Floristics and distribution of Wattle Dry Sclerophyll Forests and Scrubs in north-eastern New South Wales

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Abstract: *Acacia blakei* forests and scrubs of north-eastern NSW are described and compared to similar vegetation found in the south-east of the state, primarily dominated by *Acacia silvestris*. Like those in the south, Northern Wattle Dry Sclerophyll Forests form often discrete stands with abrupt margins on steep slopes in rugged terrain on shallow often rocky soils. The structure is usually of a cohort with stems of an even height and size up to 20 m tall, and a sparse understorey with few grasses, herbs or shrubs. These systems are potentially maintained by infrequent extreme fire events. Notes are made on their management and conservation.

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Introduction

Clayton-Greene & Wimbush (1988) were the first to fully describe an unusual vegetation association of dense *Acacia*-dominated scrubs and forests on the eastern fall of the Great Dividing Range in southern NSW. This class of vegetation, primarily dominated by *Acacia silvestris* (Bodalla Silver Wattle), occurred between the Byadbo region of the Snowy Mountains to south of Deddick in Victoria. The assemblage was characterised by being composed of dense stands of *Acacia* often of a uniform height, with very little understorey (sparse in grasses with only scattered smaller shrubs), and occurring on steep north and west-facing slopes, on metasediments or coarse grained granite. The edges of these *Acacia* scrubs were sharp and clearly-defined.

Similar vegetation, called 'Black Jungle' or 'Black Scrub", was classified under Forest Type 214 (Anon 1989), and as *Acacia* Scrub (Map Unit 4) by Keith & Bedward (1999) in their mapping of south-eastern NSW forests. Though *Acacia silvestris* was the most common dominant, other wattles such as *Acacia binervia, Acacia doratoxylon, Acacia falciformis* and *Acacia kettlewelliae* sometimes formed similarly structured assemblages (Clayton-Greene & Wimbush 1988; Keith & Bedward 1999). Keith (2004) considered that these assemblages showed little close affinity with other vegetation classes but did share taxa with rock outcrop communities.

Keith (2004) considered these *Acacia*-dominated systems, which he termed Southern Wattle Dry Sclerophyll Forests, as a curious anomaly, as the only (non-regrowth) class of vegetation in eastern flowing catchments of the Great Dividing Range to be dominated by *Acacia* rather than *Eucalyptus*. Similar vegetation however has been reported elsewhere in eastern NSW for over a decade. Stands dominated by *Acacia bulgaensis* occur in the Wollemi, Yengo, Parr and Pokolbin areas west of Newcastle (Bell et al. 1993; Binns 1996). Vegetation dominated by *Acacia blakei* subsp. *diphylla* occurs in areas north from Gloucester (Binns 1994; Binns 1995; Anon 1995; Hunter 1998; Hunter et al. 1998; Benwell 2000; Hunter 2004). Extensive field investigations have highlighted that the latter northern vegetation, in particular, mirrors the physical and structural characteristics of the southern scrubs and forests. Here I describe, compare and contrast these Northern Wattle Dry Sclerophyll Forests and Scrubs with those from southern NSW.

Occurrences in Northern New South Wales

Many assemblages similar to the 'Black Scrubs' of south-eastern NSW have been reported. Binns (1994) described an *Acacia blakei* subsp. *diphylla–Plectranthus graveolens* low forest or woodland from the Chaelundi area north of Dorrigo. An *Acacia blakei* subsp. *diphylla* forest association was noted near the Henry River Falls on metasediments in Guy Fawkes River National Park (Anon 1995). Benwell (2000) described an *Acacia blakei* subsp. *diphylla* scrub associated with low quartz sedimentary rock types and acid volcanics in Nymboida National Park. Benwell (2000) also discusses finding similar stands within Guy Fawkes River National Park. Extensive stands of *Acacia blakei* scrub also occur within Oxley Wild Rivers National Park (*pers. obs.*) where they are quite extensive compared to other northern occurrences. These stands are often associated with dry rainforest, and due to their similar colour on aerial photographs may be included in dry rainforest mapping units (CRA 1999). Table 1 compares features shown by the southern and northern stands.

