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Elements of the Past

An Environmental History of the
Blue Mountains, Australia.

Trevor J. Daly

VOLUME ONE

A thesis submitted in fulfilment
of the requirements for the degree of
Doctor of Philosophy

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For Lily,

In the hope that the Blue Mountains will forever remain a place of beauty and inspiration
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LIST OF ABBREVIATIONS

BMCC      Blue Mountains City Council
BMCL      Blue Mountains City Library
BMHS      Blue Mountains Historical Society
HRA       Historical Records of Australia
HRNSW     Historical Records of NSW
JNSWLC    Journal of the NSW Legislative Council
JPRAHIS   Journal and Proceedings of the Royal Australian Historical Society
JPRSNW    Journal and Proceedings of the Royal Society of NSW
MWSDB     Metropolitan Water Sewerage and Drainage Board
NSWLAVP   NSW Legislative Assembly Votes and Proceedings
NSWLCVP   NSW Legislative Council Votes and Proceedings
NSWPD     NSW Parliamentary Debates
NSWPP     NSW Parliamentary Papers

VOLUME TWO CONTAINS THE BIBLIOGRAPHY, APPENDICES, FIGURES AND MAP.
Introduction

'Apart from the limitless beauty of the mountains, what historical associations surround them?' Anon. (1903)¹

Viewed from the city of Sydney, the Blue Mountains of Australia stretch in a seemingly unbroken wall across the western horizon. Forming a natural boundary to the western expansion of Sydney, the 'mountains', as Sydneysiders have always called them, have retained their own identity despite their proximity to the 'harbour city'. This unique, though sometimes indistinct, identity has been shaped by the environment. Moreover, the environment of the Blue Mountains has in innumerable ways greatly influenced the history of the region.

The history of the Blue Mountains has been told many times and from many different perspectives.² Early writers focused on the 'heroic' era of exploration, which culminated in 1813 with the 'discovery' of a route over the mountains by Blaxland, Lawson and Wentworth - the 'Dauntless Three'.³ Whether dealing with specific individuals or collectively, these 'heroic explorer' histories have done little to explain the post-1788 history of the Blue Mountains beyond

¹ Anon., A Mountain Souvenir of the Blue Mountains, NSW, Australia, Sydney, 1903, n.p.n.
² Some of the references cited in this Introduction are not listed in the Bibliography (Volume Two) and full bibliographic details are instead provided in the relevant footnotes.
³ Despite the fact that there were seven in the party, along with five dogs and four horses. For examples of heroic history, See F. Walker, Official History of the First Crossing of the Blue Mountains in 1813, Sydney, 1914, and the numerous articles contained in the Journal of the Royal Australian Historical Society. For example, R. Cambage (Vol.3, 1915 and Vol.6, 1920), E. Else-Mitchell (Vol.24, 1938 and Vol.25, 1939), T. Whitley (Vol.1, 1908) and G. Wood (Vol.12, 1926).
treating it as a saga of human triumph over inhospitable nature. There has also been a plethora of local Blue Mountains histories, many published by local historical societies, which have tended to focus narrowly on individual mountain towns.⁴ Other writers have covered more sectoral issues, such as the history of the railway.⁵ Given the scenic impressiveness of the region, there has also been a host of publications which feature the scenery of the Blue Mountains (in either photographic or landscape art form) and include a brief outline of the area’s history.⁶ More recently, heritage studies and the Aboriginal history of the region have received attention from writers.⁷ So too have studies of human perceptions of the mountain landscape.⁸ However, there have been very few publications which have provided a complete overview of the entire history of the Blue Mountains region. The best example


to date is the collection of essays edited by Peter Stanbury, *The Blue Mountains: A Grand Adventure for All* (1988) which also covers some aspects of the region's environmental history.⁹

However, this study provides the most comprehensive 'environmental history' to date of the Blue Mountains of New South Wales, Australia.¹⁰ The thesis demonstrates that the environment has been a significant, yet largely unappreciated and unacknowledged, factor in the history of the Blue Mountains. Drawing on a wide and diverse selection of sources, the thesis uses the environment as the central theme to interpret the history of the Blue Mountains. As well as providing a history of the landscape and natural environment of the Blue Mountains, this study details how the environment of the region has been used, abused and cared for by its human inhabitants.¹¹

**Environmental History - A Definition**

Environmental history makes the 'environment' the focal point for historical enquiry. It can be broadly defined as the study of the interaction between

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¹⁰ Internationally, there are at least ten other mountains or mountain ranges known as the 'Blue Mountains' - in India (the Blue Mountains of Combatooor, also known as the Neigherry Hills), Jamaica, China, New Zealand (South Island), Canada (Ontario) and in the USA (Arizona, New Hampshire, Maine, Pennsylvania and Oregon).

¹¹ Unlike previous studies, this thesis gives less attention to human perceptions of the Blue Mountains and focuses more on how the human inhabitants of the region dealt directly with the environment and the results of that interaction.
humans and the environment over time. Environmental history demonstrates how humans have used and modified the environment through time, what impacts this has had on the environment, and how environmental factors have helped shape human affairs. However, environmental history is not merely human history, for it also recognises and takes into account the fact that other lifeforms have an interrelated ecological history with humans.

With a few notable exceptions, 'environmental' history is largely a product of the 20th Century. Although many writers from the 19th Century and earlier discussed contemporary environmental issues and concerns, the specific documenting of the past interaction of people with their environment (and the impacts which resulted) is a relatively modern phenomenon. Within the academic discipline of history, environmental history is viewed as a relatively new enterprise. This is despite the fact that some individual historians, particularly those with an interest in land use, have frequently had strong environmental overtones to their work. Furthermore, it should be recognised

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12 This is not to imply that humans are somehow separate or apart from the natural world but that the chief focus of study is the interface between people and environment. The interaction is of course a two way process. People everywhere influence the environment they inhabit and equally the environment they inhabit influences them. In general, environmental history focuses on the historical relationships and interactions between people and environment and not exclusively on either human history or 'natural' history.


14 Arguably the most significant and highly influential exception was G.P. Marsh, Man and Nature: or Physical Geography as Modified by Human Action, Sampson Low, Son and Marston, London, 1864.

