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# The natural vegetation of the Wollongong area

**Abstract**
It is commonly accepted, both in popular opinion and in scientific literature that the Illawarra was once covered in its entirety In luxuriant rainforest. This view is incorrect, as is clearly evidenced by the vegetation which remains in the area today, The original vegetation cover of the Wollongong area consisted of a diverse mosaic of plant groupings, ranging from wind-swept coastal dune communities to luxuriant sub-tropical rainforest. This diversity, which can be seen in terms of both floristic characteristics (plant species) and structural characterisitcs (growth forms: trees, shrubs, ferns vines etc. and their spatial arrangement), is dependent on variations in topography, soil characteristics, rainfall and proximity to the sea, in addition to more subtle environmental influences. Changes in one or more of these factors can produce, over a few metres a complete transformation in the vegetation present. The key to understanding the distribution of vegetation communities lies with an appreciation of the environmental conditions under which these communities developed.

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WOLLONGONG STUDIES IN GEOGRAPHY No.13
Department of Geography, University of Wollongong.

# THE NATURAL VEGETATION OF THE WOLLONGONG AREA

KEVIN MILLS

It is commonly accepted, both in popular opinion and in scientific literature, that the Illawarra was once covered in its entirety in luxuriant rainforest. This view is incorrect, as is clearly evidenced by the vegetation which remains in the area today. The original vegetation cover of the Wollongong area consisted of a diverse mosaic of plant groupings, ranging from wind-swept coastal dune communities to luxuriant sub-tropical rainforest. This diversity, which can be seen in terms of both **floristic** characteristics (plant species) and **structural** characterisitcs (growth forms: trees, shrubs, ferns, vines, etc. and their spatial arrangement), is dependent on variations in topography, soil characteristics, rainfall and proximity to the sea, in addition to more subtle environmental influences. Changes in one or more of these factors can produce, over a few metres, a complete transformation in the vegetation present. The key to understanding the distribution of vegetation communities lies with an appreciation of the environmental conditions under which these communities developed.

Most of the original coastal plain vegetation has been removed over the past 200 years and in the Wollongong-Shellharbour-Kiama area only 8 percent forest cover remains below 100 metres elevation. On the whole, these forest remnants have been greatly degraded from their natural condition and thus do not exhibit their original floristic and structural diversity. The scientific value of such areas should not be underestimated, however, as they provide the only available evidence of past vegetation patterns.

Although much of the forest cover remains on the escarpment slopes and on the plateau, its composition has been changed through logging, clearing and altered fire regimes since European settlement. The following account of the vegetation of the district is thus based on extrapolation from the remaining coastal plain remnants and existing forest elsewhere, bearing in mind the changes brought about by European disturbances. The generalised pattern of the existing vegetation in the area is shown in Figure 1.

The terminology used in this discussion to describe vegetation communities generally follows that of Specht (1970) (see Table 1). The nomenclature outlined by Beadle and Costin (1952) is given for comparison. Individual species, as far as possible, are referred to by their common names: for scientific names and for descriptions of the trees themselves, see Fuller (1982).

