

# *The* Gib



MOUNT GIBRALTAR  

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SOUTHERN HIGHLANDS



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Editorial Group  
Jane Lemann, Jenny Simons, Elizabeth Smith,  
Carmen Wright, Julie-Rose Moffatt, Michael Elphick

Mount Gibraltar Landcare and Bushcare  
under the auspices of  
Wingecarribee Shire Council

## MOUNT GIBRALTAR LANDCARE AND BUSHCARE

PO Box 141 Moss Vale NSW 2577



Editors: (L-R) Carmen Wright, Julie-Rose Moffatt,  
Jane Lemann, Michael Elphick, Elizabeth Smith, Jenny Simons

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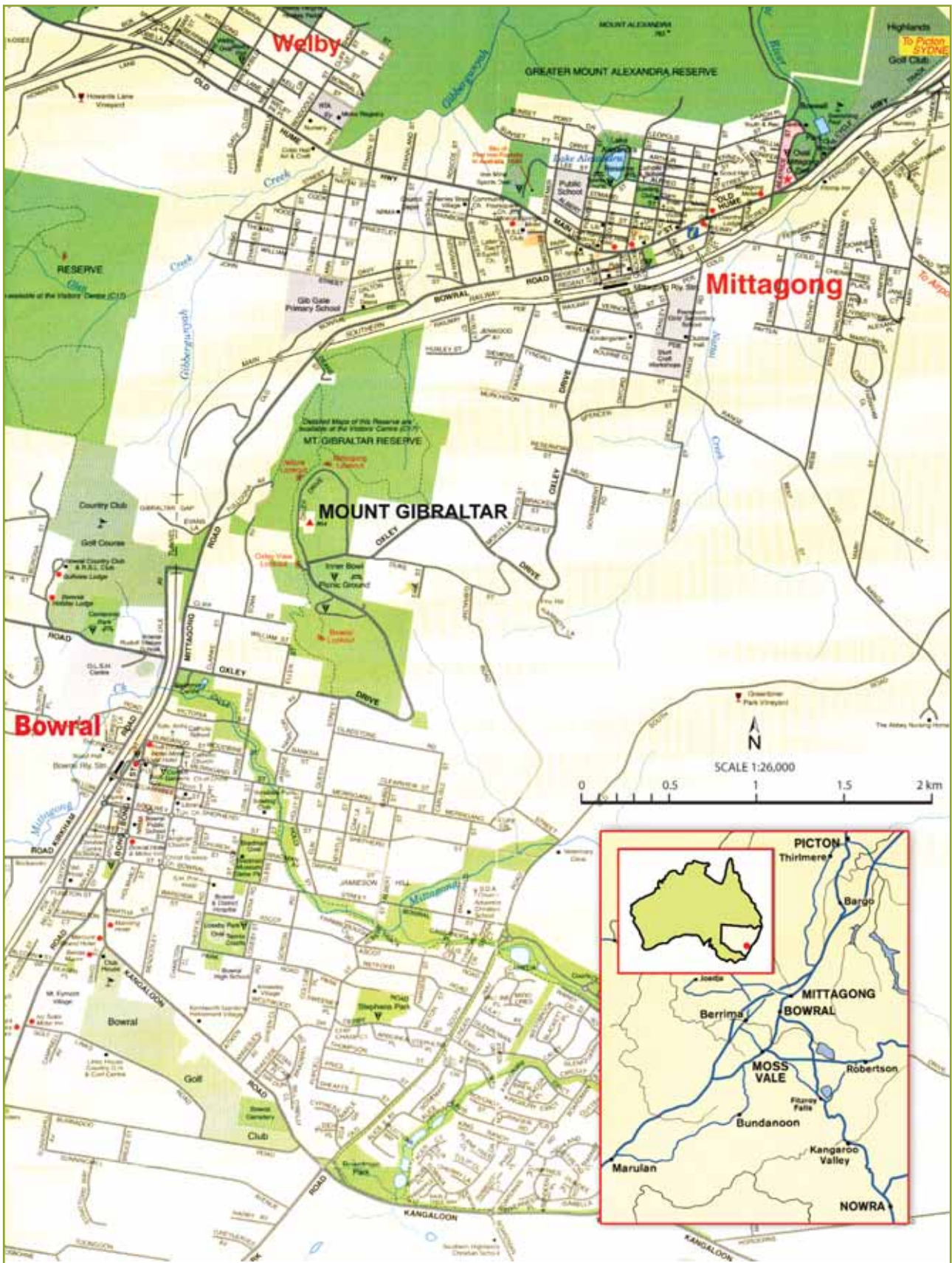
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# The Location of Mount Gibraltar in the Southern Highlands of New South Wales





OFFICE OF THE GOVERNOR

SYDNEY 2000

Message from Her Excellency Professor Marie Bashir AC CVO

*The Gib: Southern Highlands*  
Mount Gibraltar Landcare and Bushcare Group

**FOREWORD**

The volunteers of the Mount Gibraltar Landcare and Bushcare Group have dedicated themselves for many years to restoring Mount Gibraltar Reserve, the beautiful mountain area between Mittagong and Bowral. Regeneration of the endangered forest with all its components has been their inspired objective. Their longstanding familiarity with this area of historical significance, together with the assistance of scientific experts, have given this book an integrity which sets a standard for those who have a commitment to the preservation of our unique and precious natural environment.

This handsome book is indeed a proud celebration of the beauty of our natural world, and it essentially proclaims the need for more thoughtful and sensitive care of what remains. The social, industrial and natural history of Mount Gibraltar has also been recorded. Therefore this volume, presenting the different voices of many contributors, provides a legacy for the next generation.

This worthy project has attracted the generous support of the local community, who are the proud beneficiaries of this skilled restoration.

This book also crystallises the many facets which comprise a successful community project.

I congratulate most warmly all those involved.

Professor Marie R Bashir AC CVO  
Governor of New South Wales

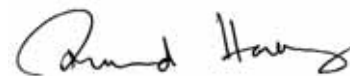
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This book is a product of the enormous good will and energy of people in our community. We thank the many individuals who have been generous in sharing their experience and advice and offering financial support.

My thanks to the authors who have voluntarily given their expertise and the people who have worked physically at restoring the Reserve.

As convenor of Mount Gibraltar Landcare and Bushcare, I thank the editorial group for bringing this wonderful book to life. Their enormous input of time and effort has created a unique work that tells us the story of The Gib. The group has been greatly assisted by the computer skills of Julie-Rose Moffatt, BA and the financial expertise of Michael Elphick, FCA.

Dr Richard Hanbury



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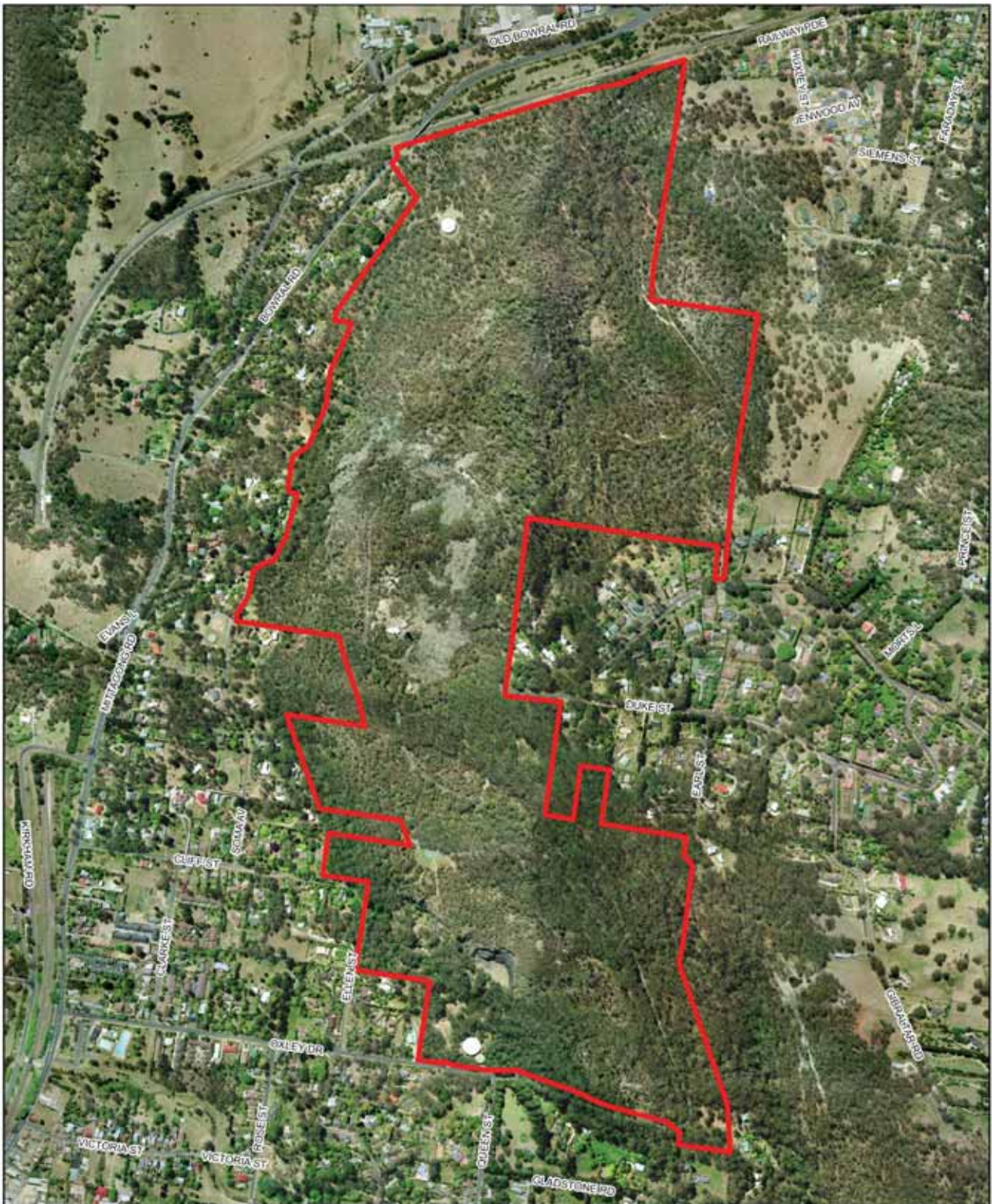
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*Mount Gibraltar Forest* Courtesy of Highlife Magazine



# Mount Gibraltar Reserve



## Legend

 Mt Gibraltar Reserve



Produced by the GIS Section  
Wingecambee Shire Council

Aerial photography current  
as at November 2002.

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## Mayor's Introduction

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The Gib's physical presence dominates the Southern Highlands landscape, but the value of this mountain to our local community stretches far beyond that. For that reason the Council is committed to the conservation of the bushland area to be enjoyed by both residents and visitors to our district.

Mount Gibraltar Reserve is one of the most important assets for which Wingecarribee Shire Council is responsible. Since buying land in 1919 for the purpose of creating a reserve, succeeding councils have steadily acquired adjacent land and quarries to secure its future.

One of the proudest achievements in my early years on Council was having a hand in Bowral Municipal Council's purchase of a quarry on Mount Gibraltar. If the council of the day hadn't bought it, I shudder to think what an ugly scar would have been inflicted on the side of this magnificent mountain by now.

I commend the wonderful work done by many volunteers to not only restore this important reserve, but to have produced this book to inform the community, and to ensure Mount Gibraltar remains an important icon in the landscape of Wingecarribee Shire, standing proudly as the world changes around it.

Gordon Lewis  
Mayor of Wingecarribee Shire Council

## Editors' Introduction

---

'The Gib' is the popular name of Mount Gibraltar that stands at the gateway to the Southern Highlands of New South Wales. This name has been chosen for the title of our book as a friendly introduction to our well-loved mountain. We aim to convey the charisma of the mountain and its immediate surroundings.

Mount Gibraltar, on the main highway from Sydney to Canberra and Melbourne has a history that reflects the story of the development of Australia. We follow this story through ancient geological formation to more recent times when the Gundungurra (Mountain People) roamed the rich and bountiful area between the Blue Mountains and the Southern Highlands. The story describes settlement by the early Europeans who cleared the forest, grazed their stock and exploited the valuable rock resources. It shares the success and sometimes failure of these enterprises.

Today, increasing urban development makes environmental restoration and conservation essential. Mount Gibraltar Reserve at the summit of the mountain is significant because its rich trachyte-derived soil supports some of the last remnants of endangered plant and animal communities that once thrived throughout the Southern Highlands.

In *The Gib* we present the material we have gathered in our study of Mount Gibraltar. We wish to make this information accessible to everyone. Residents and visitors will find the book interesting and students will be able to use the information in their studies. This work also provides a reference that can be built upon in the future.

The preparation of this book was achieved as a volunteer community project conceived by members of the Mount Gibraltar Landcare and Bushcare group and encouraged by Wingecarribee Shire Council. We have drawn on the talents of local people: historians, scientists, artists, photographers, writers and the help of staff of government agencies and Council. The various chapters reflect the individual voices and styles of the contributors, giving each chapter a vibrant and personal voice.

The first part of the book describes the mountain today and records its human history; the second part describes its natural history.

We acknowledge with warm appreciation the many people who have voluntarily helped with the production of the book and the care of the Mount Gibraltar Reserve.

We hope *The Gib* will increase your understanding and enjoyment of this special place.

Editors



Craggy view from Mount Jellore Lookout

Photo: C Segelov

For all those who come after us

## Part I



# Mount Gibraltar

A HUMAN HISTORY

## History of Mount Gibraltar:

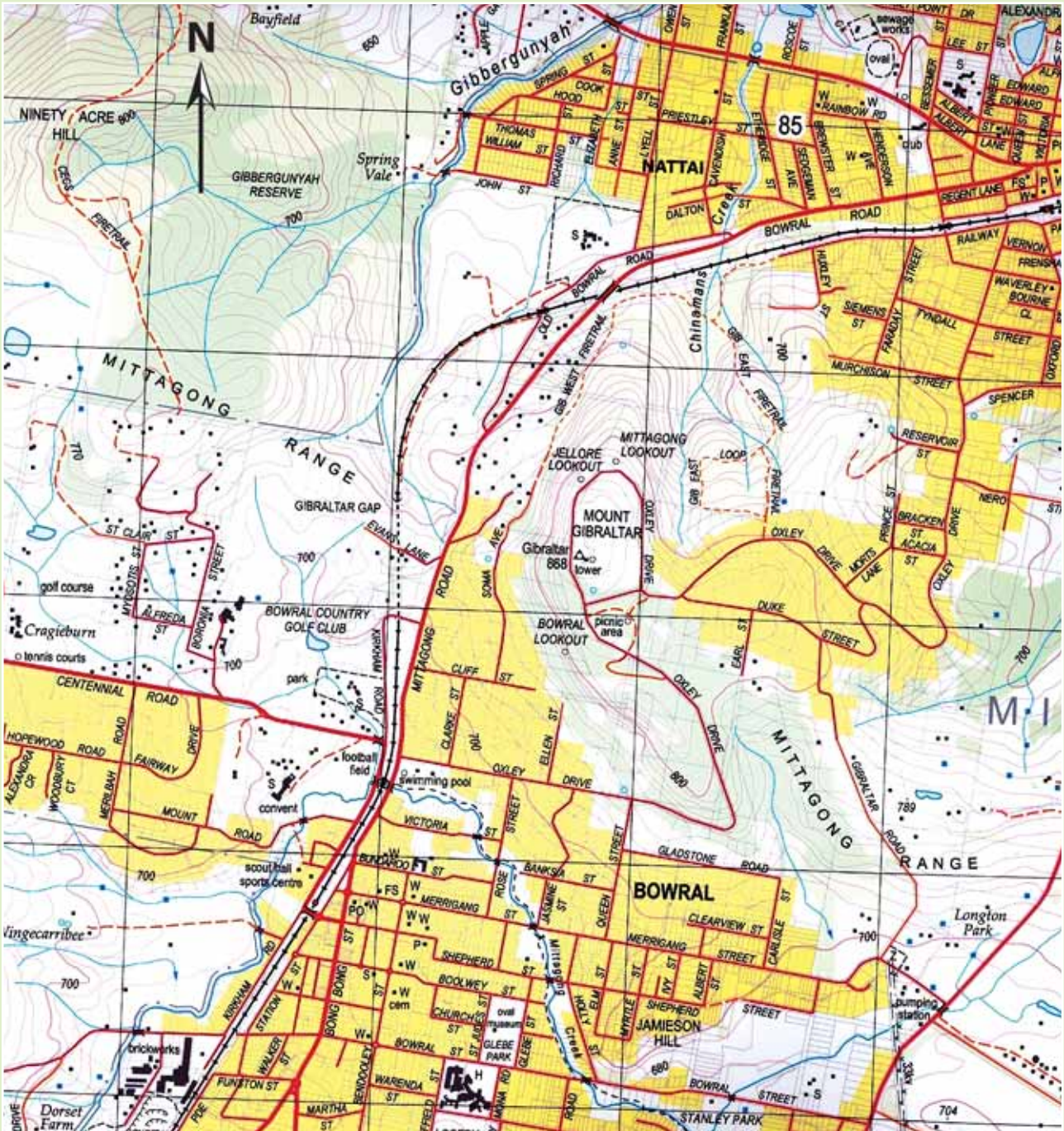
Before	Part of Gundungurra country
1798	Exploration: John Wilson and his party explore the area
1814	Exploration: H and J Hume and possibly J Kennedy explore the area
1816	Arrival of stock: Surveyor Lieutenant J Oxley sends a herd of cattle to the area Route opened over the Mittagong Range to Bong Bong, establishment of Old South Road
1819	Dr C Throsby becomes the first settler in the Southern Highlands
1820	Governor Macquarie visits the Southern Highlands
1828	Ascent of Mount Gibraltar: Surveyor Major Mitchell climbs Mount Gibraltar to take measurements. J Oxley dies
1831	Route opened: new south road through Berrima commenced (Lennox Bridge built over Wingecarribee River 1836)
1839	Survey of resources: Rev. WB Clarke, geological survey for coal, iron, trachyte
1848	Industry: iron smelting begins at Fitzroy Iron Works
1850	Land Grant: A Brand
1852	Route opened: road from Mittagong to Moss Vale
1854	Land Grant: T Callaghan
1855	Land Grant: HM and JN Oxley and their mother E Oxley
1859	Survey and subdivision for private town of Bowral by JN Oxley
1863	Railway line: Mittagong-Bowral railway begun; work on tunnel
1867	Railway line: tunnel through Mount Gibraltar opens, track continues to Moss Vale
1868	Land Grant: J Powell
1869	Quarrying: commences at several sites
1872	Subdivision of land: PLC Shepherd purchases large tracts of land from JN Oxley
1885	Quarrying: W Charker's NSW Trachyte Stone Quarrying Co. starts in Cliff Street Other quarries operated by Leggat, Loveridge and Hudson, Amos Bros
1889	Local Government: proclamation of Municipality of Mittagong Survey of Resources: Geological Survey JB Jacquet
1890s	Local Government: Municipality of Bowral proclaimed, boundary with Mittagong dissects Mount Gibraltar Quarrying: Government resumes land from Amos Bros, opens ballast quarry for construction of Great Southern Railway line and new tunnel. A Amos reclaims his land and now owns north and western slopes of the mountain Quarries operated by Saunders, Amos, Loveridge and Hudson, Raward, Phippard, Pope Building construction: period of major construction of stone buildings in Australia and overseas
1905	Bushfire
1913	Frensham school founded
1914-18	First World War
1915	Quarrying: A Amos dies. Union Trustee Coy administers his land, subdivides and sells western section to private owners
1919	Mount Gibraltar Reserve: initiated as Joshua Stokes secures 32 hectares on summit for a Reserve Quarrying: Crown resumes 65 hectares from Union Trustee Coy on northern slope of the mountain in Mittagong for trachyte to construct Sydney water supply dams
1920s	Quarrying: Union Trustee Coy sells Amos quarry in Soma Avenue 1927 Water supply: Bowral water supply develops. Reservoirs built in Soma Avenue Water supply: Sydney water supply dams built



# A Chronological Summary

1930s	<p>Mount Gibraltar Reserve: Oxley Drive and Scenic Road, shelters and lookouts are constructed by Department Public Works during Spooner relief scheme</p> <p>Lots 138, 139 Duke Street are added to Reserve</p>
1939	Bushfire
1939-45	Second World War
1940s	Mount Gibraltar Reserve: declared a Bird and Animal Sanctuary
1950s	<p>Mount Gibraltar Reserve: land from CH Cull; Lots 24-29 added to Reserve</p> <p>Bowral Municipal Council sells land on summit to Postmaster General's Department for communication towers 1955</p> <p>Quarrying: quarries operating mostly for road aggregate and kerb stones</p> <p>Water supply: reservoirs in Oxley Drive 1952; Spencer Street 1959</p>
1960s	<p>Mount Gibraltar Reserve: Bowral Lookout and Inner Bowl picnic areas created by Bowral Rotary Club</p> <p>Water Supply: Warragamba Dam completed 1961, Medway Dam completed 1965</p> <p>Reservoirs in Murchison Road 1969 and Oxley Drive High Level 1969</p> <p>Quarrying: Concrete Ready-Mix set up on Loveridge and Hudson property</p> <p>Quarry closes: Amos - Haines, Soma Avenue, 1962</p> <p>Trachyte supplied for National Library Canberra</p>
1970s	<p>Mount Gibraltar Reserve: Pope's Granite Ware Quarry, King Street, purchased and closed by Bowral Municipal Council and included in Reserve; Amos - Haines Quarry, Soma Avenue purchased and included in Reserve</p> <p>Water supply: Shoalhaven Water Supply Scheme completed 1977</p>
1980s	<p>Local Government: Councils amalgamate; Bowral Municipal Council and Mittagong Shire Council included in Wingecarribee Shire Council, 1981</p> <p>Mount Gibraltar Reserve: Walking tracks developed by National Parks Association</p> <p>Land added to reserve when Wingecarribee Shire Council purchases and closes Loveridge and Hudson - Melocco Bros quarry. End of quarrying 1986</p> <p>Part of some adjacent blocks of land added to Reserve</p> <p>Water supply: reservoirs in Dean Street, Mittagong 1986, Oxley Drive No. 2 Bowral 1987</p>
1990s	<p>Mount Gibraltar Reserve: Management Committee formed (later to become Mount Gibraltar Landcare and Bushcare, 1993)</p> <p>Restoration project commenced 1994</p> <p>Crown land on Mittagong side added to Reserve, gazetted 1995</p> <p>Remaining Melocco Bros land purchased by Wingecarribee Shire Council and added to Reserve</p> <p>Adjacent blocks of land purchased and added to Reserve</p>
2000s	<p>Mount Gibraltar Reserve: <i>Mount Gibraltar Forest</i> gazetted as Endangered Ecological Community 2001</p> <p>NSW Landcare Award 2001 for restoration project</p> <p>Adjacent land purchased and added to Reserve</p> <p>New Bowral Lookout constructed by Wingecarribee Shire Council 2002</p> <p>NSW Landcare Gold Award 2004 to Wingecarribee Local Government for environmental activities</p> <p>Drought</p> <p>Mount Gibraltar Bushcare Project continues</p>

# Mount Gibraltar



MITTAGONG Topographic map, 1:25,000, 2005

# Chapter 1



## Mount Gibraltar Today

Latitude 34°27' S Longitude 150° 25' E  
Easting: 263000 [UTM zone 56, GDA 94] Northing: 6183000

**M**ount Gibraltar is a prominent tree-clad bluff at the western end of the Mittagong Range. It can be seen across the undulating pastures of the Southern Highlands and from the freeway when travelling from Sydney. It is a local landmark easily identified by the spires of the communication towers on its summit. The towns of Bowral and Mittagong have developed in the sheltered valleys at its base.

At 863 metres it is the highest point in the region and was called Bowrell (High Mountain)<sup>1</sup> or Mittagong (Rocky Hill)<sup>2</sup> by Aboriginal people then, later, Gibraltar by the first stockmen, after the famous Mediterranean rock. That name derives from the Arabic, *Jebel Tariq* meaning 'Tariq's Mountain' and refers to Tariq ibn-Ziyad who led the Muslim conquest of Spain in 711AD.<sup>3</sup> In both places Gibraltar is shortened colloquially to 'The Gib'.



Mount Gibraltar from Oxley Hill Road

Photo: C Segelov

## Gibraltar Reverie

Dorothy Pearce

Dorothy Pearce (1918- ) won a prize for this poem in 1987 in a local competition. She has published two books of poems and continues to write poetry. Her father helped build the road over Mount Gibraltar in the 1930s.



*What are you dreaming of Old Mount Gibraltar?  
Is it of days one can never recall  
When the ring of the axe and the hoof beats of horses  
Clattered and thundered as they made the long haul?  
With their goods and their chattels they pressed ever onward  
To find a new home in this land of the free  
Despising all hardships, enduring all weathers,  
Those brave pioneers from far over the sea.*

*What secrets you hold as you dream of past ages  
When only the black man this country did roam,  
Not knowing the white man would come in great numbers  
And gouge from your face the timbers and stone  
To build on your crown for his family a home.*

*Though fires have swept o'er you and winters have brought you  
A carpet of snow to lay at your feet,  
You stand there unmoved by the hustle and bustle  
Of modern day traffic which roars on the streets  
Of the fast growing township we proudly call Bouldal,  
Whose sons, yes and daughters are renowned for achievements  
That many another will find hard to beat.*

*Now tree shaded lawns and gardens adorn  
The acres of grassland where kangaroos roamed  
And folk from all countries have come here to settle  
And make a new life far away from the strife  
And the want that had spoiled their own.*

*Now we all work together in fair or foul weather  
To make this a place of joy and delight  
And hope you approve of the bright beds of Tulips  
Which beckon all lovers of beauty to come.  
And behold with great pleasure the beautiful treasure  
Which has sprung from the earth, with the aid of the sun  
And the raindrops, which fall in quite copious numbers  
Yet awaken you not from your long years of slumber.*

*So dream on Gibraltar, our sons and our daughters  
Will think of you fondly wherever they roam  
And all through the nation each new generation  
Will come to revere you and love their new home.*

## Bushland Reserves in the Southern Highlands

The following reserves provide for conservation of various ecological communities and for delightful and accessible recreational opportunities. The Wingecarribee Visitors Information Centre in Mittagong and the Fitzroy Falls Centre provide detailed information and maps for these and other smaller reserves.

### National Parks and Wildlife Service

Morton National Park, Budderoo National Park, Macquarie Pass National Park, Nattai National Park, Robertson Nature Reserve, Cecil Hoskins Nature Reserve, Barren Grounds Nature Reserve.

### Wingecarribee Shire Council

Mount Alexandra Reserve, Gibbergunyah Reserve, Berrima Weir Reserve, Hammock Hill Reserve, Mansfield Reserve, Mount Gibraltar Reserve, Bong Bong Common.

### Further Reading

Chalker, M and Bensley, T *Bush Walks around Mittagong* [n.d.]  
Fairley, A *Discovering the Southern Highlands* Envirobooks, Sydney 2000  
Hall, P *Walks near Bundanoon in Morton National Park* NPWS [n.d.]



Tree Fern *Cyathea australis*

Photo: J MacMaster

Once buried beneath the earth's crust, The Gib's hard old bones of plutonic rock have been exposed as the ancient land eroded away. The 180 million year-old mountain is composed of igneous rock called microsyenite, a type of trachyte which was quarried extensively until 1986. This left huge scars in the rock faces which are scenically magnificent and are a legacy of the hard physical labour and enterprise of our forebears. Valued for its strength and hardness, the rock was used for many important buildings, kerbing stones and railway ballast, thereby giving the abandoned quarry sites strong heritage significance. Some of the rock from the quarries has been used for landscaping works in the Mount Gibraltar Reserve, where it is easy to see and which acknowledges the fundamental stone character of the mountain.



The Gib, an exposed rock c. 1906. Professor Thomas Griffith Taylor wrote 'while studying under Professor Sir Edgeworth David 'That great massif of syenite known as The Gib... is a place of some importance in my career, since (Sir Douglas) Mawson and I wrote our first geological paper about the rocks around it.' Taylor, TG *Journeyman Taylor: The Education of a Scientist* Robert Hale 1958. The two students visited several times in 1902-03 before all three men went off to become polar explorers. Photo: With permission BDHFHS



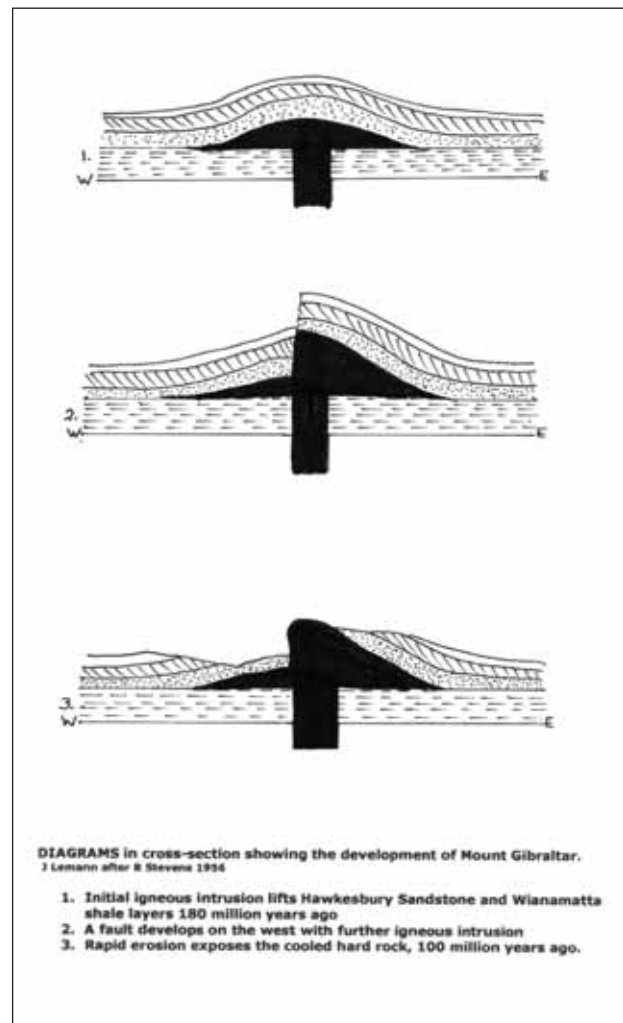
A trachyte quarry today

Photo: C Segelov

The mountain plays a significant role in the area's water supply, being an important headwater source for both the Wingecarribee and Nattai Rivers. Chinaman's Creek runs down the north side at the interface of the volcanic and sandstone rocks, to join Gibbergunyah Creek, a tributary of the Nattai (see Map). On the south side an unnamed watercourse drains through Fern Gully to the Mittagong Rivulet in Bowral, a tributary of the Wingecarribee. In the early days of European settlement, several springs on the mountain were used for local water supplies.

The area is occasionally subject to tremors, with notable earthquake events centred in Robertson in 1961, Picton in 1973, Lithgow in 1985 and Newcastle in 1989, all causing some damage to buildings and reservoirs on the mountain.<sup>4</sup>

After millions of years of erosion, the volcanic base rock supports a very fertile soil. This was first cleared for grazing and farming and is now largely built upon. Early in the 1900s Mount Gibraltar was almost denuded of tree cover, most having been cleared for grazing, mine props, fuel for steam engines of the day and by members of the large navy camps established during the building of the original railway line. This has led to many of today's mature regrowth trees being of uniform age.





*The Zenith* a Mount Gibraltar garden

Photo: M Maclean



The Gib from the Bowral Golf and Country Club

Photo: C Segelov

Bushfires and drought have also taken their toll. In 1905 and again in 1939, fanned by fierce westerly winds, fires swept in and burned much of the mountain and the town of Mittagong, including buildings at Frensham school. A wind change prevented total destruction but it turned the fire into lower Mittagong forcing it northward to engulf Aylmerton, Yerrinbool and beyond.<sup>5</sup>

Drought, too, has had a powerful effect on the vegetation of those areas of the mountain where the soil is shallow and many trees struggled to survive through the 2003–2004 drought.

Because of its height, the mountain experiences a somewhat different climate from the surrounding country and provides a climatic buffer for Mittagong. It experiences snow, high winds and extremes of heat and cold as the solid rock absorbs and reflects the temperature changes (see Panel).

When the Southern Railway was extended south from Mittagong, a significant tunnel was driven through the side of The Gib to open the way to the south (see Chapter 3).

The first Tourist Guide to the Southern Highlands issued in 1934 contained references to the many extensive and beautiful gardens on The Gib. The fertile soil and cool climate led to the development of an 'English' style of gardening which was achieved by planting deciduous trees and a variety of conifers. The layout of gardens included fountains, rills, pathways, stone walls, hedges and herbaceous borders which have delighted gardeners and visitors ever since. Some of the gardens have been professionally designed by such well-known designers as Paul Sorensen (*Redlands*), Michael Bligh (*Tintagel* waterfall) and Nicholas Bray (*Greyladyes*).

The soil is so fertile that a keen gardener in the 20th century, Sir Hugh Poate, a surgeon, first president of the Royal Horticultural Society of Australia, purchased a block of land (believed to be the present *Lindenhof*) in order to remove soil to improve his garden, *Semiramis*, in Burradoo. Here he grew tulips and daffodils for the Sydney market and his was one of the first gardens to open to the public.<sup>6</sup>

The elaborate private gardens on Mount Gibraltar today give pleasure to many, particularly those who visit through the Australian Open Garden Scheme and other charitable events. These gardens exemplify the beauty of cold-climate gardening, seldom seen in Australia's more typical flat and dry landscapes.



The Gib from Bowral railway station

Photo: C Segelov



Maple in autumn *Acer palmatum*

Photo: C Segelov



The Gib from Welby

Photo: C Segelov

# What Is The Weather Like?

Elizabeth Smith



The Gib after snow, 2002

Photo: A Palmer

At any time of the year a person standing on the The Gib will find it is cooler than it is in the townships below or down on the coast. In summer the altitude and vegetation give the top of The Gib pleasantly cooler, drier and cleaner air than that in the towns. However, when the temperature reaches its peak and the hot westerlies blow then comes the thought, the fear, the threat and perhaps the reality of bushfire. Fortunately there has been no wildfire on The Gib itself for years although in 2003 fire came to the edge of Mittagong, Aylmerton and the northern villages.

The district at latitude 34° south has a temperate climate. Its location around 30km from the sea gives it a climate similar to that of the coast but modified by its altitude of over 600m. The north and north-east winds in summer bring moisture which is shed as the wind rises up the coastal escarpment. Thus dried and cooled the air acquires that clear highlands characteristic, so much more comfortable to many, than the humid warmth of the coastal lowlands.

Put simply, north, south and west winds coming over land are necessarily drier than those from the east. Winds in summer, from the hot, dry inland are themselves hot and dry, while those from the south in winter and early spring coming off the alpine snow are very cold. As the graphs show, temperature moves evenly down from summer through autumn

to winter and back again through spring to summer without any dramatic peaks or falls. Rain can fall in any month, most of it over summer in November and March and the least usually in July. Extremes of temperature can be from 40°C to -11°C.

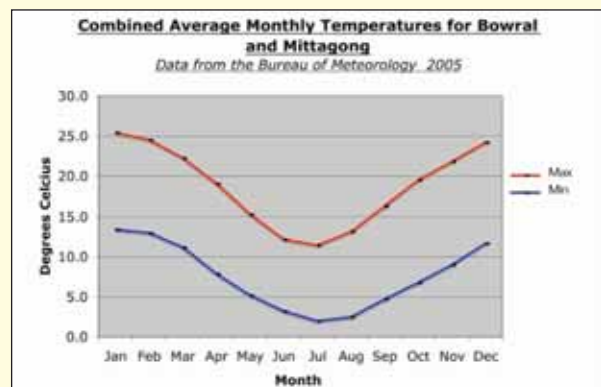
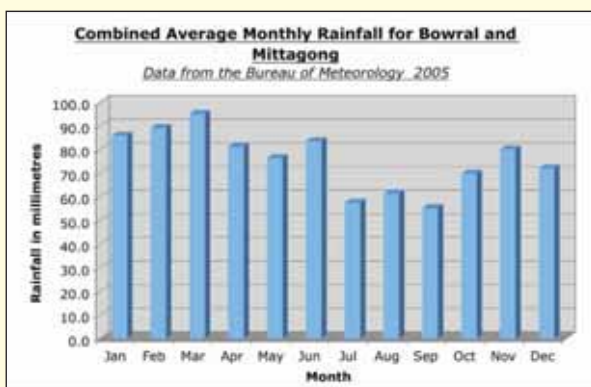
Without the extreme heat of summer or cold of winter, spring and autumn are usually voted the most pleasant seasons. Spring, being spring, is both exciting and frustrating. Its welcome warmth, sunlight and exuberant plant growth after winter can be offset by the chill breezes that often come with cloudless blue skies – ‘sunshine, blue skies, dancing daffodils and perishing cold’.

Autumn brings blessed relief from the heat of summer. Mists sneak into the mornings and evenings and can envelop the mountain. There is humidity enough to make the air comfortably moist. Generally it is very pleasant to be outside for all of the daylight hours. Gardens are one of the attractions in the area in this season because the deciduous trees present a kaleidoscope of colour. Foliage changes from greens into yellows, flame, orange, tan, reds and purples before fading through browns and falling in winter to leave the naked branches which have the beauty of their own integrity.

Winter can be called brisk but not bleak. Its cold air is made doubly uncomfortable by the chill of any wind especially that from the snow fields in the south. Morning and evening mists are common. Sometimes the mist will sit on top of the mountain, exciting to the romantics and a bother to others who might be walking through its wisps and skeins swirling among the tree trunks. At other times it will lie in the valleys obliterating river, road, railway and towns completely so that a visitor to the mountain top stands as on an island looking out over a sea of white with only the tips of other high points visible.

On the coldest mornings there can be white frosts and ice over the puddles. Ground frosts have happened but are rare, as are the brief snow falls. What is memorable and priceless about a snow fall, apart from its rarity and the magic change that the white blanket makes to an otherwise familiar landscape, is the unearthly, absolute silence it brings, flake by flake, as it falls and settles.

Well fed and well clothed, a person can enjoy a frosty highland morning in the early spring when the moss gardens found on the rocks of The Gib are vibrant with new life, and the warmth of the morning sun begins to melt their frost cover.







The approach to Mittagong Lookout

Photo: J Lemann



Mount Jellore Lookout

Photo: C Segelov



Bowral Lookout platform

Photo: J Lemann

## Mount Gibraltar Reserve

Due to one man's foresight which led to the development of the Mount Gibraltar Reserve everyone can enjoy The Gib today. Alderman Joshua Stokes gave council and the community a priceless treasure when he secured land on the summit in an altruistic gesture in 1919. Successive councils have realised its importance and have added land for both public recreation and the conservation of the remnant forest. Wingecarribee Shire Council now manages the Reserve in trust for the community, with the help of the Mount Gibraltar Landcare and Bushcare group.

Mount Gibraltar Reserve is immensely important. As a small island in a sea of urban and rural development, it forms part of an archipelago of remnants of native forests. These include the Gibbergunyah Reserve, Cecil Hoskins Nature Reserve, Frensham school's Upper Holt, Bebrue, Mansfield Reserve and the Berrima Weir Reserve, all of which provide refuges across the landscape for native flora and fauna (see Panel). It also provides a glimpse of the richness of the world in which our Aboriginal predecessors once lived.

Through a combination of rocks, soils, climate and aspects, today's 130 hectare Reserve contains a variety of habitats, the most important being the Endangered Ecological Community of *Mount Gibraltar Forest*. This includes tall trees with ferny glades, exposed rock platforms, steep cliff faces and damp shrubby areas, each with distinctive vegetation and dependent wildlife.

# Mount Gibraltar Telecommunication Towers

Jane Lemann

Dominating the mountain, the communication towers project a defining image of our ever-increasing dependence on information technology and communication. The two Telstra telecommunication towers are focussed on Razorback near Picton, Red Rocks above Kangaroo Valley and Freestone at Penrose, sending the invisible waves that link us to worldwide networks.

In 1955, Bowral Municipal Council sold about one acre of land on the summit of Mount Gibraltar to the Postmaster General's Department (now Telstra) for £150.<sup>1</sup>

The first telecommunication tower and the building that houses back-up generators and batteries were gradually enlarged in the late 1950s and then linked to the main Subscriber Trunk Dialling (STD) service with connections to the co-axial cable between Sydney, Canberra and Melbourne, together with analogue radio links and television.



Communication Towers on the summit of Mount Gibraltar, 2005  
Photo: C Segelov

This was superseded in 2000 as technology moved on, and today the two big towers are operated by Telstra Communications Global Operation-Melbourne, through Telstra Regional Services Southern Highlands. Their main purpose is for microwave point to point coverage for mobile telephones which transmit thousands of messages simultaneously. They link to the optical fibre network for multi-data transmissions, which has the great advantage of not being affected by lightning. These towers also transmit radio telephone to remote areas such as Bindook and Wombeyan Caves and carry the Government Radio Network.

Wingecarribee Shire Council leased another piece of the Reserve's Community Land in 1990 to Win 4 Television and jointly constructed a third tower and support buildings. This is known as the 'Mount Gibraltar Radio Facility' and is an income-producing council asset. It supports an aggregation of television channels including Win 4, Prime, ABC, Capital 10 and SBS in conjunction with the Knights Hill UHF tower. It also provides aerials for community radio 2WKT, commercial radio FM 2ST and a narrow-casting specialist station.

There are also numerous two-way radio links on this tower for private companies; Government Radio Network for local police, ambulance, fire brigade; and mobile phone transmitters for companies such as Orange and Optus, the latter having its own building on the site. There is also facility for transmission of local media pictures for broadcasting television news. The Rural Fire Service has its own separate building, tower and aerials on the Telstra land.

The facility includes a diesel emergency generator which starts up automatically if there is a power interruption.

As the services expand, the towers are reinforced to withstand high wind pressure on the dishes and now their height requires a red warning beacon for aircraft. Lately the facility has required the protection of security fencing.

The present tower complex is a far cry from the original wooden pole supporting a single aerial remembered by long-time residents of the area. It is hoped that one day technology will allow all these structures to be removed from the Reserve.

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## Reference

<sup>1</sup> DP 856512 Lot 22, Vol 10121 Fol 63. Last title 6735 Fol 210,211

## Acknowledgements

My thanks to Mark Lautizar, Telstra and Stephen Burnett, Wingecarribee Shire Council.



Bowral Lookout picnic area

Photo: C Segelov



Stone Stairway from Cliff Street Bowral

Photo: C Segelov

A scenic road over the mountain takes the traveller to views over Mittagong to Sydney, to the Blue Mountains, Bowral and the Wingecarribee Valley. It also provides service access to the communication towers on the summit, (see Panel) the latest of many systems that echo the signals possibly sent by Aboriginal people from this site.

The main picnic area is found near the Bowral Lookout from which walking tracks depart in several directions. For the more athletic, the mountain can be approached from below by an imposing flight of stone steps built by the quarry workers and renovated in the 1930s. This was a Depression relief program which also drew on the skills of quarrymen to construct the scenic road that is supported by a superb wall of stone blocks.

Today The Gib is a favoured residential area that continues to be developed. The Reserve at its summit bears evidence of much of its history and is protected and cared for. It is made attractive to visitors by its new and restored lookouts, its walking tracks and the condition of the natural bushland now regenerating after the removal of the smothering infestation of exotic weed plants.

The Mount Gibraltar Landcare and Bushcare group hopes that the Reserve will retain its restored integrity and scientific significance in the years to come through on-going careful management by the Council. The group also hopes that local gardeners will accept responsibility to contain exotic plantings within their gardens in order to avoid the spread of non-native species into the Reserve.

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#### References

- <sup>1</sup> Baker, DWA *The Civilised Surveyor: Thomas Mitchell and the Australian Aborigines* MUP 1997
- <sup>2</sup> Reed, AW *Place Names of Australia* Reed 1973
- <sup>3</sup> Earlier it was known as Calpe, one of the Pillars of Hercules guarding the entrance of the Mediterranean, en. wikipedia.org
- <sup>4</sup> *Earthquakes* Australian Geological Survey Organisation 1993
- <sup>5</sup> Chalker, MA *The Bushfires of 1939* Chalker 1994
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# Gundungurra Lands



Source: Meredith, J 1989

## Chapter 2



# Gundungurra People

Jenny Simons

Jenny Simons, MA, President of the Australian Plants Society, Southern Highlands, an experienced bush regenerator, has been working as a volunteer on Mount Gibraltar from the beginning of the project.

*We endeavour to present some account of the people who lived in the Southern Highlands, as reported by the early Europeans and by more recent historians. An invitation was given to a Gundungurra representative to contribute this chapter but this was not taken up and we have relied on a limited source of reference material; however, it is all that is available to us. We trust that your understanding of the plight and early disappearance of the first inhabitants of the Southern Highlands will be clarified, and that you will support future efforts to elucidate their history.*



Geebung *Persoonia linearis* used for food and medicine  
Illustration: M Peach

As observed by Cook in 1770, Australia was an inhabited continent. When Captain Arthur Phillip and his fleet of convicts and soldiers arrived in Sydney Cove in 1788, Australia was already populated by people with an extremely long heritage, rich traditions and cultures; people who had every right to continue their ownership of, and their deep spiritual relationship to, their lands. With the perception by the British that this land was without an owner, *terra nullius*, the overthrow of the Aboriginal people's way of life began.

## The Gundungurra People of the Southern Highlands

We do not know their numbers before the arrival of the Europeans; however, conflict, disease and starvation soon resulted in all but total extinction.

The area inhabited by the Gundungurra, known as the 'Mountain People', extended from the Southern Highlands, north to Camden, west to the Blue Mountains and south to Goulburn. It included the Burratorang Valley and a good deal of high country (see Map).

The Gundungurra people moved around this land in small groups, travelling according to the season, following food gathering opportunities and coming together with other groups according to social and customary arrangements.

In the Southern Highlands, the summit of Mount Gibraltar would have been a useful point for sending and receiving messages.<sup>1</sup>

We do not know how long the Gundungurra people lived in the Southern Highlands but it is assumed they or their forebears lived here for perhaps 40,000 years.<sup>2</sup> Some Aboriginal people are currently living in the Southern Highlands and the number appears to be increasing with more moving in and more identifying themselves as Aborigines.<sup>3</sup>

### Gundungurra Culture

In the Southern Highlands, physical evidence of the Gundungurra people's life includes examples of drawings, paintings, stencils, rock shelters, axe-grinding grooves, scar trees, open camp sites, tooled items and flakes. Some examples may be seen at the Berrima District Historical Society's Museum in Berrima.

The National Parks and Wildlife Service has classified and recorded Gundungurra sites in the Southern Highlands in the following places: Bullio, Mandemar, Nattai River, High Range, Upper Burratorang, Mt Jellore, Colo Vale, Mount Flora, Renwick, Aylmerton, Alpine, Bargo, Avon Dam, Joadja, Medway and the Wingecarribee Swamp.

Some of the artifacts found on hillsides along the Wombeyan Caves Road are made from



Mat Rush *Lomandra longifolia* used for mats, baskets, food, eel traps, twine and dilly bags  
Illustration: M Peach



Aboriginal grinding grooves by a waterhole in Welby Photo: L Knapman



Aboriginal artifacts found in the Southern Highlands Photo: L Knapman



Gundungurra shield

Photo: Anon

# List of Material Equipment used in the Blue Mountains Area by the Gundungurra People

## Men's Tools

### 1. Wooden

- spears, both barbed and simple pointed
- fishing spear, multi-pronged
- spear thrower (*woomera*)
- shields, to ward off clubs (narrow) and spears (wide)
- club (*nulla-nulla, waddy*)
- boomerang

### 2. Stone

- flaked siliceous stone for cutting, scraping, piercing, chopping
- natural pebbles for hammering (hammer and anvil stones)
- ochre (red, yellow, white) for personal adornment and painting

### 3. Hafted

- edge-ground axes, for chopping wood/bark, climbing trees (*mogo*)
- adze flake for woodworking

### 4. Constructed

- trap, a wood and reed tunnel for birds and small mammals
- pitfall trap for wallabies
- fish trap, barrier of rock and wood across watercourse
- bark canoe

### 5. Fire

- For warmth, cooking, toolmaking, hunting, clearing land

## Women's Tools

### 1. Wooden

- Digging stick
- Coolamon, a basket of wood or bark

### 2. Stone

- pounders and grinders for food preparation

### 3. String

- made from inner bark of kurrajong tree
- dilly bag, slung over the shoulder
- fishing line with shell hook
- nets to trap fish and birds

## Clothing

### 1. Skin Cloak

- possum and kangaroo skins, scored for pliancy, sewed with kangaroo sinew, worn fur inside; special to mountains

### 2. Men's possum hair belt, from which to hang weapons and tools

### 3. Arm band

### 4. Women's necklace or headband of kangaroo teeth and reeds

## Accommodation

- open or shelter campsites centred on hearth
- bark hut, a lean-to of bark propped up by sticks (*gunyah*)

(Italicised words are of Dharug origin)

Source: Stockton, ED 1993 p90

stone not found in this locality, indicating that trading took place with visiting people from other areas.

The Australian National Museum holds four items associated with the Gundungurra man Boonda/Jacky Plowright who lived in the Berrima district between the 1830s and 1850s. These are a boomerang, a club, a shield and a stone hatchet head. Labels on the items describe Plowright as 'Last King of the Berrima Tribe' and that they were used in a fight against the 'Shoalhaven River Tribe' in about 1848.

The Australian Museum, Sydney holds a wooden shield from the Southern Highlands – one of the few wooden objects which have survived.

## The Early Days of European Occupation

In the 1826 Government Muster, 67 people in the local Bong Bong group were recorded, 10 in the Mittagong group. By 1832, the government had begun issuing blankets to adults (with half a blanket allowed per child) and so censuses were obtained in some areas. In Berrima in 1832, 40 adults and children were recorded; in Bong Bong, near Moss Vale, there were 46 in 1836.

We know that the number of Aboriginal people declined rapidly after European invasion. European illnesses of every kind beset them; measles, influenza, smallpox and venereal diseases all took their toll. Often in the remaining groups, now reduced in number of individuals, there was neither the physical strength nor sufficient people to engage in collecting food. Further decimation occurred in the 1830s when a wave of smallpox swept through the Gundungurra clans.

Settlers, squatters and townspeople were speedily acquiring the Gundungurra people's land and denying it to groups who had previously hunted and gathered plant materials on it. Any not so taken up was often useless, with low food resources; or not Gundungurra land.

There was almost no employment for these people, just a little seasonal labour and no significant land over which they could have control to continue their traditional life.

Concerned Europeans began the practice of giving Gundungurra people European food such as flour, sugar and tea, sometimes supplemented with tobacco and poor quality liquor. The effect of this change of diet, from fresh meat and vegetables to starch, sugar and liquor proved disastrous.

Also devastating was the change in clothing from traditional bare-skinned or water-proof fur-coated body covering to an assortment of second-hand clothing, including porous blankets which once wet, chilled those who wore them.

## Language

Several Europeans became interested in the Gundungurra language and it was recorded in part, but never fully.

The explorer Ensign Francis Barrallier was the first to record any language in the 1802 journal he kept of his travels in the area.

Sir Thomas Mitchell, Surveyor-General, travelled through Gundungurra lands in 1828 and recorded the vocabulary he gathered. In 1900, ethnologist RH Matthews published more vocabulary as well as the beginnings of a grammar, researched by Mary Everitt.

Just prior to his death Werriberri/William Russell, a Gundungurra leader in the Burratorang Valley, also recorded some examples of language in his 1914 memoirs. Listed there are birds and animals, implements, the seasons, the elements, human emotions and some action words.

When we read the fraction of their language which remains (about 500 words) we can have some appreciation of Gundungurra daily life and people's interdependence with the land and its creatures. The language was still spoken early in the twentieth century but is thought to be no longer spoken. The list of English-Gundungurra words is given in Appendix I.

## Local Names

Some Gundungurra names are still used in the Southern Highlands for geographical features and places: Bargo (Barago), Berrima, Bong Bong (Toom Bong, Boong Boong), Bowral (Bowrell), Bullio, Burrawang, Bundanoon, Burradoo, Colo, Gingenbullen, Jellore (Jeloure), Mittagong (Mirriken, Marraken, Nittigong), Nattai, Tahmoor, Wanganderry (Wanganderry), Wingecarribee (Winge Karrabee), Wombeyan, Yanderra, Yerrinbool.<sup>4</sup>

## Beliefs

The Gundungurra people believed their ancestors were the original inhabitants of this land; that they had formed it; and that the land and its people were one.

A Gundungurra Dreaming story tells of Gurangatch, a fish/reptile creature who lived in the Wollondilly River. Gurangatch was attacked by Mirragan, the tiger cat. As Gurangatch sought to escape, he extended the surrounding river valley so that the Wollondilly, Cox's River and tributaries attained their present size.

## First Contacts

In the Wingecarribee area, the Gundungurra people were first visited in 1798 by the explorer John (James) Wilson. One member of his group kept a diary:

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Wilson run and caught one of them, a girl, thinking to learn something from them, but her language was so different from that one which we had with us that we did not understand her ... we gave her a tomahawk and sent her to the rest of the natives, which were covered with large skins, which reached down to their heels. Here we came to the top of a fine hill in the middle of the day and took a view of the country.<sup>5</sup>

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This 'fine hill' could have been Mount Gibraltar.

Botanist and explorer George Caley met the Gundungurra leader Cannabaygal near Stonequarry Creek in 1804. Caley described him as of athletic build, far surpassing the local men in height and stoutness. Cannabaygal was killed near Appin in a massacre perpetrated by Europeans in 1816.

In 1806, Caley noted that Gundungurra people in the area of Thirlmere (called by them Couridjah, the name now used for a local village) used the banksia

## Summary of Staple Foods used by Gundungurra People in the Blue Mountains Area

### Plants

1. Tree fern
2. Ground orchids
3. Nectar – eg grevillea, waratah, bottle-brush
4. Fruit – eg geebung, lilly-pilly, native currant, native cherry
5. Ground ferns
6. Other plants – lilies, wattle, kurrajong, tree orchids, burrawang (*Macrozamia* sp.)
7. Fungi
8. Exudates – gum, lerp, manna

### Animals

1. Reptiles – snakes, goanna, lizards, tortoises, eggs
2. Small mammals – bush rat, mice, bandicoots, small possums and gliders, echidna, platypus, bats and flying foxes, rat kangaroos
3. Medium sized mammals – wombat, dingo, koala, small wallabies, larger possums and gliders
4. Large mammals – kangaroo, wallaroo, wallaby
5. Birds – ibis, emu, ducks, lyre bird, bower bird, quail, pigeons, parrots, black swan, brush turkey, eggs
6. Insects – ants, cicadas, termites, moths, beetles, bees, wasps, larvae and honey
7. Fish – eels, lampreys, herrings, perch, bass, mullet
8. Molluscs – mussels
9. Amphibians – frogs

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Source: Merriman, J 1993 p85





Black Wattle *Acacia mearnsii* used by Aboriginal people for weapons, implements, ornaments, beverage, waterproof sealant, medicine, twine, tinder and tanning agent

Photo: Anon

(couridjah) flowers surrounding the lakes as the source of a sweet drink.

In 1812 the explorer Evans was assisted by an Aboriginal man, Bundle, who also guided some later explorers.

Other early visitors were John Kennedy, Hamilton Hume and Dr Charles Throsby. Governor Macquarie mentioned encounters with Gundungurra people near Goulburn in 1820. They gave him five eels caught in the Mulwaree Ponds. Macquarie noted the hardiness of the people when he observed them sleeping in the open by their fires in a violent rainstorm with the temperature at 4°C.

### Way of Life

During the early years of settlement, the Gundungurra people's way of life was reported in some detail by explorer Ensign Francis Barrallier, who recorded his observations in a diary. His plan was to discover a way to cross the Blue Mountains by starting in a southerly direction and in 1802 he set out with a small group of men and one Aboriginal assistant, Gogy, whose wife also accompanied the group.

Gogy assisted Barrallier throughout his journeys and introduced many Gundungurra people to him, including Goondel, a Gundungurra leader.

Among his observations is a description of the

method of killing a kangaroo. Working as a group, the men formed a vast circle, one or two miles in diameter. At a given signal, each person lit a small fire in a few tufts of grass which he had prepared and the fire was guided inwards, compelling the kangaroos to stay within the fiery circle. As the fire got closer the animals tried to escape but were speared. The meat was roasted whole with no skinning or gutting and the cooked food cut up, divided according to precedent and distributed among the groups. However, catching kangaroos was difficult and so people mostly ate items that were easier to obtain: possum, snake (skinned and roasted with some tree fern which they also ate), bandicoots, lizards, kangaroo rats, fish and shellfish, lizard eggs, koala (called 'colo'), wombats and 'wild dog'. A parrot's nest was observed and the tree climbed; the man offered the eggs to Barrallier and was insulted when Barrallier declined to accept them.

To cook large items, a hole was dug, a fire lit inside it and the coals covered with earth and rocks. When the hole was hot they opened it up, put the carcass inside, covered it again and let the meat roast.

Gundungurra people's overnight huts were built of bark slabs resting on a cross bar and positioned against the wind. Barrallier's men also used such huts for overnight shelter. On a return journey, Barrallier

found these to have been burnt by others who did not want visitors to their territory.

Weapons were carried on a belt made from possum hair, plaited, about 2cm wide, which was wound around the waist.

Each man would own a waddy, a woomera, spears and a small axe; by 1802 most men had obtained a metal axe. The boomerang was observed by Barrallier:

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It is composed of a piece of wood in the form of a half circle, which they make as sharp as a sabre on both edges and pointed at each end. They throw it on the ground or in the air making it revolve on itself and with such a velocity that one cannot see it returning toward the ground; only the whizzing of it is heard.<sup>6</sup>

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The adults were noticed as being extremely indulgent towards their children. Everything they desired was granted to them such as spears, and the children, play-acting with spears, might even wound their parents.

As Barrallier's group walked through one inhospitable area of land, he noted signs of human occupation and was told that this was the area in which people assembled to make visits into enemy territory. They also used this place to come together with a singer who would arrive here with friends to teach new songs.

We have no information on plant usage in the

Southern Highlands by the Gundungurra people, but we include details of plants used by the nearby Dharawal people supplied by Dharawal woman Frances Bodkin. Many of the plants used by the Dharawal grow on Mount Gibraltar (see Appendix II).

Another close observer of the Gundungurra way of life was William Govett, who published *Sketches of New South Wales* on his return to England. At Tarlo, near Goulburn, Govett visited a camp:

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The next gunya contained two young men, and one of these seemed to be employed with two double sets of string, which by twisting and changing in a very intricate manner, he constantly drew out with the back parts of his hands into a variety of forms and shapes, such as diamonds, squares, and circles.

It was astonishing with what celerity he managed to change the figures, and then hold them up to the observation of his companion. In other gunyas might be seen men and women of different ages, who were either smoking and chatting, or had fallen asleep; but wherever there were boys, infants or adults, something appeared to be doing for the sake of amusement. I observed one man, in particular, who was engaging the attention of a child not more than two years old, by placing a leaf of a particular shape on the back of his left hand, and by striking it with his finger, the leaf would ascend perpendicularly to the height of fourteen to sixteen feet; then



*Three blacks encamped for the night* painting by William Romaine Govett 1807-1848

Photo: National Library of Australia nla.pic-an3365011

descending by degrees, it made various circles, and the child endeavoured, with his little arms extended, to catch the glittering object, to the great amusement of those around. Other children, who were all quite naked, were amused in various ways; some with little tomahawks, were pretending to be cutting and hacking, while others were digging the earth with sticks, in imitation of their mothers, in search of food. Two boys commenced quarrelling, and were making a noisy squabble, but they were soon silenced by the voice of the chief; and I observed some men who were more industriously employed in mending spears, scraping their boomerangs, &c., while others were humming a sort of song, and keeping time by striking two sticks together.<sup>7</sup>



*Moyengully* drawing by TL Mitchell from his *3 Expeditions into the Interior Vol.2* 1828; a kooradgie of the Gundungurra people (c. 1800-1858)

Photo: Mitchell Library, State Library of NSW (ML REF: 981/2B2)

### Conflict, War, Corroboree

Acts of both kindness and hostility occurred on many occasions in the course of Barrallier's journeys of 1802 but in general, the Gundungurra people were peaceable in their meetings with the invaders.<sup>8</sup>

However, in 1816 there was a problem between a Gundungurra group and some Europeans. Governor Macquarie sent soldiers to 'Wingie Karrabee' (Wingecarribee). Some property stolen from stockmen was recovered but no fighting took place. The episode at 'Wingie Karrabee' related to the 1816 war at Cowpastures, when Cannabaygal and others were massacred.

This was the only recorded clash in the Southern Highlands.

In 1830 a battle between a Southern Highlands Aboriginal group (called Bong Bong) and an Illawarra Aboriginal group occurred at Fairy Meadow on the South Coast when intermittent warfare took place for three days. Seventy people were killed.

In 1860, a Gundungurra corroboree was held near Moss Vale. Hundreds of Aboriginal people came from many parts of NSW and Europeans were invited to watch. The occasion was reported in the local press.<sup>9</sup>

### Some Well-Known Leaders

Goondel and Cannabaygal have already been mentioned.

Moyengully (c.1792-1858) was a leader (kooradgie) in the 1840s. He met with Major Mitchell, who drew his portrait and presented him with a pair of trousers, of the same quality as his own. Moyengully would accept no less.

Werriberri, William Russell, (1830-1914) of mixed parentage became a leader of his people in the Burratorang area. His memoir was written in 1914.<sup>10</sup>

### Later Developments

In 1878 two selections of land which had been sought for purchase by the Gundungurra people were instead gazetted as Aboriginal Reserves in the Burratorang Valley. This came about because of interference from European settlers. A small community was established and it was here that William Russell lived. He died in Camden in 1914. These reserves and others in Burratorang Valley had little value for subsistence purposes and the Aborigines gradually dispersed, some moving to La Perouse, a Sydney suburb, where many Aboriginal people had come to live. It is believed that the Gundungurra language would have been known there until the 1950s.<sup>11</sup>



Gristle Fern *Blechnum cartilagineum* used by Aboriginal people for food and warnings

Photo: S Cains

## Indigenous Matters in the Wingecarribee Shire

Wingecarribee Shire Council has established an Indigenous Advisory Committee and appointed an Indigenous Liaison Officer.

At local public events a 'Welcome to Country' ceremony takes place.

Educational programs are conducted in local schools and Indigenous history courses are taught in two schools.

An active Reconciliation group meets regularly and arranges public activities.

A grant to fund information and training of local Aboriginal people has been provided.

Local plaques and sculpture are displayed at Robertson; an annual memorial ceremony is conducted at the Gibbergunyah Nature Reserve; a memorial stands on Oxley Hill.

Native Title claim has been made on Crown land in the Southern Highlands by Gundungurra people in the Blue Mountains. (People affected by Native Title on Crown land agree to Indigenous people using the land for traditional purposes, so long as it does not interfere with what is currently being done with the land. A claim is valid only on Crown land when Native Title has not been extinguished.)<sup>12</sup>

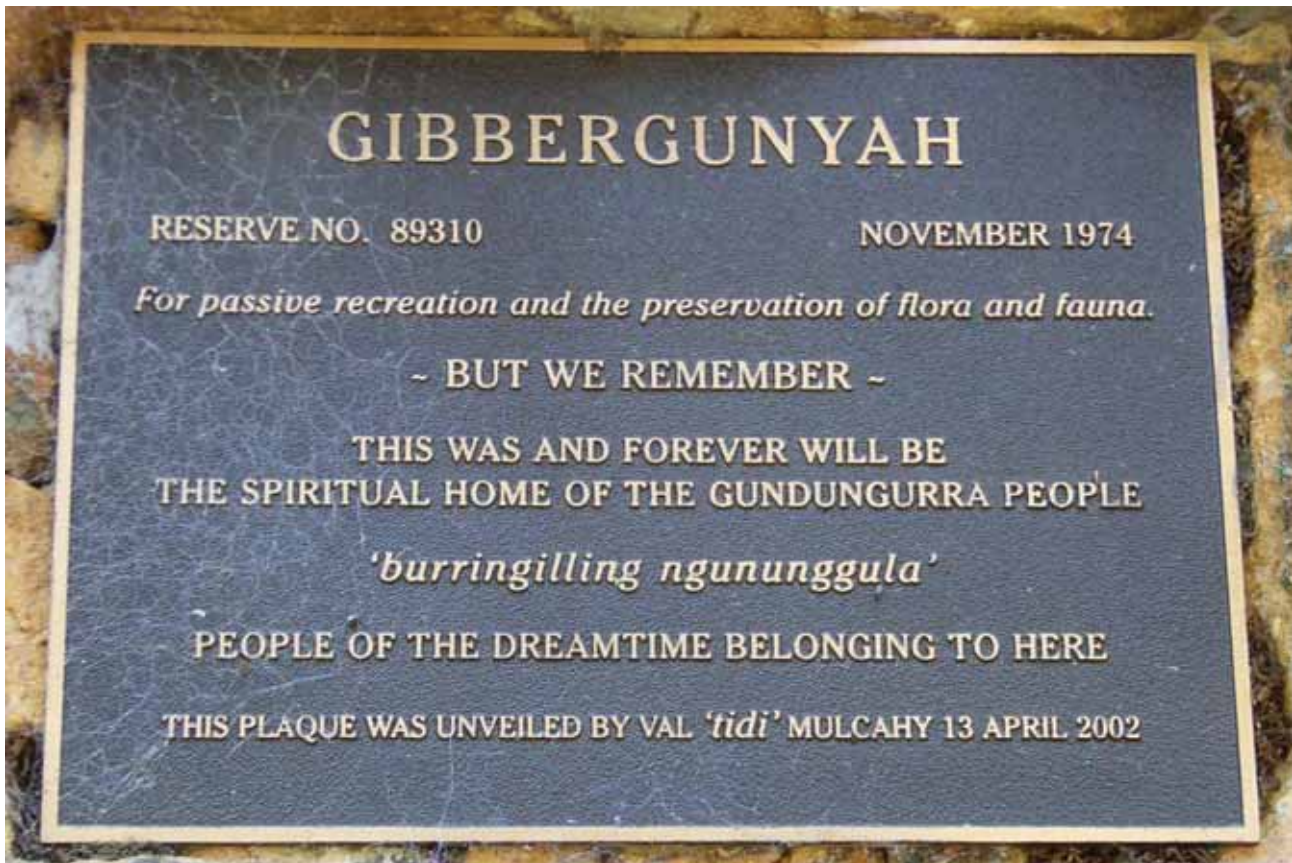


Sweet Sarsaparilla *Smilax glycyphylla* used by Aboriginal people for food, beverage and medicine

Photo: P Jordan

### Note

The Gundungurra Tribal Council may be contacted c/- Mr Bill Hardie, Gundungurra Tribal Council, 14 Cak Street, Katoomba NSW 2780.



Gundungurra memorial plaque in Gibbergunyah Reserve

Photo: J Lemann

### Acknowledgement

Thanks to Leonie Knapman for her valuable assistance.

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### Appendices

- Appendix I Language
- Appendix II Plant Use



*Gable End*, trachyte cottage

Photo: C Segelov

## Chapter 3



# Settlement

Carmen Wright

The writer is a bush regenerator who has been a member of the Mount Gibraltar Landcare and Bushcare Group for seven years. She has lived on the mountain for 16 years.

The first recorded European exploration of the Southern Highlands was in 1798, when two expeditions were led by John Wilson, a former convict who had become an expert bushman.<sup>1</sup>

The first expedition reached the rich pasture lands of the Southern Highlands but, after the return of the second, Governor Hunter did not encourage further exploration. Fear of uncontrolled expansion of the settlement combined with concerns for the security of the increasing herds of government cattle at the Cowpastures made sure that very little exploration took place during the ensuing years.

As the population of the colony and the flocks of animals both increased, the pressure to find suitable land for new settlement grew. It was not, however, until 1814 that the young Hume brothers, Hamilton and John, possibly with their uncle John Kennedy, found the way to those fertile pastures discovered by Wilson.

When his herd of cattle near Bargo failed to thrive on the poor grasses, Lieutenant John Oxley RN, Surveyor General for the colony, was permitted by Governor Macquarie to move the herd to fresh pastures.<sup>2</sup> Thus early in 1816 Oxley's stockmen followed the Humes' track to the Wingecarribee River and grazed the cattle at a camp a little north of the present town of Berrima.

Dr Charles Throsby with Deputy Surveyor General James Meehan, Joseph Wild and Hamilton Hume then explored much of the Highlands. Throsby was ordered to direct the making of a new cart road to the area and upon receiving a 1000 acre land grant east of present day Moss Vale, became the first settler in 1819. Governor Macquarie, when he visited the region in 1820, was delighted with the park-like grounds, rich pastures, ponds and springs of the grant and named it Throsby Park.

Macquarie himself passed close by Mount Gibraltar on returning from Throsby Park to Sydney, writing in his journal:



Lieutenant John Oxley, RN  
Courtesy L Knapman

# Scientific Connections

Dr John Simons

John Simons, PhD MSc, is President of the Berrima District Historical and Family History Society.



John Whitton memorial plaque at Sturt, Mittagong Photo: J Lemann

## Streets of Mittagong

On the lower slopes of the Mittagong side of The Gib, six streets are named after famous scientists and an engineer of the 1880s: Huxley, Siemens, Tyndall, Murchison, Spencer and Faraday. While originally there were 20 streets in Mittagong named after prominent scientists, the irony is that the name of the most famous of them all, Darwin, was lost when Range Road was so prosaically renamed.

The choice of these street names was an expression of the generally held belief that New Sheffield (later Mittagong) would enjoy a significant industrial future. That future did not develop even though the first steel produced in Australia was smelted at the Fitzroy Ironworks. All that remains of the industry is Lake Alexandra, built to supply water to the ironworks and recently revealed extensive archeological sites.

The street names represent 19<sup>th</sup> century English and European scientists. The name of a famous Australian scientist is also preserved. He was Robert Etheridge, a palaeontologist, for many years Director of the Australian Museum. He died in 1920 and is buried in Welby Cemetery. Until recently, his grand-daughter was living in the family home on Mount Gibraltar. The street in Mittagong commemorates him, as do a glacier in Antarctica, a peak in the Kosciuszko National Park and a goldfield in Queensland.

## Father of the New South Wales Railways

Another renowned name associated with the Mittagong side of The Gib is that of John Whitton, 'father of the New South Wales railways'. While maintaining his house in Sydney after retirement, he passed a great deal of time at Mittagong where he stayed at the guest house *Marchmont* which stood

on the site of present day Sturt workshop and restaurant. There the original flagging of the verandah and steps can still be seen and a memorial plaque may be viewed. He died at *Marchmont* in 1898.

From that building he was able to contemplate the first important railway station (with dining room) he designed on the southern line, as well as the hill through which he had tunnelled to take the line farther south. He probably also spent pleasant hours chatting with Horatio Carslaw, a Professor of Mathematics of Sydney University, who lived in the district and whose *Mathematical Tables* was a mandatory purchase for all high school maths students until the advent of the hand-held electronic calculator.

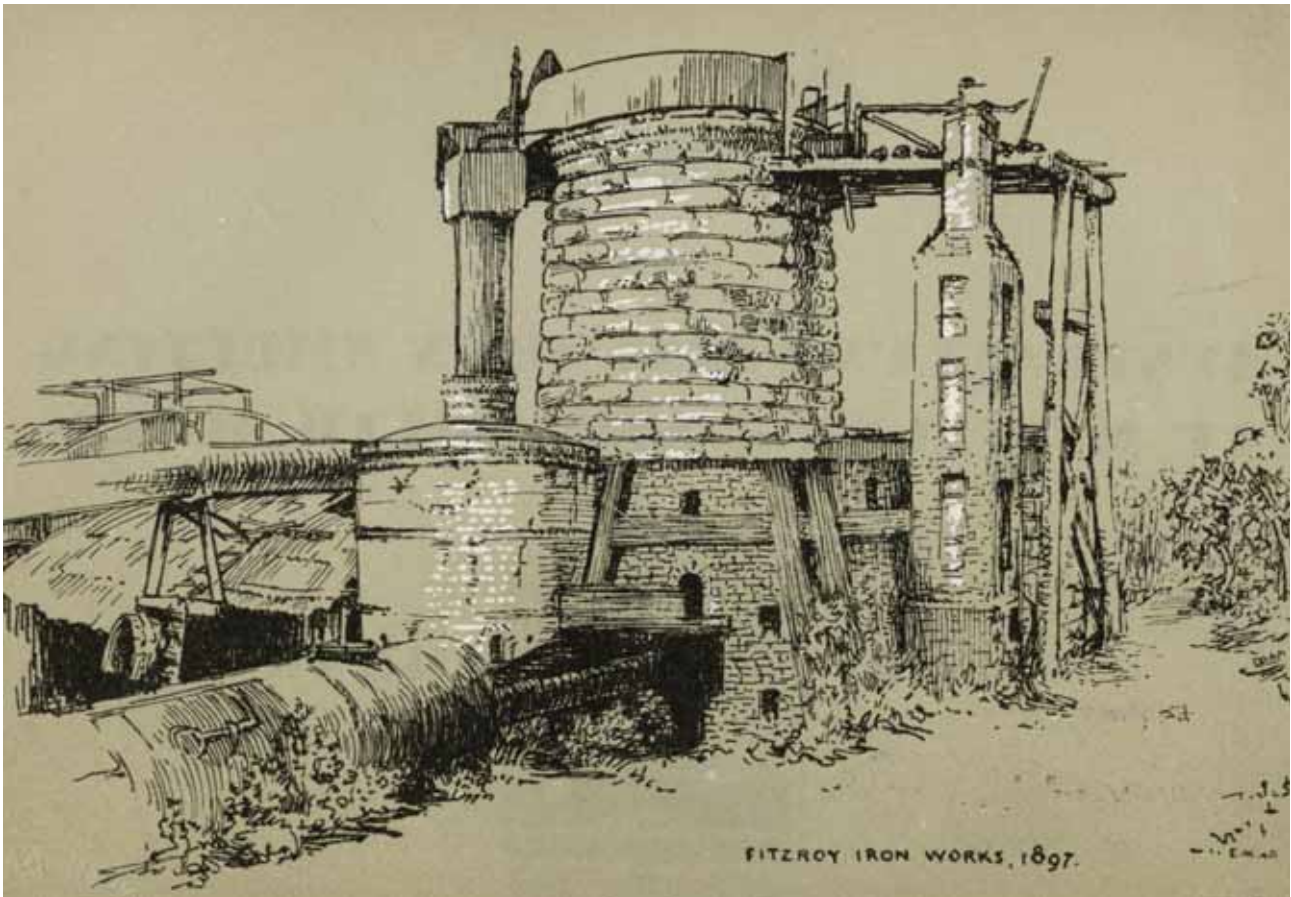
## Dr Edgar Booth

Another science luminary associated with The Gib is the physicist Edgar Booth. The textbook *Physics: Fundamental Laws and Principles* that he co-authored with Phyllis Nicol was more succinctly known as 'Booth and Nicol' by students in both schools and universities for decades.

During his time on The Gib, Booth measured the magnetic aspects of the mountain in order to refine techniques of locating ore deposits by means of such data. His paper about his work was highly regarded.

Following Booth's move to New England University College, his Mount Gibraltar property was bought by Don Hoskins of Australian Iron and Steel, the company his family established and ran for many years until bought by BHP. The Hoskins still live on The Gib but no longer on the original Booth property.





*The Fitzroy Ironworks 1897 pen and wash drawing by Eirene Mort*

Source: National Library of Australia

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Our party...turned off the road to the left along the Wingecarabee [sic] River for 3 or 4 miles to see Mr Oxley's cattle. We struck afterward into the road at the bottom of the Mittagong Range, from which we had a fine view of all the adjacent country.<sup>3</sup>

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In 1821, William Chalker, Principal Overseer of Government Stock, was permitted to graze cattle on the Mittagong Range and on land he was granted in the Mittagong area.<sup>4</sup> Settlement of the Southern Highlands and beyond had begun, for the road was extended south to the Goulburn district.

Major Thomas Mitchell visited the Highlands in 1828 and on climbing the western end of the range recorded the first mention of the name, Gibraltar.

He wrote:

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There is a naked rocky spot called by the stock people, Gibraltar.<sup>5</sup>

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After the death of Oxley in 1828, Major Mitchell was appointed Surveyor General. He surveyed a new southern road to Goulburn as the existing road had steep and difficult grades. Old South Road follows that route today. The new road avoided the Mittagong Range and instead ran through Berrima,

construction starting in 1830 and completed in 1836. It is now known as the Old Hume Highway. Berrima had been chosen by Mitchell to be the principal town of the County of Camden. In 1837 the post office moved to Berrima from Bong Bong, the site of the first village beside the Wingecarabee River. The gaol and courthouse were completed in 1839.

In 1852 another road was surveyed and proclaimed around the western side of Mount Gibraltar to link what is Mittagong today with the Bong Bong area.

In his field notes, written while surveying near present day Mittagong, Mitchell mentioned the presence of the rock 'whinestone' [sic], an old name for microsyenite or trachyte, a stone much admired for its beauty and strength in building.<sup>6</sup> The massive intrusion of Mount Gibraltar trachyte became highly prized in the 1880s and several quarries were established on the mountain for its extraction (see Chapter 6).

During the making of Mitchell's new road in 1833, deposits of iron ore were found a little west of present day Mittagong and in 1848 smelting commenced. The iron works, originally called the Fitzroy Iron Mine, became the first iron works in Australia.<sup>7</sup> Coal deposits were found at Black Bob's Creek some 18 miles away but when coal was found on Crown land adjacent to the works it was decided to obtain a lease to mine that area.

# Mount Gibraltar Railway Tunnel

David Burke, OAM

David is the author of 20 books on many subjects. He has been a resident of the Southern Highlands for 19 years.

In 1863, the Colonial government began an extension to the Great Southern Railway, which then ran from Sydney to Picton. The extension was to include Mittagong (called Chalker's Flat then Nattai), Bowral, Moss Vale (Sutton Forest), Marulan and Goulburn. Under the direction of Engineer-in-Chief John Whitton, the work was completed in 1869, giving a total distance from Sydney of approximately 140 miles (224km) to Goulburn.