15 For example since the 1920s, French historians associated with the journal Annales (such as Marc Bloch, Lucien Febvre, Fernand Braudel and Emmanuel Le Roy Ladurie) have featured the environment heavily in their historical studies, Worster, op. cit., pp.291-292.
that geographers, natural scientists and various other non-historians had been researching and writing what is essentially environmental history for quite some time, although often under other names such as 'historical geography'. Some early international examples include Graham Jacks and Robert Whyte's *The Rape of the Earth* (1939), Fairfield Osborn's *Our Plundered Planet* (1948) and the conference report edited by William Thomas, *Man's Role in Changing the Face of the Earth* (1956).

Labels aside, environmental history *per se* first gained popular appeal in the 1970s, as interest in environmental issues and concern over the state of the world's ecology spread around the world. In the USA in particular, environmental history has since become a highly specialised and well developed field. So much so, that a dedicated society now exists (the American Society for Environmental History), which holds annual conferences, produces its own journal, *Environmental History* (formerly *Environmental History Review* which was founded in 1976) and has a website.

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16 The distinction between what historians call 'environmental history' and what geographers call 'historical geography' remains unclear. They are largely one and the same thing, although if there is an identifiable difference it is that historical geography tends to be more scientific or empirically based (often with an emphasis on statistics and mapping environmental change), while environmental history is more narrative in form. For a wider discussion of this overlap, see M. Williams, 'The relations of environmental history and historical geography', *Journal of Historical Geography*, Vol.20, No.1, 1994, pp.3-21 and J. M. Powell, 'Historical geography and environmental history: an Australian interface', *Journal of Historical Geography*, Vol.22, No.3, 1996, pp.253-273. For consistency, the label 'environmental history' is used in this thesis to describe both types of works.

During the 1980s and 1990s there was a spectacular worldwide growth in works identifying themselves as 'environmental history'. Since 1995 in particular there have been numerous environmental histories published covering regions such as Europe, the Americas, Africa, Asia and Australia. Furthermore in the 1990s a European Society of Environmental History was established and another journal dedicated to the burgeoning field, *Environment and History*, began publication in 1996. It is clear that environmental history is now a truly global endeavour which is enjoying a large measure of popularity with researchers from many disciplines.

Because it usually requires a long-term perspective and a broad approach, one of the advantages of environmental history is its interdisciplinary nature. More often than not, studies of environmental history utilise, incorporate and synthesise information from a wide variety of specialised sources, such as the natural sciences (e.g. biology, geology, ecology, geomorphology etc.), prehistory (archaeology, palaeontology), as well as other humanities (ethnography, sociology, cultural studies, even philosophy). The interdisciplinary approach of environmental history can therefore serve as a bridge between the often separate worlds of science and the humanities resulting in useful cross-fertilisation of ideas.

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19 Published in Britain, *Environment and History* describes itself as an 'international journal of environmental history'.
20 This thesis is no exception.
As with other types of history, there exist a variety of theoretical/ideological approaches to environmental history. Some studies emphasise the role of economic relationships and modes of production (from either a Left or Right viewpoint) and how these have impacted on human/environment interactions in the subject area.\textsuperscript{31} Others place emphasis on the social elements of environmental history, taking into account such aspects as the role of race\textsuperscript{22} (for example colonial/indigenous people relations or black/white relations) and gender\textsuperscript{23} (for example the 'eco-feminist' perspective) in the history of human/environment interactions. There are also studies which the role of biological, ecological and/or evolutionary factors in the history of human/environment interactions. Some examples include the concept of biological/ecological 'imperialism' as an explanation for the global dominance of Europeans,\textsuperscript{24} or the role played by specific plants,\textsuperscript{25} or climate in influencing the course of human history.\textsuperscript{26}

As to be expected, the different theoretical/ideological approaches involved have led to many debates amongst environmental historians over which is the


\textsuperscript{23} For the classic example of this approach see Carolyn Merchant, \textit{The Death of Nature: Women, Ecology, and the Scientific Revolution}, San Francisco, 1980.


\textsuperscript{26} For example, see E. Le Roy Ladurie, \textit{Times of Feast, Times of Famine: A History of Climate Since the Year 1000}, New Jersey, 1971, R. Rotberg and T. Raab (eds.), \textit{Climate and History: Studies in Interdisciplinary History}, New Jersey, 1981, and T.M.L. Wigley,
most useful way to interpret and explain environmental history. Unfortunately some theoretical/ideological approaches are applied in a rather too rigid and determinist fashion, which appears to defeat the value which should be obtained by taking a broader and interdisciplinary perspective. However, as with other forms of history, theoretical consensus remains elusive and debate continues.²⁷

**Environmental History in Australia**

There is an incredible variety of Australian studies which deal in some way with the relationship between humans and the environment over time. As Dovers has stated, this diversity makes it difficult to define 'what is and what is not environmental history'.²⁸ Furthermore, unlike the American situation, environmental history in Australia cannot be regarded as a 'discipline' or even 'sub-discipline', but rather a broad and loosely defined area of study in which many different Australian researchers contribute to.²⁹ Even so, the following is a brief review of past work in Australia which can be broadly referred to as 'environmental history'.

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²⁷ Previously much of this debate has been American based and focused, although this is now changing as more studies from other areas appear. See 'A Round Table: Environmental History', *Journal of American History*, special issue, March, 1990, pp.1087-1147, Kendall Ballees (ed.), *Environmental History: Critical Issues in Comparative Perspective*, Lanham, MD, 1985, and 'Theories of Environmental History', *Environmental Review*, Vol. 11, 1987, pp.251-305.

The development of environmental history in Australia has mostly mirrored that of the international scene, with sporadic efforts until the 1970s followed by a substantial growth in environmental history studies up to the present day. In an early review, Bolton traced the origins of Australian environmental history to the environmental overtones evident in the writings of some of the early nineteenth century historians of Australia (including John Dunmore Lang, John West and George William Rusden) who maintained a strong utilitarian view of the environment which reflected the prevailing attitudes of the time.  