The Demon Fault, the western boundary of Demon Nature Reserve, runs along the western base of the Malara Plateau east of Tenterfield. Along this geological feature is a distinct linear patch of vegetation dominated by *Acacia blakei* subsp. *diphylla* which forms a dense cohort of scrub on the steep western facing slopes (Hunter et al. 1998). The *Acacia* scrub

Fig. 1. *Acacia blakei* scrubs on the Demon Fault within the Demon Nature Reserve.

forms a distinct linear patch whose boundary is clear and sharp within a larger *Eucalyptus* forest. The understorey was sparse with scattered grasses and a few shrubs (Fig. 1). The height of most of the stand was only 4 to 8 m but some sections consisted of much older cohorts.

Stands of *Acacia blakei* forests and scrubs were found on steep north and western facing slopes in dissected metasediment gorge country within the Washpool National Park western additions (Hunter 1998). These stands occurred on shallow soils but had sharp and distinct boundaries with the surrounded *Eucalyptus*-dominated forests. The understorey was very sparse, with only a few grasses and some scattered smaller shrubs. The dominant *Acacia blakei,* up to a height of 20 m, formed a cohort of similar-aged individuals with little recruitment evident (Fig. 2). In floristic analyses this community was closely allied to rock outcrop assemblages which they sometimes occur around (Hunter 1998).

Fig. 2. Stand of *Acacia blakei* forest within Washpool National Park.

Hunter (2004) described stands of *Acacia blakei* subsp. *diphylla* forests and scrubs within Mann River Nature Reserve. The stands were often associated with shallow soils on northerly facing slopes of course grained granite. These stands often also occurred around rock outcrops and were floristically associated with outcrops in floristic analyses

Table 1. Comparison of Southern Wattle Dry Sclerophyll Forest (sensu Keith 2004) and Northern Wattle Dry Sclerophyll Forests. Information for southern localities derived from Clayton-Greene & Wimbush (1988), Keith & Bedward (1999) and Keith (2004).

Characteristic	Southern Wattle DSF	Northern Wattle DSF
Dominant taxon	*Acacia silvestris* sometimes *A. kettlewelliae*, rarely *A. doratoxylon* or *A. falciformis*	*Acacia blakei* subsp. *diphylla* sometimes *A. blakei* subsp. *blakei*
Boundaries	Discrete & very abrupt within a sea of Eucalypt forest	Discrete & very abrupt within a sea of Eucalypt forest
Slopes	Steep north & west facing	Steep to gentle primarily north & west facing, sometimes east facing.
Landscape	Usually in remote, dissected terrain	Remote dissected terrain
Soil	Shallow & rocky	Shallow & rocky
Rock type	Metasediments and course grained granite	Metasediments and course grained granite, rarely acid volcanics
Canopy	Generally uniform, closed canopies, stems of similar height & size away from ecotone	Generally uniform, closed canopies, stems of similar height & size away from ecotone
Diameter at breast height	0.8–20 cm. Average 4.4 cm ± 3.3 cm.	16.1–37.5 cm. Average 22 cm ± 6 cm. (Mann River)
Height	5 to 20 m tall	5 to 20 m tall
Understorey	Sparse, little ground cover, few grasses, some scattered shrubs	Sparse, little ground cover, few grasses, some scattered shrubs
Floristic relationships	With rock outcrop floras	With rock outcrop floras
Occurrence	3585 ha (south eastern NSW Keith & Bedward 1999)	Possibly 700 ha

Fig. 3. *Acacia blakei* forests within the Mann River Nature Reserve.