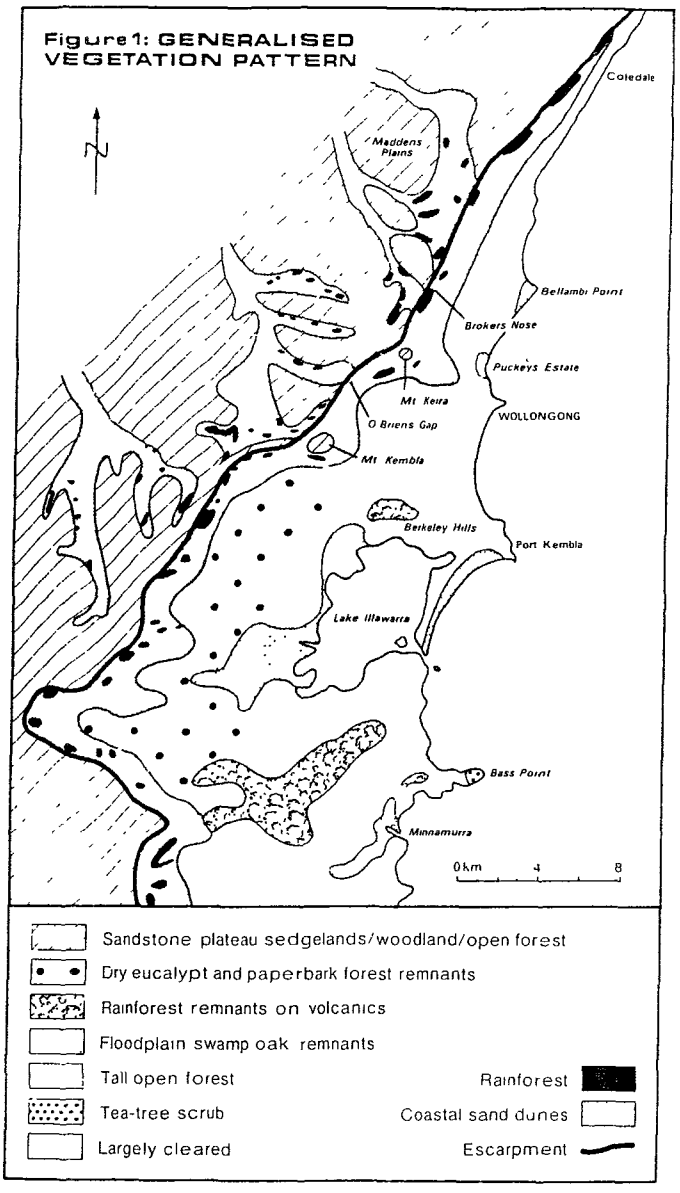
TABLE 1: VEGETATION NOMENCLATURE

| Specht | Characteristics of Tallest Strata Height (m) | P.F.C.(%)* | Beadle and Costin |
|---|---|---|---|
| Sedgeland | 0-2 | 30-70 | Fen |
| Open Healthland | 0-2 | 30-70 | Heath |
| Closed Scrub | 2-8 | 70-100 | Wet Scrub |
| Woodland | 10-30 | 10-30 | Savannah Woodland |
| Open Forest | 10-30 | 30-70 | Dry Sclerophyll Forest |
| Tall Open Forest | 30 | 30-70 | Wet Sclerophyll Forest |
| Closed Forest | 10-30 | 70-100 | Rainforest |

*Projected Foliage Cover

## VEGETATION COMMUNITIES AND ENVIRONMENTAL INFLUENCES

Vegetation communities are influenced by a wide range of environmental characteristics most of which are inter-related and act in combination to determine the patterns of vegetation distribution. Amongst these are rainfall, soil type, topography, altitude, fire, salinity, water-logging and the effects of man. Rainfall has a profound effect on the forest type an area can support. Major changes in species composition observed over broad areas ard more subtle local changes in species distribution can be attributed to differences in rainfall. Such changes can be seen along the Illawarra Highway between Robertson and Moss Vale, where a change from rainforest to eucalypt forest is apparent on the basalt soils. Within regions of similar rainfall other factors become important in determining vegetation types. Changes in vegetation can occur gradually across wide ecotones (boundaries) or, as often happens, a complete floristic and structural change occurs over a distance of only a few metres.



The variables most commonly associated with such changes are soil type and topography (aspect). Soil type (which is closely related to parent rock) can cause abrupt variations in species composition, producing strikingly visible boundaries between communities. This change is nowhere more abrupt than at the junction of the Hawkesbury Sandstone and the adjacent shales and claystones. The former supports woodland and open forest while the latter supports tall open forest and rainforest. Although these soils consistently support these different formations, species composition changes with other variables such as rainfall, aspect and slope.