However, it is not until the 20th Century that more substantial works appeared which more clearly documented the human use and abuse of the Australian environment. Prior to the 1920s, most academic historians were more interested in the political and economic developments of Australia's short European history. Furthermore, although evidence of ecological impact was available, most historians of this era believed that the study of 'environmental' history was the responsibility of geographers and agricultural scientists.  

However, there was one Australian historian who took more than a passing interest in the environment in the 1920s - William Keith Hancock. W.K. Hancock, was a pioneer of environmental history in Australia and, although

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29 Ibid., pp.7-9. Dovers describes Australian environmental history as being located at a 'confluence of disciplines'.  
31 Ibid., pp.116-117. Although giving little attention to the environmental impact, there were some early histories of land use which considered environmental factors, notably S.H. Roberts, The History of Australian Land Settlement 1788-1920, Melbourne University Press, Melbourne, 1924.
largely unrecognised, one of its earliest practitioners worldwide.\textsuperscript{22} Hancock's second book *Australia* (published in 1930) provided perhaps the earliest example of environmental history in Australia. Although the book as a whole is a sweeping general analysis of the political, economic and cultural life of Australia, Hancock also devoted significant attention to the environmental problems which were the legacy of European settlement. As Bolton has stated, nobody had written before with such clarity about the history of the human relationship with the environment in Australia.\textsuperscript{23} Hancock left Australia in 1933 and only scattered attention was given to environment history over the following two decades, usually as an aside to land use studies.\textsuperscript{24}

However by the late 1950s and early 1960s, environmental history began to receive increased attention from researchers in Australia. This was largely due to the widespread reinterpretations of Australian history which were being made at this time, and the increased recognition and substantial growth of geography at Australia's universities. As Bolton has acknowledged, 'most of the early breakthroughs in environmental history were in fact the work of historic geographers'.\textsuperscript{25} In general, the historical studies produced by geographers at this time dealt mostly with the initial European settlement of

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\textsuperscript{22} I have detailed more fully elsewhere Hancock's important contributions to Australian environmental history, see T.J. Daly 'Discovering Hancock: A Profile of an Australian Environmental Historian', *Limina*, Vol.4, 1998, pp.69-84.


\textsuperscript{25} Williams, op. cit., pp.403-404. Bolton, op. cit., p.120.
the landscape and the subsequent utilisation patterns. One of the first was by a visiting American geographer, Donald Meinig, whose study of the historic use of the northern wheat growing areas of South Australia, *On the Margins of the Good Earth: The South Australian Wheat Frontier 1869-84* (1962) provided a benchmark for later regional studies.\(^\text{36}\)

While historical geographers blazed the trail, some Australian historians, especially those focused on regional history, also began to consider environmental factors far more in their work during the 1960s.\(^\text{37}\) For example, Geoffrey Blainey's classic study *The Tyranny of Distance: How Distance Shaped Australia's History* (1966) was largely an account of the influence of the environment on Australian history.\(^\text{38}\) Increased studies of Aboriginal prehistory in the 1960s also began to assert an influence on Australian history, and demonstrate the significance of the environment during the much


larger part of the continent’s past which occurred before 1788. As elsewhere in the world, the increased interest in environmental history in 1960s also reflected the growing environmental concern in the community. This is partly reflected in the important role played by non-academic historians in Australia, who during this period produced excellent accounts of environmental history which did much to help popularise the subject in Australia.  

During the 1970s more comprehensive and sophisticated accounts of Australian environmental history began to appear which more closely and fully detailed the environmental impacts involved. Once again a leading pioneer was W.K. Hancock, whose regional study, Discovering Monaro: A Study of Man’s Impact on his Environment (1972) remains a classic text and without doubt one of the finest Australian environmental histories ever produced. However, as in previous years, in the 1970s most academic historians in Australia lagged well behind the historical geographers and natural scientists in focusing on the role of the environment in Australian history. Even so, throughout the decade interest in environmental matters intensified in Australia and conferences and symposiums were held to bring

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38 An influential example was D.J. Mulvaney, The Prehistory of Australia, Thames & Hudson, Melbourne, 1969. Also see the conference publication, D.J. Mulvaney and J. Golson (eds.), Aboriginal Man and the Environment in Australia, ANU Press, Canberra, 1971.


40 W.K. Hancock, Discovering Monaro: A Study of Man’s Impact on his Environment, Cambridge University Press, Cambridge, 1972. As well as being a milestone in Australian environmental historiography, this study was also one of the first truly interdisciplinary accounts of an Australian region. For a fuller discussion of the significance of Discovering Monaro, see Daly, op. cit. At the time that Hancock’s study appeared, environmental history in the USA was still in its infancy.
together those researchers with a strong interest in learning more about the environment and its influence (both past and present) on society. Several of these conferences resulted in publications which included important additions to the growing Australian environmental history literature.42

Since the 1970s studies of Australian environmental history have proliferated dramatically and have continued to grow exponentially since then. This is no doubt a response to the increasing public interest in both Australia's environment and its history.43 The following is a brief review of some of the recent major works on Australian environmental history which have been classified by the type of approach used.44

**Approaches to Environmental History**

Studies of environmental history in Australia (and elsewhere) can be usefully classified into three main groups - single-topic, spatial multi-topic and perceptualional, although some overlap exists in some works.

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42 Two influential examples were A. Rapoport (ed.), *Australia as Human Setting*, Angus & Robertson, Sydney, 1972, and G. Seddon and M. Davis (eds.), *Man and Landscape in Australia: Towards an Ecological Vision*, AGPS, Canberra, 1976. The *Man and Landscape* collection was particularly noteworthy for the attention given by various contributors to perceptions of the environment, and because it contained the earliest attempt by a historian (Bolton, op. cit.) to chart the development of environmental history in Australia.


