VAST–2: Site-based recording of use and land management and their effects on native vegetation over time

Citation: Thackway, R (2012). Cumberland State Forest, NSW, regrowth of compartments 8b, 9a and 9b. Ver.1. VAST-2: tracking vegetation transformation in Australian landscapes. Australian Centre for Ecological Analysis and Synthesis, University of Queensland, Brisbane.

1. Name of site/area

Cumberland State Forest compartments 8b, 9a and 9b.

2. Last modified (version no 1)

Minor changes July 2013.

3. Location of site

State: New South Wales

Biogeographic context

REG_NAME_7:	REG_CODE_7:	SUB_NAME_7:	SUB_CODE_7:
Sydney Basin	SYB	Cumberland	SYB08

Co-ordinates: Cumberland State Forest 33°44'39.84"S,151° 2'27.88"

4. Area of the site

Compartments 8b, 9a and 9b account for around 2 ha of the cleared area. Cleared area shown in 1943 air photo was approximately 13 ha. The total area of the State Forest is ~40 hectares.

5. Brief description of the natural undisturbed ecosystem of the site/area

The Cumberland State Forest is part of the Blue Gum High Forest (Daniel Connolly pers comm). It is a tall wet sclerophyll forest found on Wianamatta group Ashfield Shale. Soils derived from this Shale are deep, red, podsolic soils of clay loam texture with heavy clay layers in the B horizons (Forestry Commission of NSW 1984). Wianamatta Shale comprises claystone, siltstone, laminite and fine to medium grained lithic sandstone weathering to low fertility soils ranging in texture from loam to heavy clay (Tozer 2003).

Cumberland S.F. receives an average annual rainfall of approximately 900 -1300 mm and moderate daily temperatures (January mean max. 29℃, min. 16℃; Jul y mean max. 16℃, min. 5℃) (Forestry Commission of N SW 1984). Monthly rainfall records from 1970 to 2003 for Cumberland S.F. were used to calculate White's Moisture Stress Index (White 1986). Standard normal deviates of their long-term means (33 years) were calculated for the periods November to February and May to August. (Stone and Simpson 2006, DECCW 2009).

Mild frosts can occur from May to September.

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Blue Gum High Forest is dominated by Sydney blue gum (*E. saligna*), blackbutt (*E. pilularis*), and Turpentine (*Syncarpia glomulifera*) with a number of other Eucalypts occurring patchily (DECCW 2009). A sparse open cover of small trees includes a variety of sclerophyllous and mesophyllous species. The ground layer is variable in composition and cover, including ferny, grassy or herbaceous and/or vines and climbers. The characteristics of the ground cover are related topographic position.

6. Current purpose (2011) of the site/area

State Forest used for recreation. The larger area consists of 39 ha of intensively managed regrowth forest (Stone and Simpson 2006).

7. Reference or benchmark vegetation description: pre-clearing or pre-European community

The reference state for Cumberland State Forest compartments 8a, 8b, 8c, 9a and 9b is Unit 15 Turpentine Ironbark Forest (Tozer pers comm 2012).

Area of the plot: 22 quadrats were surveyed by Tozer; each survey site was described within a quadrat of area 0.04 ha (Tozer 2003).

NVIS level VI – sub-association	Overstorey	Midstorey	Understorey - ground layer
Dominant Species	E. saligna (Sydney blue gum) +/- E. paniculata (Grey Ironbark) +/- E. eugenioides (Thin-leaved stringybark) occurring less frequently.	Syncarpia glomulifera +/- Pittosporum undulatum +/- Trema aspera +/- Acacia parramattensis subsp. parramattensis.	Shrub layer usually sparse, and contains predominantly mesic species such as Pittosporum revolutum, Breynia oblongifolia, Maytenus sylvestris, Polyscias sambucifolia subsp. A, Notelaea longifolia f. longifolia and Ozothamnus diosmifolius. The ground stratum consists of a dense mixture of herb and grass species dominated by Oplismenus aemulus, Pseuderanthemum variabile and Echinopogon ovatus. Other frequently recorded species include Entolasia marginata, Pratia purpurascens, Dianella longifolia, Arthropodium milleflorum and Rubus parvifolia.
Species richness	4	4	Shrub = 11 Ground cover = 18
Growth form	Tree	Tree	Shrub Ground layer: mixture of herb and grass
Structural Formation Class	Tall Open Forest	Tall Woodland	Open shrubland Dense forbland
FPC	35.8 +/- 19.6	29.4 +/- 18.1	Shrub layer 14.4 +/- 20.1 ground layer 70.8 +/-31.1
Height	23.3 +/- 6.8	9.6 +/- 1.7	Shrub layer 2.6 +/- 0.9 ground layer 0.7 +/- 0.5

