
Tree of the Year : *Eucryphia moorei*

In the 2014 Tree of the Year article **BEN WALLACE** writes about the plumwood, an endemic of New South Wales in Australia, grown for its spectacular white flowers, but which has an interesting history and ecology.

Introduction

Val Morrell was born into a poor poultry farming family near Sydney, just before the outbreak of war in 1939. She attended a local school, and later, during the 1960s studied philosophy at the University of Sydney, becoming a renowned environmental philosopher and author, studying and lecturing in universities around the world. Particularly she championed lifeform groups and entities disadvantaged by the dominant controlling classes in human society. Such entities ranged from indigenous peoples, and women, to rainforests of eastern Australia and indeed the planetary environment and the rights of all forms of life that have evolved in it. This background helps explain her writing a paper entitled *Being Prey*, following a near death experience of attack by a large saltwater crocodile (including three 'dead rolls') in Kakadu National Park in 1985. After this she lived alone in a stone yurt on her 300 acre property, Plumwood Mountain (there 'chooking it', a term she coined from her chickens roosting safe and sound, remote from danger and disturbance), near Clyde Mountains high on the eastern scarp of the Great Dividing Range in south-eastern New South Wales. The selection contains a large tract of temperate rainforest, including pristine, fully matured stands of *Eucryphia moorei*, plumwood. She changed her surname to Plumwood and here 'acquired a deep knowledge of nature that became legendary' (enviroethics.org). On 29 February 2008 Val suffered a severe, unpredicted stroke at home and passed on among the entities for which she fought so hard.



Photograph © Ben Wallace

Eucryphia moorei F. Muell. *Fragmenta Phytographiae Australiae* 4 (24):2 (tax. nov.) 1865

Description of *Eucryphia moorei*

Eucryphia moorei is a medium tree growing to about 40 m in height (*see table 1 opposite for data on five specimens in Penance Grove¹ and photos on pages 15 and 16). It produces sucker shoots from the swollen trunk base, some of which grow on to produce a ring of trunks while the original dies and rots

¹ Name is derived from the epic poem *Buddha-carita* of Aśvaghōṣa, a classical Sanskrit poet.
(<https://www.scribd.com/doc/232552687/Buddhacarita-Translation>)

Table 1. Measurements taken from five specimens in Penance Grove*

Tree #	1	2	3	4	5
Height (m)	39.4	39.3	37.6	26.0	25.5
Girth (m)	3.6	2.9	3.6	2.5	4.5

Opposite. Val Plumwood on her property in south-eastern New South Wales, indicating point of germination of *Eucryphia moorei* on *Dicksonia*.

Photograph © Ben Wallace

Right. A middle-aged tree *Eucryphia moorei* on the margin of a Cool Temperate rainforest, in Penance Grove, Monga. It is 29.5 m high and has a 200 cm girth.

away. The bark is smooth with some fine longitudinal grooving, pale grey to a light brownish grey and usually dappled with encrusting lichens. Leaves are imparipinnate with 5-13 leaflets which are sessile except for the terminal one, which is shortly stalked. Sun leaves of flowering foliage are often reduced to three leaflets and are dark green. Leaflets are 10-70 mm × 5-15 mm, narrowly oblong to elliptic, entire (distinguishing it from *Eucryphia glutinosa* which has toothed leaflet margins); glabrous above and whitish tomentose below; young twigs and leaf stalks also tomentose (see photos on page 17). Flowers are produced



from midsummer to early autumn; they are solitary on inflorescences but several may be produced from a single leaf axil. Flowers are white with four

* Height and girth data from the largest specimens of *Eucryphia moorei* in the Penance Grove population. (Heights were taken with a Brunton inclinometer; girths at breast height.)

Photograph © Ben Wallace



broad petals 10-15 mm long; stamens are numerous and almost as long as the petals (see photos on page 18). The fruits are dry, dehiscent, ovoid to oblong capsules 10-15 mm long. Seeds are small and winged, indicating dispersal by air movement.

As can be seen from the above taxon citation, *E. moorei* was described by the Victorian Government Botanist, Ferdinand von Mueller who published



Above. The backlit foliage, upper twigs and leaf stalks of *Eucryphia moorei* showing a pale tomentum (Penance Grove, Monga). **Inset.** Young shade leaves of *Eucryphia moorei*.