44 Further references to environmental history and/or historical geography studies in Australia can be found in S. Dovers (ed.), *Australian Environmental History*, op. cit., and J.M. Powell, 'Historical geography and environmental history: an Australian interface', op. cit., pp. 253-273. Also see the bibliographies of the books cited in the
These studies focus exclusively on the history of a specific environmental topic or sector (e.g. forests, water resources, fire, pollution, population etc.). Usually, single-topic environmental histories are regional or national in scope, although some are comparative histories with an international focus. As to be expected for a continental-sized country, there have been a large number of single-topic environmental histories produced in Australia. Subjects covered include introduced pest species, fire, soil, pollution, wilderness protection, and wildlife species. Aboriginal environmental history has also been the subject of much further study recently, particularly efforts to document the full extent of Aboriginal use of the environment prior to European arrival and the likely impacts caused. Undoubtedly there are also countless other articles and theses which could be sought out by those intrepid enough.

Historical geographers have previously labelled the single topic approach the 'vertical theme' model (or a version of 'systematic' geography) - see M. Williams, 'Places, Periods and Themes: A Review and Prospect of Australian Historical Geography', Australian Geographer, Vol.11, No.3., 1970, pp.403-416.


An early contribution was G. Blainey, Triumph of the Nomads: A History of Ancient Australia, Melbourne, 1975, but this has since been superseded by more recent...
Some single-topic Australian environmental histories have been more regional in scale. For instance, there have been a number of 'water' histories which have taken a regional, usually State-based approach.\(^{55}\) Most studies of Australia's forest history have also taken a regional approach. Beginning with Eric Rolls's acclaimed *A Million Wild Acres: 200 Years of Man and an Australian Forest* (1981), which gives an account of the Pilliga Scrub area of NSW, the regional forest approach has since been used by several others, notably Tom Griffiths's account of Melbourne's Ash Range.\(^{54}\) Many individual accounts of forest history in Australia have also appeared in the conference publications produced so far by the Australian Forest History Society, founded in 1988.\(^{56}\)

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*Spatial Multi-Topic*

These studies focus in detail on a specific spatial or geographical area (usually at the regional or national level) and chronicle a range of environmental topics of relevance to the history of the subject area.\(^6\) The classic example of this approach already cited above is W.K. Hancock's *Discovering Monaro* (1972). Other writers, especially historical geographers, have also made important contributions using the spatial multi-topic approach, often focusing their attentions on the individual States of Australia.\(^7\) In a novel move away from the State-based approach, Seddon has recently applied the more ecologically appropriate method of using the river catchment area as the basis for his study of the Snowy River, *Searching for the Snowy* (1994).\(^8\)

A few brave souls have applied the spatial multi-topic approach across Australia, providing national overviews of Australia's environmental history. Early contributors were Powell, *Environmental Management in Australia 1788-

\(^6\) Geographers call this approach the study of 'multi-feature formal regions', although more often the features examined by regional geographers are contemporary rather than historical. For a wider discussion, see M.H. Barlow and R.G. Newton, *Patterns and Processes in Regional Geography*, McGraw-Hill, Sydney, 1981, pp.12-32.

1914 (1976), and Bolton, *Spoils and Spoilers: Australians Make Their Environment* (1981). Several more national overviews of Australian environmental history were published in the 1990s. A popular account was Lines's *Taming the Great South Land* (1991) which, although entertaining and impressive in its coverage, suffers somewhat from its simplistic, anti-capitalist tone and its tendency to lay blame for the environmental impacts which occurred during Australian history. More balanced, though less inspired recent accounts are Cary and Barr's *Greening a Brown Land* (1992) and Young's, *Environmental Change in Australia Since 1788*, (1996).

Some Australian prehistorians have also examined the environmental history of the entire Southwest Pacific region in the era before European colonisation. The most recent in this line is Flannery's best seller, *The Future Eaters* (1994), which provides an 'ecological' prehistory of Australia, New

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Guinea, New Zealand and New Caledonia. Although not Australian, a few writers have taken the spatial, multi-topic to its logical conclusion and produced an environmental history of the world. The most well known example is Ponting's *A Green History of the World* (1991).  

**Perceptual**

These studies overlap with cultural history and focus on how the environment or 'nature' (in either a specific location or generally) has been perceived and viewed by people, and how these perceptions of the environment have influenced human culture and attitudes.  

There is a substantial literature dealing specifically with past perceptions of the Australian environment. Often drawing on the works of various artists or writers, these studies demonstrate how the cultural attitudes of the European colonisers influenced the way they initially perceived the Australian environment. They also show how the influence of the 'new' environment of Australia came to gradually modify the cultural attitudes of the settlers, which is a process which continues up to the present day. One of the earliest and

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58 T.F. Flannery, *The Future Eaters: An Ecological History of the Australasian Lands and People*, Reed, Sydney, 1994. In fact, it can be argued that the vast majority of 'prehistory' is in fact environmental history, as the sources used (e.g. archaeological evidence) primarily provide information on human interactions with their environment and little more.


In the 1990s, a few edited collections of environmental history essays were published in Australia which contained examples of all three approaches, most notably Garden’s *Created Landscapes: Historians and the Environment*, (1993), and Dovers’s *Australian Environmental History: Essays and Cases* (1994). However, regardless of the type of approach used, to date environmental historians in Australia have mostly reflected the international

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trend of giving far less attention to urban or city-based environmental history. All to the lack of specific studies on the history of the 'built' environment, is the paucity of works on Australia's cultural landscapes and 'heritage'. In addition, some topics (or 'sectors') have received far more attention than others. For example, forest history studies continue to multiply, yet the history of Australia's coastal and maritime environment has so far been largely ignored.

The theoretical approaches used so far in Australian environmental history have also been far more limited than the topics covered. Quite a few studies have employed ecological or evolutionary interpretations of the history of environmental change in Australia, which downplay or discount the influence of 'social' factors. While there have been few environmental histories in Australia which have closely examined the interactions between environment and class, economics, ethnicity or gender, equally most historical studies of

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8 Dovers, 'Australian Environmental History: Introduction, Review and Principles', op. cit., p.8. Powell, 'Historical Geography and Environmental History', op. cit., p.261. There is however a large urban history literature in Australia some of which covers important environmental issues and themes.


71 I have previously made a contribution to this neglected area of Australian environmental history, see T.J. Daly, 'Seals and Sea-Elephants: A Tragedy of the Australian Frontier', B.A. (Hons.) Thesis, School of History, University of NSW, Sydney, 1994.