The main tree species represented on shale soils are grey ironbark (*Eucalyptus paniculata*), Sydney blue gum (*Eucalyptus saligna*), forest red gum (*Eucalyptus tereticornis*), white mahogany (*Eucalyptus acmenioides*) and rough-barked apple (*Angophora floribunda*). The absence of blackbutt (*Eucalyptus pilularis*), which is commonly represented nearby on shale soils, may be due to early, selective logging. Blackbutt begins to appear at lower levels.

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Soil	Type, compaction, hydrology, depth of A0 horizon, chemistry (NPK),	
Fire	Importance for regeneration and reproduction, frequency, area burnt.	

Sources: DECCW 2009 and Tozer (2003)

8. Brief history of the site/area:

1788-	Area managed by indigenous people speaking Darug people
1788-1824	Region explored - un-modified native forest Blue Gum/Ironbark on shale
1825	Parcel selected by Shepherd
1826-1907	Grazing cattle on native pastures
1860	Tree cover likely to have been thinned ~ selective logging
1908	Commenced clearing patches of trees for improved pasture, chooks, orchards
1909-1937	Managed as improved pasture for grazing
1937-38	Purchased by NSW Forestry Commission
1941-42	Area cleared of remaining native forest trees
1946-73	Area managed for education and demonstration - regenerating native forest
1974-84	Area increasing managed for recreation - regenerating native forest
1985-2012	Area managed for recreation - regenerating native forest

9. Proximity to large area of intact and largely intact and unmodified remnant

n/a

10. Sources of data and information used to complete description of use and management and their effects of native vegetation over time

A. Tim Liston pers comm 2012. Senior Ranger Cumberland State Forest.

B. 1941 Aerial photograph. Black and white. Map:1312/ Broken Bay: Run:17, 1942. 8'/4" RF 1/14550 restricted. 3735

C. 1943 Aerial photograph. Black and white. No details

D. 1951 Aerial photograph. Black and white. No details

E. 1978 Aerial photograph. Black and white. NSW 2710 466. County of Cumberland. 1:16000 (I.S.G) (Misc. 1029) Run 10. 29.3.1978. 2590 m ASL. Land and Property Information

F. 1982 Aerial photograph. Colour. 10 Aug 1982, Run 17, 146-195. NSW 3242. 1:16000. Sydney (M1474) 2560 M ASL. Land and Property Information

G. 1984 Aerial photograph. Colour. Cumberland National Forest. 1:5000. 13 Feb 1984. FC 18 03 83-13. 209.73 mm. 1219 m ASL. Forestry Commission.

H. 1999 Aerial photograph. Colour. Product of QASCO Australia. 5050 ASL. 1:10000. Run 1, 3540-3542. QAS 3241c 18 April 1999. Cumberland Forestry.

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I. 2006 Cumberland State Forest compartment map 3 May 2006 Draft

J. 2012 Google earth image.

K. Inferred by Richard Thackway 2012

L. Cumberland State Forest. Escape the everyday in Australia's only metropolitan State forest, West Pennant Hills, Sydney. http://www.gwsjoeys.org.au/wp-content/uploads/2011/10/cumberland-rec-brochure.pdf

M. Forestry Commission 1984. Management plan for Cumberland Management Area 1984.

N. Indigenous Language Map http://www.abc.net.au/indigenous/map/

O. Land and marine exploration http://atlas.nsw.gov.au/public/nsw/home/topic/article/exploration.html.

P. Stone C. and Simpson J. (2006). Leaf, tree and soil properties in a *Eucalyptus saligna* forest exhibiting canopy decline. *Cunninghamia* 9(4): 507–520.