The difficult terrain between Picton and Moss Vale required the boring of a deep tunnel through the side of Mount Gibraltar.

Whitton's deputy engineer, George Cowdery who, like his master, had built railways in England, was appointed to supervise the work, which up to that time constituted Australia's greatest engineering feat.

Framed by elliptically-shaped portals, the tunnel of 572 yards (515 metres) had to be cut through the Gibraltar Gap. Shafts were sunk at different depths in the shale, the deepest at 156 feet (48 metres) and stone blasted out below was raised by skips to the surface. The contractors, Larkin and Wakeford, took two years to drive the tunnel and a further year to line it with masonry blocks and brick. The hundreds of navies engaged in

the task lived in a tent encampment beyond the northern portal; men were encouraged to spend their hard-earned pay in the contractor's 'tommy (supply) shops' or at the inevitable sly grog shack.

The extended railway opened to Moss Vale in 1867 and across the Southern Highlands industry and tourism began to change the newly emerging towns because people and goods could now travel to Sydney and back by rail.

A note in the local paper suggests few, if any, trains ran on Sunday. It said: 'Many people of both sexes are in the habit of taking a walk through the tunnel on the Sabbath day.' (Berrima Free Press, 27 June 1885).

After the line was completed, The Gib quarries were able to use its services. A trachyte tramline was installed and stone was taken to the railway by this and other methods.

The Bowral Quarry Siding at the north end of the tunnel was built in 1891 and closed in 1899. The start of the 3'6" gauge Joadja shale mining line and the standard gauge Box Vale colliery line began on the flanks of Mount Gibraltar.

Duplication of the Southern Railway in 1919, following a new route through Bargo and Yerrinbool, called for a second Gib tunnel to be constructed almost parallel to the first one. The 'new' tunnel which our trains use today is better ventilated than the original and somewhat shorter. Once by-passed, the old tunnel was leased to a mushroom grower and during World War II had an RAAF guard stationed at the portal to safeguard ammunition stored within.

As a matter of interest, the tunnel beneath Mount Gibraltar is the last on the Southern line until the train reaches Bethungra, near Wagga Wagga.



Steam Train Emerging from Tunnel, painting by D Burke 2005  
Photo: C Segelov



Tunnel entrance  
Photo: With permission BDHFS

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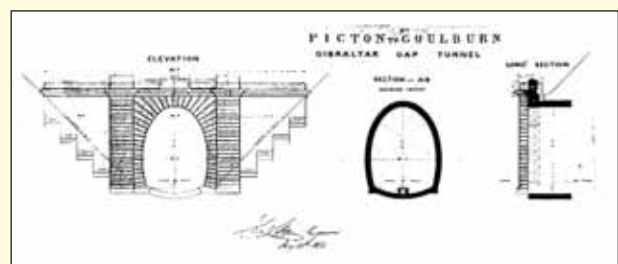


Diagram of tunnel construction

Optimism about the industrial future of the Southern Highlands was high. Land set aside by the re-named Fitzroy Iron Mining Company was to become the town of New Sheffield, an area north of the highway in present day Mittagong and in 1865 a subdivision of 250 lots was offered for sale.<sup>8</sup> This met with some success influenced by the knowledge that construction of the railway line was approaching from Sydney.

Work on the southern railway began in 1855 but because of the difficult terrain did not reach Moss Vale until 1867. The story of the tunnels through the side of Mount Gibraltar is described in detail (see Panel). The single track, used until 1975, followed what is known today as the ‘Loop Line’ and ran west of the present main line. The double track main line

was started in 1913 and reached Moss Vale in 1919.

The arrival of the railway in the Highlands saw the pace of development gain momentum. Deposits of high quality kerosene shale were found in the Joadja valley and a productive industry developed. In 1880 a tramway linked Joadja and Mittagong to transport kerosene and other products of the shale to the railhead and then on to its markets. By 1890 the industry supported a population of 1200 people living in the valley<sup>9</sup> (see Map, Chapter 10).

The Southern Highlands is rich in minerals although often the deposits are in places that are difficult to access. Large coal deposits were found in many areas but the mining of these deposits was intermittent. In the Nattai area in 1883 the Mittagong Coal-Mining Company worked a mine which became known as the Box Vale Colliery. In 1888 a standard gauge line was built to run from the colliery to Mittagong station and then straight to the buyers, but the mine closed in 1896, due, in part, to the absence of secure future contracts. Today the remains of the Box Vale line make an interesting walking track.

The title ‘The Sanatorium of the South’ was given to the Southern Highlands, as the climate was considered beneficial. The 19<sup>th</sup> century belief in miasma or airborne disease led to the appreciation of fresh country air. The chalybeate springs, adjacent to the ironworks, were promoted and drew people to ‘take the waters’. Holiday homes were built. The Highlands and Mount Gibraltar, like Poona in India,



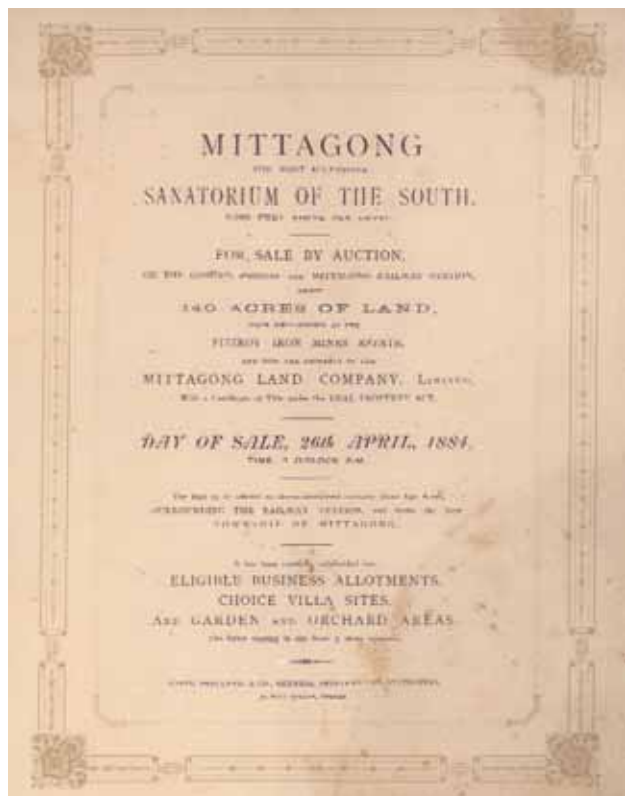
Fitzroy Ironworks circa 1880

Photo: With permission BDHFHS



Ironworks Monument. In 1848 the first Iron Smelting Works in Australia was established near this site. This monument was built to commemorate the event and was unveiled by His Excellency the Governor, Lieutenant General J Northcott, on 2 October 1948

Photo: C Segelov



Sanatorium of the South

With permission BDHFHS

became another 'hill-station' whereby the wealthy could escape the trying heat and humidity of the Sydney summers.

A tourist industry began with the advent of the railway and people could visit the Highlands in greater numbers. Boarding houses for tourists were to be found at popular destinations and as a local paper noted in 1893, 'Bowral holds its own as a fashionable resort.'<sup>10</sup> In 1900 the road to the Wombeyan Caves was completed and tourists could travel to the caves from Bowral, rather than make the much longer trip via Goulburn.

By 1900, despite a number of attempts, the promise of a viable steel industry was fading. The production of steel proved to be uneconomic for both the amount of iron ore was limited and the coal inferior when compared to other sites. The costs of mining kerosene shale were also increasing. This was due to difficulties in accessing the remaining deposits, the imposition of an excise of fourpence a gallon in 1904, and cheaper imported products which were allowed to undercut the price. The company went into liquidation in 1906.<sup>11</sup>

Economic prospects of the region were improved in 1899 when a malthouse was built by the Malting Company of NSW at Mittagong.<sup>12</sup> The altitude was thought to be suitable for the malting process and its proximity to transport, markets and a water supply also contributed to selection of this site.

Quarried trachyte stone was in great demand and prospects for tourism promising as the area became one of the chief tourist resorts in NSW. The rich pastures of the Southern Highlands also allowed small farming to be carried on successfully. Orchards, vegetable crops such as potatoes and cabbages, cattle breeding and timber mills all proved viable. The development of refrigeration and butter-making machines made dairying with all its products a prominent industry. By the new century the Southern Highlands was well established as a productive rural centre.



Trachyte cottages 2005

Photo: J Lemann



*The Turn of the Century*, the road between Mittagong and Bowral, showing the semi-detached trachyte cottages circa 1900 With permission BDHFS

## The Settlement of Mount Gibraltar

By 1900 the natural state of Mount Gibraltar, or The Gib as it was popularly known, had changed. Some clearing of the land had taken place and the savage scarring of the mountain by quarrying was revealed.

Country life in Australia has always held the threat of bushfire and fire has left its mark on The Gib. Stuart Kyngdon tells:

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My father Roger was born in 1905 at *Darjeeling*, the stone cottage on Old South Road. His grandfather, Dr Boughton Kyngdon, had settled in Bowral in 1893 and his eldest son, Francis Kyngdon, in 1903 leased *Darjeeling* and much of the land along Range Road and commenced farming. Francis had been instrumental in establishing the Hawkesbury Agricultural College and was to remain its chief examiner for 16 years. An Oxford University Blue in Athletics, he became the first man to win a University Medal in the discipline of Agricultural Science in the 1860s. A drought had been in progress since the late 1890s, then in January 1905, a devastating fire swept over The Gib and destroyed all the trees in its path as well as my grandfather's cattle. The stone cottage survived only because of its construction but the fire dealt a severe financial blow to the family. At an early age, Roger, my father, remembered being able to see from *Darjeeling* to the original *Whinstone Park* as no trees remained in between. He also remembered the prospectors digging holes all over The Gib looking for gemstones.<sup>13</sup>

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## Development on The Southern Side The Oxley Family

The largest grant of land on The Gib was on the southern side of the mountain and was given to the family of former Surveyor General, John Oxley. In 1855, 27 years after his early death in 1828, his service to the colony was recognised by a grant of 5000 acres made to his family: 4200 acres in the Parish of Mittagong and 800 acres in the Parish of Berrima. Oxley had paid £125 towards this grant upon receiving permission from Governor Brisbane to purchase the land in May 1825.<sup>14</sup>



John Norton Oxley  
Courtesy L Knapman

In 1858 Oxley's elder son, John Norton Oxley, became the sole owner of the 4200 acre grant when his brother, Henry Molesworth Oxley,

sold his interest to him for £7,350 and his mother, Emma, released her interest by a payment of 10 shillings.<sup>15</sup> The land stretched from Burradoo in the south to Bowral, up and across the summit of The Gib, down its eastern slopes and also to the west.

At this time John Norton lived at the original Oxley family home, *Kirkham*, on 1000 acres on the Nepean River near Camden. He married Anne Platt, who died in childbirth, then, in 1854 he married Harriet Hassell, the daughter of the 'galloping parson', the Reverend Thomas Hassall of Cobbity, and a grand-daughter of the Reverend Samuel Marsden.<sup>16</sup>



Henry Molesworth Oxley  
Courtesy L Knapman

Henry Molesworth lived on his father's earlier grant of land on Oxley Hill and in 1849 married Emily Orchard.<sup>17</sup> In 1857 he imported and erected the pre-fabricated iron home which is still used as a family residence to-day. He called the property *Wingecarribee*, where he was to live for the next ten years, until in 1867, he died in his forties as had his father.

The Oxley brothers had invested heavily in property in outback Queensland but they incurred large debts, forcing them to sell many of their holdings, including much of their land in the Southern Highlands. Both men were magistrates and members of the Legislative Council. John Norton, a railway enthusiast, had a great interest in modern technology and was aware of the development potential of his land.<sup>18</sup> Knowing that the railway line would cross his property he had 200 acres surveyed in 1859 and later subdivided for the 'private' township of Bowral (first called *Wingecarribee*, then Burradoo and finally Bowral).

Also in 1859 he donated 43 acres to the Anglican Church, an area still known as The Glebe, which today encompasses the Bradman Oval. John Norton continued selling land throughout the 1860s but finally he was forced to sell the beloved family property, *Kirkham* about 1871.<sup>19</sup> He retired with his family to his mother's home, *Molesworth* at Hunters Hill in Sydney, where Emma died in 1895.

Patrick Lindesay Crawford Shepherd became a property developer in the area in 1869 when he bought lots 1-7 of the Bowral development from John Norton Oxley and subsequently subdivided them.<sup>20</sup> Shepherd was born in Sydney, the youngest son of Thomas Shepherd, a horticulturist who started the Darling Nursery on 35 acres in an area which

became part of the suburb of Darlington, later absorbed into the Sydney University campus. His son gained experience in selling land when his father's property was subdivided in 1856.

PLC Shepherd was to continue buying, subdividing and selling land in the Highlands. He promoted various developments; the Village of Gibraltar at the base of The Gib; the Town of Manchester on the summit; the Wingecarribee Farm; the Gibraltar Estate; all had some measure of success. He became a member of the Legislative Assembly in 1874 and after living in Bowral, built *Lindesay Hall* at Colo Vale in 1883, living there for some years. At a later date its name became *Wensley Dale* and it is still used as a home to-day.

As in the rest of NSW, the 1870s and 1880s in the Southern Highlands were generally times of prosperity and expansion and this was reflected in many of the fine houses which were built on the slopes of The Gib, some of which are described below.

*Rift House* in Carlisle Street, built in 1875 for Sydney merchant and banker Alfred Stanger-Leathes, is in the popular Victorian Italianate style of the time. The building is considered to have regional and state-wide aesthetic significance as a rare and intact example of this style.<sup>21</sup> With its timber coach house, tennis court and extensive gardens, it is an excellent example of a Victorian gentleman's residence. During World War II the Sacred Heart Convent in Rose Bay evacuated the children of its junior boarding school to *Rift House* (and later to Kerever Park in Burradoo).<sup>22</sup>

*Earlsbrae* is an Italianate house in Queen Street which has trachyte foundations. It was once the home of Sir George Fuller, premier of NSW from 1922 to 1925.

*Mount Hamilton*, in Hamilton Avenue, is a very graceful example of the Victorian Georgian style.

*Robin Wood* in Oxley Drive, first known as *Fernside*, was built for Benjamin Short, an insurance salesman who became a director of the AMP Society and who helped to establish the Sydney City Mission in 1862. Short was a man whose success and prominence in society was also defined by his strong faith in his Protestant religion. In his garden he planted every tree mentioned in the Bible, and as an evangelical Baptist, had Sunday church services conducted under one of those trees in the rear garden.

Ernest Henry Burchell, a member of the well known local family and a professional gardener, was engaged during Short's ownership. A later owner of *Robin Wood*, David Absalom, was one of the founders of Tulip Time, a spring festival held in the district.

*Kurkulla* in Evans Lane was built in 1871 and is a surviving example of a 19th century homestead.



*Rift House*

Photo: H Foley



*Earlsbrae*

Photo: C Segelov



*Mount Hamilton*

Photo: Ian Rayner Real Estate



*Maloya* in the 1920s hosting the Physical Culture Club  
 Courtesy: B and M Bratter

In 1909 it became the home of William Evans, managing director of Wunderlich, and his sister Ada Emily Evans. It remained in the Evans family until 1996. Ada Evans became Australia's first female lawyer in 1902, an achievement commemorated by the Macquarie Law School in 2002.<sup>23</sup>

*Maloya* in Gladstone Road was part of a total of 700 acres John Norton Oxley sold to Frederick Tooth in 1872, after Oxley was forced to sell *Kirkham*.<sup>24</sup> The present owners think that the house was built in the 1860s which would place its origins during the ownership of John Norton Oxley, although there is some uncertainty about this.<sup>25</sup> Whilst the house has been extensively altered during its lifetime, the garage, a separate building, shows evidence of prior use, as outlines of an earlier structure may be seen in the walls. In 1880, PLC Shepherd bought the property and a year later sold to William Thomas Angus in whose family it stayed for 45 years.<sup>26</sup>

All the properties mentioned above are still privately owned and occupied as homes today.

### Development on the Northern Side

As Mittagong, on the northern side of The Gib, was established before Bowral, land grants were made earlier than on the southern side of the mountain. Among the grantees were Alexander Brand, John Burton, Thomas Callaghan, William Hynes, Thomas Holt, John Moring, and James Powell.

#### Alexander Brand

In 1850 Alexander Brand was granted Portion 64 (30 acres).<sup>27</sup> Prior to this, in 1845, Brand had leased the *Kangaroo Inn*, later to be known as the *Fitzroy Inn*, in Mittagong, from the owner, Ann Cutter. Ann

and George Cutter purchased the Inn in 1837 but two years later George was transported to Van Diemens Land for attempted murder.<sup>28</sup>

It was quite understandable, then, to read that a condition of Brand's lease stated that George Cutter was only able to occupy the premises under the sufferance of Alexander Brand.<sup>29</sup> George Cutter was subsequently charged with the attempted murder of Alexander Brand in 1851.<sup>30</sup> In 1859, Brand sold his 30 acres on The Gib to James Powell, a storekeeper at Berrima.<sup>31</sup>

#### James Powell

At the age of 14 James Powell was convicted of pickpocketing and transported to Sydney for a term of 14 years. In 1843 he married Mary Ritchey (Ritchie) and gained his freedom in 1845. He became a carrier, and eventually the business partner of an older man, Joseph Levy, who had a store at Berrima. It proved a successful partnership and when Powell's wife, Mary, died, he married Levy's ward, Jane Henshall, in 1853.<sup>32</sup>

Powell became a prosperous storekeeper and postmaster at Berrima. He held a position of trust, acting as banker for those who had gone to the goldfields.<sup>33</sup> He also won the contract to construct the rail line from Haslems Creek Station to Rookwood Cemetery which was completed by 1864.<sup>34</sup>

In 1867 he was granted Portion 63 of 125 acres on The Gib, then in 1868 purchased three allotments from John Norton Oxley (allotment 9 of 32 acres, allotment 10 of 45 acres, and allotment 28 of 115 acres).<sup>35</sup> With the addition of the 30 acres purchased from Alexander Brand, he owned over 347 acres thereby earning the title 'the man who owned the Gib'.<sup>36</sup> He had become a respected member of the community.

In 1870 Powell and his wife moved to Sydney to *Allington*, 88 Blues Point Road, McMahons Point on the harbour. He died there in 1885<sup>37</sup> attended by Dr Kyngdon, whose family is mentioned earlier in this chapter. The eastern window in the Holy Trinity Church at Berrima is a memorial to Powell from his wife, who died in 1902.

#### Thomas Callaghan

In 1854 Thomas Callaghan was granted Portion 65 of 45 acres and Portion 108 of 38 acres. Born in Ireland, he was called to the Irish Bar after graduating from Trinity College, Dublin in 1836. One of his brothers had migrated to NSW and Thomas decided to follow him, arriving in Sydney in 1839. He was admitted to the Bar, becoming number 11 on the roll of barristers. In 1841 he was appointed a commissioner for reporting on claims of grants of land and also acted as a temporary crown prosecutor.<sup>38</sup>



In 1847 he married Eliza, daughter of Justice Milford and his personal diary, which he kept from 1838 to 1845, was preserved by his wife.

He first attended the Berrima court in 1844 and in his diary comments on one of his journeys from Camden travelling ‘in the mail’ that the road was ‘terrific’ (i.e. terrifying). Not surprisingly he borrowed a gig for his return journey.<sup>39</sup>

In 1848 he published two volumes of Acts

and Ordinances for which he was awarded a bronze medal at London’s Great Crystal Palace Exhibition in 1851. He became one of the foundation judges and chairmen of Quarter Sessions after the District Courts Acts was passed in 1858. In 1859 he presided at the first sitting of the District Court held in the Southern District at Goulburn.

Possibly Callaghan, with his Irish love of horses, wished to breed a few horses on Mount Gibraltar and perhaps to build there, for he did not like accommodation at public inns. However, in 1861 he sold the 83 acres for £250 to the well known entrepreneur, Thomas Sutcliffe Mort.<sup>40</sup>

Callaghan acquired a property in Braidwood and while attending a horse sale there, an accident unexpectedly led to his death in 1863 at the age of 48.<sup>41</sup> By public subscription the townspeople erected an obelisk to his memory ‘in testimony of the impartiality and ability with which he discharged his official duties’.

A resident of The Gib, Dr JM Bennett, AM, writes as editor in the 2005 publication of *Callaghan’s Diary*:

His contribution to the law in NSW was not merely judicial, but one of great public usefulness in helping to make the law accessible. He was also a pioneer of professional law reporting in Australia.<sup>42</sup>



Morts Lane, Mount Gibraltar

Photo: R Rogers



The two houses of *Whinstone Park* are shown with *Greenhayes* on the left. The man standing is popularly believed to be WH Jones.

Courtesy of D Taylor



### **Thomas Sutcliffe Mort**

In 1864, Mort, with Thomas Chalder, sold Portion 65 to Jane Davey and John Dawson.<sup>43</sup> Later, part of a second lot, Portion 108, became a small subdivision known as *Green Hills*.<sup>44</sup>

Mort was a proponent of refrigeration and founded the New South Wales Fresh Food and Ice Company. The first dairy depot outside Sydney was built in 1882, with its own rail siding, beside The Maltings site in Mittagong.<sup>45</sup> Mort died in 1878 before he could see the success of this business.

In 1937, Mort's great-niece, artist Eirene Mort, with her friend Nora Weston, a wood carver, bought an old building and a number of acres on The Gib adjacent to the land which her great uncle had once owned.<sup>46</sup> The new owners improved and enlarged the building over the years, for the rear part was of a slab construction and quite old. There is a deep well at the back of the property, which is covered today, but in earlier times was fed by a drain running from the roof of the cowshed. Still used as a home, the house was named *Greenhayes* after Thomas Sutcliffe Mort's home near Manchester in England and today the lane in front of the house is known as Morts Lane.<sup>47</sup>

This old house *Greenhayes* was once part of a large estate known in the 1880s as *Whinstone Park*. The illustration shows the two houses of the estate. The first house, *Greenhayes*, still standing today, is on the left, but the second house on the right has gone. The two houses were shown for sale in separate lots on the Whinstone Park Estate subdivision of 1928.

In 1938, Victor Bradman, former President of the Nattai Shire and elder brother of Sir Donald Bradman, bought the second lot and built *Yammatree* on this ten acres of land. He and his son Paul planted the trees along Morts Lane.<sup>48</sup>

### **John Thompson**

A man of some wealth, John Thompson purchased land on The Gib in the early 1880s. When his wife Sarah died in 1886, he moved to the estate which he had named *Whinstone Park*.<sup>49</sup>

John Thompson's father, Joseph, brought his large family to Sydney from England in 1834 and developed a prosperous drapery business. Joseph, a very religious man, was a Dissenter and with David Jones, John Fairfax, the Wilshire family and others attended the Independent Chapel in Pitt Street, Sydney.<sup>50</sup> This later became the Congregational Church. The family business of Thompson and Giles was closed in 1890 and the property resumed by the NSW Government as part of Martin Place. John Thompson's son, John Gilbert Thompson, purchased a partnership with David Jones and Company and, at a later date, became managing director.<sup>51</sup> David Jones was, and still is, one of the leading emporiums in Australia.

Early in 1889, a notice was placed in the Southern Mail by a firm of Sydney architects calling for builders to tender for alterations to the property *Whinstone Park*.<sup>52</sup> John Thompson, then aged 70, married Miss Anne Mate on 7 May 1889 in Wagga Wagga.<sup>53</sup> Unfortunately he was taken ill and died intestate 10 days later.

The inheritance was complicated. The land came into the hands of Thomas Pratt by marriage to John Thompson's only daughter Annie Caroline. Pratt's widow Barbara and Elsie, a child from his first marriage, became the vendors of their interests to the development company, The Greenacre Park Ltd in October 1924.<sup>54</sup> This company was associated with the property developer, Sir Arthur Rickard. The land, over 293 acres, was subdivided in 1928.

### **William Henry Jones**

Another name often linked with *Whinstone Park* was that of William Henry Jones. With his parents he had come to the area from Staffordshire in England as an ironworker in 1884. He may have moved to *Whinstone Park* during the time of John Thompson. He leased the dairy, occupied one of the houses, which later became known as *Greenhayes* and stayed there for many years, raising a family of six children. He left when he knew the property was to be sold.<sup>55</sup>

WH Jones was a Methodist lay preacher, a Sunday School Supervisor and a Freemason. He became a successful businessman and a mayor of Mittagong.<sup>56</sup> His long-standing friend, Joshua Stokes, was also a Freemason and was one of the founders of the Primitive Methodist Church in Bowral.<sup>57</sup> A lover of music, Stokes supervised the Methodist choir and orchestra and he too became a successful businessman and a mayor of Bowral.

### **The Mount Gibraltar Reserve**

#### **Joshua Stokes**

In 1919, Joshua Stokes acted with inspired foresight when he saw the opportunity to purchase about 79 acres of land on the summit of The Gib previously owned by the deceased Alexander Amos. His vision was to see the area used as a nature reserve by the people of the district rather than letting private individuals enclose it.

Joshua Stokes is said to have funded the purchase of about 59 acres of this land until it could be secured by the Bowral Municipal Council. The Governor of NSW, Sir Walter Davidson, whose consent was required at that time for councils to buy land, approved the purchase for the purpose of a



Joshua Stokes, 1909  
With permission BDHFHS

PARK AND RECREATION GROUND for £147.10.00 on 13<sup>th</sup> August, 1919.<sup>58</sup>

About the same time Joshua Stokes purchased, for the sum of £50.13.6 approximately 20 acres on the Mittagong side of the summit. In 1920 it was resumed by the Minister for Public Works and leased back to the Council of Mittagong Municipality in 1925.<sup>59</sup>

Unfortunately his actions angered many of the local people who thought he was wasting public money. After his 23 years of community service, he failed to be re-elected as a councillor.

During the Depression in the 1930s, the new Minister for Local Government, Eric Spooner, visited the Highlands. On being taken up to The Gib by the Council's Electrical Engineer, Keith Crisp, Spooner expressed delight with the area and announced that £60,000 would be available for relief work. This was to be used to build a road from Mittagong to the top of the mountain and down to Bowral.<sup>60</sup> At last the value of the site was understood.

Bert Venables, a councillor and later, mayor of the time, wrote:

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The acres that Jos. Stokes had bought for £150 had turned into something.<sup>61</sup>

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Joshua Stokes died in 1935. In his obituary eulogies, there was no mention of his public-spirited gesture of buying land for a reserve for the local community. In 1938 there was a proposal by Councillors Blackett and Pickles to perpetuate the memory of Joshua Stokes in some way but it was not carried out until 1950, when, at a ceremony on The Gib, a plaque was dedicated and unveiled by his son, Walter Stokes.<sup>62</sup> This, after 30 years, was public recognition of his service to the community in 1919. This memorial may be seen at the T-junction of Oxley Drive and the scenic loop road.

In 1936 the Lands Department gazetted the new road on The Gib. This road and the lookouts on the mountain were built with money from the Spooner Emergency Relief Scheme. Spooner himself seems to have maintained an interest in the program. In August 1937 he suggested that a plan of layout should be prepared so that men on the job could be employed to prepare the Reserve for parking, picnicking or garden plots. This plan was referred to Spooner's department.<sup>63</sup>

The Depression was a time of hardship for many people and there are accounts of soup kitchens at Berrima and Colo Vale in 1931.<sup>64</sup> A usual practice was for married men to be employed for a longer period of time than those who were single. Stuart Kyngdon tells of his grandfather, Stan Griffiths, who had a charcoal burning business at Colo Vale:



This commemorative plaque honours Joshua Stokes and was unveiled by his son Walter on 26 November 1950.

Photo: C Segelov



Trachyte wall built during the Spooner unemployment relief program

Photo: C Segelov

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He drove as far as Canyonleigh and Picton in his 4-ton truck picking up and dropping off workers. The men worked on The Gib, sleeping by the side of the road, one week in four. The stone remnants of one of their camps can still be seen in King St, not far from Mittagong Lookout. This gave Stan Griffiths work for two half days per week and petrol to the value of 6 shillings which he collected from Mittagong Police Station after each trip.<sup>65</sup>

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This policy was in accordance with Spooner's wish, as Bert Venables writes,

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that some work be found for men outside the area and they were to camp on the job to get them away from home and mother where they could sit and brood or stir up strife.<sup>66</sup>

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Small mounds of stones are still visible and are all that remain of the bark humpies and huts that those workmen made to protect themselves from the elements. The Gib had become another 'Struggletown.'

The Reserve was gradually expanded from the original 79 acres (32ha) of Joshua Stokes' purchase in 1919 to the 320 acres (130ha) of today. After the Second World War, first the Bowral Municipal Council, then the Wingecarribee Shire Council followed a policy of acquiring land for the reserve whenever possible (see Chapter 8).

It was declared a fauna and flora reserve in 1940. In the 1960s the Rotary Club of Bowral created pleasant picnic grounds at the Inner Bowl and the Bowral Lookout. In 1993 The Mount Gibraltar Landcare and Bushcare group was formed to restore the neglected Reserve (see Chapter 7). In 1986, after a time of fierce public opposition to new quarrying proposals, the quarries were finally closed and the land added to the Reserve (see Chapter 6).

### Mount Gibraltar: The Present

*Frensham*, the well known girls' school, is situated at the base of The Gib on the Mittagong side. Noted for its focus on the arts, the school was started by the remarkable educationist Winifred West, CBE and her friend Phyllis Clubbe in 1913. A suitable house for the school was found in AW Tooth's home, *Y-Berth*. A lease for three years was signed and *Frensham* began.

As the school prospered new buildings were bought and adapted. In 1917 a large area of land was purchased. This included land near Range Road where a special area of intact bush stretches through the foothills of The Gib and is known as the *Upper Holt*.

Winifred West believed in schools interacting with the local community and an example of this occurred



*The Forest, Frensham* by Harold Cazneaux 1878 -1953  
National Library of Australia PIC P644/1-5 P696 P1187

in 1941. Her concern for local untrained young people led her to create *Sturt*, a handcraft centre where special skills, such as weaving, carpentry and pottery could be learnt (see Chapter 4). *Sturt* today is a vital art and crafts centre and a creative stimulus for the region. *Frensham*, *Sturt* and nearby *Gib Gate* preparatory school, with its pleasant old homestead, are administered by Winifred West Schools Ltd.<sup>67</sup>

The parents of *Frensham* students have often lived on The Gib or had holiday homes there. In 1951, the family of the first student, Mary Nicholson, bought *Robin Hill* in Oxley Drive near the top of The Gib. Mary Nicholson's niece is Dr Catherine Hamlin OAM, one of Australia's National Living Treasures, renowned for her dedicated work with her husband, the late Dr Reg Hamlin. Over many years in Ethiopia they created and ran a fistula clinic which Dr Hamlin still supervises. Dr Hamlin, nee Nicholson, was also a student of *Frensham* and no doubt continued her association with the school when staying over the years at *Robin Hill*.<sup>68</sup>



Whinstone Park, springtime

Photo: J Lemann



Girl Guide emblem for Bebrue

Photo: J Lemann

Another relative, Dr Richard Hanbury, lives close by with his family at the second *Whinstone Park* which, in spring, is noted for its sweep of daffodils and jonquils down to the roadside. Dr Hanbury is Convenor of the Mount Gibraltar Landcare and Bushcare group.

A property near the top of The Gib in Duke Street is *The White House*, part of the Whinstone Park subdivision. In the 1980s it became the residence of pop star Jimmy Barnes and his family. Bemused residents became accustomed to tourist buses slowly driving by. Everything was painted white: the extensive house, the two-storey garage, pool house, gazebo, fences and gates, all making a distinctive impression.

Further down Oxley Drive on the Mittagong side of The Gib is *Bebrue*, a centre for the Girl Guide movement. In 1970, Winifred Egan gave the movement an eight acre block of land for use as a campsite where native trees, plants and wildlife were to be protected.

A badge showing the emblem of a bird, which Guides may purchase, was designed by Merrillyn, daughter of Claude Crowe whose family nursery at Berrima supplied many of the great gardens of the Highlands. Joyce Arnold gave the original shed and equipment and the centre was opened in 1972. The Bowral/Mittagong Rotary Club built a cottage which was opened in 1984 and put to community use on many occasions.<sup>69</sup>



Reed

Photo: S Cains



Stanhope

Photo: C Segelov



Greyldayes Farm

Photo: Courtesy of Highlife Magazine

The second *Whinstone Park* was part of the 1928 subdivision and over 26 acres bought by Richard Traill, a Sydney dentist and his wife, Mary.<sup>70</sup> The house was built in 1932 as their holiday home and the local spring and swimming pool became private property and provided water, propelled to the house by a hydraulic ram pump.

In 1938 it was purchased by Mick and Dorothy Florance and was to become their principal home. Their cousin, Dr Brian Florance, who is now a resident of The Gib, remembers his first visits to his cousin's home at *Whinstone Park* and his holiday spent with his grandparents at their home in Links Road.

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I must have been 10 years old in December 1938 and I remember the extremely hot weather. In January it became even hotter and eventually the terrible bushfire of 1939 had begun. I had also become aware of a griping pain in my abdomen and my father, a doctor, diagnosed my pain as acute appendicitis but, by this time the fire was spreading and it was decided that it was too dangerous to operate at Bowral Hospital as the ether might ignite in the intense heat. That night, as the road to Sydney was open, my father decided to drive there. Passing The Gib the memory of the mountain ablaze along its western side and curling around to Mittagong remains with me today. My father made our way through the fires and we finally reached the Sydney hospital.<sup>71</sup>

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*Whinstone Park* was not affected by the fire but others were not so fortunate. Over 40 houses in the Highlands were burnt to the ground on 14th January 1939.

Today dairy farming and stock grazing, once the main industries on the mountain, have declined and only the occasional paddock of cattle is seen. Mushroom growing in the old railway tunnel has been carried on intermittently. Mining for gemstones was pursued without success during the early 1900s. During the last century, small areas on the slopes were used for commercial vegetable and flower growing but this has now ceased. Reynolds Nursery opposite Bracken Street has long since gone and the trachyte quarries are closed.

Residential construction is becoming the predominant industry as the Southern Highlands, part of the Sydney to Canberra corridor, now serves to some extent, as a dormitory area for Sydney and its satellite centres.

The inaccessibility of The Gib hindered its initial development. The early subdivisions by PLC Shepherd were of an introductory nature but the 1928 *Whinstone Park Estate* subdivision signalled

development of large areas of The Gib, which accelerated when the new scenic road was completed. As the mountain became more accessible, it became a holiday destination as people took advantage of splendid residential sites, some having magnificent views. Holiday ‘shacks’ dotted the area, interspersed with a few substantial homes.<sup>72</sup>

Today the roads of the mountain wind down displaying a range of properties. Both contemporary and traditional houses may be seen, some with panoramic outlooks and acreage and others set in bushland or in well-tended, cool-climate gardens.

It is also of interest to note that well known established families such as Blatch, Burchell, Foley, Kyngdon, Pope, Robinson and Stokes are still living on the mountain.

From its natural state The Gib became firstly a rural area, then a quarry site, a temporary ‘Struggletown’, a holiday destination and finally a highly desirable residential area.

The mountain’s microsyenite rock with its rich volcanic soil supports the endangered remnant *Mount Gibraltar Forest*. This makes the Mount Gibraltar Reserve a rare place in the Australian environment. It is a heritage for our nation and will be appreciated by future Australians. It is a place for all to enjoy.



Aberley

Photo: S Gregson

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- <sup>3</sup> Ibid. p146
- <sup>4</sup> Jervis, J *A History of the Berrima District 1798-1973* Library of Australian History 1986 p17
- <sup>5</sup> Mitchell, TL *Field Notes and Sketchbooks No 42*
- <sup>6</sup> Mitchell, TL *Field Notes and Sketchbooks No 38* ‘On this portion of the road excellent whinestone is at hand in several places’
- <sup>7</sup> Else-Mitchell, R *Early Industries in the Mittagong District* Berrima District Historical Society 1981 p2
- <sup>8</sup> *Encyclopaedia Britannica* 13th ed. Sheffield is a city in Yorkshire, England then engaged in the manufacture of heavy steel
- <sup>9</sup> Knapman, L *Joadja Creek: the Shale Oil Town and Its People 1870-1911* Hale and Iremonger 1988
- <sup>10</sup> Jervis, J op.cit. p170
- <sup>11</sup> Else-Mitchell, R. op.cit. p49
- <sup>12</sup> Jervis, J op.cit. p167. The industry did not receive a lot of support from local barley growers at first. Tooth and Co Ltd bought the business and erected another malthouse and by 1916 there were three houses. Today it is no longer operating.

- <sup>13</sup> Stuart Kyngdon, letter 3 November 2005
- <sup>14</sup> Dowd, BT ‘Gift, Land Grant to Oxley Family at Wingecarribee’ pp.203-5 Royal Australian Historical Society
- <sup>15</sup> LTO, OST Book 54 No 697 Oxley/Oxley
- <sup>16</sup> *Australian Dictionary of Biography 1788-1850 Vol 1* p522
  - i. Rev. Thomas Hassall had a very large parish, from Cobbitty to Berrima to Bong Bong to Goulburn. He was probably the first of Australia’s bush parsons.
  - ii. Vol. 2 p207 Samuel Marsden in 1794 became assistant to the chaplain of NSW. He settled at Parramatta as a large landowner and farmer.
- <sup>17</sup> Jervis, J op. cit. p94
- <sup>18</sup> Rowland, EC ‘Life and Work of Lieutenant John Oxley RN’ Royal Australian Historical Society Journal Vol.8 Part 14, 1942
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- <sup>24</sup> LTO, OST Book 133 No 163 (193 acres). LTO, OST Book 133 No 769 (509 acres)
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- <sup>37</sup> Death Cert. James Powell Reg. No 6279
- <sup>38</sup> Holt, HTE *A Court Rises* The Law Foundation of NSW pp21-26
- <sup>39</sup> Callaghan, T, Bennett, JM (ed.) *Callaghan's Diary* Francis Forbes Society for Australian Legal History 2005 p193
- <sup>40</sup> LTO, OST Book 74 No.167 Callaghan/Mort
- <sup>41</sup> Holt, HTE op.cit. p26
- <sup>42</sup> *Callaghan's Diary* op. cit. p10
- <sup>43</sup> LTO, OST Book 89 No. 226/7 Mort and Chalder/Davey and Dawson
- <sup>44</sup> Parish Map of Mittagong [n.d.], 556 Drawer 19 Berrima District Historical Society
- <sup>45</sup> McColgan, J *Southern Highlands Story* McColgan p146
- <sup>46</sup> LTO, TT Register 4708 Fol. 167
- <sup>47</sup> *The Australian Dictionary of Biography 1851-1890 Vol 5* p199. Thomas Sutcliffe Mort came to Sydney in 1838. By 1843 he was holding wool auctions and then became associated with many business enterprises. He developed Mort's Dry Dock in 1855 and later an agricultural company at Bodalla on the south coast of NSW, eventually becoming a benefactor to these two concerns. As a result of speculation and inflation he became a wealthy man. A keen gardener, he was president of the Botanical and Horticultural Society of NSW. He was also well known as a prominent layman in the Anglican Church. His statue stands in Macquarie Place, Sydney.
- <sup>48</sup> Stuart Kyngdon, Letter 3 November 2005
- <sup>49</sup> Bowral Free Press 25 May 1889 p1 'Since the death of his wife Mr Thompson has resided at Whinstone Park'
- <sup>50</sup> *Australian Dictionary of Biography 1851-1890 Vol.4* p148.
- i. John Fairfax, one of the worshippers mentioned at the Independent Chapel was an immigrant with little financial backing who arrived in Sydney with his wife and three children in 1838. He had trained as a printer and part-owned a small newspaper in England. When he died in 1877, as the founder of the Sydney Morning Herald, he had seen it become one of the most respected and influential journals in the British Empire. The Fairfax family dynasty continued its ownership of the Fairfax Press until its sale in 1989.
- Australian Dictionary of Biography 1788-1850 Vol. 2* p608
- ii. The Wilshire family became prominent in the tanning industry. James, the founder of the family, arrived in Australia in 1800 and worked in the Commissary Department whilst starting up his own business at Brickfield Hill. He retired from the Department in March 1812.
- <sup>51</sup> ER Baker, Letter 19 January 2005
- <sup>52</sup> Southern Mail 26 February 1889 p3 'To builders. Tenders are required for additions and alterations to a weatherboard cottage at Whinstone Park, Greenhills near Mittagong. Plans and specifications may be had upon application at the above address or with the undersigned, to whom tenders are to be submitted not later than Saturday, March 9th. Wilshire and Shaw Architects, Evans Chambers, 50 Castlereagh St, Sydney.'
- <sup>53</sup> Marriage Reg. No 5890 Federation Index. John Thompson and Anne Mate 1889
- <sup>54</sup> LTO, OST Book 1366 No 347 Land Titles Schedule 267700
- <sup>55</sup> Southern Mail 11 May 1923 p3 col5 Auction Sale at Whinstone Park on account of WH Jones Esq. Dairy Cattle and Farming Machinery.
- ii. Southern Mail 5 Jun 1923 The well known farm Whinstone Park, Green Hills, Mittagong, containing an area of about 800 acres and with two residences, was sold at auction in Sydney last week by Messrs Richardson and Wrench.
- <sup>56</sup> Southern Mail 21 August 1942 p3 The late WH Jones' obituary notice
- <sup>57</sup> Southern Mail 9 May 1922 'Wedding. Knight/Stokes "Brides Parents"' proposed by W.H Jones'
- <sup>58</sup> LTO, Transfer NA 503055 Local Government (Shires) Act 1905 No 33 (15/16)
- <sup>59</sup> LTO, Transfer A503054 LTO Notice of Resumption A639288 LTO Memorandum of Lease B172451, Memorandum of Lease B199230
- <sup>60</sup> The Four Mails 1December 1950 'Memorial Plaque Unveiled'
- <sup>61</sup> *The Venables Papers* (former Mayor of Bowral Ald. H. Fergus Venables) Berrima District Historical Society p10
- <sup>62</sup> The Four Mails 1December 1950 'Memorial Plaque Unveiled'
- <sup>63</sup> Bowral Council Minutes of Meeting 1935-1942 25 August 1937 No 1979
- <sup>64</sup> Commonwealth Association History *50 Years Colo Vale*. Southern Mail 18 August 1931 'Soup Kitchen at Berrima'
- <sup>65</sup> Stuart Kyngdon, pers. comm.
- <sup>66</sup> *Venables Papers*, Berrima District Historical Society p10
- <sup>67</sup> Tuckey, EV *Fifty Years of Frensham* Halstead Press 1963 p68
- <sup>68</sup> Dr Richard Hanbury, pers. comm.
- <sup>69</sup> Marilyn Horton, pers. comm.
- <sup>70</sup> LTO, TT Register 4450 Fol.181, Reg. 4232 Fol. 212, Reg. 4450 Fol.180
- <sup>71</sup> Dr Brian Florance, Letter 23 December 2005
- <sup>72</sup> Stuart Kyngdon, pers. comm.

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### Abbreviations

LTO- Land Titles Office  
 OST- Old System Titles  
 TT - Torrens Title  
 LO - Lands Office (Department of Lands)

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### Further Reading

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*The Vale of Mittagong* (1892 watercolour over pencil 55.1 x 96.1 cm) by Arthur Streeton, Australia 1867-1943  
W Booth Bequest 1961 National Gallery of Victoria, Melbourne



## Chapter 4



# Art on The Gib

Jenny Simons

Jenny Simons, MA, President of the Australian Plants Society, Southern Highlands, an experienced bush regenerator, has been working as a volunteer on Mount Gibraltar from the beginning of the project.

The Gib has inspired several artists of renown who have recorded their impressions for us to share. Such talent helps us to interpret Mount Gibraltar through their eyes and gain a new dimension in our appreciation of the mountain.

### Sir Arthur Streeton

Streeton (1867–1943) was a landscape painter who brought to popular understanding the beauty of the Australian landscape. An art critic says:

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In adapting the high keyed palette of Turner to the local scene he gave great emphasis to the well known contention that Australia was a blue and gold country... [He convinced] a large middle class Australian public that English oaks and elms were not the sole requisite of excellence in landscape painting, and that the Australian countryside, with its blue-shadowed eucalypts and golden pasturelands, had unique indigenous beauty.<sup>1</sup>

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As the new century approached, Streeton, a Victorian, achieved success when his landscape painting *Still Glides the Stream* was purchased by the Art Gallery of NSW. He then came to live in Sydney and in 1892 visited Mittagong to paint. Writing to his friend, the painter Tom Roberts, about his new work, *The Vale of Mittagong*, he says:

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Have been 4 or 5 days on a picture from the summit of a huge precipice called The Gib. (Gibraltar) – This picture I wish to make chiefly remarkable for its delicate colouring & to that end have climbed the aforesaid rock (400 or 500 feet up) 5 times & down again, after a walk of 1½ miles from the township – However have done my best – & have I think already made the picture – Much my best commencement for picture in Watercolour paints. – Mittagong is beautifully surrounded by high & rocky hills – there are about 4 or 5 churches, 4 or 5 public houses, a Blacksmith shop, store etc etc.<sup>2</sup>

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## Janet Cosh



Janet Cosh (1900-1989) was an extremely active local historian and amateur botanist who collected plant material all over the Southern Highlands including Mount Gibraltar.

This she described and illustrated. Her working drawings and watercolours are now held at Fitzroy Falls Visitors Centre in the Morton National Park and at the Janet Cosh Herbarium, University of Wollongong.

Janet Cosh is the grand-daughter of the remarkably talented local pioneer, Louisa Atkinson.



Sydney Golden Wattle *Acacia longifolia*, watercolour sketch by Janet Cosh.

Courtesy of Janet Cosh Herbarium, University of Wollongong

Painted from a spot near the present Mount Jellore Lookout, Streeton's *The Vale of Mittagong* (1892), a large work in watercolour and pencil, was first purchased, in Melbourne, by the collector William Lynch in 1896.

It was acquired by the National Gallery of Victoria in 1961. In its exhibition notes the gallery says:

Although the practice of watercolour on this scale was still relatively new to Streeton... he tackled the challenging scene with attention to small details, such as the train in the foreground and the crimson waratahs blooming on Gibraltar Rock. He initially outlined the composition in pencil before applying broad washes of colour, adding single darker strokes to some areas and scratching in lines with the end of his brush, exposing white areas of the paper to add greater highlights. The result is a beautiful panorama with a delicate sense of colouring.<sup>3</sup>

After this period he lived and exhibited in Europe and North America, winning a Gold Medal, Paris Salon in 1908. He returned permanently to Australia in 1924, won the Wynne Prize at the NSW Art Gallery in 1928 and has become a much loved Australian artist.

## Neville Cayley

At about the same time as Streeton was painting, Neville HP Cayley (1853-1903) painted a view of Bowral from his home on Mount Gibraltar. Cayley is better known as a painter of birds, who, with John Gould, helped develop popular interest in Australian birds. His paintings were purchased by many local residents<sup>4</sup> and some may still be in private hands in Wingecarribee.

His watercolour painting of Bowral (1890) was described in the local press:

Mr Neville Cayley is busy painting the town of Bowral on a large scale, being under the impression that it would be a sin to allow such beautiful landscape to remain without its being reproduced in the best way possible, so that the whole of the colonies may see what the sanatorium of NSW is like.<sup>5</sup>

This painting was raffled and won by JL Campbell of the Grand Hotel and later bought at an auction sale by James Huggett.<sup>6</sup> The present owner has given a photographic copy of the work to the Berrima District Historical and Family History Society where it may be viewed.

Neville HP Cayley's son, Neville W Cayley (1886-1950) was also a bird painter. His best known work is



Painting of Bowral (untitled) Neville HP Cayley 1890

With permission of the owner



*A View of Bowral and its Surroundings*, oil painting by John Salvana 1895. It carries the caption:

'There Bowral stands, while high The Gib defends  
High hills and lovely scenes for nature's friends.' PD Lorimer

Photo: With permission BDHFHS

the book *What Bird Is That?* (1931). Cayley Jr created both the text and the illustrations. This work has been continuously in publication, the most recent printing being in 2000. He also illustrated *What Butterfly is That?* by GA Waterhouse (1932).

Cayley Sr's daughter, Alice, was born on Mount Gibraltar in 1889. She also became a water colourist and painted bird studies like those of her father and brother.<sup>7</sup>

### John Salvana

Salvana (1873–1956) was a landscape painter and teacher. He was born in New Zealand and by the age of 22 was living in the Southern Highlands and known for his artistic talents. The Bowral Free Press said of his work:

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We would suggest to our energetic painter to prepare his contemplated view of Bowral in time for the approaching Amateur Art Society's Second Exhibition, feeling sure it would secure considerable attention. We think it only right thus to encourage local talent.<sup>8</sup>

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He did as advised but failed to secure a prize.<sup>9</sup> A sharp letter about the Bowral District Amateur Art Society then appeared in the local press over his signature. He complained about all prizes having been awarded to Sydney exhibitors and that some entries broke competition rules. He also said that the judge, Arthur Streeton, was 'an intimate friend of the special prize winner', Miss E Stephen. According to the press, the patron was Mrs SA Stephen, presumably her mother and the prize was donated by the Hon. SA Stephen, presumably her father. In addition Salvana claimed that the rule about timing had been broken because the winning picture had been exhibited two years previously in Sydney.<sup>10</sup>

Salvana exhibited his picture at the Bowral Free Press office at about the same time as he criticised the local art society. Salvana's painting of Mount Gibraltar and Bowral (1895) drew the following comments from the press:

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The principal painting was *A View of Bowral and Its Surroundings* taken from Oxley's Hill. It shows the Gib with a glimpse of the Mittagong mountains in the distance. The quarries show clearly on the face of the Gib. Bowral itself, with its streets running east and west, shows out prominently. Its principal buildings and churches show well. Altogether it is more of an educational work. It gives a splendid picture of sunshine and shower. One shower is just clearing off at the point of the Gib, when another appears from the direction of Kangaloon. The creek was in flood a little at the time, and its muddy water can be traced clearly. An area of about five miles square is shown on the canvas. This clever painting was executed under considerable difficulties, Mr Salvana having got drenched through several times while sketching it... and it would be a pity if such a genuine work of art were allowed to go out of Bowral. Even the School of Arts might do worse than secure it.<sup>11</sup>

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The painting was purchased by the local Council and when the amalgamation which resulted in the (present) Shire of Wingecarribee occurred in 1981, it was presented to the Berrima District Historical Society in a deplorable condition. It was then restored<sup>12</sup> and carries a caption written by PD Lorimer.<sup>13</sup>

Salvana is represented in state and regional galleries. The painting may be viewed at the rooms of the Berrima District Historical and Family History Society in Mittagong.

### Thea Proctor

At the 1895 Art Exhibition in Bowral, at which Salvana failed to secure a prize, a painting of a violin by the young Thea Proctor (1879 – 1966) received a prize for 'best picture by local amateur'. At that time she was a pupil of *Lynthorpe Ladies College*, another grand house on Mount Gibraltar.<sup>14</sup> This award was an indication of Proctor's talent, for she went on to become one of the most elegant and influential of the Sydney modernists. 'She was an exotic, ... a bird of paradise, her use of colour... startling.'<sup>15</sup>

### Grace Crowley and Ralph Balson

Grace Crowley (1890-1979) and Ralph Balson (1890-1964) were both Sydney modernists. He progressed from post impressionism to cubism following Grace Crowley's teaching. Mary Eagle writes, 'They went further than other artists of their generation in producing abstract colour paintings expressive of transparent light.'<sup>16</sup>

In 1954 Grace Crowley bought her first home, *High Hill* close to the summit on the northern side of Mount Gibraltar. She wrote, 'I become expert at digging up weeds but it finishes my painting life.'<sup>17</sup>



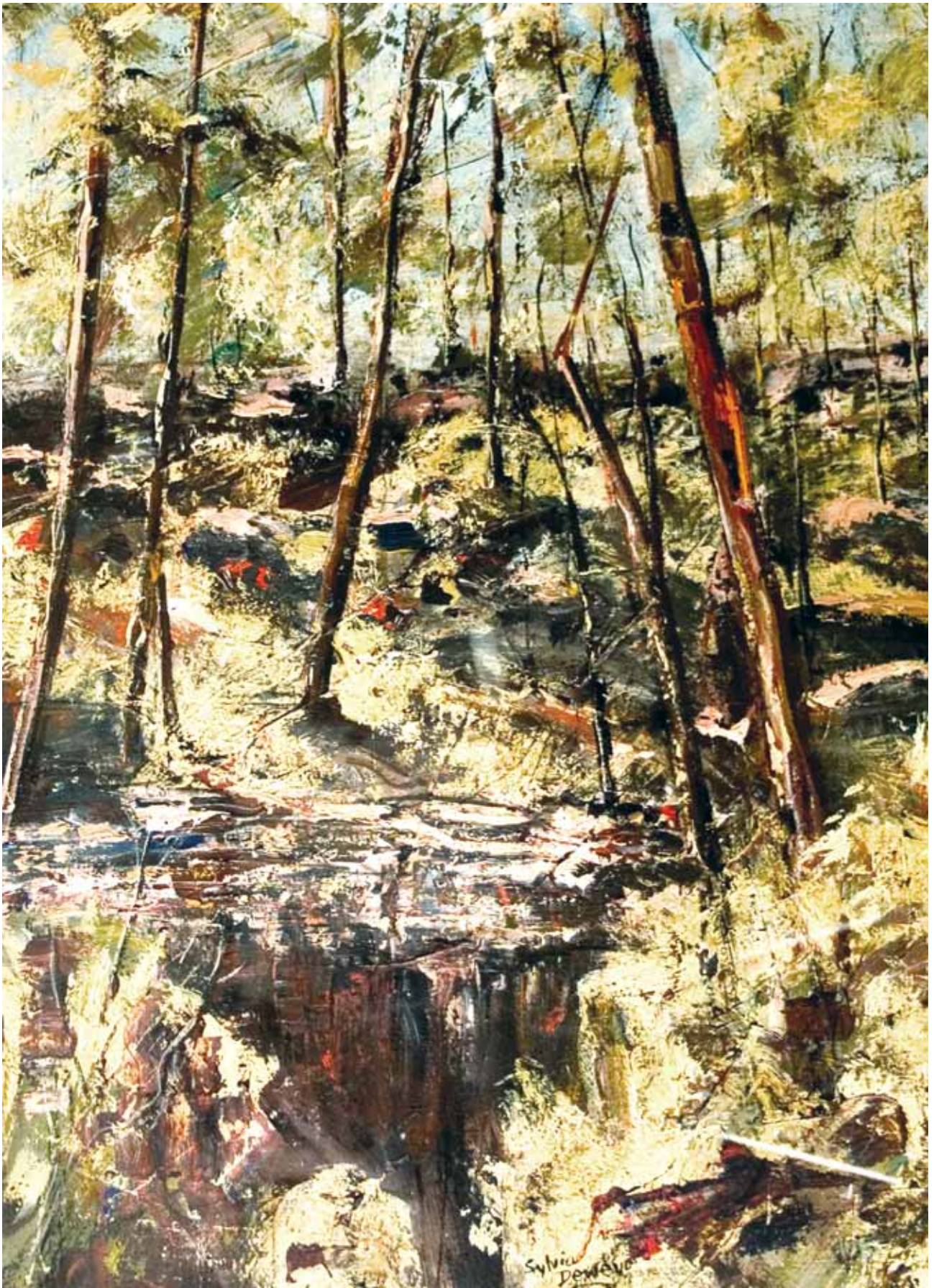
*Painting No.9* by Ralph Balson 1959 synthetic polymer paint on hard-board, 137.0 x 137.0cm board: Purchased 1960

Robert Hughes wrote: 'Shimmering dots and dabs... light filled walls... seemed to extend forever, beyond the edges of the frame. The painting... (was) in perfect equilibrium' *The Art of Australia* 1966

Collection: Art Gallery of New South Wales © R Balson Estate

From the 1930s she encouraged the career of Ralph Balson (1890-1964) who visited *High Hill* over the ensuing years as well as painting in his studio in George Street, Sydney. At *High Hill*, he worked in a double garage converted into a studio for his use, exhibiting on ten occasions in Sydney. The critic Bruce Adams said of his non-objective paintings, 'The new series which flourished in Mittagong consisted of finely modulated fields of spotted colour which spread continuously across the surface of each composition.' Crowley was struck by the resemblance of these 'spotty spots' to Seurat's stippled surfaces of broken colour.<sup>18</sup>

1959 saw the first of his 'matter' paintings, then in 1960-61 he travelled overseas for the first time, visiting New York, then London and Paris where he exhibited. He saw the most recent contemporary art and on his return experimented with new forms. Balson is represented in the National and State gallery collections.



*A Walk on The Gib* by Sylvia Dewey, Wingecarribee Acquisitive Prize 2002

Photo: C Segelov

## Sturt Craft Workshops



Sturt, Mr Southerden's woodwork class 1941

Photo: Sturt Craft Centre

The Sturt craft workshops on Mount Gibraltar, established in 1941 by the visionary educator Winifred West, are a stimulating part of the art scene in the Southern Highlands. What began in 1941 with weaving, spinning and carpentry has now expanded to include ceramics, jewellery and fine woodwork.

In 1951 Sturt established its first professional workshop with the arrival of a succession of master weavers from Germany. The weaving studio became an important production and commissioning centre during the 1960s and 70s under the long term guidance of Elizabeth Nagel.

Sturt Pottery was established in 1953 as a production and teaching centre by Ivan McMeekin. After searching locally for suitable clay he began using the clay surrounding the new pottery. In the microsyenite rock of Mount Gibraltar he found a glaze that varied from a pleasant dark green matt to a dense shining black. The potter Les Blakebrough worked at Sturt with Ivan McMeekin in the late 1950s. Both he and McMeekin are represented in all State collections and in the National Gallery, Canberra. Other well known potters Colin Levy, John Edye, Ian McKay and Campbell Hegan also worked at Sturt. This strong tradition continues.

At the Sturt School of Wood a full-time fine woodworking course was established by Alan Wale in 1985. It has been continued by Tom Harrington and is at the forefront of Australian wood craftsmanship.

Short courses in a wide variety of arts and crafts are also offered on an ongoing basis, and at summer schools.

The Centre holds frequent craft exhibitions, offers fine craft work for sale and is surrounded by inspiring gardens.

Both artists made a significant contribution to abstract art in Australia.

### **Eirene Mort**

Eirene Mort (1879–1977) is important to this account of art on The Gib because she lived and worked here as an artist for 40 years, also teaching at Frensham school. She constantly sought to improve the quality of Australian design with a witty and inventive use of Australian motifs.<sup>19</sup> (See Chapter 3 for details about her home *Greenhayes* and her connection with Thomas Sutcliffe Mort.)

At 86 she was highly commended for an entry in a decimal currency design competition and was still working on a book when she died in Bowral at the age of 98.

### **Other Artists**

Amongst the other artists who lived and worked on Mount Gibraltar, Joyce Allen (1916–1992) spent her later years working as a painter and printmaker. She also taught for 20 years at the Berrima District Art Society studio and is represented in State gallery collections in Brisbane and Sydney.<sup>20</sup>

In 1999 Mount Gibraltar was the theme of an exhibition by the Southern Highlands Printmakers in which a number of artists showed works depicting their individual interpretations of The Gib.

The painting *Walk on the Gib* by Sylvia Dewey, herself a resident, belongs to the Wingecarribee Shire Council. It was acquired in 2002 as an acquisitive art prize by the council and may be seen at the Wingecarribee Shire Council Chambers.

### **Sculpture**

For many years Geoffrey Cousins' sculpture collection at *Tintagel* on Mount Gibraltar was frequently on display. This collection is now dispersed although some works remain in the area.

High on the mountain, a Gary Deirmendjian sculpture of huge proportions in Wilton stone, *Lantern*, has been constructed on private property owned by Jon and Karen Stanton.

### **Photography**

Photography found its expression on Mount Gibraltar through Harold Cazneaux (1878–1953) and Frank Hurley (1885–1962). Cazneaux visited Frensham school in 1933–4, photographing the school and its woodland areas, producing a beautiful 1934 publication, *The Frensham Book: 100 Pictures by Cazneaux of an Australian School* (see Chapter 3). Hurley also visited the area, photographing several sites, including the imposing *Bowral Anzac Memorial* which is made from Mount Gibraltar trachyte (see Chapter 6).

## Literature

Novelist Arthur Upfield (1888–1964) spent the last years of his life in Jasmine Street on Mount Gibraltar where he wrote several of his 30 novels; one, *Boney and the Kelly Gang* has Robertson scenery. His last novel, unfinished at the time of his death, *The Lake Frome Monster*, was completed by local author JL Price and D Strange, an editor for Upfield's London publisher. A children's book, *The Gibrogs*, written by I.V. Iliff was published in 1994. It tells the story of the Gibrogs' care of a Monster (a human) who becomes trapped in a cave on Mount Gibraltar.

Mount Gibraltar continues to attract creative people: artists, sculptors, photographers, musicians, actors, potters, fine wood workers, weavers, jewellers, writers and poets who are all inspired by the ambience of their surroundings. Their varied works will provide further insights for the enjoyment of our mountain.



Wild Parsley *Lomatia silaifolia*  
from *A Popular Guide to the Wild  
Flowers of N.S.W.* F Sulman,  
Angus and Robertson 1913  
(Its present common name is  
Crinkle Bush)

Illustration: Eirene Mort

## Acknowledgement

Thanks to Carmen Wright for her detailed research for this chapter and Collin Segelov for images of local works.

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- <sup>6</sup> *Commonwealth Jubilee Bowral* 1951 p2
- <sup>7</sup> Campbell, J *Watercolour Painters 1780-1980* Rigby and Australia Council 1983
- <sup>8</sup> Bowral Free Press 19 January 1895
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- <sup>12</sup> By a student in conservation, Beryl Free, at the Canberra College of Advanced Education.
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- <sup>17</sup> Crowley, G *Diary Notes* Box 1, Folder 10, [n.d.], NSW Art Gallery
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- <sup>20</sup> McCulloch, op.cit.



Lantern by Gary Deirmendjian

Photo: C Segelov

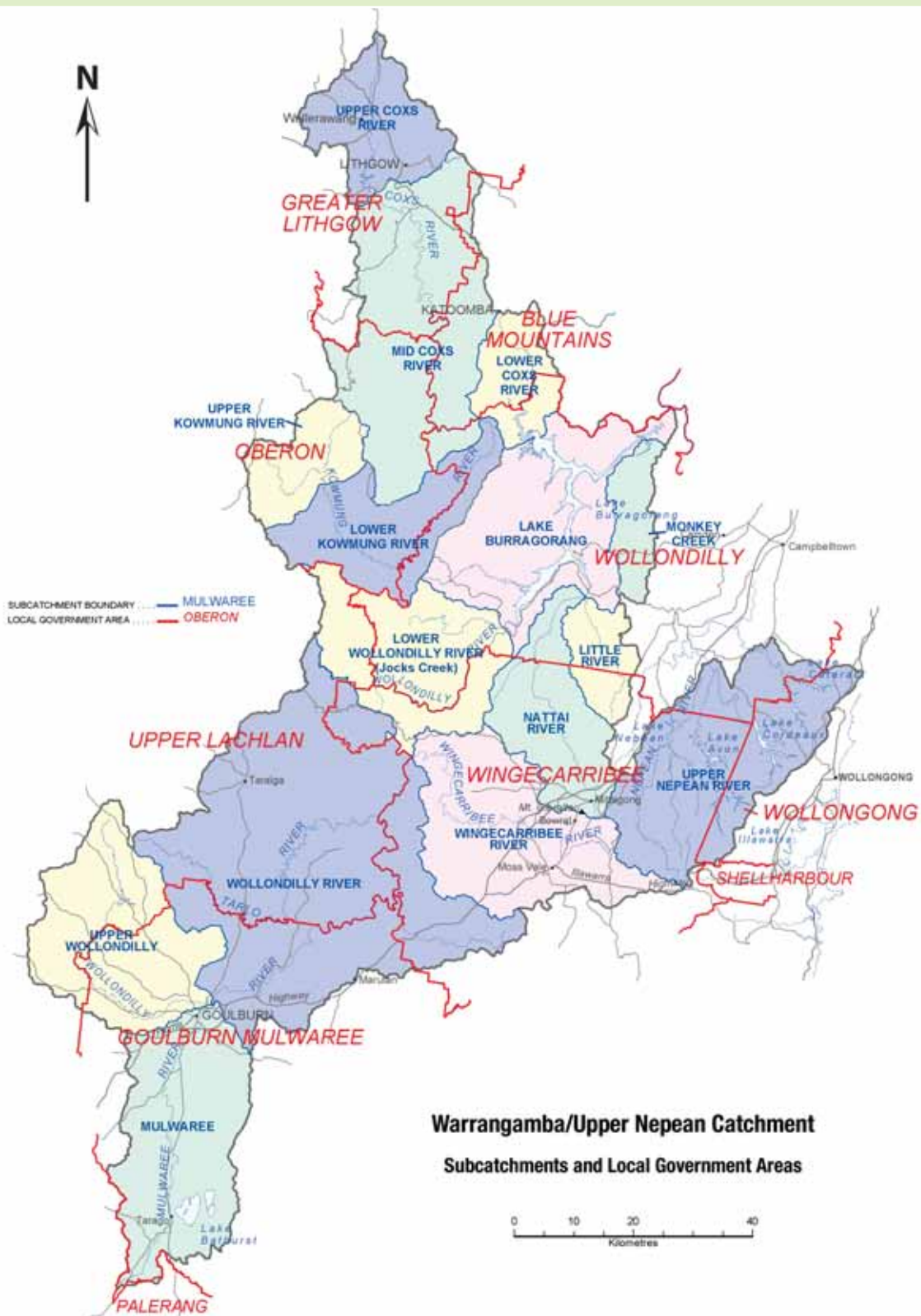


DIAGRAM PREPARED BY SOUTH COAST RESOURCE INFORMATION UNIT  
 DEPARTMENT OF INFRASTRUCTURE, PLANNING AND NATURAL RESOURCES



# Chapter 5



## Water Supply

Jane Lemann

Jane Lemann, DipSKTC HortCert BushRegen, has lived in the area for forty-five years. She is a volunteer conservationist working hard to care for what is left of our natural environment, in particular the Mount Gibraltar Reserve, as a member of the Mount Gibraltar Landcare and Bushcare group.

Since it pushed up to the earth's crust 180 million years ago, Mount Gibraltar has been shaped through the inexorable action of water carrying the smaller particles from its surface down to the valleys and on to the sea, leaving the hard rocky core exposed as we know it today.

Being solid rock, Mount Gibraltar sheds water quickly, feeding the headwaters of two rivers in the Sydney Drinking Water Catchment. On the north side water flows to the Nattai River via Chinaman's Creek and Gibbergunyah Creek, and thus to Warragamba Dam. On the south side the water flows to the Wingecarribee River via the Mittagong Rivulet through Bowral, and then to the Wollondilly River and Warragamba Dam. The Mount Gibraltar Reserve, through its natural ecosystems, provides the best possible water cleaning service for flows off the mountain into these water supply rivers.

Water is the basic raw material of life and the recent story of Mount Gibraltar is inextricably tied to the supply of water for the ever increasing needs of the human population both locally and in Sydney.

Locally, Surveyor John Oxley's stockmen were first attracted to the large pools at the foot of Mount Gibraltar where they camped and watered stock in 1815.<sup>1</sup> Over the years these pools in the Mittagong Rivulet have disappeared due to the cleaning and modification of Bowral's urban creek.

It was the Mount Gibraltar springs in Gladstone Road which first supplied the little township of Bowral with water. By 1888 these springs supplied two 400 gallon (1800 litre) tanks built in Carlisle Street and water was distributed daily by water cart.<sup>2</sup> When a drought in 1894 forced the Council to think about new sources of water there was a proposal to put

three solid dams in Fern Gully and collect water from the 'five springs around Mount Gibraltar'.<sup>3</sup> In 1907 a spring-fed reservoir was built in Gladstone Road together with a water main to Merrigang Street from which householders were able to obtain supplies at the standpipes.

Quarryman Francis Pope told the story of women taking their washing to the springs in Soma Avenue when household supplies were low. These were quite social occasions.<sup>4</sup> Mittagong people enjoyed swimming in a spring-fed waterhole on Whinstone Park where they came to picnic on hot days<sup>5</sup> and there are even reports of warm springs on the Mittagong side where water emerges from great depth.

Numerous springs around the lower mountain, particularly after rain, often made the soil unstable and caused landslips where the land was cleared. This limited development<sup>6</sup> quite severely for many years. Many of these springs no longer flow unless there is very heavy rain.

In 1912, after a close-run local referendum, the State Government was asked to provide a water supply to the growing town of Bowral but it was not until 1922 that water from a weir at Wingecarribee Swamp (The Sheepwash) became available<sup>7</sup> and was pumped to an open reservoir in Soma Avenue on Mount Gibraltar for a town supply.<sup>8</sup>

### Water for the Sydney Region

Gradually the Southern Highlands has become more and more involved in water supply schemes. As Sydney has grown it has always been in need of more water: first from the Tank Stream, then from the Hawkesbury-Nepean River system and now from the Shoalhaven River.

Within 38 years Sydney had outgrown and despoiled the Tank Stream into little more than a sewer. In 1837 water was brought through the convict-built tunnel called Busby's Bore from the Lachlan Swamps that are now Centennial Park. By 1858 the city was drawing more water from the Botany Swamps near the present airport.

In 1880 the Sydney Water Supply and Sewerage Board was formed (later, in 1924, it became the Metropolitan Water Sewerage and Drainage Board, MWSDB) and was responsible for the dams, reticulation, sewerage and stormwater drains of Sydney and the South Coast to Wollongong.

During the drought of 1886 water was brought to Sydney from the Upper Nepean River, through the Hudson Temporary Scheme, to augment the Botany Swamp supply. The engineer of the scheme, Herbert Hudson, also owned a quarry on Mount Gibraltar with Thomas Loveridge (see Chapter 6). Hudson Brothers' engineering works manufactured much of the machinery and pipes for the Sydney water supply,



View of the Old Wingecarribee Weir, Sheepwash Road Glenquarry

Photo: G Goodfellow

# Diagrammatic Layout of Sydney Water Supply Systems

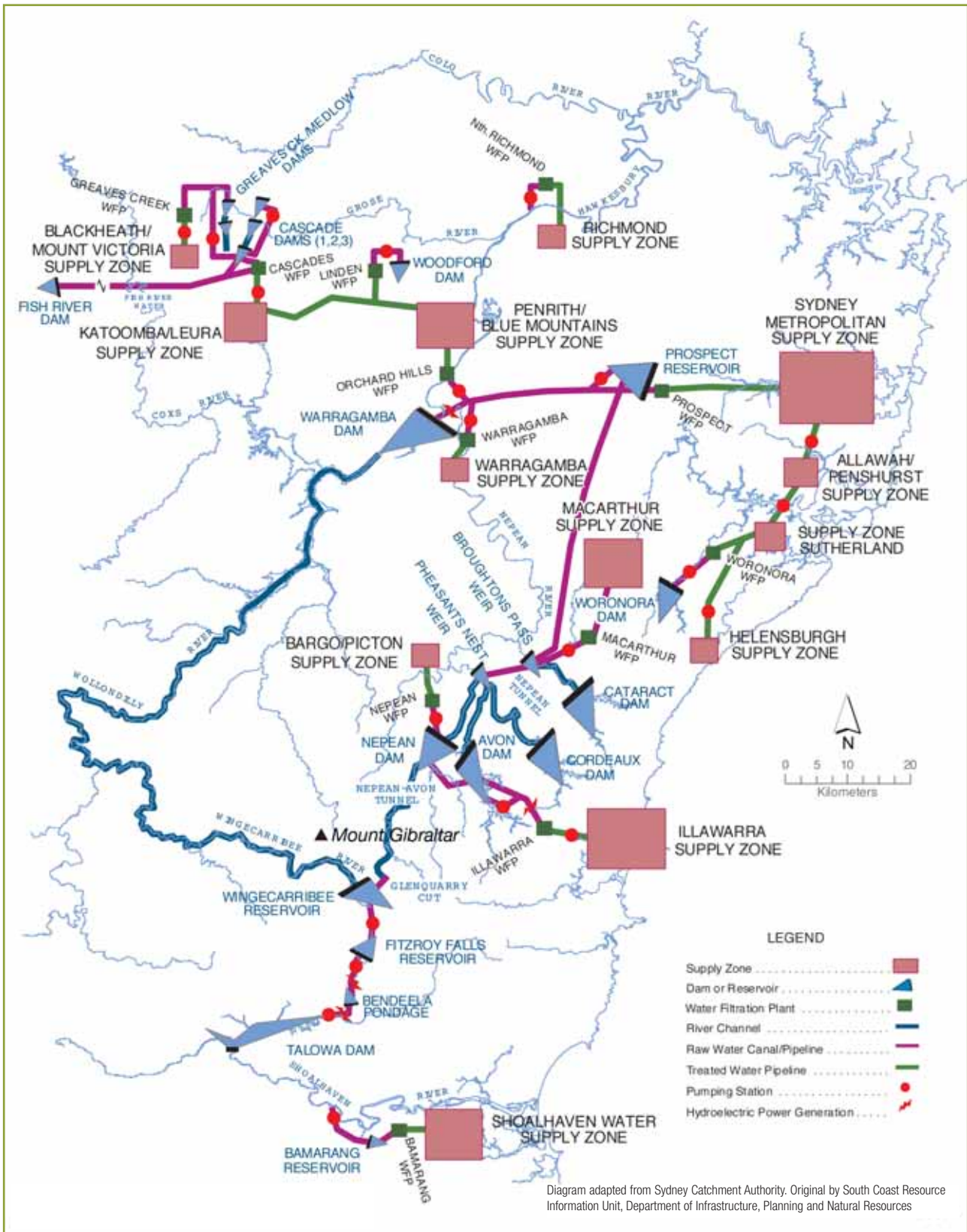


Diagram: Dept Infrastructure Planning and Natural Resources



View of the new Wingecarribee Dam and Filtration Plant, Glenquarry

Photo: J Lemann



Water reservoirs, Mount Gibraltar, Oxley Drive Bowral

Photo: J Lemann

and a great deal of rolling stock for the railways, later becoming Clyde Industries.

After another drought and two Royal Commissions into the Sydney water supply, the era of dam building began. In those days the effect on the environment of such monumental engineering works was not considered.

Prior to these constructions, lands were appropriated by the Government, including some of the original grants and private properties in this region.

In 1919 land on the north face of Mount Gibraltar was resumed for the supply of trachyte stone for the construction of the Avon Dam. However, the stone does not appear to have been used as Avon Dam is made of sandstone and concrete for which the aggregate was purchased from existing quarries.

Over the next 30 years the construction took place of the Cataract Dam in 1907, Cordeaux Dam in 1926, Avon Dam in 1927 and Nepean Dam in 1935. These were progressively connected via the Upper Canal to the Prospect Reservoir and the city reticulation system and most of their catchments became protected land.

As the population expanded and the cycles of drought and flood continued, further constructions were planned. In 1941 the Woronora River was dammed to supply areas south of Sydney around the Georges River. During the long and severe drought of 1934-42 the Warragamba Emergency Scheme provided a weir on the Wollondilly River and a pipeline to Prospect Reservoir. Warragamba Dam was built between 1946-56, surviving big floods in 1956. Pipelines were improved in 1958, again using the skills of Hudson Brothers Engineering.<sup>9</sup>

Warragamba Dam was officially opened in 1961, holding back the immense Lake Burragorang, but soon engineers were searching further afield and, with the help of the Snowy River Engineers Corporation, developed the Shoalhaven Scheme which was devised to transfer water from the Shoalhaven River to Sydney in times of drought. Completed in 1977 at a cost of \$128 million, this scheme provided the Tallowa Dam in Kangaroo Valley from which water is pumped up to Fitzroy Falls Reservoir and up again to Wingecarribee Reservoir and is then fed down the natural waterways to Warragamba Dam or Nepean Dam to supply Sydney and the South Coast.

In 2004, water levels in the dams fell below 40% due to prolonged and severe drought conditions and high consumption in expanding urban areas. Serious consideration was given to storm water retention, recycling and desalination, together with care for the health of the rivers and the environment which had now become part of the decision-making process. Rather than constructing more dams, it is planned to

raise the level of Tallowa Dam in order to hold back more water in the Shoalhaven River, and to extract ground water from the Highlands aquifers.

### **Water for the Southern Highlands**

Returning now to the local supplies, the Wingecarribee Swamp has supplied Bowral with water since the 1920s. It was very clean and soft water which was eventually, in 1929, filtered and treated at the plant at the end of Boardman Road, East Bowral, then pumped to reservoirs in Soma Avenue on Mount Gibraltar for reticulation to the town. In 1952 an additional concrete reservoir was installed in Oxley Drive which was followed by a second steel reservoir in 1989.<sup>10</sup>

Mittagong Municipal Council first built a dam in 1908 on Bakers Creek, (now called Nattai Creek) in Welby. This collapsed during pressure trials so water was not reticulated to Mittagong until 1910 when a replacement dam was built. In 1931 a larger dam was completed upstream, near the Wombeyan Caves Road, followed by a filtration plant in 1934.<sup>11</sup> The supply did not extend to dwellings in Oxley Drive, Mittagong until the Spencer Street Reservoir on Mount Gibraltar was constructed in 1959. The Welby supply system was finally de-commissioned in 1991 after a period of intermittent use once the Medway (see below) and Wingecarribee Water Treatment Plants came into use. The filtration plant was demolished in 1998.<sup>12</sup>

In 1965 the Medway Dam, near Berrima, was completed and supplied both Bowral (west of the railway) and Mittagong. It was connected to the Soma Avenue Reservoirs, via St Clair Street, on Mount Gibraltar and since 1969 water has been pumped to the reservoir near the towers on the summit of The Gib to supply residents in the high level zone on the mountain.

In the 1970s Council completed negotiations for the local supply of water to be purchased from the newly constructed Wingecarribee Reservoir, a part of the Shoalhaven Scheme owned by MWSDB. Wingecarribee Shire Council built the new filtration plant on Sheepwash Road, Glenquarry, which opened in 1989. The MWSDB became Sydney Water Corporation and managed the catchments and the supply of bulk (wholesale) and retail water to Sydney. It also managed the inter-catchment transfer of water from the Shoalhaven River to the Wingecarribee Reservoir to buffer the Sydney water supply against drought.