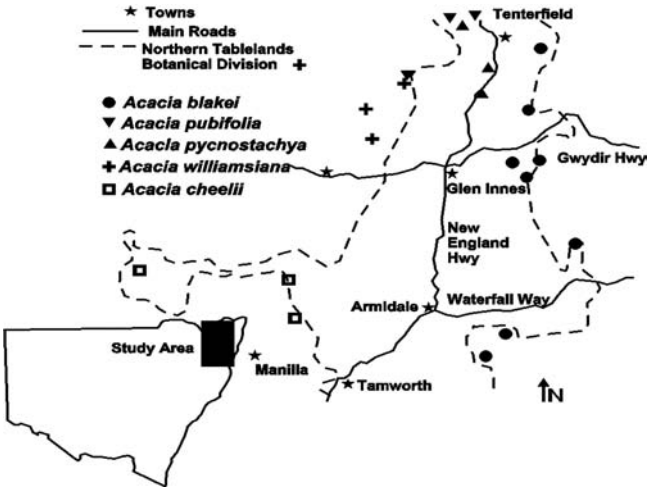

Fig. 4. Known locations of Wattle Dry Sclerophyll Forests and Scrubs of north-eastern New South Wales. *Acacia blakei* is the only taxon dominating these communities in eastern flowing catchments.

(Hunter 2004). As with the previously described stands the understorey was sparse and open and the boundaries of the patches were clear and distinct within a general *Eucalyptus* forest and woodland matrix, although scattered *Acacia* individuals were commonly found in other forests and woodlands. The *Acacia* stands were mainly of even size within each patch though different patches were often different heights. In most patches the stems were 10–18 m tall, with stem diameters (dbh) averaging 22 cm (Fig. 3).

Based on full floristic field survey sites *Acacia blakei* communities typically contain the shrub *Ficus rubiginosa;* the forbs *Cheilanthes sieberi* subsp. *sieberi*, *Commelina cyanea, Desmodium varians, Dianella caerulea, Gahnia aspera, Lomandra longifolia, Lomandra multiflora, Opercularia hispida, Pomax umbellata, Pratia purpurascens, Scleria mackaviensis, Sigesbeckia australiensis* and *Hybanthus stellarioides*; the grasses *Cymbopogon refractus, Entolasia stricta, Oplismenus aemulus* and *Themeda australis*.

Acacia blakei appears to be the only species that forms these clear and distinct assemblages with these ecological characteristics in the eastern flowing catchments of northern NSW. The abrupt and clear boundaries of these systems are distinctive in many situations, but in some situations the boundaries (as with many vegetation communities) can be extended and somewhat blurred (as is the situation in the southern occurrences as well - Clayton-Greene & Wimbush 1988). Other wattle taxa, such as *Acacia falciformis, Acacia dealbata, Acacia elata, Acacia irrorata*, often form dense stands but only as an understorey component of *Eucalyptus* forests or as short-term (i.e. > 20 yrs) regrowth following disturbance in sites that will eventually support eucalypt forests.

Similar vegetation on western flowing catchments of the north-east

On the western flowing catchments on the Northern Tablelands and North Western Slopes structurally similar wattle forests and scrubs also occur, and are dominated by taxa with broad affinities to *Acacia blakei* (Juliflorae) and which share the same site characteristics (Fig. 4). Between Deepwater and Tenterfield *Acacia pycnostachya* forms scrubs and forests in Bolivia Hill and Bluff River Nature Reserves (Hunter & Clarke 1998; Hunter 2002). In the northern parts of the Northern Tablelands *Acacia pubifolia* forms similar stands at Torrington, and in Queensland within Girraween and Sundown National Parks (Hunter & Clarke 1998). *Acacia cheelii* forms dense cohort stands in the south-west of the Northern Tablelands at Mt Kaputar and Warrabah National Parks and at Ironbark and Melville Range Nature Reserves (Hunter & Clarke 1998; Hunter & Alexander 2000; Hunter & Hunter 2003). In north-west New England, *Acacia williamsiana* forms structurally similar stands in similar situations at Torrington State Recreation Area, Kwiambal and Kings Plains National Parks and Severn River Nature Reserve (Hunter 1997; Hunter & Clarke 1998; Hunter et al 1999; Hunter 2000ab).

