# Lost and found: *Nothofagus moorei* at Comboyne

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*Bale, C.L.[1] & Williams, J.B.[2] ([1]New England Institute of TAFE, Armidale, NSW, Australia 2350; [2]Botany Department, University of New England, NSW, Australia 2351) 1994. Lost and found:* Nothofagus moorei *at Comboyne.* Cunninghamia *3(3): 529–533.* A knowledge of the distribution and species associates of *Nothofagus moorei* (F. Muell.) Krasser is useful in elucidating the former distribution and significance of the species. Although previously thought to have been lost from Comboyne Plateau, *N. moorei* is now known to occur there in at least four small stands. The size distributions of *N. moorei* individuals and the floristics of these communities are reported together with a discussion of the significance of this extension to the known contemporary distribution of the species.

## Introduction

*Nothofagus* is regarded as an ancient genus of great importance to Southern Hemisphere biogeography (Melville 1982, Hill 1992). *Nothofagus moorei* (F.Muell.) Krasser is a broad-leaved species of the subgenus *Lophozonia* (Hill 1992) and is one of the most geographically isolated species of the genus. This species occurs disjunctly on mountain, plateau, and escarpment positions in eastern Australia between the Barrington Tops area (latitude 32° 03′ S) and the Lamington Plateau (latitude 28° 15′ S). Floyd (1989) lists most of the known locations of *N. moorei* in New South Wales.

A detailed knowledge of the contemporary distribution of *N. moorei* is useful in several ways. As noted by Melville (1982), the present distribution of the genus is important in elucidating not only its former significance and distribution, but also in making broad paleoclimatic and paleobiogeographic inferences. At the species level, Bale and Williams (1993) showed that distributional and floristic data were useful in elucidating the refugial status and classification of communities dominated by *Nothofagus moorei*. Further, to achieve the kind of morphological and genetic data called for by Hill (1992), it is desirable to sample throughout the known range of *Nothofagus* species. An account of previously unknown contemporary occurrences of *N. moorei* on the Comboyne Plateau is thus warranted.

The Comboyne Plateau (Figure 1), centred on latitude 31° 36′ S and longitude 152° 28′ E, is a scarp-bounded paleoplain remnant located between the Great Escarpment and the seaboard on the central north coast of New South Wales (Pain & Ollier 1986). The plateau forms a low ramp from 450 m elevation in the north to about 700 m at the southern rim. Tertiary basalts overlie much of the plateau surface, giving rise to generally fertile krasnozemic soils. In the southern third of the plateau, some of the basaltic mantle has been removed, exposing the underlying Triassic sediments of the Lorne Basin. Drainage lines form a typical radial pattern. The Thone River, flowing north, and Mumfords Creek, flowing west, drain the largest catchments of the plateau surface.

The former natural vegetation of the Plateau was mostly 'Softwood Brush' (Chisholm 1925); now described as Subtropical Rainforest (Baur 1965) or Complex Notophyll Vine Forest (Webb et al. 1984). Almost all of the original vegetation was removed in the first quarter of this century, particularly from those parts of the plateau surface and benches where soils were richest. Only small samples of the original rainforest