Bowral, Moss Vale, the Northern Villages and Robertson are now supplied from the Wingecarribee Reservoir. The water can also be mixed with Medway water to augment the Mittagong supply if necessary.

# Mount Gibraltar Water Supply Reservoirs



## Management of Water Resources

The Sydney Catchment Authority was established in 1999, in response to the Sydney Water Inquiry into the contamination of Sydney's water supply and the tragic collapse of the Wingecarribee peat swamp in 1998. Its brief is to manage and protect the catchment and supply clean bulk water. Sydney Water Corporation now buys and manages the retail supply, reticulation and the disposal of water for Sydney, Illawarra and the Blue Mountains.

The newly formed Hawkesbury-Nepean Catchment Management Authority oversees the whole catchment area. The Hawkesbury-Nepean river system is fed from the Southern Highlands and Tablelands and provides run-off water for the dams. From Tarago to Taralga, Robertson to Lithgow, all the creeks and tributaries feed this river which eventually, in a sadly depleted state, flows out to sea at Pittwater.

### Reservoirs on Mount Gibraltar

#### Soma Avenue 1:

Round, 1.1ML 1922, supplied Bowral from Wingecarribee Swamp.

#### Soma Avenue 2:

Hexagonal, 2.1ML 1931, supplied Bowral from Wingecarribee Swamp

Both now decommissioned.

#### Oxley Drive 1:

Concrete, 2.3ML 1952, supplies Bowral from Wingecarribee Swamp

#### Oxley Drive 2:

Steel, 10ML 1987, supplies Bowral from Wingecarribee Swamp

#### Oxley Drive Gib High Level:

0.5 ML 1969, supplies dwellings high on Mount Gibraltar from Medway Dam through the Soma Av pumping station

#### Spencer Street Mittagong:

2.3 ML 1959, supplies Mittagong from Medway Dam

#### Murchison Road Mittagong:

0.23 ML 1969, supplies Mittagong from Medway Dam

#### Gib North, Dean Street, Mittagong:

6 ML 1986, supplies Mittagong from Medway Dam and Wingecarribee Swamp

Table supplied by WSC

Wingecarribee Shire Council purchases bulk water from the Sydney Catchment Authority and provides the local reticulation and disposal systems.

## Conclusion

Mount Gibraltar has played a central role in the water supply system for Bowral and Mittagong, as the reservoirs positioned on the mountain give suitable height for the reticulation of water to the towns. Inevitably these installations have caused severe disturbance to the landscape, encouraged weeds and destroyed habitat. This impacts heavily on the small remnant forest of Mount Gibraltar Reserve. Wingecarribee Shire Council is developing a more responsible, environmentally sustainable practice in maintaining these reservoir sites in an effort to reduce their damaging effects on the Reserve.

## Acknowledgements

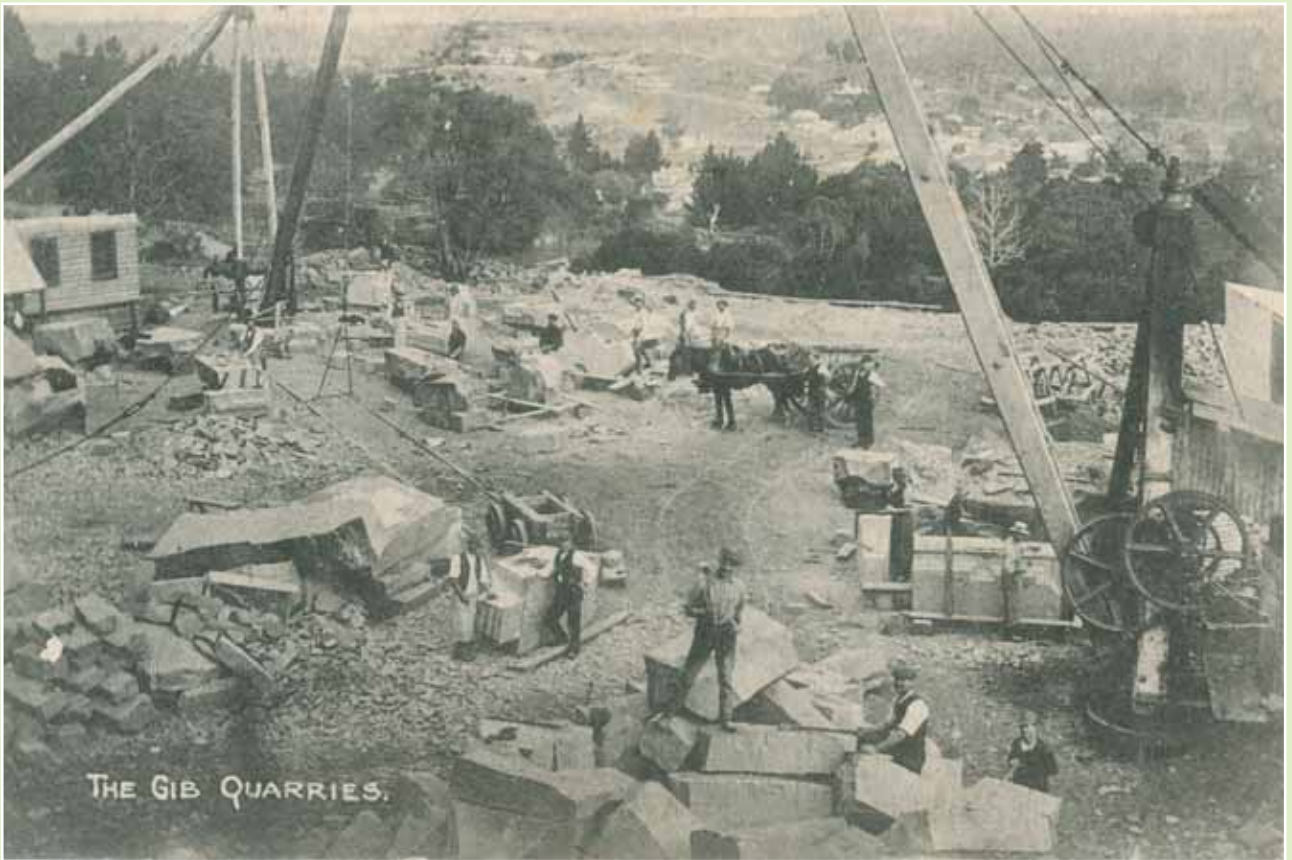
Thanks to Kelvin Lambkin of the Sydney Catchment Authority and Mark Williams of Wingecarribee Shire Council for their assistance with information. Thanks to Stuart Murray, Department of Infrastructure Planning and Natural Resources, for the map and diagram he prepared for this chapter.

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Mount Gibraltar trachyte quarry, Loveridge and Hudson

Photo: With permission BDHFHS



## Chapter 6



# Trachyte Quarries of Mount Gibraltar

Jane Lemann

Jane Lemann, DipSKTC HortCert BushRegen, has lived in the area for forty-five years. She is a volunteer conservationist working hard to care for what is left of our natural environment, in particular the Mount Gibraltar Reserve, as a member of the Mount Gibraltar Landcare and Bushcare group.

Mount Gibraltar was quarried for almost 100 years from c.1886-1986. Following the opening of the railway in 1867 the area began to develop and stone quarrying opportunities were taken up by several enterprising companies around the mountain.

'Mount Gibraltar Microsyenite' is the technical name for the particular type of trachyte rock that forms the mountain. At the time of quarrying there was a belief that a government tax could be avoided by working the rock under the generic name of 'Bowral Trachyte'.<sup>1</sup> Local pragmatism prevailed and a wide market was established for the stone under that name. It was very hard to work, but its strength and its fine grain, which took a beautiful polish, made it valuable to architects and builders.

Many buildings of note constructed at the turn of the century contained Bowral Trachyte. Such was the demand that stone was sent all over Australia and across the world. Mount Gibraltar was the only available source of trachyte of this type and fine quality which explains the significance of the quarries and their importance in this study of Mount Gibraltar.

Remarkably detailed early geological surveys were carried out by the renowned Rev. WB Clarke and by EF Pittman and JB Jaquet, describing the area and its mineral potential. In 1935 Edgar Booth carried out a modern magnetic survey confirming the earlier geologists' reports.

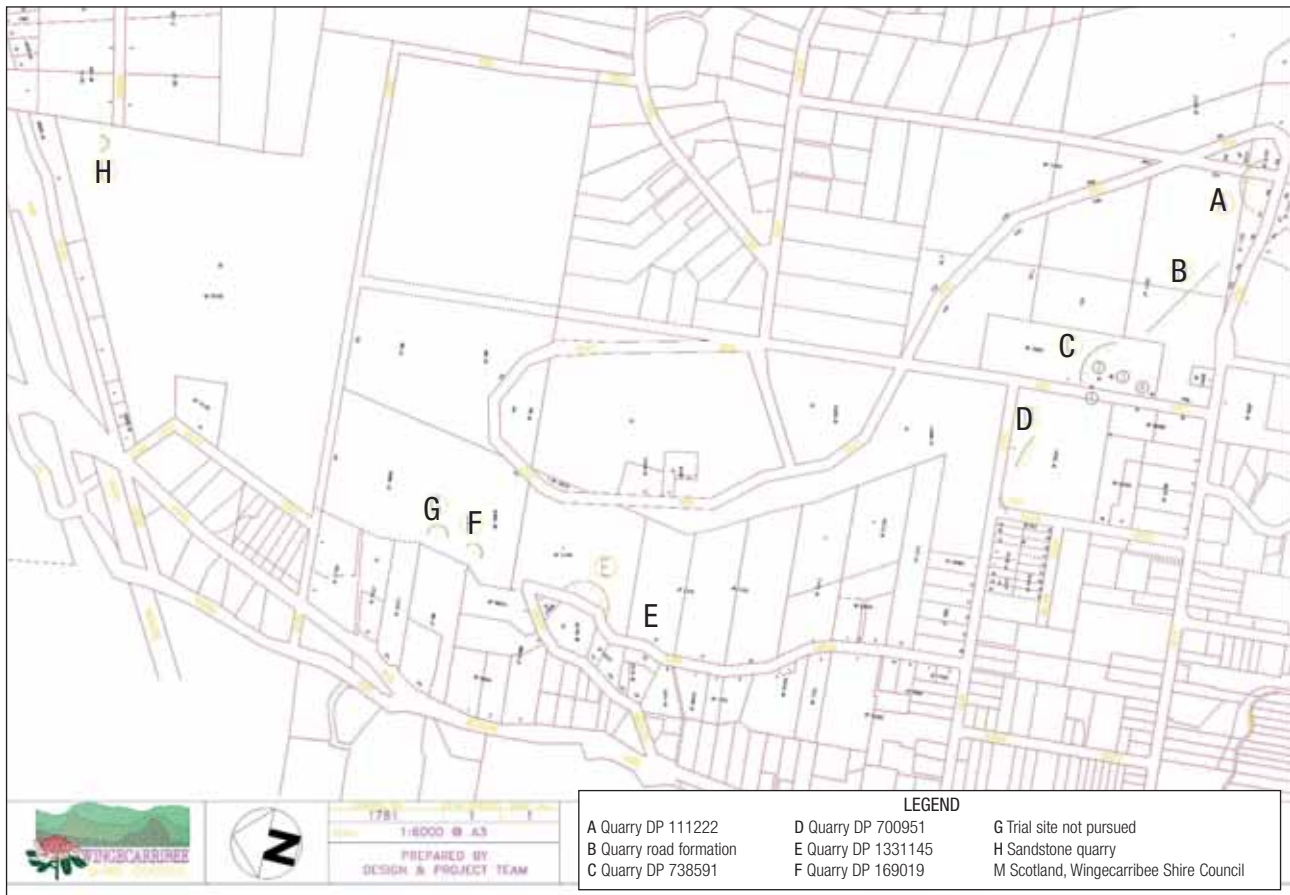
In 1909 curator, author and scientist RT Baker said:

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This really beautiful stone of unique colour, which may be described as dark olive green, or, perhaps dark grey, is very solid and takes a beautiful polish...some of the finest architectural structures in Sydney are built of this rock.<sup>2</sup>

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## Mount Gibraltar Quarries Survey - Assessment for Heritage Significance - June 2000



Bowral trachyte was used in the construction of many significant buildings (see Appendix III) as well as for kerb and guttering, railway ballast and road aggregate. Its strength made it suitable for foundations supporting great loads, such as the first Hawkesbury River rail bridge, the base courses for the Garden Island seawalls and hard wearing steps for the Art Gallery of NSW, the State Library and Central Railway Station in Sydney. It was used rough cut, sawn and polished in buildings such as the Queen Victoria Markets (now the Queen Victoria Building) and the Bank of Australasia in Sydney and for many war memorials, monuments and headstones throughout the State.

Building activity reached a peak at the time of Federation when great edifices and public works were an expression of the spirit of the Empire and the country was prosperous following the gold rushes.

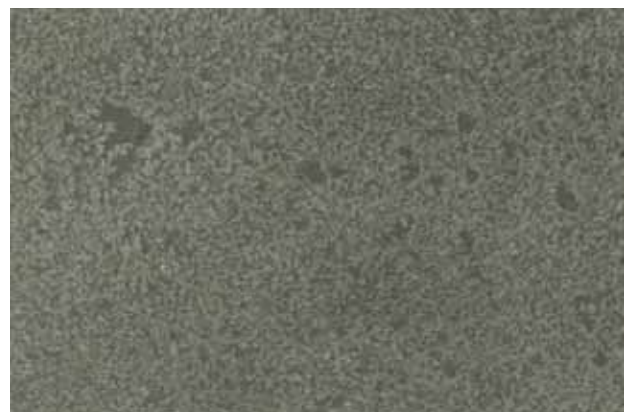
For the archaic ceremony, The Gib provided the great Commonwealth Stone in Centennial Park on which Earl Hopetoun stood as he was sworn in as the first Governor-General of the Commonwealth in January 1901.<sup>3</sup>

It also provided the foundation stone for the Commencement Column in Canberra, laid by the Governor-General, Lord Denman, in 1913, when the states had finally agreed on a site for the National



Hawkesbury River rail bridge 1909

Photo: R Baker



Polished trachyte

Photo: R Baker



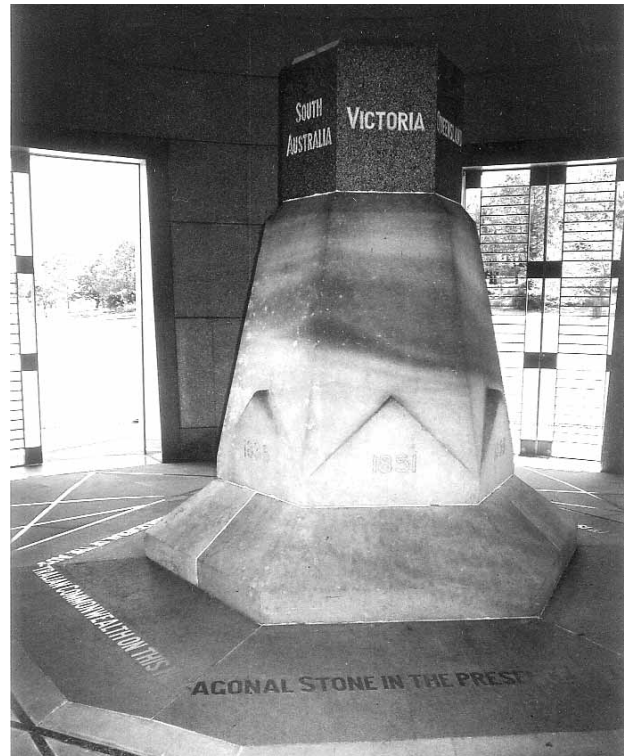
The Bi-centennial Temple, designed by Alex Tzannes

Photo: J Lemann



The Right Hon. The Earl Hopetoun

Photo: Courtesy L Knapman



Commonwealth Stone

Inscription reads 'On Jan 1st 1901 The Right Hon. The Earl Hopetoun was sworn in as the first Governor General of The Australian Commonwealth on this hexagonal stone in the presence of the representatives of the six states.' The column was added later, and it is now enclosed in the temple in Centennial Park, designed by Alex Tzannes as a Bi-centennial project in 1988.

Photo: J Lemann



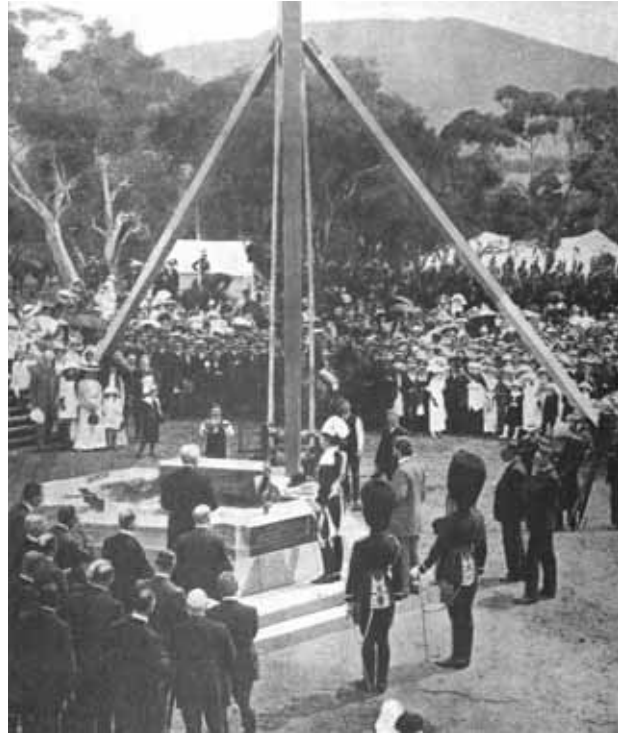
The Foundation Stone for the Commencement Column of Canberra  
 This was stone laid on Capital Hill and moved, in 1988, to Federation Mall between the two houses of Parliament in Canberra.

Photo: J Lemann

Capital and the choice of name for the capital was announced.

The story of the quarries starts with William Charker (Quarry D on the map) who began operations in 1885 at the top of Cliff Street. He formed the NSW Trachyte Stone Quarrying Co. on a sub-division of land originally granted to JN and HM Oxley in 1855. He was a civic-minded man ‘...infusing a good deal of energy and spending much money on the quarry with a view to establishing a trade for this district’.<sup>4</sup>

In the early days, much of the machinery was operated by wood-fired steam engines but the heavy stone was transported on horse-drawn wagons to the railway siding which was situated across the road



The Laying of the Foundation for The Commencement Column of Canberra, 12 March 1913 by the Governor General Lord Denman, the Prime Minister, Andrew Fisher and the Minister for Home Affairs, King O’Malley. The six blocks (one for each state) form the base of a column designed by John Murdoch, architect of Old Parliament House, which was not completed due to two world wars, the depression and post-war shortages.

Photo: Courtesy L Knapman



The quarry on Mr Beer’s land

Photo: With permission BDHFS

from the *Imperial (Port of Call) Hotel* on the present Bowral War Memorial site. The roads were rough and deeply rutted, making delivery very difficult.

In 1886, TR Dunwoodie, who is claimed to be the father of trachyte quarrying on The Gib, saw stone samples that a Mr Leggat sent to Sydney for assessment. He felt the stone was suitable for quarrying and came to Bowral to help Leggat & Co. establish The Gibraltar Rock Quarries on Eli Beer's paddock. At this time the large surface boulders provided the stone. Many of the stonemasons who came to the district from Melbourne found the rock harder to work than the Melbourne Basalt or Bluestone to which they were accustomed. They needed persuading to stay and work the hard stone, so a small scale monument was made to show it could be done.

CS Wilkinson, Geological Surveyor-in-Charge wrote in the *1888 Annual Report for Department of Mines NSW*, Sydney 1889:

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Very little actual quarrying or excavation has as yet been carried on, for the large solid masses lying loose upon the surface have afforded good material ready to hand for cutting up...The stone cleaves with a straight clean fracture in any direction when skilfully struck and consequently may be readily shaped into rectangular blocks of all sizes down to cubes for street-paving... When its durability and other important qualities become more widely known there will be an increasing demand for it, especially for the construction of works subject to severe exposure, such as piers and retaining walls in sea-water; also for kerbing, door-steps, pillars, &c...

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He also felt it could be supplied at a lower price than bluestone from Melbourne. Later, several quarries installed crushers to convert the spalls (rock chips) into saleable aggregate for roads and railway ballast as a by-product of the cut stone.

The quarries became important employers in the local towns (see Appendix IV), not only of quarrymen but of men in the supporting industries such as carriers, farriers, wheelwrights and blacksmiths. The stonemasons developed great skill in dressing the hard stone. Quarrymen and stonemasons were also brought in for particular projects and lived a hard and dangerous life. There were 200 men working in the quarries in the early 1890s<sup>5</sup> many of whom lived in a shanty town of tents and huts dubbed 'Struggletown', between Victoria Street and the Mittagong Rivulet in Bowral.

Men worked for low pay and there were many injuries and several deaths in the quarries and crushers, so in 1891 men working in all the quarries combined to form the Berrima District Workmen's

Accident Relief and Endowment Fund and later the Operative Stonemasons Union.<sup>6</sup>

Bowral Free Press 25 October 1893 reports:

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On Monday a blasting accident occurred at Raward and Co's quarry. It appears that a charge was put in on the previous Saturday, but mis-fired. On Monday morning C Hensen, J Murchie and J White, thinking the charge had gone off, commenced to clear out the tamping to fire it again. They used plenty of water, but as soon as the steel drill struck the rock it caused the powder to ignite, and of course an explosion was the result. The drill, which is 18 feet long and weighs about 1 cwt, was thrown 40 feet in the air and fell on the road some 200 yards off. The powder struck the three men more or less severely. Hensen was thrown up and fell on his head, recovering consciousness just in time to prevent himself falling over the edge of the rock, 20 feet deep...White had his face blackened a good deal, and was struck over the eye...Murchie was only slightly hurt...

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In the depression of the 1930s local men were glad to find work in a relief program organised by government minister Eric Spooner. This drew on the quarrymen's skills to create the scenic road, lookouts and picnic shelters on Mount Gibraltar (see Chapter 3).

Several quarries were operating during the same period and often worked together on particular projects. Some of these are here described by site in more or less chronological order.

### Quarry D

#### Charker - Loveridge and Hudson Pty Ltd - Melocco Bros Pty Ltd

Thomas Loveridge and his lifelong friend and brother-in-law Herbert Hudson (see Chapter 5) formed their business partnership based on the training they had received together from his father, master stonemason, Aaron Loveridge. Their partnership continued the long association of those family members who had built the Great Hall of Sydney University in 1860.<sup>7</sup> Thomas Loveridge lived in *Lynthorpe*, Gladstone Road, Bowral and his daughter Dorothy became Lady Hoskins, wife of Sir Cecil Hoskins.<sup>8</sup>

In 1888 Loveridge and Hudson Pty Ltd was operating the quarry at the top of Oxley Street (Quarry A) on Mr Angus's property '...on the south-eastern point...where the rock stands out prominently as a large rounded mass...'<sup>9</sup> Oxley Drive now runs through this site.



Thomas Loveridge  
Sydney Mail 1896

The stone was considered of poorer quality than further round the mountain.<sup>10</sup> So, in 1888 they took over William Charker's quarry (Quarry D) from which, over the succeeding years, an enormous amount of high quality stone was taken for many constructions carried out by this major building company.<sup>11</sup> Loveridge and Hudson also operated several other quarries from which they sourced their ornamental dimension stones (cut building blocks).

Their greatest work was the 1893 Equitable Life Building at 350 George Street, Sydney.

In 1897, the six ton buried cable-thrust blocks for the Hampden Bridge in Kangaroo Valley were taken down the Barrengarry Pass by bullock wagon.<sup>12</sup> In 1901, a 12 ton block was taken to Sydney to be the central pivot stone for Pymont Bridge.<sup>13</sup> FJ Pope remarked that it took a whole month to get it to the Bowral railway yard due to broken axles and the terrible rutted state of the road. These were massive undertakings indicative of the quality of the stone and the wide demand for it.



Trachyte quarry sketch: Quarry A Photo: With permission BDHFHS



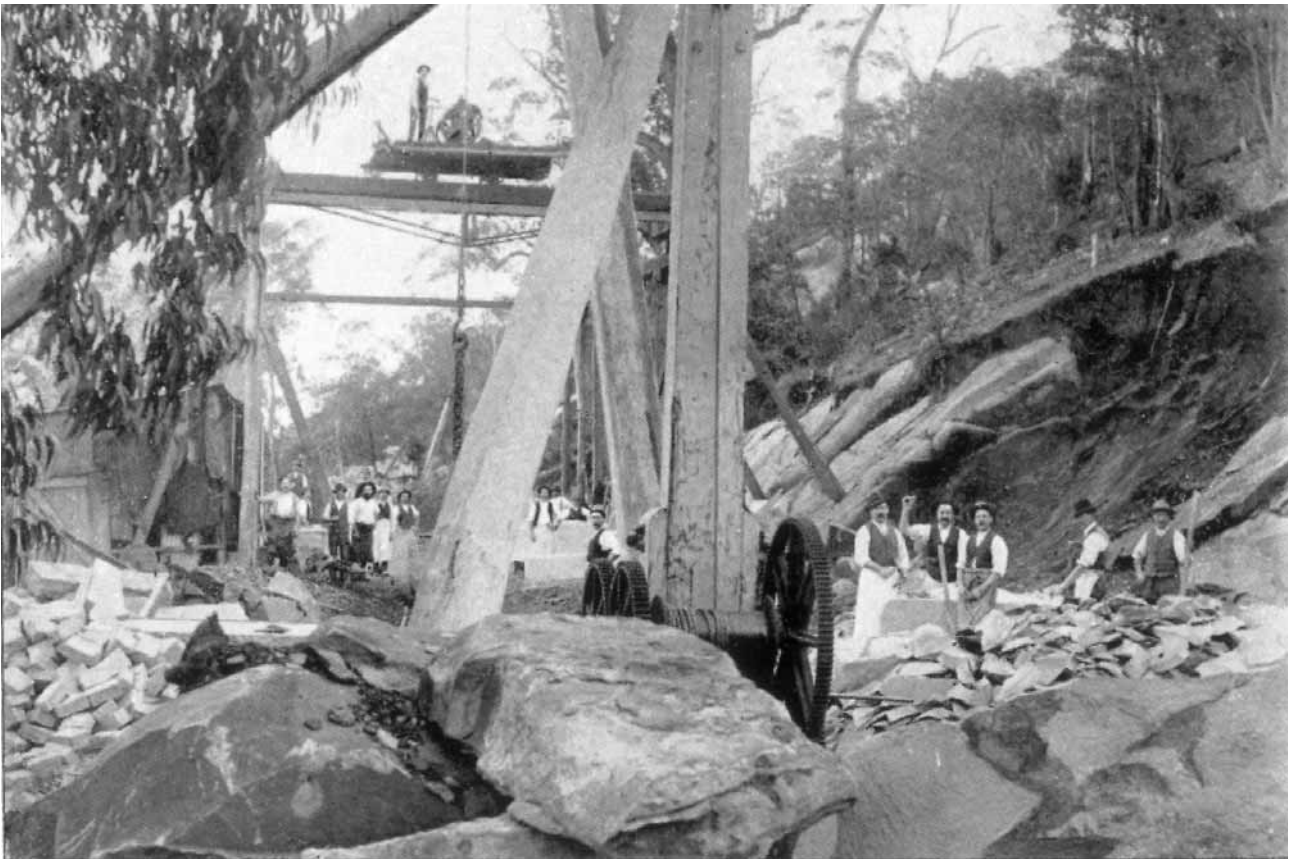
Quarrymen and stonemasons Photo: With permission BDHFHS



Equitable Life Building 350 George Street Sydney, designed by American architect Mr Raht.

'The Mighty Arch - There is no question that the great arch has a most dramatic quality with its span of 46 feet and twenty-one huge voussoirs, each of which weighs between three and four tons. Thus, excluding its own weight of some sixty tons and carrying the superimposed loads above of over 700 tons, there was no settlement whatsoever, this being attributed to the skilful cutting of the blocks and to the fact that molten metal was poured into the joints, thus providing an unyielding mass' (D Hoskins notes, 1996)

Photo: R Baker



Loveridge and Hudson quarry 1909

Photo: R Baker



Bowral Trachyte kerb stones Photo: J Lemann



Bowral Trachyte, rough cut, sawn and polished, Angel Place Sydney Photo: J Lemann

A large part of the Loveridge and Hudson business was the cutting of kerb stones, many of which can still be seen around the Southern Highlands towns and in the Sydney CBD.

In 1909 an additional piece of land was purchased<sup>14</sup> adjoining King Street on Mount Gibraltar thus providing access to Oxley Street (later to become Oxley Drive).

In 1953 the Loveridge and Hudson quarry closed for two years. This was the result of falling demand

for stone due to the development of concrete kerbing. New building methods, the changing preferences of architects and the difficulties of ensuring colour consistency in veneer stones meant there was no longer much demand for dimension stone and the quarry remained dormant.

In 1960 Concrete Ready-Mix was established on the land beside Oxley Drive and later became Specified Concrete Pty Ltd, a subsidiary of Blue Metal Industries.

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# Raward's Steam Crane

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## A MEMORABLE EVENT

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Article in Bowral Free Press 5 July 1893

The crane that has hitherto done service at Mr. F. R. Raward's trachyte quarry on the Gib at Bowral has now been found too light and too slow, so it was wisely resolved to secure the steam crane from Sydney recently used by Messrs. Phippard Bros. Then the question came up, how is it to be conveyed - by train or by team?

After making a comparison of the costs in both cases, Mr. Raward decided upon having it brought by team, and accordingly Messrs. Harry Cockburn and Pat Byrnes left Bowral on Tuesday fortnight, 20th June. Cockburn took his dray and four horses, while Pat had charge of Raward's waggon and six horses. They left Bowral immediately after breakfast, taking a number of masons with them. Will Clayton also accompanied them down, but got home a few days before the others on horseback. Sydney was reached in the evening of the third day - Thursday, 23rd June.

Next morning Cockburn and Pat discovered that the two teams were utterly incapable of carrying the crane and its appurtenances. There had been a misunderstanding as to its weight - the information being that it was a sister crane to Messrs. Loveridge and Hudsons' steam crane at Bowral. To Cockburn's query, it was explained that it was a sister crane in principle, but much heavier and stronger; for while Loveridge and Hudsons's crane weighs 6 tons, Raward's crane comes up at about 14 tons. A whole day was consequently lost in making arrangements to hire a powerful lorry (weighing two tons itself) and eight massive horses in Sydney to help to convey the crane to Bowral. The three teams were then loaded.

At 4p.m. on Saturday, 24th June they started from Sydney. They halted at 7 o'clock, having travelled 10 miles over a good level road, camping about 1½ miles this side of Ashfield.

Sunday, 25th June. - Only managed 7½ miles, and stopped 2 miles before reaching Liverpool. The roads were unmade and boggy compelling them to bring one team along at a time in places, and then go back for another - double-banking the teams.

Monday, 26th June. - Got about 4 miles this side of Liverpool, doing 6½ miles. Road still bad, and double-banking necessary in places.

Tuesday, 26th June. - Only managed 3½ miles, having to double-bank the whole piece.

Wednesday, 28th June. - Passed through Campbelltown, and half-way to Narellan - 8½ miles.

Thursday, 29th June. - Reached the top of Little Razorback. Good road but steep; double-banking necessary.- 8½ miles.

Friday, 30th June. - Over Razorback and into Picton.- 8 miles.

Saturday, 1st July. - Got 4 miles this side of Bargo River.

Sunday, 2nd July. - Passed through Mittagong, and reached the Gib opposite Hines's gate near Beers' orchard.

Monday, 3<sup>rd</sup> July. - Had 1½ miles to finish the journey, and at 9 this morning reached the Bowral station. At 11 o'clock Mr Cockburn got his load - the engine itself - right on to Raward's quarry. The track is rough, steep, and winding, and it required skill in coaching seven horses along it. Close behind followed Pat with massive cogwheels, while the ponderous beams, &c., followed in due time.

We congratulate Mr Raward on his pluck, and the drivers on their carefulness. We believe the steam crane will lift 20 tons, while the old crane could only manage about 5 tons.





Concrete batching plant, Lot 20 Oxley Drive Photo: G Goodfellow



Raward and Co's trachyte quarries 'What appears in the illustration to be a solid wall of rock is in reality a gigantic stone blown from the face of the quarry to the position shown, a distance of 30 or 40 yards from its original bed... in its dislodgement a great deal of skill and patience had to be exercised. Three holes, each 16ft deep, were bored and charged with blasting powder; and the shots were fired simultaneously by means of an electric battery. The final charges contained 20lb of powder each, and when they were fired the concussion shook nearly every house in the town, crockery and window panes suffering considerably... the stone was afterward cut into pieces weighing from 10 tons downwards.'

The Sydney Mail 7 November 1896 Courtesy G Goodfellow

In 1980 the quarry site was sold to Melocco Bros and soon after, in 1982, the company put in an application to re-open the quarry to remove 200 cubic metres of rock for extensions to the National Library in Canberra. There was considerable fear that the quarrying would then continue, so some local residents formed the Save The Gib Committee to oppose the re-opening (see Panel).

Melocco Bros retained a narrow strip of land along Oxley Drive which included Quarry A, until it was purchased by the Wingecarribee Shire Council in 1999.<sup>15</sup> Permission to quarry for six months had been refused. Most of the land was then incorporated into the Reserve.

### Saunders Quarry, Mittagong

(not shown on the map)

In 1894, Robert Saunders ran a quarry for kerb stones and road setts (pavers) near the present railway bridge, Mittagong, where the Private Township of Gibraltar was laid out but never built. The present Bowral to Mittagong Road runs across this land. Robert's father, Charles, started and developed the massive sandstone quarries at Pymont and ran a large building company in Sydney.

### Quarry C

#### FR Raward and Co. - Phippard Bros Pty Ltd - FJ Pope and Sons

It has been hard to discover any official records about Frank R Raward, although his activities are well recorded in the local papers. He was a builder, contractor, quarrymaster and an active member of the Methodist church, a Freemason and an alderman.

He was an identity of the time for, with an eye to effective publicity, 'Frank Raward - Builder' was painted in huge white letters on the prominent Mount Gibraltar cliff face and lasted for many years until it weathered away.<sup>16</sup>

FR Raward owned a brick yard in Shepherd Street and built the Glenquarry Public School. The company leased Quarry C from John Thompson in 1889 from which, in 1890, a single block weighing almost 10 tons was brought to Bowral railway siding destined for Centennial Park as one of the bases for gate pillars on the Randwick side. It also supplied stone for the basement of the portico of the Town Hall, the stone work in connection with the Cowra bridge on the Murrumbidgee, all the stone for the base of the police courts in Liverpool Street and the paving of the Flemington sheep pens.<sup>17</sup>

In 1893 he purchased a steam crane from Phippard Bros in Sydney and brought it up by horse team. The description of this journey vividly evokes the period.<sup>18</sup> (See Panel)

In 1894 he provided the steps and the 12 ton keystone for the Mutual Life Insurance Co. of New York on the corner of Pitt Street and Martin Place.<sup>19</sup> The same year his foundation stone for Royal Prince Alfred Hospital was put in place.

In 1897 FR Raward's tender was accepted for supply of 80,000 yards (sic) of railway ballast to the Government. 'He will be employing some 30 or 40 drays to convey the stone to the Government crushers at The Gib'.<sup>20</sup>



Queen Victoria Market opened in 1898 designed by George Macrae and built by Phippard Brothers using stone from several of their quarries

Photo: R Baker

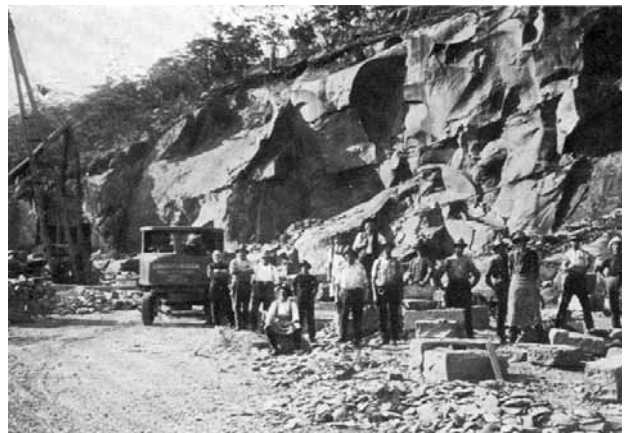
During this period the newspapers report that he supplied the rough stone to another major Sydney builder, Phippard Bros Pty Ltd, for use in the Queen Victoria Markets. Phippards set up large travelling crane at the Bowral railway yards where up to twenty masons worked at dressing the stone before it was sent to Sydney by rail, ready to be put in place. The piers, ground floor and polished columns are of trachyte and the beautiful stairs that curve around the lifts in the present Queen Victoria Building are a readily visible example of Bowral Trachyte.<sup>21</sup>

### FJ Pope and Sons

Francis Pope was born in Melbourne and came to Bowral in 1894. The son of a Scottish stonemason, he came to pursue work in his family tradition. He first worked with Loveridge and Hudson in Quarry A, and also when they started in Quarry D.

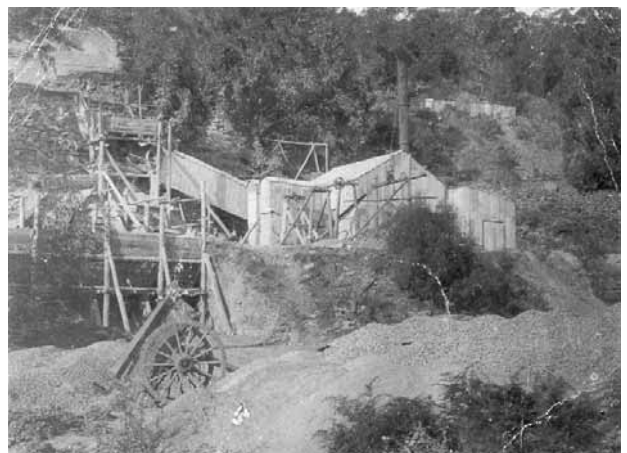
In 1912, following Raward, Francis Pope leased, operated and later (in 1928) bought the big Quarry C in King St from Elsie Muriel Pratt of Whinstone Park.<sup>22</sup> Francis Pope encouraged university students on their geology field trips to study the rock at this site and listened with interest to their lecturers such as Professor Griffith Taylor, Professor TW Edgeworth David<sup>23</sup> and the young Douglas Mawson and became very knowledgeable himself.

Three generations, Francis, his son Arthur and his grandson Donald worked closely with the adjacent



FJ Pope and Sons quarry

Photo: With permission BDHFHS



FJ Pope and Sons, stone crushing plant

Courtesy S Hicks



Australia House, London '... a base of Bowral trachyte supports nine stories of yellow sandstone from Bondi quarries - few stones lend themselves to such dignity of treatment as does the deep grey-colour of igneous trachyte of Bowral. Judged whether in the glassy polish of the heavy Tuscan columns at the entrance, or in the chiselled blocks supporting them, its sober hues well accord with the modern classic of the building and the business that it houses...'

Sydney Morning Herald, Centenary Issue 18 April 1931  
 Photo: Australian High Commission, London.

Loveridge and Hudson enterprise on the supply of dimension stone and also worked quarries in Gunning and Marulan. They worked this quarry continuously through both wars, the Depression and the postwar shortages.

Arthur's brother, James, went to Gallipoli and was later killed in France during the First World War and Donald served in both wars, while Arthur ran the quarry until his return.

A crusher was installed to use the spalls and it became a basic part of the business to sell aggregate for road improvement and for the wartime construction of the airstrip at Mittagong.

Arthur Pope remarked that the use of compressed air had done away with a lot of the drudgery in the quarry as the workers could, with a machine, do in half an hour what had taken three men a whole day.

In 1913, foundation stones were cut, dressed and sent to England for Australia House in London.

Stone was also sent to Cape Byron and Norah Head lighthouses which both have trachyte turrets and balconies.

In 1930 the Pope quarry filled a big contract for stone for the Commonwealth Bank in Sydney. A new building regulation allowed buildings to be constructed in concrete and veneered in stone. With modern equipment, such as carborundum wheels and wire saws, a few blocks of stone could be sawn to face a building that previously might have taken two or three hundred tons of stone. This depressed the dimension stone business, so the Mount Gibraltar quarrymen were particularly disappointed when JC Bradfield chose Moruya Granite for the Sydney Harbour Bridge instead of Bowral Trachyte.

Over time the use of stone had changed in the building industry from a structural to an ornamental function. By 1966 an example of this could be seen in the trachyte podium of the National Library in Canberra where blocks from the Mount Gibraltar quarries were cut into facing pieces for the base courses. The podium bears the inscription, 'The Rt. Hon. Sir Robert Menzies KT CHOC set this stone on 31st March, 1966'.<sup>24</sup>

The business continued providing monumental stones and crushed rock for roadmaking until, in 1971, FJ Pope and Sons leased the quarry to Granite Ware Pty Ltd. This company provided dimension stone for other suppliers such as Gosford Quarries Pty Ltd who in turn supplied the sawn stone cladding for the Treasury Building extensions in Canberra.

By this time the community had begun to protest about the quarrying activity due to the daily blasting and landscape destruction. The council decided to acquire the quarries to add to the Mount Gibraltar Reserve.



Byron Bay Lighthouse, Bowral Trachyte balcony

Photo: M Ryan



National Library, Canberra, Bowral Trachyte podium

Photo: J Lemann

In 1975 the Pope quarry was sold to Bowral Municipal Council who leased it back to Granite Ware Pty Ltd<sup>25</sup> with a royalty of \$1 per cubic foot of any dimension stone removed to fulfil outstanding orders.<sup>26</sup> Finally, in 1980 Bowral Municipal Council bought back the lease, the quarry was closed and the land incorporated into the Reserve. This supported a growing community wish to conserve the mountain for its landscape and environmental value.(see Panel overleaf).

#### **Quarries E & F on the western face**

##### **Amos Bros Pty Ltd - Government Ballast**

Amos Bros acquired the quarry site in 1881<sup>27</sup> and by 1888 the large Quarry E in Soma Avenue (Amos spelt backwards) was producing stone for railway ballast.<sup>28</sup>

The Railway Commissioners resumed land from the Amos Brothers and Eli Beer near the railway in 1890<sup>29</sup> and opened the Government Ballast Quarry (Quarry F). It had a double tramway to a crusher near the railway tunnel entrance and provided ballast for the construction of the new Great Southern (Sydney to Melbourne) railway line.<sup>30</sup>

The quarry closed within two years and, after a court case in 1894,<sup>31</sup> Alexander Amos got back the land he had valued at £209,800 which the Railway Commissioners had resumed and valued at only



Treasury Building, Canberra, Bowral Trachyte facing Photo: J Lemann

£1500. The Railway Commissioners paid for the rock removed, at six shillings per ton for first class stone, and one shilling and sixpence for spalls. Alexander Amos was heard to say that he valued his trachyte more than a gold mine. Eli Beer also went to court for damages to his property and orchard and won. He died in 1917 and his descendents gave his land for the *Mount Gibraltar Boys Home*, through their connections with the Salvation Army. It is now *Gibraltar Park*.

By 1893, Robert Amos had transferred his share to his brother Alexander Amos.<sup>32</sup> Alexander Amos was a grazier and prominent railway contractor who constructed a number of railway lines. He had



Government ballast quarry

Photo: With permission BDHFHS



Government ballast quarry tramway

Photo: With permission BDHFHS



Government ballast crusher

Photo: With permission BDHFHS

## Government Ballast Quarry

Article in Bowral Free Press 15 October 1890

‘— The quarry will be started this week; and the tram line and crushers will probably be ready for work in about a month. When in full work the crushers will turn out about 850 tons of metal a day. The staging on which the crusher is erected at the siding on the railway line near the mouth of the tunnel, is 100 feet long by 40 feet high. It is an extensive piece of work and is being carried out under the supervision of Mr W Marcroft, who has been foreman carpenter for Messrs Hudson Bros, for fourteen years...In the woodwork there are 60 iron bark posts 12 x 12 and 40 feet long, the flooring is all 6 inch hardwood, and the bracings are Oregon. The staging will be enclosed under a galvanised iron roof, 100ft x 25 ft.

The staging is built in three tiers. On the top tier there are six automatic tippers. The skips, full of stone, will run down the line into these tippers, and will capsize the contents automatically on to the second tier of the staging. Here the metal will be fed into the crushers, from which it will fall on to iron screens, and from there, into the hoppers below. Underneath the hoppers there are three lines of railway, along which railway trucks will travel to receive the metal from the hoppers. Thus the stone from the quarries will be received on the top staging, and it will be crushed and separated as it passes down into the railway trucks underneath. The machines will be driven by a 30 horse power engine, and this engine will also drive a rock drill at the quarry (by compressed air). The machines, the ordinary rock breakers, are on the ground, together with about 40 skips. About 26 men have been engaged in this work.

A double train line will run from the crushers to the quarry, a distance of about a quarter of a mile, and the full trucks coming down will bring the empties back. The drum, 6 feet in diameter, and about three tons in weight, will be erected on an iron bark timber frame 20 feet long by 11 feet high and 7 feet wide on Mr Beer's land at the quarries. The drum was cast at Messrs Hudson Bros, and this firm also supplied the shaft and pullers &c. The shaft (wrought iron) at the crushers is 3 inches in diameter and 100 feet long.

The engine house at the crushers will be 25 feet x 18 feet and the engine, 30 horse power, is one of Robey's semi-portable. Two of the crushers are supplied by Park and Lacy and the other four are from Melbourne.

When the machines are in full work they will require the attention of 15 men and not less than 50 men will be kept busy at the quarry.’



Anzac Memorial, Bowral, New South Wales

Photo: Frank Hurley 1885-1962 National Library of Australia PIC FH/10160



Bowral Court House designed by Walter Liberty Vernon, Government Architect, Bowral Trachyte and sandstone Photo: J Lemann

bought most of the northern and western part of the mountain from the developer, PLC Shepherd. After Alexander died in 1915,<sup>33</sup> the Union Trustee Coy of Australia Ltd owned his land and administered his estate.<sup>34</sup> It sold the summit site to Joshua Stokes for a future Reserve (see Chapter 3) and subdivided land along the Mittagong to Bowral road for dwellings.

In 1917 a portion was again vested in the Railway Commissioners.<sup>35</sup> At this time the Public Works

Department resumed the Amos land on the north face of the mountain in order to use the trachyte for the construction of Avon Dam.<sup>36</sup> However, Avon Dam was built of sandstone and it appears that aggregate for the concrete was purchased from existing quarries. So, fortunately, this area<sup>37</sup> remained undeveloped Crown land and was assessed and gazetted in 1994 as part of the Mount Gibraltar Reserve, to be managed by the Wingecarribee Shire Council. This acquisition doubled the size of the Reserve.

In 1927, the Union Trustee Coy of Australia Ltd advertised for sale Quarry E and Lot 16 adjoining the quarry in Soma Avenue, as ‘containing good trachyte and having splendid panoramic views’.<sup>38</sup> It was purchased by Anna Russel Ingeborg<sup>39</sup> who then leased out the site.

In 1930 the quarry was operated by the Haines family, trading as Mascot Granite Works, mainly using the boulders at the base of the cliff. It was a large quarry with an exposed face 100ft high and 100ft long, from which some stone was worked and dressed for kerb and guttering and tramway borders. It also crushed and processed aggregate for local Council road works.<sup>40</sup> It ceased operation in 1962. The land changed hands several times in the 1970s and was finally sold to Bowral Municipal Council in 1979<sup>41</sup> for inclusion in the Reserve.

## Mount Gibraltar Quarries Close Down

By November 1973, Bowral residents were protesting about the noise of the blasting and the increasing scars on Mount Gibraltar due to the quarrying. At this time only Quarry C was active.

Letters to the Bowral Municipal Council from Lynne Hayes and Rachel Roxburgh of the National Parks Association triggered a process steered by the Mayor, David Wood, during which he held discussions with community members and the quarry operators and owners. He then saw the Council invoke its Town Planning Ordinance and inform the State Planning Authority that it intended to reserve all land zoned as Extractive Industry on The Gib as Open Space. Negotiations were carried out with FJ Pope and Sons and R Watson of Granite Ware Industries Pty Ltd to close down and buy the quarry.

Ten years later, in 1983 Melocco Bros (a unit of Blue Metal Industries) applied to the newly amalgamated Wingecarribee Shire Council to re-open the dormant (for 16 years) Quarry D to extract 200 cubic metres of dimension stone for extensions to the National Library in Canberra. The Council Works and Town Planning Committee recommended approval. This sparked a community uproar which led to the formation of the 'Save The Gib' committee by Susan Webb, Rowan Cahill, Colin McPhedran, Patrick Wilde, Stuart Kyngdon and Maurice Bratter. On careful reading it appeared the application was for on-going quarrying.

Opinion was sought from Murray Wilcox QC who advised against approval as the development did not comply with the Local Environment Plan.

Mr Eric Bedford, Minister for the Environment and Planning and the Heritage Council of NSW were asked to intercede while the Department of Mines requested deferral of a decision.

The Council, led by Shire President Geoff Larsen and Deputy David Wood, reviewed the initial recommendation and negotiated a deal for Melocco Bros to sell the 11 acres of quarry and the concrete batching plant to the Council for \$2 in exchange for the right to quarry for four years. They were entitled to take out 1450 cubic metres of rock and required to rehabilitate the site for public open space. This avoided court proceedings, provided the unique rock for the extensions, and closed the quarry permanently in 1986.

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Around 1966–67 Gosford Quarries worked a small quarry at the end of Tullooona Avenue, under the cliff near the old Government quarry. Only a few blocks were taken from the submerged boulders as they were found to contain many pegmatite (larger mineral) veins that detracted from its appearance, especially when polished.<sup>42</sup> The firm then purchased their stone from FJ Pope and Sons.

### The End of Quarrying

Gradually the quarries closed down as building methods and materials changed and the community became more concerned for the beauty of the mountain and the quality of life so close to the quarries. Many residents remember how the blasting would shake the town prior to the next day's crushing (see Panel).

Once closed, the quarries were abandoned and were quickly overgrown by weeds. Bowral Municipal Council knocked down and buried much of the derelict machinery and filled the waterholes in an effort to make the quarries safer.

In 2004 The Mount Gibraltar Landcare and

Bushcare group completed an Assessment of Heritage Significance of the Quarries for the Wingecarribee Shire Council. This was guided by Assoc. Professor Ian Jack and Council heritage advisers and led to the nomination of the quarries to the NSW State Heritage Register.

Recognition of the skilled workmanship and the quality of material from these quarries plays an important part in the history of construction in Australia. It is with considerable pride that we can view the massive stone buildings standing today in the city of Sydney, and notice the local buildings such as the Bowral Court House, domestic gateposts and walls and the many monuments built of Bowral Trachyte.

### Recent Activity

In 2003 the Department of Public Works removed some loose blocks to be used for repairs to the NSW State Library steps. In 2004 an honours student from Wollongong University undertook a scientific study of minerals in the pegmatite veins in the rocks<sup>43</sup> the first since Sir Douglas Mawson's study in 1903.

## Trachyte Structures



Bong Bong Memorial

Photo: J Lemann



Intelligence Department, columns, flagging and base-courses of Bowral Trachyte 1909

Photo: R Baker



FR Raward's keystone for the Mutual Life Insurance Co of New York bogged in Bowral. 'The stone shown in the illustration is being drawn by a team of 10 horses. It weighed about 12 tons, and the vehicle that conveyed it from the quarries to the railway station became bogged in the main street, the wheels cutting through the coating of metal.'

Photo: The Sydney Mail 7 November 1896 With permission BDHFHS



Moss Vale cottage walls

Photo: J Lemann



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## Acknowledgements

I wish to acknowledge the assistance of the Berrima District Historical and Family History Society (BDHFHS); Dr John Simons, president; Leonie Knapman, historian; Suzanne Hicks (nee Pope); Andrea Humphreys, heritage adviser; Assoc. Prof. Ian Jack, History Department of Sydney University; and Rowan Cahill of the Save The Gib Committee.

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- <sup>4</sup> Obituary, Wollondilly Press 14 December 1910 This is another William Charker, not the first settler in the Mittagong area.
- <sup>5</sup> Loveridge, I Letter to D Hoskins and Pope, AW Family notes from S Hicks
- <sup>6</sup> Bowral Free Press 6 August 1892
- <sup>7</sup> D Hoskins, pers. comm.
- <sup>8</sup> Sir Cecil Hoskins was knighted for services to industry and his name is commemorated in the Cecil Hoskins Nature Reserve. He was born in 1890. His company Hoskins Iron and Steel Co Ltd, became in 1928 Australian Iron and Steel Co Ltd, and in 1935 merged with The Broken Hill Proprietary Co Ltd (now Bluescope Steel). He also pegged out the limestone quarry at South Marulan which is used as a basis for Southern Portland Cement (now Blue Circle Southern Cement Ltd). He was also a director of Southern Portland Cement. His sons Donald and Kenneth set up the Southern Limestone Co at Moss Vale. Donald was also an executive in Blue Metal Industries which amalgamated with Melocco Brothers.
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- <sup>10</sup> Pope, FJ Talk to Rotary Club
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- <sup>12</sup> Clark, A *The Hampden Bridge Story*, 1998
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- <sup>14</sup> Land Titles Office Vol. 1962 Fol. 104, 1909 bought from J. Clayton
- <sup>15</sup> Part. DP 111222
- <sup>16</sup> Pope, AF Family Notes
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- <sup>18</sup> Bowral Free Press, 5 July 1893
- <sup>19</sup> Bowral Free Press, 17 March 1894
- <sup>20</sup> Bowral Free Press, 17 July 1897
- <sup>21</sup> A. Phippard, pers. comm.
- <sup>22</sup> Land Titles Office Book 1532, No 964
- <sup>23</sup> After World War I Edgeworth David was asked to recommend suitable enduring stone for the 30,000 Australian war graves and he suggested Bowral Trachyte and Melbourne Bluestone. In the event, however, his advice was not acted upon and English Portland Stone was used. (Branagan, D *TW Edgeworth David: A Life* National Library of Australia 2005)
- <sup>24</sup> Inscription on the Foundation Stone, National Library, Canberra
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- <sup>35</sup> Land Titles Office, Vol 2874, Fol 124, Vol 1110, Fol 235
- <sup>36</sup> Southern Mail 1920
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The Inner Bowl picnic area, Mount Gibraltar Reserve (Top) 1995 severely compacted and denuded by vehicle misuse  
(Bottom) 2000 regenerating forest, same view  
Photo: Mount Gibraltar Landcare and Bushcare records (MGLB)

# Chapter 7



## Restoration

Jane Lemann

Jane Lemann, DipSKTC HortCert BushRegen, has lived in the area for forty-five years. She is a volunteer conservationist working hard to care for what is left of our natural environment, in particular the Mount Gibraltar Reserve, as a member of Mount Gibraltar Landcare and Bushcare group.

This chapter describes the success of The Mount Gibraltar Restoration Project. Supported by the Wingecarribee Shire Council and Landcare, the project has been driven by caring members of the community with a concern for the future.

In 1992 Mount Gibraltar Reserve was a neglected 65 hectares. Having been greatly disturbed by the various quarrying activities, road works, installation of urban services and frequent fire, it was so weed infested that the native vegetation was being overcome and few replacement trees were emerging as the canopy aged. Blackberry, English Ivy, Japanese Honeysuckle, Barberry, Holly, Cherry Laurel, Cotoneaster, Privet, Banana Passionfruit, Blue Periwinkle, Bridal Creeper, Turkey Rhubarb, Bamboo, Gorse and English Broom had taken hold. The Reserve sheltered feral Goats, Foxes, Cats and Rabbits.

It was so abused by vehicle hooliganism that the Inner Bowl and Bowral Lookout Picnic Areas were reduced to bare compacted arenas; so frequently burned that the habitat had almost disappeared; so mistreated that timber and rocks were being stolen regularly and rubbish was dumped at every access point. Vandalism had all but destroyed the heritage shelters. It was not a nice place.



Threats to the Mount Gibraltar Forest: towers of English Ivy *Hedera helix*  
Photo: MGLB



Threats to the *Mount Gibraltar Forest*: carpets of English Ivy *Hedera helix*

Photo: MGLB



Threats to the *Mount Gibraltar Forest*: invasion by Japanese Honeysuckle *Lonicera japonica*

Photo: MGLB

By 1993 community pressure and the National Parks Association caused Wingecarribee Shire Council to call a public meeting to discuss the natural reserves in the shire. It was chaired by Councillor David Wood, and led to the formation of five volunteer Management Committees for the care, control and management of Mount Gibraltar, Mount Alexandra, Gibbergunyah, Mansfield and Hammock Hill Reserves.

At the same time Council arranged suitable public liability insurance to enable volunteers to work on public land. Without this, bushcare projects could not have gone ahead.

The first Mount Gibraltar Management Committee consisted of Geoff Allen (President), Stuart Kyngdon, Arthur Beasley, Geoff O'Connor, Pat Shaw, Jane Lemann, Christine Perry, Barry Webb and Ian Armstrong.

Funded first by a gift of \$75 from the National Parks Association and then by \$2000 from Wingecarribee Shire Council, this Committee carried out assessments of the Reserve and prepared



Threats to Mount Gibraltar Forest:  
invasion of Privet *Ligustrum lucidum* and Barberry *Berberis vulgare*  
Photo: MGLB

a Management Plan (see Appendix V). One of the first projects was to protect the remaining vegetation from further vehicle damage so rocks and logs were placed as barriers, and special carpark areas were prepared. A successful application was made to Landcare for a grant for a fauna survey by naturalist Pat Jordan; a landscape master plan was prepared by landscape architect Mark Tickner and materials were purchased for a bush regeneration project to be supervised by bush regenerator Jane Lemann.

Concurrently negotiations began with the NSW Department of Land and Water Conservation for the 65 hectares of undeveloped Crown land on the Mittagong side to be assessed and included in the Reserve, rather than sold as was planned. This was achieved and gazetted in 1995 thereby securing the land as public reserve to be managed by council, and doubling the size of the Reserve to 130 hectares.

The volunteer bush regeneration work gathered momentum and has proceeded on a weekly basis since 1995. The Bush Regeneration Plan is to start at the top and work down systematically, creating a mosaic of weeded and regenerating, part weeded and yet-to-be weeded areas. This is to prevent loss of habitat and exposure of too large an area at one time. The methods used are accepted bush regeneration techniques of the National Trust (see Appendix VI).

Ivy growing on trees has been cut, the jungle of exotic shrub weeds cleared and the ground Ivy and Honeysuckle have been meticulously removed. Steadily each year more of the forest has been released from the clutches of the weeds and has leaped into natural regeneration.

Now, 11 years later almost the whole of the Reserve is recovering. All that is needed in most areas is the essential annual inspection and maintenance to remove any seedling or resprouting weeds.

A bond of friendship has grown within the volunteer group through shared experiences, hard



Volunteer bush regenerators working on English Ivy

Photo: MGLB

work, stories and laughter, together with the satisfaction of seeing the job well done and the forest coming to life.

Moments of delight enjoyed by the volunteers have included: watching Sulphur-crested Cockatoos defending their tree hollow from a Brush-tailed Possum searching for a home; finding themselves quietly observed by Swamp Wallabies; discovering weird and wonderful pupae, native snails, extraordinary fungi; monitoring regiments of tiny orchids and receiving a visit from an Echidna during a morning tea break.

The volunteer regenerators record their hours of labour. These hours become the in-kind component for matching State and Federal Grants. Receiving substantial grants of money has made possible the full recovery of the Reserve.

The grants enable a professional bush regeneration contractor, Proust Bushland Services, to be employed to work on the very steep and difficult slopes of the mountain, in the same systematic manner as the volunteers.

As the weeds are removed and stockpiled for burning by the Rural Fire Service, the natural regeneration of the native plants is exciting to observe.

In 2001 the NSW Scientific Committee declared the *Mount Gibraltar Forest* an Endangered Ecological Community to help protect what remains of this small remnant of the particular plant community (see Appendix VII).

The Shire's Reserves volunteer management committees realised they needed expert scientific guidance for the responsibility of caring for these precious natural areas. By pooling all their recorded hours of work they were able to obtain grant money for a Bushcare Officer to be appointed to Wingecarribee Shire Council for three years. From 1996 Larry Melican was the scientist who set up the framework for the regeneration activities being continued today.

The group working on The Gib has been very aware of the important part the mountain plays as a source for two rivers in the Sydney Drinking Water Catchment (see Chapter 5). With help and advice from Brad Davies of Wollondilly Catchment Protection, work has been carried out to reduce erosion and sedimentation affecting waterways downstream of the Reserve. Repairs to the eroding firetrails and walking tracks and installation of gates to stop unauthorised vehicle access have achieved better soil stability.

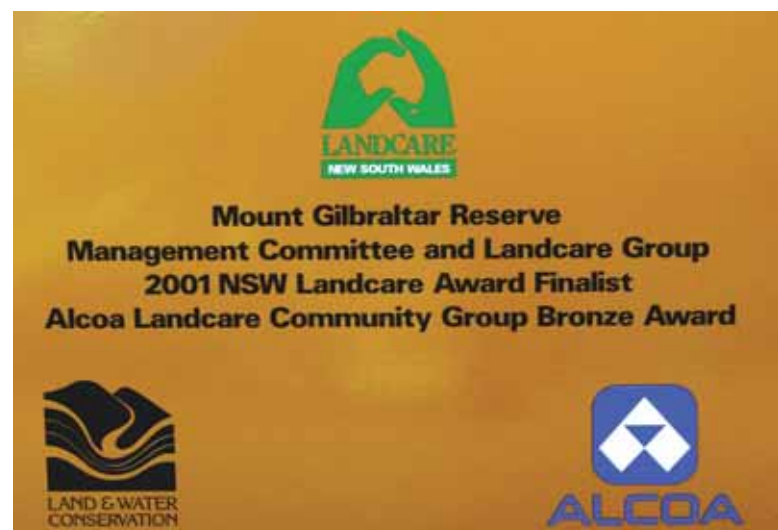
Huge and seeding pine trees had become established in the Reserve and the Yallah TAFE arborists and Wingecarribee SES have assisted with their removal.



Volunteer bush regenerator Elizabeth Smith dealing with English Ivy  
Photo: MGLB



Contract Bush Regenerators, Proust Bushland Services: Wendy Craddock, Megan Smith, Jan Sweetnam, Gerard Proust, Ailee Calderbank  
Photo: Proust Bushland Services



Mount Gibraltar Landcare Award 2001

Photo: D Young

Feral Cats and Foxes were decimating the native animal populations, so the Rural Lands Protection Board has helped to trap and bait these pests. Goats have not been sighted in the Reserve for several years.

There has also been some assistance provided by Government LEAP, Green Corps programs and the Conservation Volunteers in weeding and restoration work.

In 2001, with much pride, the Mount Gibraltar Restoration Project won a NSW Alcoa Landcare Award.

Under the leadership of Councillor Sara Murray, who served as mayor between 1997 and 2000, there was a positive change of attitude towards the importance of conservation of the natural areas of the Shire. Councillors and staff are now more aware of their responsibilities towards the sustainable management of our natural resources. They are supporting the swelling number of community volunteers prepared to work hard for conservation of the remaining vulnerable areas on both public and private land.

Council has made the essential position of Bushcare Officer a permanent one to guide the care of the natural areas of the Shire, and the volunteers

have formed a Wingecarribee Bushcare and Landcare Network Group for mutual support. Council publishes a Bushcare newsletter, 'The Wingecarribee Web' and provides training in First Aid, Occupational Health and Safety and other practical workshops for the volunteers.



Wingecarribee Landcarer of the Year Award 2005, Geoff Allen

Photo: MGLB



Volunteers replanting the Mount Jellore Lookout access track

Photo: MGLB



Mount Gibraltar Reserve, Bowral Lookout picnic area Landscaping Project, Stage 2

Photo: MGLB



Inner Bowl shelter

Photo: MGLB



WSC bush regeneration team: Kate Cretney, Stuart Chadwick, Erin Couper  
Photo: Wingecarribee Shire Council

With funds carefully managed by Maurice Bratter and steered by Dr Richard Hanbury, the Mount Gibraltar group has been able to carry out part of the landscaping plan to restore the heritage lookouts and shelters in sympathy with the hard rock character of the mountain.

Stonemason Stephen Bensley and volunteer Geoff Allen built the fine stone walls, steps and paths that both control vehicle intrusion and protect the adjacent forest while making the visitors' experience more enjoyable. Volunteer Stuart Kyngdon rebuilt and painted several of the dilapidated shelters. In 2001 when the endangered forest could no longer be cut down to reveal the view (as had occurred in the past), Wingecarribee Shire Council provided a new \$50,000, platform lookout with wheelchair access above Bowral and now also maintains the walking tracks and removes rubbish.

The industrial and social heritage of the old quarries merited an Assessment of Heritage Significance which was submitted to the NSW Heritage Committee in 2004. This will provide a basis for the management of these significant sites, a project which lies in the future due to difficult risk factors.

In 2001 the Management Committees were reorganised as Bushcare Groups and gave up financial control of their funds, as Council took up the care of the Reserves. However, volunteers were very anxious that their landcare and bushcare





Mount Gibraltar Reserve, Bowral Lookout entrance drive (Top) 1998 Damage caused by vehicles leaving the roadway (Bottom) 2004 Regeneration of the *Mount Gibraltar Forest* Photo: MGLB



Mount Gibraltar Forest recovering

Photo: MGLB

achievements should not be left to deteriorate due to changing Council priorities. They pushed very hard for a shire Environment Levy to help pay for reliable, on-going professional maintenance of the natural areas. Employment of a qualified and experienced bush regeneration team through this levy has proved to be an essential and equitable feature of Council's environmental management and should ensure on-going care of the Reserves.

The Mount Gibraltar Landcare and Bushcare group has worked hard to raise environmental awareness in the Shire through publicity, talks, displays and guided tours. It has supported Council through work on Council committees and through careful reading and comment on planning documents and environmental reports.

In 2004 Wingecarribee Shire Council won the NSW Landcare Gold Award for Local Government, an outstanding achievement.

Following the nearby fires in 2003 Council commissioned a revised Fire Management Plan for each of the Reserves that encompassed protection of life and property and, based on current scientific knowledge of fire ecology, protection of the special endangered communities.

After a considerable struggle to prevent sale or reclassification, several adjacent blocks of land have now been included in the Reserve as Community Land. These blocks are being carefully regenerated to

enlarge the forest area as much as possible as this helps to reduce the 'edge effect' by buffering the inner forest from adjacent clearing and weed invasion.

Now it is a joy to walk quietly through the Reserve where shaded paths wander among tall trees in which birds occupy the many hollows; where one can see the young replacement saplings gathering strength and the steady expansion of the pink tipped ferns. Gone are the gloomy towers of English Ivy, dense thickets of shrub weeds and the compacted bare areas. There is always something special to notice, from tiny orchids to leaping wallabies. The extraordinary richness and diversity of the plant and animal life in this small Reserve is the best possible reward for those who have worked so long and hard for its conservation.

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Mount Gibraltar Landcare and Bushcare Records 1993-2006

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#### Appendices

Appendix V	Reserve Management Objectives
Appendix VI	Bush Regeneration Principles and Techniques
Appendix VII	NSW Scientific Committee Final Determination

**Restoration of Mount Gibraltar  
Summary of Activities and Financial Support 1993-2006**

Activity	Sponsor	\$ Cost
Planning, administration, publicity, infrastructure, (fire trails, gates, signs, lookout repairs, landscaping)	WSC, TCM, Illawarra Sport and Rec, Garden History Society	146,214
Bush regeneration c.130 hectares	WSC, Landcare, NHT, WCMC, SCA, TSN, Envirofund, NSW Envirotrust	232,530
Heritage assessment	Local heritage grants	4,000
Feral animal management	WSC	4,000
Bushland co-ordinator 1996-1999	Save the Bush, DLWC	67,504
Book production	WSC, Norman Wettenhall Foundation, Local sponsors Australia Post/Landcare	29,100
Volunteer input	24,875 hours	<u>497,500</u>
<b>Total project value to June 2006</b>		<b>\$980,848</b>

Key

WSC Wingecarribee Shire Council	WCMC Wollondilly Catchment Management Committee	TSN Threatened Species Network,
TCM Total Catchment Management	SCA Sydney Catchment Authority	DLWC NSW Dept Land and Water Conservation, now DIPNR Department of Infrastructure, Planning and Natural Resources.
WOFE Wingecarribee Our Future Environment Levy	NHT Federal Natural Heritage Trust & Envirofund	



One of the Bush Regeneration Group's Anniversary Cards

Sketch: Anon



Trees in mist

Photo: J Lemann

# Chapter 8



## Reserve Expansion Land Acquisition for Mount Gibraltar Reserve Jane Lemann

The following tables and charts provide an overview of the history of the various pieces of land that make up the Mount Gibraltar Reserve. The information was researched for historical background for this study and should only be used as links to further study as there are several puzzles we could not resolve.

The land owned by Wingecarribee Shire Council is classified as Community Land for public passive recreation. The Crown land has been gazetted as part of the reserve for conservation of the native bushland and for public recreation and is managed by the Council.

### Summary of Acquisitions

In 1919 Joshua Stokes secured approximately 79 acres (approx 32 hectares) on the summit of Mount Gibraltar for a public reserve, 59 acres in Bowral Municipality and approximately 20 acres in Mittagong Municipality. (This division accounts for discrepancies in some reports). The land was acquired from the Union Trustee Company, the executor for Alexander Amos (see Chapter 3).

In 1938 adjustments were made for construction of part of Oxley Drive and the scenic loop road and some blocks, once part of John Thompson's estate, were included thus creating the Inner Bowl area and providing access to the Bowral Lookout site.<sup>1</sup>

In 1953 more land on the south side was acquired from Clarence Cull who had purchased part of the John Thompson estate from the executors Barbara and Elsie Muriel Pratt.

Some land was lost when in 1954 Bowral Municipal Council sold land near the trig station to the PMG as a site for communication towers, and in 1964 there were minor boundary adjustments. It was felt at the time that Council had recouped the extravagant expense of buying land for a natural reserve. Alderman HF Venable remarked:

That sale of one acre of land on the summit to the PMG for £150 meant the council was no longer out of pocket for the expenditure of the £150 for Joshua Stokes' purchases in 1919.<sup>2</sup>

In 1975 the land belonging to FJ Pope and Sons was purchased by Council in conjunction with closure of the quarry. This was followed in 1979 by the land once quarried by Alexander Amos in Soma Avenue and these lands were added to the Reserve.

Council then pursued a policy of acquiring those parts of neighbouring land zoned 6d (Future Recreation) as and when opportunity arose.

In 1984 the former Loveridge and Hudson quarry lands were bought from Melocco Bros for \$2 in exchange for permission for four years of quarrying. Quarrying finally ceased in 1986. This land was added to the Reserve as Public Open Space.

In 1995 Crown land on the northern slopes was assessed and gazetted for inclusion in the Reserve.

In 1999 the last of the quarry land beside Oxley Drive was purchased from Melocco Bros after permission for further quarrying was refused. Also, on 25 August 1999 Council resolved to include Lot 20 Oxley Drive in the Reserve as Community land.

This was part of the land purchased from Melocco Bros in 1984 to be Public Open Space but was then classified Operational (saleable) land. Unfortunately this inclusion has not been carried through.

At the present time, Council remains committed

to acquiring adjacent land whenever possible in order to enlarge the area of open space in the centre of our increasingly urbanised community. Such acquisitions increase the potential for sustainable management of the Reserve for conservation of the endangered *Mount Gibraltar Forest*.

However, it appears that when Council is in need of money, selling Reserve land, rather than acquiring it, becomes a possibility. Our local community should resist any such selling of Reserve land.

#### Acknowledgements

We acknowledge assistance given by staff of the Land Titles Office and Trevor Sutton of Wingecarribee Shire Council in researching the titles, and by Kristy Bewert, Landcare Co-ordinator, Hawkesbury-Nepean CMA, for creation of the maps.