Generally plant species diversity increases along gradients in soil nutrient status. The greatest diversity, at the level of tree species, is exhibited locally by sites on volcanic soils which support subtropical rainforest. Within a small area of the best developed local rainforest, over 60 trees and large shrubs can be found. 'Sifting' of plant species can occur along environmental gradients, for example, in relation to soil nutrient level, rainfall and altitude. This phenomenon is most apparent in the local rainforests and generally involves a decrease in species diversity with decreasing soil nutrient status, decreasing rainfall and increasing altitude. This latter factor involves an increase in the prevalence of frosts and decline in average air temperatures.

Topography, particularly aspect, is important because of its affect on winds, fire behaviour, rainfall patterns and the amount of solar radiation received.

## VEGETATION AT ENVIRONMENTAL EXTREMES

Extremes in environmental conditions tend to restrict plant species diversity, sometimes to the point that only one species occurs (in such a case the community may be termed **monospecific**). In the Wollongong area such extremes exist where soils are waterlogged and/or highly saline, and where wind exposure, fire frequency or human interference are unusually high. Some examples of local vegetation communities which have developed under different types of extreme conditions are shown in Table 2.

Species which occur in these communities generally have special adaptations to combat the rigorous environmental conditions. For example, the creeping rhizomes of Blady Grass and Bracken Fern protect these plants against frequent firing; and the pneumatophores of Grey Mangrove provide specialised root projections which allow gaseous exchange with the atmosphere.

### TABLE 2: VEGETATION COMMUNITIES UNDER EXTREME CONDITIONS

| Community | Limiting Factors |
|---|---|
| Swamp Oak Forest | Waterlogged soil of floodplains. |
| Mangrove Forest | Saline, waterlogged soils with regular inundation during tidal phases. |
| Sand Dune Vegetation (e.g. Spinifex) | Sand and salt-blasted fore-dunes allow only specially adapted species to grow. |
| Blady Grass-Bracken Grassland | Frequent fires maintain this community by eliminating nearly all other species. |
| Lantana Scrub | Established by substantial disturbance, is promoted and maintained by fire to the exclusion of other species. |

## VEGETATION TYPES

1) **Coastal Zone:** The narrow strip where the sea meets the land supports a number of characteristic vegetation types, depending on proximity to the sea, salinity, and water-logging. Behind the coastal sand dunes and around estuarine and lagoon systems distinctive vegetation zonation occurs. As environmental conditions change, the vegetation responds and a succession of species takes place parallelling the environmental gradient (Figure 2).

Exposed fore-dunes support little else than specially adapted species such as Spinifex and Coastal Fan-flower. Marram grass, an introduced species, has been planted extensively to stabilise these dunes. Coast Golden Wattle, a low-growing shrub, can sometimes be found as scattered individuals here also. Immediately behind and in the lee of the dunes are thickets (closed scrub) of Coast Tea-tree. Further inland this quickly changes to forest dominated by Bangalay (a eucalypt) and Coast Banksia. Typical understorey shrubs include **Monotoca elliptica** and Coast White-beard, both members of the heath family (EPACRIDACEAE). In favourable locations littoral rainforest can develop, usually with eucalypt emergents. The best local development of both closed Coastal Tea-tree scrub and littoral rainforest can be seen at Bass Point. This littoral rainforest contains a number of characteristic tree species such as Native Celtis, Corkwood, Ribbonwood and Plum Pine.

Immediately adjacent to the lagoons and estuaries found inland of most dune systems a narrow band of Swamp Oak occurs, often with a dense reed swamp understorey. Depending on location and tidal influences, the zone between open water and the Swamp Oak fringe may consist of mangroves, reed beds or salt marsh. The Mangrove community, composed of the tree Grey Mangrove and the shrub River Mangrove, is best developed locally at the Minnamurra Esturary and only occurs around Wollongong itself as single plants here and there (e.g. Puckeys Estate, North Wollongong). Reed beds of the Common Reed can be seen at a number of locations around Lake Illawarra and at small lagoons such as at Bellambi. Due to past destruction, salt marsh is very limited in extent in the Wollongong area, occurring only as small and isolated patches. Again the best development of salt marsh is at the Minnamurra Esturary with some small patches around Lake Illawarra. Salt marsh species, such as Seablite and Glasswort, are highly salt-tolerant and occur on areas which are only infrequently inundated. Scattered individual mangroves can also be found here.