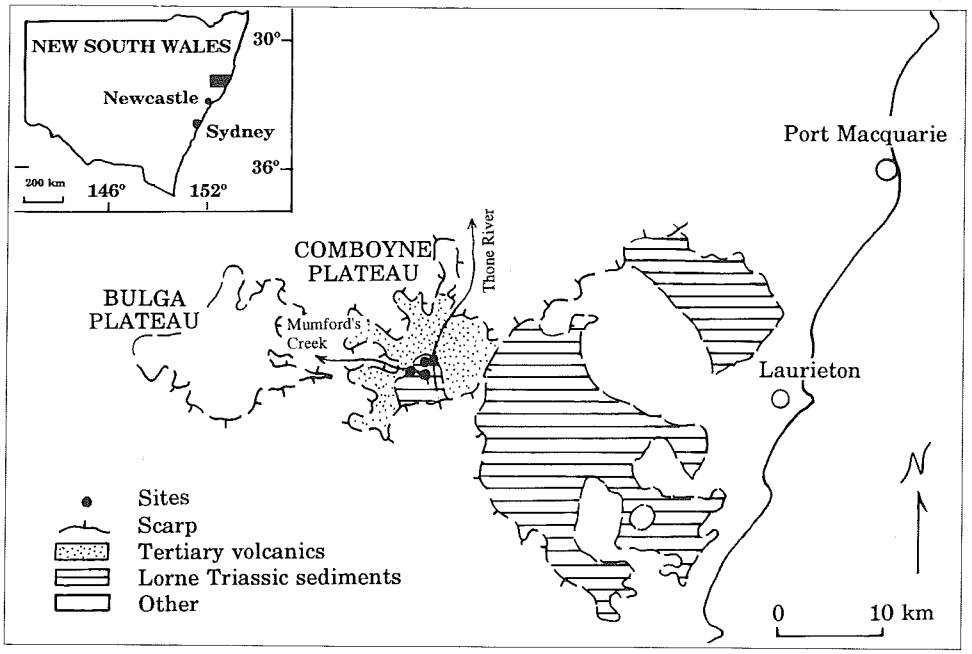


**Figure 1. Location and geomorphology of the Comboyne Plateau and surrounding area (after Pain & Ollier 1986).**

**Table 1. Descriptions of four *Nothofagus moorei* sites at Comboyne**

| | Site 1 | Site 2 | Site 3 | Site 4 |
|---|---|---|---|---|
| **Location** | Thone River | Thone tributary | Mumfords tributary | Mumfords Creek |
| **Site description** | Surrounded by pasture. Cleared early 1900s. | Surrounded by pasture. Cleared early 1900s. | Stream-side remnant surrounded by pasture. Cleared early 1900s. | Stream-side rain-forest with large relic individuals. Some Coachwood extraction since 1940s. |
| **Aspect** | Level stream terrace | Level stream terrace | W | S |
| **Altitude (m)** | 580 | 600 | 620 | 590 |
| **Stand size ($m^2$)** | 200 | 200 | 1000 | 5000 |

**Table 2. Floristic richness of four *Nothofagus moorei* sites at Comboyne**

| Lifeform | Site 1 | Site 2 | Site 3 | Site 4 |
|---|---|---|---|---|
| Trees & Shrubs | 12(2[a]) | 16(4[a]) | 23(1[a]) | 27(3[b]) |
| Lianas | | 0 | 2(1[a]) | 1(1[a]) 5 |
| Epiphytes | 1 | 4 | 2 | 8 |
| Herbs | 2(2[c]) | 7(6[c]) | 8(6[c]) | (4[c]) |
| Total | 15 | 28 | 34 | 47 |

[a]Introduced; [b]Marginal; [c]Ferns.

cover remain, of which the stands at Boorganna Nature Reserve and Hills Brush are most notable.

The pioneering botanical survey of Comboyne by Chisholm (1925) is significant in many respects, but our attention was particularly drawn to his mention of *'Fagus moorei* (Negrohead Beech), which is extremely rare, although many trees were undoubtedly destroyed during clearing'. In recent years, the elusiveness of *Nothofagus* [Fagus] *moorei* has led some authors to the conclusion that it no longer survives at Comboyne. Based on the evidence of some associate species, Floyd (1990) surmised that *N. moorei* may have previously occurred on Mumfords Creek. Adam (1992) concorded that 'The absence (of *N. moorei*) from the Bulga and Comboyne Plateaux is explained by clearing early in the twentieth century'.

## Recent investigations

During the past four years, several searches of selected parts of the Comboyne Plateau were made by us. Given the gallery rainforest habitat of *N. moorei* at similar altitudes at East Dorrigo, efforts were directed at searching similar sites at Comboyne. Searches of the southern and eastern escarpment of Comboyne and of the adjoining Bulga Plateau were also made. With the help of local residents we were able to discover that *Nothofagus moorei* still occurs on the Comboyne Plateau and to date four stands of *N. moorei* have been located. All are in gallery positions in the southern half of the Plateau. These range in size from two adjacent trees in otherwise cleared pasture to a relatively intact stand of more than 20 mature trees together with many juveniles and a range of associate species. Herbarium specimens NE 057405, NE 057406, and a duplicate lodged at the National Herbarium of NSW were collected at the latter site. In areas of apparently suitable environmental conditions on Bulga Plateau, no *N. moorei* occurrences have yet been found.

All four sites on the Comboyne Plateau were found high in the catchments of Mumfords Creek and the Thone River at elevations of between 570 and 630 metres (Table 1). Our observations indicated that none of the sites occurs directly on the basalt-derived eutrophic soils. Rather they occurred on soils derived from either the Lorne Basin sediments, or the contact between these rocks and the overlying volcanics. It was likely however that at some sites soils contained basaltic contributions from upslope caprock. At these relatively low altitudes, it appeared that the gallery positions of sites are critical in providing *N. moorei* with cool moist micro-climates and abundant soil moisture.

### Site floristics

Species lists were compiled at all sites, and a summary of floristic richness is presented in Table 2. Vascular species richness increased with stand size, although the number of species of trees and shrubs differed little between the two Mumford sites, despite marked differences in site histories. Substantial numbers of liane and epiphyte species occurred only at Site 4 (Mumfords Creek), indicating that this site has attained a greater structural integrity than the others. At all sites, ferns dominated the herb stratum.