#### Appendix

Appendix VIII Mount Gibraltar Reserve: History of Land Ownership

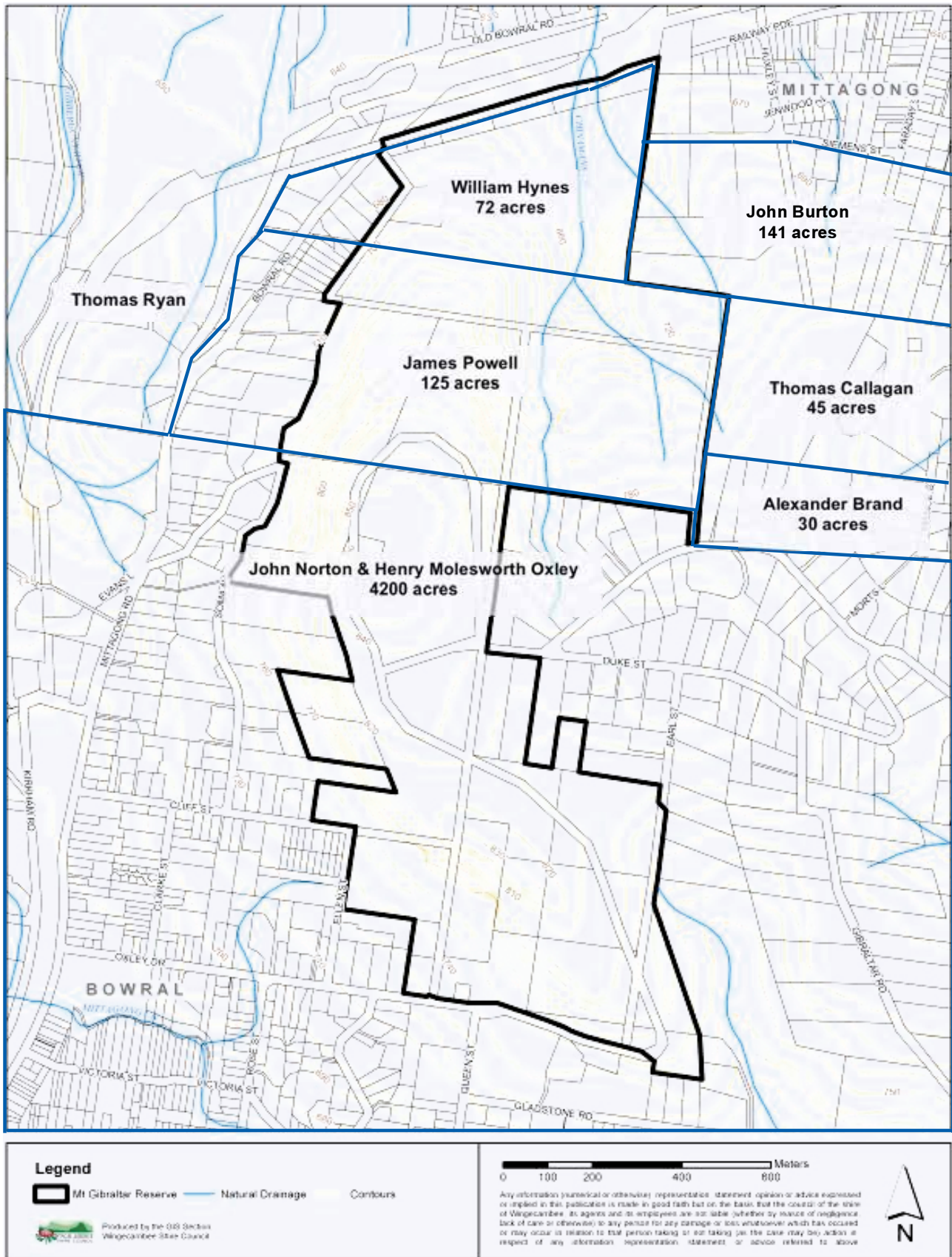
#### References

- Field Book Vol. 1079 and Plan 1974 Department of Works and Local Government
- Bowral Council Minutes 1935–1942, 5 November 1936 No. 1904

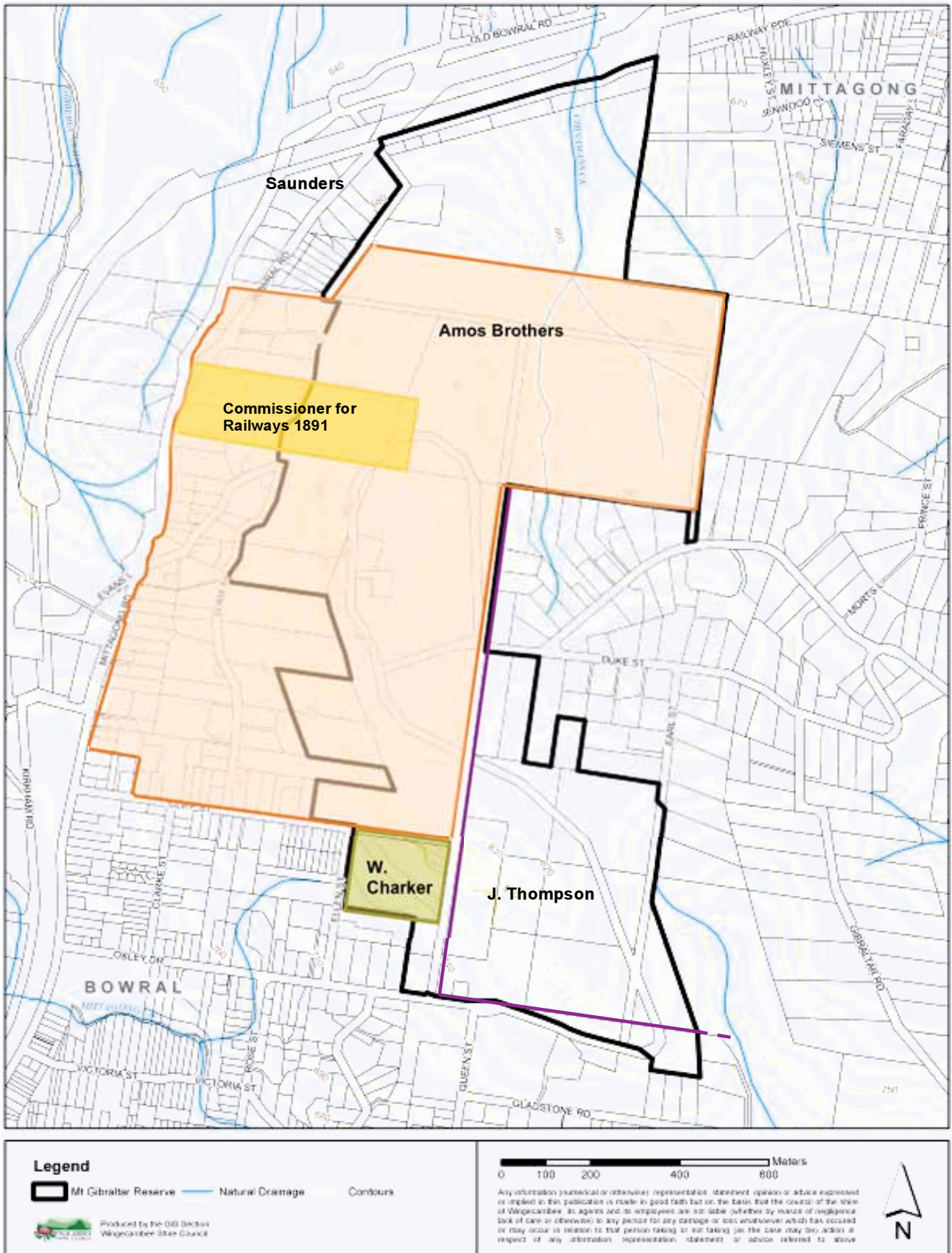
### Key to Land Title Maps, Mount Gibraltar Reserve

Date	DP No	Folio	Volume		Previous Owners
1919	666	2987	38		J Stokes, Union Trustee, Amos
1919	771155				Ditto
1919	856512-22	2987	39		Union Trustee, Amos, Shepherd
1938	15496 - 138	4125	115		Greenacre Pty Ltd
1938	15496 - 139	4882	104		AJ Johnstone
1938	111222 Lot 24	1644	17		J Thompson
1953	111222 - 24-29	2243	248		C Cull, EM Pratt & B Pratt 1932
1954	83436	2874	124		Crown, J Stokes, Union Trustee, Amos Gazetted 30-3-54
1955	856512	10121	63	Sold	Bowral Municipal Council to PMG
1964	856512	6735	210/211	Sold	Bowral Municipal Council to PMG
1975	738591	3217	450		Pope & Sons, EM Pratt 1928 (CT335)
1979	111372	6633	117		PK Loveridge, Ingeborg 1927, Union Trustee
1979	133145	6633	117		Ditto
1982	262408	14010	40		Tilbury Pty Ltd, Francis, Angus, Shepherd
1984	700951				Melocco Bros, L&H, Charker, Oxley
1986	739403 Lot 19p2				AW Pope, Union Trustee 1931, Amos
1987	862590 Lot 21				Melocco Bros, L&H 1909, Clayton, Charker
1990	803046				Gibson Subdivision
1995	169019	Gazettal	24-3-95		Crown 1919, Union Trustee, Amos
1995	770845 Lot 6				C Foley Subdivision
1999	862590 Lot 20				WSC, Melocco Bros, L&H, Clayton, Charker
1999	111222 Part Lot 27				Melocco Bros (CT155), L&H 1902, Angus, Shepherd
2002	1037922	4957	155		B Allen Subdivision

# Map 1 Original Grants, Mount Gibraltar Reserve

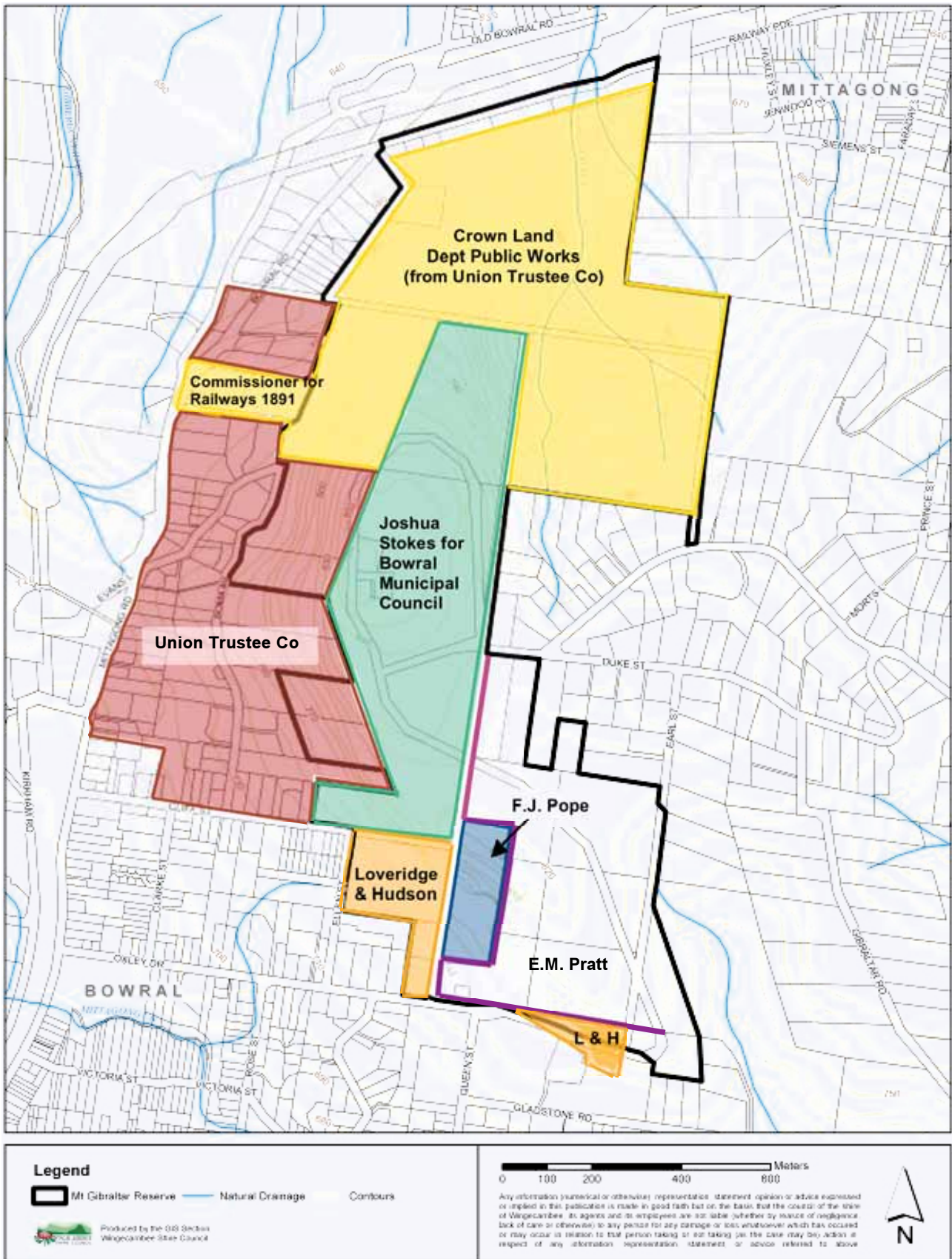


## Map 2 1887 Mount Gibraltar Reserve

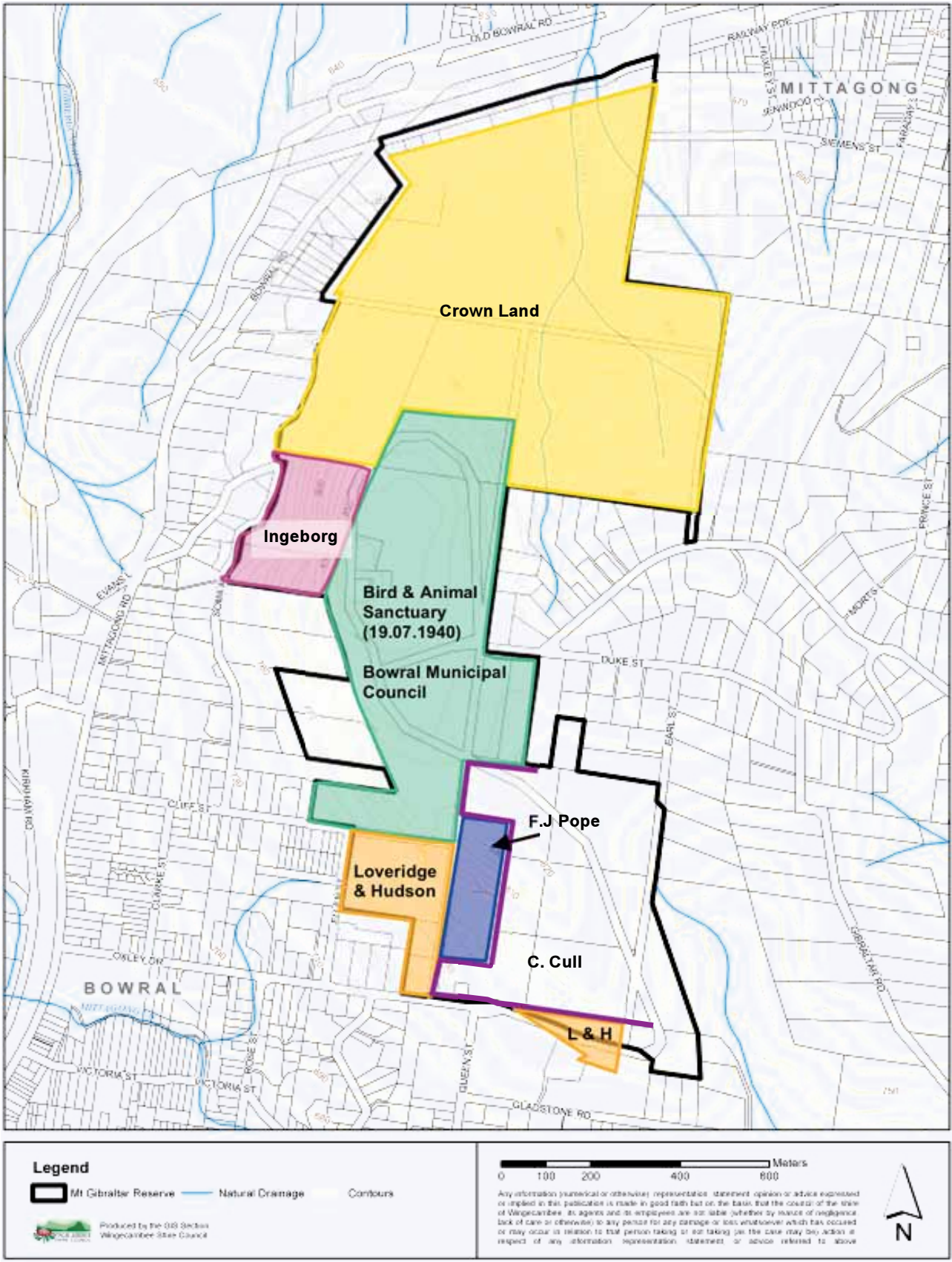




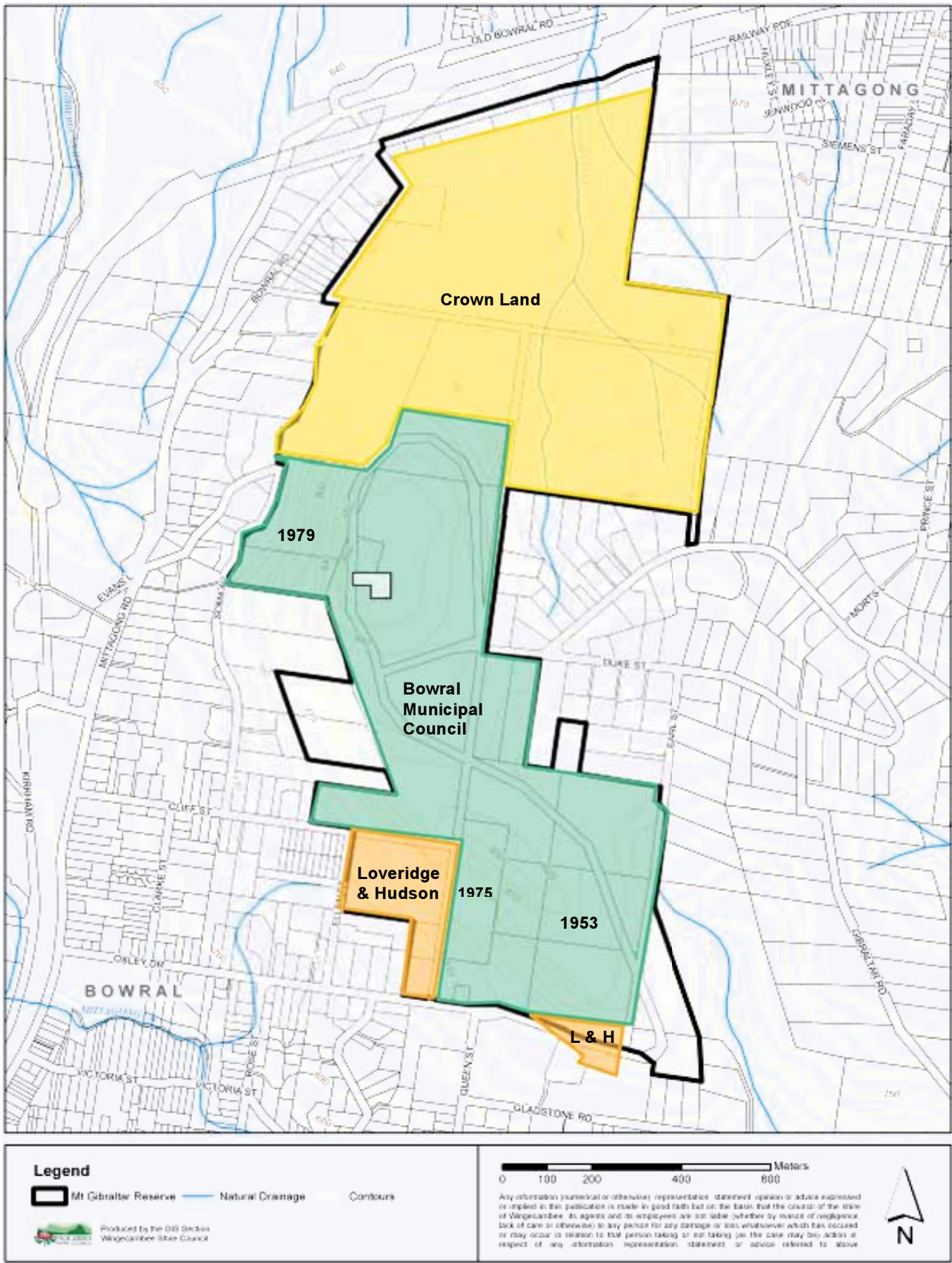
# Map 3 1919-1920 Mount Gibraltar Reserve



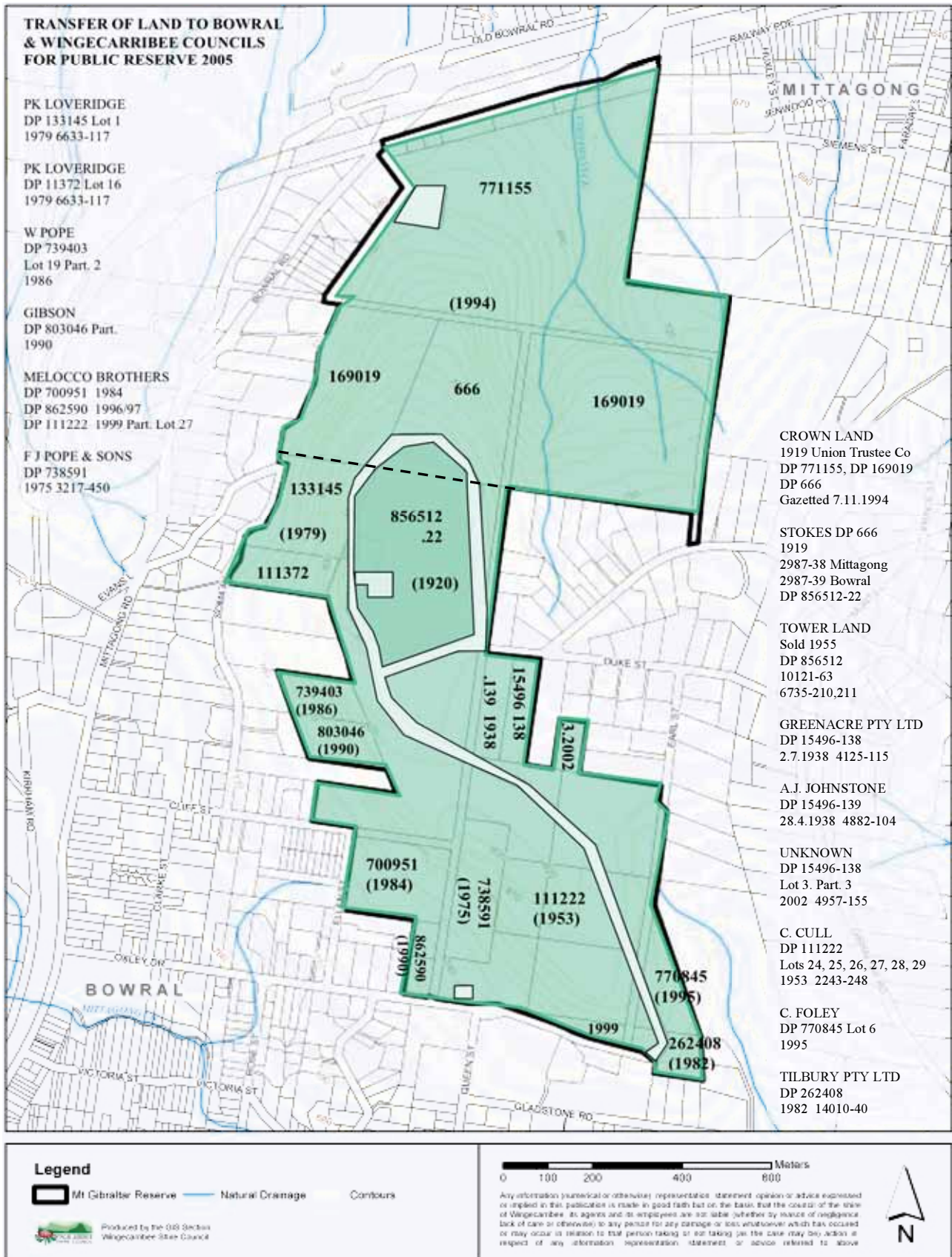
# Map 4 1940 Mount Gibraltar Reserve

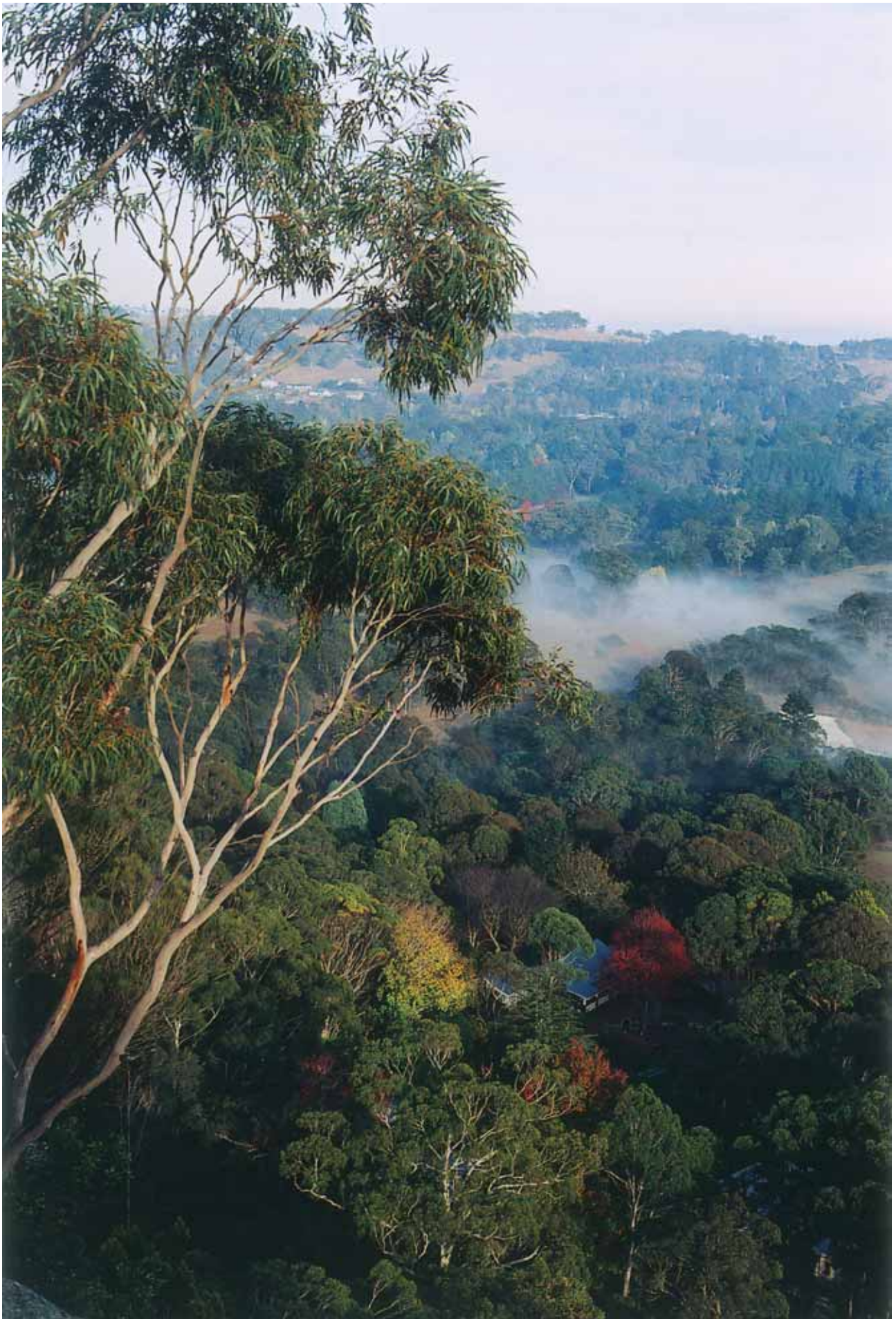


# Map 5 1980 Mount Gibraltar Reserve



# Map 6 2005 Mount Gibraltar Reserve





View from Mt Jellore Lookout

Photo: S Cains

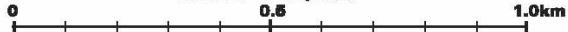
# MT. GIBRALTAR RESERVE

Reserve No.83436

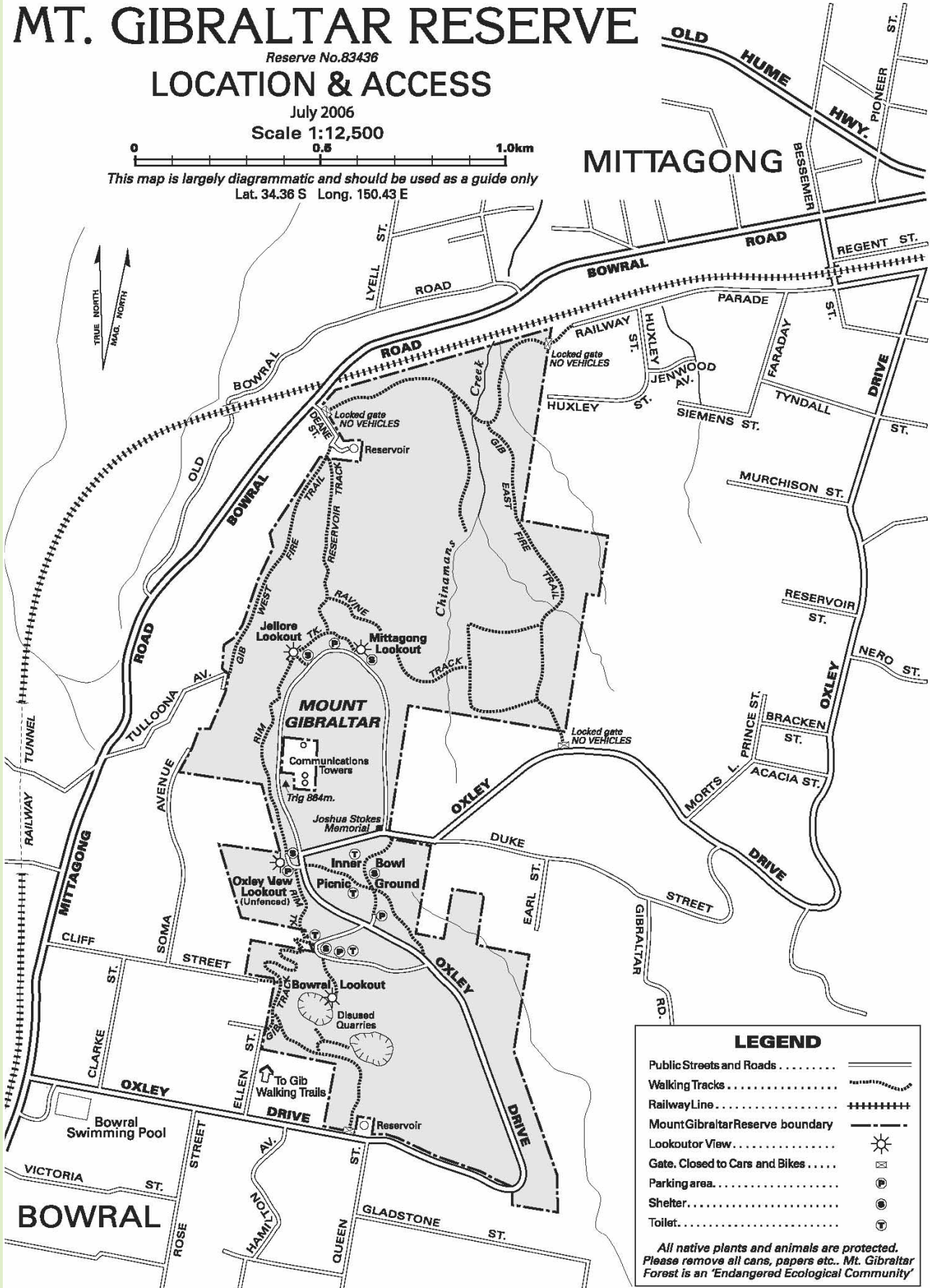
## LOCATION & ACCESS

July 2006

Scale 1:12,500



This map is largely diagrammatic and should be used as a guide only  
 Lat. 34.36 S Long. 150.43 E



**LEGEND**

- Public Streets and Roads . . . . .
- Walking Tracks . . . . .
- Railway Line . . . . .
- Mount Gibraltar Reserve boundary . . . . .
- Lookout View . . . . .
- Gate, Closed to Cars and Bikes . . . . .
- Parking area . . . . .
- Shelter . . . . .
- Toilet . . . . .

*All native plants and animals are protected. Please remove all cans, papers etc.. Mt. Gibraltar Forest is an 'Endangered Ecological Community'*

# Chapter 9



## Visitor's Guide

Mount Gibraltar Landcare and Bushcare  
and  
Wingecarribee Shire Council

**M**ount Gibraltar (863m) is a collapsed volcanic core composed of very hard rock called Mount Gibraltar Trachyte or microsyenite. 150 million years ago it pushed through the Hawkesbury Sandstone to form a high mountain now largely eroded away by wind and water.

It was first climbed by a European - explorer John Wilson - in 1798 and was known as "Bowrell" by the local aborigines. Surveyor Major Mitchell also climbed the mountain. In 1919 Alderman Joshua Stokes had the vision to acquire some of the land for a Reserve. A plaque for him is found on a stone memorial on Oxley Drive, Mittagong. The road and lookout shelters were constructed in the 1930s in an unemployment programme (the Spooner Relief Scheme).

Mount Gibraltar has been extensively quarried for stone for building and road construction. The quarries were eventually acquired by the community and finally closed in 1986.

Acquired in 1919 and added to since, the reserve was gazetted in 1995 and is presently managed by volunteers as Mt Gibraltar Landcare and Bushcare.

Please stay on the tracks and take care of the bushland. All native plants, animals and rocks are protected.



### **Picnic Areas** **The Inner Bowl**

The Inner Bowl provides a protected site where the rich soil supports a unique vegetation community of eucalypts with an understorey of ferns. Carparking is at the western entrance. Table and a shelter available.

### **Bowral Lookout** (*view south-west*) *has disabled access*

The new Bowral Lookout provides a scenic view overlooking Bowral, the Wingecarribee River Valley and Moss Vale. Mount Gingenbullen, and the Cookbundoon Ranges (near Goulburn) can be seen.

Walking tracks radiate from here (see map). Carparking, toilets, tables and a shelter are available.



Bowral Lookout, view over Bowral

Photo: S Cains

### **The Lookouts**

*Located on the Rim Track or Tourist Loop*

#### **Oxley View Lookout**

*View South-West to West (unfenced)*

Overlooks the original ‘Wingecarribee’ grant to John Oxley c.1820. The Oxley home (large white building opposite) c.1840 is still with the family.

#### **Mount Jellore Lookout** *View West to North-West*

Regarded as the finest view on the mountain with the Mittagong-Bowral Road and Main Southern Railway (before it enters the Gib Tunnel) in the foreground with the Gibbergunyah Reserve on the west.

To the north-west, farmland gives way to the bush of Mt. Alexandra Reserve on the other side of the Old Hume Highway. In the middle distance Mt Jellore can be seen protruding above the dissected plateau. In the far distance, the Nattai and Kanangra wilderness areas and the Blue Mountains (Katoomba) can be seen. Hippo Rock is 100m south on the Rim Track.

#### **Mittagong Lookout** *(unfenced) View North*

The township of Mittagong is immediately below with the Old Hume Highway and Railway clearly visible. Mt Alexandra Reserve lies opposite with the Nattai wilderness (N.W.) and Sydney Water Catchment Area (N.E.). On a clear day Centrepont and Sydney city buildings can be seen over the shoulder of Mount Alexandra (about 80km away). To the right Mt Keira (near Wollongong) is visible. The Cavern is 50m below on the Reservoir track.



Mittagong Lookout

Photo: S Cains

### **Walking Tracks**

#### **The Rim Track**

Yellow Code. Length 1.2km; approx 25 min

This track connects all 4 lookouts on the west side of the reserve. Excellent views of Bowral, Mittagong and the countryside. A suggested walk is to start at Bowral Lookout, walk along the track to Mittagong Lookout and return via the road and Inner Bowl.

#### **The Reservoir Track**

Red Code. Length 700m; approx 25 min

From Mittagong Lookout to the Reservoir tank adjacent to the road overbridge on the Mittagong-Bowral Road. The track descends to meet the East and West fire trails. Suggested walk is from Mittagong Lookout, down the Reservoir Track and returning via the Gib West fire trail, Soma Ave and The Gib track to Bowral Lookout.



### The Ravine Track

Blue Code. Length 600m; 20 min.

Links Reservoir track to the East fire trail. This is an undulating track with stepping blocks across Chinamen's Creek. Suggested walk from Mittagong Lookout via Ravine track, East and West fire trails, Reservoir track.

### The Gib Track

White code. Length 300m; 10 min

This track connects Bowral Lookout with Ellen and Cliff Streets below with a grand stone stairway. Visit the quarries en route. Suggested walk from Bowral swimming pool: walk up Oxley Drive, Ellen Street, Gib track to Bowral Lookout. Return the same way or via Rim and Reservoir tracks, Gib West fire trail and Soma Ave.

### Flora and Fauna *Endangered Ecological Community*

Native animals sighted in the Reserve include wallabies, gliders, wombats, echidnas, brush and ringtail possums, various lizards and snakes.

Over 50 species of birds have been noted, including kookaburras, magpies, currawongs, crimson and eastern rosellas, sulphur crested, gang-gang and yellow tailed black cockatoos, galahs, king parrots, wattle birds, eastern spinebills, blue wrens, robins, blackfaced cuckoo shrikes, thrush, silvereyes, spotted

pardelotes and brush-tailed cuckoos. Many migratory birds visit on passage.

The vegetation comprises a rare remnant of the once common volcanic soil community, now called 'Mount Gibraltar Forest' of *Eucalyptus fastigata* (brown barrel), *E. piperita* (Sydney peppermint), *E. smithii*, (gully gum), *Acacia melanoxydon* (sally wattle) with an understorey of ferns. Other plants include *Exocarpus* (native cherry), *Notelaea* (native olive), *Allocasuarina* (black sheoak). *Persoonia* (geebung), *Leptospermum* (teatree), *Melaleuca hypericifolia* (honeymyrtle), *Xerochrysum* (golden everlasting daisy), *Stypandra* (blue lily), *Dianella* and species rich ground cover.

### Bush Regeneration

The Reserve has been badly infested with weeds: blackberry, pine, holly, laurel, cotoneaster, berberis, hawthorn, honeysuckle, ivy and turkey rhubarb. A small group of volunteers has been systematically weeding the mountain since 1994. Natural regeneration is encouraged, volunteer help is always appreciated.

*Assistance has been received from: Landcare, WSC, SCA, NHT, TSN, NSW Envirotrust and Catchment Grants. Produced by the Mount Gibraltar Landcare and Bushcare. PO Box 981, Bowral 2576 and Wingecarribee Shire Council.*



View to Mount Jellore

Photo: S Cains



A Spiny Spider *Gasteracantha minax* wrapping a wasp

Photo: D Young

## Part II



# Mount Gibraltar Reserve

A NATURAL HISTORY



In memory of Patricia Mary Jordan  
who embraced the natural world and whose way of life  
encouraged this book.



Mount Gibraltar Forest

Photo: S Cains

## Landscape Full of Trees

Andrew Taylor

Andrew Taylor (1940- ) is Foundation Professor of English at Edith Cowan University, Perth. He has published 10 books of poetry, including *Selected Poems*, 1982.

*Landscape full of trees – no single word  
for this lack of horizon, this  
whispering presence overhead,  
this vertical world whose green roof  
and spiky floor were the nursery  
of language.*

*Call it jungle  
and it menaces, crackling with active  
and aggressive verbs. Forest  
sighs, but with lupine hunger  
sharpening each almost inaudible  
vowel.*

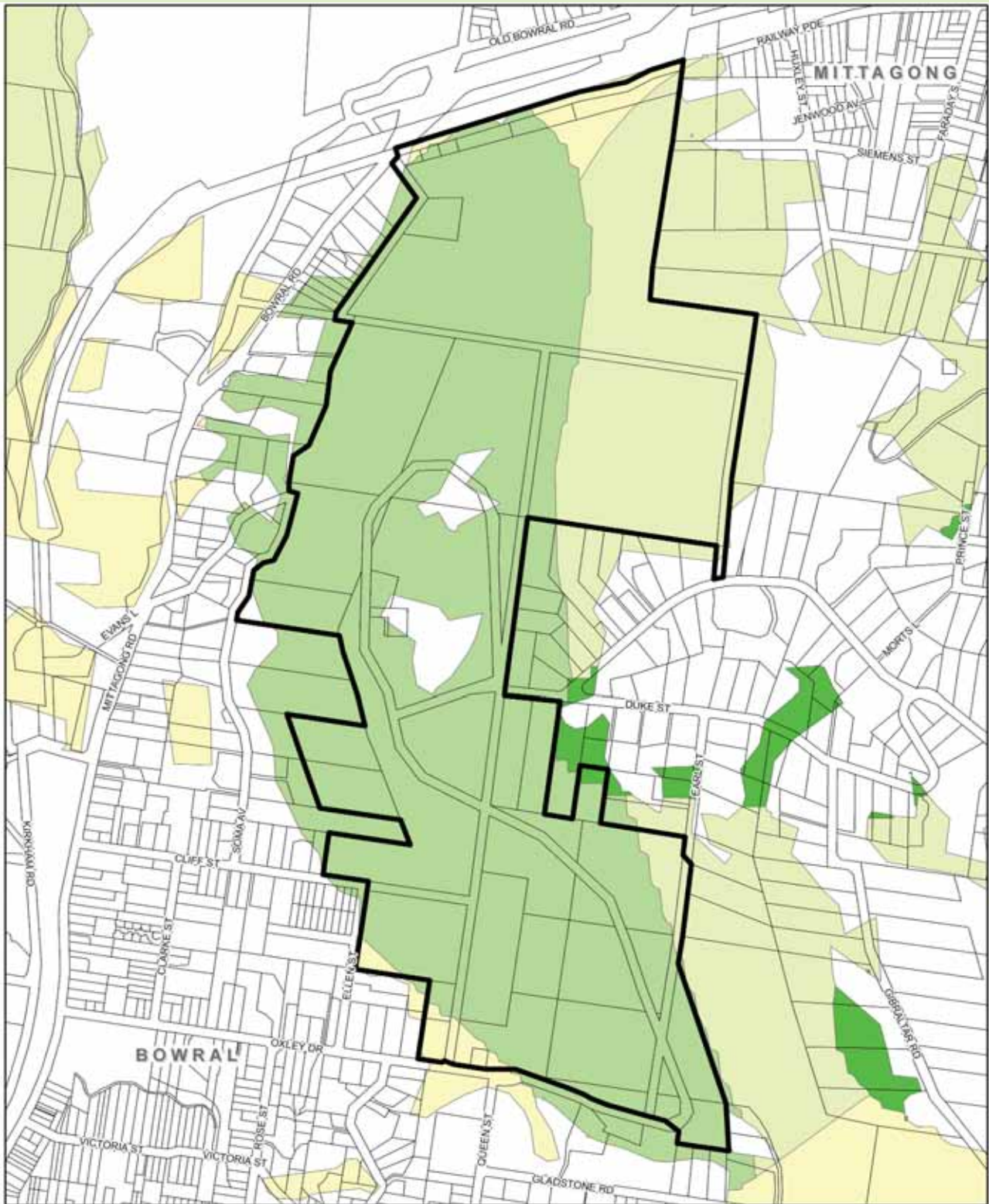
*Woods I know better,  
various particles of beech and oak  
and birch learned with a traveller's  
aptitude for ignoring  
subtleties, to find the quick path  
to the vital point – Burg Eltz  
wrapped in a leafy conspiracy,  
Trifels absorbed in its regard  
of treetops. Woods must be gone through  
like German at school to reveal  
whatever they contain  
which is not wood, beautiful  
though the light is and intricate  
the uncertainties of leaves  
in their autumn egotism.*

*Only bush is really native  
to me, and I understand it  
least. I speak it in my sleep –  
those reticent shifts of mood  
which are seasons, and summon  
those very proper names, banksia,  
melaleuca, callistemon, a thousand  
watery syllables in a dry breeze –  
and like sleep cannot explain  
nor comprehend. Growing up inside it  
steals my horizon, I'm trapped  
in its million and one paths  
that never reveal what shape it has  
from outside.*

*All language,  
the invisible family, is a landscape  
of trees and utters more than we,  
its denizens, can. Seeds  
in the feathers of migratory birds,  
pollen in the wind, flotsam  
eddying for years, messages  
from jungle to forest, wood,  
bush and back, the great conversation  
continues, while our stammered  
intimacies, our ultimata, even  
those proud achievements of literature,  
continue to begin.*

Note: Burg Eltz and Trifels are castles in Germany, both situated in woods.

# Vegetation Communities: Mount Gibraltar



**Legend**

- Mittagong Sandstone Woodland
- Robertson Basalt Tall Open Forest
- Mt Gibraltar Forest
- Southern Highlands Shale Woodland
- Mt Gibraltar Reserve

Produced by the GIS Section,  
Wategar State Park, Wategar State Park

0 100 200 400 600 Meters

Any information (numerical or otherwise), representation, statement, opinion or advice expressed or implied in this publication is made in good faith but on the basis that the council of the Shire of Wategar, its agents and its employees are not liable (whether by reason of negligence, lack of care or otherwise) to any person for any damage or loss whatsoever which has occurred or may occur in relation to that person taking or not taking (as the case may be) action in respect of any information, representation, statement, or advice referred to above



# Introduction



## Keeping Nature's Balance

Jane Lemann

Each community of plants and animals is dependent on the soil on which it lives, and that soil is derived from the underlying rock through the slow physical process of erosion.

Mount Gibraltar Trachyte supports the *Mount Gibraltar Forest* community, the Hawkesbury Sandstone supports the *Mittagong Hawkesbury Sandstone Woodland* community, and the Wianamatta Shale supports the *Southern Highlands Shale Woodland* community. There are species of plants and animals that are common to all of these communities and some that are specific to each, being dependent on the particular configuration of elements and growth patterns.

Every native tree, shrub or herb can be a host for wildlife. Many of our creatures require tree holes, hollow logs or loose bark for shelter and reproduction, others need rocks and mounds, thick shrubbery, grasslands, deep litter or burrows in which to live, reproduce and make up the natural systems that replenish and keep our world operating.

Many creatures have such specific requirements that they cannot exist without them. e.g. the butterfly whose caterpillar feeds only on Mat-rush *Lomandra* spp. No Mat-rush: no butterfly. The plants, in their turn are dependent on other organisms, such as symbiotic root fungi, pollinators and seed distributors. There are numerous and complex interdependencies for survival. Humans also cannot exist without the help of organisms that make up our ecosystems.

So many of these ecosystems have been removed, damaged or fragmented that it is essential to conserve the survivors that are left in reserves. These reserves are like banks for the future, and we must do our best to raise the capital of more habitat and niches that will promote the dividend of the recovery of all that we are close to losing. A small start could be to stop 'tidying-up' the vegetation quite so much, in order to leave some long grass and litter for habitat.

Our problem is that we don't understand half of what is going on in front of our eyes. Our knowledge is minimal and requires expertise to see and interpret. The following chapters have been written by friends with that expertise, to help open our eyes by providing an introduction to some of the fields of study.

Above all we hope these chapters will inspire care for the Mount Gibraltar Reserve, so it can support its biological systems while we all try to interpret the processes and assist their survival.

### What Is An Endangered Ecological Community?

Two Endangered Ecological Communities, *Mount Gibraltar Forest* and a small section of *Southern Highlands Shale Woodland* are protected within Mount Gibraltar Reserve. The Gib also supports some remnants of the *Robertson Basalt Tall Open-forest* outside the Reserve.

Ecological communities are assemblages of species that occur together in an area.<sup>1</sup> They include all the plants and animals and the processes and interactions that bind them together to sustain life. However, no community is completely stable, and there is a succession of organisms that are part of the community but may not be evident at any one time.

The Australian and State Governments have legislation in place to protect the most endangered ecological communities from processes that cause serious loss or degradation of their biological diversity (see Appendix IX) and the potential assets that they may contain.

'Endangered Ecological Community' is a legal term within the NSW Threatened Species Conservation Act that is applied to a specific community by the NSW Scientific Committee. After careful assessment, the Committee applies the term to those communities that have become rare and are in danger of becoming extinct due to the threats they face. This is then gazetted for public information as a legal announcement.

*Mount Gibraltar Forest* was gazetted on 16 March 2001 (see Appendix VII) and the *Southern Highlands Shale Woodland* on 21 February 2001.

The ecological community of *Mount Gibraltar Forest* is supported by the soil derived from the unique microsyenite rocks. It consists of all the life forms: vegetation, fungi, animals, (including all the invertebrates and the micro-organisms), bacteria and the genes they carry into the future. There is very little of this particular assemblage outside the Reserve due to there being so little of this igneous base rock, although most of the individual species may be found in some other communities.

The *Southern Highlands Shale Woodland* once had a



Rocks

Photo: S Cains



Ferns

Photo: J Lemann



Urban expansion surrounding The Gib

Photo: J Lemann





Habitat trees

Photo: J Lemann



Both feral and domestic cats are predators of wildlife. Cats should be confined at night  
Photo: NPWS

much broader range, being on the fertile Wianamatta Shale soils, but has been cleared away for rural and urban development and now exists only as small scattered remnants, often with no understorey plants due to grazing or mowing. On the small Mount Gibraltar site it is represented by the canopy trees Grey Gum *Eucalyptus punctata* and White Topped Box *E. quadrangulata* and the shrub Native Blackthorn *Bursaria spinosa*.

Life in the small Reserve is under great pressure from surrounding urban development: weeds, rubbish dumping, theft of plants, rocks and timber, cats and dogs, feral animals, burning, edge clearing, night lights, roadways, vehicles, construction of reservoirs, pipelines, powerlines, communication links, public expectation of lopping, mowing, road surfacing, safety railing, previous quarrying, and of course people.

Many individual species of native plants and animals have been identified under Threatened Species Conservation Acts and those found in the vicinity of The Gib are listed in Appendix IX to remind us all to value what is left of our unique heritage.

### Legal Obligations

Please be aware that it is illegal to collect anything from the Mount Gibraltar Reserve.

No plants, no animals, no rocks, nothing at all, dead or alive can be taken without a permit.

A permit is even required to remove weeds!

If you are interested in carrying out a study you will need a scientific collector's licence, Section 132c National Parks and Wildlife Act, which can be obtained from:

The Wildlife Unit  
Parks and Wildlife Service  
PO Box 1967  
HURSTVILLE NSW 1485  
(See [www.nationalparks.nsw.gov.au](http://www.nationalparks.nsw.gov.au).)

You will also need permission from Wingecarribee Shire Council.

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### Reference

<sup>1</sup> Keith, D *Ocean Shores to Desert Dunes* Dept. Environment and Conservation (NSW) 2004

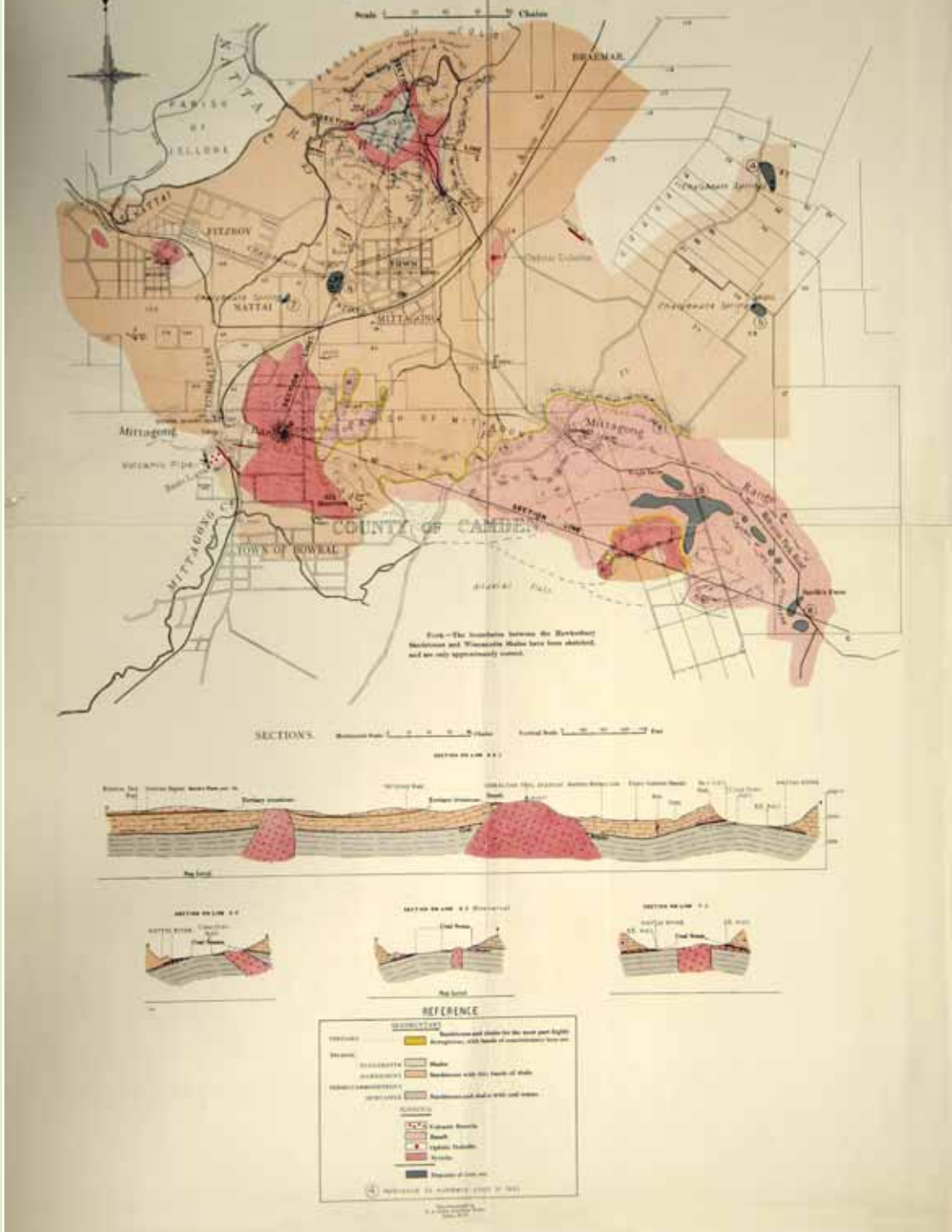
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### Appendices

Appendix VII NSW Scientific Committee Final Determination  
Appendix IX Indication of Threatened Species in the Mount Gibraltar Area 2005

# GEOLOGICAL MAP OF MITTAGONG

With Sections. Showing iron ore deposits and coal seams.  
By J. B. JAQUET, A.R.N.M., F.G.S., Geological Surveyor, assisted by L. F. Harper,  
Field Assistant.  
Prepared under the direction of E. F. FITZMAURICE, A.R.N.M., Government Geologist,  
Department of Mines and Agriculture, Sydney, 1901.



Jaquet J B 'The Iron Ore Deposits of NSW' *Memoirs of the Geological Survey of NSW. Geology No 2.*

Map: Department of Mines and Agriculture 1901

# Chapter 10



## Geology of Mount Gibraltar

Dr Paul Carr

Paul Carr, PhD (University of Wollongong) BSc(Hons) (University of Queensland), is currently Associate Professor, School of Earth and Environmental Sciences, University of Wollongong.

Like everything else on planet Earth, the current components of Mount Gibraltar originated in the stars. Some 4.6 billion ( $4.6 \times 10^9$ ) years ago, a gigantic hot cloud of gas and dust began to collapse under its own gravitational attraction to form a rotating disc with a bulge in the centre. This bulge grew into a star (our Sun). Planets in our Solar System formed from the series of rings of gas and dust that spun off from the rotating disc. Individual planets evolved by accretion, the process involving collision and incorporation of smaller objects into larger objects by mutual gravitational attraction. Within the first half-billion years of the formation of the Solar System much of the dust and gas had been swept up by the planets, although the process still continues today with the accretion to Earth (and other planets) of meteorites and other cosmic debris.

The early Earth consisted of gases together with molten metal and silicate that segregated into layers under the action of gravity. The liquid metal, being the more dense, sank to form a core while the silicate-rich melt formed a series of progressively lighter shells around the core. We live on the thin, outermost solid layer or crust. The outermost layer of Earth is gaseous (the atmosphere) and gravitationally bound to the planet. Some of this atmosphere accumulated from the original formation of the Solar System but most was produced by evaporation from the hot planetary interior. The atmosphere has been further modified by interaction with living organisms that have dramatically changed the relative amounts of oxygen and carbon dioxide throughout geological time.

Some of the earliest crust developed on Earth is preserved in Western Australia. Here, rocks approximately 3.9 billion years old occur in the Yilgarn as do 4.4 billion year old mineral grains that were derived from even older rocks that are apparently not preserved. As the Earth evolved, and continues to evolve, continental landmasses formed, grew, moved around on the globe on gigantic plates akin to conveyor belts and were ultimately broken up again in the dynamic cycle of plate tectonics. The continents as we know them today are fragmented pieces of much larger landmasses or supercontinents. Several episodes of



Gondwana 180 million years ago, showing distribution of southern continents when Mount Gibraltar was emplaced Diagram: P Carr

GEOLOGICAL ERA	GEOLOGICAL PERIOD	AGE (million years ago)	Major Events	Southern Highlands Events
CENOZOIC		0	modern humans	erosion, logging, urban development
		65	rapid evolution of mammals <b>- Major Extinction</b> extinction of dinosaurs earliest flowering plants Australia splits from Antarctica & Lord Howe Rise - New Zealand	eruption of basalts
MESOZOIC	CRETACEOUS	145	initial breakup of Gondwana	erosion of rocks overlaying Mt Gibraltar & surrounding areas
	JURASSIC	200	dinosaurs & flying reptiles appear	emplacement of Mt Gibraltar & other igneous intrusions (eg Mt Flora, Mt Misery, Mt Jellore)
	TRIASSIC	251	<b>- Major Extinction</b> coal deposition in Gondwana (southern continents) Gondwana glaciation	rise in sea level deposited Wianamatta Group;
	PERMIAN	295	coal deposition in Laurentia (northern continents)	Sydney basin succession deposited in marine and terrestrial environments massive braided stream deposited Hawkesbury Sandstone
PALAEOZOIC	CARBONIFEROUS	355		
	DEVONIAN	370	<b>- Major Extinction</b> first amphibians abundant fish	
	SILURIAN	410	earliest land plants	
	ORDOVICIAN	435	<b>- Major Extinction</b>	
	CAMBRIAN	500	rapid evolution of all major phyla first shelly fossils	deposition, burial, deformation and intrusion to produce Lachlan Fold Belt
	EDIACARAN	540	ediacaran fauna emerges	
PRECAMBRIAN		600		
		3200	oldest fossils	
		3400	oldest known rocks	
		4400	oldest known zircon grain	
	4600	Earth formed		

Simplified Geological Time Scale showing ages (millions of years) and significant events in Earth's history. More detail is shown for the part relevant to formation of Mount Gibraltar. Diagram: P Carr

supercontinent formation have occurred since the Earth formed, but due to recycling of the crust the evidence for the oldest landmasses is sparse and difficult to interpret. The picture for Australia becomes much clearer by the Early Palaeozoic (about 500 million years ago) when Australia, India, Africa, South America and Antarctica were all joined together into a single supercontinent called Gondwana.

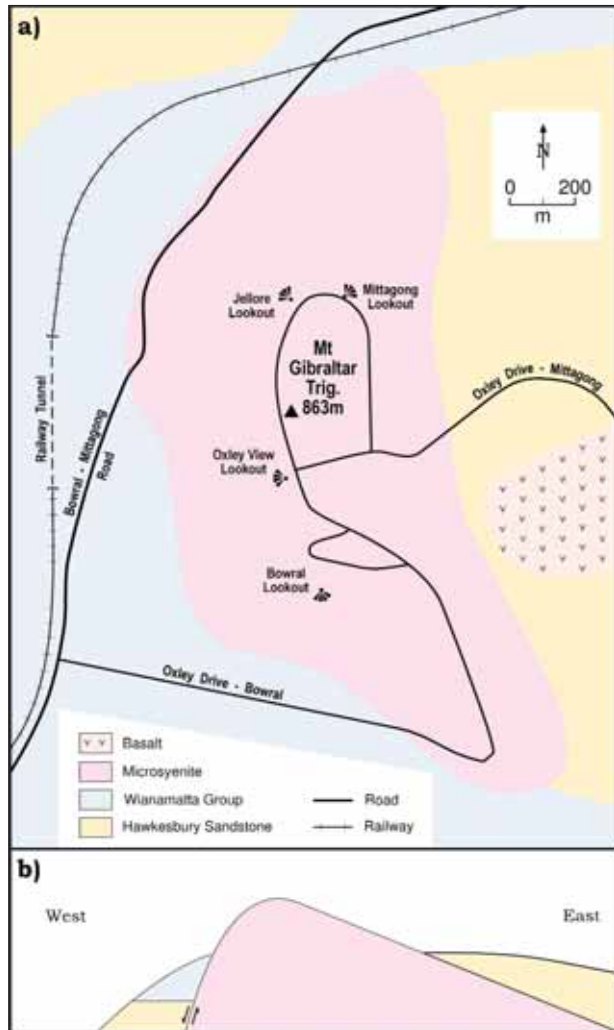
Today continental Australia rides atop the Australian Plate that is moving northward at approximately 7 cm per year and is being pushed below the overriding Eurasian Plate to produce the numerous earthquakes and volcanic eruptions that regularly occur throughout Indonesia. Because the Australian continent is far removed from the active plate boundaries it is geologically relatively stable. Numerous small earthquakes, many too small to be noticed by humans, do occur but large, destructive earthquakes are very rare, and no active volcanoes exist on the continent.

Throughout Earth's history the blocks that now constitute the Australian continent have been transported as part of the crust so that the continent has not always had the same shape, orientation or location on the globe. The continents have evolved in response to several related phenomena including heat loss from deep in the Earth (the driving force of plate tectonics), changes in sea-level, and changes in climate. What we now recognize as the Australian continent is simply the current configuration of a series of merged geological blocks, some are geologically ancient and others are relatively young. The continent essentially grew from west to east in response to the prevailing tectonic setting.

In the Early Palaeozoic, eastern Australia did not exist as we know it today. Only the western two-thirds of the continent had formed a landmass with parts periodically inundated with shallow seas. This continental fragment straddled the Equator and formed part of Gondwana which had a warm, wet climate. The area that was to become the eastern one-third of Australia was a deep ocean with several shallow belts associated with strings of active volcanoes. A similar environment prevailed throughout the Middle Palaeozoic as Australia drifted southwards and the continent grew as the eastern seaboard moved farther east due to accretion of the earlier formed volcanic and sedimentary deposits. Extensive deformation and mountain building occurred during this time. Melting in the Earth's mantle and lower crust produced vast volumes of molten rock that migrated towards the surface because it was more buoyant than the surrounding rock. Some molten rock reached the surface to form volcanoes but much solidified below the surface as granites.

## The Origin of Mount Gibraltar

By the Carboniferous the global climate had changed from greenhouse to icehouse and an ice sheet covered central Gondwana, including parts of Australia. Volcanoes still stretched along much of the east coast of Australia and erosion of the older rocks to the west formed east-trending valleys partly-filled with coarse gravels. Also at this time, a major depositional event that continued throughout the Permian and Triassic and affected much of the east coast of Australia commenced. In the context of the



(a) Simplified geological map of Mount Gibraltar showing the local roads and distribution of microsyenite, Hawkesbury Sandstone, Wianamatta Group and basalt.

(b) Schematic cross-section of Mount Gibraltar showing the location of the fault on the western side.

Diagram: P Carr

origin of Mount Gibraltar the important part of this depositional event was the development of the Sydney Basin which extends from Durras to Newcastle along the coast, west to Mudgee and east to the edge of the continental shelf. The Sydney Basin formed on the earlier Palaeozoic rocks and it is composed mainly of sedimentary rocks and volumetrically minor volcanic units. Major units dip inwards from the margins of the saucer-shaped basin towards the depositional centre at Parramatta.

Throughout much of the Early Permian, cold, shallow seas that deposited sands and silts covered the southern Sydney Basin including the Bowral area. By the Late Permian sea level had dropped and immense swamps and deltas that accumulated plant material to form peat and ultimately the economically significant coal deposits of the region covered the basin. The extensive peat swamps of northern Canada are a possible modern analogue of this cold but luxuriant Late Permian environment. The dominant plant material in the Late Permian was the *Glossopteris* flora, a primitive seed fern, which is a characteristic vegetation of Gondwana. Floods and rivers that deposited sand and silt periodically inundated the peat swamps producing seven major coal seams in the Bowral area.

A dramatic global warming and accompanying catastrophic extinction event occurred at the end of the Permian. Numerous species, possibly as much as 95% of all plants and animals, became extinct and the peat-forming swamps and deltas abruptly disappeared. The cause of the dramatic change is still being debated but impact from an extraterrestrial object is a possibility. During the Middle Triassic a massive braided river system, analogous to the present day Brahmaputra River, deposited the spectacular Hawkesbury Sandstone throughout much of the Sydney Basin. A rising sea level eventually drowned the Hawkesbury Sandstone to form the shale and siltstone of the overlying Wianamatta Group.

The post-Triassic rocks that crop out in the southern Sydney Basin mainly comprise igneous intrusions, lavas and minor sediments. Jurassic sedimentation apparently did occur in the Sydney Basin but no units of this age are preserved. During the Early to Middle Jurassic (approximately 180 million years ago) Australia was still at high latitude and an integral part of Gondwana. Large volumes of molten basaltic rock upwelled from deep in the Earth and were emplaced near the surface over a large belt extending from South Africa through Antarctica and into southern Australia. This episode of magmatic activity heralded the breakup of Gondwana and was responsible for the emplacement of Mount Gibraltar and several other igneous masses in the Southern Highlands.



Massive microsyenite rock face of Quarry C

Photo: C Segelov

### The Composition of Mount Gibraltar

Mount Gibraltar is composed of a rock termed microsyenite, with the 'micro' referring to the small size of the constituent grains (typically 1 mm). The microsyenite also contains thin pegmatitic veins that consist of much larger mineral grains, typically greater than 10 mm in size. Syenite is composed of alkali feldspar together with minor amounts of other minerals such as pyroxene. The rock at Mount Gibraltar has also been termed trachyte, particularly in commercial applications. The Mount Gibraltar Microsyenite has been used extensively as a building and ornamental stone in Sydney and the Southern Highlands and as far afield as Australia House in London.

The microsyenite evolved from a basaltic parent by the process of fractionation. The basaltic parent was produced by partial melting in the upper mantle during the Early Jurassic and made its way towards the Earth's surface along fractures and other planes of weakness. As it approached the Earth's surface, the basaltic melt began to cool with the high-temperature minerals solidifying first such that the remaining melt had a different composition from the parent. This process continued until the remaining melt had a syenitic composition rather than a basaltic



Pegmatite vein in a microsyenite spall (actual size 300mm x 387mm)

Photo: J Lemann

composition. The syenitic melt separated from the earlier formed high temperature minerals and was emplaced below the Earth's surface to cool and solidify, probably at a depth of about 1 km where the surrounding rocks would have been at about 50°C. The small grain size of the microsyenite results from the relatively fast cooling due to rapid loss of heat

near the Earth's surface. The minerals formed during the early cooling and solidification of the syenitic melt did not incorporate volatile components so that the proportion of water and other gases progressively increased in the remaining liquid fraction. Consequently, the last fraction of melt to solidify formed pegmatite minerals containing water and other gases. The high gas content of this fraction was conducive to the formation of larger grains from the pegmatitic fluids that were injected along planes of weakness formed during cooling and contraction of the syenitic mass.

The syenitic melt was injected from below and was emplaced near the bottom of the Hawkesbury Sandstone. Injection of this melt arched up the Hawkesbury Sandstone and overlying Wianamatta Group to the east but fractured the rock to the west. The blocks of rock on either side of this fracture, termed a fault, moved relative to each other such that the western block moved down relative to the eastern block. The microsyenite is exposed today only because erosion has removed this original cover and other material surrounding the intrusion. No evidence supporting the proposal that Mount Gibraltar represents the core of an erupting volcano has been found. In fact, the occurrence of the pegmatites indicates a confining pressure and implies that the syenitic mass was not open to the atmosphere.

When the rock that now constitutes Mount Gibraltar formed approximately 180 million years ago, the climate and landscape were very different

from that of today. At that time the Mittagong area was situated at approximately 69°S latitude (equivalent to the edge of Antarctica today) but the climate was warm and wet. Transformation of the Permian peat into the high quality coking and steaming coal currently being mined in the southern Sydney Basin resulted from a series of complex chemical and physical changes driven by burial and locally by the heat given off from molten igneous rocks emplaced into the region. The properties of this coal imply that an additional 2 km of rock once covered the coal and that this material has been eroded off over many millions of years to produce the current land surface.

The occurrence of Cenozoic basaltic lavas in the Southern Highlands and in the vicinity of Bowral indicates that erosion of the rocks overlying Mount Gibraltar occurred between approximately 180 and 65 million years ago. Most of the erosion probably occurred after about 100 million years ago when the Southern Highlands formed the uplifted western side of a rift valley as the Tasman Sea began to open and New Zealand and New Caledonia moved away from Australia.

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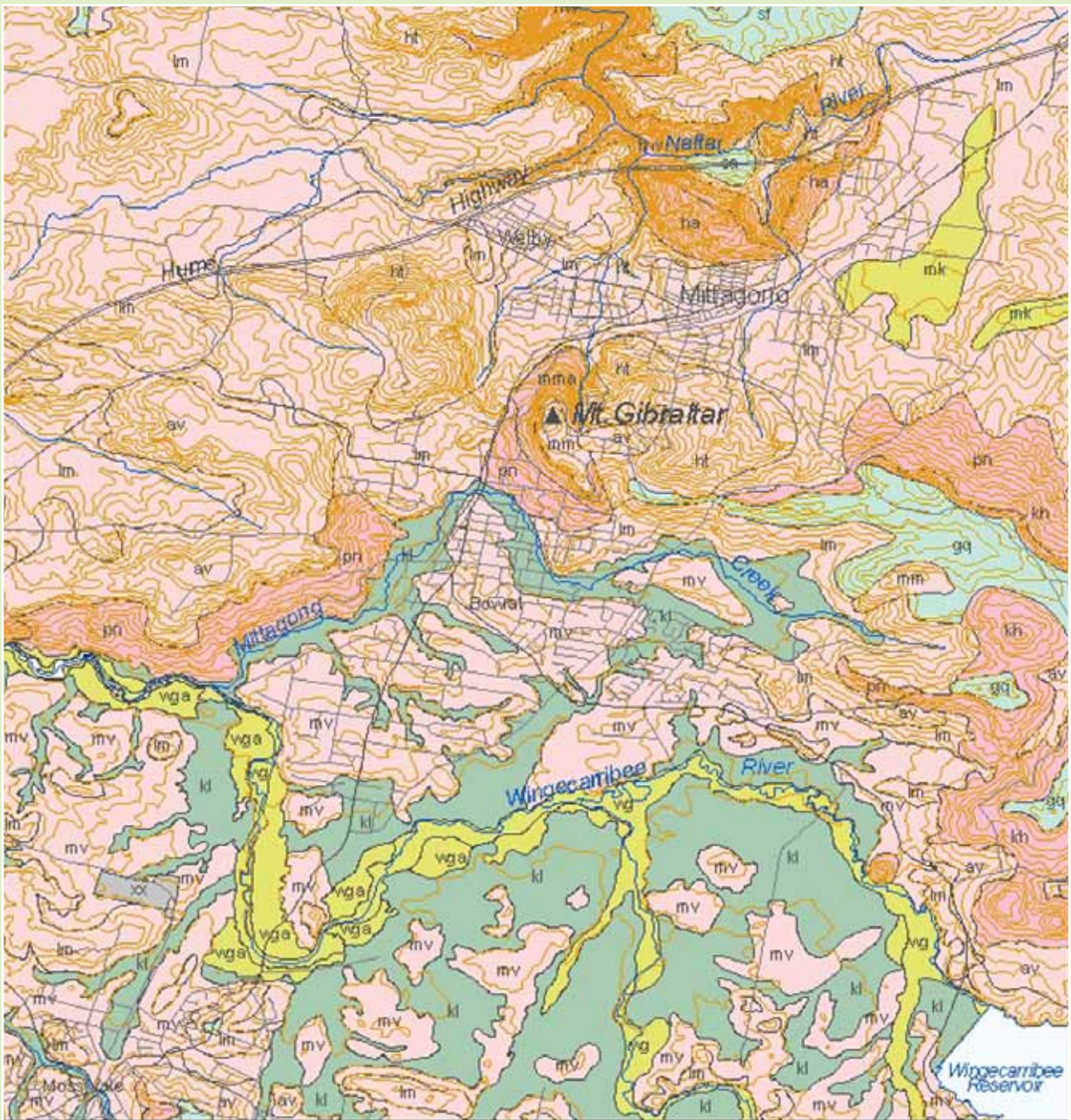
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Mount Gibraltar, Quarry C

Photo: MGLB

## Soil Landscape of Mount Gibraltar and Surrounding Region



**SOIL LANDSCAPE PROCESS GROUP**

ALLUVIAL LANDSCAPES .....	
COLLUMAL LANDSCAPES .....	
EROSIONAL LANDSCAPES .....	
RESIDUAL LANDSCAPES .....	
TRANSFERRAL LANDSCAPES .....	
DISTURBED LANDSCAPES .....	
WATER .....	

ADAPTED FROM BURRAGORANG 1:100,000 SHEET  
 SOIL LANDSCAPE MAP OF SOIL LANDSCAPES OF THE  
 SYDNEY CATCHMENT AUTHORITY HYDROLOGICAL CATCHMENTS  
 BY SOUTH COAST RESOURCE INFORMATION UNIT  
 DEPARTMENT OF NATURAL RESOURCES

HIGHWAY .....	
MO TO HIGHWAY .....	
MAIN ROAD .....	
ROAD .....	
RIVER/CREEK .....	
CONTOUR .....	





# Chapter 11



## Soil Landscapes of Mount Gibraltar Region

Linda Henderson

Linda Henderson has a Bachelor of Environmental Science degree and commenced working in soil science with Soil Conservation Service in 1991. Publications include *Soil Landscapes of the Dungog 1:100 000 Sheet 2000*, *Soil Landscapes of the Newcastle 1:100 000 Sheet 1995*, and *Soil Landscapes of the Ironbark Creek Catchment 1993*.

The soil types of Mount Gibraltar are uncommon within the Southern Highlands. They have formed as a result of a unique combination of geology types and geomorphological activity. The soil landscapes of the Mount Gibraltar area have been mapped and described in *Soil Landscapes of the Sydney Catchment Authority Hydrological Catchments* report and maps<sup>1</sup> at 1:100 000 scale. The soils and their major constraints to development have also been described in 'Urban Capability Study – Mount Gibraltar, Bowral'.<sup>2</sup> Soil landscapes can be used to distinguish mappable areas of soil because there are similar causal factors in the development of both soils and landscapes.<sup>3</sup> A soil landscape is defined as having a specified landform pattern, parent materials and soil materials with specified patterns of occurrence within a specified climatic zone.<sup>4</sup> Each soil landscape is named after a 'typical' occurrence within the region. The soil landscapes that occur at Mount Gibraltar are described below.

### Soil Landscapes

Avoca (av) – named after Avoca Township at Fitzroy Falls, occurring on undulating to rolling hills predominantly on basalts. It is present on the eastern side of Mount Gibraltar summit.

Mount Misery (mm) – named after Mount Misery, north of Berrima and a variant of this soil landscape called Mount Misery 'a' (mma) which occupies the steeper slopes. These soil landscapes occur on syenite and related rock outcrops in the Southern Highlands, the most locally prominent of which are Mount Gibraltar and Mount Flora.

Hilltop (ht) – named after Hilltop Township, north of Mittagong and occurring on low hills of the Mittagong Formation. The Mittagong Formation comprises 'passage beds'

between the lower Wianamatta Shales and upper Hawkesbury Sandstone.<sup>5</sup> The Hilltop soil landscape occurs on the eastern slopes of Mount Gibraltar.

Picton (pn) – occurs on steep, unstable slopes on the Wianamatta Shales. Often these slopes are topped by basalt or other volcanic rocks that create a protective capping, allowing these unstable slopes to form. The Picton soil landscape occupies the southern and western slopes of Mount Gibraltar.

Kangaloon (kl) – named after Kangaloon Township, south-east of Bowral and occurring on the alluvial flats to the south of Mount Gibraltar.

Lower Mittagong (lm) – formed on rises to low hills on the Wianamatta Shale Group, this is a commonly occurring soil landscape in the Bowral-Mittagong region. Lower Mittagong occurs on the footslopes and low hills surrounding Mount Gibraltar.

See the schematic diagrams showing the occurrence and relationship of dominant soil materials for each soil landscape.

### Soil Transects

A useful visual comparison of the various soil landscape types of Mount Gibraltar may be had by examining two transects across the area.

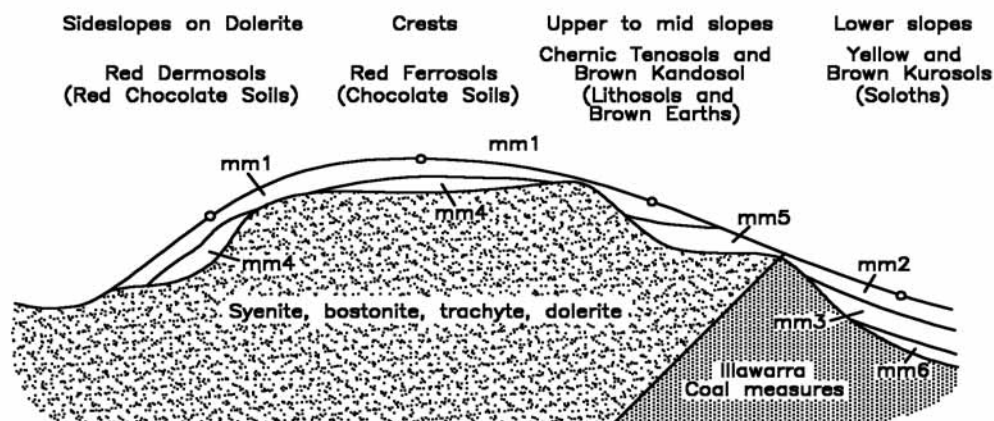
Transect one begins from near the summit at the corner of Oxley Drive and Duke Street and extends to Banksia Street on the south. The second transect begins at Oxley Drive between the two intersections with Duke Street, then travels south down Gibraltar Road. Soils have been described in accordance with ‘Australian Soil and Land Survey Field Handbook’<sup>6</sup> and classified using the Australian Soil Classification<sup>7</sup> and Great Soil Group.<sup>8</sup>

### Transect One

#### Stop 1 - Road batter opposite picnic area near junction Oxley Drive and Duke Street – Mount Misery Soil Landscape

This soil type occurs on a large part of the summit of Mount Gibraltar and has formed directly from weathering of the underlying resistant syenite rock. Rock commonly outcrops at the surface and often soils occur only in fissures within the rock. Syenite is an alkaline igneous rock predominantly comprised of orthoclase. Mineral stability to weathering is high. Parent material rock with a high content of minerals resistant to weathering tends to weather more slowly and forms shallower soils. The high feldspar and silica content parent materials are also low in bases and clay-forming

**Distribution diagram of Mount Misery soil landscape showing the occurrence and relationship of dominant soil materials**



- mm1** – crumbly brown gravelly loam (topsoil – A horizon)
- mm2** – brown gravelly sandy loam (topsoil – A1 horizon)
- mm3** – hard bleached silty clay loam (topsoil – A2 horizon)
- mm4** – reddish brown polyhedral clay (subsoil – B horizon)
- mm5** – yellowish brown sandy clay (subsoil – B horizon)
- mm6** – mottled brown clay (subsoil – B horizon)

(In a soil profile the different layers are known as horizons)

Diagram: L Henderson

materials, so soils tend to be lower in clay content. Discontinuous pockets of deeper soils, Red Ferrosols and Red-Orthic Tenosols (Chocolate Soils) also occur; often developing in fissures within the parent rock.

### Soil Description

Brown Kandosol (Yellow Earth)

From the surface to 25cm depth, a very dark greyish brown fine-crumb loam with 20 – 50% syenite gravel and pH 6.5, overlies...

yellowish brown sandy clay fine-crumb subsoil with 20 – 50% gravel and pH 6.0, which overlies...

slightly weathered syenite bedrock at 40 – 80cm depth.

### Stop 2 – Road batter at intersection of Queen St with Oxley Drive – Mount Misery (variant a) Soil Landscape

This soil type has formed from syenite parent material that has been transported and deposited from the cliff line above. It occurs on the western and southern faces of Mount Gibraltar and is a deeper soil with better developed subsoil than at Mount Gibraltar summit.

Topography is typically ‘benched’ or hummocky

and surface boulders are common, indicating slope instability. Topography plays an important role in the development of this soil. The slope orientation has produced a moist microclimate, allowing for greater rates of mineral weathering and clay movement. Topsoils have high organic matter contents and friable structure. Subsoils are strongly acid, indicating high rates of water movement through the soil. Slope steepness affects the rate of surface water run-off and the likelihood of mass movement of soil materials. There is evidence of past slope failures in steep syenite.<sup>2</sup> Well-defined drainage lines are absent from this soil landscape due to the high permeability of these colluvial soil materials.

### Soil Description

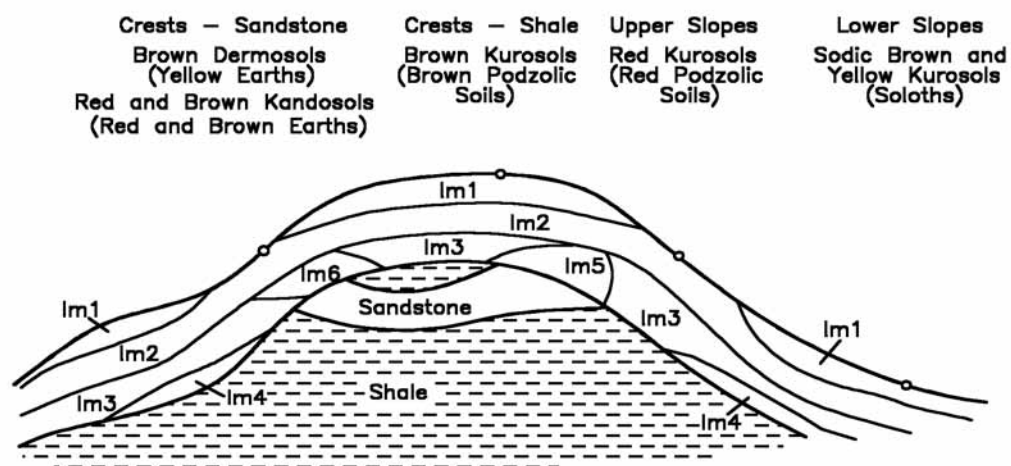
Red Ferrosol (Chocolate Soil)

Up to 75cm of very dark reddish brown friable clay loam, pH 6.5 – 7.0 with 20–50% syenite cobbles overlies...

a dull reddish brown well-aggregated clay loam or clay subsoil, pH 4.5–5.0 with many syenite cobbles, which grades to...

highly weathered syenite parent material at 50 – >120 cm.