2) **Coastal Plain:** The coastal plain is defined here as that area below 100 metres altitude, excluding the narrow coastal zone dealt with above. This boundary is arbitrary and there is no suggestion of abrupt vegetation changes here. The plain varies in width, rainfall, geology and soil type, and all of these factors influenced the type of vegetation which developed. The greater part of the area is now cleared and supports the Wollongong-Shellharbour urban-industrial complex.

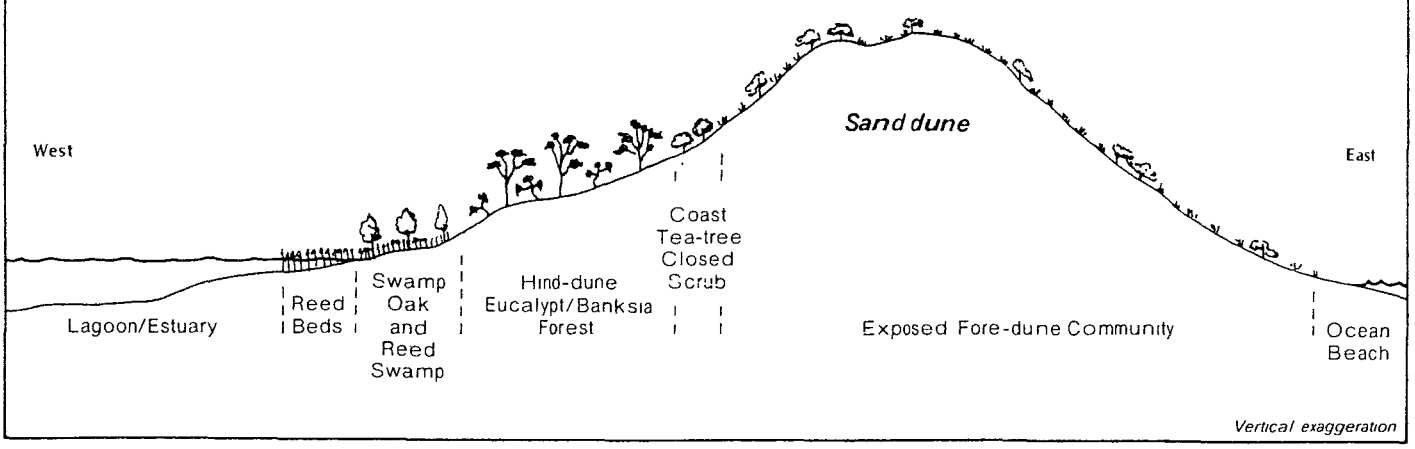
Before European settlement, almost all of the plain was forested, the forest type depending on rainfall, soils and soil moisture. On the low-lying floodplains to the west of Lake Illawarra and adjacent to the Minnamurra River, pure stands of Swamp Oak occurred. Remnants of these stands can be seen along streams and around the lake margin. Further inland, away from saline water influences, River Oak can be found along stream verges, as for example in the upper reaches of Macquarie Rivulet. Away from the floodplains the general forest type is open forest/woodland. Over the lower rainfall areas these forests are dominated by Forest Red Gum. Paperbark forest, consisting of the Prickly-leafed paperbark and **Melaleuca decora** seems to have formed as an intermediate forest community between Swamp Oak and the dryer eucalypt forests. The paperbarks also co-dominate areas with the eucalypts. Other species prominent in these forests are Rough-barked Apple, Green Wattle and Woollybutt.

