

Semi-evergreen vine thicket vegetation at Derra Derra Ridge, Bingara, New South Wales

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Benson, J.S.¹, Dick, R.² and Zubovic, A.² (¹ National Herbarium of New South Wales, Royal Botanic Gardens, Sydney, NSW, Australia 2000, ² Land Assessment Unit, National Parks and Wildlife Service PO Box 1967 Hurstville, NSW, Australia 2220) 1996. *Semi-evergreen vine thicket vegetation at Derra Derra Ridge, Bingara, New South Wales* *Cunninghamia* 4(3): 497–510. Semi-evergreen vine thicket (SEVT) in New South Wales is mainly restricted to a few basalt hills on the North Western Slopes, although it is more common in Queensland (other dry rainforests are present in north-western Australia). SEVT has been largely cleared in both States and is a threatened vegetation type. Derra Derra Ridge (lat 29°52' long 150°27') contains the largest area of SEVT in NSW. Eight plant communities are mapped for the area. The vine thicket is dominated by *Notelaea microcarpa* var. *microcarpa*, *Cassine australis* var. *angustifolia* and *Geijera parvifolia*, with *Eucalyptus melanophloia* and *Callitris glaucophylla* as emergent trees. Small patches of brigalow, *Acacia harpophylla* and hummock grass, *Triodia scariosa* subsp. *scariosa* add to the biogeographic significance of the area. Ninety vascular plant species were recorded. A nationally listed rare legume, *Isotropis foliosa*, is present in low numbers. Comparisons are made with another vine thicket, Planchonella Hill, further north. It is recommended that at least the Crown land component of Derra Derra Ridge (1458 ha) should be fenced off from stock, destocked, and be dedicated and managed as a nature reserve.

Introduction

Location, geology, climate and land use

Derra Derra Ridge, latitude 29°52' longitude 150°27', is located in the Shire of Bingara, 12 km west of Bingara, 12 km south of the junction of the Gwydir and Horton rivers, and 80 km north-east of Narrabri, on the North Western Slopes of NSW (Fig. 1).

Derra Derra Ridge rises to a height of 690 m from 400 m at its base. It is 12 km west of the Peel Fault that separates the New England Block from the Tamworth Fold Belt (Rob 1974). Most of the Ridge is composed of a residual capping of Tertiary basalt derived from lava flows of the Nandewar volcanism at Mount Kaputar 18–17 million years ago (Wellman & McDougall 1974). The basalt is underlain by mudstone of the Luton Formation of the lower Carboniferous (NSW Department of Mines 1971). This mudstone outcrops on some of the slopes on the Derra Derra Ridge.

The average annual rainfall of nearby Bingara is 745 mm. This peaks over summer with an average of 92 mm in January, while winter is drier with an average of 45 mm in August. The average summer maximum temperatures are 33° with a minimum of 18°. The average winter maximum temperatures are 19° and with a minimum of 3° (Bureau of Meteorology 1988).