**Distribution diagram of Lower Mittagong soil landscape showing the occurrence and relationship of dominant soil materials**



- lm1** – dark brown loam, fine sandy (topsoil – A1 horizon)
- lm2** – brown silty loam (topsoil - A2 horizon)
- lm3** – brown mottled clay (subsoil – B2 horizon)
- lm4** – mottled orange medium clay (subsoil – B3 horizon)
- lm5** – red blocky clay (subsoil – B horizon)
- lm6** – gravelly brown clay loam (subsoil – B horizon)

Diagram: L Henderson

**Stop 3 – Road batter on Oxley Drive opposite Hamilton Avenue – Picton Soil Landscape**

This soil type occurs where colluvial materials from up slope overlie soil materials derived from Wianamatta Shale parent material. It extends from Oxley Drive the length of Hamilton Avenue to Banksia Street. Boulders and cobbles are common at the surface and within the soil profile. The shale-formed soil materials have low permeability, as a result, shallow groundwater is forced to the surface in numerous seepage zones throughout this area.<sup>2</sup>

**Soil Description**

Red Dermosol (Red Podzolic Soil)

35–90cm of dark crumb loam to clay loam with pH 6.0–6.5 and common cobbles and boulders overlies...

brown or yellowish red strongly aggregated clay subsoil, pH 5.0–6.0, with 20–50% boulders to 120cm depth or greater, grading to...

highly weathered shale.

**Stop 4 – Cul-de-sac at the end of Banksia Street – Kangaloon Soil Landscape**

This soil type has developed on the poorly drained flats beneath Mount Gibraltar and is derived from Wianamatta Shale parent material, which has been transported by streams and overland flow and deposited on the flats.

Water tables are usually high and subsoils have low permeability and are seasonally saturated. Soils have low to moderate fertility and are moderately acid, due to the highly siliceous (quartz-rich) shale parent material.

**Soil Description**

Brown Kurosols (Yellow and Brown Podzolic Soils)

Up to 20cm of hardset brown silt loam, pH 6.5 overlies...

pale hardset silt loam, pH 6.0 to 35cm depth, which overlies...

bright brown clay with many red mottles, pH 5.0, grading to...

a grey clay at 200cm depth.

**Distribution diagram of Picton soil landscape showing the occurrence and relationship of dominant soil materials**

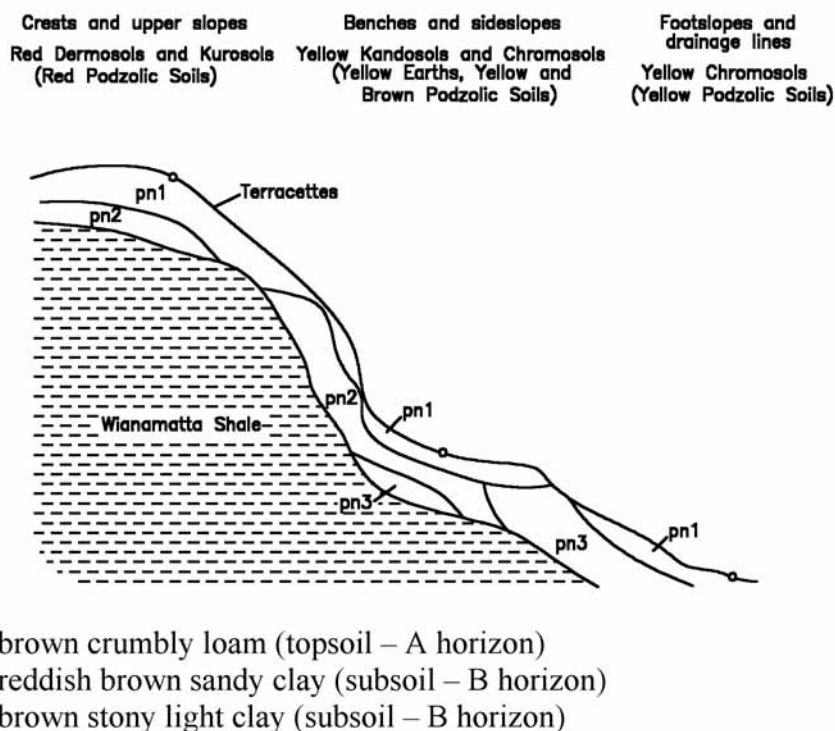


Diagram: L Henderson

## Transect Two

### Stop 5 – Batter on Oxley Drive bend, 580 m east of upper intersection with Duke Street – Avoca Soil Landscape

This soil type occurs on crests and upper slopes on basalt, extending along Duke Street, east from Oxley Drive intersection. The basalt is a remnant capping of Late Jurassic or early Tertiary flows, which have since been extensively eroded.<sup>5</sup> The soil has formed directly from weathering of the basalt substrate. This soil forms an interesting contrast to stop 1 at the picnic area on syenite parent material. Whereas syenite contains minerals highly resistant to weathering, basalt contains olivine, a ferromagnesian mineral, with low resistance to weathering. Olivine has large quantities of bases and materials available for clay formation, so soils are usually deeper, with higher clay content and fertility.

## Soil Description

Red Ferrosol (Chocolate Soil)

Up to 25cm of friable dark clay loam, pH 6.0 – 7.0 with many basalt rock fragments overlies...

dark reddish brown strongly structured clay with common basalt fragments, 65 -250cm depth, which grades to...

highly weathered basalt.

### Stop 6 – Batter on Gibraltar Road 50m north of Road Ends sign – Hilltop Soil Landscape

Here the soils have developed on Hawkesbury Sandstone, one of the more common geologies of the region. The highly siliceous parent material has given rise to very low fertility soils.

## Soil Description

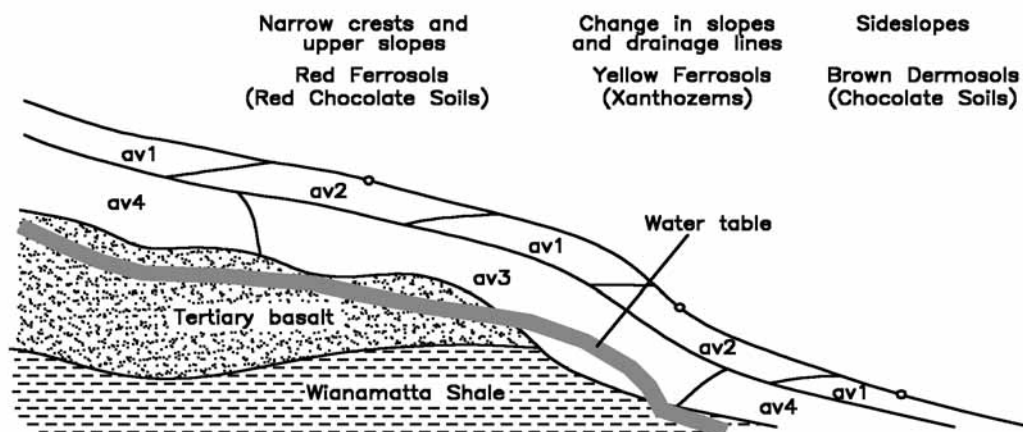
Brown Kandosol (Yellow Earth)

Brown earthy sandy loam, pH 6.0 – 6.5, to 15cm depth overlies...

yellowish brown (orange) earthy sandy clay loam or sandy clay, pH 5.0 – 5.5, 40 to 120cm in depth, which overlies...

moderately weathered sandstone.

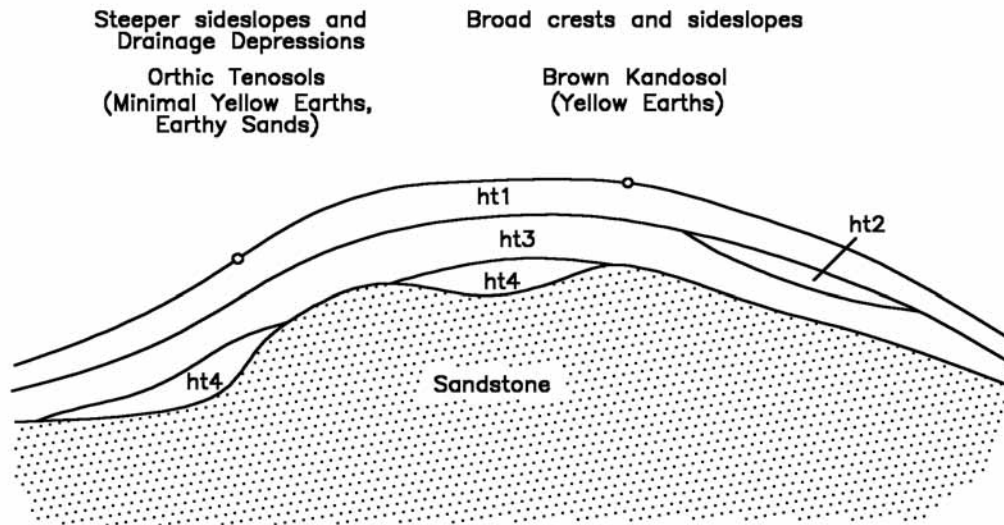
**Distribution diagram of Avoca soil landscape showing the occurrence and relationship of dominant soil materials**



- av1 - dark brown crumb ped clay (topsoil – A horizon)
- av2 - crumbly dark clay loam (topsoil – A horizon)
- av3 - brown to yellowish brown pedal clay (subsoil – B horizon)
- av4 - red crumbly clay (subsoil – B horizon)

Diagram: L Henderson

**Distribution diagram of Hilltop soil landscape showing the occurrence and relationship of dominant soil materials**



- ht1** – brown weak water repellent loam (topsoil – A1 horizon)
- ht2** – brown gravelly clayey sand (topsoil – A2 horizon)
- ht3** – earthy yellowish brown sandy clay loam (subsoil – B horizon)
- ht4** – yellowish brown clayey sand (subsoil – B horizon)

Diagram: L Henderson

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- <sup>4</sup> Charman, PEV and Murphy, BW *Soils: Their Properties and Management* 2<sup>nd</sup> ed. Oxford University Press 2000
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Soil Landscape (Hilltop) View from corner of Merrigang Street, Old South Road, Bowral

Photo: J Lemann



Soil Landscape (Hilltop) View from corner of Range Road and Old South Road, Mittagong

Photo: J Lemann



The tall forest in The Gib

Photo: E Smith



# Chapter 12



## Vegetation of Mount Gibraltar

Elizabeth Smith

Elizabeth Smith, BA, ALAA, DipSchLib, a member of Mount Gibraltar Bushcare and Landcare, has been walking, weeding and photographing in the local bush for the last 33 years and has been systematically weeding The Gib for the last thirteen.

**S**tep off the bitumen into the Gibraltar bush. Feel through the soles of your feet the give and resist of earth and rock.

There! You are in touch with the mountain, the rock giving rise to the soil and the soil which in turn sustains the plant/animal community in which you stand.

Come for a walk with me.

### The Tall Forest

Over the greater part of Mount Gibraltar, that is, its top and southern flank, the plant community is tall forest. Tree species vary with the depth of the soil and terrain but the tall character of the dominant trees is constant. At its most weed infested, for example, where weeds choke the ground and Ivy has climbed the trees to flower and berry high up in the canopy, or where it most nearly approaches its pristine integrity, the character is the same: tall trees, well spaced, rising high above the middle or understorey. (Sometimes these tall trees

rise straight out of a bed of fern with no shrub layer at all.) Wherever you are on Mount Gibraltar you are aware of light and space, at once exhilarating and restful, of a feeling of freedom.

The tallest trees grow where the soil is deep. Brown Barrel *Eucalyptus fastigata* which stand straight as Greek temple columns (or gun barrels, hence the name perhaps), and Sydney Peppermint *E. piperita* rising to about 30 metres, with never a branch below 20 metres. Their canopy (50%-70% Specht classification system) is light, like a lace shawl covering but not obscuring the sky.

You always know where the sun is and the colour of the sky. Shade is as light as always with gum trees, which cleverly turn their leaves edge on to the sun. Shrubbery can be nonexistent or thinly scattered and rarely reaches more than a third of the height of the tall trees.

Individual Cherry Ballart trees *Exocarpos cupressiformis*, Blackwood *Acacia melanoxylon*, Black Sheoaks *Allocasuarina littoralis*, Veined mock-



Canopy of the tall forest at the top of The Gib.

Photo: E Smith



The Gib forest in morning light

Photo: E Smith

olive *Notelaea venosa*, Native Mulberry *Hedycarya angustifolia*, Geebung *Persoonia linearis* and *P. levis* grow scattered among the more numerous and less substantial daisy bush, Wallaby Weed *Olearia viscidula* and Woolly Pomaderris *Pomaderris lanigera*. The ground cover is a knee-deep mix of grasses, herbs, lilies, orchids and ferns.

The silk tassels of Spear Grass *Austrostipa* sp. seed-heads can grow to man-high. When that happens footpaths disappear and animal tracks become tunnels. Kangaroo Grass *Themeda australis* on the other hand seems to like more sun, occupying clearings and road verges, never growing to more than knee-high.

In places, Bracken *Pteridium esculentum* dominates the ground with very few shrubs in its dark mass under the trees. Gristle Fern *Blechnum cartilagineum* can do the same, becoming quite eye-catching. The bright new leaf growth is a show stealer.

Aptly named Rasp Fern *Doodia aspera* is only noticeable when it too is in new leaf. Then, scattered patches of it light up the ground delightfully with its translucent pink fronds. Less noticeable than these until you are right beside it is the common Maiden Hair Fern *Adiantum aethiopicum*. Here a wisp, there a clump and further on a bed of delicate, frothy light green fronds, it is at its most beautiful when spangled with the quicksilver of frost, dew or raindrops.



Sunlit young gum leaves

Photo: E Smith



Black Sheoak *Allocasuarina littoralis* seed capsules in dew  
Photo: E Smith



Geebung *Persoonia linearis* Photo: S Cains



Blackwood *Acacia melanoxylon* Photo: S Cains



Greenhood orchid *Pterostylis coccinea* Photo: E Smith



Gristle Fern *Blechnum cartilagineum* in pink-tinted new growth  
Photo: S Cains



Woolly Pomaderris *Pomaderris lanigera* Photo: E Smith



Nodding Blue Lily  
*Stypandra glauca*  
Illustration: A Hyman

Blue Flax Lilies *Dianella* spp. are common but unnoticeable until they flower. Then dark stems, each bearing a head of blue lily flowers with bright yellow anthers appear in the grass. Although quite beautiful, these flowers can be missed as they often face the ground. You would be less likely to miss the astonishing, brilliant blue berries that follow.

A similar, brighter blue flower with gold anthers appears about the same time. It is the Nodding Blue Lily *Stypandra glauca* more noticeable because it grows taller so that the summer sky blue flowers look you straight in the eye.

Settler's Flax *Gymnostachys anceps* (pronounce it Jim-no-stack-us) has a quite dramatic appearance among the ground cover plants. It is usually a cluster of about half-a-dozen leaves: stiff, narrow straps standing proud at least as tall again as its nearest neighbours.

The most delightful jewels in the grass are the Bluebells *Wahlenbergia* spp. and orchids. The bright blue bells face up out of the grass on hair-fine stems, making it perhaps the most delicate flower in the forest.



Blue Flax Lily berries *Dianella caerulea*

Photo: E Smith



Hyacinth Orchid *Dipodium punctatum*

Photo: E Smith



Nodding Blue Lily *Stypandra glauca* looks you straight in the eye

Photo: S Cains



Sydney Golden Wattle *Acacia longifolia* cheering the grey of winter and early spring  
Photo: S Cains



Black Wattle *Acacia mearnsii*  
Photo: S Cains

Tiger Orchids or Doubletails *Diuris* sp. appear singly or in small colonies in the spring. Butter yellow with brown markings, they catch the sunlight cheerily. Later, in summer, the pink Hyacinth Orchids *Dipodium punctatum* appear. These are spikes of spotted pink orchid flowers rising leafless from the ground. They do look like tall thin versions of the cultivated bulb but with dark brown satin stems.

On the edge of the forest where the ground drops abruptly and the soil is thin and dry, an exposed patch, which wattles can cope with, is occupied by a colony of Broad-leaved Hickory *Acacia falciformis*. This is an unremarkable small tree. Its flowers are nearly white, disappearing among the blue-grey foliage. Its claim to fame is that these sickle-shaped leaves are so like gum leaves that the tree can be mistakenly referred to as 'just another little gum tree'.

Look closely at one of these leaves (which are, in this case, properly called phyllodes) and you should see the mark of the acacia, a gland at its base.

Sydney Golden Wattle *Acacia longifolia* subsp. *longifolia* also occurs as single specimens. Their rods of cheerful gold blossom appear in early spring after the grey of winter — patches of trapped sunshine. Another wattle here is Black Wattle *Acacia mearnsii* which is commonly cut down as a weed and referred to as 'that useless, ugly rubbish'.

None of these terms in the context of this ecosystem is correct because here *A. mearnsii* plays a vital role. To begin with, like all acacias, it is able to fix nitrogen from the air and store it in nodules on its roots. As nitrogen is a necessary plant food wattles (and peas and beans too) are able to grow in those soils which are called 'poor' due to lack of nitrogen. When the wattle dies, the unused nitrogen on its roots goes into the soil enriching it for the next plants in succession. Is that useless?

In its youth, it grows surprisingly quickly so it can provide shelter from sun and wind for slower growing plants. Knowing this, nursery people and landscapers use wattles as nurse trees to protect others in plantings such as windbreaks. Its flowers and foliage provide food and shelter to insects and birds. Then, as it ages, it is attacked by borers whose larvae are sought out by cockatoos, who can chop into wood with those bolt-cutter beaks, to get high protein food which borer grubs provide.

As it ages it also exudes quantities of gum, playing a very interesting part in the web of life. That sticky gum provides winter food for Sugar Gliders *Petaurus breviceps*.

In summer, the possums, having survived the winter with the help of acacia gum, move on to the eucalypts where they eat the Christmas Beetles which, in large enough numbers, can defoliate and seriously set them back. Is that useless?



Sugar Glider *Petaurus breviceps* is a gum tree's vital defence against defoliation by Christmas Beetles

Photo: C Lee

No Black Wattles = possums starve over winter = don't eat Christmas Beetles in summer = sick gum trees.

As for the people, those who know their firewood value the Black Wattle as one of the best.

Like the rest of the Australian bush, that on Mount Gibraltar is never a blaze of colour like a bed of petunias. Its delights are small things widely scattered like jewels in the grass. If you go for a walk in the tall forest you will immediately be aware of light, space and vital dignity. The small things you will find are in the grass at your feet.

You might glimpse the flicker of one of the tinies foraging in the undergrowth - a wren here, a firetail there - rosellas squabbling in the canopy above or hear the thud of a retreating Swamp Wallaby. And you will probably do a quick check of your buttons when a Kookaburra bursts into rude laughter just above your head!



Swamp Wallaby *Wallabia bicolor*

Photo: M Hallowell



Black Sheoak *Allocasuarina littoralis* on the dry western flank  
Photo: E Smith



Black Sheoak *Allocasuarina littoralis* Photo: E Smith



A Paper-bark *Melaleuca hypericifolia* in flower Photo: E Smith

## The Western Flank

Although Mount Gibraltar has its sheltered part on the deep soil, it also has its harsher side. This is the exposed steep, dry western flank. It has cliffs, vertical walls of old quarries, talus slopes, loose rock, thin soil, areas of exposed rock and, the mark of a volcanic landscape, huge boulders.

Walking is difficult there, and off the track, downright dangerous. Plants cling tenaciously to any scrap of purchase they can find and, if flowering is necessary for the production of seed, flower.

The tall trees are Sydney Peppermint *Eucalyptus piperita* and Gully Gum *E. smithii* and this is where some of the Black Sheoaks grow.

If, at the word Sheoak, your mind presents you with a picture of huge trees in dense stands drooping over a river, most of them with their feet in water, here are some other pictures.

About two minutes as the crow flies north-west of Mount Gibraltar is a stand of Sheoaks as dense as a well clipped old box hedge. The plants are wind-pruned to a uniform mass. They are growing on a sandstone slope high above any water, the tallest no more than shoulder high. Further on, near a river but not in it, grow those Sheoaks whose name is *Allocasuarina diminuta* 'the little one' which grow to two or three metres in loose company with one another and are wispy, dainty, fragile little things - a chiffon scarf to the great-coat of the River Oaks *Casuarina cunninghamiana*.

Mount Gibraltar Sheoaks are at about the middle of that line - not as dainty as *A. diminuta* or as robust as *C. cunninghamiana* nor do they grow only as individuals under the tall trees. Stands of them occur at the edge of the forest and where they grow together they are fairly exclusive. Nothing grows under them in their thick brown carpet of fallen needles. Footsteps there are silenced. If you have never stood among Sheoaks and heard their unique whispered sound, you have missed an experience which is balm to the human soul.

Because of the steep slope, the soil, still rich because it is derived from the same rock, is absent or thin or allowed to collect only in shallow pockets. Surprisingly, therefore, there is shrubbery and in places it forms impenetrable hedges, sometimes usefully, on the lower edge of the track, keeping people firmly on the track where they are safe. These shrubs are predominantly tea tree *Leptospermum* sp. and the flame-flowered paperbark *Melaleuca hypericifolia* both of which flower generously when the conditions are right. Here, too, is where the Golden Everlasting daisy *Xerochrysum bracteatum* rampages. Its lush new growth looks tender and good enough to eat. When the flowerbuds come they are sculpted in gold. Open, the flower bracts are hard and



Golden Everlasting paper daisy *Xerochrysum bracteatum* sculpted in gold  
Photo: E Smith



Maidenhair Fern *Adiantum aethiopicum* will grow in the cool damp shelter of a trachyte boulder.  
Photo: E Smith

sharp as finely carved wood. They brazen their way through the whole summer smiling at the worst that February can throw at them, then release clouds of fluffy yellow seed and very, very slowly deteriorate to dry sticks over autumn and winter. Sometimes the boulders give purchase to mats of small rock orchids and in cool, damp places in their shadow wisps of bright green common Maiden Hair Fern *Adiantum aethiopicum* flourish.

### The Bare Rock

There is harsher country yet for the Mount Gibraltar community. In some places rock which is more horizontal than vertical is exposed and bare of soil. These outcrops can be small, no more than a few paces across, hidden by the surrounding vegetation or large enough to be seen as 'bare rock landscape'.

Depending on how much soil can collect in crevices and depressions on the surface of the rock, this is where lichens and mosses come into their own. In the dry, lichens are brittle, crunching under foot like cornflakes. With a little more moisture they lose their crunch, spread flat on the bare rock clinging so close that they become one with the surface. A little more moisture and they gain substance and thickness and grow to spread their blue-green discs over the smooth rock like water-lily leaves over a pond. (Trachyte is very hard and smooth making it a dangerously slippery surface for walking. The quarried stone polishes like steel.)



Bare rock landscape at the summit of The Gib

Photo: S Cains





Bare rock and water at the summit

Photo: S Cains



Poison Rock Fern or Resurrection Fern *Cheilanthes sieberi*

Photo: E Smith



The Gib's rare tea-tree *Leptospermum brevipes*

Photo: S Cains

Moss gardens can grow where there is little more than a film of soil on the rock – delightful in their variety and fine detail.

Never more than a couple of centimetres deep, mosses form mounds and cushions in a patchwork of different textures and shades of green ranging from bright lettuce to almost black dark olive, and are usually seen around the edges of the drier, lichened centre of the outcrop.

Fissures and pockets sometimes hold enough soil to support a wisp of grass, an orchid, a small shrub, even the odd yellow daisy. Poison Rock Fern *Cheilanthes sieberi* also known as Resurrection Fern lives its miraculous life here – one day a handful of brittle black twigs, the next after a drop of rain, a posy of green fronds. In winter, a moss cushion will often be decorated with a wild native Geranium *Geranium solanderi* var. *solanderi* with perhaps one red winter leaf in its green rosette.

The largest of these moss and lichen gardens at the top of the mountain is enclosed by a hedge of thick shrubbery, largely of *Melaleuca hypericifolia* and the rare Tea Tree *Leptospermum brevipes*.



On the sandstone

Photo: E Smith



Old Man Banksia *Banksia serrata*

Photo: E Smith



Crinkle Bush *Lomatia silaifolia*

Photo: E Smith

### The Sandstone

Molten rock which formed Mount Gibraltar welled up and cooling, solidified under Hawkesbury Sandstone and Wianamatta Shale. The result is, that after 150 million years most of the covering sandstone and shale eroded away, leaving the mass of the mountain as igneous trachyte with a small proportion of sandstone and shale at its northern end.

If you come down the hill and cross Chinaman's Creek in one step you have moved from trachyte to sandstone, to a different sort of bush – a dramatically different plant community. The tall trees on the nutrient-deficient sandstone are less tall, predominantly Silver-Top Ash *Eucalyptus sieberi*, Blue-leaved Stringybark *E. agglomerata* and Sydney Peppermint *E. piperita*. Shrubs are those common to others growing on sandstone.



Satin Everlasting Daisies, *Helichrysum leucopsideum*

Photo: E Smith



A Flannel Flower *Actinotus helianthi* making the most of the light litter on the sandstone

Photo: E Smith

Incredibly, the rapidly draining sandstone and its soil which is almost pure sand produce showier vegetation than does the rich volcanic soil of the mountain top. *Proteaceae* abound, giving the landscape its character: tall, gnarled blue-grey Old Man Banksia *Banksia serrata*, bright orange-tan flower spikes of Hairpin Banksia *B. spinulosa*, cream froth of the various hakeas with their remarkable woody seed capsules and the white lace of Crinkle Bush *Lomatia silaifolia*.

Most spectacular of the ground cover are the various yellow and white daisies: paper daisies and yellow buttons, tall, short and sprawling with bright green or silver-grey leaves; they are ubiquitous together with the seemingly indestructible Flannel Flowers *Actinotus helianthi*. The latter will grow out of hair-fine crevices in sandstone and out of pockets of sand and gravel. Sometimes they will reach no more than four or five centimetres in height, then stubbornly stand there surviving savage heat and drought. After rain, these small grey scraps of plants manage to seize enough water before it drains away through the sandstone to grow a little and produce flowers and seeds. A step away from one such plant could be another, luckier one which could grow to knee-high or more, branch and branch again to produce a posy of green tipped white flannel flowers each as big as the palm of your hand.

Old Man's Beard *Clematis aristata* grows all over the mountain. Here at the foot of the mountain on the sandstone and in the creek it is more exuberant, sprawling over the shrub tops and draping itself in heavy swags from lower tree branches, producing masses of creamy white four-petaled blossom in early summer followed by clouds of fluffy parachuting seed.

Blueberry Ash *Elaeocarpus reticulatus* grows in these gullies. It is an unremarkable tree until the emergence of its translucent pink and pale gold new leaves. The flowers are delicate, sprays of fringed white bells, each one no bigger than a finger nail. They are followed finally in late summer by blue berries which bring currawongs to clown and carol.



Old Man's Beard *Clematis aristata* flowers

Photo: E Smith

So, there it is: the bushland of Mount Gibraltar from top to bottom, summit to foot, tall trees to moss and lichened rocks.

A complete list of plants of Mount Gibraltar Reserve can be found in Appendix X.

I would like to close this chapter with a plea for the protection of the Reserve. In the words of one of the earliest 'Greenies', the 19<sup>th</sup> century English priest and poet Gerard Manley Hopkins:

---

What would the world be once bereft  
 Of wet and wildness? Let them be left,  
 O let them be left, wildness and wet,  
 Long live the weeds and the wilderness yet.  
*Inversnaid*

---

Should I apologise for Hopkins' 'long live the weeds'? Certainly not! That would be to miss the point entirely. Not because one man's weed is another man's useful plant but because a world in which only the useful (economically viable) is valued is a sadly sterile one. In the words of this humble weeder and bushwalker, should we not respect and protect the bush for its own sake?

#### Acknowledgements

My thanks to Lolita Godsell who helped me choose the pictures and to Dr Kevin Mills for reviewing the chapter.



Blueberry Ash *Elaeocarpus reticulatus*

Photo: E Smith

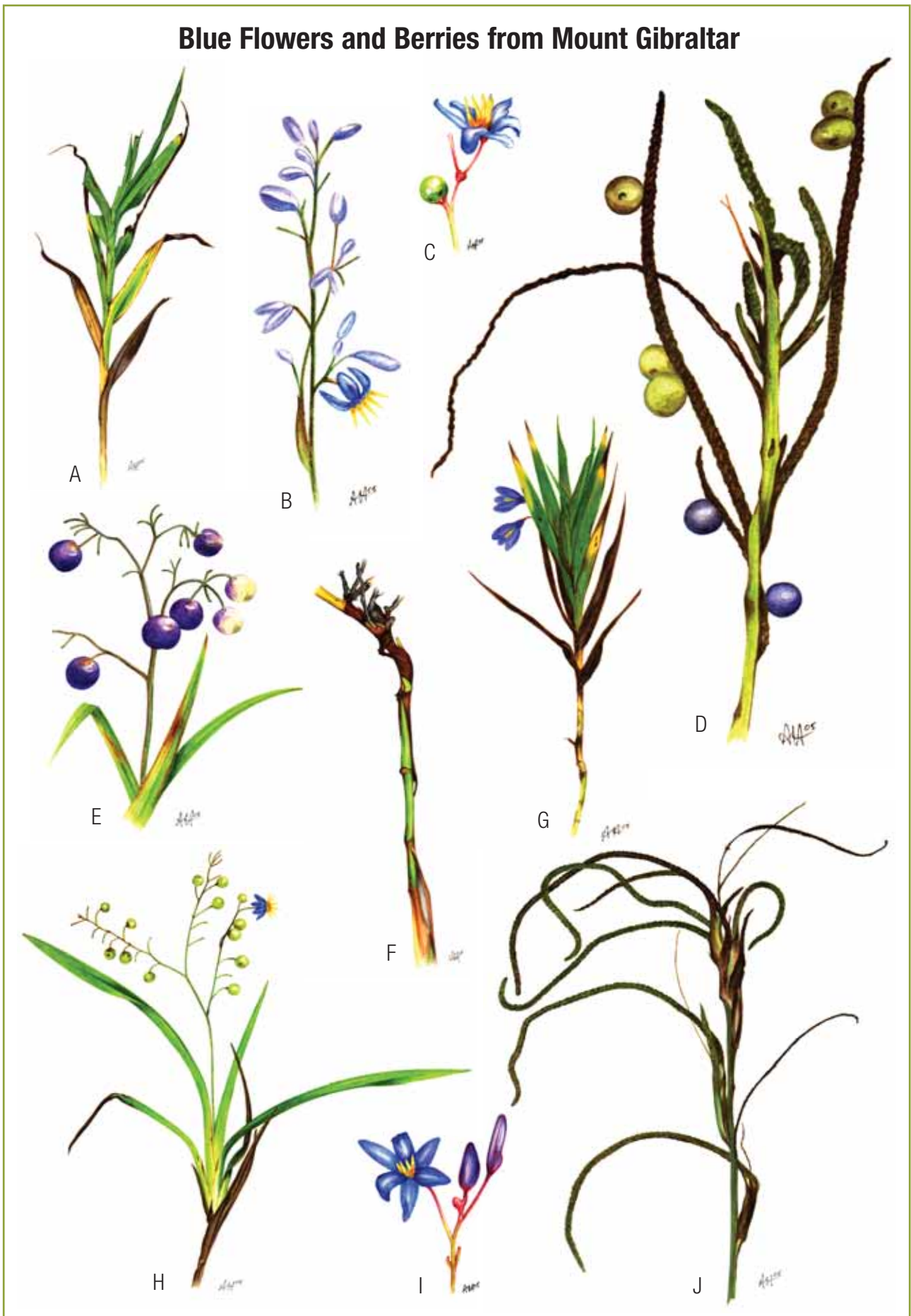
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- Hopkins, GM *Complete Poems and Selected Prose* Fount 1996

#### Appendix

Appendix X Mount Gibraltar Reserve Plant List

## Blue Flowers and Berries from Mount Gibraltar



A,G,I Nodding Blue Lily *Stypandra glauca*, B,C,E,H Blue Flax Lily *Dianella caerulea*, D,F,J Settle's Flax *Gymnostachys anceps*  
Watercolour paintings: A Hyman



*Frullania* growing on sheltered rock face

Photo: E Brown

# Chapter 13



## Mosses and Liverworts

Dr Elizabeth Brown

Dr Elizabeth Brown gained her PhD from Auckland University for her thesis on the thalloid liverwort family Aneuraceae in New Zealand. In 1989 she joined the National Herbarium of NSW where she has worked on the Asteraceae (daisies) for the Flora of New South Wales series, the epacrids (Styhelioidae, Ericaceae) and the Lepidoziaceae (leafy liverworts).

The bryophyte (moss and liverwort) flora of Mount Gibraltar represents a distinctive assemblage in a challenging environment. The mountain protrudes dramatically above the surrounding landscape and the bryophytes must be able to survive exposure to extremes of heat and cold, strong winds, desiccation, exposure to high light levels, substrates that retain little moisture and frequent fire. Although the species list is not extensive, the combination of species is interesting as it includes some that occur only on silica-based rocks (sandstones, shales), some that typically occur on volcanic rocks (here microsyenite) and species associated with disturbance from urban development.

Mosses, liverworts and hornworts (which have not been found in this area) are members of plant groups that were amongst the earliest colonisers of land. They are often described as 'lower' plants because they lack roots, flowers and a vascular system. Bryophytes require water to complete their life cycle; like ferns, they produce spores instead of seeds and water is essential for fertilisation. In spite of these limitations they have developed a range of strategies for survival and are found in virtually every habitat, as they have the ability to colonise surfaces on which it is impossible for flowering plants or ferns to grow. Bryophytes often use strategies similar to those used by 'resurrection' plants. As they dry out, the plants enter a state of suspended animation and only recommence functioning as they absorb water. This happens very quickly as the leaves are mostly only one cell thick. Even so, *Eucalyptus* forests and woodlands are hostile environments. Bryophytes are unable to colonise the trunks and branches of many species of eucalypts that shed their bark regularly and they are unable to survive under a dense accumulation of leaf litter on the forest floor. Fire can be catastrophic, but is usually followed some months later by recolonisation that occurs when spores, carried by air currents, land on suitable substrates. Some bryophytes do

not produce spores frequently and the process of re-colonisation may be very slow.

While *Eucalyptus* may not be a good host, there are many other suitable micro-habitats in the open sclerophyll forests on Mount Gibraltar. The bark of *Acacia melanoxylon* is rough and stable, particularly suitable for lichens, but bryophytes, such as *Chiloscyphus semiteres*, a very common liverwort, often grow at the base of the trunk. Mosses, including *Rosulabryum* and *Wijkia*, can be found in patches amongst the ground cover. Fire actually provides suitable habitats for some species, such as *Cephalozia hirta* (a tiny dark brown-green liverwort) that grows on charred wood. Large, partially shaded boulders in moister areas provide niches for mosses such as *Sclerodontium pallidum* (previously known as *Dicnemoloma pallidum*), *Campylopus introflexus*, *C. clavatus* and *Fabronia scottiae*. The dark brown, creeping stems of *Frullania spathistipula* may occur in profusion on the sheltered sides of boulders.

The first place a casual visitor may notice an abundance of mosses is at the Joshua Stokes Memorial. Here mosses have taken full advantage of a man-made habitat. A number of species thrive on the calcium leached from the limestone mortar. Much of the bright yellowish-green between the paving stones is *Thuidiopsis sparsa*, a moss that occurs commonly in natural bushland, but is equally at home in an urban environment. Its creeping habit and ability to grow from tiny fragments that have broken off the plant make it ideally suited to spreading through this shaded habitat. Patches of other species also occur on the paving and on the walls (e.g. blackish-grey *Grimmia pulvinata* var. *africana*, *Ptychomitrium australe* and *Ceratodon purpureus*), amongst the lichens which also find this a suitable site.

The exposed rock outcrop at the summit is scantily clothed in flowering vegetation and appears to be inhospitable to anything other than grey splashes of lichen. A closer look in crevices and the shelter of the small overhangs reveals a surprising number of mosses that are capable of withstanding desiccation. Perhaps the most immediately obvious are the grey-black patches of *Grimmia* and the hummocks of *Campylopus* that look like they are ready to roll down the rock face. A closer inspection of the surface of these hummocks reveals one of their methods of dispersal; numerous tips of the plants are broken off, ready to be dispersed by heavy rain or strong wind. In the shelter of the rocks, colonies of *Hedwigidium integrifolium* and *Schistidium apocarpum* occur as pure or mixed populations. Very few liverworts can cope with this regime but in the deeper crevices *Chiloscyphus semiteres* manages to survive. North of the tower is an area that retains



*Campylopus* clumps on rock outcrop

Photo: E Brown



*Hedwigidium integrifolium* showing moist uncurled plants to left and dried stems to right

Photo: E Brown



moisture for longer periods of time; this area supports a mosaic of *Grimmia* (identifiable not only by the blackish colour but also the long silvery leaf tips), *Campylopus*, *Polytrichum commune* and the bright yellow-green *Barbula calycina*. A fireplace provides the disturbed habitat and rich nutrients required for a patch of *Bryum argenteum* (named for its silvery colour) and *Funaria hygrometrica*, a moss that frequently occurs in great profusion after fire. During the wetter winter months ephemeral liverworts such as *Fossombronia* and *Riccia* may be found in small depressions.



*Campylopus* and *Barbula calycina* on moister rock outcrop  
Photo: E Brown



*Grimmia* with capsules  
Photo: E Brown

Winter and early spring is the time to find many mosses with capsules which provide important characters that aid in identification. Look carefully to find the capsules. In *Schistidium* the capsules do not extend beyond the leaves and in *Grimmia* the stalks of the capsules curl downwards to lodge the capsules into the protection of the leaves until they mature. The capsules of many species, however, are held erect and are immediately obvious.

#### Further Reading

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Flora of Australia supplementary series 14, ABRIS, Canberra 2002
- Glenny and Malcolm *Key to Australasian Liverwort and Hornwort*  
Genera CD-ROM, ABRIS 2005
- Meagher and Fuhrer *A Field Guide to the Mosses and Allied Plants of Southern Australia* Flora of Australia supplementary series 20, ABRIS, Canberra 2003

### Bryophytes, Mount Gibraltar

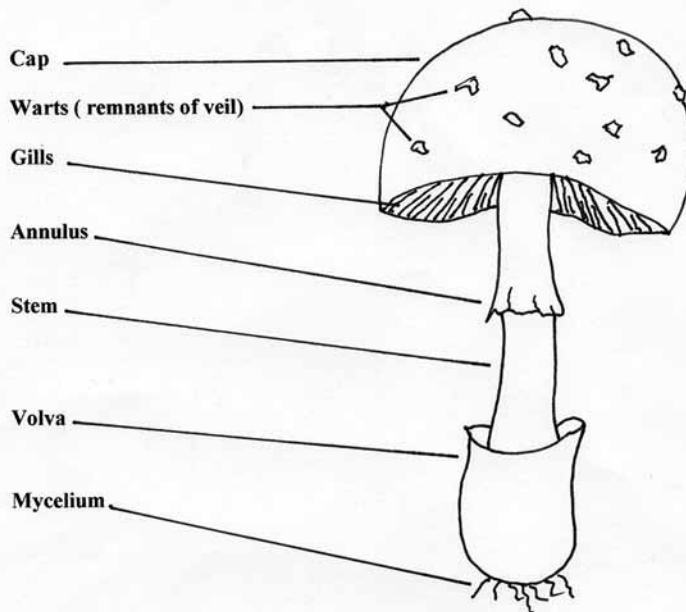
#### Mosses

- Barbula calycina*
- Brachythecium salebrosum*
- Breutelia pseudophilontis*
- Bryoerythrophyllum binnsii*
- Bryum argenteum*
- Campylopus clavatus*
- Campylopus introflexus*
- Ceratodon purpureus*
- Didymodon torquatus*
- Fabronia scottiae*
- Funaria hygrometrica*
- Gemmabryum dichotomum*
- Grimmia pulvinata* var. *africana*
- Hedwigidium integrifolium*
- Hypnum cupressiforme*
- Macromitrium ligulaefolium*
- Philontis affinis*
- Pogonatum subulatum*
- Polytrichum commune*
- Ptychomitrium australe*
- Racopilum cuspidigerum* var. *convolutaceum*
- Rosulabryum billarderi*
- Schistidium apocarpum*
- Sclerodontium pallidum*
- Sematophyllum subhumile* var. *contiguum*
- Thuidiopsis sparsa*
- Wijkia extenuata*

#### Liverworts

- Cephalozia hirta*
- Chiloscyphus biciliata*
- Chiloscyphus semiteres*
- Fossombronia* sp.
- Frullania pentapleura*
- Frullania spathistipula*
- Lejeunea flava*
- Metzgeria furcata*
- Reboulia hemispherica*
- Riccia* sp.

## Basic Parts of an Agaric Fruiting Body



### Some fungal types



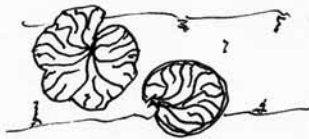
*Russula* – straight white, brittle stem  
White gills, bright, coloured cap.



*Lactarius*- funnel shape,  
bleeds white latex when cut,  
pale orange gills may bruise blue.



*Crepidotus*-eccentric short  
stem from which gills radiate.  
Pale, on wood.



*Anthracophyllum archeri* colonises  
wood. Rust colour and gill pattern  
are characteristic.



*Mycena sp* are often delicate  
gregarious toadstools, with  
small caps.



*Geastrum* have spore sacs  
and an outer star-shaped  
base.

# Chapter 14



## Fungi - The Recyclers

Roy Freere

After completing a BSc degree in Geology and Biology at the University of London, Roy worked as a technical author, translator and trainer in the Microscopy Division of Wild Heerbrugg, Switzerland, later moving to management and sales in Australia.

Subsequently he ran his own microscopy training and consulting business from Robertson. Roy has published widely in optical microscopy, both here and overseas. After retiring he gained TAFE certificates in Bush Regeneration and Visual Arts. He is a long-standing member of the Sydney Fungal Studies Group, for whom he and his wife Joan lead an annual foray to the Robertson Rainforest Reserve where over 135 species of fungi have been found.

Living organisms are divided scientifically into five major kingdoms. One, the Eumycota includes the true fungi. The fungi have been listed separately: they are multicellular, but are clearly neither plants nor animals, though they may exhibit certain characters found in these two kingdoms. Fungi have no chlorophyll and thus, like animals, depend on other forms of life for nourishment. However, like plants, they are sedentary and develop special fruiting bodies for reproduction.

Unlike the attention given to the plants and animals of Australia, the scientific study of fungi has proceeded very slowly, with the result that one recent author has stated that 'perhaps only 5-10% of Australian fungi have been named and another 10% are known but not yet named' (Bougher and Syme 1998). With an estimated likely total of over 200,000 species, there are a lot that we still have to find and record!

Mount Gibraltar is no exception: virtually no records exist in State or National herbaria for species collected from our area. This paper will therefore consider the place of fungi in the ecosystem and the identification of some of the major genera which may be represented.

The collection and recording of the fungi of The Gib will be a major operation, requiring a lot of fieldwork (mycologists use the term 'foray'), specimen collection, observation, recording, preservation and perseverance! The dearth of funded positions for research scientists and taxonomists in Mycology (fungal studies) means that access to expert mycologists is considerably restricted outside a few specialised areas (e.g. plant pathology).



*Mycena* sp. in leaf litter (height to 6 cm)

Photo: R Freere



*Chlorociboria aeruginascens*, the green-staining ascomycete (diameter to 4mm)

Photo: R Freere

### Ecology

The fruiting bodies of fungi are found in a wide range of habitats, as solitary forms or massed in large numbers. They are known as the great recyclers, since many are **saprophagic**, living on the decaying remnants of trees and other plants and animals, in the process breaking down structures into fairly simple components for the access and nourishment of other life forms. The saprophages may be found in building and exterior timber work (dry rot), as well as in woodland, making them of economic significance. Certain species may restrict their habitats to a particular type of vegetation (e.g. eucalypt forest or open grassland) or climatic range. (Some field guides have been organised on this basis, e.g. Pegler 1981).

Very specific associations may be found, e.g. in some coprophilous types which exist only on the faeces of one species of animal. Temperature and humidity both play a role in the appearance of the easily recognisable fruiting bodies (toadstools), which may appear in swarms, but last for only a day or two. Generally autumn is the best time for finding fungi, though some, such as the larger bracket fungi, may exist for many years, growing larger each season.

The fungal kingdom also includes many forms which are **parasitic**, attacking living plants and animals, including other fungi. These can be of economic significance, and include forms such as rusts, which attack wheat, grasses and other plants. Fungi causing disease in humans include the agents for Athletes Foot *Tinea pedis* and the lung disease *Aspergillosis*.



Split-gill Bracket Fungus *Schizophyllum commune*

Photo: R Freere

The **symbiotic** fungi are also significant and much work has been done in this area, especially on mycorrhiza. These are fungi, of various species, which grow in close association with the roots of plants and facilitate the take-up of nutrients by the root hairs. Such fungi will often have preferred plant partners. The most evident example is perhaps Fly Agaric *Amanita muscaria*, with bright red caps and white gills and stems, which in the Southern Highlands is always found associated with pine trees.

The other great symbiotic examples are the lichens, in which a fungus and an alga live in very



Starfish Fungus *Aseroe rubra*, a stinkhorn

Photo: R Freere

close association and form an organism differing in appearance from either. The members of this combination are so interdependent that neither can survive without the other (see Panel).

### **Anatomy and Classification**

The characteristic umbrella shape of a toadstool or a mushroom is very familiar but these two terms are not scientifically distinguishable and seem to be exclusive to the English language. They refer to the fruiting bodies of the common fungi in the large group Basidiomycota (basidiomycetes). Generally 'mushroom' is the term used for an edible fungus and 'toadstools' are deemed poisonous. In this paper 'toadstool' is used to describe any umbrella-shaped fungus.

The basic components of a fungus are microscopically-thin, thread-like structures called hyphae, which grow below the surface. They form a mass of threads known as the mycelium. The mycelium is an expanding, persistent structure, feeding on organic matter and building up food reserves. When conditions are right a mycelium will produce visible fruiting bodies, sometimes singly but often in very large numbers. These are the toadstools, puffballs, stinkhorns, etc that we see above ground.

The hyphae play a part in a very complex reproduction process which can also include the

formation of spores in the fruiting body. Mycelia, the 'spawn' of mushroom-growers, can infest very large areas and may build up to give some of the largest organisms known.

The spores of fungi are microscopic structures, usually between 5-10 $\mu$ m (one micrometer = 0.001mm) long, looking like dust in the mass. They may be smooth, or ornamented with minute spines or ridges, or terminal pores. They are a key element in identification, but their study requires the use of a good quality high-powered optical microscope, or even better, a scanning electron microscope. The fruiting bodies are a means of spore distribution; thus the spores borne on the gills of the typical toadstool are underneath a protective cap, which keeps them dry, and can be dispersed by the wind as they mature and fall away. Vast numbers of spores are produced: it has been calculated that a toadstool 10cm in diameter could discharge 16,000 million spores over a period of six days. The wastage is obviously huge, but so is the chance that some will survive to produce new hyphae.

The two major sub-divisions of the large fungi are the basidiomycetes and the ascomycetes. The basidiomycetes typically produce fruiting bodies that are toadstool-shaped, coral-like, jelly-like, puff-balls and bracket-shaped. The ascomycetes include cup-fungi, morels, earth tongues, yeasts and the Vegetable Caterpillar *Cordyceps*.



*Hygrocybe* sp. growing in leaf litter after a bushfire (Height to 3-4cm)

Photo: R Freere

### Identification

Identification to species level is often difficult, especially in the field. However there are a number of genera that can be recognised with a fair degree of certainty, such as those mentioned in this paper.

While there are many endemic Australian species, most of the genera found here are also found overseas and foreign literature can be helpful in learning to recognise them. Some examples have been included in the list of reference books at the end of this section.

Remember, however, that the majority of Australian fungi still await discovery and classification. Also, many of the scientific names are in a state of flux, with re-naming becoming necessary as new allegiances are uncovered by current work and the use of DNA testing.

Very few Australian fungi have common names; where these exist they have been included here with the scientific names. Not all features may be visible in any one species, or at any age. Factors which assist identification (best noted on fresh specimens, in the field) are colour (of the cap, gills and stem), size of mature fruiting body (height, stem and cap

diameter), cap and stem shape and gill structure (separate or crowded).

If fungi are to be collected for later study they are best lightly wrapped individually in oven paper, or transported in divided plastic containers such as fishing tackle boxes. Do not use plastic bags. Once home, further notes can be made and spore prints (from gilled types) produced by cutting off the cap and placing it gills-downward on paper and covering with an upside-down glass for an hour or so. It is essential to note the date and place of collection and to work with fresh specimens; older fungi will often fade and some even autodigest (e.g. *Coprinus*). A collection of specimens in various stages of growth is useful but check that collecting is permitted. In National Parks and protected reserves such as Mount Gibraltar, permits are required.

Photography is a help, using a good macro lens. Daylight film of 200 ASA provides a good balance between reasonable exposure time, accurate colour and greater depth of field. Use of a tripod and cable release is mandatory. Flash can be helpful, since many fungi grow in dark holes. A macro flash, offset to one side of the lens, will give better modelling. Digital

cameras should have a correct white balance setting. A digital camera with fold-out display screen will save a lot of lying on the ground! Shots of fungi in natural growth positions, as well as 'picked' and 'sliced', help to record the substrate. A small, inconspicuous, size-marker of known dimensions (e.g. a small washer) should be included in all photographs. A notebook can be used to record details such as location, physical attributes (which could include sketches and notes such as, is the stem hollow, does it snap like a piece of chalk or is it springy or frayed?) colour and form. Identification of the plant or substrate on which a fungus is growing provides an additional reference.

### Fungi to look for

The Kingdom of fungi, Eumycota, can be subdivided into four divisions. Two of these divisions contain mostly microscopic forms, which are not considered here. The other two are the Ascomycota and Basidiomycota, members of which are referred to as ascomycetes or basidiomycetes respectively.

The **ascomycetes** are a group of species in which the spores are contained in small sacs, asci, or tubes, which exist in huge numbers. The asci are of microscopic dimensions and usually contain eight spores, sometimes fewer. The fruiting bodies are often small, shallow, cup-shaped structures, such as the orange Elf Cups *Peziza* sp. which may be found on leaf litter or decaying branches.

*Chlorociboria aeruginascens* (= *Chlorosplenium aeruginosum*) has small, shallow, blue-green cups and grows on timber, especially after the bark has been removed. Its hyphae produce a green staining in the wood.

Also included in this group are fungi which look like toadstools, but have a heavily reticulate pattern on the outside of a pointed cap, the Morels. Some of these are regarded as an edible delicacy.

Finger-like forms such as the Candle-Snuff Fungus *Xylaria hypoxylon* start as a bunch of upright black stalks (to 2cm or more in height) with white-powdered tips, turning black with age.

The *Cordyceps* fungi, which parasitise underground larvae, are also ascomycetes. Usually only a slender stalk appears above ground, with the spores in a thickened tip. Careful digging will reveal the rest of the stalk and the mummified larva underground. The fruiting body may grow up to 20cm high.

The **basidiomycetes** include many of the spectacular toadstools, as well as more diverse forms. Their spores are borne on special cells, basidia, usually in pairs. Where gills are present they carry the basidia, but the non-toadstool forms may produce spores in pores or on the surface of flattened or tubular fruiting bodies. The gilled, toadstool-shaped species predominate.

The Agaricaceae family is a group of often large

fungi with brown gills at maturity. It includes the cultured Common Field Mushroom *Agaricus campestris*.

*A. xanthodermis* is a poisonous relative with a whitish cap, which stains yellow when bruised or cut. The *Amanita* (with white gills) is a common forest genus in Australia. It includes the exotic scarlet-capped Fly Agaric *Amanita muscaria* and its smaller yellow-capped relative *A. xanthocephala*. *Agaricas* and *Amanitas* may have caps up to 15cm diameter.

Other large, distinctive forms include the *Cortinarius* family, typified by a cobwebby membrane, the cortina, which envelops the developing fruiting body. Rusty-brown spores are typical. *Cortinarius archeri* is a large, robust member of this family. It has a purplish cap and stem and grows mostly on the ground. Australia is rich in native *Cortinarius* and *Amanita* species.

Smaller capped fungi include the small *Marasmius* spp., often with caps around 2-5mm diameter and thin, dark, springy 'horsehair' stems. The *Mycena* spp. are another common genus of small gilled toadstools, with conical to hemispherical caps on fine stems, often growing in clumps, always on dead twigs and bark litter.

But not all basidiomycetes have gills. Some capped forms have instead a spongy mass of tissue-bearing spores in tubular pores, the *Boletes*. These can be large and they include the massive *Phlebopus marginatus*, which can have a cap up to 100cm diameter and a robust stem to 17cm thick. This used to be known by the somewhat more appropriately sounding name of *Phaeogyroporus portentosus*. It grows on grass in open woodland.

The bracket fungi, with pores or gills, grow on wood, projecting from the substrate like small, triangular shelves. A common example is the tough, banded Rainbow Bracket Fungus, or Turkey Tail, *Trametes versicolor*. The bands on the upper surface are predominantly brown and orange shades, while the lower, pore-bearing surface is white. The grey-brown *Schizophyllum commune* is not a true bracket fungus but is more closely related to the toadstool forms. Its unusual split gills radiate from the point of attachment. It has a velvety upper surface and a ragged margin. *Schizophyllum* grows in colonies on dead wood. It has been found to cause disease in humans, especially in people with immune deficiencies: *avoid excessive handling and inhalation*.

The Jelly Fungi, e.g. *Tremella* sp. and the Ear Fungi such as *Auricularia polytricha* grow on the trunks and branches of trees, often in long swathes.

The basidiomycetes also include the Puffballs, e.g. *Lycoperdon* and *Morganella* spp. and the Earth Stars *Geastrum* spp. These release clouds of spores when their ripe inner sacs burst (or are trodden on!)



*Morganela* sp. ruptured puffballs on a fallen tree trunk (diameter to 23mm)

Photo: R Freere

Puffballs occur on the ground but also as swarms on tree stumps and fallen timber.

The Stinkhorns, order Phallales, are a sordid group, exuding their spores in a foetid mass that attracts the flies which distribute them. The Starfish Fungus *Aseroe rubra*, holds the spore mass in the centre of an upward-facing disc, bearing 4-8 bifurcated, red arms.

Cauliflower and Flame Fungi such as *Ramaria* and *Clavicornia* spp. are attractive gregarious forms, some of which are branched. They are found growing in leaf litter and on rotting wood. Their colour varies from orange and yellow, through pink and cream, to purple. They may reach 15cm high.

### Warning

While some fungi are edible, many are toxic and some are lethal. Other than accurate identification there is no sure way of determining which are safe and which are not. If there is any doubt, leave it out! As a general rule it is best to consume cooked fungi in modest portions. Some species, while edible, may induce violent reaction if consumed with alcohol.

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### Acknowledgement

It is a pleasure to acknowledge the helpful discussion with Heino Lepp from the National Herbarium during the preparation of this paper.

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\* Recommended reference books on Australian fungi, including notes on classification, collection and habitat. Well illustrated: Bougher and Syme with superb colour paintings and drawings by Katrina Syme; Grey and Grey includes distribution maps data for the first 100 mapped species and colour-matching charts.

\*\*Includes a good range of non-toadstool forms. Well illustrated.

# Originally published in English as *Pocket Guide to Mushrooms and Toadstools*, Mitchell Beazley, 1981



# Lichens

John Simons and Jane Lemann

Growing over the rocks and on some trees on The Gib are many species of lichen that have not yet been studied and identified.

Lichens are organisms that are formed through symbiotic partnerships between a fungus and an alga (either green or blue-green). The alga contains chlorophyll and lives within the living mat of fungal threads and produces food by photosynthesis. The alga exchanges food in return for moisture, protection and a supply of mineral nutrients from the fungus. This very close,

mutually beneficial arrangement enables the lichen to grow in very inhospitable and exposed places where there may be great variations in temperature and moisture levels. This allows lichens to fill environmental niches intolerable to other organisms. Although they are very slow growing they are likely to be the pioneers that colonise newly exposed surfaces.

Lichens reproduce vegetatively by fragmentation, each fragment containing both algal and fungal cells. The upper surface of the lichen may crumble into tiny powdery granules (called soredia) or the lichen may produce tiny outgrowths (called isidia) which are easily broken off and dispersed.

Lichens are often anchored to their substrates by root-like structures. Minerals are absorbed directly through the surfaces of the lichen, not through roots.

The fungi are very efficient at concentrating mineral nutrients from dilute solutions and lichens play key roles in rock weathering and the first stages of soil formation when they die and release into the detritus the nitrogen and minerals they have absorbed.

They also indiscriminately take in substances from the atmosphere, some of which may be toxic, e.g. sulphur dioxide which damages the chloroplasts and may cause the death of vulnerable species. Observing the state of health of lichens can be an indication of pollution levels.



Fruticose lichen

Photo: C Lemann



Foliose lichen

Photo: C Lemann



Crustose lichen

Photo: C Lemann

## Further Reading

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Lepp, H and Curnow, J *Australian Cryptogams Calendar*, Canberra 2001



Swamp Wallaby *Wallabia bicolor*

Photo: J-P Ferrero

# Chapter 15



## Mammals of Mount Gibraltar

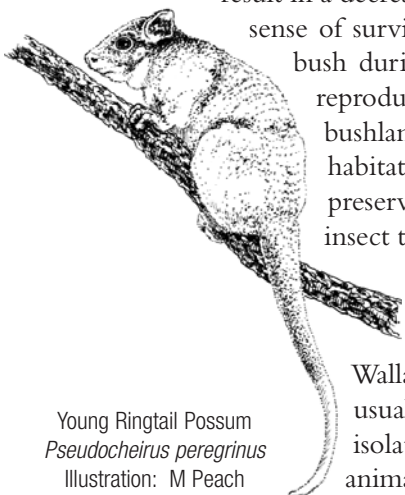
Judy MacMaster

Judy has been a member of Wingecarribee Wildlife Information, Rescue and Education Service (WIRES) since its inauguration in 1990. She has participated in the rescue, rehabilitation and release of most species of animals and birds of the Southern Highlands and has gained a good deal of knowledge during this time. She lives on the fringe of Mount Gibraltar Reserve and has observed many species of fauna during her walks in the area, including the elusive and fast diminishing Swamp Wallaby. Wombats are welcome frequent visitors to her garden, although she does not really appreciate them eating the fresh shoots of newly planted native grasses!

Judy's involvement with WIRES now focuses mainly on the training of new members each year, and the education of the public regarding the importance of preserving natural habitat for the native animals of the Southern Highlands. She is still involved with the rescue of mammals in the district. She also helps newer members with assessment of injuries as well as providing support and information for them in their rehabilitation of injured or orphaned native animals.

Despite human encroachment on the habitat of the mammals of Mount Gibraltar, there is a surprising variety and number still known to be living there. Indeed, some seem to be thriving, although the maintenance of the Reserve is a constant challenge. The increasing traffic movement through the Reserve, together with climate changes – drought and long periods of sustained hot weather – and houses being built right up to its boundaries, could result in a decrease in most species. However, native animals – and birds too – have an innate sense of survival, and they know much more than we do, about how to survive in the bush during adverse conditions, to wait for the good times when they are able to reproduce their species with the least amount of trauma. The small 'island' of natural bushland that is Mount Gibraltar is a delicate ecosystem situated amongst human habitation. Those who are entrusted with its care know the importance of preserving this home to many species of birds, animals and plants from the tiniest insect to the largest animal, from the leaf litter and fallen logs on the ground, to the tall eucalypts with their natural tree hollows.

One mammal which has been included on past fauna lists, but which has almost certainly disappeared from the Reserve, is the Common Wallaroo *Macropus robustus*. Known also as the Euro (although this subspecies is usually found west of the Great Dividing Range), the wallaroo still inhabits isolated (sparsely inhabited) parts of the Southern Highlands. It is a solitary animal driven from the Reserve by human intrusion, probably decades ago.



Young Ringtail Possum  
*Pseudocheirus peregrinus*  
Illustration: M Peach

Three other species have probably inhabited the Reserve, but have not been sighted in recent years. These are the Eastern Pygmy Possum *Cercartetus nanus*, the Grey-headed Flying Fox *Pteropus poliocephalus* and the Eastern Grey Kangaroo *Macropus giganteus*. All three can be found in varying numbers in other parts of the Southern Highlands. There are some Eastern Grey Kangaroos in Gibbergunyah Reserve, across the main access road between Mittagong and Bowral, and occasionally these have been known to travel to Mount Gibraltar Reserve, but the road is dangerous and littered with heavy mechanical beasts which usually kill them, or sadly, leave them lying by the road, awaiting a long slow death. Flying foxes feed mainly on flowering eucalypt trees, and could well dine on those in the Reserve when the trees are in flower, but there certainly is no flying fox colony in the Shire. However, WIRES members rescue these intelligent animals from other parts of the district, usually caught in netting over fruit trees, or in barbed wire fences.

The smallest of the mammals which are known to have the Reserve as their home are the tiny microbats. These bats are very difficult to see, and impossible to hear without specialized equipment. The five species most likely to be found are:

- Little Forest Bat *Vesperdelus vulturinus*. The smallest – an adult is approximately 5 grams in weight and 4 centimetres in total body length
- Chocolate Wattled Bat *Chalinolobus morio*. Average adult weight is 8 to 9 grams, body length 5 to 6 cm
- Lesser long-eared Bat *Nyctophilus geoffroyii*. Average weight 8 grams, length 4½ cm
- Gould's Long-eared Bat *Nyctophilus gouldi*. Average weight 12 grams, length 5½ cm
- Gould's Wattled Bat *Chalinolobus gouldii*. Average weight 14 grams, length 5½ to 6½ cm

These tiny bats rely on echolocation to navigate and hunt for food. The bat's vocal cords vibrate rapidly to create sound impulses that are emitted through the mouth or nostrils. These impulses bounce back when they hit an object, with the bat being able to judge its distance by the frequency of the echoes. They usually hunt below the tree canopy and their food consists of insects, hence the term, *insectivorous bat*. They eat moths, bugs, beetles, crickets, lacewings, flies, cockroaches, ants and spiders. Roost sites are tree hollows, bark linings, and where humans live, quite often in the roof or wall of a house or inside a jacket hanging on the rack outside! Modifications to bats over time have resulted in them being capable of flight, with the endearing characteristic of hanging upside down when at rest. When they give birth, or need to urinate or defecate, they turn with the head up and



Gould's Long Eared Bat *Nyctophilus gouldii*

Photo: P Jordan



Antechinus joeys in pouch

Photo: P Jordan

hang by their thumb claws – very clean and efficient! Microbats usually go into torpor during winter and appear with the first warmth, and subsequent first flush of insects, of spring.

Incidences of Australian Bat Lyssavirus (ABL) occurring (mainly in Queensland) have caused Wildlife authorities to rule that handlers of any bats be vaccinated against the virus. Authorities advise that members of the public do not handle bats and to call a wildlife care group or the National Parks and Wildlife Service (NPWS) if there is a problem, such as an injury, with any bat.

Running around in the Reserve at night are small brown mouse-like creatures called Antechinus, the most common being *Antechinus stuartii*. These are marsupial mice which, although often mistaken for a common house mouse, have a much longer and more pointed nose, and a hairy tail which is the same length as the body. (A mouse's tail is longer than its body, and has less hair). The Antechinus is a



Antechinus

Photo: NPWS



Bush Rat *Rattus fuscipes*

Photo: P Jordan

carnivore, eating beetles, spiders (including funnel-webs!) cockroaches and similar small creatures, hunting at night on the ground. They live in the ground cover and small fallen logs, sleeping during the day. They, too, may go into a mild torpor during winter to cope with a lack of food. During the mating season, late August, the males race around searching for females, and over a two week period, they mate for about six hours at a time and then die. Not a single male is left. This is because their aggressive behaviour and the need to compete with other males lowers their immune system so that they

have no reserves left after mating, thus succumbing to diseases and infections. Females can live for another year. They do not have a pouch, as such, but have exposed nipples which the young cling to for five weeks, being dragged awkwardly around until they are old enough for dispersal.

Larger than the Antechinus is the native Bush Rat *Rattus fuscipes* which prefers to live in dense undergrowth of fallen logs, ferns and shrubs, is nocturnal and eats mainly insects. Females have a defined home territory; males, especially in the spring mating season, can cover one kilometre in one night. They can survive a bushfire, by burrowing, but then do not reproduce in the following season.

There are several possums living in Mount Gibraltar Reserve. Future fauna surveys will determine numbers and show declines or increases in their populations.

There could well be the smallest of the gliding possums living in the Reserve – the Feathertail Glider *Acrobates pygmaeus*. This animal has a body length of 6.5 to 8cm and its tail is 7 to 8cm long. It is distinguished, not only by its very small size, but by its feather-like tail – when you see one, you know immediately what it is! It can volplane (glide) for 20 metres and the large pads on its toes (like those of a gecko) help it to land on smooth surfaces.

Another small gliding possum is the Sugar Glider *Petaurus breviceps*, which is an endearingly beautiful



Feathertail Glider *Acrobates pygmaeus*

Photo: K Atkinson

small animal. It is about 17cm in body length, with its fluffy grey-black tail slightly longer, light ash-grey in colour with a cream belly, a black stripe running from between the eyes and down its back. It can glide between trees for 50 metres with its gliding membrane which stretches from the last finger to the first toe. Sugar gliders live in small family groups, in tree hollows. Their diet consists of sap, nectar and pollen from acacias and eucalypts as well as insects and the exudate of various invertebrates. All possums are marsupials, and these gliders usually give birth to twin joeys (n.b. every marsupial baby is termed a 'joey') each less than a gram in weight, in spring when there is an abundant food supply. The joeys stay in the pouch for about two months (weight will then be 20 grams), after which the mother will leave them in their nest while she feeds, until they are about 4½ months old and around 80 grams in weight, when they will be fully weaned. Although they look extremely cute, they can be aggressive little animals and their sharp teeth can inflict a painful bite. They chatter angrily when captured. A nocturnal animal like all possums, the Sugar Glider has a medium pale

red eyeshine when spotlighted at night. In the Reserve, their main predators would be foxes and feral cats, although owls and kookaburras will prey on young sugar gliders.

An elusive inhabitant of the Reserve is the Greater Glider *Petauroides volans*. Much larger than the Sugar Glider, at around 40cm in body length with a long fluffy tail about 55cm long, this possum is the largest of all gliding possums and feeds almost solely on eucalypt leaves. The colour of its fur can vary from dark brown to black with a creamy-yellow belly, to cream all over. Sometimes people think they are albino possums! They nest high up in tree hollows and give birth to only one joey which remains in the pouch for four months. They are specialized eaters of eucalypt leaves - like koalas - which make them very difficult to rehabilitate when brought into care, usually from being caught in barbed wire fences. Their eyeshine is bright yellow.

Less likely to be found in the Reserve is the Yellow-bellied Glider *Petaurus australis*. This animal is on the Threatened Species list, and because of its quite large habitat range and the increasing sprawling



Greater Glider *Petauroides volans*

Photo: C Smith



Young Ringtail Possum *Pseudocheirus peregrinus*

Photo: P Jordan

urban population, it is probably not now an inhabitant of the Southern Highlands. However, should anyone come across a possum-like animal with pale yellow eyeshine at night, or even an injured or dead one during the day, please notify NPWS and the local WIRES organization. The Yellow-bellied Glider is slightly smaller than the Greater Glider, is grey-black on its back with a creamy-yellow belly with an orange tinge. This glider is very vocal, unlike the Greater Glider which is silent.

The Common Ringtail Possum *Pseudocheirus peregrinus* is another possum resident in the Reserve, along with the Common Brushtail Possum *Trichosurus vulpecula*. While the brushtail possum lives in tree hollows, the ringtail builds a spherical nest (drey) in a tree or shrub, lined with bark and leaves. The ringtail is distinguished from the brushtail in that it is smaller, can have an obvious orange tinge to its fur, has a long prehensile tail which curls and is often tipped with white.

The brushtail is grey/brown in colour, and has its forepaw digits in the same form as a human – the ringtail has three digits opposed to another two digits. Ringtails can give birth to up to four joeys, (twins are the most common), but the brushtail has only one, usually born in spring, although the brushtail can have two joeys in one year. Both possums carry their joeys on their backs for about two months after they have emerged from the pouch. Brushtails have a red eyeshine, ringtails red also but not as bright.

In the wild, both possums eat mainly eucalypt leaves, and while the ringtail also prefers flowers of native shrubs such as grevilleas, banksias etc., the brushtail has adapted very well to suburban life and will opportunistically feed on just about anything. However, wildlife authorities do not advocate the feeding of any native animals or birds.

The Short-beaked Echidna *Tachyglossus aculeatus* is a monotreme, (an egg laying mammal like the Platypus) with an adult weight of < 8kg. The Echidna is a well-known spiny animal which breaks into ant nests or termite mounds with its sharp claws, to capture the residents with its long sticky tongue. It will also eat invertebrates such as worms, grubs, soft insects, ticks and beetles. When disturbed, it curls itself into a prickly ball, or it will quickly burrow into the ground. It is a solitary animal, except in the mating season, but it has a definite home range and will stay within it, although home ranges between echidnas will often overlap. During July/August, a single female can often be seen with a number of males following her, (an 'echidna train') with the result being one egg laid into a makeshift pouch. However, the female's breeding cycle is individualistic and she may only produce an egg every five years.

The egg hatches after about 10 days, and the young echidna, commonly termed a ‘puggle’, remains in the pouch for up to three months, suckling on milk exuded from pores in the pair of mammary glands. When the puggle is too big for the mother to carry, she digs a burrow where it remains until it is weaned at about seven months of age. The mother visits the burrow only once every five or six days, so the young suckles a large quantity of milk to last until the next visit. After weaning, the young echidna is on its own. There is no known way to tell an echidna’s age, nor its gender, because both sexes can have a ‘pouch’ as well as a spur on the hind leg. This spur is non-venomous, unlike that of the male platypus.

Probably the most prolific mammal living in Mount Gibraltar Reserve is the Common Wombat *Vombatus ursinus*. With adult males weighing up to 40kg, they are indeed ‘bulldozers of the bush’, and can move surprisingly quickly when threatened. Their most dangerous asset is their teeth which can inflict a very nasty bite or even remove a portion of a human’s anatomy! The wombat emerges from its burrow in the early evenings (sometimes they come out during the day in winter to bask in the sun or graze) to eat grasses, roots and mosses, chewing with teeth that grow throughout the wombat’s life. The burrows of the wombat are quite complex, often having several resting chambers and a main sleeping chamber – they can interconnect and have several entrances. Usually solitary animals, they can overlap their home ranges and use each other’s burrows. During one night, they could travel up to 5km searching for food, leaving their characteristic rectangular-shaped faeces on the top of a rock or log. There is no set breeding season for wombats and the one that is born each year remains in the pouch for about eight months and will follow its mother for another 10 months after that.

The closest relative of the Wombat is, of course, the Koala *Phascolarctos cinereus*. Although there are none of these in the Reserve, it is highly likely that they were living there before European man arrived just over 200 years ago. Koalas still live in some outlying fringes of the Southern Highlands.

Finally, the largest, but not necessarily the heaviest, mammal in the Reserve, is the Swamp Wallaby *Wallabia bicolor*. Because of its different skull structure, dentition, blood proteins and chromosomes the Swamp Wallaby is not included in the genus *Macropus* as are other wallabies and kangaroos and is the only animal within the genus *Wallabia*. It is very dark brown to black in colour, with a cream to rufous orange coloured belly and has an adult weight of between 13kg (females) to 17kg (males). The ‘swampy’ is a secretive, solitary animal, relying on dense undergrowth of ferns, rocks and gullies to hide.



Echidna *Tachyglossus aculeatus*

Photo: J Lemann



Wombat *Vombatus ursinus*

Photo: G Parker

It is a ‘browser’ meaning that it eats native shrubs rather than grasses. It can pull down overhanging branches to eat the leaves and young shoots and sometimes will chew the bark from eucalypts. The one joey born to a swampy at any time of the year will stay in the pouch for up to eight months and will continue to suckle as a young at foot until about 15 months old, when they are old enough to reproduce.

Sadly, the numbers of swamp wallabies in the Reserve are quickly diminishing as they regularly appear as road kill on the busy road over the mountain between Bowral and Mittagong. Domestic dogs can also be a threat to swampies, chasing them so that they suffer from severe stress, resulting in death. Now there are fewer than 10 of these animals living in the Reserve.



Unfortunately, there are several species of feral mammals which inhabit the Reserve. The most common is probably the Fox *Vulpes vulpes*, followed closely by the Rabbit *Oryctolagus cuniculus*, the Cat *Felis catus* and the Rat *Rattus rattus*. The common House Mouse *Mus musculus* is probably living, like the Rat, on the fringes of the Reserve, near human habitation, competing with native animals for food and habitat. Foxes and cats will stalk, catch and eat small native animals, and although foxes will hunt rabbits, they also eat native fruits, berries and insects, thus depleting the food supply for native animals and birds and distributing weed seeds.

It would be very good to know that there are other species of mammals still living in the Reserve, and fauna surveys in the future will determine this. Even better would be the guarantee that the Reserve will remain intact forever, so that the animals and birds, together with the native flora, will have the opportunity not only to survive there, but to thrive.

To guarantee that happens will be the responsibility of the other known mammal living in the area – that is the Human *Homo sapiens*!



Swamp Wallaby *Wallabia bicolor*

Photo: P Alexander

### Acknowledgement

Thanks to Helen George for her assistance

### Further Reading

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### Glossary

Exudate: a substance that has been exuded, eg: the gum of eucalypts and the excreta (faeces) of insects which eat this gum  
 Torpor: a method for reducing energy loss by lowering the body temperature. Symptoms are coolness of the body and appearance of sleep.

### Mount Gibraltar Mammal List

** Little Forest Bat	<i>Vespardelus vulturnus</i>
Chocolate Wattled Bat	<i>Chalinolobus morio</i>
Lesser long-eared Bat	<i>Nyctophilus geoffroyii</i>
** Gould's Long-eared Bat	<i>Nyctophilus gouldi</i>
** Gould's Wattled Bat	<i>Chalinolobus gouldii</i>
Brown Antechinus	<i>Antechinus stuartii</i>
Bush Rat	<i>Rattus fuscipes</i>
Sugar Glider	<i>Petaurus breviceps</i>
Common Ringtail Possum	<i>Pseudocheirus peregrinus</i>
Common Brushtail Possum	<i>Trichosurus vulpecula</i>
Greater Glider	<i>Petauroides volans</i>
Short-beaked Echidna	<i>Tachyglossus aculeatus</i>
Wombat	<i>Vombatus ursinus</i>
Swamp Wallaby	<i>Wallabia bicolor</i>

#### Possible Inhabitants

Feathertail Glider	<i>Acrobates pygmaeus</i>
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#### Uncommon

** Eastern Pygmy Possum	<i>Cercartetus nanus</i>
** Eastern Grey Kangaroo	<i>Macropus giganteus</i>

#### Unlikely

Common Wallaroo	<i>Macropus robustus</i>
Grey-headed Flying Fox	<i>Pteropus poliocephalus</i>
** Yellow-bellied Glider	<i>Petaurus australis</i>

#### Feral

** Mouse	<i>Mus musculus</i>
** Rat	<i>Rattus rattus</i>
Rabbit	<i>Oryctolagus cuniculus</i>
Fox	<i>Vulpes vulpes</i>
Cat	<i>Felis catus</i>

\*\* not in current species list

This information is based on surveys by Pat Jordan 1995 and Kevin Mills 2003



Laughing Kookaburra *Dacelo novaeguineae*

Illustration: M Peach

# Chapter 16



## Birds of Mount Gibraltar

Richard Jordan

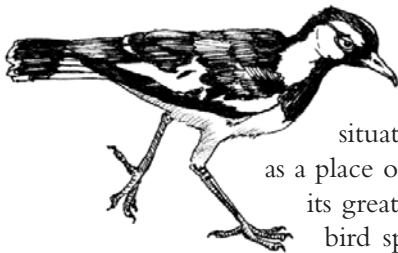
In 1982 Richard Jordan, BSc (Hons) Dip.Ed., with his wife Pat, established a bird observatory and field studies centre in Barren Grounds Nature Reserve, situated on the edge of the Illawarra Escarpment between Robertson and Jamberoo. From 1988 until his retirement in late 2004 he operated Emu Tours, an Australia-wide birdwatching tour business. Richard has carried out research on the rare Ground Parrot, and he continues to search for the enigmatic and elusive Night Parrot in the central desert areas of Australia.

The Mount Gibraltar environment currently caters well for its birds. The Reserve contains a good variety of bird habitat, from the tall open forest with fern understorey of the Inner Bowl to the drier forest on the north-facing slopes. There are also several exposed areas and wet creek gullies. As a result it hosts a good range of native birds, and there is an absence of introduced species – apart from a small population of the Common Blackbird where the Reserve borders on gardens. The discussion below, where a range of common birds in the area is related to their food requirements, shows how the wide variety of food resources at Mount Gibraltar allows for the presence of a diverse bird population.

It should also be appreciated that the presence of birds is essential for a healthy ecosystem. Fruit and seed eaters are also seed dispersers. The Mistletoebird is a good example. Mistletoe seeds pass rapidly through its digestive tract and are still viable when they are voided onto a branch. The bird even stands sideways on the branch when doing this to ensure the seeds do

not fall to the ground. Insect-eaters are vital in keeping insect populations in check. The abundant thornbills and pardalotes, for example, spend much of their time cleaning scale insects from leaves.

For people, the special importance of Mount Gibraltar lies in its situation close to the urban areas of Mittagong and Bowral and its easy access as a place of relaxation, recreation and environmental education. This also presents its greatest problems. The diversity and quality of its habitats, and hence of its bird species, can so easily be destroyed by careless and thoughtless actions, especially by the removal of dead and dying trees, clearing for roads and paths, wildfire and the uncontrolled presence of cats and dogs. Of the birds discussed below the parrots and cockatoos, the Laughing Kookaburra, White-throated



Magpie-lark  
*Grallina cyanoleuca*  
Illustration: M Peach

Treecreeper, Striated Pardalote and Tree Martin all rely upon hollows in old trees for nesting. Those birds that feed or nest near the ground such as the fairy-wrens, Red-browed Finch, Eastern Whipbird and White-browed Scrubwren are especially vulnerable to disturbance by cats and dogs.

The diversity of bird species, and the adaptation of many of them to very specific environmental niches, make them very good indicators of the health of a natural bushland community. The disappearance of a species from an area, or the appearance of a feral species, can often indicate that all is not well. There are 74 birds listed for Mount Gibraltar.