On the latite (volcanic) soils of the Berkeley Hills to the north of Lake Illawarra and to the south of Albion Park the vegetation appears to have been largely sub-tropical rainforest. This rainforest is very different from the rainforests of the escarpment, where precipitation is higher and evaporation lower, and is best described as dry sub-tropical. This type has been termed Complex Notophyll Vine-forest by Bywater (1979). These sites lack a number of the escarpment rainforest species, such as Brown Beech, Featherwood and Maiden's Blush. Species characteristic of this type of drier rainforest include Port Jackson Fig, Deciduous Fig, Brush Bloodwood, Black Apple, Whalebone Tree, Giant Stinging Tree and Native Hibiscus. The best examples remaining of this rainforest in the Wollongong area are on the two Berkeley Islands in Lake Illawarra.

To the north of central Wollongong, where the coastal plain is much narrower and the rainfall higher, the dominant trees are those from the escarpment communities which prefer the higher rainfall. Species extending onto the plain and generally absent from the wider plain to the south include Grey Ironbark, Blackbutt and Turpentine. An interesting occurrence is that of Spotted Gum on Mt. St. Thomas in Wollongong. This species is generally found further south at Nowra and is one of the main south coast species.

3) **Escarpment Zone:** This zone, which takes in the slopes of the escarpment above 100 metres, supports both tall open forest and rainforest (Figure 3). Depending on location, these are six main tree species which dominate the forests of the scarp: Blackbutt, Sydney Blue Gum (including hybrids), Gully Gum, Grey Ironbark, Coast White Box and Turpentine. Prominent understorey species include Forest Oak, Blackwood, Maiden's Wattle, and many of the rainforest species such as Pittosporum and Rosewood.