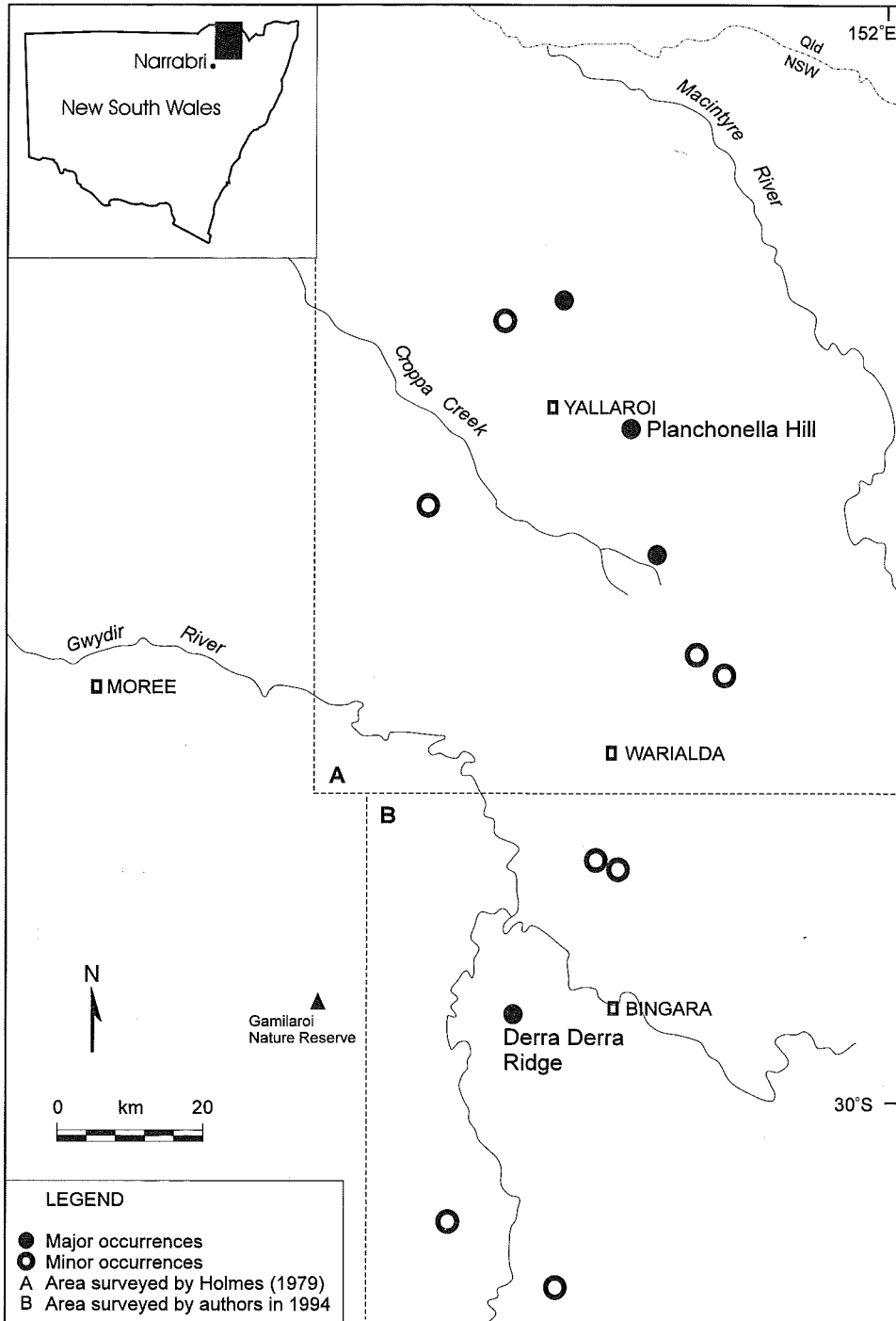


Fig 1. Location of Derra Derra and other occurrences of semi-evergreen vine thicket on the North Western Slopes of New South Wales.

Most of the undulating landscape in the Bingara region has been cleared for agriculture, but natural vegetation remains on steeper country, some of which is State Forest. The remnant vegetation on Derra Derra Ridge occupies 4120 ha (Fig. 2), of which 1500 ha is Crown land held under an annual licence for grazing and the remainder is private land. Wheat and other grains are grown on the surrounding rich colluvial and alluvial soils.

Semi-evergreen vine thickets

The term 'semi-evergreen vine thicket' (SEVT) is defined in Webb's (1978) physiognomic-structural classification of Australian rainforests. It is a type of 'dry' rainforest that has adapted to seasonal variability (Gillison 1987). 'Dry' rainforests include: northern Australian monsoon forests (Russell-Smith 1991), patches of dry rainforest in the Kimberley of Western Australia (Mckenzie et al. 1991), the softwood scrubs of inland Queensland and northern NSW (Forster et al. 1991), hoop pine scrubs of Queensland and New Guinea, and the dry rainforests of the north coast gorges (King 1980, National Parks and Wildlife Service 1985) and the Hunter Valley (Turner & Vernon 1994) of NSW. Because of some shared structural and floristic similarities to littoral dune rainforest, it is conjectured these inland 'dry' rainforests may have coastal origins (Gillison 1987). In a study of dry rainforests of inland north Queensland, Fensham (1995) found that 87% of trees, shrubs and vines also occurred on the north Queensland coast.