### The Birds of Mount Gibraltar and their Food Fruit eaters

Largest of the fruit-eaters commonly present at Mount Gibraltar is the Satin Bowerbird, and you may be lucky enough to find the display bower of the adult male. If you see or hear a male calling in the top of a tree you will sometimes find the bower on the ground below. The decorations of blue feathers, clothes pegs etc. will often catch your eye. Notice that there are usually some yellow-green flowers near the bower as well. Are you aware that the males only get their blue/black plumage when seven years old, and that the younger males look much like the green/brown females? It is much harder to find the nests than the display bowers, as they are concealed high up in dense foliage.

The Lewin's Honeyeater is one of the larger honeyeaters. This bird will take nectar from flowers, and it also eats insects, but its most important food item is fruit. Listen for a rapid, machine-gun call.

The Mistletoebird is tiny, and it really does rely upon mistletoe berries for much of its food. The red and black male is spectacular and well worth looking for in the clumps of mistletoe.



Satin Bowerbird *Ptilonorhynchus violaceus* at his bower

Photo: P Jordan



Lewin's Honeyeater *Meliphaga lewinii*

Photo: NPWS



Crimson Rosella *Platycercus elegans*

Photo: NPWS



Australian King Parrot *Alisterus scapularis*, male

Photo: P Jordan

### Seed eaters

This group includes some of the largest and most colourful birds in the area, especially the cockatoos, parrots and finches. The magnificent Yellow-tailed Black-Cockatoo is often around, using its powerful bill to crunch up tough items such as banksia cones to get to the seeds inside. This is also a good place to look for the uncommon Gang-gang Cockatoo, which will normally be found quietly feeding on gumnuts high in a eucalypt. Listen for the cracking sound of the 'nuts' being broken open. The same clue can also lead you to the Australian King Parrot and Crimson Rosella, both of which are common birds. The Australian King Parrot is particularly fond of wattle seeds and will also eat berries. The Crimson Rosella is more of a generalist. It can, for example, be found chewing through flowers for their sweetness. Male and females can easily be distinguished in the case of the Gang-gang Cockatoo and the King Parrot, but those Crimson Rosellas that are partly green are actually young birds. The adults all look the same after they reach the age of three years. You will often come across small flocks of colourful little finches down near or on the ground. The red in their tails and heads identify them as Red-browed Finches, and they will be feeding on small grass-seeds.



Eastern Spinebill *Acanthorhynchus tenuirostris*

Photo: P Jordan

### Nectar feeders - the honeyeaters

Australia has a large number of honeyeater species. All will feed on nectar, but must include insects for a balanced diet. Those found in the Reserve range from the large Red Wattlebird – to the very small Eastern Spinebill. The Yellow-faced, White-eared and New Holland Honeyeaters come somewhere in the middle. Have a close look at the beaks of any honeyeaters you see. This gives a clue about their feeding preferences. In particular look at the Eastern Spinebill. That long curved beak is perfect for foraging in tubular flowers. All the honeyeaters have tongues with a brushy tip to help them extract the nectar from flowers.

### Reptile and large insect eaters

Everyone knows the Laughing Kookaburra. See if you can spot it with a lizard or small snake. It beats its prey backwards and forwards against a branch until the bones are sufficiently broken up for the meal to slip down easily. The Kookaburra is actually a large kingfisher but, like most Australian kingfishers, it does not need to be near water. You may be lucky enough to see the smaller Sacred Kingfisher in the warmer months – its sharp ‘kak-kak-kak-kak’ call carries a long way through the forest.

Also in this group belongs the Grey Butcherbird. You will find it easier to hear than see, and the melodious call (often as a duet) is well worth stopping to listen to. This bird is often seen pouncing on large insects or small reptiles on the ground, which it has spotted from a high perch.

### Caterpillar eaters

Most birds cannot eat hairy caterpillars, but some of the cuckoos have specially-adapted throats to protect them from harm. You will easily find the Fan-tailed Cuckoo in spring, when the males spend much of the day and night calling for a mate from a prominent perch. Its call is a descending trill or, occasionally, a mournful whistle. Look for the distinctive, patterned tail and yellow eye-ring. The Shining Bronze-Cuckoo is smaller and difficult to locate. Its far-carrying whistle (like someone calling a dog) is a common forest sound in springtime.

### Flying insect eaters

Look for the aerobatic Grey Fantail as it flies out from a perch to catch flying insects. Its long tail gives it great agility. You may see the larger Black-faced Cuckoo-shrike feeding on flying insects in the treetops. Notice the way it shuffles its wings as it settles. Look above the treetops for the little Tree Martin darting after insects at high speed. The white patch at the base of the tail easily distinguishes it from the Welcome Swallow.

### Non-flying insect eaters

This group of birds is the most numerous of all. Many species of birds feed on insects on foliage, on trunks and branches, and on the ground. Eight of these are closely-related ‘pairs’, which are best considered together for a comparison.

Striated Thornbill and Brown Thornbill:- These birds are very similar to look at, but easily distinguished by habitat use and call. The Striated Thornbill normally feeds high in the crowns of tall trees, snatching insects from leaves. The Brown Thornbill feeds in much the same way but much lower down and somewhat less actively. The former also has a very short, high-pitched ‘chip’ call, whereas the latter makes a number of louder, lower-pitched and more liquid ‘chirrup’s. Both are tiny birds with streaking on the breast, but the Striated Thornbill is yellower, and has heavy streaking round the eye.

Spotted Pardalote and Striated Pardalote:- These tiny, colourful jewels are well worth searching for. Their short tails are distinctive as they glean for insects high in the forest canopy. Notable is the fact that they are hole-nesters. The Spotted Pardalote excavates its nest hole in a bank or hillock, whilst the Striated Pardalote often prefers a hollow tree.

Golden Whistler and Rufous Whistler:- These chunky, medium-sized birds are notable for the huge difference between male and female plumage. In both species the females are undistinguished ‘brown birds’, whereas the males are brilliantly coloured. The underpart colours are betrayed by the birds’ names, and both have a black-bordered white throat. The males are great vocalists, producing bursts of glorious sound. Both species locate insects in the foliage before making a swift ‘pounce’. The Golden Whistler generally prefers wetter forest types, but both species are often found in similar locations.

Superb Fairy-wren and Variegated Fairy-wren:- Look for these little birds with long, cocked-up tails ‘hop-searching’ in family groups for insects and other invertebrates on the ground. You will find males of



Brown Thornbill *Acanthiza pusilla*

Photo: P Jordan

both species in their colourful breeding plumage from September to April. The red shoulders of the Variegated Fairy-wren are distinctive. It is commonly believed that the brown birds that make up the rest of the family group are females. In fact, most of them are probably younger males, which are indistinguishable from females in the first few months of their lives. Later they can be identified by their

black bill (not reddish), and lack of red on the face (which is crimson in the Variegated and rust in the Superb Fairy-wren females). The younger males in the family group are helpers who stay on to assist with raising the latest chicks (cooperative breeding). Young females are forced to leave the family group before their first birthday. Recent research has shown that the adult male in the group is the father of the brood in only a minority of cases. Most young are fathered by males from nearby territories, whom the female has visited surreptitiously! Variegated Fairy-wrens forage over a much larger area than the other species, in which the family group defends quite a small territory.

### Other insectivores

In the early morning you will certainly hear the 'whip-crack' call of the male Eastern Whipbird at Mount Gibraltar, often as a duet with the female – which answers with a 'twee-twee'. It is a difficult bird to see, as it forages on the ground amongst thick



White-browed Scrubwren *Sericornis frontalis*, male Photo: P Jordan



Eastern Yellow Robin *Eopsaltria australis* Photo: P Jordan



Eastern Yellow Robin's nest Photo: P Jordan



Grey Shrike-thrush *Colluricincla harmonica* Photo: P Jordan

bracken. Also look close to the ground for the White-browed Scrubwren, whose face markings give it a bad-tempered appearance – another bird that is hard to see, but quite common.

Normally somewhat higher up you should look for the Eastern Yellow Robin, often perched sideways on a tree trunk as it scans the ground prior to pouncing on prey of insects or other invertebrates. Also in the same area look for the larger Grey Shrike-thrush; unspectacular to look at, but with a range of melodious, liquid calls.

A lively series of single notes will often lead to the White-throated Treecreeper as it works its way up the trunks of trees. It uses its curved bill to probe for insects under the bark. The female has a small orange spot on each side of the throat, a mark which is absent in the male.

### The generalists

This group of birds is very catholic in its food preferences. Large, obvious and easily identified, the Australian Magpie, Pied Currawong and Australian Raven (often wrongly called ‘crow’) will eat most animal matter, including eggs and small birds. They will also try seeds, even berries on occasion. Also look for small flocks of Silveryeyes, small greenish birds with distinctive white eye-rings. In the winter you might see the Tasmanian sub-species, with reddish flanks, passing through on annual migration. At other times it will be the local version with greyer flanks. Silveryeyes eat a wide range of food items – seeds, berries, insects and nectar. As a result, they are successful in a wide range of habitats.

### The birds of prey (raptors)

If you find a raptor it is most likely to be a Brown Goshawk hunting for small birds. However, this bird is very similar to the Collared Sparrowhawk. Look for the shape of the tail. If it is square it will be a sparrowhawk. A round tail indicates a goshawk. They are quite uncommon, but you just might be lucky!

Usually well hidden in the day time are the Boobook Owl and the Tawny Frogmouth, but again you might be lucky!

On Mount Gibraltar you can hear, and usually see, birds wherever you are. This is especially true on a spring morning, but many species are quite fussy about their habitat preferences, usually based upon the food that they eat. Try to look at the ways that the birds you observe are using the foraging opportunities presented by the various ecological niches.



Australian Magpie  
*Gymnorhina tibicen*  
Illustration: M Peach



White-throated Treecreeper *Cormobates leucophaeus*

Photo: P Jordan



Tawny Frogmouth *Podargus strigoides*

Photo: P Jordan

### Further Reading

#### Bird field guides

Pizzey, G and Knight, F *A Field Guide to the Birds of Australia* Collins 2003

Morcombe, M *Field Guide to Australian Birds* Steve Parish Publishing 2002

Simpson, K *Field Guide to the Birds of Australia* Viking 2004 (Also available on disc with birdsong)

Slater, P *The Slater Field Guide to Australian Birds* New Holland 2003

#### Bird conservation and ecology

Norris, K and Pain, DJ (eds.) *Conserving biodiversity: general principles and their application* Cambridge University Press 2002

Sutherland, WJ et al. *Bird Ecology and Conservation: A handbook of techniques* Oxford University Press 2004



## Mount Gibraltar Bird List

Australian King Parrot	<i>Alisterus scapularis</i>	Pied Currawong	<i>Strepera graculina</i>
Australian Magpie	<i>Gymnorhina tibicen</i>	Pilotbird	<i>Pycnoptilus floccosus</i>
Australian Raven	<i>Corvus coronoides</i>	Powerful Owl	<i>Ninox strenua</i>
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	Red Wattlebird	<i>Anthochaera carunculata</i>
Black-faced Monarch	<i>Monarcha melanopsis</i>	Red-browed Finch	<i>Neochmia temporalis</i>
Black-shouldered Kite	<i>Elanus axillaris</i>	Rose Robin	<i>Petroica rosea</i>
Brown Gerygone	<i>Gerygone mouki</i>	Rufous Fantail	<i>Rhipidura rufifrons</i>
Brown Goshawk	<i>Accipiter fasciatus</i>	Rufous Whistler	<i>Pachycephala rufiventris</i>
Brown Thornbill	<i>Acanthiza pusilla</i>	Sacred Kingfisher	<i>Todiramphus sanctus</i>
Brush Cuckoo	<i>Cacomantis variolosus</i>	Satin Bowerbird	<i>Ptilonorhynchus violaceus</i>
Chestnut-rumped Heathwren	<i>Hyacola pyrrhopygia</i>	Satin Flycatcher	<i>Myiagra cyanoleuca</i>
Common Blackbird*	<i>Turdus merula</i>	Scarlet Robin	<i>Petroica multicolor</i>
Common Bronzewing	<i>Phaps chalcoptera</i>	Shining Bronze-Cuckoo	<i>Chrysococcyx lucidus</i>
Common Koel	<i>Eudynamys scolopacea</i>	Silvereye	<i>Zosterops lateralis</i>
Crescent Honeyeater	<i>Phylidonyris pyrrhoptera</i>	Southern Boobook	<i>Ninox novaeseelandiae</i>
Crested Pigeon	<i>Ocyphaps lophotes</i>	Spotted Pardalote	<i>Pardalotus punctatus</i>
Crested Shrike-tit	<i>Falcunculus frontatus</i>	Striated Pardalote	<i>Pardalotus striatus</i>
Crimson Rosella	<i>Platycercus elegans</i>	Striated Thornbill	<i>Acanthiza lineata</i>
Dollarbird	<i>Eurystomus orientalis</i>	Sulphur-crested Cockatoo	<i>Cacatua galerita</i>
Dusky Woodswallow	<i>Artamus cyanopterus</i>	Superb Fairy-wren	<i>Malurus cyaneus</i>
Eastern Rosella	<i>Platycercus eximius</i>	Superb Lyrebird	<i>Menura novaehollandiae</i>
Eastern Spinebill	<i>Acanthorhynchus tenuirostris</i>	Tawny Frogmouth	<i>Podargus strigoides</i>
Eastern Whipbird	<i>Psophodes olivaceus</i>	Topknot Pigeon	<i>Lopholaimus antarcticus</i>
Eastern Yellow Robin	<i>Eopsaltria australis</i>	Tree Martin	<i>Hirundo nigricans</i>
Fan-Tailed Cuckoo	<i>Cacomantis flabelliformis</i>	Varied Sittella	<i>Daphoenositta chrysoptera</i>
Flame Robin	<i>Petroica phoenicea</i>	Variegated Fairy-wren	<i>Malurus lamberti</i>
Galah	<i>Cacatua roseicapilla</i>	Wedge-Tailed Eagle	<i>Aquila audax</i>
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	Welcome Swallow	<i>Hirundo neoxena</i>
Golden Whistler	<i>Pachycephala pectoralis</i>	White-browed Scrubwren	<i>Sericornis frontalis</i>
Grey Butcherbird	<i>Cracticus torquatus</i>	White-eared Honeyeater	<i>Lichenostomus leucotis</i>
Grey Fantail	<i>Rhipidura fuliginosa</i>	White-throated Treecreeper	<i>Cormobates leucophaeus</i>
Grey Shrike-thrush	<i>Colluricincla harmonica</i>	Wonga Pigeon	<i>Leucosarcia melanoleuca</i>
Jacky Winter	<i>Microeca fascinans</i>	Yellow-faced Honeyeater	<i>Lichenostomus chrysops</i>
Laughing Kookaburra	<i>Dacelo novaeguineae</i>	Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>
Leaden Flycatcher	<i>Myiagra rubecula</i>	Yellow-tailed Black- Cockatoo	<i>Calypterhynchus funereus</i>
Lewin's Honeyeater	<i>Meliphaga lewinii</i>		
Magpie-lark	<i>Grallina cyanoleuca</i>		
Mistletoebird	<i>Dicaeum hirundinaceum</i>		
New Holland Honeyeater	<i>Phylidonyris novaehollandiae</i>		
Pallid Cuckoo	<i>Cuculus pallidus</i>		

\* introduced

Based on surveys by Pat Jordan 1995 and Dr Kevin Mills 2003



Juvenile Lace Monitor *Varanus varius*

Photo: H Cogger

# Chapter 17



## Reptiles of Mount Gibraltar

Mike Jupp

As a child Mike Jupp was fascinated by Gerald Durrell's books on wildlife. He studied Biological Sciences at Leicester University, graduating with an honours degree. Mike then embarked on a career in computer software, which paid rather better than genetic research. Since immigrating to Australia in 1995 he has been sharing his passion and enthusiasm for wildlife with anyone who will listen to him. Mike joined Wingecarribee Wildlife Information, Rescue and Education Service (WIRES) in 2002 and is now a member of the WIRES Reptile Team. He has been very active, rescuing and caring for hundreds of misplaced, injured or orphaned native animals. His great loves are mygalomorph spiders, reptiles and flying foxes. He lives in Moss Vale with his understanding wife, Lynne and their children Lydia and Thomas.

Australia is well known for having a large number and wide range of reptile species. Here in the Southern Highlands we are fortunate to be living in an area with diverse geography, climate and vegetation, so we can encounter a good variety of these fascinating creatures. Mount Gibraltar Reserve provides a wealth of conditions that support these reptiles.



Lace Monitor *Varanus varius*

Photo: NPWS

Reptiles are sometimes described as cold-blooded, but this is misleading. Rather than create internal heat to keep their bodies active, as we mammals do, reptiles control their body temperature by taking heat from their environment. They do this so well that their core temperature can be much hotter than the rock they are lying on.

By making full use of a selection of micro-climates, such as those found on Mount Gibraltar, they can achieve and maintain whatever body temperature they require, higher when hunting and digesting their food, lower when they wish to rest.

Most reptiles live their lives in the same area and know where to go to find the conditions they need, even returning to a favourite site to lay eggs or bear their young. They can only do this successfully where a wide mixture of open and closed vegetation, rocks, crevices, fallen trees, burrows and water is available to them. A healthy and diverse reptile population is a good indicator of a healthy natural environment.



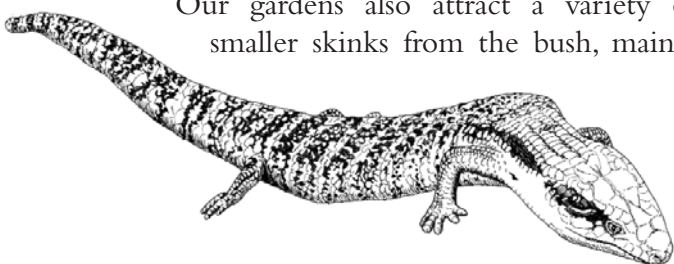
Eastern Bluetongue Lizard *Tiliqua scincoides*

Photo: H Cogger

The reptile people will be most familiar with is the Eastern Bluetongue *Tiliqua scincoides*. This harmless animal is one of the largest skinks in the world, growing to a length of 40 cm. The Bluetongue is one of the few native animals to have flourished since the arrival of Europeans and has found a new niche for itself in our gardens, where it loves feasting on the introduced Garden Snail *Helix aspera*. Bluetongues are long-lived (up to 20 years in captivity) so there is plenty of time for them to become accustomed to our presence and maybe even tolerate gentle handling. These long-term residents are usually females; males have much larger territories that overlap those of several females.

Females will produce up to 25 live young in late summer. The babies are very active and can fend for themselves at birth. They are rarely seen, as their small size and cryptic colouration allow them to hide from predators like kookaburras.

Our gardens also attract a variety of smaller skinks from the bush, mainly



Eastern Bluetongue Lizard *Tiliqua scincoides*

Illustration: M Peach



Black Rock Skink *Egernia saxatilis*

Photo: P Jordan

garden skinks and Delicate Skinks *Lampropholis* species. All have similar lifestyles and like to live in walls, fences, under concrete slabs, anywhere where they can squeeze into a crack or hole. They eat a variety of small prey, and lay their tiny leathery eggs in communal nests in mid-summer.

These little skinks can also be found in suitable areas of Mount Gibraltar Reserve, along with other species which do not come into our gardens, including the Coppertail Skink *Ctenotus taeniolatus* and the larger Black Rock Skink *Egernia saxatilis* and Eastern Water Skink *Eulamprus quoyii*, both of which reach 25cm in length.



Eastern Water Skink *Eulamprus quoyii*

Photo: H Cogger

There are many other species of skinks that could theoretically be found on Mount Gibraltar, but have not yet been recorded.

There is one type of reptile that is found throughout the world, and is represented by 30



Eastern Water Skink *Eulamprus quoyii*  
Illustration: M Peach

species in Australia, yet very few people have ever seen one. This is the blind snake, a harmless snake that looks very like a large worm. Both head and tail are blunt and rounded and the eyes are reduced to tiny spots of black pigment. They do not need to see as they spend their entire lives deep in leaf litter, or inside ant or termite nests. The local species, which I have seen only once, is the Blackish Blind Snake with the wonderful scientific name *Ramphotyphlops nigrescens*. It reaches a length of 75cm.

Also rarely seen is the Jacky Dragon *Amphibolurus muricatus*, a medium-sized dragon that is very difficult to spot due to its excellent camouflage. When disturbed low in a tree it will drop to the ground and quickly disappear. There may be large numbers of these attractive little dragons around, as the bush here is ideal for them.

The Lace Monitor *Varanus varius* has been sighted on Mount Gibraltar recently. The presence of a top predator like this is confirmation of the success of the bush regeneration effort. Lace Monitors are arboreal and feed mainly on nestling birds and eggs, other reptiles and small mammals, though they will come down to the ground to feed on carrion or scavenge for food at picnic sites. You might think that a two metre goanna would be easy to spot, however I have watched people walk right past



Coppertail Skink *Ctenotus taeniolatus*

Photo: H Cogger



Jacky Dragon *Amphibolurus muricatus*

Photo: NPWS

one lying perfectly still on the ground at a picnic site!

Another unusual animal found in the area is a legless lizard – species unknown but likely to be the Common Scaly-foot *Pygopus lepidopodus* which can reach a length of 60cm. A nocturnal animal, the Scaly-foot is usually only seen when protecting its clutch of eggs. This legless lizard and the blind snake can be mistaken for venomous snakes and are sometimes killed; however, the presence of eggs is a reassuring sign that they are harmless. With the exception of the Eastern Brownsnake the local venomous snake species all have live young.

There is also one species of turtle found here, the Eastern Snake-necked Turtle *Chelodina longicollis*. Often seen crossing roads in heavy rain, this shy and secretive animal can have a carapace length in excess of 25cm and weigh over 1kg. An endearing animal, though it does have a habit of releasing a very smelly fluid when handled.

There is a wealth of myths and legends about reptiles, more than for any other group of animals, mostly concerning snakes, and mostly rubbish! The modern myth is that Australian snakes are the most dangerous in the world. This is simply not true. Most venomous, yes, but that does not mean most dangerous. For instance, in the tables published by Broad et al. (see Reference), which are often quoted as though they relate directly to humans, the Copperhead



Scaly-foot *Pygopus lepidopodus*, a legless lizard

Photo: M Jupp

appears at number 12 in the list of lethality in mice, just above the Indian Cobra *Naja naja*. The Cobra kills hundreds of people every year, while to the best of my knowledge the Copperhead has yet to cause a single fatality.

It is an interesting fact that the deadliest venomous creature in Australia, responsible for an average of ten deaths per year, is the introduced Honeybee!

Snake identification can be tricky even for trained reptile handlers, so the golden rule is to treat all snakes as though they are dangerous – look, but don't touch. Please remember that ALL reptiles are protected by law, and some species are vulnerable or endangered.

Six species of snakes are known to occur in the environs of Mount Gibraltar. Of these the Highland Copperhead *Austrelaps ramsayi* is by far



Copperhead Snake *Austrelaps ramsayi*

Photo: H Cogger

the most often seen. The name is misleading, as the head is actually pale grey. The body may be a reddish-bronze colour, usually with black stripes running along the body, or completely dark, slate-grey, or anywhere in between these two extremes. The belly is often a pale yellow. In all specimens the colouration becomes darker towards the tail, and the belly darkens from yellow to a pearly grey. Dark specimens are sometimes locally referred to (erroneously) as yellow-bellied blacksnakes.

Highland Copperheads are smaller than the lowland species *A. superbus*, and rarely exceed one metre in length. They feed on skinks and frogs; wherever you see a lot of skinks, sooner or later you will see a Copperhead though it is much more likely that he will see you first and shoot off into cover.

The Red-bellied Blacksnake *Pseudechis porphyriacus* is fairly common, though as he loves to eat frogs he is usually found in close association with water. This snake cannot be mistaken for anything else; his shiny black colour alone is enough to identify him. The belly is

usually a bright red, but can shade down to a pale pink. Blacksnakes can reach 2.5m in length and live for 25 years. Their diet also includes small skinks and, importantly, other snakes; if you are lucky enough to have a blacksnake in your garden give him a name and make friends with him!

Both these snakes belong to the Elapid family of venomous land snakes, and their venom can kill cats and small dogs and cause serious symptoms in people. However, the good news is that both are very shy and will retire when disturbed. They will only bite under extreme provocation. Even when tangled in netting they will lie still while the netting is cut away but don't try this at home: call one of the wildlife rescue groups!

Three smaller species are fairly common but rarely seen because of their size and shy, secretive habits. These are the Swamp Snake *Hemiaspis signata*, the White-lipped Snake *Drysdalia coronoides* and the nocturnal Small-eyed Snake *Rhinoplocephalus nigrescens*. All are venomous but reluctant to bite.



Red-bellied Blacksnake *Pseudechis porphyriacus*

Photo: H Cogger



Eastern Brownsnake *Pseudonaja textilis*

Photo: H Cogger



The sixth species is the Eastern Brownsnake *Pseudonaja textilis*. Again, this is a shy animal and likely to lie still or run away when encountered; however, when it feels threatened it will readily raise itself up into a distinctive S-shape and open its mouth. Provoked further it will strike rapidly and repeatedly, though not with great accuracy. This is defensive behaviour. Should a brown-snake move away from you, do not follow it. It will move to one side to keep an eye on you and if you get too close will suddenly double back and bite. This strike is relatively slow but is very accurate. This is the one that will get you.

Brownsnakes can be found at Balmoral to the north, Canyonleigh to the west, Tallong to the south-west, Kangaroo Valley to the south and all along the east coast, but as already mentioned above they are very rarely encountered around Mount Gibraltar. WIRES know of only one or two in the last decade.

There are local populations of the Eastern Tigersnake *Notechis scutatus* in the area; the nearest I know of would be those near Hill Top and Robertson. Tigersnakes mainly feed on mammals (rats and mice) so are found more often in rural settings than towns. Tigersnakes are heavily built and are very variable in their colouration and pattern and consequently often misidentified, so remember the golden rule: treat all snakes as though they are venomous. This is especially important with Tigersnakes as they are very nervous and will readily strike in self-defence.

It is just possible that there is a local population of Death Adders *Acanthophis antarcticus* in the area. Death Adders are mainly nocturnal and their camouflage is amazingly good, so they are rarely seen. They have a distinctive shape, with a heart-shaped head, a very wide body and a very thin tail. The snake hides in leaf litter and uses its tail as a lure to attract prey, which is taken with an extremely fast strike.

Incidentally, these are not true adders. They were named for their resemblance to the European Adder. The European Adder is a member of the family Viperidae, a group which includes many very dangerous snakes (Pit Vipers, Saw-scaled Vipers, Rattlesnakes and the American Copperhead), while our Death Adders are Elapids. There are no true vipers in Australia.

The Diamond Python *Morelia spilota* is found along the coast, but here in the Highlands the climate is too cold. Any pythons seen in the area will be escaped pets, so please report them to one of the wildlife rescue groups. If left in the wild they will not survive the winter.

Australian reptiles are fascinating creatures in their own right. The vast majority are harmless and inoffensive and provide a valuable service to us by helping to control insects and other species we consider pests. Like many other types of animal, they are suffering from human interference in their environment through habitat loss and predation by pets and feral animals, and several species are now considered 'vulnerable'. By maintaining and expanding well thought out reserves which offer a wide variety of microhabitats, we can slow their decline. With education, understanding and appreciation it is my hope that we can retain our special reptiles for the enrichment of future generations.

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#### Acknowledgement

Our thanks to Dr Hal Cogger, DSc PhD, for supplying photographs from his collection.

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 Shine, R *Australian Snakes: A Natural History* Reed New Holland 1991

**Note:** Wingecarribee WIRES telephone 4862 1788. There are local branches throughout New South Wales

#### Mount Gibraltar Reserve Reptiles

Lace Monitor	<i>Varanus varius</i>
Eastern Bluetongue Lizard	<i>Tiliqua scincoides</i>
Black Rock Skink	<i>Egernia saxatilis</i>
Coppertail Skink	<i>Ctenotus taeniolatus</i>
Eastern Water Skink	<i>Eulamprus quoyii</i>
Jacky Dragon	<i>Amphibolurus murcatus</i>
Copperhead Snake	<i>Austrelaps superbus</i>
Red-bellied Blacksnake	<i>Pseudechis porphyriacus</i>
Eastern Small-eyed Snake	<i>Rhinoplocephalus nigrescens</i>
Eastern Brownsnake	<i>Pseudonaja textilis</i>

Based on surveys by Pat Jordan 1995 and Dr Kevin Mills 2003



Frog habitat

Photo: J MacMaster

## Chapter 18



# Frogs of Mount Gibraltar

Martyn Robinson

Martyn Robinson, BAppSc, is the naturalist of the Science Communication Section of the Australian Museum in Sydney. He has worked at the Museum for more than 30 years. During this time he has written eight books and numerous articles and short notes for various magazines and journals.

Although frogs are familiar animals to most people they are much more commonly heard than seen. In recent decades the silence around once noisy waterholes and creeks, or the missing voices of certain species in frog choruses in other areas, has alerted people to a worldwide decline in many frog (and other amphibian) species.

The causes for this decline are not well understood although diseases, introduced predators and land use changes have all been blamed. Perhaps the most likely overall cause may be climate change which would stress frog populations in a number of ways, making them more susceptible to death from a variety of other causes.

By contrast some other frog species are doing quite well or have even increased in numbers like the Striped Marsh Frog in urban Sydney.

Whatever the causes of frog declines they have been noted in the Mount Gibraltar area as well.

According to Geoff Goodfellow (see over) in the 1960s the following species could be found in the general area:



Striped Marsh Frog *Limnodynastes peronii*

Photo: H Cogger

## Frogs of the Southern Highlands

Green and Golden Bell Frog *Litoria aurea*  
Booroolong Frog *Litoria booroolongensis*  
Bleating Tree Frog *Litoria dentata*  
Lesueur's Frog *Litoria lesueuri*  
Peron's Tree Frog *Litoria peronii*  
Green Leaf Tree Frog *Litoria phyllochroa*  
Verreaux's Tree Frog *Litoria verreauxii*  
Eastern Brown Froglet *Crinia signifera*  
Giant Burrowing Frog *Heleioporus australiacus*  
Eastern Pobblebonk *Limnodynastes dumerilii*  
Striped Marsh Frog *Limnodynastes peronii*  
Spotted Marsh Frog *Limnodynastes tasmaniensis*  
Red Crowned Toadlet *Pseudophryne australis*  
Brown Toadlet *Pseudophryne bibroni*  
Southern Toadlet *Pseudophryne dendyi*  
Smooth Toadlet *Uperoleia laevigata*  
Blue Mountains Tree Frog *Litoria citropa*

Compiled by Geoff Goodfellow in 1996 based on frogs collected in the area during the 1970s plus three frogs shown in distribution maps compiled by both Michael Tyler and Harold Cogger.

Of these, seven are now rare, endangered or in the process of decline and the only species currently known from the Mount Gibraltar site is the Eastern Brown Froglet *Crinia signifera*.

Surveying the local frog fauna can however be quite a simple matter requiring no more than a little patience and a portable tape recorder. Simply record the various frog calls from creeks, ponds, ditches and swamps in the evenings at various times of the year and in varying weather conditions. The species present at the time can be identified later on from their calls alone. There are several tapes and CDs available with the calls of Australian frogs from the region.

Frogs are now protected in NSW and it is illegal to catch them without a NPWS licence so recording them and/or photographing any you might see are the best methods to identify what species you have found.

A good field guide that covers the frogs of the area will be useful to match up any you have seen with a species description. Of those frogs mentioned in Geoff Goodfellow's article the following are perhaps worth keeping an eye open for due to their rare or reduced status.

Green and Golden Bell Frog *Litoria aurea*. This is a large frog (to 85mm) which is usually bright green with copper or gold mottling. It is usually found

around reedy waterholes and farm dams and is commonly seen by day as it often basks in the sun. Its call sounds a bit like a motorbike changing gears.

Booroolong Frog *Litoria booroolongensis*. This medium sized (to 45mm) frog is found near rocky alpine creeks and streams usually sheltering under rock overhangs or other cover along the banks where it can rapidly jump towards the water if disturbed. It is mottled grey or brown and is active only at night.

Green Leaf Tree Frog *Litoria phyllochroa*. This medium sized frog is usually associated with overhanging creek side vegetation where it frequently seals itself to the surface of leaves during the day making it very hard to see. It can be a light grass green or can change to a dark olive but there is always a cream or gold stripe running from the nostril and down along the side.

Giant Burrowing Frog *Heleioporus australiacus*. This is a large very warty looking frog unfortunately frequently mistaken for the introduced Cane Toad. It ranges in color from dark chocolate through grey to almost black with a few yellow spots on the side. Males may have prominent spines on the backs of their hands. They burrow underground by day and are found along creeks with good water quality in sandstone areas. They are often associated with crayfish burrows. The frogs are far less often seen than are their huge tadpoles which are found in small numbers in pools along the creek.

Red Crowned Toadlet *Pseudophryne australis*. This is a small frog (to 30mm) which is dark grey or brown above with a striking orange or yellow triangle on its head and a few flecks and a short stripe of the same color on its lower back. Like all the toadlets it is also quite strikingly marked below with bold black and white marbling. It is mainly restricted to Hawkesbury sandstone areas where there are soaks below the ridges.



Eastern Brown Froglet *Crinia signifera*

Photo: H Cogger



Giant Burrowing Frog *Heleioporus australiacus*

Photo: H Cogger

Brown Toadlet *Pseudophryne bibronii*. This small frog is brown to black above and like the previous species is strikingly marked below with bold black and white marbling. There is often a yellow band on the upper arm, and a spot of the same color on the end of the body. It can be found in a variety of habitats from forest to grassland where it breeds when rains flood its burrows, washing the eggs and tadpoles into nearby depressions.

Southern Toadlet *Pseudophryne dendyi*. This small frog is very similar to the closely related Brown Toadlet but has yellow patches on the backs of its thighs. Other than that it is similar in almost every way. It is quite likely that there was confusion between the two species as the Southern Toadlet is normally restricted to SE NSW but if located and confirmed in the Mount Gibraltar area then it would be a significant range extension.

The only species currently listed from Mount Gibraltar, the Eastern Brown Froglet *Crinia signifera*, is a highly variable frog up to 30mm and can have smooth, rough, or ridged skin ranging from various shades of brown through to grey and black plus combinations of these colors in either mottles or bands. Luckily the belly coloring and call are fairly consistent. The belly is a marbled pattern of grey and white and the call is a 'crik crik crik' which may be heard at any time throughout the year. Large choruses of this species can sometimes form where

roughly half the males call at once, almost immediately answered by the other half, therefore producing a 'see-sawing' pattern of sound. As previously mentioned one of the commercially available tapes or CDs of eastern Australian frog calls will identify the sound for you.

These adaptable frogs can be found from alpine areas all the way down to the coast to within a metre or so of the high tide mark as long as there is a freshwater soak nearby. They are usually found near water and favor shallow creeks, ditches, soaks and puddles – often those with little or no plant cover. Strangely for frogs that are mostly found in or near water, their fingers and toes are unwebbed. They can be found in both urban and bushland environments and are active mainly at night.

The eggs are a small black and white 'yolk' surrounded by a clear protective jelly and they are usually attached to submerged twigs and roots. They look disproportionately large compared to the size of the adult frog but this is because the jelly absorbs water after being laid.

The tadpoles are as variable as the adult frogs and can be a variety of colors from almost black to a pale golden mottle. They can achieve metamorphosis in less than two months and both the young and adult Eastern Brown Froglets feed on small insects and other invertebrates that they find around their habitats.



Verreaux's Tree Frog *Litoria verreauxii*

Photo: H Cogger

**Editor's note:** It is quite possible that there are other species of frogs on Mount Gibraltar but so far they have not been collected or documented. The most likely are Verreaux's Tree Frog *Litoria verreauxii*, Peron's Tree Frog *Litoria peroni* and the Striped Marsh Frog *Limnodynastes peronii*.

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#### Acknowledgement

Our thanks to Dr Hal Cogger, DSc PhD, for supplying photographs from his collection.

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## Our Local Frog Fauna Forty Years Ago

Geoff Goodfellow

Geoff Goodfellow is the Customer Service and Media Manager with Wingecarribee Shire Council, but in an earlier life he spent a fair bit of spare time among the local frog fauna, particularly in the Bullio country just west of Mittagong, where he grew up on the family sheep grazing property.

When I was a young bloke growing up out Bullio way, west of Mittagong, back in the sixties, nobody ever paid much attention to frogs. Most people took them for granted. Frogs were just there like rabbits, foxes and blowflies. They were in farm dams, creeks, puddles, swimming in the sheep dip, squashed on the road or hiding under logs. Bloody noisy critters at night that occasionally frightened hell out of someone in the outside toilet. Our couple of thousand acres of rugged, hilly Bullio country, dissected by pristine spring-fed creeks and dotted with waterholes, was a great habitat for a variety of frogs.

My family ran about two merino wethers on every three acres we owned. At that level of stocking, the sheep had minimal impact on the biodiversity, almost blending in with the

lyrebirds, echidnas, wedgetailed eagles, bell-birds, wallaroos and wallabies as part of the living landscape.

Green and Golden Bell Frogs *Litoria aurea* basked in the reedy sections of our farm dams. The creeks contained Booroolong Frogs *Litoria booroolongensis* in profusion and probably Lesueur's Frog *Litoria lesueuri*. The distinctive "bonk, bonk, tok" of the large Bullfrog, or Pobblebonk *Limnodynastes dumerilii* could always be heard coming out of the depths near the crystal clear waterholes of the spring-fed creeks. Up in the trees near creeks or along the Wollondilly River banks you would often hear the beautiful Green Leaf Tree Frog *Litoria phyllochroa* and if you were really lucky you might find one clinging under some bark. Probably in



Eastern Pobblebonk *Limnodynastes dumerilii*

Photo: H Cogger



Green Leaf Tree Frog *Litoria phyllochroa*

Photo: H Cogger

the same trees would be its cousin from across the hills, the Blue Mountains Tree Frog *Litoria citropa*, but I was never lucky enough to see one. Then there was Peron's Tree Frog *Litoria peronii*. It regularly stopped by the windows of our house at night to pluck off unsuspecting moths attracted by the kitchen light.

Actually, frogs got the young bloke on the property next to ours into a spot of bother one day. He was sitting on a rock overlooking a quietly trickling creek in one of their rugged gullies chatting with his grandfather and asked, "Can you make a noise like a frog, Grandad?"

'I guess so mate', said the old bloke, 'but why do you ask?'

'Well Mum said this morning that we can all go to Disneyland when you finally croak.'

He never did get to Disneyland, but on a wet spring night by any of the farm dams he could listen to a veritable cacophony of frogs croaking. The Verreaux's Tree Frog *Litoria verreauxii* dominated, but there was also the lovely Bleating Tree Frog *Litoria dentata* with its red eyes and athletic body, plus of course, the visiting

*Limnodynastes* brothers, the Spotted Marsh Frog *Limnodynastes tasmaniensis* and the large Striped Marsh Frog *Limnodynastes peronii*. Turn over a log in any of the swampy wet areas near waterholes or farm dams and you would be bound to find a variety of colour variations of the tiny Eastern Brown Froglets *Crinia signifera* or even the Smooth Toadlet *Uperoleia laevigata*. Another damp log dweller that you more often heard calling rather than actually meeting, was the intriguing *Pseudophryne* spp. the Southern Toadlet *Pseudophryne dendyi* or the more common Brown Toadlet *Pseudophryne bibronii*.

If you ventured off the farm to Mittagong and climbed into the damp Hawkesbury sandstone soaks on Mount Alexandra, a colony of the spectacular Red Crowned Toadlet *Pseudophryne australis* could always be found croaking away up there.

Out Robertson way, where they traditionally produced left-handed hockey players, wild potato growers and frisky cow cockies, they also probably played host to a few remnant coastal rainforest species of frog in those few bits of





Spotted Marsh Frog *Limnodynastes tasmaniensis*

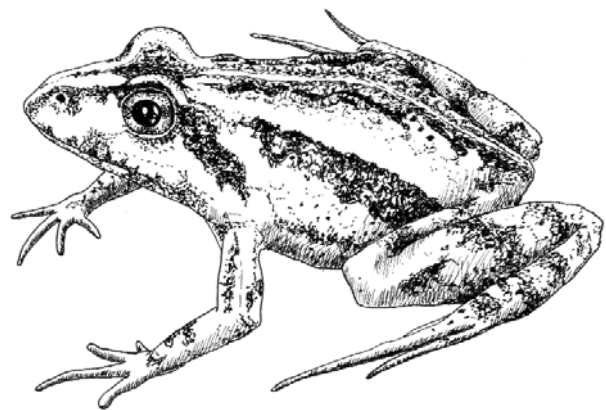
Photo: H Cogger

untouched bush not being farmed. The Giant Burrowing Frog *Heleioporus australiacus*, for example is reputed to have lived there.

Now, forty years on, the world has changed a lot. Are these frogs still croaking away on the Southern Highlands, or have some of them now vanished, like much of the Australian frog fauna in recent years? I haven't seen a Green and Golden Bell Frog in this district since the seventies. The Booroolong Frog is feared gone, while that colony of Red Crowned Toadlets appeared to vanish from Mount Alexandra well before the Freeway thundered through its old habitat.

We would like to know much more about our local frog fauna and seek your help.

Perhaps you would like to tell us about any of these frogs, or others you know about that are still thriving on the Southern Highlands these days. You never know, there may be more frog diversity than we think tucked away in those quiet corners of Wingecarribee Shire where only intrepid torch-wielding naturalists in gumboots tread on warm, wet, misty nights.



Eastern Brown Froglet *Crinia signifera*

Illustration: M Peach



Case Moth, larva

Photo: P Jordan

# Chapter 19



## Moths of Mount Gibraltar

Ted Edwards

Ted Edwards, BScAgr, has worked on Australian moths at the Australian National Insect Collection, CSIRO, Canberra for 35 years. Over this period he has provided identifications and advice to innumerable government and non-government organisations and private individuals. He has published on the taxonomy or biology of many moths and butterflies, in particular contributing to *The Checklist of the Lepidoptera of Australia* and to the *Zoological Catalogue of Australia 31.6 Lepidoptera, Hesperioidea, Papilionoidea* (butterflies). Recently he has been involved in the development of a website illustrating many Australian moths, [www.ento.csiro.au/gallery/moths](http://www.ento.csiro.au/gallery/moths). He has collected moths in many parts of Australia and helped to build the National Collection into a world-class collection of Australian moths.

**M**oths contribute importantly to the ecology of an area through their interactions with plants and other animals. Almost all moth larvae feed on plants and so they are very important in maintaining the balance of different plants in plant communities. They are also important in maintaining animal populations, particularly bats, birds and reptiles, many species of which feed extensively on moths. The birds involved are not only the insectivorous birds but others, like the honeyeaters, often have an important insect component in their diet. On Mount Gibraltar the torn branches of eucalypts and wattles attest to where Yellow-tailed Black-Cockatoos have extracted moth or sometimes beetle

larvae boring deep in the wood. These wood-boring moths are usually Cossidae (wood moths) or Xyloryctinae (stem girdlers) which use the bore in the branch for shelter while feeding on scar tissue at the entrance to the bore (Cossidae, some Xyloryctinae) or on excised leaves (Xyloryctinae). The cockatoos rely on larvae for a high-protein supplement to their seed diet while rearing young. Some species, particularly hawk moths and the Noctuidae, are important pollinators but many others rarely visit flowers and a significant proportion of species have reduced mouth parts and are unable to feed.

The moist temperate climate of Mount Gibraltar suggests that most of the moths will fly early in the night but there will be a few Anthelidae and Lasiocampidae (snout moths) which also fly in the



*Australartona mirabilis* (family Zygaenidae)

Photo: V Rangsi



*Paraterpna* sp. (family Geometridae)

Photo: V Rangsi



John Keast

Photo: J Lemann

early hours of the morning. These moths fly with great rapidity and have a thick coating of long insulating hair scales on the thorax and so can maintain a high thoracic temperature, necessary for very rapid flight, in cold conditions. There will also be a significant proportion of moths which may be disturbed easily in the day time or even be day-active. By contrast, in hot and dry climates fewer are active in the day and in moist tropical rainforests moths may fly plentifully all night.

The first record of collecting on Mount Gibraltar was of an aberrant specimen of the Common Brown butterfly *Heteronympha merope* collected by GA

Waterhouse at the age of 16 on 10 January 1894. Waterhouse later became the world expert on Australian butterflies.

The first moth collecting seems to have been done by Gilbert Macarthur Goldfinch (1887-1943), a great-great-grandson of Philip Gidley King, the third Governor of NSW. Recently, very extensive collecting was carried out by the late John Keast to whom we owe almost all our knowledge of the moths of Mount Gibraltar.

Goldfinch (see Further Reading) made at least seven visits between November 1924 and November 1928 covering the months of November, December, February, March and April. Goldfinch labelled his specimens 'Mittagong' and some may have come from areas other than Mount Gibraltar but certainly some of his collecting was on Mount Gibraltar. His records are not listed here because they did not definitely come from Mount Gibraltar. His special interest was the Geometridae (geometers or loopers) and he described no fewer than seven new species of these from Mittagong. In a paper revising a small group of moths within the Geometridae he recorded nine species from Mittagong out of a total of 47 Australian species, so his collecting must have been quite thorough. Curiously he missed two species in this group later discovered on Mount Gibraltar by John Keast.

One of the geometrid moths Goldfinch missed remains undescribed today although Goldfinch did describe the similar *Paraterpna harrisoni* from Barrington Tops. The relatively ineffective collecting methods of Goldfinch's time probably explain why he did not see these moths. Goldfinch would have searched for resting moths in sheltered places in the day as well as beaten bushes to catch what flew out. At night he may have visited electric lights or run a stationary pressure lamp with a white sheet for moths to settle on. We know he collected by carrying a pressure lamp in one hand with a net in the other and stout steel-capped boots to kick saplings.

Today collecting techniques are immensely more effective and hundreds of moths may be attracted by a bright source of ultraviolet light on a warm, calm night. The ultraviolet light wavelengths most attractive to moths are just beyond human vision and are not the shorter ultraviolet wavelengths which are most damaging to human skin and eyes. Ultraviolet lights should not be used unless care has been taken to ensure they are safe and even then some protective clothes like a hat or UV-opaque glasses are useful. These lights were used by the late John Keast in his survey of moths of Mount Gibraltar during 2001 and 2002 which has contributed so much to our modern knowledge of the moths. He had the advantage of living locally as well as the use of modern collecting techniques. A 250 watt mercury vapour lamp run by



*Paralaea polysticha* (family Geometridae)

Photo: V Rangsi



*Lophothalaina habrocosma* (family Geometridae)

Photo: V Rangsi

a portable generator or alternator was used as well as a small battery-operated light trap incorporating a small black light tube, both of which are very effective. John recorded 169 species from Mount Gibraltar. These are listed at the end of this chapter.

Some interesting moths have been collected from Mount Gibraltar particularly in the family Geometridae, *Lophothalaina habrocosma* whose larvae feed on *Leptospermum* spp. and *Paralaea polysticha* with larvae probably on *Eucalyptus* spp. Both these species have curiously disjunct populations in south-eastern Australia considering the ubiquity of their food plants. Recently *Australartona mirabilis* a forester moth (family Zygaenidae), was described from the summit where it was collected by Gerhard Tarmann although it had earlier been collected by Goldfinch in 1927. This moth is active during the day and is closely related to a south-east Asian group of palm-feeding moths. The majority of Australian foresters feed on a variety of plants including Guinea Flower *Hibbertia* spp. and Native Grape *Cissus* spp. but it is not known what those on Mount Gibraltar feed on, although it is probably a grass.

So far only the larger moths (macrolepidoptera) have been mentioned, but there were some smaller moths (microlepidoptera) described from Goldfinch's collecting at Mittagong. In the family Oecophoridae alone (sometimes called mallee moths), between 1929 and 1946, Dr AJ Turner, a Brisbane paediatrician, described seven new species collected by Goldfinch at Mittagong. Neither Goldfinch nor John Keast specialised in the microlepidoptera and so there must be a very large uncollected fauna on Mount Gibraltar.

From what we know of the moths of Mount Gibraltar, the fauna is typical of the coastal ranges of southern NSW. If the moths were collected and studied thoroughly we could expect well over 1000 to 1500 species, many of which would be microlepidoptera. So far none of the species known are restricted to Mount Gibraltar. Those species originally described from Mittagong have all been found in other places in the southern tablelands and all are probably fairly widely distributed. The moth fauna, like that found throughout southern Australia, is dominated by the Oecophoridae with 54 species in John's list but no doubt hundreds will be recorded eventually. These are small, usually less than 3 cm in wingspan, with conspicuously sickle-shaped labial palpi. This group has explosively radiated in Australia (Common 1990, 2000, Nielsen *et al.* 1996) because they have adapted very well to feeding as larvae on the leaves of the dry-fruited Myrtaceae including *Eucalyptus* spp., *Leptospermum* spp. and *Melaleuca* spp. Many tie leaves together with silk and some make cases out of leaves or twigs for shelter. A large number

# Mount Gibraltar Moths



Photo: A Barker

# Collected by John Keast 2001-2002





Cup Moth *Doratifera quadriguttata*, larva

Photo: NPWS

have become specialised in feeding on the dead leaves and the leaf litter on the forest floor.

Often a fallen eucalypt branch will be seen where all the leaves attached to it are skeletonised and this is the work of several species of Oecophoridae. But many others specialise in various other situations in the leaf litter. A few are specialised to feed in the scats of marsupials: the genus *Telanepsia* in the scats of possums and koalas and the genus *Oxythecta* in the scats of wombats and wallabies. Three species of *Telanepsia* have so far been collected on Mount

Gibraltar. So common are the Oecophoridae that they must contribute substantially to the reprocessing of dry litter on the forest floor and to the recycling of nutrients. They are important in preventing the unlimited build up of leaf litter as happens in eucalypt plantations overseas where the Australian Oecophoridae are absent.

Prescribed burning, a frequently used management tool, kills all the biological agents which break down the leaf litter naturally and they may take many years to recolonise and recover. Prescribed burning should only be used in extremely limited areas and then with great caution. A much greater knowledge of its long-term biological effects than is currently available is necessary for its safe use if biodiversity is to be conserved.

#### Acknowledgements

I thank the late Mr John Keast for wonderful company in the field. His collecting provided almost all the records on which this paper is based. Mrs Judy Keast provided gracious hospitality and encouragement to write this article and Mr Len Willan was great company in the field and helped in innumerable other ways.

#### Further Reading

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## Distinguishing between Moths and Butterflies

J and J Simons

**Moths**  
 Usually held tent-like, enclosing the body; front and rear zipped  
  
 Rod like, or feathery; sensory organs scattered  
  
 Great majority nocturnal; shiver to warm up before being capable of flight

**Wings**  
  
**Antennae**  
  
**Behaviour**

**Butterflies**  
 Opened wide in display, periodically flicked together above the body; front and rear never zipped together  
  
 Rod like, with sensory organs bunched together as a bulb at the antenna's end  
  
 Invariably daytime feeders; need sun's warmth before being capable of flight



# List of Moths Taken on Mount Gibraltar 2001-2002

by the late John Keast, Len Willan and Ted Edwards

Hepialidae	Geometridae	<i>Ochrogaster lunifer</i> Herrich-Schäffer
<i>Aenetus eximia</i> Scott	3 unidentified species	<i>Sorama bicolor</i> Walker
<i>Elhamma australasiae</i> Walker	Ennominae	<i>Trichiocercus sparshalli</i> Curtis
<i>Fraus</i> sp.	<i>Boarmia suasaria</i> Guenée	
<i>Oncopera</i> sp.	<i>Capusa senilis</i> Walker	Lymantriidae
	<i>Casbia melanops</i> Rosenstock	<i>Urocoma marginalis</i> Walker
Adelidae	<i>Dissomorphia australiaria</i> Guenée	
2 unidentified species	<i>Ectropis bispinaria</i> Guenée	Arctiidae
	<i>Ectropis mniaria</i> Turner	<i>Asura cervicalis</i> Walker
Plutellidae	<i>Ectropis</i> sp.	<i>Manulea replana</i> Lewin
<i>Plutella xylostella</i> Linnaeus	<i>Gastrina cristaria</i> Guenée	<i>Spilosoma canescens</i> Butler
	<i>Pholodes sinistraria</i> Guenée	<i>Spilosoma curvata</i> Donovan
Oecophoridae	<i>Picromorpha pyrrhopa</i> Lower	<i>Termessa gratiosa</i> Walker
<i>Acanthodela erythrosema</i> Meyrick	<i>Scioglyptis chionomera</i> Lower	<i>Utetheisa pulchelloides</i> Hampson
<i>Garrha limbata</i> Meyrick	<i>Scioglyptis lyciaria</i> Guenée	
<i>Garrha</i> sp.	<i>Thalaina clara</i> Walker	Herminiidae
<i>Hoplomorpha abalienella</i> Walker	<i>Thalaina selenaea</i> Doubleday	<i>Simplicia caeneusalis</i> Walker
<i>Hoplomorpha notatana</i> Walker	Oenochrominae	
<i>Leistarcha</i> sp.	<i>Epidemia chilonaria</i> Herrich-Schäffer	Noctuidae
<i>Tanyzancla</i> sp.	<i>Epidemia hypenaria</i> Guenée	Hypeninae
<i>Telanepsia</i> sp. 3 species	<i>Gastrophora henricaria</i> Guenée	<i>Paonidia anthracias</i> Lower
<i>Tortricopsis pyroptis</i> Meyrick	Geometrinae	Catocalinae
<i>Tortricopsis uncinella</i> Zeller	<i>Chlorocoma vertumnaria</i> Guenée	<i>Dasyppodia selenophora</i> Guenée
<i>Wingia aurata</i> Walker	<i>Crypsiphona ocultaria</i> Donovan	<i>Fodina ostorius</i> Donovan
<i>Wingia lambertella</i> Wing	<i>Cyneoterpna wilsoni</i> Felder &	<i>Pantylidia sparsa</i> Guenée
40 unidentified species	Rogenhofer	<i>Praxis porphyretica</i> Guenée
	<i>Hypobapta percomptaria</i> Guenée	<i>Rhapha suscitatalis</i> Walker
Cosmopterigidae	<i>Parepisparis lutosaria</i> Felder &	Plusiinae
<i>Limnaecia</i> sp.	Rogenhofer	<i>Chrysodeixis argentifera</i> Guenée
	<i>Parepisparis multicolora</i> Lucas	<i>Thysanoplusia orichalcea</i> Fabricius
Blastobasidae	<i>Prasinocyma semiochrea</i> Walker	Acontiinae
<i>Blastobasis</i> sp.	<i>Sterictopsis divergens</i> Goldfinch	<i>Amyna natalis</i> Walker
	Larentiinae	Amphipyriinae
Gelechiidae	<i>Anachloris uncinata</i> Guenée	<i>Athetis tenuis</i> Butler
7 unidentified species	<i>Chrysolarentia lucidulata</i> Walker	<i>Cosmodes elegans</i> Donovan
	<i>Epyaxa subidaria</i> Guenée	<i>Proteuxoa sanguinipuncta</i> Guenée
Cossidae	<i>Melitulias graphicata</i> Walker	<i>Proteuxoa tortisigna</i> Walker
<i>Idioses littleri</i> Turner	<i>Visiana brujata</i> Guenée	<i>Proteuxoa</i> sp.
	Lasiocampidae	Hadeninae
Tortricidae	<i>Pararguda nasuta</i> Lewin	<i>Leucania exarans</i> Lucas
<i>Cryptoptila immersana</i> Walker	<i>Pararguda rufescens</i> Walker	<i>Mythimna convecta</i> Walker
8 unidentified species		<i>Persectania ewingii</i> Westwood
	Anthelidae	Noctuinae
Limacodidae	<i>Anthela acuta</i> Walker	<i>Agrotis infusa</i> Boisduval
<i>Pseudanapaea transvestita</i> Hering	<i>Anthela ocellata</i> Walker	<i>Diarsia intermixta</i> Guenée
	<i>Anthela repleta</i> Walker	Heliothinae
Carposinidae	<i>Munychryia senicula</i> Walker	<i>Helicoverpa armigera</i> Hübner
2 unidentified species	<i>Pterolocera</i> sp.	<i>Helicoverpa punctigera</i> Wallengren
	Saturniidae	
Pterophoridae	<i>Opodiphthera eucalypti</i> Scott	
1 unidentified species	<i>Opodiphthera helena</i> White	
	Sphingidae	
Pyralidae	<i>Hippotion scrofa</i> Boisduval	
<i>Hygraula nitens</i> Butler		
<i>Hednota</i> sp. 1	Notodontidae	
<i>Hednota</i> sp. 2	<i>Epicoma melanospila</i> Wallengren	
<i>Orthaga thyrissalis</i> Walker	<i>Hylaeora capucina</i> Felder	
<i>Uresiphita ornithopteralis</i> Guenée		
3 unidentified species		



Fiery Copper *Paralucia pyrodiscus*

Photo: S Brown

## Chapter 20



# Butterfly Fauna of Mount Gibraltar

Dr Stephen Brown

Stephen Brown, MDS BSc, developed an interest in science and biology from an early age. He started collecting butterflies at about age 9 and has collected in most parts of Australia and overseas. Stephen has an extensive reference collection of butterflies from Australia which has been used in the recent publications on butterflies of Australia. He has a number of published papers on Australian butterflies and is part of a group that has recently described a new species of butterfly from Torres Strait and new records of butterflies from Australia. Stephen and his wife Tristy have lived in Bowral for 16 years.

The butterfly fauna of Australia comprises approximately 416 species (Braby 2004), with more being described every year as scientists explore the more remote areas of the country and as the significance of DNA studies becomes more apparent. The DNA studies are increasingly being used to study the relationships between closely allied species that are superficially alike. Of the 416 species recorded to date, approximately 65 species have been recorded from the Mount Gibraltar area in the Southern Highlands. None of the recorded species is endemic to this area although the majority are restricted to Australia.

The Southern Highlands falls into the Bassian Faunal region – a biogeographical area that extends from Southern Queensland through New South Wales and the Australian Capital

Territory to Tasmania and Western Victoria and is represented by 193 butterfly species (Braby 2004). Almost one third of these occur on Mount Gibraltar. The species are usually habitat-specific and frequently occupy particular ecosystems. Mount Gibraltar has a fairly wide range of different ecosystems and this may explain the relatively high diversity of butterflies encountered in the area.

A number of butterfly species' immature stages are polyphagous, in that their larvae feed on a broad range of different plant species, which provides a great survival advantage. Such species are usually widespread. Papilionids (Swallowtails) and Nymphalids (Nymphs and Danaines) generally fall into this group.

Mount Gibraltar is home to a number of species that have a very restricted food plant range. These species have highly specialised



Barred Skipper *Dispar compacta*

Photo: S Brown



Fiery Copper *Paralucia pyrodiscus*, underside

Photo: S Brown



Imperial Hairstreak (previously Imperial Blue) *Jalmenus evagoras*

Photo: S Brown

ecological requirements with some members of the Lycaenids (Blues, Coppers, Hairstreaks and Metalmarks) exhibiting the highest degree of specialisation.

The Fiery Copper *Paralucia pyrodiscus* and the Bright Copper *Paralucia aurifer* are Lycaenid butterflies that have an obligate symbiotic or mutualistic relationship with the ants *Notoncus capitatus* (Formicinae) and *Anonychomyrma* sp. (Dolichoderinae) respectively) (Braby 2000) that colonise small plants of Native Blackthorn *Bursaria spinosa* (Pittosporaceae) upon which the butterfly larvae feed.

The ant colonies occur underground around the root mass of the shrubs and the butterfly larvae shelter in the ant colonies. The larvae travel above ground to feed on the leaves at night attended by the ants. (A study by Pierce and Nash (1999) on the Imperial Blue *Jalmenus evagoras* suggested that the ants are provided with a fluid rich in sugars and amino acids secreted from a gland on the dorsum (back) of the butterfly larva. In return, it is believed that the ants provide protection from predators such as parasitic wasps.) The relationship is so specific that



Imperial Hairstreak *Jalmenus evagoras*, larvae with attendant ants  
Photo: S Brown

adult females of these two species of butterfly may only lay eggs on shrubs that have colonies of the respective attendant ant species. If the ant colony is invaded by a different ant species, the butterfly colony may cease to exist. Large colonies of these two butterfly species occur on the western slopes of Mount Gibraltar where there are extensive stands of Native Blackthorn.

The Imperial Hairstreak *Jalmenus evagoras evagoras* and the Silky Hairstreak *Pseudalmenus chlorinda chloris* have a similar specific ant relationship although the larvae of these two species are fully exposed on the foliage of the wattles *Acacia* sp. (Mimosaceae) upon which they feed. Colonies of the Imperial Hairstreak occur below the summit of Mount Gibraltar in the picnic area and in favourable years can undergo population explosions whereby the adults number in the thousands. At such times dozens of wattles may be utilised within a large area (sometimes many hundreds of square metres).

Hesperiids (Skippers, Flats, Awls and Darts) are well represented on Mount Gibraltar with 15 species recorded. These butterflies dart or skip from flower to flower or take up 'point duty' on hilltops. In the latter



Meadow Argus *Junonia villida*

Photo: S Brown



Bright Shield-skipper *Signeta flammeata*

Photo: S Brown



Common Brown *Heteronympha merope merope*

Photo: S Brown



Two-spotted Grass Skipper *Pasma tasmanicus*

Photo: S Brown

situation, males patrol the areas at the summit of hills (the large, rocky open area at the top of Mount Gibraltar and the rocks near the viewing platform on the western side) and fight off other males competing for females that fly to the summit to mate. The species in the genus *Trapezites* are very specific in their food plant choice and in Eastern Australia eat only the leaves of various species of Mat-rush *Lomandra* (Xanthorrhoeaceae). This genus is widespread over the mountain, mainly as the Spiny-headed Mat-rush *L. longifolia* and is predominantly found in the moister areas on the eastern side.

The Splendid Ochre *Trapezites symmommus symmommus* is the largest of the Ochre Skippers and is generally common wherever the food plant Spiny-headed Mat-rush grows. The Silver-studded Ochre *Trapezites iacchoides* is particularly stunning, with six to ten silver spots on the underside of the hind wing. A common species in the area is the Orange Ochre *Trapezites eliena*. This is a large Skipper (wing span approximately 4cm) with a beautiful golden-orange underside with a number of bright silver spots. Skippers are generally not noticed by the untrained eye and are often mistaken for large flies.

The large 'showy' members of the Papilionids (Swallowtails) are not well represented at this altitude and are generally more coastal in their distribution. However the Macleay's Swallowtail *Graphium macleayanus macleayanus* is very common on Mount Gibraltar and can often be seen flying rapidly over the summit area, pausing to feed at the nectar of flowers. The introduced *Buddleja davidii* (Buddlejaceae) is an excellent plant on which to watch this species feed and provides an opportunity to see the brilliant green markings on the wings, which are barely visible when the insect is in flight. The Orchard Swallowtail *Papilio aegaeus aegaeus* is one of the largest of the Papilionids and may be seen as occasional specimens flying through gardens where the introduced food plant, *Citrus* sp. (Rutaceae) grows.

The Nymphalids (Browns, Nymphs and Danaines) is a group that is conspicuous in the moister areas of Mount Gibraltar. Late summer and autumn is when most species are on the wing. The Spotted Brown *Heteronympha paradelpha* is uncommon and frequents shady grassy areas where it flits just above the ground. The larvae of this and other species in the group feed on native grasses and take 10 to 11 months from when the eggs are laid to emerge as an adult butterfly which lives for just two or three weeks. The genus *Oreixenica* (the Xenicas) is a beautiful group of small, dainty butterflies that are orange and black with bright silver marking on the underside of the wings. The Silver Xenica *Oreixenica lathoniella herceus* is a very common inhabitant of the grassy areas at the



Forest Brown *Argynnis cyrila*, larva

Photo: S Brown



Ringed Xenica *Geitoneura acantha*

Photo: S Brown

Bowral lookout. These adults emerge in March and April and are one of the last butterflies to fly before winter sets in.

One of the most spectacular butterflies in the area belongs to the Pierids (Whites and Yellows). Adults of the Imperial Jezebel *Delias harpalyce* can be seen soaring high around the eucalypts, occasionally flying low enough for us to see the bold red and yellow markings on the underside of the hind wing. Two allied species, the Black Jezebel *Delias nigrina* and the Spotted Jezebel *Delias aganippe* can also be found around the summit but are not as common as the Imperial Jezebel. These butterflies occur from

September to May with peak numbers in spring and autumn. The larvae of all the Jezebels feed exclusively on mistletoe (Loranthaceae) and Cherry Ballart *Exocarpos cupressiformis* (Santalaceae) plants which are parasitic shrubs growing on eucalypts (Myrtaceae), wattles and other native trees. The larvae of the Imperial Jezebel are gregarious and form large silken webs over the leaves of the food plant just prior to pupation and often number twenty to sixty individuals. The larvae ultimately pupate together on these webs and generally have a synchronised emergence as adults.

Butterflies can be seen on Mount Gibraltar from late August until early May, weather permitting. The reserve provides a safe haven for its butterfly fauna; in the current climate of land development it thus provides an essential component to our entomological heritage. Butterfly communities are recognised as important indicators of ecological health. Braby (2004) stated:

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The focus on butterflies as flagships for conservation has given them special significance, as ‘ambassadors’ for the general conservation of invertebrate biodiversity, much of which is still poorly understood.

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The unique geology of the mountain has created a location where a great number of butterflies are protected by virtue of the diverse flora, associated ant communities and ecological habitats.

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#### Acknowledgements

I thank Cliff Meyer, Dr Michael Braby and Jane Lemann for reviewing the manuscript.

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 Pierce, NE and Nash, DR ‘The Imperial Blue’ *Biology of Australian Butterflies* Vol. 6 Chapter 18, 1999

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#### Further Reading

The recently published *The Complete Field Guide to Butterflies of Australia* (2004) by Dr Michael Braby is an excellent companion for anyone with an interest in Australian butterflies. The clear illustrations make the identification of even closely related species quite easy and the concise text provides accurate information about butterfly behaviour and habitats.



Tailed Emperor *Polyura sempronius*, larva

Photo: S Brown



Cabbage White *Pieris rapae*

Photo: S Brown



# Mount Gibraltar Butterflies

Lepidoptera Species List

S Brown 2005

## Hesperiidae (15)

Bronze Flat	<i>Netrocoryne repanda repanda</i>
Heath Ochre	<i>Trapezites phigalia</i>
Montane Ochre	<i>Trapezites phigalioides</i>
Orange Ochre	<i>Trapezites eliena</i>
Silver-studded Ochre	<i>Trapezites iacchoides</i>
Splendid Ochre	<i>Trapezites symmomus symmomus</i>
Two-spotted Grass Skipper	<i>Pasma tasmanicus</i>
Barred Skipper	<i>Dispar compacta</i>
Dingy Grass-skipper	<i>Toxidia peron</i>
Bright Shield-skipper	<i>Signeta flammeata</i>
Spotted Sedge-skipper	<i>Hesperilla ornata ornata</i>
Flame Sedge-skipper	<i>Hesperilla idothea idothea</i>
Eastern Iris-skipper	<i>Mesodina halyzia</i>
White-banded Grass-dart	<i>Taractrocera papyria papyria</i>
Greenish Grass-dart	<i>Ocybadistes walkeri sothis</i>

## Papilionidae (6)

Macleay's Swallowtail	<i>Graphium macleayanus macleayanus</i>
Blue Triangle	<i>Graphium sarpedon choredon</i>
Pale Triangle	<i>Graphium eurypylus lycaon</i> (rare migrant)
Orchard Swallowtail	<i>Papilio aegeus aegeus</i>
Dainty Swallowtail	<i>Papilio anactus</i>
Chequered Swallowtail	<i>Papilio demoleus sthenelus</i>

## Pieridae (9)

Lemon Migrant	<i>Catopsilia pomona</i> (rare migrant)
Small Grass-yellow	<i>Eurema smilax</i> (migrant)
Caper White	<i>Belenois java teutonia</i> (migrant)
Cabbage White	<i>Pieris rapae</i> (introduced)
Imperial Jezebel	<i>Delias harpalyce</i>
Black Jezebel	<i>Delias nigrina</i>
Spotted Jezebel	<i>Delias aganippe</i>
Yellow Albatross	<i>Appias paulina ega</i> (rare migrant)
Narrow-winged Pearl-white	<i>Elodina padusa</i>

## Nymphalidae (19)

Sword-grass Brown	<i>Tisiphone abeona abeona</i>
Rock Ringlet	<i>Hypocysta euphemia</i>
Brown Ringlet	<i>Hypocysta metirius</i>
Dusky Knight	<i>Ypthima arctous arctous</i>
Forest Brown	<i>Argynnina cyrila</i>
Ringed Xenica	<i>Geitoneura acantha</i>
Marbled Xenica	<i>Geitoneura klugii klugii</i>
Silver Xenica	<i>Oreixenica lathoniella herceus</i>
Common Brown	<i>Heteronympha merope merope</i>
Spotted Brown	<i>Heteronympha paradelpha paradelpha</i>
Shouldered Brown	<i>Heteronympha penelope penelope</i>
Bank's Brown	<i>Heteronympha banksii banksii</i>
Tailed Emperor	<i>Polyura sempronius</i>
Glasswing	<i>Acraea andromacha</i> (rare migrant)
Meadow Argus	<i>Junonia villida calybe</i>
Australian Painted-lady	<i>Vanessa kershawi</i>
Yellow Admiral	<i>Vanessa itea</i>
Lesser Wanderer	<i>Danaus chrysippus petilia</i>
Monarch	<i>Danaus plexippus</i> (rare migrant)
<b>Lycaenidae (16)</b>	
Fiery Copper	<i>Paralucia pyrodiscus</i>
Bright Copper	<i>Paralucia aurifer</i>
Moonlight Jewel	<i>Hypochrysops delicia delicia</i>
Yellow Jewel	<i>Hypochrysops byzos</i>
Broad-margined Azure	<i>Ogyris olane olane</i>
Dark Purple Azure	<i>Ogyris abrota</i>
Silky Hairstreak	<i>Pseudalmenus chlorinda chloris</i>
Imperial Hairstreak	<i>Jalmenus evagoras evagoras</i>
Stencilled Hairstreak	<i>Jalmenus ictinus</i> (rare)
Copper Pencil-blue	<i>Candalides cyprotus cyprotus</i>
Varied Dusky-blue	<i>Candalides hyacinthina hyacinthina</i>
Yellow Spotted-blue	<i>Candalides xanthopilos</i>
Two-spotted Line-blue	<i>Nacaduba biocellata biocellata</i>
Fringed Heath-blue	<i>Neolucia agricola agricola</i>
Long-tailed Pea-blue	<i>Lampides boeticus</i>
Common Grass-blue	<i>Zizina labradus labradus</i>



A *Camponotus* mating flight begins. Two queens are preparing for flight. The smaller winged ants are the males.

Photo: M Hallowell

# Chapter 21



## Ants of Mount Gibraltar

John Harrison

John 'Rex' Harrison is a public relations and marketing consultant who lives in Tahmoor, NSW. He spends much of his spare time exploring the Southern Highlands with his lovely wife, Barbara. He has spent many years making up for what he did to ants in his childhood. This is just one small step towards that apology. Ants rule, o.k.?

**A**nts live in holes. Big holes with lots of tunnels, egg chambers and a thumping big ant called the queen who gives lots of orders and is guarded by a bunch of fanatically loyal soldiers. Workers toil ceaselessly for the good of the nest. Then they die.

Now we have that out of the way...

### **Why looking at ants is a Good Idea**

Ants are part of the Hymenoptera order which also includes bees, wasps and sawflies. They have been around for about 110 million years and are one of the planet's most spectacular examples of habitat adaptation.

Ants can be found throughout Australia with around 1300 known species and subspecies of ants in more than 100 genera. It is believed that only about a quarter to a half of all Australian ant species have been formally identified.

All of which means that ants are an ideal area of study for a budding zoologist. Chances are good that one or two are within a few metres of you right now. They live in soil, logs, tree canopies, buildings and the odd ant farm. Ants can be nocturnal or rely on the heat of the day to get them moving. There is even a marine species. They don't care much for Antarctica although they don't mind the ski season at Thredbo.

They are predators, farmers, harvesters, slavers and prey (ask any echidna or blind snake). Their role in the Australian ecosystem is vital as they help to aerate the soil as well as breaking down and redirecting nutrients throughout their foraging range.

Ants play an important role in monitoring the health of a local environment. As Shattuck (1999) points out:

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A wide range of government and non-government agencies and private companies use the monitoring of ant communities to assist them in making decisions about managing the environment. For instance, ants are often studied when looking at the effects of bushfires so as to help develop management strategies which optimise the impact [of controlled fires].

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There are several Australian studies on ants and seed preservation. Many species collect seeds for food and store them in the nest. Ants often eat the ‘flesh’, or elaiosome, that covers the seed but leave the actual and less tasty seed alone. The ants then discard these seeds on the nest’s refuse pile. Interestingly, this means that seeds collected in this way have a higher germination and survival rate as they are protected from other predators by the natural defences of the ants and the humus of the refuse pile. It is quite possible that ants play a significant role in the preservation of some plant species.

The Mount Gibraltar Reserve is a temperate zone sclerophyll forest with many formal and informal paths throughout its area. This makes it an ideal place for ants to establish colonies and foraging routes. There are fewer species here than in the tropics but the range is still impressive.

### The Lifestyle

The average ant can live for about a year. She crowds a lot into that year.

The best way to describe an ant colony is as a complex system. Yes, there are roles in the nest but they are not necessarily rigid.

Minor workers can look very busy but sometimes they will just stand there, having a break or waiting on a chemical tip on a new food source from one of their co-workers.

Major workers (soldiers) do defend the nest but no more than other workers. They just look better at it.

The queen is best described as an egg factory. Males are only useful as sperm producers.

Ant communities are a complex system because almost every individual in a given colony or nest does a bit of everything and everything gets done. An individual ant may not be highly intelligent but when she gets together with her co-workers, all necessary tasks tend to be achieved without the need for a central directing authority. It might sound like a recipe for chaos, but as the last 110 million years show, it’s a system that works pretty well. So well, in fact, that NASA is developing robotic explorers based on ant behaviours.

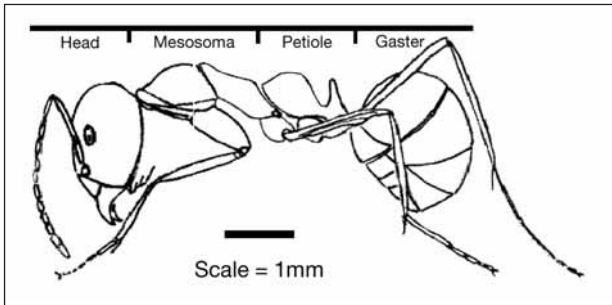


Ants have a role in seed germination. These Black Wattle *Acacia mearnsii* seeds were collected by foragers who store them in the nest. The colony eats the flesh around the seeds and, like all good housekeepers, tidies the nest by taking the seeds outside where they germinate and grow into more acacias.

Photo: J Lemann

## Identification

Identifying ants can range from the very simple (*Iridomyrmex* and *Myrmecia*) to the horribly complex (any number of little black ants.) Let's concentrate on some of the major features a taxonomist would use at first glance:



Meat Ant *Iridomyrmex purpureus*

Diagram: J Harrison

### Identification Features

Head	Ant heads are a good indicator. Compare the shape of a <i>Leptomyrmex</i> head to the <i>Iridomyrmex</i> above.
Mesosoma and alitrunk	These terms are used to describe the mid section of an ant. For want of a better term, it's the chest.
Legs	If you can't find the legs on an ant, check that you're not looking at a worm.
Petiole & post-petiole	The connecting sections between the mesosoma and the gaster. This is often a huge clue to distinguishing species as some ants do not have a post-petiole, some have horn-like spurs while others have a simple tube structure.
Gaster	The gaster can be another big clue in identification. A Replete or Harvesting Ant can have a huge gaster.
Colour	Colour is always a useful snap indicator. Our Meat Ant friend above, for instance has a distinctive dark red head and mesosoma with a black gaster.
Size	Ants can range from 1mm to 30mm long. The <i>Myrmecia</i> , for instance, are very easy to spot simply by their huge size and pincers, especially the pincers.

## Common Ants in the Reserve

Here are some of the most common genus types to be found in the Reserve. It is not an exhaustive list and does not include any of the many species of LBAs (little black ants) that you'll find throughout the reserve.

### Meat Ants *Iridomyrmex*

Appearance: *Iridomyrmex* are some of the most industrious and well organised of all the colony ants. There are over 60 species described in Australia alone. *Iridomyrmex purpureus* get their common name from their reddish black colour. The workers are from 5mm to 10mm long.

Where to find them: *I. purpureus* have a very wide distribution. A nest can range from a few hundred up to well over a quarter of a million individuals.

Their nests are easily recognised as large mounds covered in small gritty pebbles. Some nests can be well over twenty years old and cover metres of ground. You can also make out well cleared highways leading away from the nest towards areas of regular supply (seeds from a particular tree, for example).

*I. purpureus* are not really carnivorous although they are aggressive towards others in defence of their foraging areas.

### Sugar Ants *Camponotus*

Appearance: *Camponotus* is the largest genus in Australia with around 130 described species and subspecies. *Camponotus consobrinus* are some of the easiest ants to identify and study even though their size can vary from around 7 to 15mm. They have a distinctive yellow-orange and black body with a black head. They are not aggressive but are prepared to defend themselves if necessary.

Where to find them: *Camponotus* have a range of nest styles. The most common is called a turret. It is a raised circular wall made of small pebbles and dirt up to around 70mm high. It is an effective design for keeping water out although several species are just as



Sugar Ant *Camponotus* turret nests. These entrances are very handy protection against wind and water and can be easily repaired.

Photo: J Lemann

happy with the classic hole in the ground. You will find them almost everywhere but commonly near paths or disturbed ground.

*Camponotus* is one ant species that can co-exist with *Iridomyrmex*. It is not uncommon to find the two species living within a few metres of each other. Their feeding ranges, times and tastes are so different that the *Iridomyrmex* do not seem to find them a threat.