Q. Christine Stone pers comm 2012.

R. http://warragamba.net.au/warra/index.php?option=com_content&view=article&id=66&Itemid=73.

S. http://www.waterforlife.nsw.gov.au/__data/assets/pdf_file/0015/1455/06mwp_chapter_3.pdf

T. NSW National Parks and Wildlife Service (2002). Interpretation Guidelines for the Native Vegetation Maps of the Cumberland Plain, Western Sydney, NSW NPWS, Hurstville. http://www.environment.nsw.gov.au/resources/nature/cumbPlainMappingInterpguidelines.pdf

U. Tozer, M (2003) The native vegetation of the Cumberland Plain, western Sydney: systematic classification and field identification of communities. *Cunninghamia* 8(1): 1–75

V. Tony Yates pers comm Oct 2012.

W. Judie Rawling field visit with Richard Thackway on 13 December 2012.

X. Forestry NSW (2011). Cumberland State Forest Hazard Reduction. Date of map 9/09/2011.

Y. DECCW (2009). The Native Vegetation of the Sydney Metropolitan Catchment Authority Area Draft report to the Sydney Metropolitan Catchment Authority. DECCW

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Description of use and management and their effects on native vegetation over time (explanation of numbered codes in Attachment 1)

Year	Source year	Reliability year	Land use (ALUM)[1]	List of LU[2] and LMP[3]	Source LMP	Reliability LMP	Observed effects and consequences on ecological function and native vegetation	Source effects	Reliability effects
1788-1820	K	4	Managed resource protection 1.2.0	Area managed by indigenous people speaking Darug language	N	7			
1825?	K	5	Other minimal use 1.3.0	… originally a land grant made to a John Shepherd. p46	M	7			
1850	U	5	Other minimal use 1.3.0	By the mid- nineteenth century the majority of the Cumberland Plain was either under cultivation or subject to grazing p3	U	7			
1860	K	5	Grazing native vegetation 2.1.0	Likely thinning of overstorey trees to promote pasture	K	8	Foliage projective cover dropped from 36% to around 20%	K	8
1897-1902	R	4	Grazing native vegetation 2.1.0	Successive droughts in the period	R	7			
1908	P	5	Grazing modified pastures 3.2.0/	Area was cleared for fruit tree orchards	P	8			
1904-1910	R	4	Other minimal use 1.3.0/ Grazing modified pastures 3.2.0/ Land in transition 3.6.0	Prolonged drought	R	7			
1908	L	4	Grazing modified pastures 3.2.0/ Land in transition 3.6.0	Originally privately-owned land, the forest was cleared for agriculture	L	8	Not all the forest was cleared as show by 1941 photo. Assume what was cleared in 1908 remained open and cleared until 1941	K	7
1908	K	5	Grazing modified pastures 3.2.0/	Area likely to have been ploughed on the gentler slopes and sown to non-native improved pasture species.	K	8			
1910	K	5	Grazing modified pastures 3.2.0/	Managed as improved pasture for grazing cattle and horses	K	8			
1920	K	5	Grazing modified pastures 3.2.0/	Managed as improved pasture for grazing cattle and horses	K	8			
1925	M	4	Grazing modified pastures 3.2.0/ 0	Major fire recalled by neighbours p28	M	7			
1925	K		Grazing modified pastures 3.2.0/	Managed as improved pasture for grazing cattle and horses	K	8			

[1] ALUM = Australian Land Use and Management classification
[2] LU = Land use
[3] LMP = land or vegetation management practice