The vine thickets on the North Western Slopes, including Derra Derra, fit with the Webb (1978) structural category of semi-evergreen vine forest (SEVT). The trees and shrubs are

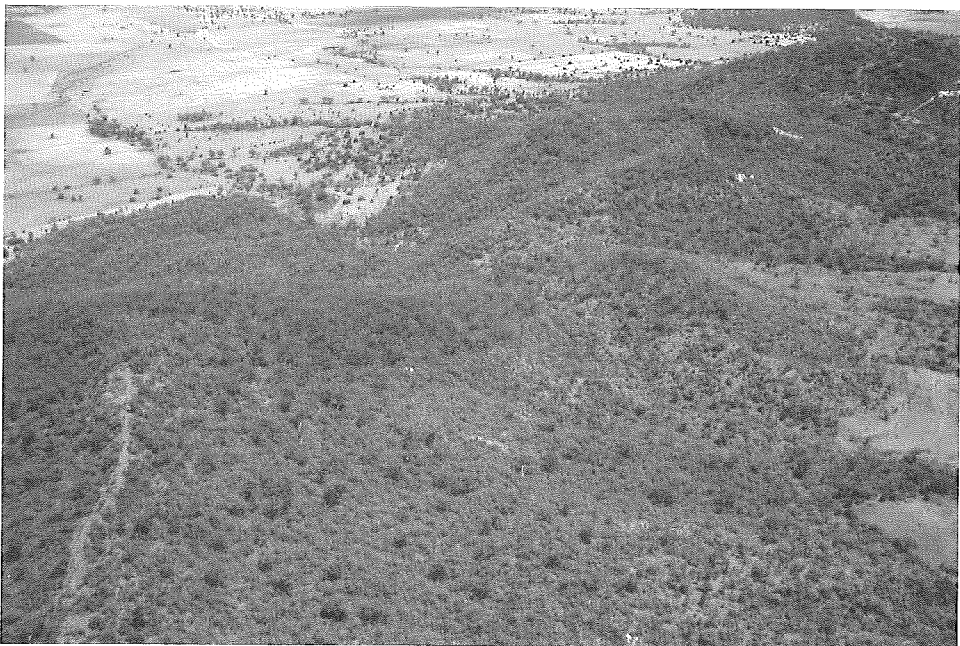


Fig. 2. Oblique aerial photograph of Derra Derra Ridge showing it is a native vegetation remnant surrounded by cleared crop and grazing land. (Photo: J. Benson)

less than 10 m in height, most species have small leaves (microphyll) and facultatively deciduous tree species are usually present. There are fewer deciduous species in the thickets in NSW than those in Queensland (Forster et al. 1991). Vine thickets often contain emergent trees that may be typical of surrounding woodlands. Floyd (1990) placed NSW vine thickets under suballiance No. 32 *Notelaea microcarpa* – *Ehretia membranifolia* – *Geijera parviflora* in his floristic classification of rainforest in NSW.

Stands of SEVT on the North Western Slopes of NSW are shown on Fig. 1. Those north of Warialda were identified by Holmes (1979) during a survey of remnant vegetation on Tertiary basalt. Several of these remnants were cleared in the early 1980s. The largest and best preserved SEVT identified by Holmes (1979), a 450 ha remnant at Planchonella Hill near Yetman, was subsequently documented by Pulsford (1983) and recently purchased by the NSW National Parks and Wildlife Service for management as a nature reserve. Hull (1992) prepared a plant species list of the SEVT at Derra Derra and first noted the botanical significance of the area. The SEVT on Derra Derra Ridge is at, or near, the southern limit for SEVT in Australia, although Floyd (1990) includes the dry rainforest of the Hunter Valley, 150 km to the south-east of Derra Derra, under the same suballiance in his floristic classification. While there may be similarities with upper Hunter Valley dry rainforest, the lower Hunter dry rainforest, documented by Turner and Vernon (1994), is structurally and floristically different from the SEVT on the north-western slopes.

