woodland	644	C	26	
			Silvertop Ash-Scribbly Gum Woodland	47	E	27	L
			Narrow-leaved Scribbly Gum Woodland	1289	F	28	
			Angophora Woodland	62	S	29	L
Sydney Hinterland Dry Sclerophyll Forests	10ag. Sydney Sandstone Gully Forest (part)		Narrow-leaved Apple Gully Forest	93	B	30	R
	10ar. Sydney Sandstone Ridgetop Woodland (part)		Grey Gum-Scribbly Gum Woodland	4403	D	31	
			Yellow Bloodwood Woodland	284	T	32	
Sydney Coastal Heaths	10ar. Sydney Sandstone Ridgetop Woodland (part), and 21g. Coastal Sandstone Heath (part)		Scribbly Gum Open-woodland/Heath	660	G	33	
			Rock Platform Heath	19	H	34	R

NSW vegetation class (Keith 2004)	Sydney vegetation map unit (Benson 1986, 1992, Benson and Howell 1994, Ryan <i>et al.</i> 1996)	Endangered ecological community (EPBC and TSC Acts)	Hornsby vegetation community	Mapped area (ha)	Map symbol	Page	Status
Coastal Heath Swamps	21g. Coastal Sandstone Heath (part)		Sandstone Swamp	10	I	35	R
Coastal Swamp Forests	27a. Coastal Swamp Forest Complex (part)	Swamp Sclerophyll Forest on Coastal Floodplains (part)	Swamp Mahogany Forest	7	SF1	36	N
Coastal Floodplain Wetlands	27a. Coastal Swamp Forest Complex (part)	Swamp Sclerophyll Forest on Coastal Floodplains (part)	Floodplain Paperbark Scrub	12	SF2	37	N
			Floodplain Reedland	20	SF3	38	N
	4a. Estuarine Complex (part)	Swamp Oak Floodplain Forest	Swamp Oak Floodplain Forest	110	SO	39	N
Mangrove Swamps	4a. Estuarine Complex (part)		Mangrove Swamp	321	W	40	L
Saltmarshes	4a. Estuarine Complex (part)	Coastal Saltmarsh	Coastal Saltmarsh	53	CS	41	N

Table 3. Characteristics of the native vegetation communities of Hornsby Shire

Vegetation community	Structure	Main species	Geology
Coachwood Rainforest (O1)	Low closed-forest or closed-forest	<i>Ceratopetalum apetalum</i> , * <i>Ligustrum sinense</i> , <i>Callicoma serratifolia</i> , <i>Pittosporum undulatum</i> , <i>Tristaniopsis laurina</i>	Hawkesbury Sandstone
Grey Myrtle Rainforest (O2)	Low closed-forest or closed-forest	<i>Backhousia myrtifolia</i>	Narrabeen Group
Blue Gum Shale Forest (BG1)	Tall open-forest	<i>Eucalyptus saligna</i> , <i>E. pilularis</i> , <i>E. paniculata</i> , <i>Angophora costata</i> , <i>Syncarpia glomulifera</i>	Wianamatta Group
Blue Gum Diatreme Forest (BG2)	Tall open-forest	<i>Eucalyptus saligna</i>	Jurassic volcanic
River-flat Eucalypt Forest (RF)	Tall open-forest	<i>Eucalyptus saligna</i> , <i>E. pilularis</i> , <i>Angophora floribunda</i> , <i>Allocasuarina torulosa</i>	Quaternary alluvium
Blue-leaved Stringybark Diatreme Forest (N)	Open-forest	<i>Angophora costata</i> , <i>Eucalyptus agglomerata</i> , <i>Allocasuarina torulosa</i>	Jurassic volcanic
Turpentine-Ironbark Forest (TI)	Open-forest	Variable - <i>Syncarpia glomulifera</i> , <i>Angophora costata</i> , <i>Corymbia gummifera</i> , <i>Eucalyptus resinifera</i> , <i>E. pilularis</i> , <i>E. paniculata</i> , <i>E. punctata</i> , <i>E. globoidea</i> , <i>E. acmenoides</i>	Wianamatta Group, Mittagong Formation and shale lenses in Hawkesbury Sandstone
Duffys Forest (DF)	Open-forest	Variable - <i>Corymbia gummifera</i> , <i>Angophora costata</i> , <i>Syncarpia glomulifera</i> , <i>Eucalyptus piperita</i> , <i>E. pilularis</i> , <i>E. sparsifolia</i> , <i>E. punctata</i> , <i>E. agglomerata</i> , <i>E. globoidea</i> , <i>E. haemastoma</i>	Hawkesbury Sandstone with shale lenses or near Wianamatta Group
Blackbutt Gully Forest (L)	Tall open-forest	<i>Eucalyptus pilularis</i> , <i>Angophora costata</i> , <i>Syncarpia glomulifera</i>	Hawkesbury Sandstone with shale lenses or near Wianamatta Group
Rough-barked Apple-Forest Oak Forest (Q1)	Open-forest	<i>Allocasuarina torulosa</i> , <i>Angophora floribunda</i> , <i>Eucalyptus punctata</i> , <i>E. piperita</i>	Narrabeen Group and Hawkesbury Sandstone
Blackbutt-Rough-barked Apple Forest (Q2)	Open-forest	<i>Eucalyptus pilularis</i> , <i>Allocasuarina torulosa</i> , <i>Angophora floribunda</i> , <i>A. costata</i> , <i>Corymbia gummifera</i>	Narrabeen Group and Hawkesbury Sandstone
Narrow-leaved Apple Slopes Forest (R)	Open-forest	<i>Angophora bakeri</i> , <i>Allocasuarina torulosa</i> , <i>Eucalyptus tereticornis</i> , <i>E. punctata</i> , <i>E. eugenioides</i> , <i>Corymbia eximia</i>	Narrabeen Group
Shale/Sandstone Transition Forest (SS)	Open-forest	<i>Eucalyptus punctata</i> , <i>E. eugenioides</i> , <i>Corymbia gummifera</i> , <i>Angophora costata</i>	Hawkesbury Sandstone with shale influence
Peppermint-Angophora Forest (A)	Open-forest	<i>Eucalyptus piperita</i> , <i>Angophora costata</i>	Hawkesbury Sandstone

Vegetation community	Structure	Main species	Geology
Bloodwood-Scribbly Gum Woodland (C)	Woodland or open-forest	<i>Corymbia gummifera</i> , <i>Eucalyptus haemastoma</i>	Hawkesbury Sandstone
Silvertop Ash-Scribbly Gum Woodland (E)	Woodland or open-forest	<i>Eucalyptus sieberi</i> , <i>E. haemastoma</i> , <i>Corymbia gummifera</i> , <i>Angophora costata</i>	Hawkesbury Sandstone
Narrow-leaved Scribbly Gum Woodland (F)	Woodland or open-forest	<i>Eucalyptus racemosa</i> , <i>Corymbia gummifera</i>	Hawkesbury Sandstone
Angophora Woodland (S)	Woodland or open-forest	<i>Angophora costata</i> (usually dominant), <i>Corymbia gummifera</i> , <i>Eucalyptus umbra</i>	Hawkesbury Sandstone and Narrabeen Group
Narrow-leaved Apple Gully Forest (B)	Open-forest	<i>Eucalyptus piperita</i> , <i>Angophora bakeri</i>	Hawkesbury Sandstone
Grey Gum-Scribbly Gum Woodland (D)	Woodland or open-forest	<i>Corymbia gummifera</i> , <i>Eucalyptus punctata</i> , <i>E. haemastoma</i> , <i>Angophora costata</i>	Hawkesbury Sandstone
Yellow Bloodwood Woodland (T)	Woodland or low woodland	<i>Corymbia eximia</i>	Hawkesbury Sandstone
Scribbly Gum Open-woodland/Heath (G)	Open-woodland, low open-woodland, closed-heath or closed-scrub	<i>Eucalyptus haemastoma</i> (or <i>E. racemosa</i>), <i>Corymbia gummifera</i> , <i>Angophora hispida</i> , <i>Banksia ericifolia</i> , <i>Leptospermum trinervium</i>	Hawkesbury Sandstone
Rock Platform Heath (H)	Open-heath or closed-heath	Variable - <i>Acacia suaveolens</i> , <i>Angophora hispida</i> , <i>Baeckea brevifolia</i> , <i>B. diosmifolia</i> , <i>Banksia ericifolia</i> , <i>Dillwynia floribunda</i> , <i>Epacris microphylla</i> , <i>Kunzea ambigua</i> , <i>Leptospermum squarrosum</i> , <i>L. trinervium</i> etc	Hawkesbury Sandstone
Sandstone Swamp (I)	Closed-sedgeland or closed-heath	Variable - <i>Baeckea imbricata</i> , <i>Banksia ericifolia</i> , <i>B. oblongifolia</i> , <i>Callistemon citrinus</i> , <i>Hakea teretifolia</i> , <i>Lepidosperma filiforme</i> , <i>Leptospermum squarrosum</i> , <i>Schoenus brevifolius</i> , <i>Viminaria juncea</i> , <i>Xanthorrhoea resinifera</i> etc	Hawkesbury Sandstone
Swamp Mahogany Forest (SF1)	Open-forest	<i>Eucalyptus robusta</i> , <i>Melaleuca quinquenervia</i>	Quaternary alluvium
Floodplain Paperbark Scrub (SF2)	Closed-scrub	<i>Melaleuca ericifolia</i>	Quaternary alluvium
Floodplain Reedland (SF3)	Closed-grassland	<i>Phragmites australis</i>	Quaternary alluvium
Swamp Oak Floodplain Forest (SO)	Closed-forest or open-forest	<i>Casuarina glauca</i>	Quaternary alluvium
Mangrove Swamp (W)	Low closed-forest or closed-scrub	<i>Avicennia marina</i> , <i>Aegiceras corniculatum</i>	Quaternary alluvium
Coastal Saltmarsh (CS)	Closed-rushland	<i>Juncus kraussii</i>	Quaternary alluvium