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Year	Source year	Reliability year	Land use (ALUM)[1]	List of LU[2] and LMP[3]	Source LMP	Reliability LMP	Observed effects and consequences on ecological function and native vegetation	Source effects	Reliability effects
1930	K		Grazing modified pastures 3.2.0/ 0	Managed as improved pasture for grazing cattle and horses	K	8			
1934-1942	R	4	Grazing modified pastures 3.2.0/ 0	Drought	R	7			
1935	K	4	Grazing modified pastures 3.2.0/	Managed as improved pasture for grazing cattle and horses	K	8			
1937	M	4	Grazing modified pastures 3.2.0/ Land in transition 3.6.0	The search for an area to fulfil all these requirements [set by the Commissioner] ended with the selection of the area known locally as "Shepherds Bush", originally a land grant made to a John Shepherd. p46 The northern section was partly cleared, thus suitable for arboretum establishment, and the remainder timbered with what was regarded as second growth forest. p46	M	7	When originally purchased, little of the original vegetation remained on the arboretum portion of Cumberland State Forest i.e. 13 ha shown in the aerial photos 1941 and 1943	B	7
1937-38	M	4	Land in transition - treed 2.3.0/ Plantation forestry 3.1.0	Four adjoining properties, with a total area of 33 hectares, were purchased … in 1937 and 1938. p46	M	7			
1938	L	4	Land in transition - treed 2.3.0/ Plantation forestry 3.1.0	Site was taken over by the then NSW Forestry Commission with one third of the land planted as an arboretum and the rest allowed to naturally regenerate. The aim was to create an urban forest for all Sydney siders and visitors to enjoy.	L	7			
1939	M	4	Land in transition - treed 2.3.0/ Plantation forestry 3.1.0	Four adjoining properties were dedicated as Cumberland State Forest on 10th July, 1939. p46	M	7			
1939	M	4	Land in transition - treed 2.3.0/ Plantation forestry 3.1.0	Area dedicated as the Cumberland National Forest under the Forestry Act 1916	K	7			

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1938	M	4	Land in transition - treed 2.3.0/ Plantation forestry 3.1.0	The wet sclerophyll native forests of the Cumberland - I.B.M. Area were certainly substantially logged in the past. The forest was regarded as second growth when purchased by the Forestry Commission in 1938. The presence of blackbutt saplings, "six inches in diameter at breast height", was recorded and it was observed that veteran trees present were non-commercial species. p24		7			
1939-84	M	4	Land in transition - treed 2.3.0/ Plantation forestry 3.1.0	Broad area burning was excluded [from arboretum] p27	M	7			
1939-44	K	4	Land in transition - treed 2.3.0/ Plantation forestry 3.1.0				Shale soils tend to exhibit greater longevity of native plant seeds than do sandstones. It is expected that given prior use and management of the site that the soil was relatively high in phosphate. It is expected that these higher levels over time would have somewhat stabilised and equilibrated as the arboretum and the forest regeneration established and developed	W	
1939-74	K	4	Land in transition - treed 2.3.0/ Plantation forestry 3.1.0	Management of Cumberland State Forest since … 1939 has been directed primarily at the development of the nursery and arboretum	M	7			
1940-84	K	4	Land in transition - treed 2.3.0/ Plantation forestry 3.1.0				[in the arboretum, weeds that] established in the early stages, particularly lantana (Lantana camara) and privet (Ligustrum lucidum and L. sinense), have persisted in the understorey.	M	7
1940-1984	K	4	Managed resource protection 1.2.0				An absence of fires in Cumberland State Forest probably has helped perpetuate moist elements in the understorey, which in turn inhibit the regeneration of eucalypts. Turpentine, being more shade tolerant, regenerates more readily under these conditions which, no doubt, favour its spread. p12	M	7