Methods

The survey involved aerial and ground survey of the SEVT at Derra Derra Ridge, as well as a regional assessment to identify other SEVT occurring in the Bingara region, which lies south of the region surveyed by Holmes (1979).

Aerial photographic interpretation (API) of 1: 50 000 black-and-white aerial photos taken in 1985 formed the basis for discerning the main structural variation of the vegetation on Derra Derra Ridge. The API was refined during and after the field survey which took place over two days in December 1994. Seven 20 × 20 m plots were sampled, covering the major vegetation types identified from the API. At each plot, vascular plant species were assigned a cover rating based on a modified Braun-Blanquet six point scale (Benson 1994). Physiographic attributes, slope, aspect, altitude, soil texture and substrate were also recorded (Table 1). The plot data is stored on a relational database at the National Herbarium of New South Wales. A species list was developed from these sites and other records. Data analysis was not undertaken due to the small size of the data set.

Native vegetation remnants on Tertiary basalt within 20 km of Bingara were mapped by overlaying native vegetation discerned from recent LANDSAT TM images on 1: 250 000 geology maps covering the region (Fig. 1). These were surveyed by air using a light aircraft to determine whether they contained SEVT.

Table 1. Location (Terry Hie Hie 1: 50 000 topographic map), geology, soils, landform, altitude, slope and aspect for sample sites at Derra Derra Ridge

Site	AMG Grid Ref.	Geol.	Soil	Landform	Alt (m)	Slope (°)	Aspect (°)
SEVT001	253800 6692200	Basalt	Brown loam	Upper slope	640	7	330
SEVT002	253000 6694200	Basalt	Brown loam	Lower slope	425	40	340
SEVT003	253600 6694400	Basalt	Brown loam	Lower slope	450	12	200
SEVT004	253600 6694600	M'stone	Brown clay	Upper slope	490	22	270
SEVT005	254200 6693400	Basalt	Brown loam	Ridge	610	0	0
SEVT006	253300 6692600	Basalt	Brown loam	Mid-slope	580	25	270
SEVT007	253200 6691500	Basalt	Brown loam	Mid-slope	540	5	120

Results

The aerial survey identified four small stands (< 20 ha) of SEVT additional to that occurring at Derra Derra Ridge. Derra Derra Ridge was confirmed as the largest stand of SEVT in the region.

Plant communities

Eight vegetation communities are mapped for Derra Derra Ridge (Fig. 3) based on varying structure (Walker & Hopkins 1990) and floristics. The SEVT, community 2 at Derra Derra Ridge occupies 1350 ha of the 4120 ha remnant. Most of the SEVT occupies the central section of the remnant on the basaltic upper slopes and ridges (Figs 3 and 4). Emergent *Eucalyptus albens* and *Callitris glaucophylla* are common here. About 990 ha of the SEVT occurs on Crown land and the remainder on private land. Vine thicket is less common on the lower slopes where a mid-high open woodland of *Eucalyptus albens* and *Eucalyptus melanophloia* (community 5) is prevalent. Some of the highest ridges support a mid-high open woodland composed of *Eucalyptus albens*, *Eucalyptus dealbata* and *Callitris glaucophylla* (community 1). Isolated stands of *Eucalyptus melanophloia* with *Callitris glaucophylla*, containing a dry open understorey (community 6), are present on stony rises on the lower northern slopes.

Open forest dominated by *Angophora floribunda* (community 3) occurs on the southern mid-slopes, while dense stands of *Melaleuca bracteata* (community 7) line water courses in the area.

A reference point on Fig. 3 coinciding with site 7 indicates the location of a small patch of dense forest of brigalow, *Acacia harpophylla*, (community 4). It occurs on the southern side of the main east-west ridge. A small patch of hummock grassland dominated by porcupine grass, *Triodia scariosa* subsp. *scariosa* (community 8) occurs on a north-western aspect on the northern side of the main east-west ridge, coinciding with site 6.