Table 4. Relationship between the vegetation classifications in this survey and our previous Hornsby surveys

2006 Hornsby vegetation communities (this report)	1990-95 Hornsby vegetation communities (Smith and Smith 1990a, 1990b, 1993, 1995)
Coachwood Rainforest (O1)	O. Warm Temperate Rainforest (in part - Hawkesbury Sandstone)
Grey Myrtle Rainforest (O2)	O. Warm Temperate Rainforest (in part - Narrabeen Group)
Blue Gum Shale Forest (BG1)	J. <i>Eucalyptus saligna</i> Tall Open-forest (in part - shale soils)
	K. <i>Eucalyptus pilularis</i> - <i>E. saligna</i> - <i>E. paniculata</i> Tall Open-forest
Blue Gum Diatreme Forest (BG2)	J. <i>Eucalyptus saligna</i> Tall Open-forest (in part - volcanic soils)
River-flat Eucalypt Forest (RF)	J. <i>Eucalyptus saligna</i> Tall Open-forest (in part - alluvial soils)
	P. <i>Eucalyptus pilularis</i> - <i>Angophora floribunda</i> Tall Open-forest (in part - alluvial soils)
Blue-leaved Stringybark Diatreme Forest (N)	N. <i>Eucalyptus agglomerata</i> - <i>Angophora costata</i> - <i>Allocasuarina torulosa</i> Open-forest
Turpentine-Ironbark Forest (TI)	M. <i>Syncarpia glomulifera</i> - <i>Eucalyptus paniculata</i> - <i>Angophora costata</i> Open-forest
Duffys Forest (DF)	Not distinguished
Blackbutt Gully Forest (L)	L. <i>Eucalyptus pilularis</i> - <i>Angophora costata</i> - <i>Syncarpia glomulifera</i> Tall Open-forest
Rough-barked Apple-Forest Oak Forest (Q1)	Q. <i>Angophora floribunda</i> - <i>Allocasuarina torulosa</i> Open-forest
Blackbutt-Rough-barked Apple Forest (Q2)	P. <i>Eucalyptus pilularis</i> - <i>Angophora floribunda</i> Tall Open-forest (in part - Narrabeen Group and Hawkesbury Sandstone)
Narrow-leaved Apple Slopes Forest (R)	R. <i>Angophora bakeri</i> - <i>Eucalyptus punctata</i> - <i>E. tereticornis</i> Open-forest
Shale/Sandstone Transition Forest (SS)	D. <i>Eucalyptus punctata</i> - <i>E. gummifera</i> - <i>E. haemastoma</i> Woodland (in part - shale-influenced soils)
Peppermint-Angophora Forest (A)	A. <i>Eucalyptus piperita</i> - <i>Angophora costata</i> Open-forest
Bloodwood-Scribbly Gum Woodland (C)	C. <i>Eucalyptus gummifera</i> - <i>E. haemastoma</i> - <i>E. oblonga</i> Woodland
Silvertop Ash-Scribbly Gum Woodland (E)	E. <i>Eucalyptus sieberi</i> - <i>E. gummifera</i> - <i>E. haemastoma</i> Woodland
Narrow-leaved Scribbly Gum Woodland (F)	F. <i>Eucalyptus racemosa</i> - <i>E. gummifera</i> - <i>Angophora costata</i> Woodland
Angophora Woodland (S)	S. <i>Angophora costata</i> - <i>Eucalyptus gummifera</i> - <i>E. umbra</i> Woodland
Narrow-leaved Apple Gully Forest (B)	B. <i>Eucalyptus piperita</i> - <i>Angophora bakeri</i> Open-forest
Grey Gum-Scribbly Gum Woodland (D)	D. <i>Eucalyptus punctata</i> - <i>E. gummifera</i> - <i>E. haemastoma</i> Woodland (in part - sandstone soils)
Yellow Bloodwood Woodland (T)	T. <i>Eucalyptus eximia</i> Woodland
Scribbly Gum Open-woodland/Heath (G)	G. <i>Eucalyptus haemastoma</i> - <i>Angophora hispida</i> - <i>Banksia ericifolia</i> Low Open-woodland
Rock Platform Heath (H)	H. Rock Platform Heath
Sandstone Swamp (I)	I. Sandstone Swamp
Swamp Mahogany Forest (SF1)	U. <i>Eucalyptus robusta</i> Open-forest
Floodplain Paperbark Scrub (SF2)	X. <i>Melaleuca ericifolia</i> Closed-scrub
Floodplain Reedland (SF3)	Z. <i>Phragmites australis</i> Reed Swamp
Swamp Oak Floodplain Forest (SO)	V. <i>Casuarina glauca</i> Closed-forest
Mangrove Swamp (W)	W. Mangroves
Coastal Saltmarsh (CS)	Y. Saltmarsh

2.4 Vegetation Mapping

The distribution of the 30 vegetation communities in the survey area was mapped by correcting the digitised vegetation layer in Hornsby Shire Council's geographic information system (GIS). The corrections were based on the GIS air photo layers. For the most part, these were high definition colour photos taken in October 2005. We also examined hard copies of the photos at a scale of 1:11 000 (urban areas) or 1:18 000 (rural areas), using a 4X stereoscope for a three-dimensional image that greatly assisted in the delineation of vegetation boundaries. Recent air photo coverage was not available for some of the more sparsely settled areas (between Singletons Mill and Brooklyn, between Brooklyn and Cowan, and between Cowan and Berowra), and the mapping in these areas was based on less detailed 1998 GIS colour air photos, without hard copies of the photos for stereoscopic examination.

We concentrated particularly on remapping the vegetation in the vicinity of cleared urban and rural areas, but also did extensive remapping of the vegetation away from these areas. To assist in identification of vegetation communities, we used tree species data from the 404 sample sites in our earlier survey (Smith and Smith 1990a), together with site-specific data from the other studies listed above in section 2.2. These data were added to the GIS vegetation layer.

Additional data were collected from 209 sample sites during the present survey over a total of 13 days fieldwork between 23 February and 26 July 2006. At most sites, this consisted of the tree species present and their relative abundance, and sometimes the main understorey species as well. At 13 sites, a comprehensive species list was compiled in order to test whether the vegetation represented Turpentine-Ironbark Forest, Shale/Sandstone Transition Forest or Duffys Forest, using the methods of Tozer (2003) and Smith and Smith (2000).

3. Vegetation Community Descriptions

3.1 Coachwood Rainforest (Community O1)

Description: Low closed-forest or closed-forest characterised by *Ceratopetalum apetalum* (Coachwood) as the dominant tree species or one of the dominants. Other common tree and shrub species include *Callicoma serratifolia* (Black Wattle), *Pittosporum undulatum* (Pittosporum), *Tristaniopsis laurina* (Water Gum), and the introduced *Ligustrum sinense* (Small-leaved Privet). Less common are *Acmena smithii* (Lilly Pilly), *Ceratopetalum gummiferum* (Christmas Bush), *Schizomeria ovata* (Crabapple), and the introduced *Ligustrum lucidum* (Large-leaved Privet). There is often a sparse layer of emergent taller trees above the rainforest canopy, such as *Allocasuarina torulosa*, *Angophora costata*, *Eucalyptus pilularis*, *E. piperita* and *Syncarpia glomulifera*. Ground layer species include *Adiantum aethiopicum*, *Blechnum ambiguum*, *Calochlaena dubia*, *Lomandra longifolia*, *Sticherus flabellatus*, and the introduced *Ageratina riparia*, *Ligustrum sinense* (young plants) and *Tradescantia albiflora*. Climbers include *Morinda jasminoides* and *Smilax glyciphylla*. Epiphytes include the ferns *Hymenophyllum cupressiforme* and *Pyrrosia rupestris*.

Distribution and habitat in survey area: Typically occurs in a narrow band along creeks in sheltered gullies on Hawkesbury Sandstone.

Total extent in survey area: 108 ha.

Conservation significance: Identified as a regionally significant community in the Hornsby Shire Biodiversity Conservation Strategy (Hornsby Shire Council 2004). It is an uncommon community in the Sydney region and is particularly prone to weed invasion, especially by *Ligustrum sinense* (Small-leaved Privet). **Regionally Significant Community**



Photo 1. Coachwood Rainforest, Asquith

3.2 Grey Myrtle Rainforest (Community O2)

Description: Low closed-forest or closed-forest characterised by *Backhousia myrtifolia* (Grey Myrtle), which is usually the most common tree species. Other tree and shrub species include *Acmena smithii* (Lilly Pilly), *Ceratopetalum apetalum* (Coachwood), *C. gummiferum* (Christmas Bush), *Ficus rubiginosa* (Port Jackson Fig), *Glochidion ferdinandi* (Cheese Tree), *Pittosporum undulatum* (Pittosporum) and *Tristaniaopsis laurina* (Water Gum). There is often a sparse layer of emergent taller trees above the rainforest canopy, such as *Allocasuarina torulosa*, *Angophora floribunda*, *Eucalyptus piperita*, *E. punctata* and *E. tereticornis*. Ground layer species include *Adiantum aethiopicum*, *Dianella caerulea*, *Microlaena stipoides* and *Pellaea falcata*. Climbers include *Geitonoplesium cymosum* and *Morinda jasminoides*.

Distribution and habitat in survey area: Typically occurs on Narrabeen Group geology in sheltered sites beside the Hawkesbury River and Berowra Creek.

Total extent in survey area: 11 ha.