At Site 1 (Thone River), the only tree species associating with *N. moorei* were *Tristaniopsis collina*, *Acacia melanoxylon* and *Callicoma serratifolia*. *Doryphora sassafras* occurred as an occasional sapling. Site 2 (Thone tributary) was similar to Site 1, although the shrub layer was floristically richer and *Callicoma serratifolia*, although locally abundant, was absent from the stand. *Lomatia arborescens* was the most prominent small tree at this site. Much of the nearby streambank was infested with exotic

species such as *Ligustrum sinense* and *Solanum mauritianum*, and these species had invaded the small *N. moorei* stand. Much of the floristic complement of Site 2 was also present at Site 3 (Mumfords Creek tributary), together with many typical temperate rainforest species such as *Caldcluvia paniculosa* and *Schizomeria ovata*. Several small tree species of differing rainforest affinities occurred here too, including *Cryptocarya glaucescens, Lomatia arborescens* and *Backhousia myrtifolia. Cyathea australis* and *Todea barbara* were important shrubs. All of the foregoing species occurred at Site 4. At this location however, *Ceratapetalum apetalum* was codominant, and attained sole dominance in surrounding areas where *N. moorei* was absent. A feature of the floristics at Site 4 was the mix of species of microthermal and mesothermal affinity. *Quintinia sieberi, Alyxia ruscifolia* and *Orites excelsa* are typical associates of *N. moorei* at considerably higher altitudes, yet here they occurred with mesothermal elements such as *Guioa semiglauca* and *Platycerium bifurcatum*. Common species typical of these mid-altitude sites on oligotrophic and mesotrophic soils included *Cryptocarya meissneriana* and *Acradenia euodiiformis*.

## Significance

The rediscovery of *N. moorei* at Comboyne is not significant in a historic biogeographic context; it has long been regarded as a former element of Comboyne rainforests. However, this find is important for other reasons. Firstly, it extends the contemporary distribution of *N. moorei* and provides some evidence that the species is of sufficient vagility to survive severe disturbance and fragmentation, despite here approaching its lower altitude limit and being somewhat remote from other populations. Secondly, it appears that at Comboyne *N. moorei* is fastidious in its site requirements, particularly in relation to site conformation. It is thus unlikely that *N. moorei* had extensive occurrences in the area. The impact of clearing and logging appears to have been in fragmenting perhaps already discontinuous ribbon-like galleries of these rainforests stands. In these situations *N. moorei* forms essentially stable assemblages with species of differing rainforest affinities. Many of these species are known to occur preferentially on oligotrophic and mesotrophic soils (Floyd 1990), or to have rather broad edaphic tolerances. The only other region known to us in which *N. moorei* routinely occupies similar topographic positions with a similar floristic complement is at East Dorrigo (Bale & Williams 1993).

Thirdly, at least two of these stands of *N. moorei* are of importance because they demonstrate a considerable dependence on seedling recruitment (Table 3). Whilst many old relic individuals are multistemmed or support well-developed coppices, field checks have established that a substantial component of the younger cohorts were seedling-derived. It appears that under the disturbance regimes at Comboyne, site conditions promote successful *N. moorei* seedling responses. The spread of individuals through seedling and juvenile cohorts suggests that positive seedling responses have occurred over many decades. We expect that seedling recruitment will diminish as disturbance-recovery proceeds and that individual replacement will then be maintained by coppicing.

Finally the stands of *N. moorei* at Comboyne are notable in that they represent a second low-altitude domain of the species. To our knowledge, the only other area in which *N. moorei* occurs below 650 m elevation is at East Dorrigo (Bale & Williams 1993). Whether or not any significant genetic differences occur between these low altitude populations and the much larger populations of the high plateaus and escarpment areas of northern New South Wales is currently being investigated. Should it eventuate that the extent of *N. moorei* forests is diminished by climatic change, then these low-altitude populations may be useful, both as *in situ* indicators of change, and as a genetic resource which might migrate to higher elevations.

**Table 3. Numbers of individuals in size cohorts, largest individuals, and abundance of coppices in *Nothofagus moorei* stands at Comboyne (seedlings and some saplings verified as genets)**

| | Site 1 | Site 2 | Site 3 | Site 4 |
|---|---|---|---|---|
| **Size Cohort** | | | | |
| Mature (> 20 m tall) | 2 | 2 | 8 | 23 |
| Semi adult (10-20 m) | 0 | 0 | 5 | 19 |
| Sapling (2-10 m) | 0 | 0 | > 40 | 21 |
| Seedling (< 2 m) | 0 | 2 | 8 | 5 |
| **Diameter of largest individual (cm)** | 60 | 26* | 70 | 150 |
| **Relative abundance of coppices** | — | + | ++ | +++ |

* Largest stem of multi-stemmed individual

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