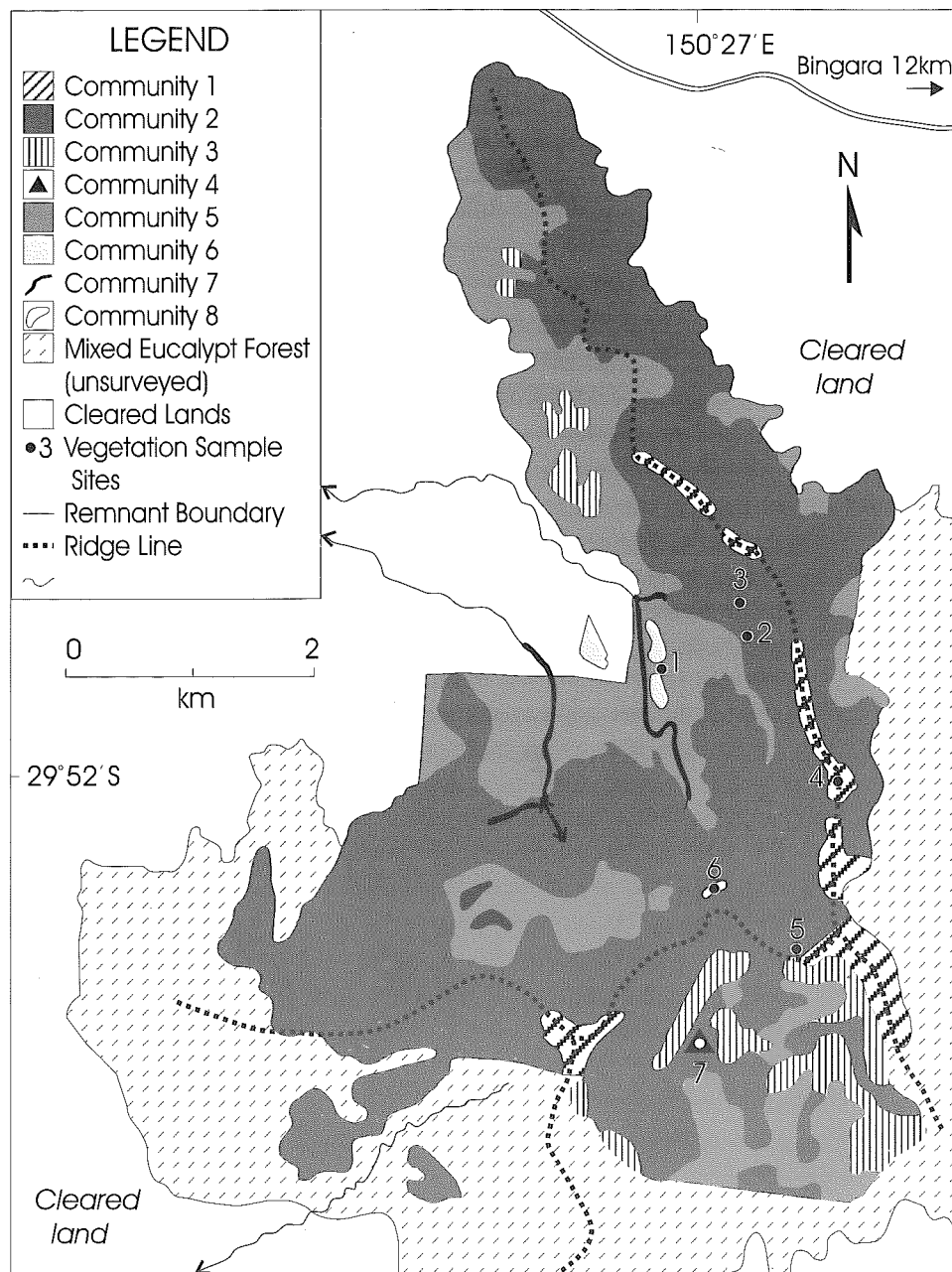


Fig. 3. Vegetation communities at Derra Derra Ridge. **Communities:** 1. Mid-high open woodland on higher slopes dominated by *Eucalyptus albens* – *E. melanophloia* – *Callitris glaucophylla*. 2. Semi-evergreen vine thicket on mid to high slopes with emergent isolated trees of *Eucalyptus albens* and *E. melanophloia*. 3. Mid-high open forest on southern aspects on mid-high slopes dominated by *Angophora floribunda*. 4. Closed forest on east-facing terrace dominated by *Acacia harpophylla*. 5. Mid-high open woodland on lower slopes dominated by *Eucalyptus albens* and *E. melanophloia*. 6. Mid-high open woodland on stony lower ridges dominated by *Eucalyptus melanophloia* and *Callitris glaucophylla* with a dry open understorey. 7. Mid-high closed forest along major drainage lines dominated by *Melaleuca bracteata*. 8. Open hummock grassland on a rocky north-west facing slope dominated by *Triodia scariosa* subsp. *scariosa*.

The API and ground survey showed that the open woodland on the central section of Crown land has been thinned in the past. The tree cover is sparser there than adjacent areas. Most of the ridge contained a sparse ground layer. This was probably due to grazing by sheep combined with the effects of a prolonged drought.

Floristics

A total of 90 species (88 native and two exotic) have been recorded from all vegetation types on Derra Derra Ridge compared to 68 species (66 native and two exotic) for the Planchonella Hill remnant, 100 km to the north (Table 2). Many more species, particularly grasses and forbs, would be recorded from both locations with further survey over a range of seasons.

Commonly recorded plant species in the SEVT mapped as community 2 on Fig. 3 at Derra Derra were: emergent trees: *Eucalyptus melanophloia*, *Eucalyptus albens*, *Callitris glaucophylla*; trees and shrubs: *Canthium oleifolium*, *Cassine australis* var. *angustifolia*, *Alectryon subdentatus*, *Alstonia constricta*, *Geijera parviflora*, and *Notelaea microcarpa* var. *microcarpa*; understory shrubs: *Beyeria viscosa*, *Dodonaea viscosa* var. *angustifolia*, *Carissa ovata*, *Indigophora brevidens*, *Spartothamnella juncea*, *Pimelea neo-anglica* and *Phyllanthus subcrenulatus*; ground cover: the tall grasses *Aristida ramosa* and *Thellungia advena* were dominant in some parts, elsewhere the ground was largely bare due to drought. *Boerhavia dominii* and *Dichondra repens* were the most common forbs, along with the ground fern *Cheilanthes sieberi* subsp. *sieberi*. Climbers *Parsonsia eucalyptophylla* and *Pandorea pandorana* were found on shrubs and trees.