Conservation significance: An uncommon community in the Sydney region. It is a form of Narrabeen Slopes Forest (Benson and Howell 1994, map unit 9h), which has been recognised as a regionally significant community by the NSW Department of Environment and Conservation (2006). **Regionally Significant Community**



Photo 2. Grey Myrtle Rainforest, Wisemans Ferry

3.3 Blue Gum Shale Forest (Community BG1)

Description: Tall open-forest in which *Eucalyptus saligna* (Sydney Blue Gum) is the dominant tree species or one of the dominants. Other common tree species include *Angophora costata* (Sydney Red Gum), *Eucalyptus paniculata* (Grey Ironbark), *E. pilularis* (Blackbutt) and *Syncarpia glomulifera* (Turpentine). Less common are *Eucalyptus punctata* (Grey Gum) and *E. resinifera* (Red Mahogany). Low tree and shrub species include *Allocasuarina torulosa*, *Angophora floribunda*, *Leucopogon juniperinus*, *Notelaea longifolia*, *Ozothamnus diosmifolius*, *Pittosporum undulatum* and the introduced *Ligustrum lucidum*, *L. sinense*, *Ochna serrulata* and *Rubus fruticosus* spp.agg. Ground layer species include *Adiantum aethiopicum*, *Lomandra longifolia*, *Oplismenus aemulus*, *Poa affinis*, *Pseuderanthemum variable* and *Pteridium esculentum*. Climbers include *Clematis aristata*, *Eustrephus latifolius* and *Smilax glycyphylla*.

Distribution and habitat in survey area: Undulating topography on Wianamatta Group shales in the southern parts of the Shire (north to Round Corner).

Total extent in survey area: 42 ha.

Conservation significance: Listed as a critically endangered ecological community, 'Blue Gum High Forest', in both the Australian *Environment Protection and Biodiversity Conservation Act 1999* and the NSW *Threatened Species Conservation Act 1995*. The community has been severely depleted, with over 95% of its original extent now cleared (Tozer 2003, Threatened Species Scientific Committee 2005a). The remnants are fragmented, surrounded by urban development, and badly degraded by weed invasion. Very little of the community is represented in conservation reserves.

Critically Endangered Community



Photo 3. Blue Gum Shale Forest, Beecroft

3.4 Blue Gum Diatreme Forest (Community BG2)

Description: Tall open-forest dominated by *Eucalyptus saligna* (Sydney Blue Gum). Other, less common tree species include *Angophora costata* (Sydney Red Gum), *Eucalyptus pilularis* (Blackbutt), *E. piperita* (Sydney Peppermint) and *Syncarpia glomulifera* (Turpentine). Low tree and shrub species include *Acacia parramattensis*, *Angophora floribunda*, *Pittosporum undulatum*, and the introduced *Cinnamomum camphora*, *Ligustrum lucidum* and *L. sinense*. Ground layer species include *Adiantum aethiopicum*, *Blechnum cartilagineum*, *Calochlaena dubia*, *Dichondra repens*, *Lomandra longifolia*, *Microlaena stipoides*, *Oplismenus aemulus*, *Poa affinis*, *Pteridium esculentum*, and the introduced *Lonicera japonica*. Climbers include *Morinda jasminoides*, *Pandorea pandorana*, *Smilax australis* and *Stephania japonica*.

Distribution and habitat in survey area: Restricted to gullies on Jurassic diatremes (volcanic necks) along tributaries of Waitara Creek at Hornsby and Westleigh.

Total extent in survey area: 14 ha.

Conservation significance: Forms part of the critically endangered ecological community, 'Blue Gum High Forest', as listed in the NSW *Threatened Species Conservation Act 1995* (NSW Scientific Committee 2007), but not as listed in the Australian *Environment Protection and Biodiversity Conservation Act 1999*, which only covers the Blue Gum Shale Forest (Threatened Species Scientific Committee 2005a). The community has a very restricted distribution in the Sydney region, and may now be confined to the Hornsby Local Government Area (Benson and Howell 1994; map unit 6c, subunit i). It has been depleted by extensive quarrying for blue metal aggregate at Old Mans Valley, which is the largest of the diatremes. **Critically Endangered Community**



Photo 5. Blue Gum Diatreme Forest, Hornsby

3.5 River-flat Eucalypt Forest (Community RF)

Description: Tall open-forest in which the main tree species are *Eucalyptus saligna* (Sydney Blue Gum), *E. pilularis* (Blackbutt), *Angophora floribunda* (Rough-barked Apple) and *Allocasuarina torulosa* (Forest Oak). Less common are *Angophora costata* (Sydney Red Gum), *Eucalyptus paniculata* (Grey Ironbark), *E. piperita* (Sydney Peppermint) and *Syncarpia glomulifera* (Turpentine). Low tree and shrub species include *Acacia floribunda*, *Glochidion ferdinandi*, *Synoum glandulosum* and the introduced *Lantana camara* and *Ligustrum sinense*. Ground layer species include *Calochlaena dubia*, *Dianella caerulea*, *Entolasia marginata*, *Hypolepis muelleri*, *Imperata cylindrica*, *Lomandra longifolia*, *Oplismenus imbecillis* and *Pteridium esculentum*. Climbers include *Cissus hypoglauca* and *Morinda jasminoides*.

Distribution and habitat in survey area: Quaternary alluvium on floodplains at the junction of Terrys Creek and Lane Cove River; along Berowra Creek around Crosslands; and along Marramarra Creek. The community also formerly occurred on the alluvial flats at Dangar Island, but is now represented there only by remnant trees. A different form of the community, dominated by *Eucalyptus tereticornis* (Forest Red Gum), occurred on the alluvial flats along the Hawkesbury River in the northern parts of the Shire, but now appears to be represented only by remnant trees. No intact remnants were located during the survey.

Total extent in survey area: 6 ha.

Conservation significance: River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions is listed as an endangered ecological community in the NSW *Threatened Species Conservation Act 1995*. River-flat Eucalypt Forest is a rare and depleted community in Hornsby Shire, and prone to degradation from weed invasion. **Endangered Community**



Photo 4. River-flat Eucalypt Forest, Crosslands

3.6 Blue-leaved Stringybark Diatreme Forest (Community N)

Description: Open-forest in which the main tree species are *Angophora costata* (Sydney Red Gum), *Eucalyptus agglomerata* (Blue-leaved Stringybark) and *Allocasuarina torulosa* (Forest Oak). Other tree species include *Corymbia gummifera* (Red Bloodwood) and *Eucalyptus punctata* (Grey Gum). Shrub species include *Acacia ulicifolia*, *Astrotricha floccosa*, *Persoonia linearis*, *Platysace linearifolia*, *Pultenaea daphnoides*, *Rapanea variabilis* and *Xanthorrhoea arborea*. Some rainforest species occur in small numbers, including *Acacia elata*, *Ceratopetalum apetalum* and *Doryphora sassafras*. The ground layer is dominated by the ferns *Calochlaena dubia*, *Blechnum cartilagineum* and *Pteridium esculentum*, especially on the gully floor. Other species in the ground layer include *Dianella caerulea*, *Entolasia stricta* and *Lomandra longifolia*. *Cissus hypoglauca* is a common climber.

Distribution and habitat in survey area: Restricted to one gully on a Jurassic diatreme (volcanic neck) on a western tributary of Fiddletown Creek. Another nearby diatreme, on an eastern tributary of Fiddletown Creek, may have supported similar vegetation in the past, but has been cleared.

Total extent in survey area: 8 ha.

Conservation significance: Identified as a regionally significant community in the Hornsby Shire Biodiversity Conservation Strategy (Hornsby Shire Council 2004). The community has a very restricted distribution in the Sydney region (Benson and Howell 1994; map unit 6c, subunit ii). Another recorded example is at Campbells Crater in Kuring-gai Chase National Park, where the tree species are *Eucalyptus agglomerata*, *Angophora floribunda*, *Allocasuarina torulosa*, *Angophora costata* and *Eucalyptus umbra* (Thomas and Benson 1985a). **Regionally Significant Community**



Photo 6. Blue-leaved Stringybark Diatreme Forest, Fiddletown

3.7 Turpentine-Ironbark Forest (Community TI)

Description: Open-forest of mixed and varying tree species composition. The most frequent trees are *Syncarpia glomulifera* (Turpentine) and *Angophora costata* (Sydney Red Gum). Other tree species include *Corymbia gummifera* (Red Bloodwood), *Eucalyptus acmenoides* (White Mahogany), *E. globoidea* (White Stringybark), *E. paniculata* (Grey Ironbark), *E. pilularis* (Blackbutt), *E. punctata* (Grey Gum) and *E. resinifera* (Red Mahogany). Low tree and shrub species include *Acacia parramattensis*, *A. ulicifolia*, *Allocasuarina littoralis*, *A. torulosa*, *Bossiaea obcordata*, *Bursaria spinosa*, *Dodonaea triquetra*, *Leucopogon juniperinus*, *Notelaea longifolia*, *Ozothamnus diosmifolius*, *Pittosporum revolutum*, *P. undulatum*, *Platysace linearifolia* and *Pultenaea tuberculata*. Ground layer species include *Adiantum aethiopicum*, *Austrostipa pubescens*, *Dianella caerulea*, *Dichondra repens*, *Entolasia stricta*, *Lomandra longifolia*, *Poa affinis*, *Pseuderanthemum variable* and *Themeda australis*. Climbers include *Eustrephus latifolius*, *Glycine clandestina* and *Pandorea pandorana*.

Distribution and habitat in survey area: Undulating topography on shale soils (Wianamatta Group, Mittagong Formation, and shale lenses in Hawkesbury Sandstone) in the western parts of the Shire, from Epping to Maroota.

Total extent in survey area: 301 ha.