77 This is probably due to the large contributions made by geographers, archaeologists and others of a more 'scientific' bent in Australia. A potential problem with over-emphasising the biological or ecological factors in environmental history, is the possibility of too easily sliding into environmental determinism - see J. Ope, 'Environmental history: pitfalls and opportunities', in K.E. Bailes (ed.) Environmental History: Critical Issues in Comparative Perspective, Latham MD, 1985, pp. 22-35.
class, economics, ethnicity or gender in Australia have yet to incorporate a serious environmental component.\

**An Environmental History of the Blue Mountains**

The subject of this thesis is an environmental history of the Blue Mountains of New South Wales, Australia. As with any regional study, it is important to define the precise geographical area covered, however defining the study area for this thesis has proved problematic, as the 'Blue Mountains' are an ill-defined and indistinct geographical entity. There is no universally accepted definition of where the Blue Mountains of Australia begin and end. Defining the northern and southern boundaries of the region is particularly troublesome. In popular imagination, the 'Blue Mountains' is usually viewed as all of the area of the Eastern Highlands (inaccurately named the 'Great Dividing Range') that lies to the west of Sydney, and which roughly stretches south to link up with the also ill-defined 'Southern Highlands' and north to somewhere in the Wollemi region near the Colo River.

While the precise boundaries remain unclear, it is possible to gain a broad idea of the overall extent and limits of the Blue Mountains region, by noting those neighbouring areas which are not usually considered part of the Blue Mountains. For example, in most peoples' minds, the area east of the Nepean River and Lake Burragorang is considered outer Sydney, and the actual eastern boundary of the Blue Mountains is generally placed at the obvious

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73 Powell, 'Historical Geography and Environmental History', op. cit., p.265.
geographical feature of the Lapstone Monocline, where the land begins to climb abruptly. Towns to the west of Sydney, such as Lithgow and Oberon (although still situated on the eastern highlands) are not usually considered part of the Blue Mountains, so the western boundary of the region must lie to the east of these locations (in the Coxs River valley). In the north, the Blue Mountains do not extend as far as the Goulburn and Hunter Rivers, therefore the northern boundary of the region must lie somewhere in the Wollemi area (among the upper tributaries of the Colo River). In the south, the Mittagong-Goulburn area is clearly not part of the Blue Mountains, so the southern boundary of the region must lie somewhere among the upper tributaries of the Wollondilly River.

Keeping these broad indicators in mind, this study has delineated a specific geographical region for the 'Blue Mountains' (see Map 1). For the purposes of this study, the region of the 'Blue Mountains' is broadly defined as most of the area lying between longitudes 150° 00' E and 150° 45' E and latitudes 33° 15' S and 34° 15' S. In defining the precise boundaries of the study area, natural geographical and topographical features have been used (such as watercourses, contour lines, mountain peaks) in preference to human settlement features (such as roads or local government area boundaries). Due to the complex terrain in the southwest of the area, several straight lines between mountain peaks were used to form the western boundary."

"The study area is defined as all of the area: west of the Nepean River and Lake Burragerang; south of the Colo River and its tributaries Wollangambe and Nayook Creeks; north of the Wollondilly River and a straight line drawn from its junction with Jocks Creek to Mount Werong; and east of Cockatoo Hill, Bald Hill, Dargans Creek,
recognising that these boundaries have been arbitrarily set, the area chosen includes the vast majority of locations and features which are generally perceived to be part of the Blue Mountains.

As with many regional environmental histories, the time period covered is necessarily a long one, and this study embraces three distinct eras - the pre-human history of the Blue Mountains (ca. 300 million years ago to ca. 100-60,000 years ago), the Aboriginal prehistory of the Blue Mountains (ca. 100-60,000 years ago to 1788) and the history of the Blue Mountains since 1788. The major focus of the study is the period 1788-1988, as this is the era of greatest environmental change in the Blue Mountains in recent millennia. The primary purpose of this study is to provide an 'environmental' history, and not merely a 'social', 'cultural', 'economic' or any other type of history camouflaged in green. This thesis therefore treats the environment as the core subject of historical focus and generally treats humans as a combined group in their relationship with it.\(^7\)

The overall approach used in this thesis is a version of the spatial multi-topic approach.\(^7\) In this case, the spatial area covered is the Blue Mountains region (as defined above) and this study documents many aspects of the history of

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\(^7\) Generally, I have used W.K. Hancock’s *Discovering Monaro* as both a model and an inspiration for this study.

River Lett, Cox’s River and Long Swamp Creek, and east of a line between Table Mountain, Oberon Hill and Mount Werong. For precise boundaries see Map 1.

\(^7\) It is recognized that the ways in which people of different cultures, ethnicity, class or gender have used and viewed the Blue Mountains has varied, however a detailed examination of these differences in addition to providing a comprehensive overview of the entire region’s environmental history was considered beyond the scope of this study. Others are invited to more fully investigate these topics as they relate to the Blue Mountains.
the human-environment interaction within this area. However, this thesis has used an original conceptual framework which combines a spatial multi-topic approach with the narrower focus of a single-topic approach. This framework, which I call the 'elemental' approach, has been achieved by using the four primary physical elements - earth, water, fire, air - with the addition of a fifth living element - life - as the central, overarching themes with which to interpret the environmental history of the Blue Mountains.

As outlined above, several previous environmental histories in Australia have used an individual primary element (e.g. fire or water) as the central theme for their narrative, however they have tended to overemphasise the significance of just one element of the human-environment interaction. Instead, this thesis represents the first attempt to more thoroughly examine the combined influence of a group of environmental 'elements' on the history of a specific geographical region.