**Figure 2: TYPICAL VEGETATION ZONES BEHIND AN OCEAN BEACH**

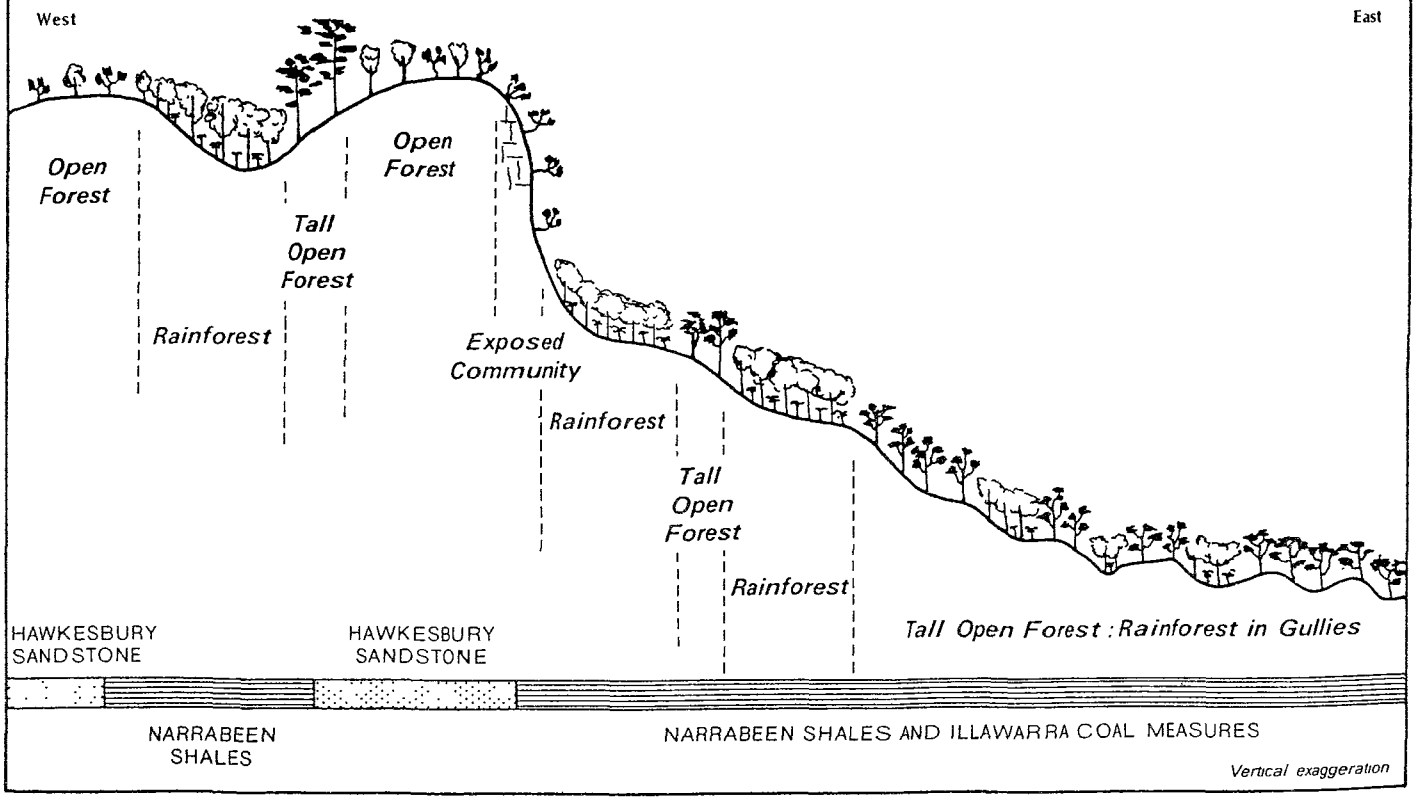



The rainforest proper, generally a closed forest which lacks a prominent eucalypt or other sclerophyllus component, is found in situations of good protection from wildfire and where there is high moisture availability. Generally the escarpment's rainforests fall into two categories: warm temperate, which is found on the upper slopes, and sub-tropical, which occurs on the benches. The benches probably support the more diverse rainforest because of higher soil moisture and nutrient accumulation on these sites. This rainforest has been classified by Bywater (1979) as mixed notophyll vine-fern forest. Some of the prominent species of the sub-tropical type are: Moreton Bay Fig, Brown Beech, Sassafras, Maiden's Blush, Red Cedar, and Cabbage Palm. The steeper upper slopes tend to be less diverse in species, although this depends on aspect. The main species here are: Coachwood, Lilly Pilly, Native Laurel, Pittosporum and Tree-heath. The rainforest along the escarpment can be seen from a distance as dark green patches contrasting with the surrounding eucalypts.

4) **Plateau Zone:** The plateau is dominated by the Hawksbury Sandstone which generally forms sandy skeletal soils which are usually low in nutrients and moisture-holding capacity (Young, 1982). The main vegetation type is an open forest type dominated by Silvertop Ash, Red Bloodwood and Old-man Banksia. The understorey is dependent upon such variables as fire regime and drainage although generally it is dominated by the Familes PROTEACEAE and EPACRIDACEAE and a number of wattles (**Acacia sp**).

Where soils are wetter, as in depressions, and where the bedrock (and hence the water table) is close to the surface, treeless sedgelands and heathlands develop. Small patches of trees within these areas reflect better drained sites. Sedgelands are dominated by members of the RESTIONACEAE and CYPERACEAE families while the heathland areas are composed by such genera as Banksia, Hakea, Melaleuca and Epacris. Often around these areas Scribbly Gum woodland occurs.

**Figure 3: TYPICAL VEGETATION TRANSECT: ESCARPMENT TO COASTAL PLAIN**



The exposed escarpment edge also supports a characteristic plant assemblage, usually of stunted or low-growing species such as mallees which extend a few metres back from the edge. Species found here include the two eucalypt mallees, Mountain Mallee and Budawang Ash, as well as stunted Black She-oaks. This community can be seen at Brokers Nose, for example. In the north where the scarp falls directly into the sea, Swamp Oak, Coast Banksia and Drooping She-oak can also be found on the exposed sea cliffs.

Where streams have cut through the Hawkesbury Sandstone exposing the underlying shales and where higher-nutrient soils and protected situations occur, tall open forest and rainforest have developed. The rainforest, supported by sites with protection from westerly winds, wildfire and extreme solar heating, is similar to that found on the upper slopes of the escarpment. This rainforest type is fairly consistent throughout the plateau gullies and is dominated by Coachwood which sometimes forms almost pure stands. Other common species are Native Laurel, Lilly Pilly, Sassafras, and Featherwood. Tree-ferns are also prominent here, particularly the prickly Tree-fern, with the Soft Tree-fern along streams.