Conservation significance: Listed as an endangered ecological community in the NSW *Threatened Species Conservation Act 1995*, and as a critically endangered ecological community in the Australian *Environment Protection and Biodiversity Conservation Act 1999*. The community is severely depleted and inadequately reserved. Over 96% of its original extent on the Cumberland Plain, its main area of occurrence, has been cleared (Tozer 2003, Threatened Species Scientific Committee 2005b). **Critically Endangered Community**



Photo 7. Turpentine-Ironbark Forest, Cherrybrook

3.8 Duffys Forest (Community DF)

Description: Open-forest of mixed and varying tree species composition. Tree species present at most sites, but in varying abundance, are *Angophora costata* (Sydney Red Gum), *Corymbia gummifera* (Red Bloodwood), *Eucalyptus pilularis* (Blackbutt), *E. piperita* (Sydney Peppermint) and *Syncarpia glomulifera* (Turpentine). Prominent at some sites, but absent from others, are *Eucalyptus agglomerata* (Blue-leaved Stringybark), *E. globoidea* (White Stringybark), *E. haemastoma* (Broad-leaved Scribbly Gum), *E. punctata* (Grey Gum) and *E. sparsifolia* (Narrow-leaved Stringybark). Shrub species include *Banksia spinulosa*, *Bossiaea obcordata*, *Ceratopetalum gummiferum*, *Hakea sericea*, *Lasiopetalum ferrugineum*, *Leptospermum trinervium*, *Persoonia levis*, *Platylobium formosum* and *Pultenaea tuberculata*. Ground layer species include *Austrostipa pubescens*, *Cyathochaeta diandra*, *Entolasia stricta*, *Epacris pulchella*, *Imperata cylindrica*, *Micrantheum ericoides*, *Patersonia glabrata*, *Pteridium esculentum*, *Themeda australis*, *Xanthorrhoea media* and *Xanthosia tridentata*. Compared with Turpentine-Ironbark Forest, Duffys Forest has a more pronounced sandstone influence, characterised by species such as *Eucalyptus haemastoma*, *E. piperita* and *E. sparsifolia*.

Distribution and habitat in survey area: Scattered locations (North Epping, Dural and Cowan) on ridges and plateaus on Hawkesbury Sandstone where there is a shale influence (from shale lenses in the sandstone or from proximity to Wianamatta Group shales).

Total extent in survey area: 15 ha.

Conservation significance: Listed as an endangered ecological community in the NSW *Threatened Species Conservation Act 1995*. A rare and depleted community, with an estimated 84% of its original extent now cleared (Smith and Smith 2000). **Endangered Community**



Photo 8. Duffys Forest, Dural

3.9 Blackbutt Gully Forest (Community L)

Description: Tall open-forest in which the main tree species are *Eucalyptus pilularis* (Blackbutt), *Angophora costata* (Sydney Red Gum) and *Syncarpia glomulifera* (Turpentine). Other, less common tree species include *Corymbia gummifera* (Red Bloodwood), *Eucalyptus piperita* (Sydney Peppermint) and *E. resinifera* (Red Mahogany), with occasional *E. punctata* (Grey Gum) and *E. saligna* (Sydney Blue Gum). Low tree and shrub species include *Acacia linifolia*, *Allocasuarina littoralis*, *A. torulosa*, *Banksia serrata*, *Callicoma serratifolia*, *Ceratopetalum gummiferum*, *Dodonaea triquetra*, *Elaeocarpus reticulatus*, *Grevillea linearifolia*, *Leptospermum trinervium*, *Persoonia linearis*, *Pittosporum undulatum* and *Pultenaea flexilis*. Ground layer species include *Calochlaena dubia*, *Dianella caerulea*, *Entolasia stricta*, *Lomandra longifolia*, *Microlaena stipoides*, *Pratia purpurascens*, *Pteridium esculentum* and *Xanthosia pilosa*. Climbers include *Billardiera scandens*, *Cassytha pubescens* and *Smilax glycyphylla*.

Distribution and habitat in survey area: Gullies on Hawkesbury Sandstone with a shale influence (from shale lenses in the sandstone or from proximity to Wianamatta Group shales), in the southern parts of the Shire (Epping to Galston).

Total extent in survey area: 836 ha.

Conservation significance: Identified as a locally significant community in the Hornsby Shire Biodiversity Conservation Strategy (Hornsby Shire Council 2004). Although it is a common community in Hornsby Shire, it is uncommon and poorly conserved outside the Shire. For example, only small areas occur in Ku-ring-gai Chase National Park (Thomas and Benson 1985a). **Locally Significant Community**



Photo 9. Blackbutt Gully Forest, Beecroft

3.10 Rough-barked Apple-Forest Oak Forest (Community Q1)

Description: Open-forest in which the main tree species are *Allocasuarina torulosa* (Forest Oak), *Angophora floribunda* (Rough-barked Apple) and *Eucalyptus punctata* (Grey Gum). *Eucalyptus piperita* (Sydney Peppermint) is a co-dominant on Hawkesbury Sandstone. Other tree species that may be present include *Angophora costata* (Sydney Red Gum), *Corymbia eximia* (Yellow Bloodwood) and *Ficus rubiginosa* (Port Jackson Fig). Low tree and shrub species include *Acmena smithii*, *Astrotricha floccosa*, *Banksia integrifolia*, *Dodonaea triquetra*, *Elaeocarpus reticulatus*, *Glochidion ferdinandi*, *Leptospermum trinervium*, *Pittosporum undulatum*, *Rapanea variabilis*, *Tristaniaopsis laurina* and *Xanthorrhoea arborea*. Ground layer species include *Adiantum aethiopicum*, *Calochlaena dubia*, *Dianella caerulea*, *Entolasia stricta*, *Lomandra longifolia*, *Poa affinis*, *Pteridium esculentum* and *Themeda australis*. Climbers include *Pandorea pandorana* and *Smilax glyciphylla*.

Distribution and habitat in survey area: Lower slopes beside the Hawkesbury River (downstream of Gentlemans Halt) and the wider sections of Berowra Creek. Occurs on both Narrabeen Group rocks (Hawkesbury River and lower Berowra Creek) and Hawkesbury Sandstone (upper Berowra Creek). Replaced by Narrow-leaved Apple Slopes Forest upstream of Gentlemans Halt.

Total extent in survey area: 271 ha.

Conservation significance: Identified as a locally significant community in the Hornsby Shire Biodiversity Conservation Strategy (Hornsby Shire Council 2004). However, it is a form of Narrabeen Slopes Forest (Benson and Howell 1994, map unit 9h), which has been recognised as a regionally significant community by the NSW Department of Environment and Conservation (2006). **Regionally Significant Community**



Photo 10. Rough-barked Apple-Forest Oak Forest, Crosslands

3.11 Blackbutt-Rough-barked Apple Forest (Community Q2)

Description: Open-forest of *Eucalyptus pilularis* (Blackbutt), *Allocasuarina torulosa* (Forest Oak), *Angophora costata* (Sydney Red Gum), *A. floribunda* (Rough-barked Apple) and *Corymbia gummifera* (Red Bloodwood). Low tree and shrub species include *Banksia integrifolia*, *B. serrata*, *Ceratopetalum gummiferum*, *Dodonaea triquetra*, *Elaeocarpus reticulatus*, *Glochidion ferdinandi*, *Hakea dactyloides*, *Leptospermum trinervium*, *Notelaea longifolia*, *Persoonia linearis*, *Pittosporum undulatum*, *Platylobium formosum*, *Pultenaea flexilis* and *Xanthorrhoea arborea*. Ground layer species include *Calochlaena dubia*, *Dianella caerulea*, *Entolasia stricta*, *Lomandra longifolia*, *Pteridium esculentum* and *Themeda australis*. Climbers include *Eustrephus latifolius* and *Smilax glyciphylla*.

Distribution and habitat in survey area: Lower (Narrabeen Group) and upper (Hawkesbury Sandstone) slopes beside the Hawkesbury River at Dangar Island.

Total extent in survey area: 7 ha.

Conservation significance: A form of Narrabeen Slopes Forest (Benson and Howell 1994, map unit 9h), which has been recognised as a regionally significant community by the NSW Department of Environment and Conservation (2006). Blackbutt-Rough-barked Apple Forest appears to be restricted to Dangar Island, where it has been depleted by urban development. **Regionally Significant Community**



Photo 11. Blackbutt-Rough-barked Apple Forest, Dangar Island

3.12 Narrow-leaved Apple Slopes Forest (Community R)

Description: Open-forest of *Angophora bakeri* (Narrow-leaved Apple) in combination with other tree species, including *Allocasuarina torulosa* (Forest Oak), *Eucalyptus punctata* (Grey Gum), *E. tereticornis* (Forest Red Gum) and, less frequently, *Corymbia eximia* (Yellow Bloodwood) and *Eucalyptus eugenioides* (Thin-leaved Stringybark). Shrub species include *Astrotricha floccosa*, *Breynia oblongifolia*, *Bursaria spinosa* and *Leucopogon juniperinus*. Ground layer species include *Desmodium rhytidophyllum*, *Gahnia aspera*, *Entolasia marginata*, *E. stricta*, *Microlaena stipoides* and *Themeda australis*.

Distribution and habitat in survey area: Lower slopes on Narrabeen Group geology beside the Hawkesbury River upstream of Gentlemans Halt. Replaced by Rough-barked Apple-Forest Oak Forest downstream of Gentlemans Halt.

Total extent in survey area: 282 ha.

Conservation significance: Identified as a locally significant community in the Hornsby Shire Biodiversity Conservation Strategy (Hornsby Shire Council 2004). However, it is a form of Narrabeen Slopes Forest (Benson and Howell 1994, map unit 9h), which has been recognised as a regionally significant community by the NSW Department of Environment and Conservation (2006). **Regionally Significant Community**



Photo 12. Narrow-leaved Apple Slopes Forest, Singletons Mill

3.13 Shale/Sandstone Transition Forest (Community SS)

Description: Open-forest of mixed composition, including *Angophora costata* (Sydney Red Gum), *Corymbia gummifera* (Red Bloodwood), *Eucalyptus eugenioides* (Thin-leaved Stringybark), *E. punctata* (Grey Gum) and, less commonly, *Corymbia eximia* (Yellow Bloodwood) and *Eucalyptus haemastoma* (Broad-leaved Scribbly Gum). Low tree and shrub species include *Acacia linifolia*, *Allocasuarina littoralis*, *Bossiaea obcordata*, *Daviesia corymbosa*, *Hakea sericea* and *Pultenaea tuberculata*. Ground layer species include *Austrostipa pubescens*, *Dianella caerulea*, *Entolasia stricta*, *Lomandra longifolia*, *Patersonia glabrata*, *Pteridium esculentum* and *Themeda australis*.

Distribution and habitat in survey area: Only recorded from two sites on a Hawkesbury Sandstone plateau at Maroota, apparently where there is a shale influence in the soils. Lembit (2005) recorded the community more widely in Hornsby Shire, but close examination of a selection of his sites indicated that they are not Shale/Sandstone Transition Forest as circumscribed by Tozer (2003).