Management and conservation

Clayton-Greene & Wimbush (1988) showed that the 'Black Scrubs' of south-eastern NSW were long-lived with some trees of *Acacia silvestris* and *Eriostemon trachyphyllus* having ring-counts indicating ages of up to 100 years or more, though most appeared to be between 25 and 35 years old. These scrubs did not appear to carry low intensity fires probably due to the sparse understorey and the comparative lack of flammability of *Acacia* leaves (Clayton-Green & Wimbush 1988). However due to lack of resprouting ability the dominant wattles were likely to be killed by fire (Keith 2004). Such evidence, along with investigations of previous fire patterns, lead Clayton-Green & Wimbush (1988) to surmise that these scrubs were maintained by infrequent intense fire events, and that they may not persist in the absence of such events. Each cohort is likely to be related to

a specific intense wildfire event (Keith 2004). A very similar dynamic was proposed for rock outcrop floras of northern NSW with which these scrubs and forests are closely allied (Hunter et al. 1998; Hunter 2003).

Within eastern NSW potentially less than 5 000 ha of this vegetation may exist north of the Hunter region. Around 700 ha have been mapped in northern NSW though it is likely that not all stands have been recorded. In the south-east where more extensive investigations have occurred, 3585 ha are known. These distinctive communities are probably part of a long-term dynamic reliant on unique site characteristics and extreme fire events. In 1988 Clayton-Greene and Wimbush suggested that the only conceivable threat to the continued existence of the southern scrubs would be attempts to exclude intense fire by too-frequent low-intensity burns in the surrounding woodland. Under such regimes the likelihood of these wattle scrubs and forests persisting in landscapes where extreme fire events are actively discouraged by management activities may be reduced. Although most occurrences in northern NSW are within reserves managed by the National Parks and Wildlife Service; most are small and isolated stands and they may be under threat while we do not understand the mechanisms enabling persistence. These communities should be perceived as both a significant and unusual vegetation association of limited extent.

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Appendix 1. List of vascular plant species associated with *Acacia blakei* Dry Sclerophyll Forests and Scrubs of eastern flowing catchments of north-eastern NSW. Taxa were recorded from field plots. Nomenclature follows that of Harden (1992-2002) Flora of New South Wales, except where recent changes have been made.

DM = Demon Nature Reserve (5 x 0.1 ha sites).

MR = Mann River Nature Reserve (4 x 0.1 ha sites).

NY = Nymboida National Park (Benwell 2000).

WWP = Washpool National Park Western Additions (3 sites).

PTERIDOPHYTES	
Adiantaceae	
Adiantum hispidulum	NY, WWP
Cheilanthes distans	DM, MR
Cheilanthes sieberi subsp. *sieberi*	DM, MR, NY, WWP
Pellaea falcata	WWP
Pellaea nana	DM
Aspleniaceae	
Asplenium flabellifolium	WWP
Polypodiaceae	
Pyrrosia rupestris	NY
MONOCOTYLEDONS	
Anthericaceae	
Arthropodium milleflorum	DM
Tricoryne anceps var. *pterocaulon*	DM, WWP
Commelinaceae	
Commelina cyanea	DM, MR, WWP
Cyperaceae	
Cyperus imbecillis	DM
Cyperus fulvus	MR
Cyperus gracilis	MR, NY
Cyperus lhotskyanus	DM
Fimbristylis dichotoma	DM, MR
Gahnia aspera	DM, MR, NY, WWP
Lepidosperma laterale	DM, WWP
Schoenus melanostachys	DM, MR
Scleria mackaviensis	DM, MR, WWP
Haemodoraceae	
Haemodorum planifolium	DM
Iridaceae	
Patersonia glabrata	WWP
Patersonia sericea	DM
Lomandraceae	
Lomandra confertiflora	DM
Lomandra filiformis	DM
Lomandra longifolia	DM, MR, WWP
Lomandra multiflora subsp. *multiflora*	DM, MR, WWP
Eustrephus latifolius	DM, WWP
Geitonoplesium cymosum	NY
Orchidaceae	
Acianthus apprimus	DM
Bulbophyllum minutissimum	MR
Dendrobium kingianum	MR
Phormiaceae	
Dianella caerulea var. *caerulea*	DM, MR, NY, WWP
Poaceae	
Aristida acuta	MR
Aristida calycina var. *calycina*	MR
Aristida jerichoensis subsp. *subspinulifera*	DM
Aristida ramosa var. *ramosa*	MR
Austrodanthonia racemosa var. *racemosa*	MR
Austrostipa rudis subsp. *nervosa*	WWP
Austrostipa scabra subsp. *scabra*	MR
Cenchrus caliculatus	MR, WWP
Cymbopogon refractus	DM, MR, NY, WWP
Deyeuxia mckiei	DM
Dichelachne micrantha	MR, WWP
Dichelachne rara	DM
Digitaria breviglumis	DM, MR
Digitaria diffusa	MR
Digitaria ramularis	MR, WWP
Echinopogon caespitosus var. *caespitosus*	MR
Echinopogon ovatus	DM
Entolasia marginata	MR, WWP
Entolasia stricta	DM, MR, NY, WWP
Eragrostis elongata	DM, MR
Eragrostis leptostachya	MR
Eragrostis molybdea	MR
Joycea pallida	MR
Microlaena stipoides	DM
Notodanthonia longifolia	DM, WWP
Oplismenus aemulus	DM, MR, WWP
Oplismenus imbecillis	NY
Oplismenus undulatifolius var. *mollis*	DM, MR
Panicum effusum	MR
Panicum simile	DM
Paspalidium constrictum	DM
Poa labillardieri	DM, WWP
Poa sieberiana var. *sieberiana*	MR
Sorghum leiocladum	WWP
Themeda australis	DM, MR, WWP
Tripogon loliiformis	DM, MR
Restionaceae	
Baloskion stenocoleum	DM
Smilaceae	
Smilax australis	NY
DICOTYLEDONS	
Acanthaceae	
Brunoniella australis	WWP