Opposite. *Eucryphia moorei*, showing the trunk and large epicormic basal branches in Laurie Woods, Penance Grove, Monga.

the protologue, a full page description in Latin, in his *Fragmenta*, Volume 4, in 1865. It appears to have been discovered and probably collected, and the holotype specimen certainly, supplied to Mueller, by Charles Moore; the holotype still resides in the National Herbarium of Victoria at the RBG Melbourne (pers. comm. Dr Roger Spencer, Hort. Botanist at the RBG) where Mueller was based. Moore was a man of many interests, talents and



Left. The flowers and foliage of *Eucryphia moorei* growing in cultivation at Woodbank Nursery, Longley, Tasmania.

Above right, *Eucryphia moorei* flower, Plumwood Mountain.

achievements, who at the time was Director of the Botanic Gardens in Sydney (1847-96). Mueller names him as the collector; he was an avid collector having gathered specimens from the New Hebrides to New Caledonia, and many localities in eastern Australia, among other places.

A number of vernacular names have some currency for *Eucryphia moorei*, of varying aptness. Robson (1993) lists acacia plum, plum wood, eastern leatherwood, mainland leatherwood, pinkwood, leatherwood, southern leatherwood, stinkwood, white sally, and yulbah.

Acacia plum refers to the pinnate leaves which at a glance may resemble the foliage of coarser bipinnate wattles, e.g., *Acacia elata* which shares habitat with *E. moorei*. Yulbah is probably a local Aboriginal name; white Sally is also used for *Eucalyptus pauciflora* where it refers to the white bark of that species (black Sally, *Eucalyptus stellulata* is in the same Series, and has darker, olive coloured bark). Both plumwood and pinkwood refer to the timber, (and possibly stinkwood also). These names almost certainly originated in the early days of the timber trade when this species was logged (see uses below). Leatherwood, and eastern leatherwood do express relationship with the original leatherwood, *Eucryphia lucida*, but its use for other species is confusing. The very distinctively flavoured honey long produced from *E. lucida*, and widely used (and as with durian, either loved, or loathed!), has firmly attached the name to it. The appellation 'eastern' does not help, as all five Australian species of *Eucryphia* occur only in the moist eastern rim of the continent, or in Tasmania, which is in the east. In view of all this and the above regarding Val Plumwood and her championing of *Eucryphia moorei*, and



The flowers of *Eucryphia* × *hillieri* 'Winton', at Woodbank Nursery Longley, Tasmania.

indeed the environment of all life on planet Earth, I venture to suggest that 'plumwood' is the most appropriate vernacular name for the species.

The classification and biogeography of *Eucryphia moorei* and its congeners

The family Eucryphiaceae was established by Jacques Gay in 1848 from the genus *Eucryphia* which had previously been described by Antonio Cavanilles in 1797, based on the Chilean species *Eucryphia cordifolia*.

Recent molecular research (Bradford & Barnes, 2002) has revealed phylogenetic affinity of *Eucryphia* with the family Cunoniaceae but because of the strong morphological similarities within the genus, and its distinctiveness, or, difference from all other groups, I have here chosen to maintain the rank of family, Eucryphiaceae for the group.

There are currently seven recognised species of *Eucryphia*, three endemic in the Australian continent, two endemic in Tasmania (see map on page 21), and two endemic in southern Chile and Argentina (Munoz 1980). This disjunct, southern distribution indicates a Gondwanan origin for the group and dispersal via continental drift, rather as in the genus *Nothofagus*.

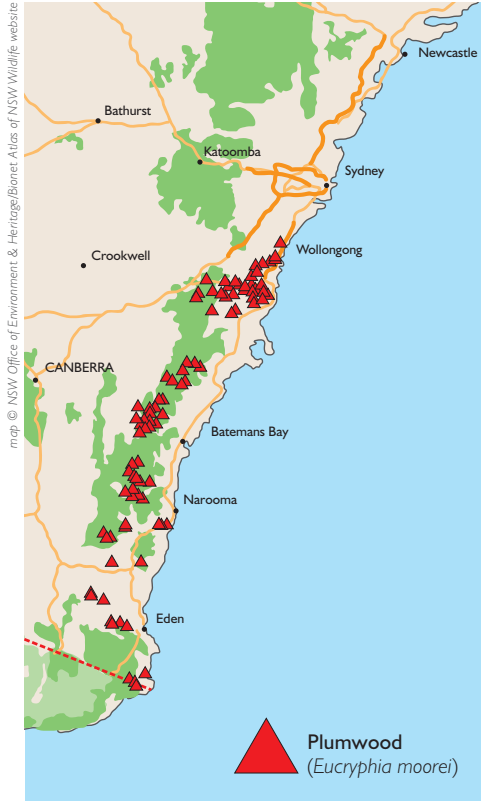
The two Tasmanian species, *E. lucida* and *E. milliganii* are sympatric, often occurring in the same community, though the latter tends to be more concentrated at higher altitudes (Ken Gillanders pers. comm.).