Fig. 4. Community 2 is composed of semi-evergreen vine thicket with emergent *Callitris glaucophylla*, *Eucalyptus albens* and *Eucalyptus melanophloia*. (Photo: R. Dick)

Common species in other communities on the Derra Derra Ridge included *Eucalyptus albens*, *Eucalyptus dealbata*, *Olearia elliptica*, *Gahnia aspera*, *Desmodium brachypodium*, *Solanum parvifolium*, *Cryptandra longistaminea*, *Correa glabra*, *Acacia cheelii* and *Poa sieberiana* var. *hirtelli*.

One nationally listed rare species was recorded. The legume, *Isotropis foliosa* described by Crisp (1987), was recorded in site 6 situated in community 8 composed of hummock grassland. It is coded 3KC- on the national rare or threatened Australian plant list (Briggs & Leigh 1996), a code that indicates it is of poorly known status, has a distribution of over 100 km, and is known from at least one conservation reserve. Only nine collections of this species are held in the National Herbarium of New South Wales, and seven of these are before 1980. One of the original collections was made by J.L. Boorman from Bingara in 1907. *Isotropis foliosa* is endangered in Queensland with only two population known from the Moreton District, both with less than 50 individuals (Crisp 1987, J. Briggs pers. comm.). The species was not recorded in any of the 232 plots in a survey of vine forests in Queensland (Forster et al. 1991), nor was it recorded by Sheringham and Westaway (1995) as occurring in the north-eastern part of NSW. However, *Isotropis foliosa* is known to be locally abundant at least one location in the upper Hunter Valley (J. Hoskings pers. comm.). It would appear to be an under-collected species, mainly present in agricultural regions but is not known to be protected in any conservation reserve. Several of the herbarium records have notes stating that the species may be poisonous to stock. Given the above, the exact status of *Isotropis foliosa* requires further examination.