Total extent in survey area: 5 ha.

Conservation significance: Listed as an endangered ecological community in both the NSW *Threatened Species Conservation Act 1995* and the Australian *Environment Protection and Biodiversity Conservation Act 1999*. An estimated 78% of the original extent of the community on the Cumberland Plain has been cleared (Tozer 2003).

Endangered Community



Photo 13. Shale/Sandstone Transition Forest, Maroota

3.14 Peppermint-Angophora Forest (Community A)

Description: Open-forest in which the main tree species are *Eucalyptus piperita* (Sydney Peppermint) and *Angophora costata* (Sydney Red Gum). Other tree species may include *Corymbia gummifera* (Red Bloodwood), *Syncarpia glomulifera* (Turpentine) and, less frequently, *Eucalyptus punctata* (Grey Gum) and *E. resinifera* (Red Mahogany). Low tree and shrub species include *Acacia suaveolens*, *Allocasuarina littoralis*, *Banksia serrata*, *Ceratopetalum gummiferum*, *Dillwynia retorta*, *Dodonaea triquetra*, *Grevillea linearifolia*, *Leptospermum trinervium*, *Persoonia levis*, *Platysace linearifolia* and *Pultenaea flexilis*. Ground layer species include *Actinotus minor*, *Calochlaena dubia*, *Caustis flexuosa*, *Dianella caerulea*, *Entolasia stricta*, *Lomandra longifolia*, *Pteridium esculentum*, *Stylidium productum*, *Xanthosia pilosa* and *X. tridentata*. Climbers include *Billardiera scandens*, *Cassytha pubescens* and *Smilax glycyphylla*.

Distribution and habitat in survey area: Hawkesbury Sandstone gullies throughout Hornsby Shire.

Total extent in survey area: 5,579 ha.

Conservation significance: The most common community in Hornsby Shire. Well represented in local conservation reserves.



Photo 14. Peppermint-Angophora Forest, Brooklyn

3.15 Bloodwood-Scribbly Gum Woodland (Community C)

Description: Woodland or open-forest, sometimes low woodland or low open-forest, in which *Corymbia gummifera* (Red Bloodwood) and *Eucalyptus haemastoma* (Broad-leaved Scribbly Gum) are the dominant species or co-dominant with one or more of *Allocasuarina littoralis* (Black She-oak), *Angophora costata*, *Corymbia eximia* (Yellow Bloodwood), *Eucalyptus oblonga* (Sandstone Stringybark), *E. piperita* (Sydney Peppermint) and *E. sparsifolia* (Narrow-leaved Stringybark). Shrub species include *Acacia suaveolens*, *Banksia serrata*, *B. spinulosa*, *Dillwynia retorta*, *Grevillea buxifolia*, *Lambertia formosa*, *Leptospermum trinervium*, *Petrophile pulchella*, *Platysace linearifolia* and *Pultenaea tuberculata*. Ground layer species include *Actinotus minor*, *Anisopogon avenaceus*, *Caustis flexuosa*, *Cyathochaeta diandra*, *Dampiera stricta*, *Entolasia stricta* and *Lomandra glauca*.

Distribution and habitat in survey area: Plateaus, ridges and exposed slopes on Hawkesbury Sandstone from Pennant Hills north to Cowan, Coba Ridge and Fiddletown.

Total extent in survey area: 644 ha.

Conservation significance: A common community in the Sydney region (e.g. Smith and Smith 2005). Well represented in local conservation reserves.



Photo 15. Bloodwood-Scribbly Gum Woodland, Dural

3.16 Silvertop Ash-Scribbly Gum Woodland (Community E)

Description: Woodland or open-forest in which the main tree species are *Corymbia gummifera* (Red Bloodwood), *Eucalyptus sieberi* (Silvertop Ash), *E. haemastoma* (Broad-leaved Scribbly Gum), *Angophora costata* (Sydney Red Gum), and either or both of the stringybarks, *E. oblonga* (Sandstone Stringybark) and *E. sparsifolia* (Narrow-leaved Stringybark). Low tree and shrub species include *Acacia suaveolens*, *Allocasuarina littoralis*, *Banksia ericifolia*, *Lambertia formosa*, *Leptospermum polygalifolium*, *L. trinervium*, *Persoonia pinifolia*, *Pittosporum undulatum*, *Platysace linearifolia* and *Woollsia pungens*. Ground layer species include *Anisopogon avenaceus*, *Cyathochaeta diandra*, *Dianella caerulea*, *Entolasia stricta*, *Lepyrodia scariosa*, *Lomandra glauca*, *L. longifolia* and *Pteridium esculentum*. *Cassytha pubescens* is a common climber.

Distribution and habitat in survey area: Plateaus, ridges and exposed slopes on Hawkesbury Sandstone in scattered locations in the east of Hornsby Shire, from Asquith north to Berowra Heights, and west to the western side of Berowra Valley Regional Park.

Total extent in survey area: 47 ha.

Conservation significance: Identified as a locally significant community in the Hornsby Shire Biodiversity Conservation Strategy (Hornsby Shire Council 2004). A rare community in the survey area, poorly represented in Berowra Valley Regional Park, and threatened by urban development because of its association with plateaus and ridgetops. **Locally Significant Community**



Photo 16. Silvertop Ash-Scribbly Gum Woodland, Asquith

3.17 Narrow-leaved Scribbly Gum Woodland (Community F)

Description: Woodland or open-forest, sometimes low woodland or low open-forest, with a mixed tree layer that includes *Eucalyptus racemosa* (Narrow-leaved Scribbly Gum) and *Corymbia gummifera* (Red Bloodwood). The other tree species vary, and may include *Allocasuarina littoralis* (Black She-oak), *Angophora costata* (Sydney Red Gum), *Corymbia eximia* (Yellow Bloodwood), *Eucalyptus haemastoma* (Broad-leaved Scribbly Gum), *E. oblonga* (Sandstone Stringybark), *E. piperita* (Sydney Peppermint), *E. punctata* (Grey Gum), *E. sieberi* (Silvertop Ash) and *E. sparsifolia* (Narrow-leaved Stringybark). Shrub species include *Banksia serrata*, *Dillwynia retorta*, *Epacris pulchella*, *Grevillea buxifolia*, *Lambertia formosa*, *Leptospermum trinervium*, *Petrophile pulchella*, *Phyllota phyllicoides*, *Platysace linearifolia* and *Pultenaea tuberculata*. Ground layer species include *Actinotus minor*, *Austrostipa pubescens*, *Caustis flexuosa*, *Dampiera stricta*, *Dianella caerulea*, *Entolasia stricta*, *Lepyrodia scariosa*, *Lomandra glauca*, *Micrantheum ericoides*, *Stylidium productum*, *Xanthorrhoea media*, *Xanthosia pilosa* and *X. tridentata*.

Distribution and habitat in survey area: Plateaus, ridges and exposed slopes on Hawkesbury Sandstone from Westleigh north to Cowan in the east, and Glenorie in the west.

Total extent in survey area: 1289 ha.

Conservation significance: A common community in Hornsby Shire, well represented in Berowra Valley Regional Park and other local conservation reserves.



Photo 17. Narrow-leaved Scribbly Gum Woodland, Mt Kuring-gai

3.18 Angophora Woodland (Community S)

Description: Woodland or open-forest in which *Angophora costata* (Sydney Red Gum) is usually the dominant species. Other tree species include *Corymbia gummifera* (Red Bloodwood), *Eucalyptus umbra* (Bastard White Mahogany) and, less frequently, *E. punctata* (Grey Gum) and *E. piperita* (Sydney Peppermint). Low tree and shrub species (only one site examined) include *Banksia integrifolia*, *Ceratopetalum gummiferum*, *Elaeocarpus reticulatus*, *Glochidion ferdinandi*, *Monotoca elliptica*, *Notelaea longifolia*, *Pittosporum undulatum*, *Pultenaea daphnoides*, *P. flexilis* and *Xanthorrhoea arborea*. Ground layer species (only one site examined) include *Calochlaena dubia*, *Dianella caerulea*, *Entolasia stricta*, *Lindsaea microphylla*, *Lomandra longifolia* and *Poa affinis*. *Smilax glyciphylla* is a common climber.

Distribution and habitat in survey area: Moderate to steep slopes, sometimes ridgetops, in scattered sites along the Hawkesbury River from Brooklyn to Fishermans Point, and at one site north of Cowan. Occurs on both Hawkesbury Sandstone and Narrabeen Group geology. Exposure to salt-laden breezes appears to be an important feature of the habitat.

Total extent in survey area: 62 ha.

Conservation significance: Identified as a locally significant community in the Hornsby Shire Biodiversity Conservation Strategy (Hornsby Shire Council 2004). A rare community in the survey area, but more common in Ku-ring-gai Chase National Park (Thomas and Benson 1985a, Community 13) and Muogamarra Nature Reserve (Thomas and Benson 1985b, Community 13). **Locally Significant Community**



Photo 18. Angophora Woodland, Brooklyn

3.19 Narrow-leaved Apple Gully Forest (Community B)

Description: Open-forest in which the main tree species are *Eucalyptus piperita* (Sydney Peppermint) and the lower-growing *Angophora bakeri* (Narrow-leaved Apple). Other tree species that may be present include *Corymbia gummifera* (Red Bloodwood), *Eucalyptus punctata* (Grey Gum) and *E. racemosa* (Narrow-leaved Scribbly Gum). Shrub species include *Banksia spinulosa*, *Ceratopetalum gummiferum*, *Dillwynia retorta*, *Lambertia formosa*, *Leptospermum trinervium*, *Persoonia linearis*, *Platysace linearifolia*, *Pittosporum undulatum* and *Xanthorrhoea arborea*. Ground layer species include *Actinotus minor*, *Dianella caerulea*, *Entolasia stricta*, *Lepidosperma laterale*, *Lomandra cylindrica*, *L. glauca*, *L. longifolia* and *Pteridium esculentum*.