On the mainland, three geographically well separated species occur. The northernmost is *Eucryphia wilkiei*, known only from the upper southeastern slopes of Queensland's highest mountain, Mount Bartle Frere in the Cairns hinterland. It occurs between 1,200 m and 1,500 m altitude in low, wind-

pruned dwarf temperate rainforest among large granite boulders. It grows to 6 m (small tree) in height but is mostly less than 5 m, a tall shrub.

Moving south, *Eucryphia jinksii* was first discovered as recently as 1993, restricted to a single creek catchment area near Springbrook in far south-eastern Queensland. Here it is a medium-size tree, to ca. 25 m in height, growing in Warm Temperate rainforest. A second small population was later found in an adjacent area of New South Wales where it is a multi-stemmed shrub less than 5 m high; growing on wind swept rocky slopes.

The southernmost species on the Australian mainland is *Eucryphia moorei* which is endemic in the state of New South Wales, but for a small 'spill-over' across the border into Victoria, in the Howe Range near Eden (as shown on the map to the right).



Map produced from the Bionet Atlas of NSW Wildlife website, showing 258 valid records of *Eucryphia moorei* in New South Wales.

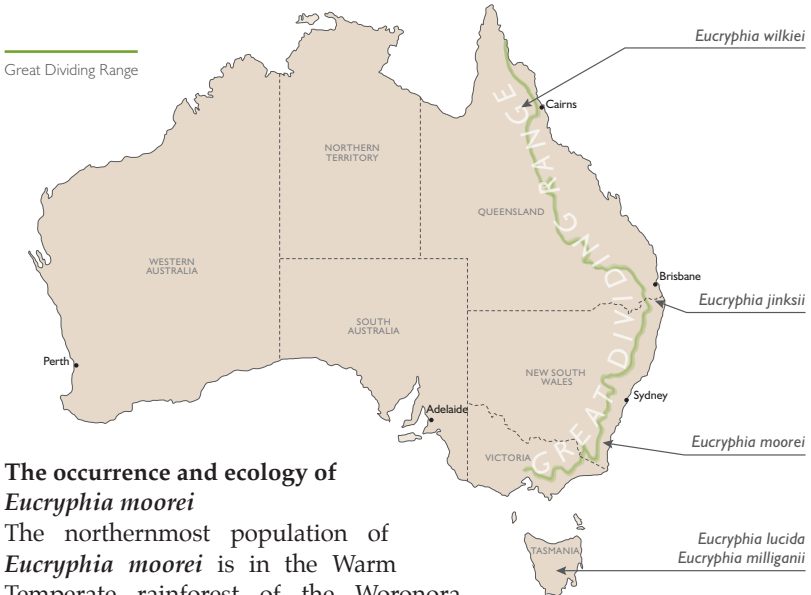
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Hybrids involving *Eucryphia moorei*

It seems that only one hybrid of *E. moorei* has been brought to light, crossed with *E. lucida* and given the grex name *Eucryphia × hillieri*. This is thought to be a chance crossing, which volunteered in the Chandlers Ford nursery of Hillier & Sons, Hampshire, England, in about 1945 (Hillier & Coombes, 2002). Other clones of this putative parentage have been discovered and the commonest of these in cultivation is 'Winton'. The photo (on page 19) was taken at 'Woodbank Nursery' Longley, by Ken Gillanders (pers. comm.), who considers this clone to be little different from typical *E. moorei*.

In this connection it is of interest to note that hybrids occur in the wild between the two Tasmanian species, *E. lucida* and *E. milliganii*, where their ranges overlap. This taxon is known as *Eucryphia × hybrida* and is intermediate in characters between the parent species (Hillier & Coombes, 2002).

Distribution of *Eucryphia* species in Australia



The occurrence and ecology of *Eucryphia moorei*

The northernmost population of *Eucryphia moorei* is in the Warm Temperate rainforest of the Woronora Plateau, in the hinterland of Wollongong, to the near south of Sydney. It is distributed southward in sporadic, disjunct populations on the eastern scarp of the Great Dividing Range, southward to the Howe Range (see map above).

Its preferred environment is in sheltered, fertile, well watered, humid sites such as in east running gullies protected from the prevailing westerly winds, cold and dry in winter and hot and dry in summer. In these environments it associates with co-dominant trees such as *Doryphora sassafras*, yellow sassafras, *Ceratopetalum apetalum*, coachwood, *Acmena smithii*, lilli pilli, *Callicoma serratifolia*, callicoma or black wattle (NB this name is also applied to a group of bipinnate *Acacia* species); in the north, *Quintinia sieberi*, possumwood and *Acacia elata*, cedar wattle, and in the south, *Tristania laurina*, water gum.