A number of species recorded at Derra Derra are outside their areas of main distribution. The small stand of Brigalow, *Acacia harpophylla*, on the southern side of the ridge, represents an eastern limit for this species in NSW. The small patch of semi-arid hummock grass *Triodia scariosa* subsp. *scariosa* is of biogeographical interest as it grows only on one exposed north-west slope, surrounded by vine thicket. Whitewood, *Atalaya hemiglauc*, is near its eastern limit. *Acacia salicina* is widespread on the North Western Slopes and inland flood plains of NSW and Queensland but is most common on floodplains. Only two of the 16 records of this species in the National Herbarium of New South Wales record it as growing on ridges.

Prickly pear, *Opuntia stricta* subsp. *stricta*, was recorded in six of the seven plots at Derra Derra and was the most common introduced plant species in the area. Exotic herbaceous species may be common but were not present due to the drought.

Discussion

Edaphic factors appear to be important in determining the presence of SEVT. All occurrences of SEVT in NSW occur on deep, loamy, high nutrient soils derived from basalt. McKenzie et al. (1991) reveal that climate, moisture availability, nutrients and proximity to other patches explained the presence of and variation in dry rainforest composition in the Kimberley. Kelly et al. (1988) quoted in Farnsworth (1993) implicate soil moisture availability, calcium concentration and nutrient availability as key factors in the sustenance of semi-evergreen communities in the Carribean. Similar

factors may explain the restriction of SEVT to basalt on the North Western Slopes of NSW. In addition to the availability of nutrients, the fine-grained soil would retain moisture and enhance seedling establishment of mesic species. At Derra Derra Ridge site 4 was located on mudstone and the vegetation there was more open with fewer rainforest species, and dominated by shrubs such as *Correa glabra*.

The southern occurrences of SEVT in NSW differ in their floristic assemblage from the softwood scrubs in Queensland (Forster et al. 1991, Benson 1993) and species such as the bottle tree, *Brachychiton rupestris*, are absent. In Queensland, both brigalow, *Acacia harpophylla*, and ooline, *Cadellia pentastylis*, often co-exist with vine thicket species (Johnson 1964). A small patch of *Acacia harpophylla* is present at Derra Derra and at Planchonella Hill (Pulsford 1983), but it is not a dominant plant at any of the SEVT sites in NSW. It was once widespread on the gilgai soils on the plains north from Narrabri to the west of Derra Derra but has been extensively cleared (Pulsford 1984). Neither *Acacia harpophylla* forest nor SEVT communities mix with *Cadellia pentastylis* forest in NSW (Benson 1993), although all three plant communities share a number of species. The nearest *Cadellia pentastylis* occurrence, in the Gamilaroi Nature Reserve, is only 30 km to the west of Derra Derra (Fig. 1).

Derra Derra and Planchonella Hill share a number of western plains species but others such as *Ventilago viminalis*, *Casuarina cristata*, *Santalum lanceolatum* and *Maireana microphylla*, recorded from Planchonella Hill, appear to be absent from Derra Derra. The tree, *Planchonella cotinifolia* var. *pubescens*, which is rare in NSW, has not been recorded south of Planchonella Hill and has not been recorded from Derra Derra. This species extends to north-central Queensland where it is more common (Forster et al. 1991). These differences in species composition may in part be explained by the fact that Derra Derra receives 100 mm more rainfall on average than Planchonella Hill.

The hypothesis of coastal origins for inland dry rainforests (Gillison 1987) holds true more at the generic than species level for the SEVT on the North Western Slopes of NSW. In contrast to the situation in inland north Queensland (Fensham 1995), few dry rainforest species present in SEVT in NSW (Table 2) are found on the coast. However, many genera in SEVT in NSW are shared between the inland and the coast. These include *Ehretia*, *Geijera*, *Notelaea*, *Parsonsia*, *Pittosporum*, *Clematis*, *Citriobatus*, *Croton* and *Alectryon*.