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1941	M	4	Land in transition - treed 2.3.0/ Plantation forestry 3.1.0	2 hectares were added to the northeast of the original dedication; dedicated as Extension Nos. 1 on 4th February 1941. p46	M	7			
1939-41	V	7	Production forestry 2.2.0	Site preparation for the adjacent arboretum	V	7	Removal of any residual native vegetation including trees and shrubs	V	7
1941	B	6	Grazing modified pastures 3.2.0	Aerial photo interpretation - date of photo: 1941	K	8	Tree cover of the site very heavily logged 70% of area only a few large crowns remain. 1. Estimated overstorey height 2m 2. Estimated cover of overstorey 10% 3. Structural diversity is very low Of the 30% area cleared of tree cover, it appears that pasture grasses have been established.	K	8
1943	M	4	Land in transition - treed 2.3.0/ Plantation forestry 3.1.0	42 hectares were added to the southwest of the original dedication; dedicated as Extension Nos. 2 on 28th September, 1943. Number 2 Extension is generally referred to as 'the boot'. p46	M	7			
1943	C	6	Grazing modified pastures 3.2.0	Aerial photo interpretation - date of photo: 1943	K	8	Tree cover of the site - all large crowned trees removed. 1. Estimated overstorey height 0m 2. Estimated cover of overstorey 0% 3. Structural diversity is nil It appears that pasture grasses have been established over 100% of the area	K	8
1951	D	4	Land in transition - treed 2.3.0/ Plantation forestry 3.1.0	Aerial photo interpretation - date of photo: 1951	K	8	Tree cover appears to be naturally rehabilitating i.e. not regular planting over 100% of area. 1. Estimated overstorey height 5m 2. Estimated cover of overstorey 10% 3. Structural diversity is very low Ground layer appears a mix of woody plants and pasture grasses have been established. Wood y cover occurs as scattered clumps not even spread.	K	8
1960	K	4	Land in transition - treed 2.3.0/ Plantation forestry 3.1.0				… the combination of fertile soil and open canopy during the establishment period allowed the simultaneous growth of an assortment of introduced weeds. p24	M	7

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1964	M	4	Land in transition - treed 2.3.0/ Plantation forestry 3.1.0				Natural regeneration of Sydney blue gum, endemic shrubs and some of the planted species have filled in gaps and given a more natural appearance. p19		7
1968	T			Drought	T	7			
1970-84	K	6	Land in transition - treed 2.3.0/ Plantation forestry 3.1.0				Fuel quantities, particularly if understorey is included, are relatively high but in equilibrium. p27	M	7
1964	M	4	Land in transition - treed 2.3.0/ Plantation forestry 3.1.0	Survey to assess survival and health. p19 & p21	M	7	Assessment recorded 255 species in plots and gully plantings in blocks A to I. p25	M	7
1972	M	4	Land in transition - treed 2.3.0/ Plantation forestry 3.1.0	First formal management plan was written in 1972 and was directed toward improvement and enlargement of the nursery; maintenance of the arboretum; maintenance of natural forest areas; expansion of the recreation role and associated facilities; and regulation of inappropriate uses. p21	M	7			
1974-84	M		Land in transition - treed 2.3.0/ Plantation forestry 3.1.0	… weekend prison labour from Silverwater was used manually to remove weeds. This operation would not have been financially feasible without this labour source. Manual methods have been preferred to alternative methods such as poisoning or mechanical slashing, both of which tend to inhibit natural regeneration of desirable species. While follow-up treatment is essential, each operation should become easier, with natural regeneration of endemic and some introduced species progressively filling in the gaps. p27	M	7	The more effective endemic colonisers of weeded areas included tick bush, Parramatta wattle and sally wattle in open areas, and sweet pittosporum in shaded areas. Some arboretum species themselves are active colonisers. p27 Along with these welcome colonisers, removal of the dominant lantana and privet can be followed by a new generation of invaders including honeysuckle (Lonicera japonica), crofton's weed (Ageratina adenuphorum) and blackberry (Rubus vulgaris). Blackberry in particular is a potentially very serious problem, increasing in some areas at an alarming rate. p27 The weed control program in the arboretum has had the effect of fuel reduction by the manual stacking and burning of unwanted vegetation and some woody material from the forest floor. p27	M	7