Plumwood often is the main or sole dominant tree species in the communities in which it occurs, particularly in the colder sites at higher altitudes. It forms a dense canopy, giving rise to a sparse understorey, with the treefern *Dicksonia antarctica* as the main subdominant species. Bryophytes are prominent with the trailing epiphytic moss *Papillaria* draped over twigs and rocks; the climbing epiphytic gesneriad *Fieldia australis* ascending particularly treefern trunks. It is interesting to note that in corresponding South American communities, the similar gesneriads *Mitraria*, *Asteranthera* and *Sarmienta*, occur, behaving in similar ways—a case, perhaps of vicarious Gondwanan communities. Research into the diverse and often brightly coloured fungi may provide further evidence in support of this concept; c.f. the moss family

Dicnemonaceae, and the parasitic fungal genus *Cyttaria*, both associated with *Nothofagus* in vicarious Australian and southern South American communities.

An aspect of the germination and establishment of *E. moorei* seedlings is a point of considerable interest. Many mature trees show evidence of having germinated on the trunks of *Dicksonia* (see photo opposite), and sending roots down through the moist, fibrous trunk, into the soil to access greater supplies of water and dissolved mineral nutrients. This would initiate the main life phase of tree growth. The photograph of Val Plumwood (on page 14) indicating such a point of germination on the treefern trunk, also illustrates this clearly. Investigation of other trees in this, Plumwood Mountain population, and the nearby Penance Grove population, revealed many such instances, suggesting this is a normal life cycle pathway. One of its ecological associates, *Quintinia sieberi*, is very similar in this habit, as is its congener *Q. fawkneri* of similar ecology in North Queensland.

The history of *Eucryphia moorei*

After the fragmenting of the super continent Gondwana, the Australian tectonic plate drifted northward for some tens of millions of years carrying with it *Eucryphia* species which were to give rise to the species extant today. For a lot of that time mesic conditions prevailed across the continent, much as it is in Tasmania today. But hotter, drier conditions eventually set in and temperate rainforests contracted to a relatively few, small refugia along the Great Dividing Range, in which populations of *Eucryphia* species survived; some almost certainly would have gone extinct. Some recent expansion of these refugia probably occurred, to produce the current configuration, with differentiation in isolation from other populations, in separated refugia, to give the current distribution. *Eucryphia moorei* has much the largest range of the mainland species (see map on page 20) but is still considered relictual, being distributed in more or less isolated populations.

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The human context

For as long as 40 millennia some groups of the nomadic Australian Aboriginal people presumably lived some part of their lives in forests dominated by *E. moorei*, hunting various marsupials, birds and reptiles. They may have built their makeshift gunyahs from the branches and dense, 'dorsiventral' foliage for roof cladding, providing shelter from rain, warmth in winter and a cool relief from the hot summer sun.

After the arrival of the British colonists, *E. moorei* was logged for a century from about 1850 to 1950 for its timber which is tough and close-grained (Elliot & Jones 1992). In the early colonial days it was probably pit-sawn into timber useful for building construction and, later used for cabinet making, particularly inlay work, and turnery (Alistair Watt, pers. comm.). Exploitation for these purposes and this length of time would have been moderate and non-

threatening in conservation terms, unlike *Toona ciliata*, red cedar, which was hunted and logged relentlessly, to a critical conservation status.

The relevance of plumwood to modern society lies in its recreational, horticultural, educational and scientific values. The genus provides good evidence in support of the theory of plate tectonics and continental drift, having species distributed in Fuegian South America, and in continental Australia, and Tasmania. This theory is of profound scientific importance and is fundamental to understanding Planet Earth, leading to its interpretation and promulgation in education. The stand of *Eucryphia moorei* known as Penance Grove at Monga, near Clyde Mountain in the hinterland of the NSW South Coast, provides a good example. This is in a sheltered gully at ca.750 m altitude, where *E. moorei* is the sole dominant tree species. NSW Office of Environment and Heritage has promoted the site as a nature walk, constructed a raised boardwalk to lessen the impact of visitation, and set up interpretation along the way, combining science and education with recreation. This treatment can also be applied and similar outcome achieved in horticultural settings such as botanical gardens, arboreta and municipal parks.

photograph © Ben Wallace



Eucryphia moorei having germinated on *Dicksonia*.