### **Spider Ants *Leptomyrmex***

Appearance: *Leptomyrmex*'s gold and black colours can superficially resemble *Camponotus* but it is pretty easy to tell them apart. They have an elongated head a bit like an AFL football, long legs and, when excited, rush around with their gaster pointing straight up. This behaviour gives them their common name 'spider ants'. There are around thirty Australian species.

Where to find them: You can find *Leptomyrmex* on or beside paths or disturbed ground.

*Leptomyrmex* use a particular type of worker called a replete. If you were to dig up one of their nests, it is likely that you would find a chamber with several of these replete ants with enormous gasters hanging onto the ceiling. They are being used as living food storage containers. They make reasonable bush tucker, but I would not recommend sitting near a nest of enraged spider ants.

### **Bull Ants *Myrmecia***

Appearance: There are almost 90 Australian species of *Myrmecia*. One look at their enormous pincers should persuade you that they are worthy of your respect. Some of the largest ants on the planet, they have a few unfortunate tendencies, such as aggressiveness, a very nasty sting and the occasional jump, although this ability is often exaggerated. They also have very good eyesight. Always remember that while you are looking at them, they are looking at you in a less than friendly way. Be careful.

Where to find them: *Myrmecia* nests can vary from a simple hole in the ground up to a centimetre in diameter to a small mound around twenty centimetres high. The nests are sometimes covered in grass as animals know enough not to graze near them.

*Myrmecia* are sometimes referred to as 'primitive' as they are closer in form and organisation to the wasps, their *Hymenoptera* cousins.

### ***Polyrhachis***

Appearance: *Polyrhachis* is the second largest Australian group with around 115 described species. They tend to black although some have yellow gasters (which sometimes gives them the name Golden Bums). They are up to 10mm long.



A Spider Ant *Leptomyrmex* is one of the greatest ants ever. This little ant is pretty upset. Her gaster is raised, she is up on her legs and she is looking for trouble. An agitated *Leptomyrmex* nest is amazing to watch. Photo: C Lemann



Bull Ant *Myrmecia*. She is fast and has good eyesight. She is a solitary hunter and is afraid of nothing. Respect her. Photo: C Lemann

*Polyrhachis* are omnivorous but particularly like nectar. They are not the bravest ants in the kingdom and like to be left alone but they can give you a pretty good nip if you are too inquisitive.

Where to find them: You can find *Polyrhachis* living in soil and in tree stumps and trunks.

### ***Diamma bicolor***

Appearance: When is an ant not an ant? When it's a wasp. Mimicry is an important part of the arsenal of many insects. One of the most impressive is that of a female wingless wasp *Diamma bicolor* often called the Blue Ant.

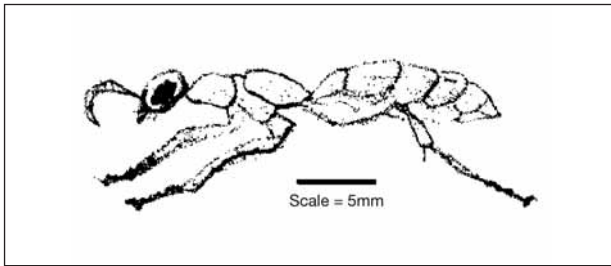


'Blue Ant' wasp *Diamma bicolor*

Photo: D Young

Where to find them: You will occasionally see these rather large (around 30mm long) metallic blue wasps wandering through the undergrowth. Look at them closely and you will see that they have too many post-petiole segments to be a true ant. It is a good attempt though.

Always remember that they are wasps and can give a hefty sting if handled wrongly.



'Blue Ant' *Diamma bicolor*

Diagram: J Harrison

### Pincers, Pooters and Paintbrushes

There is a Golden Rule – always leave the bush as you found it. The Mount Gibraltar Reserve is a protected area. Do not kill, damage or take away any ants from here. Having said that, it is perfectly alright to collect specimens just to look at and later return them, undamaged, to their collection site.

Collecting ants is not very difficult, although caution is always a good idea around aggressive types such as *Myrmecia*. The well-equipped collector should aim to have the following items in his or her pack:

**Aspirator.** One of your handiest tools and sometimes called a pooter. Cut a short (around 400mm) length of flexible plastic tubing such as the aerator lines used in fish tanks. Get a small piece of muslin or cheesecloth and slip it over one end of the tubing. Now get some tubing, around 50mm long, with a bigger diameter that can slip over the cloth end of the first length. You have just made your first pooter. To use it, just point the cloth-filtered end at the ant you are trying to collect, put the other end of

the tube in your mouth and inhale. The ant is sucked into the tube. The cloth stops you choking on an ant. It can then be blown into your collecting jar.

**Forceps.** Needle tips are best. A good set of tweezers is all right but you need to be very careful not to crush your specimen. Squashed ants are hard to identify. It is also illegal to squash an ant within the Reserve. Remember that you are only visiting; she lives there.

**Fine paint brushes and tasty ant treats.** The brushes are for spreading attractive ant treats on or near an ant trail. Honey and mincemeat are the best: tasty and sticky at the same time.

**Small plastic containers.** Old pill containers with small airholes are good. Avoid glass, if you can, as it can be all sorts of trouble if you break it.

**Ethanol.** If you are collecting outside the Reserve, this is by far the best fluid for storing your specimens. Other spirits will tend to rot, dissolve or destroy your collection.

**Paper index cards.** Many ant species live in trees and bushes. If you smear some of your ant treats on an index card and pin it to a tree or bush you will find it an easy way to attract them. They also appreciate a free lunch as payment for their time.

**Records.** Be sure to record your specimens with a specific location and time. You may want to find the exact site again later. Use pencils as they do not leak in your pack.

**Magnifying glass.** Do not pretend that your eyesight is brilliant. A magnifying glass is essential to help you pick out some of the more intricate features on a specimen.

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### Further Reading

We have not even scratched the surface so far. Fortunately, there is a lot of help around. If you would like to know more about Australian ants, look for these publications:

The Australian Museum:

<http://www.amonline.net.au/factsheets/ants.htm>

A great general site for anyone interested in natural history.

The CSIRO website <http://www.ozants.com>

An excellent site with a simple-to-use key for identifying particular species.

Shattuck, SO 'Australian Ants: Their Biology and Identification'  
*Monographs on Invertebrate Taxonomy* Vol. 3 CSIRO Publishing  
Collingwood 1999

An excellent work with a lot of electron microscopy photographs to help in identification. Very highly recommended.

Gordon, DM *Ants at Work: How an insect society is organized* The Free Press, Simon and Schuster, New York 1999

A very interesting and detailed study of ant social organisation.



A Blue Banded Bee *Amegilla cingulata* inspects fallen Flax Lily *Dianella* species berries. These beautiful native bees are strongly attracted to blue objects.  
Photo: B Faulkner



## Chapter 22



# Bees of Mount Gibraltar Reserve and Adjacent Areas

Dr Brian Faulkner

Brian Faulkner, PhD BSc (Hons), has had a lifelong interest in bees and was involved in research on bumblebees at the University of Exeter, England in the early 1980s. More recently, he contributed to Australia's first field guide to native bees (*Native Bees in the Sydney Region*). Brian works as a professional horticulturist in the Southern Highlands and teaches conservation, land management and horticulture at Goulburn TAFE.

Every natural bushland area in Australia is home to a wide variety of native bee species, and the Mount Gibraltar Reserve is no exception. Whenever you visit this lovely wilderness area, take the time to check out any of the wildflowers in bloom and there is every chance you will encounter a fascinating assortment of native bees.

Native bees found in the area vary greatly in size, from miniature species such as the tiny, slender Delicate Masked Bee *Heterapoides delicata* around 3.5mm long, to much more robust insects such as the Big Black Resin Bee *Chalicodoma punctata*, which is around 14mm long. Whatever their size, all depend on nectar and pollen from flowers. Although some native bee species are not too fussy and will happily exploit a wide range of flowers, others specialise in visiting flowers of particular native plants.

For example, Persoonia Bees (Genus *Leioproctus*) specialise in visiting flowers of Geebungs, such as the Narrow-leaved Geebung *Persoonia linearis*, which is a common understorey shrub in the Mount Gibraltar Reserve. The Gold Tipped Leafcutter Bee *Megachile chrysopyga* on the other hand is more of a generalist and forages on a wider range of flower types.

Whether generalists or specialists, native bees perform a vital role in pollination of native plant species and are essential components of Australian ecosystems.

Unlike the introduced European Honeybee *Apis mellifera* which is social and lives in very large perennial colonies, most Australian native bee species are solitary and have annual life cycles. Each nest is started by a single female, who lives for only a year or less.

In some species, the next generation emerge as adults within a few weeks and there may be several generations a year. In others there is only one generation each year. The larvae may take many weeks to develop and may spend the winter months as dormant pupae in the nest before maturing and emerging the following spring.

After courtship and mating, the males die and the females set out to found new nests of their own. Some species nest in old beetle holes and other crevices in timber, some in tunnels that they dig in the ground or soft rock and some bore into decaying timber.

Although you are most likely to find native bees on the wing in the warmer months, even in the middle of winter on sunny days you may find Reed Bees *Exoneura* species foraging on wattle blossom. These tiny bees usually have a black head and thorax, with a shiny reddish-brown abdomen. They get their name from their habit of nesting in dead plant stems or reeds. Reed Bees survive the winter as adults and are also unusual in that some species may exhibit semi-social behaviour, with more than one female sharing a nest.

When the False Sarsparilla *Hardenbergia violacea* blooms in late winter and early spring, you will find the Early Spring Bee *Trichocolletes venustus* busily working amongst the beautiful purple flowers. This dark-coloured bee is similar in size to a European Honey Bee, but is far more handsome, with striking silvery bands on the abdomen.

Later in the season, as temperatures rise and the Native Indigo *Indigofera australis* starts to flower, the native bee world really starts to buzz. On the massed pink blossoms you will find dozens of glittering little gems, all frantically collecting pollen. One species that particularly stands out amongst the frenzied crowd is the superb little Emerald Homalictus *Homalictus urbanus* with its shiny green head and thorax, orange legs and glossy black abdomen. This species is very common in the Mount Gibraltar Reserve.

In late spring and right through the warmer months until the first frosts, you may be lucky enough to see Blue Banded Bees *Amegilla cingulata*. These extraordinarily beautiful bees are particularly fond of the blue flowers of Blue Flax Lilies *Dianella* species and Nodding Blue Lilies *Stypandra glauca*.

Another bee to keep a look out for in the hot summer months is the Big Black Resin Bee *Chalicodoma punctata*. This species features a shiny black body and soft white hair on the face, at the base of the thorax and the tip of the abdomen. This bee is especially fond of Pea Flowers (for example plants in the genera *Dillwynia*, *Goodia*, *Oxylobium* and *Pultenaea*), but like the Blue Banded Bee will also



A Blue Banded Bee *Amegilla cingulata* visiting flowers of Bog Sage *Salvia uliginosa* in a Southern Highlands garden. These beautiful native bees are a common sight in the summer months in the Southern Highlands.  
Photo: B Faulkner



A Persoonia Bee *Leioproctus* species visits flowers of the Narrow-leaved Geebung *Persoonia linearis*. These native bees specialise in foraging on flowers of *Persoonia*.  
Photo: B Faulkner

visit a range of other plant species such as eucalypts *Eucalyptus* sp. and tea trees *Leptospermum* spp.

Resin Bees like to build their nests in old beetle holes in dead timber, using a mix of plant resins and chewed leaf fragments.

If you are really incredibly lucky, you may encounter the spectacular Golden Green Carpenter Bee *Xylocopa aeratus*, another species that depends on standing dead timber. These huge bees bore nesting tunnels into wood, hence their common name of carpenter bees. Golden Green Carpenter Bees are around 18mm long and resemble shiny metallic green bumble bees. Although very rare, they have been recorded in the Southern Highlands and it is just possible you may find one on your bushwalks in the Mount Gibraltar Reserve.

Resin bees and carpenter bees are just a couple of examples of the many kinds of native fauna that depend on dead standing timber for survival and illustrate how important it can be not to 'tidy up' natural bushland areas.

Aside from the handful of the more spectacular bees described here, there are many other native bee species to be seen in the Mount Gibraltar Reserve. All have gentle temperaments. Although native bees

do have stings, these insects are not aggressive and pose no threat to humans. On your next bushwalk, don't forget to take time out to have a close look at the flowers along the track. You will discover an enchanting world abuzz with dazzling colours and activity!

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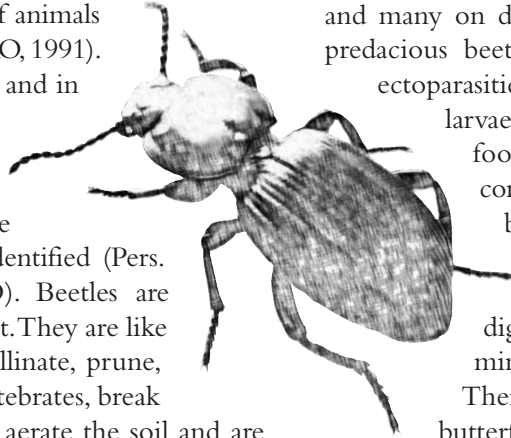
A tiny Reed Bee *Exoneura* sp. visiting flowers of Tea Tree *Leptospermum* sp. These tiny bees are found on the wing throughout the year and can even be found on wattle *Acacia* spp. blossom in winter on sunny days. Photo: B Faulkner

# Beauteous Beetles

Cate Lemann

Cate Lemann, BSc, entomological technician, has worked with the Australian Museum, Cooperative Research Centre for Fresh Water Ecology and now the CSIRO.

Beetles belong to the order of insects called Coleoptera which literally means 'sheath winged'. They are by far the most successful group of insects, some estimates having beetles at one third of all species of animals and 40% of all insects (CSIRO, 1991). They are incredibly diverse and in Australia alone a current estimate is that there may be as many as 80,000 species, of which only some 30,000 have been so far identified (Pers. comm. Tom Weir CSIRO). Beetles are essential to our environment. They are like nature's gardeners: they pollinate, prune, move seeds, eat other invertebrates, break down dead organic matter, aerate the soil and are themselves food for other animals. Bush reserves, like Mount Gibraltar Reserve, are habitat for an enormous range of beetles and the beetles help keep the bush healthy.



external part of living or dead and rotting plants, including roots, bark, trunk wood, flowers, fruit, stems, leaves and seeds.

While most beetles feed on living plant material and many on decaying vegetation, there are also predacious beetles, scavenging beetles and even ectoparasitic beetles. In many species the larvae feed on a completely different food source from the adults and consequently avoid direct competition between their developmental stages.

Different species have legs adapted for walking, running, digging, tunnelling, boring, swimming and jumping.

Their life cycle is indirect, so, like a butterfly, the egg hatches into a larva (often called a grub) which then pupates before emerging in the adult form. Beetles have a range of chemical and physical defences against infections and predation. Many exude distasteful or toxic chemicals, some have prickly hairs or sharp spines, some display nature's warning colours of red, black and yellow, many can move rapidly away from a predator and some simply play dead when disturbed. Just about any combination of the above can be found.

You will probably find a beetle almost anywhere you look.

## So What Makes an Insect a Beetle?

The clearest distinguishing feature in most beetles is their hardened forewings (elytra) which protect both the folded membranous hind-wings while not flying and the more vulnerable upper surface of the abdomen. Some adult beetles are flightless; however, when most beetles fly these elytra are held forward out of the way to allow the hind wings to do all the work. This and their often chunky shape contribute to the somewhat clumsy flight that can be associated with many beetles.

## How and Why are Beetles so Successful?

Australian beetles range in size from species smaller than 1mm to some as large as 80mm. They range in colour and form from smooth black, through a range of wonderful camouflage, to highly sculptured and spectacularly coloured.

Pick a habitat and some species of beetle will live there either in its larval form or as an adult. They can be found in or on subterranean water bodies and caves, freshwater systems, marine tidal zones, snowy mountains, deserts, fungus, dung, decaying carcasses, animal nests, soil, leaf litter, ground debris and every conceivable internal or

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Australian Museum:

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Black Beetle

Photo: C Lemann



Christmas Beetle *Anoplognathus* sp.

Photo: D Young



Blue Mountains Funnelweb *Hadronyche versuta*, female

Photo: NPWS

## Chapter 23



# Spiders of Mount Gibraltar

Mike Jupp

As a child Mike Jupp was fascinated by Gerald Durrell's books on wildlife. He studied Biological Sciences at Leicester University, graduating with an honours degree. Mike then embarked on a career in computer software, which paid rather better than genetic research. Since emigrating to Australia in 1995 he has been sharing his passion and enthusiasm for wildlife with anyone who will listen to him. Mike joined Wingecarribee Wildlife, Information, Rescue and Education Service (WIRES) in 2002 and has been very active, rescuing and caring for hundreds of misplaced, injured or orphaned native animals. His great loves are mygalomorph spiders, reptiles and flying foxes. He lives in Moss Vale with his understanding wife, Lynne and their children Lydia and Thomas.

Spiders are very ancient creatures. The first spider-like creatures appear in the fossil record about 300 million years ago. Wherever there was suitable prey to catch, spiders adapted to catch it. In the remote past there were giant millipedes and cockroaches, and the earliest spiders were correspondingly large and powerful. Today there is a myriad of insect life of all

shapes and sizes, and today's spiders have exploited every conceivable ecological niche and developed all sorts of ways of capturing their food. The more we look at spiders, the more we learn, and every year hundreds of new species are discovered. You might think that new spiders are only found in remote areas, but that is not so – a very large new spider was found only recently in Kiama, where people have been living for over a hundred years. Who knows what amazing unknown spiders are living in bush reserves right on our doorsteps?

There are two major groups of spiders. The first group is the so-called 'primitive' or **Mygalomorph** spiders, which have the same basic body plan of the earliest spiders. The second, and by far the larger, contains all the 'modern' or **Araneomorph** spiders.

Mygalomorphs are typically large, ground-dwelling, nocturnal animals that ambush crawling prey from the safety of their burrows. They have large fangs that are stabbed downwards into their prey, which is then dragged into the burrow to be consumed. They have a very low metabolic rate and can live for 10 years or more.



Nest and trapplines of Blue Mountains Funnelweb  
*Hadronyche versuta* Photo: M Jupp

## Primitive Spiders of the Southern Highlands



Unnamed *Hadronyche* sp.7, male



Southern Tree Funnelweb *Hadronyche cerebera*, female



Trapdoor *Misgolas hubbardi*, female



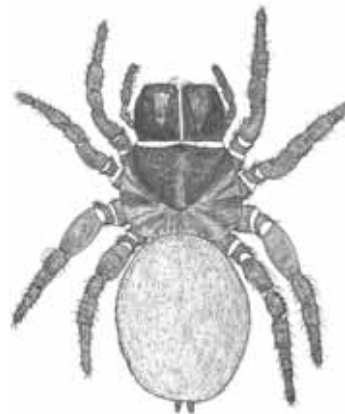
Blue Mountain Funnelweb *Hadronyche versuta*, male



Sydney Funnelwebs *Atrax robustus*, male



Trapdoor *Misgolas dereki*, male



Eastern Mouse Spider *Missulena bradleyi*, male



Small Trapdoor *Stanwellia hoggi*, female

Drawings: M Jupp (actual size)





Eastern Mouse Spider *Missulena bradleyi*, male Photo: M Jupp



Orb-weaving Spider *Eriophora transmarinas* Photo: D Young

Included in this group are the funnelweb, trapdoor and mouse spiders.

There are at least 42 species of funnelweb now known, three of which are common on Mount Gibraltar. These are the Blue Mountain Funnelweb *Hadronyche versuta*, the Southern Tree Funnelweb *H. cerbera* and the small unnamed species *H. species 7*. All three are closely related and although they have painful bites, none is known to be fatal.

The one funnelweb known to be lethal, the Sydney Funnelweb *Atrax robustus*, has been collected in Bowral in the past, though I have yet to see one closer than Alpine.

Funnelweb burrows have oval or D-shaped openings with long silk tripwires extending over the ground. Wandering insects stumble over these tripwires and alert the spider. When not feeding the spider will close the camouflaged burrow entrance against predators.

Trapdoor Spiders, although often large, are essentially harmless. These are the spiders living at the bottom of the large, silk-lined, circular burrows that are often seen in our gardens. Local species are mostly from the *Misgolas* genus, *M. hubbardi* and *M. dereki*, which do not make lids for their burrows, and *M. gracilis*, which does. A very few specimens of a *Stamwellia* species have also been collected.

Both Red-headed Mouse Spider *Missulena occatoria* and Eastern Mouse Spider *M. bradleyi* are known in the area but the numbers appear to be very small. Both make deep, extensive tunnels that open at the surface in a kind of double trapdoor.

By comparison araneomorph spiders are small and very active. Like the insects they hunt, these spiders have evolved an efficient tracheal breathing system which allows them to have a high metabolic rate (and in consequence a shorter lifespan.) Their fangs are set



Orb web Photo: J Lemann



Orb-weaving Spider *Eriophora transmarinas*, female

Photo: D Young

so that they can meet and grasp their prey in a pincer grip, and many of them utilize sticky silk as an aid to catching flying insects.

Many fascinating species can be found on Mount Gibraltar. In particular, boundaries between vegetation types create a variety of microclimates and ecological niches, all of which are exploited by spiders.

Large wheel-shaped orb-webs made by spiders of the *Eriophora* genus will be familiar to everyone. The Leaf-curling Spider *Phonognatha* spp. ingeniously places a suitable leaf in the middle of the web. The



Leaf-Curling Spider *Phonognatha graeffei*

Photo: P Jordan



Bolas Spider *Dicrostichus* sp.

Photo: M Jupp

female can hide here from predators but be ready to rush out and capture prey herself. House Spiders *Badumna insignis* build tangle webs, which can snare both flying and crawling prey.

Other webs are harder to spot. Look below overhangs and you may see small insects apparently suspended in mid-air. Look closer and you will see numerous silk filaments stretching from the overhang down to the ground. These are held on the ground by a sticky blob and the silk is under tension, so that when a crawling creature bumps into it, the tension is released and the unfortunate animal is catapulted into space, where its struggles entangle it even more. Many types of spider make webs like this – including the infamous Red-back Spider *Latrodectus hasselti*.

The wonderfully named Ogre-faced or Net-casting Spider of the *Deinopidae* family is a large animal with an interesting web-capture technique. It hangs itself over a path used by insects, on a small tree branch, for example, and holds its blue silk web in its front four legs. When an insect walks directly underneath, the spider quickly opens its front legs and drops the net onto the insect.

One of my favourites is the Bolas Spider. The large species *Ordgarius magnificus* has been found in gardens around Mount Gibraltar; it is not rare but is difficult to find without the telltale presence of its large tapered egg sacs, which can be seen hanging from its hiding place like fruit. The spider resembles a large splat of white droppings, but it is this spider's smell which is its secret weapon. At night it will crawl out along a strong silk thread between two trees and make a large sticky blob which is lowered on another strong silk rope. Bolas Spiders feed on one type of moth, and only males. They exude the same pheromone that female moths use to attract a mate, and as the hopeful male moths circle the spider, she swings her sticky silk bolas and hauls in her meal.

Other spiders do not use silk at all. Large Huntsmen Spiders live under bark and in cracks, emerging at night to run down their prey with frightening speed. There are many species of huntsmen found locally, two of which, *Delena cancerides* and the mildly toxic Badge Huntsman *Neosparassus* sp. often enter houses. Female huntsmen are excellent mothers and make a large, tough white egg sac in which they lay dozens of eggs. The spiderlings are not strong enough to escape by themselves; when the female senses their movements, she will tear an opening with her fangs to release her babies, then stand guard over them while they complete their first moult.

Wolf Spiders *Lycosa* spp. live in shallow burrows in the ground like Trapdoor Spiders, but unlike trapdoors they have excellent sight with their huge eyes, and emerge each night to roam around in search



Bolus Spider, egg cases

Photo: M Jupp



Typical male Huntsman Spider

Photo: D Young

of food. The infamous White-tail Spider *Lampona cylindrata* is another open-range hunter and preys on Black House Spiders, *Badumna* spp. which is why it enters our houses. The White-tail will carefully approach the tangle-web of the House Spider and tap it so that the House Spider thinks it has caught something. When she rushes out to grab the prey, she often becomes prey herself.

Crab Spiders (family Thomisidae) are small ambush predators that rely on their camouflage to capture prey. Some are yellow or white and sit on a



Wolf Spider *Lycosa godeffroyi*

Photo: D Young

flower waiting for a pollinating insect to arrive. Recent research<sup>1</sup> has shown that one Crab Spider species *Thomisus spectabilis*, which appears white to us, actually shines like a beacon in ultra-violet light. This makes it very conspicuous to honey bees, but instead of scaring them off, the presence of the spider actually makes the flower more attractive to the bees, which like patterned flowers. This spider has evolved an ingenious way of avoiding its own predators and attracting its prey at the same time.

Jumping Spiders (family Salticidae) also have excellent eyesight and are probably the most intelligent of the spiders. There is a tropical species which feeds on Orb-weaving Spiders. It is too small to tackle the large female orb-weavers, but will readily attack the smaller males as they sit in the web with the female. This species has been observed positioning itself upwind and above the web, then descending on a silk thread, swinging into the web



Trapdoor Spider, hole

Photo: C Lemann



Spiny Spider *Gasteracantha minax*

Photo: D Young

with the breeze, seizing the male and swinging out again to safety!

As the most numerous and most efficient predators on the planet, spiders play a vital role in the global ecological balance. We need not be afraid of them; the vast majority are harmless (and, indeed, invisible) to us. Watch them, learn about them, and remember that without their ceaseless activity the natural world we know would be very, very different.

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Saint Andrew's Cross Spider *Argiope keyserlingi*

Photo: NPWS



Southern Boobook *Ninox novaeseelandiae*

Photo: NPWS

# Chapter 24



## Biodiversity

Jane Lemann

The second part of this book is a celebration of our awakening awareness of the interdependence of all life on earth. It has told us a few of the remarkable stories of the interactions in a natural community.

It also shows clearly how little we know about the ecological systems. There is more, so much more to learn through careful, meticulous and patient observation on which few of us spend our time. We have barely begun to comprehend the vast and complicated communities of microscopic life which drive the biota machine.

Most of us are unaware of the minutiae of savagery, destruction, display and celebration going on around us unless there is a catastrophe of some sort. We often forget that a great many creatures have adapted to Australian conditions by being active at night. In this way they can avoid the extremes of temperature and the watchful eyes of predators. It is possible that many of the herbivores find more succulence in the plants at night, as the uptake of water exceeds the transpiration. Their predators must also be active at night to have the best opportunity to catch a meal.

The mountain seethes with activity at night. The hunters and the hunted emerge. Spiders and snails, mosquitoes and frogs, caterpillars and bugs start eating or become morsels themselves. The little marsupials such as antechinus chew on the roaches, grubs and fungi they find, the sugar gliders and pygmy possums lick up the nectar of blossoms or sap of wattles, the ringtail and brushtail possums and gliders munch away at the leaves. Little insectivorous bats, otherwise invisible in their camouflage, chase the winged insects through the canopy. Moths appear in a succession of species as the earth rotates beneath the stars.

Wombats and wallabies steadily graze their fill to sleep off during daylight hours. The owls and frogmouths watch, alert and silent, for unwary game. The cycles of courting, mating, nesting, raising and feeding the young coincide with periods of plenty, and the territories must be marked and defended for survival.

At first light the watches change over. The night creatures retire to concealment, many in the hollows of ageing trees, or deep in the grass and leaf litter. The bright-eyed patrol their territories for any careless or tardy snacks. Sunlight brings out the busy ants and the ant eaters, the butterflies, beetles and birds. On the rocks the lichens and mosses feed on the minerals and start the incremental soil-building process. Inside the fallen logs and under the soil the worms, tiny mites, springtails, roaches, termites, fungi and agents of decay are busily cycling detritus back to nutrient form ready for the mattress of tiny roots to absorb. Parasites seek their hosts in the complexities of the systems. Each is a cog with a place in the ecological machine. There are those that run the daily round, and those that have evolved to await a crisis such as storm, fire or flood to seize their moment to engage a gear and accelerate their life cycles.

All have difficulty with man's modification of their environment. Night lights extract many creatures from the system, more are damaged by our grosser machinations, lose their territories through our clearing ethos, or find their water fouled by our effluent. The checks and balances of the natural systems are upset leaving them struggling to find an equilibrium.

Nevertheless, the natural community has resilience and every visit to the mountain reveals something new and miraculous going on. It might be butterflies gathering on the summit before migrating; it might be a specific wasp attracted to pollinate an orchid by copulation; it might be a group of ants shepherding caterpillars or distributing seeds; it might be a particularly abundant flowering; it might be a rock pool full of tadpoles; it might be a lizard basking in the sun; a cuckoo chick being fed by a little blue wren or it might be simply a moment of enchantment in the light-dappled forest.

This whole web of life is based on the geology and the soil derived from the rocks. It is all fuelled by water and carbon dioxide within the tiny chloroplasts of the leaves and is driven by solar power. The type of

vegetation growing in this particular soil supports the specific animal relationships that have evolved together to live and die in a perpetual progression in the struggle for life.

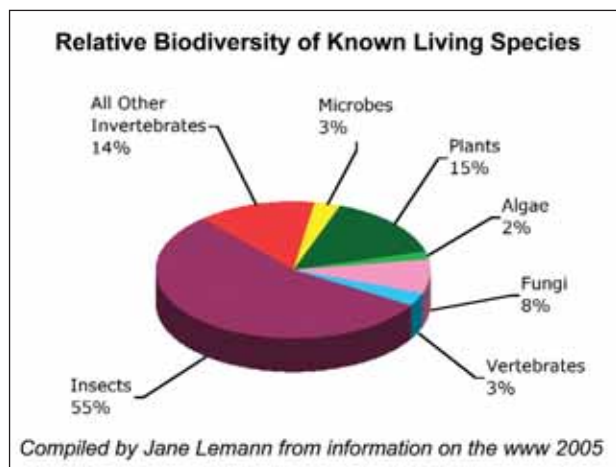
### What you can do to help the survival of our wildlife

- Plant some of the local native plants in your garden to provide stepping stones across the landscape for wildlife. (The only feeding method for wildlife recommended by NPWS and WIRES is to maintain a native garden and supply clean water)
- Leave some areas for wildlife habitat – long grass, fallen timber, rocks and trees with hollows
- Remove the plants listed as Environmental Weeds from your garden so they cannot jump the fence
- Never dump garden rubbish in the bush or on roadsides as something always grows from it
- Keep your dogs and cats under firm control, especially at night
- Let no chemicals such as detergent or fertilizer enter your drains as they flow into the waterways and affect aquatic life and drinking water quality
- Join a Bushcare group near you
- Encourage your neighbours to do likewise

### Further Reading

*Australia's Biodiversity; an overview of selected significant components*  
Biodiversity Series, Paper 2 Biodiversity Unit, Department Environment Sport and Territories, Commonwealth of Australia 1994

Beattie, AJ (ed.) *Australia's Biodiversity: Living Wealth* Reed Books 1995



The forest habitat

Photo: J Lemann



## Examples of the Biodiversity of the Mount Gibraltar Habitat



A small Willie Wagtail feeding its cuckoo chick

Photo: P Jordan



A large mound built by tiny wood eating termites

Photo: J Lemann



A Flame Robin shelters in dense cover

Photo: P Jordan



A Bracket Fungus fruiting body

Photo: J Lemann



An Antlion, larva of a Lacewing

Photo: C Lemann



The sugary lerp covers made by sap sucking Psyllids

Photo: P Jordan



Sawfly *Perga affinis* larvae protect each other

Photo: J Lemann

## Examples of the Biodiversity of the Mount Gibraltar Habitat



Dragonflies catch their prey on the wing

Photo: D Young



A resting Robber Fly

Photo: D Young



A Greengrocer Cicada *Cyclochila australasiae*

Photo: NPWS



Ants emerging to forage

Photo: D Young



Ants tending sap sucking Leaf Hoppers

Photo: J Lemann



A native snail *Austrothyrida capillaceae*

Photo: D Young



A centipede lives under rotting logs

Photo: D Young

# Epilogue

## A Place to Cherish

**We will never know what we have lost already and we know relatively little about what remains**

This book has given an overview of The Gib and the gathering momentum of changes which have occurred. The natural bushland has been cleared, parts of the mountain have been quarried away, farms and handsome gardens which once occupied the fertile slopes have turned into suburbs requiring the infrastructure and other modifications that are held necessary to human living.

The Gib has become a desirable residential area, so it is inevitable that this place will become ever more densely settled. Views will look out over suburbs with the hubbub of traffic and trains, the night skies will be eclipsed by artificial light, and there will be a dearth of native creatures.

The plant communities growing on the impoverished Hawkesbury Sandstone soils are well represented in reserves as they were not worth clearing for farming. However, the bushland on more fertile soils has been extensively cleared, leaving little natural vegetation. Many of these areas have subsequently become urban or semi-urban developments. Fortunately, like Mount Gibraltar Reserve, a few small natural places on the fertile soils have been put aside and it is just possible that some of their native flora and fauna will be able to survive, be identified and perhaps even multiply if conditions are right. We cannot know what the future will bring, or which species will be successful or important. These small reserves are an investment to be nurtured, linked and expanded wherever possible.

The Landcare and Bushcare group has shown that our native bushland can be reclaimed from a state of battered dereliction by supporting its natural resilience. The Reserve has become a living place of peace, great

beauty and a sanctuary for wildlife and also a place that is available to every person in the community.

Most importantly the guardianship of the small, 130 hectare, Mount Gibraltar Reserve must be vigilantly maintained.

It is very vulnerable as it faces increasing pressure from the urban areas surrounding it. The accompanying installation of services such as water, sewerage, powerlines, gas, telephone and access roads leads to disturbance. The constant re-seeding of weeds from nearby gardens, numerous road kills of native animals, predation by domestic dogs and cats, night-time fatal attraction to electric lighting for invertebrates and bats, the exposed 'edge' effect of neighbourhood clearing and the sheer wear and tear produced by numerous visitors threatens the long term survival of its biodiversity.

Fuel reduction burns and clearing of asset protection zones reduces habitat as it often removes the vital fallen logs and old trees with nesting hollows, the dense protective shrubs and the deep litter upon which so much native life depends.

The demands for public safety have thinned roadside vegetation thereby letting in light and wind which encourages weeds.

Damage on the exposed and fragile summit due to the construction of the industrial sites of the communication towers can affect the whole Reserve through the elimination of summit species, introduction of outside gravel, weeds and possible spills which are carried down in the water flows.

Death by a thousand cuts is still death and can only be prevented by the vigilance, concern and actions of people like you - the interested reader.



Gang-gang Cockatoo (*Callocephalon fimbriatum*)  
William T Cooper 1934-1970  
Watercolour: 45.7 x 36cm  
National Library of Australia Pic R6704

The population of this beautiful bird has dropped by 70% mostly due to habitat loss. It has now been declared a vulnerable species.



Misty morning from the summit

Photo: S Cains

# Appendices

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# Appendix I

## English – Gundungurra Dictionary

English	Gundungurra	English	Gundungurra	English	Gundungurra	English	Gundungurra
<b>A</b>		close to	ngooneena	far	warree	hot	wenyo; winu
abdomen	bendy		muthurh	father	curayn; currayn	how	wanjan
aboriginal person	murrin	cloud	kurang	female (prefix)	ngowal	how many	wannambalang
all of	ngoomirra	club	goojaroo	female (suffix)	dhoorook; dhuruk	hungry	theeallemin
all of them	darhgang	cold	caretta; cayingul	few	gooroong moogoo	hungry, to be	theulda
always	booloo	come here!	coy	fingers	marrola	hunt, to	gadin;
and	oo	coming	borga	fire	canbe;gunbee		gadinbalaree
around	waro; warroo	cormorant	billagoola	fish	ngullee	hunter	gadoowaree
ashes	bunung	corroberry	yabun	fish (perch)	dinwere	husband	maonyee
axe, steel	dowin	cow	gumbukgooluk	fish (small black)	wagga	hut	goonjee;
axe stone	mullada	crayfish	magurrung	fish	birrimbunung		goonjeoong;
<b>B</b>		crow	wagoolin; wogolin	(sprats probably		hut, to make a	gunge
bad	garruguin; gudba	cuckoo	cuckooeang	galaxias)			wenyo
bag	gooroogung	cucumber;native	muroon	food	dhungung		nyamburaniga
bandicoot	maandoo; mundo	currawong	gerregang	foot	denna;dyenna	<b>I</b>	
bark (hickory?)	millewa	(black magpie)		for	ngoo	l	goolanga;
bat (flying fox)	werrimbi	curlew	warbin;	for;in order to	ginnee		gulangga; nga
beard	yarrang		warrabing	four	borre	I myself	mittabaja
beat, to	beenga; ngooboo	cut, to	gudba	from him	dhanulangeraji	in	waro
behind	willin; willinga;	<b>D</b>		from me	gulangerajia	in front of	ngoomirra
	ngunna; bengal;	day	burrall	from whom	unnagangureji		
	warea	daytime	durrawung	full, to be	bendeya	<b>K</b>	
belonging to	warree	dead	berraga; berack	<b>G</b>		kangaroo (wallaby)	wambuyn
(suffix)		deaf	gurrimocko	geebung fruit	babathool	kangaroo	booro; burru
belonging to here	ngununggula	death	berraga	ghost	nye	kangaroo rat	balbo
belonging to this	nyingulangul	digging stick	gowwillagoong	girl	mullangan;	kangaroo's	booroongoo
belonging to you	waranalangu	dingo	merrigang;		mullunga	kangaroos, several	boorooyangang
belt made from	gnollieng		worrigal; mirri;	give, to	yoongee;	kangaroos, two	booroolallee
possum fur			mirragang		yoongeeree	kingfisher	dictagang
better	yaddung-bi	dingo, old	binure	go away!	yerraba	knee	mutoit
between	dhooreegoong;	mountain		go away, I	yerrabunya	knife	nubda
	thuree	disappearing, it is	bettyballeeman	go out of sight, to	beetyballee	know not	garragin
bird	bootya; budgang	dog	merrigang	go, to	yerra; yerro;	(I do not know)	
bird; gill	gerarc	down of an eagle	cowra		yarrabun	koala	colo, goola; gula
bite, to	burraran	hawk		goanna	werrika; wirria	koala, female	goola dhoorook
black	booraboora	dreaming	gunyunggalung	good	coolayetang;	koala, male	burrandang
boomerang	berra; berraga;	(dreamtime)			yaddung	kookaburra	kookooburra
	warrangang;	drink, to	weemba	grass	burrangurang	<b>L</b>	
	wurrangin	duck, black	gundhareen;	grass (pathway)	moorool	large	buggarabang
boy	boobal; bubal		guindaring	grindstone	gumbalbal	later	gowgow
bring, to	munna	duck, wood	goonarring;	gum tree, white	durrumbyang	laugh, to	berriga
broлга	burulga		nullabunyangang	<b>H</b>		left hand	mirra
bullock	gulunggooluk	<b>E</b>		hair	darrang	leg	ngarree
bunyip	gurungaty	eagle	malyal; mullyang	hand	marrola	lightening	marrup; mayap;
(mythical eel)		ears	kurre	hat	dhumbang		mikee
buried	taourey	earth	daoure	have, to	mullee	like; similar	gobaba
butcher bird	gooramgboon	eat, to	thi; thinbalee,	he	dhanuladhu;	lizard	maikatong
			thinbaloo		dhannooladhoo	lizard	jooloogungang
<b>C</b>		edge of stone axe	midger	he;she	jummagung	long	currar
call, to	coy	eel	cunark	head	bubyong	lyrebird	jakular
camp	ngura	eggs	cappangung;	here	nguna; ngoonin	<b>M</b>	
carry, to	yellimun		gabugan	hers	dhanulangu	magpie	kurragang
cat, native	murrunging	eggs	gubbangang	hill	babaroong	magpie lark	gilberark
cave with hand	murrolungulung	elbow	nyuna	himself	mittimbalgung	(pee wee)	
stencils		emu	birriban; ooalle	his	dhanulangu;	male (prefix)	gowul
child	coota; goodha	everyone	darhgang	hit	dhannogoolangoo	male (suffix)	goomban;
clay, white	cobbitch; cobbiti	eyes	mil	hit, to	wobburan		gumban
cloak made from	carreng	<b>F</b>		horse	ngooboo	man	cayen; murrin;
skins		falling	gulguer		yerramang		nain; baul;
close	muthurh						bowwil; boual

English	Gundungurra	English	Gundungurra	English	Gundungurra	English	Gundungurra
man (old)	cayen	pretty	yeddung	swamp	dumbidumbi	what	minya; minyaba
man, married	kunbeelang	puppy	gudhawung	swan (black)	ginyuk; kinyeac	what for	minyanniba
man, young	warrambal	python, diamond	wagul	swim, to	yarra	what with	minyangua
many	jummagunda; ambero	<b>Q</b> quail	goonanadan	<b>T</b> tail	dhoombir	when	wunda
many; a large number	irran	<b>R</b> rain	karrat; uburra	talk	pialla	where	ngoondeenee
men	nain; bowwiljillong	rain coming	uburra borga	teeth	yerra	where are you?	ngundani
men, several	murrindarragang	red	thirrimthirim	thank you	yaddung jee	where is it?	nhundaba
men, two	murrinboolallee	right hand	durrama	that	dhanu; nin; ninga	which	ngunninga
mine	golangaya; gulangguya; goolangooya	river	dhoolan; tooluan; thoolan	the	nin	white	daygaroogarack
moon	tyeluck	river in flood	goongung	theirs	dhanijimalangu; dhannooboolango	who	ngun-nunga; unuaga
more (prefix)	madee	rock	currobung	then	yanbee	whose	unnagangu
mother	gammuang	rosella	bundoluk	there	wurranandee	with him	dhanalungura
mountain top	gunar	run, to	munna; munoo	they	dhanujimalang; jillong; jummagunda; dhannooboola	with me	gulanguria
mouth	gunar	<b>S</b> salt water; salt	bullingang	thighs	darra	with this	nyingulangura
much; many	goorooong	sandy country	jarrjarr; jerjer	thirsty, to be	gnaetyung	with you	gulangurunyi
mullet	mibbi	sea	engaeatyung; gadung	this	nyin	with; by means of	ga
my (suffix)	dya	several (suffix)	dyarangang	thise two	nidyula	woman	bullan
myself	mittimbaldyaji	shaky	narre	three	colluerr; bullameddung	woman's	bullangoo
<b>N</b>		sharp	mij-jurh	throw, I	yerringga	woman, married	bouailiang
neck	kanga	she	dhanduladhu	throw, to	yerreeman	wombat	goolung
negative suffix	moogoo	short	warremugo	throwing stick	boolang	wood	ganbee
night	burri; burrie; burriooloo	shoulders	parowra	throwing, I am	yerrimanga	woomera; spear	whamharha
nipple (s)	nyapung	side	nanbil	thunder	mooraburri; morrungul; moorungul; muroongul; murungal	thrower	
no	garragin; gurrangung	sing to	yoongaba		mirragan	<b>Y</b> yam stick	gow-will-la- goong
noise	cookunday	sit, to	ngulla; ngullaminya		yangoo	yellow	gooburh
nose	nogorro	sleep, to	mungalee	tiger cat	boorandoo; portende	yes	gne; ngee
nosebone	burraga		nyamburrunega; nyamburaman; ngaboorman	today; now	darline	yesterday	barundi
not	moogoo; muga	sleeps	numbuk	tomorrow	boon	you	goolanjee
now	yengo	smoke	mugga	tongue	ngulla	you (plural)	goolanoo, goolambo
<b>O</b>		snake (any type)	gilwidge	too; also	mungarra	you (singular)	goolanjee, goolanyingoo
ochre	bulber	snake (black)	mudgerwik	tree	dhurrun	your (singular)	goolangane
on	waro; waraungoon	snake, black		tree (blue gum)	booreen	yours	gulangane
one	medung; meddung	snake, death	worrngun	tree, gum		yours (plural)	goolambooloong
one eye	wooglemai	adder	goonama	tree, stringybark		yourself	gulangunyi
only	ooloo	snake, whip	narralaminya	gum			mittimbalnyi
other side of	ngunaow	snow	gimbil	turkey, brush	boombillna	<b>Source: Kohen, JL 1993 pp138-141</b> (See Further Reading, Chapter 2)	
ours	gulangunia; goolangalia	sorry, I am	boombi	two	bulla; bullala; pulla		
owl	buddawak; buddayak	spring	kirralong borga	<b>U</b> Ulcer in groins	canoblas		
<b>P</b>		star, falling	cuangy; jerra	<b>V</b> very big	buggarabang		
people in the	burringgilling	stars	currobung	wallaby	gudba		
dreaming	murrinbil	stone	nubda	wallaby, rock			
pewit (bird)	goolung	stone with sharp		wallaby, scrub			
pig	gerang	edge	burrumburrung	(redneck?)			
place	benduk	stone	yooroang	wallaby, swamp	boombi		
plain, flat	barta; nyerriayn	(river pebbles)	yooroang;	wallaroo	gundawa		
plenty	wulali	strong	yooroang;	wallaroo, female	bawa		
plural (suffix)	mijjurh	strong, he is	bundil; bunyal	wallaroo, male	goondarwa		
point	gu	sun	winyooa	water	nadgyung		
possessive		sunrise	boongbamin	we	goolangala; gulanga; goolanga		
termination		sunset	beet gonya				
possum	wallee; wella; wille	swallow (bird)	winyoo				
possum, female	wallee dhoorook		irribigang;				
possum; male	jerrawul		irribingang				

## Appendix II

### Plants used by the Dharawal People

Frances Bodkin is a Dharawal woman of the Bidinimatta (Bitter Water) clan, a knowledge holder of Dharawal tradition and a member of the Dharawal Knowledgeholders' Council. She is the Indigenous Education Officer at Mt Annan Botanic Gardens, and author of *Encyclopaedia Botanica*.

This section contains a list of the plants used by the Dharawal people whose territory is adjacent to that of the Gundungurra people, for whom we have no plant list. Dharawal land lies to the east – extending along the coast from the Shoalhaven River to Sydney Harbour and west to the Wollondilly River (before 1788, Berrima). Many of these plants also occur on Mount Gibraltar. Dharawal plants listed here are described in Bodkin, F *Encyclopaedia Botanica* Angus and Robertson 1986.

Frances Bodkin writes: The Dharawal peoples made extensive use of plant material for food, medicine, implements, weapons, etc. From early childhood Dharawal children were taught these uses and the laws governing those uses. It is by this means that they acquired the knowledge that was essential to their continuing existence throughout life.

This is a list of plants used by the clans of the Dharawal from which my husband Gavin Andrews and I are descended. We do not know if the Gundungurra peoples used the plants in the same manner although early scribes noted that the uses and knowledge of plants differed from community to community.

Please do not experiment. The reason for this is that although many plants can be used for good, their misuse may cause you serious harm, even death. Many of the uses were confined to certain seasons or even to certain environmental conditions.

Because of the lack of Indigenous intellectual property rights in this country, the uses of our plants have been confined to one or two word descriptions.

PLANT	USE
<i>Acacia binervata</i>	Implements, weapons, ornaments, fish stunner, medicinal
<i>Acacia elata</i>	Food, waterproof sealant, tinder, medicinal, implements, weapons, ornaments
<i>Acacia falciformis</i>	Medicinal, tanning agent, implements, weapons, ornaments, warning
<i>Acacia fimbriata</i>	Food, implements
<i>Acacia floribunda</i>	Food, tinder, indicator, cricket bats
<i>Acacia implexa</i>	Food, medicinal, tanning agent, dye, warning
<i>Acacia longifolia</i>	Implements, weapons, ornaments, food, tinder, medicinal, waterproof sealant
<i>Acacia mearnsii</i>	Weapons, implements, ornaments, beverage, waterproof sealant, medicinal, twine, tinder, tanning agent
<i>Acacia melanoxylon</i>	Medicinal, ornaments, fish poison
<i>Acacia parramattensis</i>	Food, medicinal, waterproof sealant, law story, warning
<i>Acacia penninervis</i>	Implements, weapons, fish poison, warning
<i>Acacia rubida</i>	Implements, weapons, ornaments, food, medicinal, waterproof sealant
<i>Acacia stricta</i>	Food, implements, waterproof sealant
<i>Acacia terminalis</i>	Implements, weapons, ornaments, tinder, food, medicinal, paint, waterproof sealant
<i>Acacia ulicifolia</i>	Site protection
<i>Acaena nova-zelandiae</i>	Beverage
<i>Acianthus fornicatus</i>	Food
<i>Actinotus helianthi</i>	Medicinal, law story
<i>Adiantum aethiopicum</i>	Medicinal
<i>Ajuga australis</i>	Medicinal
<i>Allocasuarina littoralis</i>	Bedding, law story, lost children,
<i>Amyema</i> spp.	Food
<i>Angophora floribunda</i>	Medicinal, honey source, weapons, implements
<i>Aphanopetalum resinosum</i>	Climbing trees
<i>Apium prostratum</i>	Food, medicinal
<i>Archontophoenix cunninghamiana</i>	Baskets, mats, water carriers, toys
<i>Aristida</i> spp.	Food
<i>Arthropodium milleflorum</i>	Food
<i>Arthropodium minus</i>	Food
<i>Asplenium flabellifolium</i>	Medicinal, warning
<i>Banksia serrata</i>	Law story, medicinal, food
<i>Banksia spinulosa</i>	Law story, medicinal, food, firewood

PLANT	USE
<i>Billardiera scandens</i>	Food
<i>Blechnum ambiguum</i>	Food, warning
<i>Blechnum cartilagineum</i>	Food, warning
<i>Blechnum nudum</i>	Food, warning
<i>Bossiaea obcordata</i>	Ceremonial
<i>Brachyloma daphnoides</i>	Food
<i>Bracteantha bracteata</i>	Medicinal
<i>Breynia oblongifolia</i>	Beverage
<i>Bursaria spinosa</i>	Ceremonial, medicinal, law story
<i>Calandrina calyprata</i>	Food
<i>Calochlaena dubia</i>	Food
<i>Calystegia marginata</i>	Medicinal
<i>Calytrix tetragona</i>	Medicinal, food
<i>Cassinia aculeata</i>	Insulation
<i>Celastrus australis</i>	Yabby traps, baskets
<i>Celastrus subspicatus</i>	Yabby traps, baskets
<i>Ceratopetalum gummiferum</i>	Implements, weapons
<i>Cheilanthes distans</i>	Bedding
<i>Cheilanthes sieberi</i>	Bedding
<i>Choretrum candillei</i>	Implements, toys
<i>Clematis glycinoides</i>	Medicinal, napkins, travel
<i>Comesperma volubile</i>	Rope
<i>Cooperhooia barbata</i>	Medicinal
<i>Coprosma quadrifida</i>	Food
<i>Crassula sieberana</i>	Food
<i>Cyathea australis</i>	Food, medicinal
<i>Cymbopogon refractus</i>	Medicinal
<i>Danthonia</i> spp.	Mats, thatching
<i>Daucus glochidiatus</i>	Food
<i>Daviesia</i> spp.	Medicinal
<i>Dendrophthoe vitellina</i>	Food
<i>Dendrobium</i> spp.	Food
<i>Desmodium varians</i>	Insect repellent
<i>Dianella</i> spp.	Food, twine
<i>Dichondra repens</i>	Beverage, medicinal
<i>Dicksonia antarctica</i>	Food
<i>Dipodium punctatum</i>	Food
<i>Diuris sulphurea</i>	Food
<i>Dodonaea multijuga</i>	Medicinal, narcotic aid, ceremonial
<i>Dodonaea triquetra</i>	Medicinal, narcotic aid, ceremonial, marine stings
<i>Dodonaea viscosa</i>	Medicinal, narcotic aid, ceremonial, marine stings
<i>Doodia aspera</i>	Food



PLANT	USE
<i>Doodia caudata</i>	Food
<i>Echinopogon caespitosus</i>	Bedding, thatching
<i>Einadia hastata</i>	Food, medicinal, dye
<i>Einadia trigonus</i>	Medicinal, mullet bait
<i>Elaeocarpus reticulatus</i>	Food, implements
<i>Endiandra sieberi</i>	Implements, weapons, food
<i>Entolasia marginata</i>	Bedding, thatching
<i>Epacris microphylla</i>	Medicinal
<i>Eucalyptus agglomerata</i>	Medicinal, food, tinder, implements, weapons, ceremonial
<i>Eucalyptus amplifolia</i>	Medicinal, food, implements, weapons
<i>Eucalyptus camphora</i>	Medicinal, implements, weapons, ceremonial
<i>Eucalyptus cypellocarpa</i>	Medicinal, implements, weapons, ceremonial, narcotic aid
<i>Eucalyptus dalrympleana</i>	Medicinal, water course, ceremonial, narcotic aid, canoes, implements, weapons, food
<i>Eucalyptus dives</i>	Medicinal, implements, weapons, evil spirits
<i>Eucalyptus elata</i>	Medicinal, implements, weapons, evil spirits
<i>Eucalyptus eugenoides</i>	Medicinal, food, dilly bags, twine, nets, implements, weapons, ceremonial
<i>Eucalyptus fastigata</i>	Medicinal, food, implements, weapons
<i>Eucalyptus globoidea</i>	Medicinal, food, tinder, nets, twine, dilly bags, implements, weapons, ceremonial
<i>Eucalyptus obliqua</i>	Medicinal, food, tinder, twine, dilly bags, nets, implements, weapons
<i>Eucalyptus piperita</i>	Medicinal, implements, weapons, evil spirits
<i>Eucalyptus punctata</i>	Medicinal, ceremonial, canoes, implements, weapons
<i>Eucalyptus quadrangulata</i>	Medicinal, implements, weapons, water source, food
<i>Eucalyptus radiata</i>	Medicinal, implements, weapons, evil spirits
<i>Eucalyptus sieberi</i>	Medicinal, implements, weapons, evil spirits
<i>Eucalyptus smithii</i>	Medicinal, implements, weapons, evil spirits
<i>Eucalyptus tereticornis</i>	Medicinal, implements, weapons, ceremonial, narcotic aid, food
<i>Eucalyptis viminalis</i>	Food, medicinal, ceremonial
<i>Eustrephus latifolius</i>	Food, yabby traps
<i>Exocarpos cupressiformis</i>	Medicinal, food, weapons, law story
<i>Gahnia</i> spp.	Food, cuttings, yabby traps, insulation
<i>Geitonoplesium cymosa</i>	Food
<i>Geranium solanderi</i>	Food
<i>Glycine clandestine</i>	Food
<i>Goodenia hederacea</i>	Medicinal
<i>Goodenia ovata</i>	Medicinal
<i>Gymnostachys anceps</i>	Dilly bags, twine, yabby traps
<i>Hakea dactyloides</i>	Weapons, implements, food, medicinal
<i>Hardenbergia violacea</i>	Medicinal, beverage
<i>Hedycarya angustifolia</i>	Firemaking, weapons, implements, food
<i>Hydrocotyle peduncularis</i>	Food
<i>Hyperidum gramineum</i>	Medicinal
<i>Hypoxis hygrometrica</i>	Food
<i>Imperata cylindrica</i>	Ritual
<i>Indigofera australis</i>	Medicinal, dye
<i>Isotoma axillaris</i>	Narcotic aid, medicinal
<i>Kunzea parvifolia</i>	Beverage
<i>Lagenifera stipitata</i>	Site warning
<i>Leptomeria acida</i>	Medicinal, beverage
<i>Leptospermum juniperinum</i>	Beverage, medicinal

PLANT	USE
<i>Leptospermum polygalifolium</i>	Beverage, medicinal
<i>Leptospermum trinervium</i>	Beverage
<i>Leucopogon ericoides</i>	Food
<i>Leucopogon lanceolatum</i>	Food
<i>Logania albiflora</i>	Baby food
<i>Lomandra filiformis</i>	Mats, baskets, food
<i>Lomandra longifolia</i>	Mats, baskets, food, eel traps, twine, dilly bags
<i>Lomandra multiflora</i>	Mats, baskets, food
<i>Lomatia silaifolia</i>	Insecticide
<i>Marsdenia rostrata</i>	Food
<i>Marsdenia suaveolens</i>	Food
<i>Melaleuca hypericifolia</i>	Beverage, medicinal
<i>Melaleuca linariifolia</i>	Beverage, napkins, medicinal
<i>Microtis uniflora</i>	Food
<i>Notelaea longifolia</i>	Implements, ornaments
<i>Notelaea venosa</i>	Implements, ornaments
<i>Olearia microphylla</i>	Ceremonial
<i>Olearia viscidula</i>	Ceremonial
<i>Omphacomeria acerba</i>	Food
<i>Oxalis perennans</i>	Food
<i>Ozothamnus diosmifolius</i>	Medicinal
<i>Pandorea pandorana</i>	Weapons, law story
<i>Passiflora cinnabarina</i>	Food
<i>Patersonia glabrata</i>	Food
<i>Patersonia sericea</i>	Food
<i>Persoonia laurina</i>	Food, medicinal
<i>Persoonia levis</i>	Food, medicinal
<i>Persoonia linearis</i>	Food, medicinal
<i>Phyllanthus</i> spp.	Medicinal
<i>Pimelea linifolia</i>	Medicinal, food
<i>Pittosporum undulatum</i>	Ritual
<i>Podolepis jaceoides</i>	Food
<i>Polyscias sambuccifolia</i>	Weapons, food
<i>Pratia purpurascens</i>	Medicinal
<i>Prostanthera hirtula</i>	Insect repellent, site warning
<i>Pteridium esculentum</i>	Food, medicinal
<i>Pterostylis curta</i>	Food
<i>Pterostylis grandiflora</i>	Food
<i>Pterostylis longifolia</i>	Food
<i>Pterostylis nutans</i>	Food
<i>Pterostylis pedunculata</i>	Food
<i>Rapanea howittiana</i>	Food, implements, ornaments
<i>Rubus hillii</i>	Food, medicinal
<i>Rubus parvifolius</i>	Food, medicinal
<i>Senecio bipinnatisectus</i>	Medicinal
<i>Senecio hispidula</i>	Medicinal
<i>Senecio minimus</i>	Medicinal
<i>Smilax australis</i>	Food
<i>Smilax glycyphylla</i>	Food, medicinal, beverage
<i>Solanum aviculare</i>	Food, medicinal
<i>Solanum vescum</i>	Food, medicinal
<i>Stellaria flaccida</i>	Food
<i>Styandra glauca</i>	Ceremonial
<i>Syncarpia glomulifera</i>	Medicinal, ceremonial, canoes
<i>Thysanotus juncifolius</i>	Food, ceremonial, medicinal, indicator
<i>Thysanotus tuberosus</i>	Food, ceremonial
<i>Trema aspera</i>	Food, charcoal
<i>Tricoryne simplex</i>	Medicinal
<i>Tylophora barbata</i>	Medicinal
<i>Urtica incisa</i>	Food
<i>Viola betonicifolia</i>	Food
<i>Viola hederacea</i>	Food
<i>Xanthorrhoea resinifera</i>	Food, medicinal, adhesive
<i>Xieria smithii</i>	Insect repellent

## Appendix III

### Some Structures Containing Mount Gibraltar Trachyte

Art Gallery of NSW, steps (Loveridge and Hudson) Ref. <i>RT Baker 1908, BFP 1899</i>	Intelligence Department, Sydney, columns, flagging and base courses Ref. <i>RT Baker 1908</i>
Australia House, London, foundation stone and other foundations (FJ Pope & Sons) Ref. <i>Extracts from Architectural Review July 1918, Centenary Herald Supplement</i>	Kerb stones and steps of Sydney Central Railway, (FJ Pope & Sons) Ref. <i>BFP 4 May 1904</i>
Bank of Australasia, George Street/Martin Place 1901 Ref. Don Hoskins	Kerb stones, Sydney and Southern Highlands (Loveridge and Hudson)
British Medical Association, Elizabeth Street (Loveridge and Hudson) Ref. <i>Wollongong Press 28 August 1910</i>	Moss Vale Railway Station, Memorial
Bong Bong Village Memorial Column	Moss Vale, Cottages, base courses, walls and gateways, Elizabeth Street
Bowral Court House, Bendooley Street	Mrs Macquaries Road, bridge culvert, Royal Botanic Gardens Sydney Ref. <i>SMH 2002</i>
Bowral, duplex house, Mittagong Road	National Library, Canberra, podium facing (FJ Pope & Sons)
Bowral Public School, wall in Banyette Street Ref <i>BFP 4 September 1891</i>	National Treasury Building, facade facing (Granite Ware)
Bowral War Memorial (Loveridge and Hudson) + upgrades to 2003	New York Life Assurance, Sydney (Raward) Ref. <i>BFP 2 September 1897</i>
Bowral, 14 Banksia Street, lower courses and gateway	Norah Head Lighthouse, balcony 1896 - 1903 (FJ Pope & Sons) Ref. <i>Post 12 May 1976</i>
Bowral, Quarry manager's cottage wall Bundaroo Street	NSW Public Library steps (FJ Pope & Sons) Ref. <i>Post 12 May 1976</i>
Cape Byron Lighthouse, balcony and balustrade (FJ Pope & Sons) Ref. AW Pope	NSW Treasury Building (FJ Pope & Sons) Ref. <i>Post 12 May 1976</i>
Centennial Park, pillar for gateway (Raward)	Parkes Statue, base plinth for Henry Parkes Statue Ref. <i>BFP 30 June 1897</i>
Colonial Mutual Building, Martin Place and Pitt Street	Pyrmont Bridge, Sydney, central pivot of 12 tons (Loveridge and Hudson) Ref. <i>BFP 8 August 1901</i>
Commencement Column for new City of Canberra, 1913	Queen Victoria Building (Phippard-FJ Pope & Sons) Ref. <i>RT Baker, 1908, 'Descent' June 2004</i> (re Phippard, rough, sawn and polished trachyte)
Commonwealth Bank, Sydney (FJ Pope & Sons) Ref. <i>Post 12 May 1976</i>	Royal Insurance Office, Spring Street 1910 (Loveridge and Hudson) Ref. <i>Wollongong Press 28 September 1910</i>
Commonwealth Stone, Centennial Park, 1901	St Stephen's Church, Canberra (FJ Pope & Sons) Ref. <i>Post 12 May 1976</i>
Crushed stone, railway ballast for Great Southern Railway (Government)	Technical College, Sydney, columns and arches Ref. <i>RT Baker 1908</i>
Equitable Building, 350 George Street 1893 (Loveridge and Hudson) Ref. <i>Baker 1908</i>	Wingecarribee Shire Council Chambers, polished panel set into front desk
Fitzroy Iron Works Monument, Mittagong	
Garden Island, sea wall infill blocks (Charker)	
General Post Office Ref. <i>AW Pope Memories 1976</i>	
Hampden Bridge, Kangaroo Valley, buried thrust blocks for cables 1896 (Loveridge and Hudson) Ref. <i>Clark 1998 P11 Hampden Bridge Story, BFP 22 July 1896</i>	( ) denotes quarry source
Hawkesbury River Bridge, foundations Ref <i>RT Baker 1908</i>	BFP Bowral Free Press
	Post Highlands Post
	SMH Sydney Morning Herald

## Appendix IV

### Quarrymen and Stonemasons, Mount Gibraltar

#### 1894-95 Quarrymen Electoral Division of Mittagong General Roll of persons entitled to vote for Members of the Legislative Assembly of New South Wales: Bowral

Name	First Name	Residence	Occupation
Barry	George	Woodbine St.	Quarryman
Barry	John	Woodbine St	Quarryman
Bladder	James	Cliff St	Quarryman
Butterworth	James	Bowral St	Quarryman
Carter	Thomas	At Loveridge's	Quarryman
Condan	Arthur	Victoria St	Quarryman
Cooper	William G	Clearview St	Stonemason
Dunwoodie	Thomas	Shepherd St	Stonemason
Flew	Charles	Cliff St	Stonemason
Flew	Charles	Cliff St	Quarryman
Flew	Samuel	Cliff St	Quarryman
Hartley	James	Merrigang St	Quarryman
Hawkins	Jesse	Elm St	Quarryman
Holmes	John	Runnymede	Quarryman
Hopwood	Tasmin H	At Loveridge's	Quarryman
Horne	John	Cliff St	Stonemason
Howarth	Albert	Elm St	Stonemason
Howarth	George	Shepherd St	Stonemason
Johnston	George	Bong Bong St.	Stonemason
Jones	William Robert	Kiama St	Quarryman
Kennedy	Thomas	Merrigang St	Quarryman
Lane	James	Cliff St	Quarryman
Lawson	Thomas	North Bowral	Quarryman
Lowe	Samuel	Clearview St	Stonemason
McDonald	John	Cliff St	Quarryman
McKie	Mathew	Bowral	Quarryman
Malin	Arthur	Victoria St	Stonemason
Mathewson	Thomas	Cliff St	Stonemason
Mathewson	John Richard	Cliff St	Stonemason
Mills	Thomas	Burradoo St	Stonemason
Mitchell	Alexander	Bong Bong St	Stonemason
Murchie	James	Cliff St	Quarryman
Pope	Frank	Cliff St	Stonemason
Pringle	Robert	Cliff St	Stonemason
Reidy	Thomas	Cliff St	Quarryman
Rogers	Joseph	Carlisle St	Quarryman
Wallbank	William	Victoria St	Quarryman
Wardle	Lawrence	Bowral	Stonemason
Whittaker	John	Merrigang St	Quarryman
Workman	Samuel	Elm St	Quarryman
Wylie	Alexander	Cliff St	Stonemason
Wylie	John A	Cliff St	Stonemason

Total number of electors 470; of these, 24 quarrymen 1 stonecutter, 16 stonemasons (no women on this list: women were not enfranchised in New South Wales until 1902)

#### 1894-95 Quarrymen Electoral Division of Mittagong General Roll of persons entitled to vote for Members of the Legislative Assembly of New South Wales: Mittagong

Chapman	Luke Richard	Mittagong	Quarryman
Lee	Frederick	Mittagong	Stonemason
Lee	Joseph	Queen St	Stonemason
Mitchell	William Braidwood	Nattai	Stonemason
Speed	John	Mittagong	Stonemason

Mittagong 673 electors

#### 1894-5 Quarrymen Electoral Division of Moss Vale

Hayman	Patrick	Bundanoon	Quarryman
Merz	Robert	Moss Vale	Stonemason

Moss Vale 708 electors

#### 1903 Commonwealth of Australia State of NSW Electoral Roll Division of Werriwa Subdivision of Bowral

Surname	First Name	Residence	Occupation
Borrow	Henry	Bowral	Stonemason
Barry	John	Woodbine St.	Quarryman
Condon	Arthur	Bong Bong St.	Quarryman
Conybear	Nicholas	Bowral	Stonemason
Duncan	Alexander	Shepherd St	Stonemason
Dunwoodie	Thomas	Woodbine St	Stonemason
Gardiner	George	Oxley St	Quarryman
Hart	William	Shepherd St	Stonemason
Horne	John	Cliff St	Stonemason
Lawson	Thomas	Clearview St	Quarryman
McKie	Mathew	Bowral	Quarryman
Malin	Arthur	Shepherd St	Stonemason
Marks	George	Wingecarribee St	Quarryman
Mathewson	Thomas	Cliff St	Stonemason
Phillips	Francis	Merrigang St	Stonemason
Platt	William	Bowral	Quarryman
Reidy	Thomas	Bong Bong St	Quarryman
Rutherford	John	Burradoo St	Quarryman
Stone	Jonathon C	Merrigang St	Quarryman
Symonds	James	Cliff St	Stonemason
Watts	Adolphus	Woodbine St	Stonemason
Whittaker	John	Merrigang St	Quarryman
Workman	Samuel	Elm St	Quarryman
Workman	Thomas	Merrigang St	Quarryman
Workman	William	Bowral	Quarryman
Wylie	Alexander	Cliff St	Stonemason

949 electors (this includes women)

#### 1913 Stonemasons and Quarrymen Commonwealth of Australia State of NSW Electoral Roll Division of Werriwa Subdivision of Bowral

Surname	First Name	Residence	Occupation
Borrow	Henry	Bowral	Stonemason
Barry	John	Woodbine St	Quarryman
Bell	Albert Edward	Bowral	Stonemason
Brooks	Charles Henry	Merrigang St	Stonemason
Brooks	William Henry	Merrigang St	Stonemason
Brown	Alexander	Bong Bong St	Stonemason
Conybear	Nicholas	Bowral	Quarryman
Cooper	James	Bowral	Quarryman
Duggan	Joseph	Cliff St	Stonemason
Dunwoodie	Thomas	Woodbine St	Stonemason
Gammon	Thomas	Victoria St	Stonemason
Gardiner	George Alfred	Banksia St	Quarryman
Green	Percy Gordon	Bowral	Quarryman
Grove	Stanley Charles	Bowral	Quarryman
Harlan	Phillip	Bowral	Stonemason
Horne	John	Cliff St	Stonemason
Jones	Robert Redarn	Boley St	Stonemason
Leslie	Arthur Rae	Station St	Stonemason
Ling	George Benjamin	Bowral	Quarryman
Lobban	John	Merrigang St	Stonemason
McDonald	John	Cliff St	Quarryman

Marks	George	Bong Bong St	Quarryman
Napier	Andrew	Bowral	Stonemason
Pascoe	John	Station St	Quarryman
Platt	William	Bowral	Quarryman
Rankin	Thomas	Station St	Stonemason
Richards	Edward Albert	Bong Bong St	Stonemason
Stapleton	Michael	Burradoo St	Quarryman
Stenlake	John Daley	Woodbine St	Stonemason
Summers	William	The Folly	Stonemason
Taylor	Thomas Henry	Victoria St	Stonemason
Watts	Adolphus	Woodbine St	Stonemason
Whittaker	Ernest	Station St	Stonemason
Whittaker	John	Merrigang St	Foreman
Workman	Samuel	Elm St	Quarryman

**1913 Stonemasons and Quarrymen Mittagong and Moss Vale  
1913 Mittagong Subdivision**

Surname	First Name	Residence	Occupation
Lee	Frederick Charles	Mittagong	Stonemason
Nankiville	Henry	Fitzroy/Mittagong	Stonemason

**1913 Moss Vale Subdivision**

Hayman	Edward John	Bundanoon	Quarryman
Hayman	Patrick	Bundanoon	Quarryman
Moffat	David Wilson	Moss Vale	Stonemason

**1921 Stonemasons and Quarrymen  
Commonwealth of Australia State of NSW Electoral Roll  
Division of Werriwa Subdivision of Bowral**

Surname	First Name	Residence	Occupation
Barry	John	Woodbine St	Quarryman
Bell	Albert Edward	Merrigang St	Stonemason
Cooper	James	Park Rd.	Quarryman
Dunwoodie	Thomas	Woodbine St	Stonemason
Ellis	Edward	Commercial Hotel Bowral	Quarryman
Grove	Stanley Charles	Bowral St	Quarryman
Ling	George Benjamin	Victoria St	Quarryman
Lobban	John	Bowral St	Stonemason
McDonald	John	Bong Bong St	Quarryman
Marks	George	Burradoo St	Quarryman
Napier	Andrew	Ascot Rd	Stonemason
Pope	Arthur Francis	Mittagong Rd	Stonemason
Stenlake	John	Merrigang St	Stonemason
Warren	William Richard	Cliff St	Stonecutter
Watts	Adolphus	Cliff St	Stonecutter
Woodey	Arthur William	Bowral	Stonemason
Taylor	Henry	Merrigang St	Monumental Mason

1498 electors

## Appendix V

### Wingecarribee Shire Council Mount Gibraltar Reserve Management Objectives

The Reserve is now managed through the Wingecarribee Council Bushcare program assisted by the volunteers of Mount Gibraltar Landcare and Bushcare.

Initially an assessment was carried out and a long term management plan prepared.

Each year a work plan is prepared within the following guidelines:

**Objectives: To manage the Mount Gibraltar Reserve for:-**

- the conservation of native plant and animal communities and ecological processes
- the protection of its soil and the quality of water in and emanating from the Reserve
- the conservation of its cultural heritage, both European and Indigenous
- nature-based passive recreation that is compatible with the nature and heritage conservation objectives for the reserve
- the provision of a subject for scientific research and environmental education.

**Management Strategies**

**Objective 1: Conserve native plant and animal communities and ecological processes by:-**

- identifying, monitoring and protecting the native biodiversity of the Reserve
- ensuring that ongoing bush regeneration is undertaken throughout the Reserve
- undertaking effective control of noxious weeds on an annual basis

- reducing the external factors that impact on the plant community, such as weed dumping and other sources of weed seeds and cuttings
- ensuring that domestic animals do not roam freely in the Reserve
- undertaking ecological burns when necessary to promote native plant regeneration
- ensuring that fuel reduction management activities are done to maintain a range of habitats for native animals; to protect identified fire-sensitive plant communities and species; to protect heritage sites and other structures on the Reserve
- ensuring that a recovery plan is prepared for endangered ecological communities of Mount Gibraltar Forest.

**Objective 2: Protect soil and the quality of water in and emanating from Mount Gibraltar Reserve by:-**

- constructing and maintaining fire trails and walking tracks to best practice standard to provide for authorized access and to minimise soil erosion
- installing correct sediment control devices during construction and maintenance works in or adjacent to the Reserve
- revegetating sites disturbed during construction and maintenance activities with indigenous native plants.

**Objective 3: Conserve Indigenous and European heritage of the Reserve by:-**

- identifying and registering heritage sites
- planning management activities to avoid any impact on the identified heritage sites of the reserve.

**Objective 4: Provide nature-based passive recreation opportunities that are compatible with the nature and heritage conservation objectives for the Reserve by:-**

- providing a range of passive recreation facilities, including walking tracks, picnic areas and lookouts in clearly defined areas for the use of local residents and visitors
- maintaining a network of clearly marked walking tracks which includes walks of varying lengths and degrees of difficulty
- limiting vehicular access to defined roadways and designated car parking areas
- limiting the use of fire trails to management vehicles only.

**Objective 5: Provide a subject for scientific research and environmental education by:-**

- maintaining records of the flora and fauna
- maintaining records of the regeneration work, fires and other activities undertaken
- providing opportunities for the local community and schools to learn about the natural and cultural heritage of Mount Gibraltar
- making the Reserve available for scientific research.

## Appendix VI

### Bush Regeneration Principles and Techniques: An Outline

Successful bush regeneration requires a management process that is sensitive to the growth patterns of the particular plant community. The aim is to work with a site to activate the natural resilience of the bush. This done, it can become self-sustaining and resistant to future damage. It is a slow process that follows a natural progression. Weed invasion usually follows soil disturbance. On Mount Gibraltar there has been massive disturbance through quarrying, grazing and frequent burning, making the vegetation vulnerable to invasion by the tough exotic plants which have escaped from surrounding gardens. The weed list in Appendix X illustrates the challenge being faced in returning the Reserve to healthy bushland.

In 1967 Joan and Eileen Bradley first devised a process of weed management which was developed into the Bush Regeneration Techniques taught in natural environment management courses. Some situations require weed management that combines several methods. These may include the use of fire, mowing, solarisation and biological control as well as the more usual methods of weed removal. Bush Regeneration is a skilled occupation requiring considerable experience for effective, permanent solutions.

It has several main precepts:

- Assess the site carefully for the type and cause of problems and plan the best approach. This usually requires an experienced and trained person.
- Start at the least infested place and work towards the worst — both on the large and the small scales. This ensures that the 'good' bush can re-colonise a weeded area.
- Consider the seasonal growth cycles, as correct timing of the method chosen is crucial to success.
- Disturb the soil as little as possible so that the layers of micro-organisms can operate effectively and resist reinvasion.
- Ensure that several years of follow-up work can be carried out to remove resprouting or seedling weeds while the bush regenerates. This usually requires good botanical knowledge to recognise and identify the seedlings.
- Understand the process of natural succession which leads to true regeneration of a site, and the considerable time this may take.

These principles have led to the development of particular techniques. Before anyone commences bush regeneration activities, health and safety matters must be reviewed. Some over-riding principles are:

- Always be aware of your own safety and the safety of those around you
- Wear protective clothing
- Be observant of local conditions
- Follow directions for using chemicals

**Methods (see diagram overleaf)**

**Handpulling:** This is for young plants which pull out easily. Wear gloves and be sure you know what you are pulling. Tamp the soil down and replace litter before moving on.

**Stabbing and Twisting:** A knife or blade helps removal of underground reproductive parts, crowns, tap roots, bulbs, corms.

**Stem Scraping:** Scrape the bark from a stem and poison the exposed surface. The poison will be carried through the plant in the sap. This is used mostly for vines.

**Cutting and poisoning:** Use secateurs or saw to cut stems or trunks horizontally, then quickly (within 30 seconds) dab the peripheral cambium layer with neat glyphosate.

**Drilling or frilling:** Chip or drill into the sapwood (1-2cm inside the bark at an angle of 45°) at regular intervals around the base of the tree and immediately apply small amounts of neat glyphosate to the cuts.

**Preventing seeding:** If necessary cut off and bag any fruit for safe disposal.

**Spraying:** This is done using appropriate chemicals at the correct time of year on specific weeds by accredited people.

**Disposing of material:** This depends on the site. It may be possible to build a raft of sticks to hold piles of weeds off the ground so that they dry out without re-growing. They will eventually rot down to become nutrients to the soil, or can be burned under correct supervision. It is sometimes necessary to remove the weed waste from the site. Seeds and bulbs should be bagged and taken away.

Remember the object is not to be tidy but to encourage the remaining native plants to flourish and multiply.

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Glyphosate is a systemic herbicide which travels in sap throughout a plant. It has almost no residual effects as it binds to soil particles on contact and eventually decomposes to harmless substances. However it will kill any plant it comes in contact with. It works best when the plant is actively growing and needs at least 6 hours before rain. You are required to read the label and follow instructions.