Apiaceae	
Trachymene incisa subsp. *incisa*	DM, MR
Apocynaceae	
Alyxia ruscifolia	NY, MR
Parsonsia straminea	DM
Araliaceae	
Astrotricha longifolia	WWP
Asclepiadaceae	
Hoya australis subsp. *australis*	MR
Sarcostemma brunonianum	MR
Asteraceae	
**Bidens pilosa*	DM, MR, WWP
Brachyscome microcarpa	DM
Calotis dentex	MR, WWP
Cassinia uncata	WWP
Chrysocephalum apiculatum	DM
**Cirsium vulgare*	WWP
**Conyza albida*	DM
Euchiton sphaericus	MR, WWP
Glossogyne tannensis	DM
**Gnaphalium americanum*	DM
**Hypochaeris radicata*	DM, MR, WWP
Lagenifera gracilis	DM
Senecio diaschides	MR, WWP
Senecio hispidulus var. *hispidulus*	MR
Senecio lautus subsp. *dissectifolius*	MR
Senecio lautus subsp. *lanceolatus*	WWP
Senecio vagus subsp. *eglandulosus*	WWP
Sigesbeckia australiensis	DM, MR, WWP
Veronica cinerea var. *cinerea*	DM, WWP
Vittadinia cervicularis subsp. *subcervicularis*	DM, MR
**Zinnia peruviana*	MR
Bignoniaceae	
Pandorea pandorana	DM, MR
Campanulaceae	
Wahlenbergia communis	DM, WWP
Wahlenbergia luteola	DM
Casuarinaceae	
Allocasuarina littoralis	MR, WWP
Allocasuarina torulosa	DM
Celastraceae	
Maytenus silvestris	DM, WWP
Chenopodiaceae	
Chenopodium carinatum	MR
Einadia trigonos subsp. *leiocarpa*	WWP
Clusiaceae	
Hypericum gramineum	DM
Convolvulaceae	
Dichondra repens	DM, WWP
Dichondra sp. A	MR
**Ipomoea cairica*	MR
Polymeria calycina	DM
Crassulaceae	
Crassula sieberiana	DM, MR
Dilleniaceae	
Hibbertia obtusifolia	DM, MR
Epacridaceae	
Leucopogon lanceolatus var. *lanceolatus*	WWP
Melichrus urceolatus	DM
Escalloniaceae	
Rapanea variabilis	NY
Euphorbiaceae	
Acalypha nemorum	DM, NY
Beyeria viscosa	WWP
Breynia cernua	DM, NY
Phyllanthus gunnii	DM, NY, WWP
Poranthera microphylla	DM
Ricinocarpos speciosus	MR
Fabaceae	
Acacia blakei subsp. *diphylla*	DM, MR, NY, WWP
Bossiaea scortechinii	DM
Desmodium brachypodum	DM, MR
Desmodium rhytidophyllum	DM
Desmodium varians	DM, MR, WWP
Glycine clandestina	DM
Glycine microphylla	DM
Jacksonia scoparia	DM, MR
Mirbelia pungens	DM
Podolobium ilicifolium	DM
Goodeniaceae	
Dampiera stricta	MR
Goodenia hederacea	DM
Goodenia rotundifolia	DM
Haloragaceae	
Haloragis heterophylla	DM
Gonocarpus oreophilus	NY
Gonocarpus teucrioides	WWP
Lamiaceae	
Ajuga australis	DM
Mentha diemenica	DM
Plectranthus graveolens	DM, MR
Plectranthus parviflorus	DM, MR, WWP
Plectranthus suaveolens	MR
Prostanthera nivea	DM
Lobeliaceae	
Pratia purpurascens	DM, MR, WWP
Loranthaceae	
Muellerina celastroides	MR
Muellerina eucalyptoides	MR
Malvaceae	
Hibiscus trionum	MR