Although undoubtedly based on earlier traditions, it was the ancient Greek philosophers who first developed the concept of the four primary elements as the basis of the cosmos. Empedocles in particular, has been credited with first proposing the doctrine that everything in nature was produced by the mixture and separation of earth, water, fire and air. Aristotle later refined this idea and

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78 The elemental approach for this thesis was developed in early 1996. In 1997, David Suzuki published The Sacred Balance: Rediscovering Our Place in Nature, (Vancouver, 1997) in which he also independently used the concept of the 'elements' (also adding chapters on love and spirituality) to structure his book on the human relationship with the environment. Although Suzuki's study deals much more with contemporary issues, it confirms the value of the elemental approach for environmental studies, including environmental history.
added a fifth element - 'aether' (celestial space). Although loath to quibble with Aristotle, I have substituted his fifth element for 'life' - the non-human biota of the planet (i.e. plants and animals) which have been of more direct importance in history. In a chapter devoted to each element, this thesis shows how earth, water, fire, air and life have not only formed the Blue Mountains environment, but also significantly shaped the entire history of the region and the human experience with it. Any attempt to understand the history of the Blue Mountains must take into account the fact that earth, water, fire, air and life have been key elements of the past.

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Chapter One

Earth

Like all of the Australian continent, the environmental history of the Blue Mountains has its origin in ancient rocks. Rocks far older than even Australia itself. Well before the great, southern hemisphere super-continent of Gondwana had separated itself from its northern counterpart, rocks were being created which would one day form the deepest foundations of the Blue Mountains. To understand the environmental history of this region requires not only an appreciation of its geology, but also a recognition of the part played by the earth in moulding the landscape and history of the mountains.

Making Mountains

The Blue Mountains of today rest on basement rocks comprised of time-worn granite and various folded sedimentary rocks aged between 500 to 300 millions years old. Although generally buried deep beneath the earth, some of these rocks now lie exposed at the bottom of many of the broad valleys in the western region of the Blue Mountains, including the Cox River valley. From the various fossils imbedded in them, we know that many of the sedimentary layers were laid down under an ancient sea, which at times was shallow, clear and warm enough to allow a myriad of minute marine organisms to flourish. At different times and places volcanoes and glaciers were also active, leaving
their tell-tale marks behind in the landscape. One such volcano existed at Yerranderie around 370-390 million years ago. As its lava pushed its way to the surface of the earth it mingled with and heated the existing strata, metamorphising large areas into new rocks. In one specific area, steaming solutions gathered together which, as they slowly cooled, solidified into a rich seam of silver and lead.

Around 270-250 million years ago, massive earth movements resulted in folding and faulting to the west and north-east of the Blue Mountains region, which created a large depression in the earth now known as the Sydney Basin. In the ensuing millions of years of the late Permian and Triassic Periods (between 250 and 190 million years ago), large rivers carried and deposited into the Sydney Basin successive waves of sediment eroded from upland areas in northern and western NSW. Throughout the long period involved, the source and type of material, and the manner in which it was deposited varied greatly, thus influencing the types of rocks produced. At different times, the basin region comprised wide river deltas, lakes, swamps and intrusions from the sea. Over an extensive area (which included all of the present day Blue Mountains), layer upon layer of coarse quartz sand and fine mud particles were slowly deposited and eventually buried as subsidence occurred in the basin. Under enormous pressures these materials were

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compressed, moulded and cemented into hard rocky beds of sandstone, 
shale, claystone and conglomerate, which varied in thickness, hardness and 
permeability. In some parts, layers of decayed prehistoric plants, dinosaurs 
and other once-living matter created seams of coal and carbonaceous shale. 
In others, former marine life were smothered, crushed and moulded into 
limestone.⁴

Geologists today identify three separate groups (or stratigraphic divisions) of 
sediments from the Triassic period, which now form the upper-most layers of 
the present-day Sydney Basin and most of the Blue Mountains. The deepest 
and oldest group of Triassic sediments is known as the Narrabeen Group, 
which extends over 800 metres thick at its widest point. These layers rest on 
coal-bearing sediments of Permian age known as the Illawarra Coal Measures. 
Deposited later and now lying on top of the Narrabeen Group is another 300 
metres of layered sandstone called the Hawkesbury Sandstone. A further 300 
metres of sandstone and shale known as the Wianamatta Group was then laid 
down and now lies on top of this (see Figure 1.1)⁵.

By the Jurassic Period (190- 145 million years ago), all of what is now the 
continent of Australia was a part of the eastern half of Gondwana.⁶ In relation 
to the Blue Mountains, geology can tell us little of this period or in fact what

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⁴C. Bembrick, 'Geology of the Blue Mountains, Western Sydney Basin', in C. Herbert 
⁵It is the eroded remains of the Hawkesbury and Narrabeen sediments which make 
up the spectacular sandstone cliffs of the Blue Mountains. R.H. Goodwin, 'Triassic 
Stratigraphy - Blue Mountains, New South Wales', Journal and Proceedings of the 
Bembrick, op. cit., 138-139, 141-161.
occurred in the region up until the beginning of the Tertiary period (65 million years ago). This is because whatever geological evidence did exist has since been eroded away. There is some evidence that at least one kilometre of further sediments once lay on top of the Triassic rocks of the Sydney Basin but has since been stripped away. It would appear that the Sydney Basin continued to be an area of deposition (with occasional volcanic eruptions) up to well into the Cretaceous Period (145 to 65 million years ago).

**Drifting and Lifting**

> 'All are now ready; it only needs the mighty power that the earth holds pent up within her, to come into play, and lift the accumulated sediments above the sea.' Rev. J. Milne Curran (1898)*

If we ignore the actual origins of the rocks, the mountains we now call the Blue Mountains are really a creation of the Cretaceous. Moreover, the rise of the Blue Mountains is closely linked to the fall of Gondwana. As the southern super-continent of Gondwana split into more and more isolated fragments, massive geological changes occurred. These affected the eastern seaboard of Australia which during the late Cretaceous (80 to 60 million years ago) rifted and slowly drifted apart from the continental plates carrying New Zealand and New Caledonia away to the east. As the seafloor between the continental fragments spread to form the Tasman Sea, broad warping of the earth

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occurred in eastern Australia. This is now generally believed to have provided the impetus for the uplift of the Great Dividing Range of eastern Australia, including the spur in the southeast of the mountain range called the Blue Mountains.