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**Further Reading**

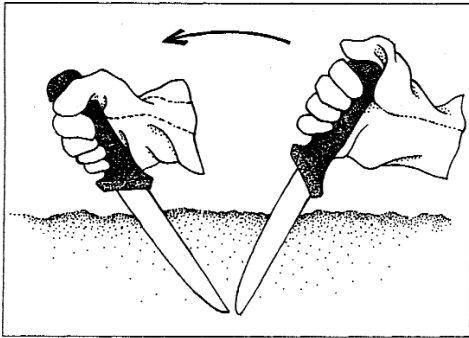
Lemann, J *Mount Gibraltar Bush Care Manual* 1994

Bradley, J *Bringing Back the Bush* Ure Smith 1991

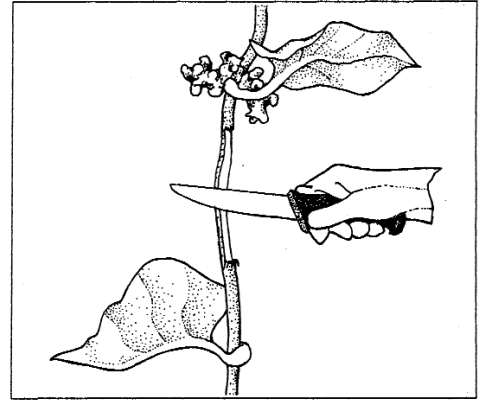
Buchanan, RA *Bush Regeneration: Recovering Australian Landscapes TAFE NSW* 1989

*Introductory Weed Management Manual* Co-operative Research Centre for Weed Management 2004

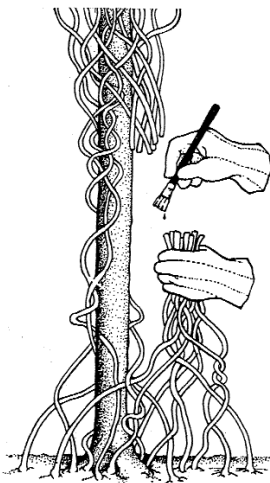
**SOME BUSH  
REGENERATION  
TECHNIQUES**  
from  
BUSH REGENERATORS'  
HANDBOOK  
National Trust of Australia (NSW)



The knife is the best tool to use in sandy or loose soil, while the trowel is more efficient in compacted soil



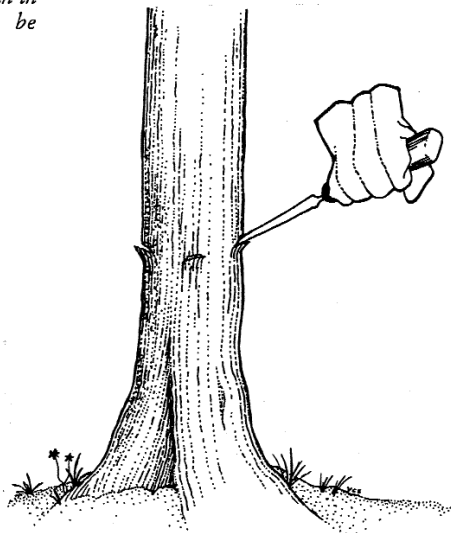
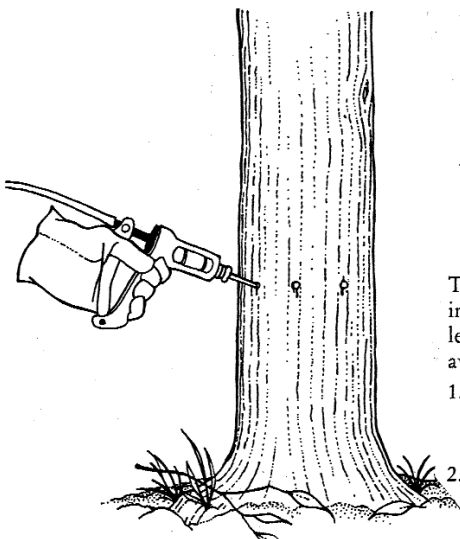
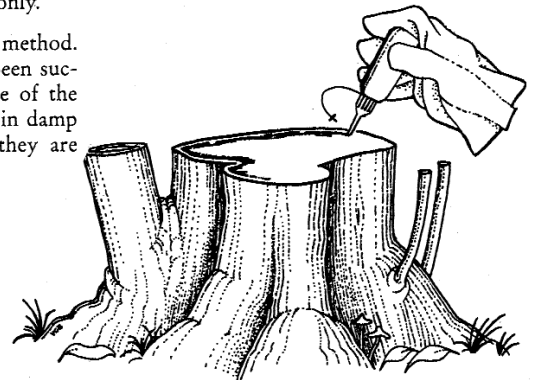
For mature vines with aerial tubers, scrape the stem and apply herbicide.



Handfuls of stems can be cut and painted with herbicide. The vines which remain in the canopy will soon die, and need not be removed.

Apply herbicide immediately as the sap ceases to flow once the tissues are severed. For convenience, use a paintbrush, eye dropper or small squeeze bottle. For larger specimens, wipe the poison around the outer rim of the cut only.

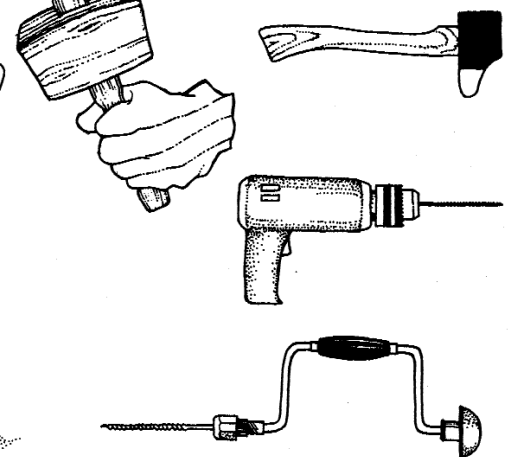
Note: If plants re-shoot, repeat the method. Ochna is especially difficult, but it has been successfully poisoned by scraping each side of the stem just below the cut. Plants growing in damp areas may require special attention as they are likely to re-shoot.



**Tree injection**

Tree injection or frilling and chipping is used in inaccessible sites where rubbish removal is a problem, or as a preliminary measure in sites which are awaiting extensive primary work.

1. Drill holes at an angle into the sapwood at regular intervals around the tree, using a cordless drill or brace and bit.
2. Place the correct dose of herbicide into each



hole as it is cut. If necessary, wait until the liquid subsides then apply the remainder. It is important to follow the manufacturer's recommendations for the correct dose.

Note: Best results are achieved with plants which are actively growing. The success of any systemic herbicide relies on the plant's normal physiological activities to move the chemical through its tissue.

# Appendix VII

## NSW Scientific Committee Mount Gibraltar Forest: Final Determination

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list the Mount Gibraltar Forest in the Sydney Basin Bioregion, as an ENDANGERED ECOLOGICAL COMMUNITY on Part 3 of Schedule 1 of the Act. Listing of Endangered Ecological Communities is provided for by Part 2 of the Act.

The Scientific Committee has found that:

1. Mount Gibraltar Forest in the Sydney Basin Bioregion is the name given to the plant community characterized by the species assemblage listed in 2 below. All sites are within the Sydney Basin Bioregion. The community is described in Fisher, Ryan & Lembit (1995).

2. The Mount Gibraltar Forest is characterized by the following assemblage:

<i>Acacia melanoxylon</i>	<i>Adiantum aethiopicum</i>
<i>Blechnum cartilagineum</i>	<i>Cyathea australis</i>
<i>Cymbopogon refractus</i>	<i>Dianella caerulea</i>
<i>Dichondra repen</i>	<i>Doodia aspera</i>
<i>Eucalyptus fastigata</i>	<i>Eucalyptus piperita</i>
<i>Eucalyptus radiata</i>	<i>Eucalyptus smithii</i>
<i>Eucalyptus viminalis</i>	<i>Eustrephus latifolius</i>
<i>Exocarpos cupressiformis</i>	<i>Hedycarya angustifolia</i>
<i>Leptospermum brevipes</i>	<i>Lepospermum polygalifolium</i>
<i>Leucopogon lanceolatus</i>	<i>Lomandra longifolia</i>
<i>Melaleuca hypericifolia</i>	<i>Notelaea venosa</i>
<i>Oreomyrrhis eriopoda</i>	<i>Pittosporum undulatum</i>
<i>Polyscias sambucifolia</i>	<i>Pteridium esculentum</i>
<i>Senecio linearis</i>	<i>Stypandra glauca</i>
<i>Themeda australis</i>	<i>Tylophora barbata</i>

3. The total species list of the flora and fauna of the community is considerably larger than that given in 2 (above), with many species present in only one or two sites or in very small quantity. The community includes invertebrates, many of which are poorly known, as well as vertebrates. In any particular site not all of the assemblage listed above may be present. At any one time, seeds of some plant species may only be present in the soil seed bank with no above-ground individuals present. Invertebrate species may be restricted to soils or canopy trees and shrubs, for example. The species composition of the site will be influenced by the size of the site and by its recent disturbance history. The number of species and the above-ground composition of species will change with time since fire, and may also change in response to changes in fire frequency.

4. Mount Gibraltar Forest includes vegetation ranging from open-forest to woodland and scrub depending on aspect, soil conditions and previous clearing and disturbance. Typical trees include *Eucalyptus radiata*, *Eucalyptus piperita* and *Eucalyptus smithii*, on the upper slopes, and *Eucalyptus radiata*, *Eucalyptus piperita*, *Eucalyptus fastigata* and *Eucalyptus viminalis* on the deeper soils on the southern side.

5. Understorey species in the open-forest are predominantly herbaceous and grassy and include *Stypandra glauca*, *Dianella caerulea*, *Dichondra repens*, *Themeda australis*, *Blechnum cartilagineum*, *Adiantum aethiopicum*, *Tylophora barbata*, *Oreomyrrhis eriopoda*, *Cymbopogon refractus*, *Senecio linearis*, *Polyscias sambucifolia*, *Exocarpos cupressiformis*, *Leucopogon lanceolatus* and *Lomandra longifolia*. The tall forest is dominated by ferns such as *Blechnum cartilagineum*, *Doodia aspera*, *Pteridium*

*esculentum*, and twiners such as *Eustrephus latifolius* and *Tylophora barbata*. There may be small patches of rainforest species such as *Acacia melanoxylon*, *Hedycarya angustifolia*, *Notelaea venosa*, *Pittosporum undulatum* and *Cyathea australis*. Scrub with *Melaleuca hypericifolia*, *Leptospermum brevipes* and *Leptospermum polygalifolium* may occur on exfoliating rock on exposed sites.

6. Mount Gibraltar Forest is found on clay soils derived from a microsyenite volcanic intrusion associated with Mount Gibraltar near Bowral, but may also have occurred on nearby mountains such as Mount Jellore, Mount Flora, Mount Misery and Cockatoo Hill depending on the extent of microsyenite. It is referred to in Fisher, Ryan & Lembit (1995).

7. Mount Gibraltar Forest is or has been known to occur in the Wingecarribee Local Government Area, but may occur elsewhere in the Sydney Basin Bioregion.

8. Disturbed Mount Gibraltar Forest remnants are considered to form part of the community including where the vegetation would respond to assisted natural regeneration, such as where the natural soil and associated seedbank is still at least partially intact.

9. Mount Gibraltar Forest has been cleared for agriculture and rural development. Remnants are mostly small isolated pockets.

10. Mount Gibraltar Forest has not been reported from any NPWS reserves.

11. Much of the remaining area of Mount Gibraltar Forest is largely isolated from other areas of bushland. Ongoing threats to the remnants include exotic weed invasion such as *Hedera*, *Lonicera*, *Ilex*, *Berberis*, *Pyracantha* and *Genista*, pressure from adjacent urban development (including dogs, cats, rubbish dumping, noise, trampling and vehicles), inappropriate fire regimes and disturbances associated with communication tower infrastructure (including clearing, movement of machinery, weed introduction, dumping of rubbish).

12. In view of the restricted distribution of this community, the ongoing threats to the remnants and its inadequate representation within conservation reserves, the Scientific Committee is of the opinion that Mount Gibraltar Forest in the Sydney Basin Bioregion is likely to become extinct in nature in New South Wales unless the circumstances and factors threatening its survival or evolutionary development cease to operate and that the community is eligible for listing as an endangered ecological community.

Dr Chris Dickman  
Chairperson  
Scientific Committee

Proposed Gazettal date: 16/3/01,  
Exhibition period: 16/03/01 – 20/04/01

### Reference

Fisher, M, Ryan, K and Lembit, R (1995) 'The natural vegetation of the Burragorang 1:100 000 map sheet' *Cunninghamia* 4 (2):143-215, 1995

### Other Endangered Ecological Communities Found in Small Areas in Mount Gibraltar Reserve

Robertson Basalt Tall Open-forest  
Southern Highlands Shale Woodland  
Details are available from NSW Scientific Committee  
c/- PO Box 1967, Hurstville, NSW 2220

## Appendix VIII

### History of Land Ownership, Mount Gibraltar Reserve Research to Date

FJ Pope and Sons quarry	Vol/Folio	Date
Description. DP No. 738591 Part of Lots 24.25.26		
FJ Pope & Sons to Bowral Municipal Council	3217 Fol 450	18. 12.1975
FJ Pope died intestate. To Annie & Donald Arthur Pope	1728 Fol 778	18. 8.1935
EM Pratt sold to FJ Pope	1532 Fol 964	12.10.1928
J Thompson died intestate. To EM Pratt		1913
<i>AW Pope claims Pope acquired from Raward who probably leased</i>		1912
<i>AW Pope claims quarry leased to Pope</i>		1890
<b>Pratt and Cull</b>		
Description. DP111222 Part Lots 24.2.26. Lots 27.28.29		
CH Cull to Bowral Municipal Council L75	2243 Fol 248	1953
B and EM Pratt to CH Cull L25		
Part lots 24.25.26 Lots 27.28.29	1640 Fol 17	12. 4.1932
J Thompson died intestate. To EM Pratt and B Pratt	1532 Fol 964	12.10.1928
Wiley to J Thompson (including Troy lots)	264 Fol 31	1.12.1882
PLC Shepherd to J Thompson and Wiley. Gibraltar Estate	688 Fol 833	6.1901
HM Oxley to PLC Shepherd		
<b>Amos land</b>		
Description. DP 169019 , DP666, DP771155		
Crown land gazetted to Reserve		1995
Gibson to Wingecarribee S Council DP 803046 Part.		1990
W Pope to Wingecarribee S Council DP739403 Part 2 Lot 19		1986
Gosford Quarries lease small section end of Tulloona Av		1966/7
Union Trustee Coy to DA Pope DP111372 Lot 18		1949
Union Trustee Coy to A Pope DP1 11372 Lot 19		1931
Crown – Stokes - Councils DP666 - 83436. Road alignment	3138 Fol 77	25.10.1920
Stokes to Crown	2987 Fol 38	1920
Union Trustee Coy to J Stokes and Bowral MC DP 856512-22	2987 Fol 38/39	1919
LTO transfer A503054 and transfer A503055		
Union Trustee Coy to Crown	2874 Fol 124	1917
A Amos died, to Union Trustee Coy as executors		1915
A & R Amos to Railway Commissioners	825 Fol 14	1887
PLC Shepherd to Amos (1881?)	6633 Fol 117	
J Powell to PLC Shepherd DP666	57 Fol 64	1867
<b>Amos quarry after his death</b>		
Lot 16 DP111372, Lot 1 DP111372		
A Ingeborg sold to others to PK Loveridge to Bowral MC	6633 Fol 117	1972
A Ingeborg leased to Haines, Mascot Industries	(c1930-1962)	
Union Trustee Coy to A Ingeborg		1927
<b>Loveridge and Hudson</b>		
Description. DP 700951		
Melocco Bros to Bowral Municipal Council		3.8.1984
L & H to Melocco Bros		9.4.1980
L & H Lots 1 & 2. Loveridge to Hudson and back		11.10.1916 to 20.7.1927
W Charker to L & H	2288 Fol 55	2.12.1912
PLC Shepherd to W Charker		
JN Oxley to W Charker		
DP 862590		
Committed to Mount Gibraltar Reserve		25.8.1999
Melocco Bros to Wingecarribee Shire Council for public open space		1987
L & H to Melocco Bros		1980
Clayton to L & H, 4 acres Lots 75 & 78	962 Fol 104	17.4 1909
PLC Shepherd to Clayton		
DP 111222 Part Lot 27		
Melocco to Wingecarribee Shire Council, part for Reserve	CT155	1999
L & H to Melocco		1980



Loveridge and Hudson	Vol/Folio	Date
WT Angus to L & H		1902
PLC Shepherd to WT Angus		
<b>Other blocks acquired for Reserve</b>		
Description. DP 770845		
C Foley to Wingecarribee Shire Council Lot 6		1995
DP 262408		
Tilbury Pty Ltd to Bowral Municipal Council (Corner)	14010 Fol 40	1982
DP 15496		
B Allen to Wingecarribee Shire Council 3 Duke St. Pt 3.	4957 Fol 155	2002
DP15496 - 139		
AJ Johnstone to Bowral Municipal Council	4882 Fol 104	1938
DP15496 - 138		
Greenacre Pty Ltd to Bowral Municipal Council	4125 Fol 115	1938
<b>Sale of Reserve land</b>		
DP 856512		
Bowral Municipal Council to PMG summit L150	10121 Fol 63	1955
Bowral Municipal Council to PMG summit	6735 Fol 210 - 211	1964

**Research: J Lemann, C Wright, T Sutton**

## Appendix IX

### Indication of Threatened Species in the Mount Gibraltar Area 2006

The following lists are of threatened species which are or might be found in the vicinity of Mount Gibraltar and have been compiled from the NSW Department of Environment and Conservation, Atlas of NSW Wildlife, The Australian Museum Bionet, NSW Scientific Committee and the Australian Government Department of Environment and Heritage Web pages.

#### Endangered Ecological Communities

*Mount Gibraltar Forest*  
*Robertson Basalt Tall Forest*  
*Southern Highlands Shale Woodland*

#### Fauna

Amphibia MYOBATRACHIDAE Red-crowned Toadlet *Pseudophryne australis* V  
Aves ARDEIDAE Australian Bittern *Botaurus poiciloptilus* V  
Aves CACATUIDAE Gang-gang Cockatoo *Callocephalon fimbriatum* V  
Aves CACATUIDAE Glossy Black-Cockatoo *Calyptorhynchus lathami* V  
Aves PETROICIDAE Hooded Robin *Melanodryas cucullata* V  
Aves PETROICIDAE Olive Whistler *Pachycephala olivacea* V  
Aves STRIGIDAE Barking Owl *Ninox connivens* V  
Aves STRIGIDAE Powerful Owl *Ninox strenua* V  
Aves ESTRILDIDAE Diamond Firetail *Stagonopleura guttata* V  
Mammalia BURRAMYIDAE Eastern Pygmy-possum *Cercartetus nanus* V  
Mammalia DASYURIDAE Eastern Quoll *Dasyurus viverrinus* E1  
Mammalia DASYURIDAE Spotted-tailed Quoll *Dasyurus maculatus* V  
Mammalia MACROPODIDAE Brush-tailed Rock-wallaby *Petrogale penicillata* E1  
Mammalia PERAMELIDAE Southern Brown Bandicoot (eastern) *Isodon obesulus obesulus* E1  
Mammalia PETAURIDAE Yellow-bellied Glider *Petaurus australis* V  
Mammalia PETAURIDAE Squirrel Glider *Petaurus norfolcensis* V  
Mammalia PHASCOLARCTIDAE Koala *Phascolarctos cinereus* V  
Mammalia PTEROPODIDAE Grey-headed Flying-Fox *Pteropus poliocephalus* V  
Reptilia ELAPIDAE Broad-headed Snake *Hoplocephalus bungaroides* E1

#### Flora

ASTERACEAE *Helichrysum calvertianum* U  
EPACRIDACEAE *Lissanthe sapida* Native Cranberry U  
FABACEAE *Phyllota humisifusa* Dwarf Phyllota V  
MYRTACEAE *Darwinia peduncularis* V  
MYRTACEAE *Eucalyptus apiculata* U  
MYRTACEAE *Eucalyptus macarthurii* Paddy's River Box V  
ORCHIDACEAE *Diuris aequalis* Buttercup Doubletail  
ORCHIDACEAE *Prasophyllum fuscum* Slaty Leek Orchid  
PROTEACEAE *Grevillea raybrownii* U  
PROTEACEAE *Persoonia acerosa* V  
PROTEACEAE *Persoonia glaucescens* E1  
PROTEACEAE *Persoonia oxycoccoides* U  
RUTACEAE *Zieria murphyi* V

Code: Definition under the National Parks and Wildlife Act (NPW Act 1974) and the Threatened Species Conservation Act 1995 (TSC Act 1995)

E1 Endangered. Refers to fauna and flora species that are likely to become extinct in nature in NSW unless the circumstances and factors threatening its survival or evolutionary developments cease to operate; or, have been so drastically reduced, that it is in immediate danger of extinction; or it might already be extinct, but it is not presumed extinct (TSC Act 1995)

V Vulnerable. Refers to fauna and flora species that are likely to become endangered unless the circumstances and factors threatening its survival or evolutionary development cease to operate. (TSC Act 1995)

U Unprotected. Refers to fauna listed in Schedule 11 of the NPW Act 1974 and to flora not listed in Schedule 13 of the NPW Act 1974 or in the TSC Act 1995

## Some Key Threatening Processes

Department of Environment and Heritage, (National) -  
Department Environment and Conservation (NSW)

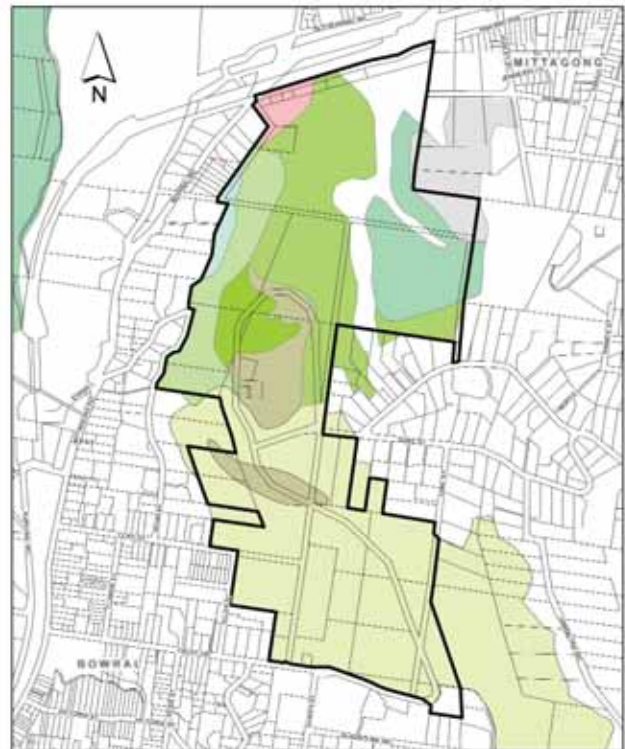
- \* Bush Rock removal
- \* Invasion of native plant communities by exotic perennial grasses
- \* Infection of native plants by the fungus *Phytophthora cinnamomi*
- \* Competition from feral Honeybees *Apis mellifera*
- \* Infection by *Psittacine circoviral* (beak and feather disease) affecting endangered psittacine species and populations
- \* Importation of Red Fire Ants *Solenopsis invicta* into NSW
- \* Removal of dead wood, dead trees and logs
- \* Competition and grazing by the feral European Rabbit *Oryctolagus cuniculus*
- \* Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands
- \* Clearing of native vegetation
- \* Loss and/or degradation of sites used for hill-topping butterflies
- \* High frequency fire resulting in the disruption of life-cycle processes in plants and animals and loss of vegetation structure and composition
- \* Predation by the feral Cat *Felis catus*
- \* Predation by Plague Minnow *Gambusia holbrooki*
- \* Predation by the European Red Fox *Vulpes vulpes*
- \* Introduction of the Large Earth Bumblebee *Bombus terrestris*
- \* Infection of amphibians with chytrid fungus resulting in chytridiomycosis
- \* Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases
- \* Predation, habitat degradation, competition and disease transmission by feral Pigs
- \* Alterations of habitat following subsidence due to longwall mining
- \* Herbivory and environmental degradation caused by feral Deer
- \* Competition and land degradation by feral Goats
- \* Invasion and establishment of exotic vines and scramblers
- \* Human - caused climate change

*Guiding principles include:*

Competition from invasive species - weeds and feral animals

## Vegetation Communities

Mount Gibraltar Reserve



Any information (numerical or otherwise), representation, statement, opinion or advice expressed or implied in this publication is made in good faith but on the basis that the council of the shire of Wingecambee, its agents and its employees are not liable (whether by reason of negligence, lack of care or otherwise) to any person for any damage or loss whatsoever which has occurred or may occur in relation to that person taking or not taking (as the case may be) action in respect of any information, representation, statement, or advice referred to above.

# Appendix X

## Mount Gibraltar Reserve Plant List

These plants are found in  
*Mount Gibraltar Forest (MGF)* Endangered Ecological Community and  
*Hawkesbury (Mittagong) Sandstone Woodland (HSS)* Community

### Significant Plants

*Acacia stricta*, unusual rhizomatous form, x 2 plants found near Oxley Drive  
*Notelaea venosa x longifolia* found in Chinaman's Creek  
*Leptospermum brevipes* found on the summit near the towers

The plant lists are arranged in order of height  
Ferns, Ground Covers, Shrubs, Trees, Vines and then Weeds

Compiled by Jane Lemann with advice from Dr Kevin Mills, ecologist; Greg Stone, consultant; Dr Barbara Wiecek, identification botanist Royal Botanic Gardens; Gerard Proust, bush regenerator

Reviewed by the National Herbarium of NSW, Royal Botanic Gardens, Sydney

### Reference

Harden, GJ (ed.) *Flora of New South Wales* UNSW Press, Sydney 1993  
with update from Dr Barbara Wiecek

### Note

Mount Gibraltar Reserve also includes a small area of *Southern Highlands Shale Woodland*, Endangered Ecological Community. As its area is less than ten hectares we have been advised to note simply that the following species are indicative of the community:  
*Eucalyptus punctata*, *E. quadrangulata* and *Bursaria spinosa*

Brackets ( ) denote common names not found in *Flora of NSW*

## Mosses and Liverworts

FAMILY	GENUS	SPECIES	COMMON NAME	SITE
POLYTRICHACEAE	<i>Dawsonia</i>	<i>polytrichoides</i>	(Moss)	MGF
POLYTRICHACEAE	<i>Dawsonia</i>	<i>longifolia</i>	(Moss)	MGF

See also Chapter 13

## Ferns

FAMILY	GENUS	SPECIES	COMMON NAME	SITE
ADIANTACEAE	<i>Adiantum</i>	<i>aethiopicum</i>	Common Maiden Hair	MGF
ASPLENIACEAE	<i>Asplenium</i>	<i>flabellifolium</i>	Necklace Fern	MGF
BLECHNACEAE	<i>Blechnum</i>	<i>cartilagineum</i>	Gristle Fern	MGF
BLECHNACEAE	<i>Blechnum</i>	<i>nudum</i>	Fishbone Fern	MGF
BLECHNACEAE	<i>Doodia</i>	<i>aspera</i>	Rasp Fern	MGF
CYATHEACEAE	<i>Cyathea</i>	<i>australis</i>	Rough Tree-Fern	MGF
DAVALLIACEAE	<i>Nephrolepis</i>	<i>cordifolia</i>	Fishbone Water Fern	HSS
DAVALLIACEAE	<i>Rumohra</i>	<i>adiantiformis</i>	(Hare's Foot Fern)	HSS
DENNSTAEDTIACEAE	<i>Pteridium</i>	<i>esculentum</i>	Bracken	MGF
DICKSONIACEAE	<i>Calochlaena</i>	<i>dubia</i>	Common Ground Fern	HSS
LINDSAEACEAE	<i>Lindsaea</i>	<i>linearis</i>	Screw Fern	HSS
POLYPODIACEAE	<i>Pyrrosia</i>	<i>rupestris</i>	Rock Felt Fern	MGF
SINOPTERIDACEAE	<i>Cheilanthes</i>	<i>distans</i>	Bristly Cloak Fern	MGF
SINOPTERIDACEAE	<i>Cheilanthes</i>	<i>sieberi</i>	(Poison Rock Fern)	MGF
SINOPTERIDACEAE	<i>Pellaea</i>	<i>falcata</i> var. <i>falcata</i>	Sickle Fern	MGF

## Ground Covers

FAMILY	GENUS	SPECIES	COMMON NAME	SITE
ANTHERICACEAE	<i>Thysanotus</i>	<i>juncifolius</i>	(Fringe Lily)	MGF
ANTHERICACEAE	<i>Thysanotus</i>	<i>tuberosus</i>	Common Fringe-lily	MGF
ANTHERICACEAE	<i>Tricoryne</i>	<i>simplex</i>	Rush-lily	MGF
APIACEAE	<i>Actinotus</i>	<i>helianthi</i>	Flannel Flower	HSS
APIACEAE	<i>Centella</i>	<i>asiatica</i>	Pennywort	MGF
APIACEAE	<i>Daucus</i>	<i>glochidiatus</i>	Native Carrot	MGF
APIACEAE	<i>Hydrocotyle</i>	<i>geraniifolia</i>	Forest Pennywort	MGF
APIACEAE	<i>Hydrocotyle</i>	<i>laxiflora</i>	Stinking Pennywort	MGF
APIACEAE	<i>Hydrocotyle</i>	<i>peduncularis</i>	(Pennywort)	MGF
APIACEAE	<i>Oreomyrrhis</i>	<i>eriopoda</i>		MGF
ARACEAE	<i>Gymnostachys</i>	<i>anceps</i>	Settler's Flax	MGF
ASTERACEAE	<i>Arrhenechthites</i>	<i>mixta</i>	Purple Fireweed	MGF
ASTERACEAE	<i>Brachyscome</i>	<i>multifida</i>	Cut-leaved Daisy	MGF
ASTERACEAE	<i>Brachyscome</i>	<i>scapigera</i>		MGF
ASTERACEAE	<i>Craspedia</i>	sp.	Billy Buttons	MGF
ASTERACEAE	<i>Helichrysum</i>	<i>calvertianum</i>	(Everlasting Daisy)	HSS
ASTERACEAE	<i>Helichrysum</i>	<i>elatum</i>	(Everlasting Daisy)	MGF
ASTERACEAE	<i>Helichrysum</i>	<i>leucopsideum</i>	Satin Everlasting	MGF
ASTERACEAE	<i>Helichrysum</i>	<i>scorpioides</i>	Button Everlasting	MGF
ASTERACEAE	<i>Lagenifera</i>	<i>stipitata</i>	Blue Bottle-daisy	HSS
ASTERACEAE	<i>Podolepis</i>	<i>jaceoides</i>	Showy Copper-wire Daisy	HSS
ASTERACEAE	<i>Senecio</i>	<i>hispidulus</i>	Hill Fireweed	MGF
ASTERACEAE	<i>Senecio</i>	<i>lautus</i> subsp. <i>maritimus</i>	Variable Groundsel	MGF
ASTERACEAE	<i>Senecio</i>	<i>linearifolius</i>	(Groundsel)	MGF
ASTERACEAE	<i>Senecio</i>	<i>minimus</i>		MGF
ASTERACEAE	<i>Sigesbeckia</i>	<i>orientalis</i> subsp. <i>orientalis</i>	Indian Weed	MGF
ASTERACEAE	<i>Xerochrysum</i>	<i>bracteatum</i>	Golden Everlasting	MGF
CAMPANULACEAE	<i>Wahlenbergia</i>	<i>gracilis</i>	Australian Bluebell	MGF
CAMPANULACEAE	<i>Wahlenbergia</i>	<i>stricta</i>	Tall Bluebell	MGF
CARYOPHYLLACEAE	<i>Stellaria</i>	<i>flaccida</i>	(Forest Starwort)	MGF
CARYOPHYLLACEAE	<i>Stellaria</i>	<i>pungens</i>	Prickly Starwort	MGF
CLUSIACEAE	<i>Hypericum</i>	<i>gramineum</i>	Small St John's Wort	MGF
CONVOLVULACEAE	<i>Dichondra</i>	<i>repens</i>	Kidney Weed	MGF
CRASSULACEAE	<i>Crassula</i>	<i>sieberiana</i>	Australian Stonecrop	MGF
CYPERACEAE	<i>Gahnia</i>	sp.	Saw-sedge Grass	MGF
CYPERACEAE	<i>Lepidosperma</i>	<i>filiforme</i>		HSS
CYPERACEAE	<i>Lepidosperma</i>	<i>laterale</i>		MGF
CYPERACEAE	<i>Schoenus</i>	<i>melanostachys</i>		MGF

FAMILY	GENUS	SPECIES	COMMON NAME	SITE
DILLENIACEAE	<i>Hibbertia</i>	<i>empetrifolia</i>	Guinea Flower	MGF
DILLENIACEAE	<i>Hibbertia</i>	<i>scandens</i>	Climbing Guinea Flower	MGF
DILLENIACEAE	<i>Hibbertia</i>	<i>serpyllifolia</i>	Guinea Flower	MGF
EUPHORBIACEAE	<i>Amperea</i>	<i>xiphoclada</i>	(Broom Spurge)	HSS
EUPHORBIACEAE	<i>Poranthera</i>	<i>microphylla</i>	(Small Poranthera)	MGF
FABACEAE	<i>Desmodium</i>	<i>varians</i>	Slender Tick-trefoil	MGF
GERANIACEAE	<i>Geranium</i>	<i>solanderi</i> var. <i>solanderi</i>	Geranium	MGF
GERANIACEAE	<i>Geranium</i>	<i>potentilloides</i>		MGF
GERANIACEAE	<i>Pelargonium</i>	<i>inodorum</i>	Pelargonium	MGF
GOODENIACEAE	<i>Goodenia</i>	<i>hederacea</i> var. <i>hederacea</i>	(Violet Leaved Goodenia)	MGF
GOODENIACEAE	<i>Scaevola</i>	<i>ramosissima</i>	(Purple Fan Flower)	MGF
GOODENIACEAE	<i>Cooperhookia</i>	<i>barbata</i>		HSS
HYPOXIDACEAE	<i>Hypoxis</i>	<i>hygrometrica</i>	Golden Weather Grass	MGF
IRIDACEAE	<i>Patersonia</i>	<i>glabrata</i>		HSS
IRIDACEAE	<i>Patersonia</i>	<i>longifolia</i>		HSS
IRIDACEAE	<i>Patersonia</i>	<i>sericea</i>	(Dwarf Purple Flag)	HSS
LAMIACEAE	<i>Ajuga</i>	<i>australis</i>	Austral Bugle	MGF
LAMIACEAE	<i>Plectranthus</i>	<i>parviflorus</i>	(Cockspur Flower)	MGF
LILIACEAE	<i>Arthropodium</i>	sp.	Vanilla Lily	MGF
LOBELIACEAE	<i>Isotoma</i>	<i>axillaris</i>	Showy Isotome	MGF
LOBELIACEAE	<i>Pratia</i>	<i>purpurascens</i>	White-root	MGF
LOGANIACEAE	<i>Logania</i>	<i>albiflora</i>		MGF
LOGANIACEAE	<i>Mitrasacme</i>	<i>polymorpha</i>		HSS
LOMANDRACEAE	<i>Lomandra</i>	<i>filiformis</i>	Wattle Mat-rush	MGF
LOMANDRACEAE	<i>Lomandra</i>	<i>glauca</i>	Pale Mat-rush	HSS
LOMANDRACEAE	<i>Lomandra</i>	<i>longifolia</i>	Spiny-headed Mat-rush	MGF
LOMANDRACEAE	<i>Lomandra</i>	<i>multiflora</i>	Many-flowered Mat-rush	HSS
LOMANDRACEAE	<i>Lomandra</i>	<i>obliqua</i>		HSS
ORCHIDACEAE	<i>Acianthus</i>	<i>fornicatus</i>	Pixie Caps	MGF
ORCHIDACEAE	<i>Caladenia</i>	<i>catenata</i>	White Fingers	MGF
ORCHIDACEAE	<i>Corybas</i>	<i>aconitiflorus</i>	Spurred Helmet Orchid	MGF
ORCHIDACEAE	<i>Dendrobium</i>	<i>speciosum</i>	Rock Lily	MGF
ORCHIDACEAE	<i>Dipodium</i>	<i>punctatum</i>	(Hyacinth Orchid)	MGF
ORCHIDACEAE	<i>Diuris</i>	<i>sulphurea</i>	Tiger Orchid	MGF
ORCHIDACEAE	<i>Eriochilus</i>	<i>culcullatus</i>	Parson's Bands	MGF
ORCHIDACEAE	<i>Gastrodia</i>	<i>sesamoides</i>	Potato Orchid	MGF
ORCHIDACEAE	<i>Microtis</i>	<i>unifolia</i>	Common Onion Orchid	MGF
ORCHIDACEAE	<i>Pterostylis</i>	<i>coccinea</i>	Greenhood	MGF
ORCHIDACEAE	<i>Pterostylis</i>	<i>curta</i>	Blunt Greenhood	MGF
ORCHIDACEAE	<i>Pterostylis</i>	<i>grandiflora</i>	Cobra Greenhood	MGF
ORCHIDACEAE	<i>Pterostylis</i>	<i>longifolia</i>	Tall Greenhood	MGF
ORCHIDACEAE	<i>Pterostylis</i>	<i>nutans</i>	Nodding Greenhood	MGF
ORCHIDACEAE	<i>Pterostylis</i>	<i>pedunculata</i>	Maroonhood	MGF
ORCHIDACEAE	<i>Pterostylis</i>	<i>truncata</i>	Little Dumpies	MGF
ORCHIDACEAE	<i>Thelymitra</i>	sp.	(Sun Orchid)	MGF
OXALIDACEAE	<i>Oxalis</i>	<i>perennans</i>	Wood Sorrels	MGF
PHORMIACEAE	<i>Dianella</i>	<i>caerulea</i>	Blue Flax Lily	MGF
PHORMIACEAE	<i>Dianella</i>	<i>caerulea</i> var. <i>producta</i>	Blue Flax Lily	MGF
PHORMIACEAE	<i>Dianella</i>	<i>longifolia</i> var. <i>longifolia</i>	Blue Flax Lily	MGF
PHORMIACEAE	<i>Dianella</i>	<i>revoluta</i>	(Mauve) Flax Lily	MGF
PHORMIACEAE	<i>Stypandra</i>	<i>glauca</i>	Nodding Blue Lily	MGF
PLANTAGINACEAE	<i>Plantago</i>	<i>gaudichaudii</i>	(Narrow Leaf) Plantain	MGF
POACEAE	<i>Austrostipa</i>	<i>rudis</i>	Spear Grass	MGF
POACEAE	<i>Bothriochloa</i>	<i>macra</i>	Red-leg Grass	MGF
POACEAE	<i>Cymbopogon</i>	<i>refractus</i>	Barbed Wire Grass	MGF
POACEAE	<i>Cynodon</i>	<i>dactylon</i>	Couch Grass	MGF
POACEAE	<i>Austrodanthonia</i>	sp.	Wallaby Grass	MGF
POACEAE	<i>Echinopogon</i>	<i>caespitosus</i>	Hedgehog Grass	MGF
POACEAE	<i>Echinopogon</i>	<i>ovatus</i>	Forest Hedgehog Grass	HSS
POACEAE	<i>Entolasia</i>	<i>marginata</i>	Bordered Panic	MGF
POACEAE	<i>Entolasia</i>	<i>stricta</i>	Wiry Panic	HSS
POACEAE	<i>Eragrostis</i>	sp.	Lovegrass	HSS
POACEAE	<i>Imperata</i>	<i>cylindrica</i>	Blady Grass	MGF
POACEAE	<i>Microlaena</i>	<i>stipoides</i>	(Weeping Grass)	MGF
POACEAE	<i>Poa</i>	<i>labillardieri</i>	Tussock	MGF
POACEAE	<i>Poa</i>	<i>sieberiana</i>		MGF

FAMILY	GENUS	SPECIES	COMMON NAME	SITE
POACEAE	<i>Themeda</i>	<i>australis</i>	Kangaroo Grass	MGF
PORTULACACEAE	<i>Calandrinia</i>	<i>calytrata</i>	(Pink Purslane)	MGF
PROTEACEAE	<i>Conospermum</i>	<i>tenuifolium</i>	(Grass Leaved Con.)	MGF
RANUNCULACEAE	<i>Ranunculus</i>	<i>lappaceus</i>	Common Buttercup	MGF
RANUNCULACEAE	<i>Ranunculus</i>	<i>plebeius</i>	(Hairy Buttercup)	MGF
RESTIONACEAE	<i>Chordifax</i>	<i>fastigiatus</i>		MGF
ROSACEAE	<i>Acaena</i>	<i>novae-zelandiae</i>	(Bidgy-widgy)	MGF
RUBIACEAE	<i>Asperula</i>	<i>conferta</i>	Common Woodruff	MGF
RUBIACEAE	<i>Galium</i>	<i>gaudichaudii</i>	Rough Bedstraw	MGF
RUBIACEAE	<i>Opercularia</i>	<i>hispidia</i>	Stink Weed	MGF
SCROPHULARIACEAE	<i>Veronica</i>	<i>gracilis</i>		MGF
SCROPHULARIACEAE	<i>Veronica</i>	<i>plebeia</i>	Creeping Speedwell	MGF
SOLANACEAE	<i>Solanum</i>	<i>cinereum</i>	Narrawa Burr	MGF
SOLANACEAE	<i>Solanum</i>	<i>opacum</i>	Greenberry Nightshade	MGF
SOLANACEAE	<i>Solanum</i>	<i>prinophyllum</i>	Forest Nightshade	MGF
STACKHOUSIACEAE	<i>Stackhousia</i>	<i>monogyna</i>	Candles	MGF
STACKHOUSIACEAE	<i>Stackhousia</i>	<i>viminea</i>	Slender Stackhousia	HSS
THYMELEACEAE	<i>Pimelea</i>	<i>linifolia</i> subsp. <i>linifolia</i>		HSS
URTICACEAE	<i>Urtica</i>	<i>incisa</i>	Stinging Nettle	MGF
UVULARIACEAE	<i>Schelhammera</i>	<i>undulata</i>	Lilac Lily	MGF
VIOLACEAE	<i>Viola</i>	<i>betonicifolia</i>	(Purple Violet)	MGF
VIOLACEAE	<i>Viola</i>	<i>hederacea</i>	Ivy-leaved Violet	MGF
XANTHORRHOACEAE	<i>Xanthorrhoea</i>	<i>resinifera</i>	Grass Tree	HSS

### Shrubs

FAMILY	GENUS	SPECIES	COMMON NAME	SITE
APIACEAE	<i>Platysace</i>	<i>lanceolata</i>	(Native Parsnip)	MGF
ARALIACEAE	<i>Polyscias</i>	<i>sambucifolia</i>	Elderberry Panax	MGF
ASTERACEAE	<i>Cassinia</i>	<i>aculeata</i>	Dolly Bush	MGF
ASTERACEAE	<i>Cassinia</i>	<i>quinquefaria</i>		HSS
ASTERACEAE	<i>Olearia</i>	<i>microphylla</i>	(Bridal Daisy)	MGF
ASTERACEAE	<i>Olearia</i>	<i>viscidula</i>	Wallaby Weed	MGF
ASTERACEAE	<i>Ozothamnus</i>	<i>diosmifolius</i>	White Dogwood	MGF
CHENOPODIACEAE	<i>Einadia</i>	<i>hastata</i>	Berry Saltbush	MGF
EPACRIDACEAE	<i>Brachyloma</i>	<i>daphnoides</i>		HSS
EPACRIDACEAE	<i>Epacris</i>	<i>microphylla</i>		HSS
EPACRIDACEAE	<i>Leucopogon</i>	<i>ericoides</i>		HSS
EPACRIDACEAE	<i>Leucopogon</i>	<i>lanceolatus</i>	Lance Beard Heath	MGF
EUPHORBIACEAE	<i>Amperea</i>	<i>xiphoclada</i>		HSS
EUPHORBIACEAE	<i>Phyllanthus</i>	sp.		MGF
FABOIDEAE	<i>Aotus</i>	<i>ericoides</i>		HSS
FABOIDEAE	<i>Bossiaea</i>	<i>obcordata</i>	(Spiny Bossiaea)	MGF
FABOIDEAE	<i>Daviesia</i>	sp.	Bitter Pea	MGF
FABOIDEAE	<i>Dillwynia</i>	<i>ramosissima</i>	Parrot Pea	MGF
FABOIDEAE	<i>Goodia</i>	<i>lotifolia</i>	(Golden Tip)	MGF
FABOIDEAE	<i>Indigofera</i>	<i>australis</i>	(Native Indigo)	MGF
FABOIDEAE	<i>Podolobium</i>	<i>ilicifolium</i>	Prickly Shaggy Pea	MGF
FABOIDEAE	<i>Pultenaea</i>	<i>blakelyi</i>	Egg and Bacon Pea	MGF
GOODENIACEAE	<i>Goodenia</i>	<i>ovata</i>	(Hop Goodenia)	MGF
LAMIACEAE	<i>Prostanthera</i>	<i>hirtula</i>	Mint-bush	MGF
LORANTHACEAE	<i>Amyema</i>	sp.	Mistletoe	MGF
LORANTHACEAE	<i>Dendrophthoe</i>	<i>vitellina</i>	Mistletoe	MGF
MIMOSOIDEAE	<i>Acacia</i>	<i>longifolia</i> subsp. <i>longifolia</i>	Sydney Golden Wattle	MGF
MIMOSOIDEAE	<i>Acacia</i>	<i>rubida</i>	Red-leaved Wattle	MGF
MIMOSOIDEAE	<i>Acacia</i>	<i>stricta</i>	(Hop Wattle)	MGF
MIMOSOIDEAE	<i>Acacia</i>	<i>stricta</i> (rhizomatous) *		MGF
MIMOSOIDEAE	<i>Acacia</i>	<i>terminalis</i>	Sunshine Wattle	HSS
MIMOSOIDEAE	<i>Acacia</i>	<i>ulicifolia</i>	Prickly Moses	HSS
MONIMIACEAE	<i>Hedycarya</i>	<i>angustifolia</i>	Native Mulberry	MGF
MYRTACEAE	<i>Calytrix</i>	<i>tetragona</i>	Fringe Myrtle	MGF
MYRTACEAE	<i>Kunzea</i>	<i>parvifolia</i>	(Small Leaf Kunzea)	MGF
MYRTACEAE	<i>Leptospermum</i>	<i>brevipes</i> *	(Tea Tree)	MGF
MYRTACEAE	<i>Leptospermum</i>	<i>juniperinum</i>	(Prickly Tea Tree)	MGF
MYRTACEAE	<i>Leptospermum</i>	<i>polygalifolium</i>	(Yellow Tea Tree)	MGF
MYRTACEAE	<i>Leptospermum</i>	<i>trinervium</i>	(Tea Tree)	MGF

FAMILY	GENUS	SPECIES	COMMON NAME	SITE
MYRTACEAE	<i>Melaleuca</i>	<i>hypericifolia</i>		MGF
OLEACEAE	<i>Notelaea</i>	<i>venosa</i>	Veined Mock-olive	MGF
OLEACEAE	<i>Notelaea</i>	<i>longifolia x venosa</i> *	Large Mock-olive	MGF
PITTOSPORACEAE	<i>Bursaria</i>	<i>spinosa</i>	Native Blackthorn	MGF
PROTEACEAE	<i>Banksia</i>	<i>spinulosa</i>	(Hairpin Banksia)	HSS
PROTEACEAE	<i>Hakea</i>	<i>dactyloides</i>	(Finger Hakea)	HSS
PROTEACEAE	<i>Lomatia</i>	<i>ilicifolia</i>	(Holly Leaved Lomatia)	MGF
PROTEACEAE	<i>Lomatia</i>	<i>silaiifolia</i>	Crinkle Bush	HSS
PROTEACEAE	<i>Persoonia</i>	<i>laurina</i>		HSS
PROTEACEAE	<i>Persoonia</i>	<i>levis</i>	Broad-leaved Geebung	MGF
PROTEACEAE	<i>Persoonia</i>	<i>linearis</i>	Narrow-leaved Geebung	MGF
PROTEACEAE	<i>Persoonia</i>	<i>myrtilloides</i>		MGF
RHAMNACEAE	<i>Pomaderris</i>	<i>aspera</i>	Hazel Pomaderris	HSS
RHAMNACEAE	<i>Pomaderris</i>	<i>lanigera</i>	(Woolly Pomaderris)	MGF
RUBIACEAE	<i>Coprosma</i>	<i>quadrifida</i>	Prickly Currant Bush	MGF
RUBIACEAE	<i>Pomax</i>	<i>umbellata</i>		HSS
RUTACEAE	<i>Zieria</i>	<i>smithii</i>	Sandfly Zieria	MGF
SANTALACEAE	<i>Choretrum</i>	<i>candollei</i>	White Sour Bush	HSS
SANTALACEAE	<i>Leptomeria</i>	<i>acida</i>	Sour Currant Bush	HSS
SANTALACEAE	<i>Omphacomeria</i>	<i>acerba</i>	(Leafless Sour Bush)	HSS
SAPINDACEAE	<i>Dodonaea</i>	<i>multijuga</i>	Hop Bush	HSS
SAPINDACEAE	<i>Dodonaea</i>	<i>triquetra</i>	Hop Bush	MGF
SAPINDACEAE	<i>Dodonaea</i>	<i>viscosa</i> subsp.		
		<i>angustissima</i>	Hop Bush	MGF
SOLANACEAE	<i>Solanum</i>	<i>aviculare</i>	Kangaroo Apple	MGF
SOLANACEAE	<i>Solanum</i>	<i>vescum</i>	(Gunyang)	MGF
TREMANDRACEAE	<i>Tetradthea</i>	<i>thymifolia</i>	Black-eyed Susan	HSS
VIOLACEAE	<i>Hymenantha</i>	<i>dentata</i>	Tree Violet	MGF

\* significant plant

## Trees

FAMILY	GENUS	SPECIES	COMMON NAME	SITE
CASUARINACEAE	<i>Allocasuarina</i>	<i>littoralis</i>	Black Sheoak	MGF
ELAEOCARPACEAE	<i>Elaeocarpus</i>	<i>reticulatus</i>	Blueberry Ash	HSS
EUPHORBIACEAE	<i>Breynia</i>	<i>oblongifolia</i>	Coffee Bush	MGF
MIMOSOIDEAE	<i>Acacia</i>	<i>falciformis</i>	Broad-leaved Hickory	MGF
MIMOSOIDEAE	<i>Acacia</i>	<i>fimbriata</i>	Fringed Wattle	MGF
MIMOSOIDEAE	<i>Acacia</i>	<i>implexa</i>	Hickory Wattle	MGF
MIMOSOIDEAE	<i>Acacia</i>	<i>mearnsii</i>	(Black Wattle)	MGF
MIMOSOIDEAE	<i>Acacia</i>	<i>melanoxydon</i>	Blackwood	MGF
MIMOSOIDEAE	<i>Acacia</i>	<i>penninervis</i>	Mountain Hickory	MGF
MYRSINACEAE	<i>Rapanea</i>	<i>howittiana</i>	Brush Mutton-wood	MGF
MYRTACEAE	<i>Eucalyptus</i>	<i>agglomerata</i>	Blue-leaved Stringybark	HSS
MYRTACEAE	<i>Eucalyptus</i>	<i>amplifolia</i>	Cabbage Gum	MGF
MYRTACEAE	<i>Eucalyptus</i>	<i>camphora</i>	Broad-leaved Sally	MGF
MYRTACEAE	<i>Eucalyptus</i>	<i>cypellocarpa</i>	Monkey Gum	MGF
MYRTACEAE	<i>Eucalyptus</i>	<i>dalrympleana</i>	Mountain Gum	MGF
MYRTACEAE	<i>Eucalyptus</i>	<i>elata</i>	River Peppermint	MGF
MYRTACEAE	<i>Eucalyptus</i>	<i>fastigata</i>	Brown Barrel	MGF
MYRTACEAE	<i>Eucalyptus</i>	<i>globoidea</i>	White Stringybark	HSS
MYRTACEAE	<i>Eucalyptus</i>	<i>obliqua</i>	Messmate	HSS
MYRTACEAE	<i>Eucalyptus</i>	<i>piperita</i>	Sydney Peppermint	MGF
MYRTACEAE	<i>Eucalyptus</i>	<i>punctata</i>	A Grey Gum	MGF
MYRTACEAE	<i>Eucalyptus</i>	<i>quadrangulata</i>	White-topped Box	MGF
MYRTACEAE	<i>Eucalyptus</i>	<i>radiata</i>	Narrow-leaf Peppermint	MGF
MYRTACEAE	<i>Eucalyptus</i>	<i>sieberi</i>	Silver-top Ash	HSS
MYRTACEAE	<i>Eucalyptus</i>	<i>smithii</i>	Gully Gum	MGF
MYRTACEAE	<i>Eucalyptus</i>	<i>tereticornis</i>	Forest Red Gum	MGF
MYRTACEAE	<i>Eucalyptus</i>	<i>viminalis</i>	Ribbon Gum	MGF
MYRTACEAE	<i>Melaleuca</i>	<i>linearifolia</i>	(Snow in Summer)	MGF
PITTOSPORACEAE	<i>Pittosporum</i>	<i>undulatum</i>	Pittosporum	MGF
PROTEACEAE	<i>Banksia</i>	<i>serrata</i>	(Old Man Banksia)	HSS
SANTALACEAE	<i>Exocarpos</i>	<i>cupressiformis</i>	Cherry Ballart	MGF
ULMACEAE	<i>Trema</i>	<i>tomentosa</i> var. <i>viridis</i>	Poison Peach	MGF

## Vines

FAMILY	GENUS	SPECIES	COMMON NAME	SITE
ASCLEPIADACEAE	<i>Tylophora</i>	<i>barbata</i>	Bearded Tylophora	MGF
ASCLEPIADACEAE	<i>Marsdenia</i>	<i>rostrata</i>	Common Milk Vine	MGF
ASCLEPIADACEAE	<i>Marsdenia</i>	<i>suaveolens</i>	Scented Marsdenia	MGF
BIGNONIACEAE	<i>Pandorea</i>	<i>pandorana</i>	Wonga Wonga Vine	MGF
CELASTRACEAE	<i>Celastrus</i>	<i>australis</i>	(Staff Vine)	MGF
CELASTRACEAE	<i>Celastrus</i>	<i>subspicata</i>	(Staff Vine)	MGF
CHENOPODIACEAE	<i>Einadia</i>	<i>trigonos</i>	Fishweed	MGF
CONVOLVULACEAE	<i>Calystegia</i>	<i>marginata</i>		HSS
CUNONIACEAE	<i>Aphanopetalum</i>	<i>resinosum</i>	Gum Vine	MGF
FABOIDEAE	<i>Glycine</i>	<i>clandestina</i>	(Love Creeper)	MGF
FABOIDEAE	<i>Hardenbergia</i>	<i>violacea</i>	False Sarsaparilla	HSS
LAURACEAE	<i>Cassytha</i>	<i>pubescens</i>	Devil's Twine	HSS
LUZURIAGACEAE	<i>Eustrephus</i>	<i>latifolius</i>	Wombat Berry	MGF
LUZURIAGACEAE	<i>Geitonoplesium</i>	<i>cymosum</i>	Scrambling Lily	MGF
MENISPERMACEAE	<i>Sarcopetalum</i>	<i>harveyanum</i>	Pearl Vine	MGF
PASSIFLORACEAE	<i>Passiflora</i>	<i>cinnabarina</i>	Red Passionflower	MGF
PITTOSPORACEAE	<i>Billardiera</i>	<i>scandens</i>	Apple Dumplings	MGF
POLYGALACEAE	<i>Comesperma</i>	<i>defoliatum</i>	(Love Creeper)	MGF
POLYGALACEAE	<i>Comesperma</i>	<i>volubile</i>	(Love Creeper)	MGF
RANUNCULACEAE	<i>Clematis</i>	<i>aristata</i>	(Old Man's Beard)	MGF
RANUNCULACEAE	<i>Clematis</i>	<i>glycinoides</i>	Headache Vine	MGF
ROSACEAE	<i>Rubus</i>	<i>moluccanus</i> var. <i>trilobus</i>	Broadleaf Bramble	HSS
ROSEACEAE	<i>Rubus</i>	<i>parvifolius</i>	Native Raspberry	MGF
SMILACACEAE	<i>Smilax</i>	<i>australis</i>	Sarsaparilla	MGF
SMILACACEAE	<i>Smilax</i>	<i>glyciphylla</i>	Sweet Sarsaparilla	MGF

## Weeds

FAMILY	GENUS	SPECIES	COMMON NAME	SITE
ALLIACEAE	<i>Nothoscordum</i>	<i>borbonicum</i>	Onion Weed	
AMARANTHACEAE	<i>Amaranthus</i>	<i>viridis</i>	Green Amaranth	
AMARYLLIDACEAE	<i>Agapanthus</i>	<i>orientalis</i>	Agapanthus	
APOCYNACEAE	<i>Vinca</i>	<i>major</i>	Periwinkle	
APOCYNACEAE	<i>Mandevilla</i>	<i>laxa</i>	Chilean Jasmine	
AQUIFOLIACEAE	<i>Ilex</i>	<i>aquifolium</i>	Holly	
ARALIACEAE	<i>Hedera</i>	<i>helix</i>	English Ivy	
ASPARAGACEAE	<i>Asparagus</i>	<i>aethiopicus</i>	An Asparagus Fern	
ASPARAGACEAE	<i>Asparagus</i>	<i>asparagoides</i>	Bridal Creeper	
ASPARAGACEAE	<i>Asparagus</i>	<i>officinalis</i>	Asparagus	
ASTERACEAE	<i>Bidens</i>	<i>pilosa</i>	Cobbler's Peg	
ASTERACEAE	<i>Chrysanthemoides</i>	<i>monilifera</i> subsp. <i>monilifera</i>	Boneseed	
ASTERACEAE	<i>Cichorium</i>	<i>intybus</i>	Chicory	
ASTERACEAE	<i>Cirsium</i>	<i>vulgare</i>	Spear Thistle	
ASTERACEAE	<i>Conyza</i>	<i>canadensis</i>	Canadian Fleabane	
ASTERACEAE	<i>Delairea</i>	<i>odorata</i>	Cape Ivy	
ASTERACEAE	<i>Hypochaeris</i>	<i>radicata</i>	Catsear or Flatweed	
ASTERACEAE	<i>Leucanthemum</i>	<i>maximum</i>	Shasta Daisy	
ASTERACEAE	<i>Onopordum</i>	<i>acanthium</i> subsp. <i>acanthium</i>	Scotch Thistle	
ASTERACEAE	<i>Senecio</i>	<i>madagascariensis</i>	Fireweed	
ASTERACEAE	<i>Silybum</i>	<i>marianum</i>	Variiegated Thistle	
ASTERACEAE	<i>Sonchus</i>	<i>oleraceus</i>	Common Sow Thistle	
ASTERACEAE	<i>Taraxacum</i>	<i>officinale</i>	Dandelion	
BERBERIDACEAE	<i>Berberis</i>	<i>aristata</i>	Barberry	
BERBERIDACEAE	<i>Mahonia</i>	<i>leschenaultii</i>	(Mahonia)	
BRASSICACEAE	<i>Lepidium</i>	<i>africanum</i>	(Peppergrass)	
BRASSICACEAE	<i>Lunaria</i>	<i>annua</i>	Honesty	
BUDDLEJACEAE	<i>Buddleja</i>	<i>dauidii</i>	Butterfly Bush	
CAPRIFOLIACEAE	<i>Lonicera</i>	<i>japonica</i>	Japanese Honeysuckle	
CAPRIFOLIACEAE	<i>Viburnum</i>	<i>tinus</i>	Viburnum	
CARYOPHYLLACEAE	<i>Stellaria</i>	<i>media</i>	Common Chickweed	
COMMELINACEAE	<i>Tradescantia</i>	<i>fluminensis</i>	Wandering Jew	
CUPRESSACEAE	<i>Juniperus</i>	sp.	Juniper	
CYPERACEAE	<i>Cyperus</i>	<i>congestus</i>	Sedge	



FAMILY	GENUS	SPECIES	COMMON NAME	SITE
DAVALLIACEAE	<i>Nephrolepis</i>	<i>cordifolia</i>	Fishbone Fern	
ERICACEAE	<i>Arbutus</i>	<i>unedo</i>	Irish Strawberry Tree	
EUPHORBIACEAE	<i>Euphorbia</i>	<i>peplus</i>	Petty Spurge	
FABACEAE/CAESAL.	<i>Cytisus</i>	<i>scoparius</i> subsp. <i>scoparius</i>	English Broom	
FABACEAE/CAESAL.	<i>Genista</i>	<i>monspessulana</i>	Montpellier Broom	
FABACEAE/CAESAL.	<i>Ulex</i>	<i>europaeus</i>	Gorse	
FABOIDEAE	<i>Vicia</i>	spp.	(Vetch)	
FUMARIACEAE	<i>Fumaria</i>	<i>muralis</i>	Wall Fumitory	
IRIDACEAE	<i>Crocosmia</i>	<i>x crocosmiiflora</i>	Montbretia	
IRIDACEAE	<i>Freesia</i>	hybrid	Freesia	
LILIACEAE	<i>Agapanthus</i>	<i>praecox</i> subsp. <i>orientalis</i>	African Lily	
LILIACEAE	<i>Hemerocallis</i>	sp.	Daylily	
LILIACEAE	<i>Lilium</i>	<i>formosanum</i>	(Formosan Lily)	
MALVACEAE	<i>Modiola</i>	<i>caroliniana</i>	Red-Flowered Mallow	
OLEACEAE	<i>Jasminum</i>	<i>officinale</i>	Jasmine	
OLEACEAE	<i>Ligustrum</i>	<i>lucidum</i>	Large-leaved Privet	
OLEACEAE	<i>Ligustrum</i>	<i>sinense</i>	Small-leaved Privet	
OLEACEAE	<i>Ligustrum</i>	<i>vulgare</i>	European Privet	
OLEACEAE	<i>Olea</i>	<i>europaea</i> subsp. <i>europaea</i>	Common Olive	
OLEACEAE	<i>Olea</i>	<i>europaea</i> subsp. <i>africanus</i>	(African Olive)	
PASSIFLORACEAE	<i>Passiflora</i>	<i>caerulea</i>	Blue Passionfruit	
PASSIFLORACEAE	<i>Passiflora</i>	<i>tarminiora</i>	Banana Passionfruit	
PHYTOLACCACEAE	<i>Phytolacca</i>	<i>octandra</i>	Inkweed	
PINACEAE	<i>Pinus</i>	<i>radiata</i>	Monterey Pine	
PITTOSPORACEAE	<i>Pittosporum</i>	<i>crassifolium</i>	Karo	
PLANTAGINACEAE	<i>Plantago</i>	<i>lanceolata</i>	Lamb's Tongue	
POACEAE	<i>Briza</i>	<i>maxima</i>	Quaking Grass	
POACEAE	<i>Dactylis</i>	<i>glomerata</i>	Cocksfoot Grass	
POACEAE	<i>Digitaria</i>	sp.	Crab or Summer Grass	
POACEAE	<i>Ehrharta</i>	<i>erecta</i>	Panic Veldtgrass	
POACEAE	<i>Holcus</i>	<i>lanatus</i>	Yorkshire Fog	
POACEAE	<i>Paspalum</i>	<i>dilatatum</i>	Paspalum	
POACEAE	<i>Pennisetum</i>	<i>clandestinum</i>	Kikuyu	
POACEAE	<i>Phalaris</i>	sp.	Canary Grass	
POACEAE	<i>Stenotaphrum</i>	<i>secundatum</i>	Buffalo Grass	
POACEAE	<i>Phyllostachys</i>	<i>aurea</i>	Fishpole Bamboo	
POLYGONACEAE	<i>Acetosa</i>	<i>sagittata</i>	Turkey Rhubarb	
PRIMULACEAE	<i>Anagallis</i>	<i>arvensis</i>	Scarlet or Blue Pimpernel	
ROSACEAE	<i>Cotoneaster</i>	<i>glaucophyllus</i>	Cotoneaster	
ROSACEAE	<i>Cotoneaster</i>	spp.	Cotoneaster	
ROSACEAE	<i>Crataegus</i>	<i>monogyna</i>	Hawthorn	
ROSACEAE	<i>Photinia</i>	<i>glabra</i>	Photinia	
ROSACEAE	<i>Photinia</i>	<i>serratifolia</i>	Chinese Hawthorn	
ROSACEAE	<i>Prunus</i>	<i>laurocerasus</i>	Cherry Laurel	
ROSACEAE	<i>Prunus</i>	<i>lusitanica</i>	Portugal Laurel	
ROSACEAE	<i>Prunus</i>	sp.	Cherry	
ROSACEAE	<i>Prunus</i>	<i>vulgaris</i>	Plum	
ROSACEAE	<i>Pyracantha</i>	<i>angustifolia</i>	(Firethorn)	
ROSACEAE	<i>Rubus</i>	<i>anglocordicans</i>	Blackberry	
RUBIACEAE	<i>Galium</i>	<i>aparine</i>	Cleavers	
SCROPHULARIACEAE	<i>Verbascum</i>	<i>thapsus</i>	Blanket Weed	
SOLANACEAE	<i>Physalis</i>	<i>peruviana</i>	Cape Gooseberry	
SOLANACEAE	<i>Solanum</i>	<i>nigrum</i>	Black-berry Nightshade	
SOLANACEAE	<i>Solanum</i>	<i>pseudocapsicum</i>	Madeira Winter Cherry	
VALERIANACEAE	<i>Valerian</i>	<i>officinalis</i>	Red Valerian	
VERBENIACEAE	<i>Verbena</i>	<i>bonariensis</i>	Purpletop	
VIOLACEAE	<i>Viola</i>	<i>odorata</i>	Sweet Violet	

# Appendix XI - 2016

This Appendix has been compiled to bring up to date the information provided in this book.

Note: Internet addresses may change in the future.

## Wingecarribee Local Environment Plan 2010

Mount Gibraltar Heritage Reserve is zoned E 2 Environmental Conservation and Heritage Conservation - Archaeological and is classified Community Land. Future land acquisitions for the Reserve will automatically receive the same status.

In 2007 Lot 20 Oxley Drive and Lot 16 Soma Avenue were classified Community Land and confirmed as part of the Reserve.

Wingecarribee Shire Council has planned for the future acquisition of some adjacent lands currently zoned as RE1 Public Recreation.

## Consolidation of Council owned lots within the Reserve

In 2015 The NSW Department of Lands registered all the amalgamated lots as DP1208300.

This does not include the unmade roads or Lot 21 DP856512 (the communication tower land).

Two sections were removed from the Reserve:

1. 2013 A laneway to Greyladyes farm from Earl St was purchased from the Crown by the Wingecarribee Shire Council to provide access to the farm.
2. 2013 An area of land in Lot 22 DP856512 adjacent to unmade King St was rezoned as public road to provide access to a private property.

**An Aboriginal Land Claim** made in 10.9.2010 for all Crown land in the Reserve except DP 784884 (Joshua Stokes land now held by the State) is currently under investigation by the Aboriginal Land Claims Investigation Unit.

## LAYERS OF PROTECTION

### Conservation Status NSW

2001 NSW Endangered Ecological Community *Mount Gibraltar Forest in the Sydney Basin Bioregion* in Part 3 of Schedule 1 of the NSW Threatened Species Act.

Listing is provided in Part 2 of the Act.

[www.threatenedspecies.environment.nsw.gov.au](http://www.threatenedspecies.environment.nsw.gov.au)

2001 NSW Endangered Ecological Community *Southern Highlands Shale Woodlands in the Sydney Basin Bioregion* in Part 3 of Schedule 1 of the NSW Threatened Species Act.

Listing is provided in Part 2 of the Act.

[www.threatenedspecies.environment.nsw.gov.au](http://www.threatenedspecies.environment.nsw.gov.au)

### Conservation Status National

2011 National Endangered Ecological Community of *Upland Basalt Eucalypt Forest of the Sydney Basin Bio-region* includes *Mount Gibraltar Forest, Robertson Tall Basalt Forest* and *Blue Mountains Basalt Forest*. Declared under the EPBC Act 1999.

[www.environment.gov.au](http://www.environment.gov.au) Fact sheet available.

2014 National Critically Endangered Ecological Community *Southern Highlands Shale Forest and Woodland of the Sydney Basin Bioregion*. Declared under the EPBC Act 1999.

[www.environment.gov.au](http://www.environment.gov.au)

Reference 'A Guide to Southern Highlands Shale Forest and Woodland' [www.shsfw.wordpress.com](http://www.shsfw.wordpress.com)

2014 The Reserve was registered with Land For Wildlife [www.wsc.nsw.gov.au](http://www.wsc.nsw.gov.au)

2014 Great Eastern Ranges Initiative. The Reserve was included in the Southern Highlands connection. [www.greasterranges.org.au](http://www.greasterranges.org.au)

2015 Greater Gliders (*Petauroides volans*) in Mount Gibraltar Reserve were listed as an Endangered Population threatened with extinction in Part 2 of Schedule 1 of NSW Threatened Species Conservation Act 1995. [www.threatenedspecies.environment.nsw.gov.au](http://www.threatenedspecies.environment.nsw.gov.au)



*Mount Gibraltar Reserve Heritage Quarries Circuit walk constructed in 2011* Map J Trenwith

### Heritage Protection

2008 National Trust of Australia (NSW) listed the *Mount Gibraltar Quarries Complex* as a Significant Industrial Site.

2013 NSW State Heritage Register listed Mount Gibraltar Heritage Reserve as a State significant site both for Endangered Ecological Communities and the Trachyte Quarries Complex. [www.heritage.nsw.gov.au](http://www.heritage.nsw.gov.au) Government Gazette Number 164.

### Statement of Significance: Extracts

*Mount Gibraltar Quarries are significant as purpose built quarries... the trachyte quarries there are unique and provided dimension stone for notable buildings throughout NSW and internationally... contributed to the built heritage of the State... significant industrial landscape.*

*The Mount Gibraltar Forest has significance due to its rarity being identified as an endangered ecological community under the NSW Threatened Species Conservation Act and threatened ecological community under the EPBC Act. The unique geology of the area supports a collection of flora that, as an assemblage, does not exist outside of the Reserve.*

### Heritage Interpretive Plan

2016 Mount Gibraltar Heritage Reserve: Heritage Interpretive Plan was prepared by 3D Projects for Wingecarribee Shire Council.

### Structural Improvements:

2010 Heritage Quarries Circuit walking track was constructed through Quarries C and D funded by the 'Caring for Our Country' program.

2013 Rotary Historic Plaque was replaced on the plinth at Bowral Lookout Picnic Area after being found in a dam near Yass.

2015 Commemorative Trachyte Entrance Retaining Wall, Oxley Drive, Bowral was constructed using funds raised from the sale of this book and a Veolia Mulwara Trust grant.

2015 Two pieces of quarry machinery were emplaced for viewing along the Heritage Quarries Circuit.

2016 Bowral Lookout was redecked and the top rail removed to allow improved viewing.

**Bush Regeneration:** Primary weeding has been carried out in the quarry areas by volunteers working on the safer sites and qualified contractors using ropes on the quarry faces and steep slopes.

It is expected to complete major primary weeding by 2017. The value of volunteer work now exceeds one million dollars.

### History of the Book. *The Gib: Mount Gibraltar, Southern Highlands*

2007 2000 copies were printed and sold or gifted.

2008 The book won the Energy Australia National Trust of Australia (NSW) Heritage Award for Interpretation and Presentation.

2009 A second printing x 1000 was funded by Hawkesbury Nepean Catchment Management Authority, \$15,000.

Total funds raised from sales = \$42,206.



*Bush Regeneration work on the quarry face. The Good Bush People using long rope technology Photo C Topp*

2015 \$26,000 of the book funds were spent, with a matching Veolia Mulwara Trust Grant, on construction of a Commemorative Trachyte Entrance Retaining Wall off Oxley Drive, Bowral.

Remaining book funds are held by Wingecarribee Landcare and Bushcare Network on behalf of Mount Gibraltar Landcare and Bushcare.



*Commemorative Trachyte Entrance Retaining Wall constructed in 2015 with funds raised from sales of the book and a Veolia Mulwara Trust grant. Photo J Lemann*

### Further Publications

2014 *Sydney's Hard Rock Story* by Irving, Powell and Irving describes Bowral Trachyte buildings and structures and the quarrying industry from Mount Gibraltar.

2014 *Mount Gibraltar Heritage Reserve Information Booklet* by Mount Gibraltar Landcare and Bushcare

2015 This booklet won a Wingecarribee Shire Heritage Award: Best Contribution to an Understanding of Heritage in the Wingecarribee Shire.

**On-going care of Reserve** The Wingecarribee Shire Council Environment Levy was made permanent 2016. The Levy provides funds for the qualified Council Bushcare Team to manage and maintain the natural areas of the Shire.

**National Rock Garden Canberra** 2016 Negotiations began for inclusion of a Bowral Trachyte boulder in the NRG due to the stone's importance as a building material in the development of the Commonwealth of Australia.



*Loveridge and Hudson steam crane pulley wheel found and installed on site in 2014 by G Allen and S Bensley Photo J Lemann*

# Additions to the Flora and Fauna lists

## Plant List additions:

### Ferns

PTERIDACEAE	<i>Pteris umbrosa</i>	Jungle Brake
PTERIDACEAE	<i>Pteris tremula</i>	
PTERIDACEAE	<i>Pellaea nana</i>	Dwarf Sickle Fern

### Ground Covers

ASTERACEAE	<i>Olearia axillaris</i>	Coast Daisy Bush
COMMELINACEAE	<i>Commelina cyanea</i>	Scurvy Weed
CYPERACEAE	<i>Carex incomitata</i>	
GERANIACEAE	<i>Pelargonium rodneyanum</i>	Magenta Storksbill
JUNCACEAE	<i>Luzula densiflora or flaccida</i>	
LAMIACEAE	<i>Mentha satureioides</i>	Creeping Mint
ORCHIDACEAE	<i>Chiloglottis seminuda</i>	Turtle Orchid
ORCHIDACEAE	<i>Calochilus platytilus</i>	Purple Beard Orchid
ORCHIDACEAE	<i>Myrmecochila trapeziformis</i>	Diamond Ant Orchid
ORCHIDACEAE	<i>Pterostylis reflexa</i>	Small Autumn
Greenhood		
PHORMIACEAE	<i>Stypantra glauca</i> (white)	Nodding Blue Lily
PHYLLANTHACEAE	<i>Breynia oblongifolia</i>	Coffee Bush
PLANAGINACEAE	<i>Plantago debilis</i>	Shade Plantain
POACEAE	<i>Austrostipa ramosissima</i>	Stout Bamboo Grass
POACEAE	<i>Danthonia sp</i>	Wallaby Grass
POACEAE	<i>Poa affinis</i>	
SOLANACEAE	<i>Solanum opacum</i>	Green berry Nightshade
SOLANACEAE	<i>Solanum prinophyllum</i>	Forest Nightshade
URTICACEAE	<i>Urtica incisa</i>	Stinging Nettle

### Shrubs

EUPHORBIACEAE	<i>Homalanthus populifolius</i>	Bleeding Heart
LOGANACEAE	<i>Logania albiflora</i>	Narrow-leaf Logania
RUBIACEAE	<i>Coprosma quadrifida</i>	Prickly Currant Bush

### Lichen

*Cladonia floerkeana*

### Slime Mould

*Physarium sp*

### Weeds

ALSTROMERIACEAE	<i>Alstromeria spp</i>	
APOCYNACEAE	<i>Araujia sericifera</i>	Moth Vine
ASTERACEAE	<i>Erigeron karvinskianus</i>	Seaside Daisy
BRASSICACEAE	<i>Lepidium africanum</i>	
BASELLACEAE	<i>Anredera cordifolia</i>	Madeira Vine
CELASTRACEAE	<i>Euonymus europaeus</i>	Staff Tree
ELAEAGNACEAE	<i>Elaeagnus pungens</i>	Japanese Oleaster
IRIDACEAE	<i>Dietes bicolor</i>	African Iris
IRIDACEAE	<i>Iris foetida</i>	
LAMIACEAE	<i>Prunella vulgaris</i>	Self- heal
POACEAE	<i>Pennisetum clandestinum</i>	Kikuyu
SAPINDACEAE	<i>Acer pseudoplatanus</i>	Sycamore
UMACEAE	<i>Celtis australis</i>	European Nettle-tree
ZINGIBERACEAE	<i>Hedychium gardnerianum</i>	Ginger Lily

## Fauna List additions:

### Mammals

Koala	<i>Phascolarctos cinereus</i>
Common Wallaroo	<i>Macropus robustus</i>
Eastern Grey Kangaroo	<i>Macropus giganteus</i>

### Micro Bats: Identified through Echolocation (Coomb 2008)

Chocolate Wattled Bat	<i>Chalinolobus morio</i>
Eastern Bent-wing Bat	<i>Miniopterus schreibersii</i>
Eastern Broad-nosed Bat	<i>Scotorepens orion</i>
Broad-nosed Bat	<i>Scotorepens sp</i>
Eastern False Pipistrelle	<i>Falstrelia tasmaniensis</i>
Gould's Wattled Bat	<i>Chalinolobus gouldii</i>
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>
Large-footed Myotis	<i>Myklotis macropus</i>
Little Forest Bat	<i>Vespadelus vulturnus</i>
Long-eared Bat	<i>Nyctophilus sp</i>
Spithern Forest Bat	<i>Vespadelus regulus</i>
White-striped Freetail Bat	<i>Tadarida australis</i>
Yellow-bellied Sheathtail Bat	<i>Saccolaimus flaviventris</i>

### Reptiles

Cunningham's Skink	<i>Egernia cunninghami</i>
Whites Skink	<i>Egernia whittii</i>
Major's Skinks	<i>Egernia frerei</i>
Weasel Skink	<i>Saprosincus mustelina</i>

### Birds

Lyrebird	<i>Menura novaehollandiae</i>
Bell Miner	<i>Manorina melanophrys</i>
Common Bronzewing Pigeon	<i>Phaps chalcoptera</i>
Barking Owl	<i>Ninox connivens</i>
Olive-backed Oriole	<i>Oriolus sagittatus</i>

### Frogs

Smooth Toadlet	<i>Uperoleia laevigata</i>
Eastern Pobblebonk	<i>Lymnodynastes dumerellii</i>

## Vale

It is with sadness that we report the death of contributors to this volume and to regeneration work in the Mount Gibraltar Heritage Reserve:

Mike Elphick, Maurice Bratter,  
John Keast, Roy Freere, Helen Foley,  
Stuart Kyndon, Chris Topp.



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The story of The Gib, the central high point of the Southern Highlands of NSW, describes its history and changing styles of occupation and settlement, the industrial history of the Bowral Trachyte quarries and the natural history of the important reserve on its summit.

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