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1974-84	K	4	Land in transition - treed 2.3.0/ Plantation forestry 3.1.0	… with repeated manual of lantana by hand using a method similar to the Bradley method	M	7	… well-established lantana can be replaced by endemic shrubs such as Helichrysum diosmifolia and Dodonaea triquetra. p28	M	7
1974-84	M	4	Land in transition - treed 2.3.0/ Plantation forestry 3.1.0	increasing attention over the recent decade to public recreation. p21	M	7			
1974-84	M	4	Land in transition - treed 2.3.0/ Plantation forestry 3.1.0	Most of the arboretum was manually treated to remove identified weeds. Generally each area has been followed-up at least once. p27	M	7	While the total bio-mass of weeds has been greatly reduced, and native species are slowly re-colonizing weeded areas, actual weed numbers may be higher in some areas with a continuing need for follow-up. p27		7
1975	K	5	Land in transition - treed 2.3.0/ Plantation forestry 3.1.0				By the 1970s lantana had grown to dense masses up to 5 metres high in more open areas, with privet growing as closely spaced tall shrubs in shaded areas. These weed species, together with the endemic Pittosporum undulatum, dominated the understorey throughout the arboretum, no doubt favoured by the absence of fires. Density of these shrubs resulted in an almost impenetrable bush and must have caused the demise of many of the shrubs planted in conjunction with tree species.	M	7
1978	E	4	Land in transition - treed 2.3.0/ Plantation forestry 3.1.0	Aerial photo interpretation - date of photo: 1978	K	8	Poor quality photo. Tree cover now dense extending over 100% of area. 1. Estimated overstorey height 20m 2. Estimated cover of overstorey 60-70% 3. Structural diversity is low (even aged regrowth) Tree cover too dense to see ground cover	K	8
1980	M	4	Land in transition - treed 2.3.0/ Plantation forestry 3.1.0				Natural regeneration of Sydney blue gum, endemic shrubs and some of the planted species have filled in gaps and given a more natural appearance. p19	M	7
1980	M	4	Land in transition - treed 2.3.0/ Plantation forestry 3.1.0	Surveys to assess survival and health. p19	M	7	192 species had survived of the 255 species recorded in 1964 p25	M	7
1982	M	4	Land in transition - treed 2.3.0/ Plantation forestry 3.1.0	Initial stages in the development of [adjacent] arboretum on the Western Suburbs Forestry Centre were completed p19	M	7			

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1982	F	4	Managed resource protection 1.2.0	Aerial photo interpretation - date of photo: 1982	K	8	Tree cover dense extending over 100% of area. 1. Estimated overstorey height 25m 2. Estimated cover of overstorey 70% 3. Structural diversity is low (even aged regrowth) Tree cover too dense to see ground cover	K	8
1982-??	K	4	Managed resource protection 1.2.0	Severe drought	K	7			
1983	M	4	Managed resource protection 1.2.0				Subsequent growth of planted species and ingrowth of endemic vegetation has now resulted in a reasonable forest canopy with a fairly natural appearance. p24 However, the combination of fertile soil and open canopy during the establishment period allowed the simultaneous growth of an assortment of introduced weeds. p24	M	7
1983	M	4	Managed resource protection 1.2.0				As a general observation it can be said that the arboretum is in decline with a continual loss of species being recorded and the health of many of those remaining is under threat. p24	M	7
1984	M	4	Managed resource protection 1.2.0	Survey to assess survival and health. p19	M	7	183 species had survived of the 255 species recorded in 196 p25	M	7
1984	M	4	Managed resource protection 1.2.0	Survey to assess survival and health. p19	M	7	Notwithstanding severe drought, initial survival of the 2000 seedlings planted has been about 80%. p19	M	7
1984	M	4	Managed resource protection 1.2.0				Introduced weeds are a serious problem in the arboretum area. p26		7
1984	M	4	Managed resource protection 1.2.0				Natural regeneration of Sydney blue gum, endemic shrubs and some of the planted species have filled in gaps and given a more natural appearance. p19 … after 45 years growth, some impressive forest stands have developed. These stands have developed by natural thinning without silvicultural treatment. p24	M	7
1984	G	4	Managed resource protection 1.2.0	Aerial photo interpretation - date of photo: 1984	K	8	Tree cover dense extending over 100% of area. 1. Estimated overstorey height 25m 2. Estimated cover of overstorey 70% 3. Structural diversity is low (even aged regrowth) Tree cover too dense to see ground cover	K	8