Distribution and habitat in survey area: Gullies and slopes on Hawkesbury Sandstone along upper Colah Creek and its tributaries between Galston and Glenorie. Also occurs on one Hawkesbury Sandstone ridgetop in Berowra Valley Regional Park at Cherrybrook.

Total extent in survey area: 93 ha.

Conservation significance: Identified as a regionally significant community in the Hornsby Shire Biodiversity Conservation Strategy (Hornsby Shire Council 2004). Appears to be restricted to Hornsby Shire, with only 4 ha (4% of its total extent) reserved in Berowra Valley Regional Park. **Regionally Significant Community**



Photo 19. Narrow-leaved Apple Gully Forest, Glenorie

3.20 Grey Gum-Scribbly Gum Woodland (Community D)

Description: Woodland or open-forest in which the main tree species are *Corymbia gummifera* (Red Bloodwood), *Eucalyptus punctata* (Grey Gum), *E. haemastoma* (Broad-leaved Scribbly Gum) and *Angophora costata* (Sydney Red Gum). Other tree species that may be present include *Eucalyptus sparsifolia* (Narrow-leaved Stringybark), *E. piperita* (Sydney Peppermint) and *Corymbia eximia* (Yellow Bloodwood). Low tree and shrub species include *Acacia linifolia*, *A. suaveolens*, *Allocasuarina littoralis*, *Banksia serrata*, *B. spinulosa*, *Dillwynia retorta*, *Epacris pulchella*, *Hakea laevipes*, *Lambertia formosa*, *Leptospermum trinervium*, *Persoonia pinifolia*, *Phyllota phyllicoides*, *Platysace linearifolia* and *Pultenaea tuberculata*. Ground layer species include *Actinotus minor*, *Dianella caerulea*, *Entolasia stricta*, *Lomandra glauca*, *L. multiflora*, *Phyllanthus hirtellus* and *Xanthorrhoea media*. *Billardiera scandens* is a common climber.

Distribution and habitat in survey area: Plateaus, ridges and exposed slopes on Hawkesbury Sandstone from Galston Gorge north to Brooklyn and Wisemans Ferry. Widespread on plateaus and ridgetops in the north of Hornsby Shire, but restricted to steep slopes at the southern end of its distribution.

Total extent in survey area: 4403 ha.

Conservation significance: A common community in Hornsby Shire, well represented in Marramarra National Park and, to a lesser extent, in Muogamarra Nature Reserve and Berowra Valley Regional Park.



Photo 20. Grey Gum-Scribbly Gum Woodland, Canoelands

3.21 Yellow Bloodwood Woodland (Community T)

Description: Woodland or low woodland in which the dominant tree species is *Corymbia eximia* (Yellow Bloodwood). Other tree species that may be present include *Angophora bakeri* (Narrow-leaved Apple), *Eucalyptus punctata* (Grey Gum), *E. haemastoma* (Broad-leaved Scribbly Gum) and *E. umbra* (Bastard White Mahogany). Low tree and shrub species include *Allocasuarina littoralis*, *Banksia integrifolia*, *Dillwynia elegans*, *Lambertia formosa*, *Leptospermum trinervium*, *Monotoca scoparia*, *Phyllota phyllicoides*, *Platysace linearifolia*, *Pultenaea tuberculata* and *Xanthorrhoea arborea*. Ground layer species include *Anisopogon avenaceus*, *Cyathochaeta diandra*, *Entolasia stricta*, *Hovea linearis*, *Lomandra glauca*, *Patersonia sericea*, *Pteridium esculentum* and *Themeda australis*.

Distribution and habitat in survey area: Steep, exposed slopes on Hawkesbury Sandstone along the Hawkesbury River from Brooklyn to Wisemans Ferry.

Total extent in survey area: 284 ha.

Conservation significance: Well represented in Marramarra National Park (1097 ha; NSW Department of Environment and Conservation 2006) and, to a more limited extent, in Muogamarra Nature Reserve and Ku-ring-gai Chase National Park. Because of its steep, rocky habitat, little of the community has been cleared or disturbed.



Photo 21. Yellow Bloodwood Woodland, Wisemans Ferry

3.22 Scribbly Gum Open-woodland/Heath (Community G)

Description: May take the form of closed-heath or closed-scrub without a tree layer, but more typically open-woodland or low open-woodland with a closed-heath or closed-scrub understorey. The tree species usually include either or both of *Eucalyptus haemastoma* (Broad-leaved Scribbly Gum) and *E. racemosa* (Narrow-leaved Scribbly Gum). Other tree species that may be present include *Allocasuarina littoralis* (Black She-oak), *Banksia serrata* (Old Man Banksia), *Corymbia gummiifera* (Red Bloodwood), *Eucalyptus oblonga* (Sandstone Stringybark), *E. punctata* (Grey Gum) and *E. sparsifolia* (Narrow-leaved Stringybark). Shrub species include *Angophora hispida*, *Banksia oblongifolia*, *B. ericifolia*, *Boronia ledifolia*, *Bossiaea scolopendria*, *Dillwynia retorta*, *Epacris pulchella*, *Grevillea buxifolia*, *G. speciosa*, *Hakea laevipes*, *H. teretifolia*, *Isopogon anethifolius*, *Kunzea ambigua*, *Leptospermum trinervium*, *Leucopogon microphyllus*, *Petrophile pulchella*, *Phyllota phyllicoides*, *Platysace linearifolia* and *Pultenaea tuberculata*. Ground layer species include *Actinotus minor*, *Cyathochaeta diandra*, *Dampiera stricta*, *Entolasia stricta*, *Lepyrodia scariosa*, *Lomandra glauca*, *Patersonia sericea* and *Ptilothrix deusta*. *Cassytha glabella* is a common climber. Wetter sites support a closed-heath or closed-scrub of species such as *Allocasuarina distyla*, *Banksia ericifolia*, *B. oblongifolia*, *Dillwynia floribunda*, *Epacris microphylla*, *Hakea teretifolia* and *Leptospermum squarrosum*. This 'Wet Heath' form of the community, which corresponds to Benson and Howell's (1994) map unit 21g, subunit (v), is rare in Hornsby Shire, but more common further east, closer to the coast. Heath vegetation in Hornsby Shire is generally characterised by species of drier conditions, such as *Angophora hispida* and *Leptospermum trinervium*.

Distribution and habitat in survey area: Shallow soils, or soils with impeded drainage (limiting tree growth), on plateaus, ridges, upper slopes, mid-slope benches and upper gullies on Hawkesbury Sandstone throughout Hornsby Shire.

Total extent in survey area: 660 ha.

Conservation significance: A common community in Hornsby Shire, well represented in local conservation reserves.



Photo 22. Scribbly Gum Open-woodland/Heath, Mt Kuring-gai

3.23 Rock Platform Heath (Community H)

Description: Pockets of open-heath or closed-heath interspersed with areas of bare rock. Species composition varies. Shrub species include *Acacia suaveolens*, *Allocasuarina distyla*, *Angophora hispida*, *Baeckea brevifolia*, *B. diosmifolia*, *Banksia ericifolia*, *B. oblongifolia*, *Dillwynia floribunda*, *Epacris microphylla*, *Grevillea speciosa*, *Kunzea ambigua*, *Leptospermum arachnoides*, *L. parvifolium*, *L. squarrosum*, *L. trinervium*, *Mirbelia rubiifolia*, *Petrophile pulchella*, *Phebalium squamulosum* and *Platysace lanceolata*. Sedge and grass species include *Austrostipa pubescens*, *Caustis pentandra*, *Lepidosperma viscidum*, *Lepyrodia scariosa*, *Lomandra glauca*, *Ptilothrix deusta* and *Schoenus imberbis*.

Distribution and habitat in survey area: Depressions, crevices and edges of flat Hawkesbury Sandstone outcrops throughout Hornsby Shire. Occurs in scattered small patches, only some of which have been mapped.

Total extent in survey area: 19 ha mapped, but other occurrences are likely to have been missed because of their small size.

Conservation significance: Identified as a regionally significant community in the Hornsby Shire Biodiversity Conservation Strategy (Hornsby Shire Council 2004). It is an important habitat for threatened plant species, especially *Kunzea rupestris* and *Micromyrtus blakelyi*, which are restricted to this habitat (but only occur in some areas).

Regionally Significant Community



Photo 23. Rock Platform Heath, Canoelands

3.24 Sandstone Swamp (Community I)

Description: Closed-sedgeland or closed-heath of mixed and varying composition. Shrub species include *Baeckea imbricata*, *Banksia ericifolia*, *B. oblongifolia*, *Bauera rubioides*, *Callistemon citrinus*, *Epacris microphylla*, *Hakea teretifolia*, *Leptospermum polygalifolium*, *L. squarrosus*, *Leucopogon microphyllus* and *Viminaria juncea*. Sedge and herb species include *Actinotus minor*, *Lepidosperma filiforme*, *Lepyrodia scariosa*, *Restio fastigiatus*, *Schoenus brevifolius*, *S. paludosus* and *Xanthorrhoea resinifera*. *Cassytha glabella* is a common climber.

Distribution and habitat in survey area: Poorly drained Hawkesbury Sandstone soils subject to prolonged waterlogging. Typically occurs along drainage lines, but may also occur in seepage zones on hillsides ('hanging swamps'). Occurs in small, scattered patches throughout Hornsby Shire.

Total extent in survey area: 10 ha mapped, but other occurrences are likely to have been missed because of their small size.