The precise timing and manner of the uplift of the Blue Mountains is still uncertain, and remains a hot topic of discussion amongst many geologists. Early writers believed that the uplift commenced during the mid-Tertiary period (around 35-40 million years ago) with a final rise in only the last few million years. However, some geologists now believe that most of the uplift of Australia's south-eastern highlands occurred much earlier, during the period of 90 to 60 million years ago. This broadly coincides with the creation of the Tasman Sea as Australia and New Zealand drifted apart.

Useful local evidence of the process of uplift is provided by the broad fold in the earth which forms the eastern edge of the Blue Mountains. Commonly called the Lapstone Monocline, this prominent geographical feature forms an east-facing escarpment (reaching a height of 600 metres) which runs roughly north to south between the Colo and Warragamba Rivers. It rises steeply from

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12 See for example Wellman, op. cit. and Jones and Veevers, op. cit. Lambeck and Stephenson have even suggested that the uplift did not happen at all but that the current mountains are the erosional remains of a landscape over 200 million years old. (K. Lambeck and R. Stephenson, 'The Post-Palaeozoic Uplift History of South-Eastern Australia', Australian Journal of Earth Sciences, Vol.33, 1986, pp.253-270).
south to north and along its length consists of a several interrelated folds and faults which have deformed the Triassic sedimentary rocks of the region.\textsuperscript{13} It has long been believed that the formation of this distinctive landform resulted from tensions in the earth during the general uplift of the Blue Mountains plateau. As David noted over a century ago, the brittle Hawkesbury Sandstone layers of the Lapstone Monocline have been bent very sharply but without significant fracturing of the rocks. This indicates that the process of folding was extremely slow.\textsuperscript{14} Recent dating of sandstone from the Lapstone Monocline indicates that the monocline is probably over 15 million years old, if not significantly older.\textsuperscript{15}

While much of the geological history of the Blue Mountains remains obscure, based on current knowledge it seems that the region was progressively uplifted (either in stages or continuously) during the last 90 million years. Significant elevation had certainly been achieved by at least the late Eocene (around 40 million years ago).\textsuperscript{16} Regardless of the precise details involved, it was during the course of the Tertiary Period (from 65 to 2 million years ago) that the Blue Mountains came into existence as a distinctive highland landscape. In fact the name Blue 'Mountains' is a misnomer. The main landform in the area is actually an upturned, saucer-shaped plateau (or

asymmetrical dome) which is tilted downwards at an angle of 2-3° from west
to east with lesser slopes to the north and south." This tilt of the rocks (and
the work of erosion) ensures that as you travel today from east to west in the
Blue Mountains the surface rocks you encounter become progressively older.

In addition to providing the building blocks for the Blue Mountains, the
various types of rocks also determine the types of soil to be found in the
region. Comprised of different sized particles and varying minerals, these
rocks form different types of soils as they weather and break down. On the
plateau areas of the Blue Mountains, the soils derived from the Hawkesbury
and Narrabeen sandstones are large-grained, sandy and retain little moisture.
In the valleys (such as the Grose and Jamison Valleys), the soils are a mixture
of particles derived from shale and claystones, as well as the sandy soils
washed down from the plateaus above. Wherever soils have been primarily
derived from granite, shale and basalt (such as in the west of the region and
on isolated volcanic outcrops) they have formed red and brown podzolic
loams. Because of their small grains and ability to retain water and nutrients,
these soils provide the best locations for luxurious plant growth.\textsuperscript{16}

As well as comprising the ancient rocks and soils of the Blue Mountains, the
earth has been highly significant in the human relationship with the region.

\textsuperscript{16} Mosley, \textit{op. cit.}, p.19.
\textsuperscript{17} Mosley, \textit{op. cit.}, p.20, Branagan et. al. 1976, \textit{op. cit.}, p.47.
\textsuperscript{18} D.P. King. \textit{Soil Landscapes of the Katoomba 1:100 000 Sheet}, Sydney, 1994, pp.2-3.
D. Morrison, 'A Voice From the Country' in P. Stanbury (ed.), \textit{The Blue Mountains:}
Touching the Earth - The First Mountaineers

'It is a story of people, not of stones, even if stones are the key to that story'. Eugene Stockton (1993)\(^{19}\)

There are few topics in Australian prehistory more widely debated than the question of when people first arrived in Australia. With every passing year and in the light of new evidence, the estimated dates of the first arrival of Aboriginal people are pushed further back in time. Although controversial, recent research suggests that Aboriginal people may have been living in northern Australia as far back as 116,000 years ago.\(^{20}\)

As with the rest of Australia, it is not known for certain when the first humans entered the Blue Mountains. Aboriginal people generally believed themselves created from the earth in the Dreamtime and therefore always an intrinsic feature of the Blue Mountains environment. The scientific view, based on current evidence, is that people first occupied the Blue Mountains at least 12-15,000 years ago, if not much earlier. The evidence for these dates, and for everything else that is known about the pre-contact Aborigines of the Blue Mountains, has come from the study of the earth. From decades of searching caves and rockshelters, and digging, sifting and collecting, archaeologists have been able to 'read the earth' to learn about the past inhabitants of the


area.\textsuperscript{21} The earth has provided much knowledge of Aboriginal life by yielding up stone implements, marks on rocks, and even tiny specks of carbon with which to date the discoveries. So far over 700 Aboriginal sites have been identified in the Blue Mountains, with many locations having over 5 sites per square kilometre (see Figure 1.2 and Table 1).\textsuperscript{22}

<table>
<thead>
<tr>
<th>Type of Site</th>
<th>Upper Blue Mountains</th>
<th>Central Blue Mountains</th>
<th>Lower Blue Mountains</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campsites, sheltered</td>
<td>54</td>
<td>44</td>
<td>55</td>
<td>153</td>
</tr>
<tr>
<td>Campsites, open</td>
<td>54</td>
<td>39</td>
<td>66</td>
<td>159</td>
</tr>
<tr>
<td>Cave Paintings</td>
<td>35</td>
<td>51</td>
<td>39</td>
<td>125</td>
</tr>
<tr>
<td>Rock Engravings</td>
<td>14</td>
<td>35</td>
<td>8</td>
<td>57</td>
</tr>
<tr>
<td>Axe Grinding Grooves</td>
<td>75</td>
<td>49</td>
<td>46</td>
<td>170</td>
</tr>
<tr>
<td>Stone Arrangements</td>
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<td>24</td>
<td>7</td>
<td>39</td>
</tr>
<tr>
<td>Scarred Trees</td>
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<td>1</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Quarries</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>244</strong></td>
<td><strong>244</strong></td>
<td><strong>222</strong></td>
<td><strong>710</strong></td>
</tr>
</tbody>
</table>

Source: E. Stockton, Blue Mountains Dreaming: The Aboriginal Heritage, 1993, p.59, Table 3.2.