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1984	M	4	Managed resource protection 1.2.0				Some planted species are regenerating within the moist understorey. These include sandpaper fig (Ficus coronata), Austrobuxus swainii, corkwood (Duboisia myoporoides), native hibiscus (Hibiscus diversifolius) red ash (Alphitonia excelsa) and whalebone tree (streblus brunonianus). Other such species could be present. p12 On shale ridges, northern to western aspects and on the fringes of sandstone gullies in the southern section of Cumberland State Forest (type B2) a somewhat drier understorey develops with black she-oak (Allocasuarina littoralis), sweet pittosporum, native cherry (Exocarpus cupressiformis) and turpentine regeneration. Associated species are sweet bursaria (Bursaria spinosa), juniper wattle (Acacia ulicifolia), tick bush (Helichrysum diosmifolium), Leucopogon juniperinus, Dillwynia retorta and white kunzea (Kunzea ambigua). p12	M	7
1992-1998	S	4		Drought	S	7			
1999	H	4	Managed resource protection 1.2.0	Aerial photo interpretation - date of photo: 1999	K	8	Tree cover dense extending over 100% of area. 1. Estimated overstorey height 30m 2. Estimated cover of overstorey 70-80% 3. Structural diversity is low (even aged regrowth) Tree cover too dense to see ground cover	K	8
2002	W	4	Managed resource protection 1.2.0	Compartment 9b was burnt in 2002. The area burnt would have been around 85-90% coverage in this compartment.	W	7			
2002-03	P	4	Managed resource protection 1.2.0	Survey to assess leaf, tree and soil properties in a Eucalyptus saligna forest exhibiting canopy decline	P	7	Plot 6 1. Estimated overstorey height: 30.5 +/- 2.5m 2. Estimated cover of overstorey 70-80% 3. Structural diversity is low (even aged regrowth) 4. Stem per ha diameters over 2.0 cm at DOBBH est: 3675 5. Relatively dense midstorey	P	8

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Year	Source year	Reliability year	Land use (ALUM)[1]	List of LU[2] and LMP[3]	Source LMP	Reliability LMP	Observed effects and consequences on ecological function and native vegetation	Source effects	Reliability effects
2002-03	P	4	Managed resource protection 1.2.0	Survey to assess leaf, tree and soil properties in a Eucalyptus saligna forest exhibiting canopy decline	P	7	A common factor [in plot 6 as well as plots 1-5] was the presence of mature trees of Eucalyptus saligna. Other tree species present in the overstorey included Eucalyptus pilularis, Eucalyptus paniculata and non-eucalypt species such as Pittosporum undulatum and Glochidion ferdinandi. The understorey varied considerably because of manual weed control and control burning, and ranged from grass (Microlaena stipoides) that was regularly mowed, to dense mesic shrubs that included the exotic weeds Lantana camara and Ligustrum spp. p510 Lantana was present in plot 6 but was not dense because of manual weed removal. p515	P	7
2006	I	4	Managed resource protection 1.2.0	Aerial photo interpretation - date of photo: 2006	K	8	Tree cover dense extending over 100% of area. 1. Estimated overstorey height 30.5 +/- 2.5m 2. Estimated cover of overstorey 80% 3. Structural diversity is low (even aged regrowth) 4. Stem per ha diameters over 2.0 cm at DOBBH 3675	P	7

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Year	Source year	Reliability year	Land use (ALUM)[1]	List of LU[2] and LMP[3]	Source LMP	Reliability LMP	Observed effects and consequences on ecological function and native vegetation	Source effects	Reliability effects
2012	Q	4	Managed resource protection 1.2.0				1. Overstorey species composition comprises mostly of species planted during the early 1940s. Some natural regeneration (e.g. E. saligna and E. pilularis) has occurred in gaps arising from failed planted species 2. Overstorey height: 30.5 +/- 2.5m 3. Overstorey FPC: 70-80% 4. Overstorey structural diversity is mostly multilayered comprising a mixed (but variable) abundance of tree growth stages. Again in stands affected by Bell Miner Associated Dieback there would be a higher proportion of senescent trees and trees that might appear overmature but in fact are suffering from crown dieback. In the northern stands, nearly all the grey ironbarks (E. paniculata) have died from this process and many E. saligna have died or have unhealthy crowns. The rainforest species planted in the gullies appear to be relatively healthy, along with most of the E. pilularis stands which are less susceptible to Bell Miner Associated Dieback. Stem per ha diameters over 2.0 cm at DOBBH est: 3675 Relatively dense midstorey 5. Understorey species composition is variable in quality because it struggles with a suite of exotic weed species (common to the surrounding suburbs). The assistance from volunteer workers helps to manage this weed problem in some but not all stands. 6. Understorey height is variable, in part due to active intervention, but in some stands it would be approximately equivalent to that expected of a regrowth stand for the reference plant community. 7. Understorey cover is very variable, with FPC estimated to be 40%, especially in the gullies and lower slopes (vines at present are prolific due to the past couple of very wet years). 8. Understorey structure diversity is variable, in part due to active intervention, but in some stands it would be approximately equivalent to that expected of a regrowth stand for the reference plant community. 9. Ground cover is variable, in part due to active intervention, but in some stands it would be approximately equivalent to that expected of a regrowth stand for the reference plant community. 10. Understorey ratio of native to weed species: Est	Q	7