Conservation significance: Identified as a locally significant community in the Hornsby Shire Biodiversity Conservation Strategy (Hornsby Shire Council 2004). However, it has been recognised as a regionally significant community by the NSW Department of Environment and Conservation (2006). It is a rare community in the survey area, but more common further east in Ku-ring-gai Chase National Park, although still limited in extent (Thomas and Benson 1985a, Community 21). **Regionally Significant Community**



Photo 24. Sandstone Swamp, Berowra Heights

3.25 Swamp Mahogany Forest (Community SF1)

Description: Open-forest in which *Eucalyptus robusta* (Swamp Mahogany) is the dominant tree species or co-dominant with *Melaleuca quinquenervia* (Broad-leaved Paperbark). Other tree species that may be present include *Angophora floribunda* (Rough-barked Apple) and *Casuarina glauca* (Swamp Oak). Low tree and shrub species include *Glochidion ferdinandi*, *Goodenia ovata*, *Melaleuca ericifolia*, *M. linariifolia* and *Pittosporum undulatum*. Ground layer species include *Blechnum camfieldii*, *B. indicum*, *Cynodon dactylon*, *Cyperus polystachyos*, *Hemarthria uncinata*, *Hypolepis muelleri*, *Imperata cylindrica*, *Phragmites australis* and *Pteridium esculentum*.

Distribution and habitat in survey area: Quaternary alluvium on the Hawkesbury River floodplain at Brooklyn (*Eucalyptus robusta* co-dominant with *Melaleuca quinquenervia*) and One Tree Reach (*E. robusta* dominant).

Total extent in survey area: 7 ha.

Conservation significance: Swamp Mahogany Forest is a form of 'Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions', which is listed as an endangered ecological community in the NSW *Threatened Species Conservation Act 1995*. **Endangered Community**



Photo 25. Swamp Mahogany Forest, One Tree Reach

3.26 Floodplain Paperbark Scrub (Community SF2)

Description: Closed-scrub dominated by *Melaleuca ericifolia* (Swamp Paperbark), interspersed with pockets of *Phragmites australis* (Common Reed) closed-grassland and *Juncus kraussii* (Sea Rush) closed-rushland.

Distribution and habitat in survey area: Quaternary alluvium on the Hawkesbury River floodplain between Laughtondale and Singletons Mill.

Total extent in survey area: 12 ha.

Conservation significance: Floodplain Paperbark Scrub is a form of 'Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions', which is listed as an endangered ecological community in the NSW *Threatened Species Conservation Act 1995*. **Endangered Community**



Photo 26. Floodplain Paperbark Scrub, One Tree Reach

3.27 Floodplain Reedland (Community SF3)

Description: Closed-grassland dominated by *Phragmites australis* (Common Reed), which may be the only species present, except at the edge of the community.

Distribution and habitat in survey area: Quaternary alluvium on the Hawkesbury River floodplain between Wisemans Ferry and Brooklyn.

Total extent in survey area: 20 ha.

Conservation significance: Floodplain Reedland is a form of 'Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions', which is listed as an endangered ecological community in the NSW *Threatened Species Conservation Act 1995*. **Endangered Community**



Photo 27. Floodplain Reedland, Wisemans Ferry

3.28 Swamp Oak Floodplain Forest (Community SO)

Description: Closed-forest or open-forest dominated by *Casuarina glauca* (Swamp Oak). Other tree species may include *Avicennia marina* (Grey Mangrove) and *Melaleuca styphelioides* (Prickly-leaved Paperbark). Apart from young *Casuarina glauca* plants, the main understorey layer is the ground layer, which includes native species such as *Apium prostratum*, *Commelina cyanea*, *Juncus kraussii*, *Phragmites australis*, *Samolus repens*, *Sporobolus virginicus*, *Suaeda australis* and *Triglochin striata*, and introduced species such as *Acetosa sagittata*, *Stenotaphrum secundatum* and *Tradescantia albiflora*.

Distribution and habitat in survey area: Quaternary alluvium on the floodplains of the Hawkesbury River (Brooklyn to Wisemans Ferry) and its tributaries, Marramarra Creek and Berowra Creek (upstream to Crosslands).

Total extent in survey area: 110 ha.

Conservation significance: Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions is listed as an endangered ecological community in the NSW *Threatened Species Conservation Act 1995*. **Endangered Community**



Photo 28. Swamp Oak Floodplain Forest, Singletons Mill

3.29 Mangrove Swamp (Community W)

Description: Varies from low closed-forest dominated by *Avicennia marina* (Grey Mangrove) to closed-scrub dominated by *Aegiceras corniculatum* (River Mangrove). The lower-growing *Aegiceras corniculatum* may form an understorey within the *Avicennia marina* low closed-forest, or it may form a separate band of closed-scrub on the landward side of the *Avicennia marina*. Other vascular plant species are absent except on the landward edge of the community.

Distribution and habitat in survey area: Intertidal zone on Quaternary alluvium fringing the Hawkesbury River (Brooklyn to Wisemans Ferry) and its tributaries, Marramarra Creek, Berowra Creek (upstream to Crosslands) and Cowan Creek.

Total extent in survey area: 321 ha.

Conservation significance: Identified as a locally significant community in the Hornsby Shire Biodiversity Conservation Strategy (Hornsby Shire Council 2004). Mangroves are vital for maintaining the ecological health and productivity of estuaries, playing important roles as primary producers and as fish habitat. **Locally Significant Community**



Photo 29. Mangrove Swamp, Brooklyn

3.30 Coastal Saltmarsh (Community CS)

Description: Sites visited were closed-rushland dominated by *Juncus kraussii* (Sea Rush). Other species include *Samolus repens* (Creeping Brookweed) and *Sporobolus virginicus* (Sand Couch).

Distribution and habitat in survey area: Quaternary alluvium along the Hawkesbury River (upstream to Singletons Mill) and its tributaries, Marramarra Creek and Berowra Creek (upstream to Crosslands). Occurs in sites that are more frequently inundated than Swamp Oak Floodplain Forest, but less frequently inundated than Mangrove Swamp.

Total extent in survey area: 53 ha.

Conservation significance: Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions is listed as an endangered ecological community in the NSW *Threatened Species Conservation Act 1995*. **Endangered Community**



Photo 30. Coastal Saltmarsh, Singletons Mill

4. Discussion

A total of 30 native vegetation communities have been distinguished and mapped in the survey area. An additional community not included in the mapping is Seagrass Meadow, referring to submerged aquatic vegetation dominated by seagrasses. Seagrass Meadow occurs in Cowan Creek and Berowra Creek (West *et al.* 1985), where the main seagrass species is probably *Zostera capricorni* (Eelgrass). It is recognised as a regionally significant vegetation community by the NSW Department of Environment and Conservation (2006).

Twenty-four of the 30 mapped communities, plus the unmapped Seagrass Meadow, are significant at national, State, regional or local level. Especially significant are Turpentine-Ironbark Forest, Blue Gum Shale Forest and Blue Gum Diatreme Forest, which have been listed as critically endangered ecological communities at either national level (Australian *Environment Protection and Biodiversity Conservation Act 1999*) or State level (NSW *Threatened Species Conservation Act 1995*). All occur on easy topography on relatively fertile soils, and have been severely depleted and fragmented by clearing for urban and rural development. Over 95% of their original extent on the Cumberland Plain has been cleared (Tozer 2003). Hornsby Shire has about a quarter of the remaining area of both Turpentine-Ironbark Forest (301 of 1183 ha) and Blue Gum Shale Forest (42 of 168 ha), and possibly all of the remaining area of Blue Gum Diatreme Forest (14 ha). Very little of these communities is conserved in the local Department of Environment and Climate Change reserves. Hornsby Shire Council has a major role to play in the conservation of the three communities.

Another community, Shale/Sandstone Transition Forest, has been listed as an endangered ecological community at national level. Seven other communities have been listed as endangered ecological communities at State level (NSW *Threatened Species Conservation Act 1995*): Duffys Forest, River-flat Eucalypt Forest, Swamp Oak Floodplain Forest, Coastal Saltmarsh, Swamp Mahogany Forest, Floodplain Paperbark Scrub and Floodplain Reedland. The last three are all forms of a single listed community, 'Swamp Sclerophyll Forest on Coastal Floodplains', but are recognised here as separate communities because of their distinct structural and floristic differences.

Shale/Sandstone Transition Forest and Duffys Forest are both associated with ridges and plateaus where there is a shale influence in the soils. Both communities are rare in Hornsby Shire, which is on the margin of their distribution. Shale/Sandstone Transition Forest is more typical of areas west of the Shire (Tozer 2003), while Duffys Forest is more typical of areas to the east (Smith and Smith 2000). The other six endangered communities are associated with alluvial soils on the floodplain of the Hawkesbury River and its tributaries (River-flat Eucalypt Forest also occurs on the Lane Cove River floodplain). The listing of coastal floodplain communities as endangered reflects the extensive clearing, disturbance and on-going threats to coastal floodplains throughout New South Wales.

Apart from the endangered communities, ten communities have been recognised as regionally significant (in the Sydney region), and four other communities as locally significant (in Hornsby Shire). The regionally significant communities are Coachwood Rainforest, Grey Myrtle Rainforest, Blue-leaved Stringybark Diatreme Forest, Rough-barked Apple-Forest Oak Forest, Blackbutt-Rough-barked Apple Forest, Narrow-leaved Apple Slopes Forest, Narrow-leaved Apple Gully Forest, Rock Platform Heath, Sandstone Swamp, and the unmapped Seagrass Meadow. The locally significant communities are Blackbutt Gully Forest, Silvertop Ash-Scribbly Gum Woodland, Angophora Woodland and Mangrove Swamp.

Most of the regionally and locally significant communities are ones with a restricted distribution in Hornsby Shire. An exception is Blackbutt Gully Forest, which is common within the Shire (836 ha in the survey area, including good representation in Berowra Valley Regional Park and Lane Cove River National Park), but uncommon and poorly conserved

outside the Shire. For example, only small areas occur in Ku-ring-gai Chase National Park (Thomas and Benson 1985a).

Two of the regionally and locally significant communities face particular threats. Coachwood Rainforest, which occurs along creeks, is highly prone to weed invasion from water-borne and bird-spread propagules, especially Small-leaved Privet (*Ligustrum sinense*), which has become a major component of many stands of this community around Sydney. Silvertop Ash-Scribbly Gum Woodland, which occurs on ridges and plateaus in the eastern part of Hornsby Shire, mainly outside Berowra Valley Regional Park, is threatened by the continual spread and intensification of urban development within its distribution. A number of stands of this community have been cleared or reduced since our 1990 survey. Others are currently threatened with clearing.