Horticultural values of *Eucryphia moorei*

'A handsome tree of rainforest gullies...' are the words used by Elliot and Jones (1992) to begin a general discourse on the attributes of this species. As a community dominant tree, it is an imposing element within the landscape notwithstanding its medium size; (eucalypt dominants of neighbouring open forest such as Brown Barrel, *Eucalyptus fastigata*, are much larger, see photo on page 25). The paucity of undergrowth in the *E. moorei* rainforests further emphasises the perception of large trunks. The multi-trunk habit, common in

older specimens, adds to the distinctiveness of the trunk.

The bark of plumwood is light brownish grey and finely fissured, usually decorated with patches of light green encrusting lichens, enhancing its aesthetic appeal. The foliage is dense and dark green when viewed from above, though when viewed from beneath, backlit with sunlight it appears golden green, when the ferny, pinnate leaves become more obvious. (see photos on page 17.)

But the crowning glory of the plumwood tree must surely be its flowers. Bourne in profusion they can present a glorious spectacle, each flower with four broad, white petals. (see photos on pages 18 and 19.)

The future for *Eucryphia moorei*

Habitat destruction such as clearing for the purposes of dairy farming, market gardening and fruit orchards did take a toll in the early days of European settlement, for example, on the Robertson Plateau to the southwest of Sydney, where remnant trees can be seen in paddocks and in easements along country roads; such clearing is not now permitted.

Exploitation: logging for timber products as described above, is also an activity of the past. There is a potential for cut flowers, owing to the attractiveness of both flowers and foliage, but I am unaware of any such usage. Any such undertaking would fall under environmental protection regulations as the majority of remaining *E. moorei* populations are conserved in protected areas such as national parks. For this same reason habitat destruction for any purpose is prohibited under the legislation.

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Climate change thus appears to be the major threat to the ongoing existence and wellbeing of the species. The major ecological requirements of the species are fertile, well-drained soil, moderately high, evenly distributed rainfall, humid atmosphere particularly relating to cloud impact, and protection from drying winds. Possible uphill movement of ecological zones driven by global warming appears to be a faint hope for all but the lowest altitude populations. The Penance Grove stand provides a good illustration—the top of the ridge is not more than *ca.* 100 m above, but the ridgetop topography does not afford shelter from the drying winds—this stand has reached ‘the end of the line’ regarding zonal uphill creep potential. Protected areas conserving whole populations are an important base for conservation, allowing for production of new generations of individuals with varied characteristics to enable selection of those adapted to changing environmental conditions. *E. moorei* exists in significant populations in 14 protected areas, including eight National Parks, three State Nature Reserves and one State Conservation Area (pers. comm. Dr Keith McDougall, Senior Scientist of the NSW Office of Environment and Heritage; see also the map on page 20, provided by him). Thus, the bulk of mature, breeding individuals, and thus the bulk of the gene pool are located within protected areas.

photograph © Ben Wallace



Looking through the ecotone out into brighter, drier eucalypt open forest towering above the *Eucryphia moorei* cool temperate rainforest at Penance Grove, Monga.

Ex situ conservation by cultivation offers some hope. Five major botanical gardens in Australia provided information on *E. moorei* in their living collections: RBG Sydney's cool climate annexe at Mount Tomah, in the Blue Mountains; RBG Melbourne; the Royal Tasmanian Botanic Garden, Hobart; Botanical Gardens of Adelaide cool climate annexe at Mount Lofty.

In all cases, where plantings were sited in cool, moist, humid, sheltered environments, plants grew well while those planted in drier, less protected locations struggled. These outcomes are not unexpected, but do indicate the species is amenable to *ex situ* conservation.

The last hope for the species, along with many other plants, must lie in long term seed preservation. The *Millennium Seed Bank Partnership* is an international project concerned with conservation of the world flora by long term germplasm preservation coordinated by the Royal Botanic Gardens, Kew. *PlantBank* is a research facility at the RBG Sydney's Australian plant annexe at Mount Annan with the purpose of collecting and storing seeds and *in vitro* live cultures of Australia's 25,000 plant species. It shares the objectives of, and co-operates with the *Millennium Seed Bank*. Such efforts based in science and maintained through time, do stand to ensure the future of many species vulnerable to the inroads of global warming, habitat destruction through human population pressures, and other major untoward environmental influences.

There is then, some reason for optimism that this ancient and noble tree will continue yearly to present its beacon display of snowy flowers perpetuating in its own right and supporting similar rights to existence of many other life forms, *Homo sapiens* but one.

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Statement of originality

Information presented in this article is sourced as acknowledged, is recollection of general knowledge as I regard it, or the product of my own direct observations.

Tree of the Year 2015

Allen Coombes has chosen to write about *Quercus rysophylla*. If anyone has comments on the species in the wild or in cultivation please contact Allen on allen.coombes@hotmail.com or the Editor (details on inside back cover of the Yearbook).