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Year	Source year	Reliability year	Land use (ALUM)[1]	List of LU[2] and LMP[3]	Source LMP	Reliability LMP	Observed effects and consequences on ecological function and native vegetation	Source effects	Reliability effects
2012	W	4	Managed resource protection 1.2.0	Two sites were visited to validate the vegetation and environmental information compiled in the historical record. Observations were made at sites in compartments 9a and 9b	W	7	Based on the historical record of the site being cleared in 1942 it is deduced that the sites comprise a 70 year old regrowth forests typical of the Cumberland Plain High Forest plant community. The two sites showed no evidence of planting indicating the compartments are regrowth. Regenerative capacity The bark of the eucalypt trunks were observed to have evidence of low intensity charring on the base of the regrowth trees. Fire regime observed to be fully natural. Soil hydrology surface and ground water observed to be fully natural. Soil structure observed to be fully natural. Soil nutrients observed to be fully natural. Soil biota observed to be fully natural. The ground cover was variable characterised by either large amounts of litter from the regrowth eucalypts and/or a diverse layer of herbs and forbs. Compartment 8b showed less grass and forbs and a considerably higher biomass of leaf litter than compartment 9b.Reproductive potential of the overstorey and understorey observed to be fully natural. Vegetation structure The overstorey height was estimated to be 25-28 m. The cover was estimated to be FPC: 70-80%. Compartment 9b had more canopy gaps, which contributed a diversity understorey. The understorey of compartment 98b was variable in density and cover indicating regrowth following a low intensity control burn, possibly in the last 10 years. This would suggest compartment 8b was burnt more recently than compartment 9b. All of the larger trees were pole and mature. Species composition Understorey weeds i.e. non-indigenous local species, were observed to be <5% of the total biomass of the understorey at two sites inspected in compartments 8b and 9b respectively. The species richness of the overstorey and understorey were observed to be what is expected in a regrowth forest i.e. observed to be fully natural.	W	7

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11. Data Use and Accuracy Disclaimer

These data are compiled to the best of our knowledge and ability. The information contained in this document is subject to revision. The user accepts all risks and responsibility for loss, damages, costs and other consequences (direct or indirect) resulting directly or indirectly from using this information.

12. License

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Attachment 1

Reliability standards used to compile historic and contemporary site-based chronologies.

Reliability level standards	Spatial precision (Scale)	Temporal precision (Year of observation)	Attribute accuracy (Land use, land management practices, effects on condition)
HIGH "Definite"	Reliable direct quantitative data. Examples: Site, plot and transect based records. **Code: 1**	Reliable direct quantitative data. Examples: Day-month-year, season-year and year. **Code: 4**	Reliable direct quantitative data. Examples: Inventory and counts, recorded observations from field survey and monitoring, farm records **Code: 7**
MEDIUM "Probable"	Direct (with qualifications) or strong indirect data. Examples: Land unit and soil-landscape reports. **Code: 2**	Direct (with qualifications) or strong indirect data. Examples: Mid 1850s **Code: 5**	Direct (with qualifications) or strong indirect data. Examples: Reconnaissance surveys, medium and moderate resolution remote sensing, regional mapping **Code: 8**
LOW "Possible"	Limited qualitative and possibly contradictory observations. More data needed. Examples: Land system, sub-bioregion and bioregion reports. **Code: 3**	Limited qualitative and possibly contradictory observations. More data needed. Examples: Early 1800s and first half of 19th century. **Code: 6**	Limited qualitative and possibly contradictory observations. More data needed. Examples: Generalised descriptions and narratives, census-based surveys **Code: 9**

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