Tall open forest in these gullies is not homogeneous throughout and is dependent on changes in rainfall and aspect, although the processes underlying these differences are not fully understood. For example, in narrow north-south gullies west of Wollongong, Blackbutt and Gully Gum dominate while more exposed east-west gullies have Sydney Peppermint and Blackbutt, and in some cases Turpentine. River Peppermint and Monkey Gum are found in valley situations south of O'Briens Gap.

Where fire is infrequent the understorey of these tall open forests is composed of rainforest species. It appears that in the absence of fire, many of these areas would eventually become pure rainforest. Where fire is too frequent for such regeneration to occur, the understorey is composed of fire-tolerant species such as Wattles, Matrush and Bracken.

With the advent of 'hazard reduction burning', understorey communities in the tall open forest are being maintained as 'fire climaxes' dominated by sclerophyllus shrubs. Most rainforest species are very susceptible to frequent burning and are being eliminated from much of the tall open forest.

## CONCLUSION

The various geological and topographic environments of the Wollongong area provide conditions for a great variety of vegetation communities. Varying environmental conditions must be appreciated if the species composition and distribution of these communities are to be understood. Some changes in vegetation are very subtle and occur over broad areas, while others can be surprisingly abrupt. Such changes are usually the result of a number of environmental characteristics interacting to cause the observed changes. The main environmental influences are fire prevalence, soil type, rainfall, and the availability of moisture.

Man can influence these communities in many ways and Aboriginal man probably had a significant impact for over 30,000 years through his use of fire. The extent of this influence is still a matter of controversy. European influences, such as clearing, logging and modified fire regimes, should also not be forgotten when considering the vegetation of any location as these are likely to have had a marked influence on the community which has developed.

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Department of Geography, The University of Wollongong, 1983.


**TABLE 3: VEGETATION COMMUNITIES IN SUMMARY**

| Zone | Formation | Prominent Species | Location |
|---|---|---|---|
| Coastal | Frontal Dune Community | Spinifex, Coast Golden Wattle | Puckey's Estate |
| | Hind Dune Community | Coast Tea-tree, Coast Banskia, Bangalay | Minnamurra Spit |
| | Lagoon Community | Swamp Oak, Common Reed, Salt Marsh plants | Bellambi Point |
| | Mangroves | River Mangrove, Grey Mangrove | Minnamurra Estuary |
| Coastal Plain | Floodplain Community | Swamp Oak | Macquarie R vulet |
| | Paperbark Forest | Prickly-leaved Paperbark | Albion Park |
| | Eucalypt Open Forest/Woodland | Forest Red Gum, Bangalay, Woolly-butt, Thin-leaved Stringybark | Yallah to Albion Park |
| | Tall Open Forest | Spotted Gum, Turpentine, Blackbutt, Grey Ironbark | North of Wollongong |
| | Rainforest | Figs, Brush Bloodwood, Whalebone Tree Giant Stinging Tree | Berkeley Hills |
| Escarpment | Tall Open Forest | Blackbutt, Sydney Blue Gum, Coast White Box, Turpentine | Corrimal |
| | Rainforest | Coachwood, Beech, Sassafras, Moreton Bay Fig, Red Cedar | Mt. Keira Scout Camp |
| Plateau | Sedgeland Heathland | Sedges, Rushes, species from EPACRIDACEAE and PROTEACEAE | Maddens Plains |
| | Woodland | Scribbly Gum | Picton Road |
| | Open Forest | Silvertop Ash, Red Bloodwood, Old-man Banksia | Mt. Keira |
| | Exposed Community | Black She-oak, Blue-Mountains Mallee, Privet-leaved Stringybark | Brokers Nose |
| | Tall Open Forest | Blackbutt, Sydney Peppermint, Gully Gum | Cataract River |
| | Rainforest | Coachwood, Sassafras, Native Laurel, Lilly Pilly | Cataract Creek |


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