The remaining six communities of lesser conservation significance are Peppermint-Angophora Forest, Bloodwood-Scribbly Gum Woodland, Narrow-leaved Scribbly Gum Woodland, Grey Gum-Scribbly Gum Woodland, Yellow Bloodwood Woodland and Scribbly Gum Open-woodland/Heath. Together, these six communities make up 83% of the native vegetation of the survey area (12 858 of 15 517 ha). The significant communities (apart from Seagrass Meadow) make up only 17% (2659 ha).

Yellow Bloodwood Woodland has a relatively restricted distribution (284 ha), but has not been recognised as regionally or locally significant because it is common outside the survey area in Marramarra National Park (1097 ha; NSW Department of Environment and Conservation 2006) and, to a lesser extent, in Muogamarra Nature Reserve and Ku-ring-gai Chase National Park.

The list of significant vegetation communities in the Hornsby Shire Biodiversity Conservation Strategy (Hornsby Shire Council 2004) needs to be updated. It should take account of:

- recent community listings in the Australian *Environment Protection and Biodiversity Conservation Act 1999*,
- recent community listings in the NSW *Threatened Species Conservation Act 1995*,
- the revised classification and nomenclature of Hornsby vegetation communities in this report,
- recommended changes in this report to the regionally and locally significant community rankings (summarised in Table 2 and discussed in the community descriptions), and
- addition of Seagrass Meadow as a regionally significant community.

References

- Benson, D.H. (1986). The vegetation of the Gosford and Lake Macquarie 1:100 000 vegetation map sheet. *Cunninghamia* 1: 467-489.
- Benson, D.H. (1992). The natural vegetation of the Penrith 1:100 000 map sheet. *Cunninghamia* 2: 541-596.
- Benson, D. and Howell, J. (1994). The natural vegetation of the Sydney 1:100 000 map sheet. *Cunninghamia* 3: 677-787.
- ESP Ecological Surveys and Planning (1999). Hornsby Shire threatened biota conservation plan. Report and maps prepared for Hornsby Shire Council. ESP Ecological Surveys and Planning, Hornsby.
- Hornsby Shire Council (2004). *Hornsby Shire Biodiversity Conservation Strategy*. Hornsby Shire Council, Hornsby.
- Keith, D. (2004). *Ocean Shores to Desert Dunes: The Native Vegetation of New South Wales*

- and the ACT. NSW Department of Environment and Conservation, Hurstville.
- Lembit, R. (2005). Endangered ecological community mapping project. Report and GIS layer prepared for Hornsby Shire Council. Gingra Ecological Surveys, Canterbury.
- NSW Department of Environment and Conservation (2006). *Marramarra National Park, Muogamarra Nature Reserve, Maroota Historic Site, Wisemans Ferry Historic Site Draft Fire Management Strategy 2006-2011*. NSW Department of Environment and Conservation, Sydney.
- NSW National Parks and Wildlife Service (2002). *Native Vegetation of the Cumberland Plain Final Edition*. Compact disc with reports, maps and GIS layers. NSW National Parks and Wildlife Service, Hurstville.
- NSW Scientific Committee (2004). Final determination to list Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions, as an Endangered Ecological Community in Part 3 of Schedule 1 of the Act, December 2004. NSW Scientific Committee, Hurstville.
- NSW Scientific Committee (2007). Final determination to list the Blue Gum High Forest in the Sydney Basin Bioregion as a critically endangered ecological community, April 2007. NSW Scientific Committee, Hurstville.
- Ryan, K., Fisher, M. and Schaeper, L. (1996). The natural vegetation of the St Albans 1:100 000 map sheet. *Cunninghamia* 4: 433-482.
- Smith, J. and Smith, P. (1993). Vegetation and fauna of Pennant Hills Park. Report prepared for Hornsby Shire Council, March 1993. P & J Smith Ecological Consultants, Blaxland.
- Smith, P. (1997a). Koala habitat assessment of Brooklyn Park, Brooklyn. Report prepared for Hornsby Shire Council, May 1997. P & J Smith Ecological Consultants, Blaxland.
- Smith, P. (1997b). Koala habitat assessment of Hornsby Park, Hornsby. Report prepared for Hornsby Shire Council, August 1997. P & J Smith Ecological Consultants, Blaxland.
- Smith, P. (2002). Development Application No. 379/02, 37 Beaumont Road, Mt Kuring-gai: review of Conacher Travers flora and fauna assessment. Report prepared for Hornsby Shire Council, December 2002. P & J Smith Ecological Consultants, Blaxland.
- Smith, P. (2003a). Flora and fauna assessment of proposed subdivision at 181 Copeland Road East, Beecroft. Report prepared for Hornsby Shire Council, August 2003. P & J Smith Ecological Consultants, Blaxland.
- Smith, P. (2003b). Flora and fauna assessment: NSW Land and Environment Court Proceedings No. 11143 of 2003, Hornsby Shire Council ats James Duignan, Lot 21 DP 30286, 3 Cornwall Street, North Epping. Report prepared for Hornsby Shire Council, November 2003. P & J Smith Ecological Consultants, Blaxland.
- Smith, P. (2005). Flora and fauna assessment of proposed subdivision at 2C Chelmsford Road, Asquith, NSW Land and Environment Court Proceedings No. 10055 of 2005, Hornsby Shire Council ats CBD Prestige Property Holding Pty Ltd. Report prepared for Hornsby Shire Council, May 2005. P & J Smith Ecological Consultants, Blaxland.
- Smith, P. (2006). Preliminary report on flora and fauna of 1 Canoelands Road, Canoelands. Report prepared for NSW Land and Environment Court, February 2006. P & J Smith Ecological Consultants, Blaxland.
- Smith, P. and Smith, J. (1990a). Hornsby Shire bushland survey. Report and maps prepared for Hornsby Shire Council, March 1990. P & J Smith Ecological Consultants, Blaxland.
- Smith, P. and Smith, J. (1990b). Vegetation and fauna of Berowra Valley Bushland Park. Report and maps prepared for Hornsby Shire Council, September 1990. P & J Smith Ecological Consultants, Blaxland.
- Smith, P. and Smith, J. (1994). *Significant Wetlands of the Hawkesbury-Nepean Valley*. NSW Department of Planning, Sydney.
- Smith, P. and Smith, J. (1995). Hawkesbury wetlands review: Wisemans Ferry to Pumpkin Point. Report prepared for Hornsby Shire Council, June 1995. P & J Smith Ecological Consultants, Blaxland.
- Smith, P. and Smith, J. (1996a). Regionally significant wetlands of the Hawkesbury-Nepean River Catchment for Sydney Regional Environmental Plan 20. Report and maps prepared for NSW Department of Urban Affairs and Planning, August 1996. P & J

- Smith Ecological Consultants, Blaxland.
- Smith, P. and Smith, J. (1996b). Flora and fauna survey of Berry Park, Mount Colah. Report prepared for Hornsby Shire Council, September 1996. P & J Smith Ecological Consultants, Blaxland.
- Smith, P. and Smith, J. (1997a). Fauna and flora survey and assessment for proposed Berowra Aquatic Leisure Centre. Report prepared for Hornsby Shire Council, July 1997. P & J Smith Ecological Consultants, Blaxland.
- Smith, P. and Smith, J. (1997b). Fauna and flora survey and assessment for proposed works at Galston Park. Report prepared for Hornsby Shire Council, August 1997. P & J Smith Ecological Consultants, Blaxland.
- Smith, P. and Smith, J. (1997c). Koala habitat assessment of Fagan Park, Galston. Report prepared for Hornsby Shire Council, November 1997. P & J Smith Ecological Consultants, Blaxland.
- Smith, P. and Smith, J. (2000). Survey of the Duffys Forest Vegetation Community. Report prepared for NSW National Parks and Wildlife Service and Warringah Council, November 2000. P & J Smith Ecological Consultants, Blaxland.
- Smith, P. and Smith, J. (2003). Flora and fauna assessment of proposed rezonings at Mt Kuring-gai and Asquith Industrial Areas. Report prepared for Hornsby Shire Council, July 2003. P & J Smith Ecological Consultants, Blaxland.
- Smith, P. and Smith, J. (2005). Warringah Natural Area Survey: vegetation communities and plant species, 2005 update. Report and GIS layer prepared for Warringah Council, August 2005. P & J Smith Ecological Consultants, Blaxland.
- Specht, R.L. (1970). Vegetation. Pp. 44-67 in G.W. Leeper (ed.), *The Australian Environment*. Fourth edition. CSIRO/Melbourne University Press, Melbourne.
- Thomas, J. and Benson, D.H. (1985a). Vegetation survey of Ku-ring-gai Chase National Park. Report prepared for NSW National Parks and Wildlife Service, May 1985. National Herbarium of NSW, Royal Botanic Gardens, Sydney.
- Thomas, J. and Benson, D.H. (1985b). Vegetation survey of Muogamarra Nature Reserve. Report prepared for NSW National Parks and Wildlife Service, August 1985. National Herbarium of NSW, Royal Botanic Gardens, Sydney.
- Threatened Species Scientific Committee (2005a). Blue Gum High Forest of the Sydney Basin Bioregion: advice to the Minister for the Environment and Heritage, 26 August 2005. Department of the Environment and Heritage, Australian Government, Canberra.
- Threatened Species Scientific Committee (2005b). Turpentine-Ironbark Forest of the Sydney Basin Bioregion: advice to the Minister for the Environment and Heritage, 26 August 2005. Department of the Environment and Heritage, Australian Government, Canberra.
- Tozer, M. (2003). The native vegetation of the Cumberland Plain, western Sydney: systematic classification and field identification of communities. *Cunninghamia* 8: 1-75.
- West, R.J., Thorogood, C.A., Walford, T.R. and Williams, R.J. (1985). *An Estuarine Inventory for New South Wales, Australia*. Fisheries Bulletin No. 2. NSW Department of Agriculture, Sydney.