SEVT is one of the most restricted, threatened and poorly-reserved vegetation types in NSW (Benson 1989). The original extent of SEVT in NSW is unknown but it is likely that most of the stands have been cleared. Approximately 2500 ha of SEVT are left in NSW. Given their biogeographical interest and their restricted occurrence, the remaining stands of SEVT merit protection. Planchonella Hill with 450 ha of SEVT and Derra Derra with 1350 ha are the two most important remnants of SEVT in NSW. Few areas composed of basalt are protected in reserves on the western slopes of NSW. As mentioned, Planchonella Hill has recently been purchased for management as a nature reserve. Derra Derra should also be considered for dedication as a nature reserve. As a minimum, the Crown land area of 1500 ha should be protected. Unlike the SEVT at Planchonella Hill, the SEVT at Derra Derra Ridge is buffered from edge effects to some degree as it is part of a block of more than 4000 ha of natural vegetation. This

may assist with long-term management. Stock should be fenced out from Derra Derra and other important vine thickets because heavy grazing and trampling may limit the regeneration of a range of plant species. Studies are required into the germination and seedling establishment of dry rainforest plant species that grow in vine thickets.

Table 2: Plant species recorded at Derra Derra Ridge and Planchonella Hill (1-7 = Derra Derra sample sites, H = recorded by Hull (1992) at Derra Derra, P = Planchonella Hill (Williams 1983), * = exotic species)

Species and family	1	2	3	4	5	6	7	H	P
<i>Abutilon oxycarpum</i> (Malvaceae)									X
<i>Abutilon tubulosum</i> (Malvaceae)								X	
<i>Acacia cheelii</i> (Fabaceae)	X	X		X					
<i>Acacia deanei</i> subsp. <i>deanei</i> (Fabaceae)		X			X				X
<i>Acacia decora</i> (Fabaceae)				X		X			
<i>Acacia harpophylla</i> (Fabaceae)							X		X
<i>Acacia implexa</i> (Fabaceae)			X						X
<i>Acacia salicina</i> (Fabaceae)	X		X	X	X				X
<i>Alectryon oleifolius</i> subsp. <i>elongatus</i> (Sapindaceae)									X
<i>Alectryon subdentatus</i> (Sapindaceae)	X		X						X
<i>Alphitonia excelsa</i> (Rhamnaceae)			X						X
<i>Alstonia constricta</i> (Apocynaceae)	X								X
<i>Amyema cambagei</i> (Loranthaceae)									X
<i>Amyema miquelii</i> (Loranthaceae)							X		X
<i>Amyema miraculosum</i> subsp. <i>boormanii</i> (Loranthaceae)									X
<i>Angophora floribunda</i> (Myrtaceae)			X						X
<i>Aristida caput-medusae</i> (Poaceae)									X
<i>Aristida ramosa</i> (Poaceae)	X	X	X	X	X		X		
<i>Atalaya hemiglauca</i> (Sapindaceae)	X								X
<i>Beyeria viscosa</i> (Euphorbiaceae)	X		X	X	X	X			X
<i>Boerhavia dominii</i> (Nyctaginaceae)		X	X	X					X
<i>Brachychiton populneus</i> subsp. <i>populneus</i> (Sterculiaceae)	X				X				X
<i>Brachycome multifida</i> var. <i>multifida</i> (Asteraceae)						X			
<i>Breynia oblongifolia</i> (Euphorbiaceae)	X					X		X	
<i>Brunoniella australis</i> (Acanthaceae)				X				X	
<i>Callitris glaucophylla</i> (Cupressaceae)		X	X	X		X			X
<i>Canthium oleifolium</i> (Rubiaceae)		X		X	X	X			X
<i>Capparis lasiantha</i> (Capparaceae)									X
<i>Capparis mitchellii</i> (Capparaceae)	X								X
<i>Carex breviculmis</i> (Cyperaceae)		X	X						
<i>Carex inversa</i> (Cyperaceae)					X				
<i>Carissa ovata</i> (Apocynaceae)	X	X	X	X	X		X		X
<i>Cassine australis</i> var. <i>angustifolia</i> (Celastraceae)	X	X	X	X	X		X		X

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