Moraceae	
Ficus rubiginosa forma *glabrescens*	DM, MR, NY
Myrtaceae	
Babingtonia collina	MR
Corymbia gummifera	DM
Corymbia variegata	NY
Eucalyptus biturbinata	MR
Eucalyptus campanulata	WWP
Eucalyptus crebra	MR
Eucalyptus dorrigoensis	WWP
Eucalyptus fibrosa	DM
Eucalyptus prava	MR
Eucalyptus propinqua	DM
Eucalyptus radiata subsp. *sejuncta*	WWP
Eucalyptus tereticornis	MR
Leptospermum arachnoides	MR
Leptospermum petersonii subsp. *petersonii*	MR
Leptospermum polygalifolium subsp. *transmontanum*	DM, WWP
Lophostemon confertus	DM, MR
Nyctaginaceae	
Boerhavia dominii	DM
Oleaceae	
Jasminum volubile	MR
Notelaea longifolia	DM, NY
Oxalidaceae	
Oxalis chnoodes	WWP
Oxalis perennans	DM
Passifloraceae	
Passiflora aurantia	WWP
Pittosporaceae	
Billardiera scandens var. *scandens*	DM
Bursaria spinosa	WWP
Polygalaceae	
Rumex brownii	WWP
Portulacaceae	
Calandrinia pickeringii	DM
Primulaceae	
**Anagallis arvensis*	MR
Proteaceae	
Hakea sericea	DM
Lomatia silaifolia	WWP
Plantaginaceae	
Plantago varia	WWP
Rhamnaceae	
Alphitonia excelsa	MR, NY
Persoonia sericea	
Pomaderris elliptica	DM
Rubiaceae	
Opercularia aspera	MR, WWP
Opercularia diphylla	MR
Opercularia hispida	DM, MR, WWP
Pomax umbellata	DM, MR, WWP
Rutaceae	
Asterolasia correifolia	MR
Correa reflexa var. *reflexa*	DM, WWP
Zieria smithii subsp. *smithii*	WWP
Solanaceae	
Solanum campanulatum	DM, MR, WWP
Santalaceae	
Exocarpus cupressiformis	WWP
Scrophulariaceae	
Veronica calycina	WWP
Veronica plebeia	WWP
Sterculiaceae	
Brachychiton populneus subsp. *populneus*	DM, MR
Lasiopetalum ferrugineum var. *cordatum*	MR
Ulmaceae	
Trema tomentosa	DM, NY
Verbenaceae	
Clerodendrum tomentosum	NY
Violaceae	
Hybanthus monopetalus	DM
Hybanthus stellarioides	DM, NY, WWP
Viola betonicifolia	DM
Viola hederacea	DM
Viscaceae	
Notothixos subaureus	MR