The earliest evidence of Aboriginal occupation in the Blue Mountains region comes from the ancient beds of the Nepean River. A number of stone choppers and steep-edged scapers has been found in the alluvial gravel beds of the Cranebrook Terrace, close to the eastern edge of the Blue Mountains. These artefacts were dated between 40,000 to 47,000 years old, which appears to indicate that Aborigines occupied the area at this time.\textsuperscript{23} The next oldest evidence of Aboriginal occupation of the mountains themselves comes from a rock-shelter on the eastern side of King's Tableland (situated 800 metres above sea-level). Here the lowest layers of sediments provided a single

\textsuperscript{21} Stockton, op. cit., p.43.

radiocarbon date of approximately 22,000 before present.\(^\text{24}\) However, due to the slender nature of the evidence involved, both the Cranebrook Terrace and King's Tableland dates have not been generally accepted by archaeologists.\(^\text{25}\)

Far more reliable evidence of Aboriginal occupation of the Blue Mountains during the period of 12-15,000 years ago has been obtained from charcoal excavated at Walls Cave near Blackheath (situated 910 metres above sea-level), Lyre Bird Dell near Leura (915 metres above sea level), and from the upper layers at King's Tableland.\(^\text{26}\) Another site near the junction of Shaws Creek and the Nepean River (known as KII rock shelter) has so far provided evidence of continuous occupation since 14-15,000 years ago.\(^\text{27}\) Another archaeological site which has been dated at 12,000 years old is Noola rock-shelter, which is situated in a valley near the northwest edge of the Blue Mountains.\(^\text{28}\) Many more occupation sites have been found in the Blue Mountains region dating from 7-8,000 years ago up to the time of European contact. These include rock shelters at Horseshoe Falls near Hazelbrook,

\(^{22}\) G.C. Nanson, R.W. Young and E.D. Stockton, 'Chronology and Palaeoenvironment of the Cranebrook Terrace (near Sydney) containing artefacts more than 40,000 years old', *Archaeology in Oceania*, Vol.22, No.2, 1987, pp.72-78.  
^{25}\) Stockton and Holland, op. cit., pp.38-42.  
^{26}\) J.L. Kohen, E.D. Stockton and M.A.J. Williams, 'Shaws Creek KII Rockshelter: A Prehistoric Occupation Site in the Blue Mountains Piedmont, Eastern New South Wales', *Archaeology in Oceania*, Vol.19, 1984, pp.57-73. Nanson et. al, op. cit., p.76. The KII record of occupation is likely to be extended back in time as the site has yet to be fully excavated.  
Springwood Creek, Lapstone Creek and in several places in the nearby Capertee Valley.²⁹

From the archaeological finds so far, it is clear that Aboriginal people have been inhabiting the Blue Mountains since at least 12-15,000 years ago, and possibly over 40,000 years ago. If the date of Aboriginal arrival in Australia is confirmed to be over 100,000 years ago, then these dates for the first occupation of the Blue Mountains are likely to be underestimates.

When Aborigines first arrived in the Blue Mountains they encountered a rugged and difficult terrain. This was not easy new ground to occupy. It is likely that they first moved into the area along the watercourses which provided easy access and abundant resources. Later, perhaps first as seasonal visitors, they moved into the steeper highland areas. It is not known if these first Blue Mountains explorers came from the coastal region to the east, or the inland rivers to the west, or from many directions at once.³⁰ Bowdler has argued that early Aborigines were largely coastal and riverine dwellers, whose later move into the mountain areas of eastern Australia was in response to rising sea-levels and the utilisation of new staple food sources.³¹

In their long occupation of the Blue Mountains, Aboriginal people made much use of the resources provided by the earth, known as 'daoure' and 'pemul' in the local languages of the area. Rocks were one of the basic elements of their technology. From selected specimens of stone Aboriginal people fashioned a wide range of hand-held tools and implements. These included ground-edge axes, hammerstones, pounding stones and a variety of scapers, knives and choppers. Small, finely pointed stone flakes (known as microliths or Bondi Points) were also used, but in what manner remains a mystery. Some stone tools were hafted to wooden handles using gumtree resin and bark string. Many stone implements were in turn used to produce and sharpen wooden tools and implements.  

Evidence of all these stone implements (and the waste material generated in their production) have been found in the Blue Mountains, and in many parts of the region flakes of worked stone are widespread. Although quartz was locally available on the sandstone ridges, the hard basalt and chert stone required for most of these implements was obtained from the nearby river beds and wide valley floors and carried up to the plateau to be worked. Specific evidence of this has been found by Stockton on a ridge overlooking the Grose River near Springwood. At this site waterworn stones were brought up from the river below and worked near a shallow rockpool before being transported to the living area on the main plateau.  

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34 To create a cutting edge or point, the chert stones were struck together until flakes of suitable size and sharpness were obtained. Basalt pebbles were ground to form an
The earth was not only a source of tools - it also provided the means to sharpen and perfect them. By constant grinding and rubbing, with added water for lubrication, various tools (both stone and wood) were ground down to a smooth and sharp edge. The rocky sandstone ledges of the Blue Mountains proved ideal locations for finishing tools, as the many sites with axe grooves attest. At least 170 axe grinding groove sites have so far been identified in the region (see Table 1).

Changes in the type and abundance of stone tools and other artefacts have led archaeologists to conclude that significant changes occurred in Aboriginal technology over the thousands of years of their occupation of the Blue Mountains. The oldest stone artefacts tend to be fewer in number but larger, thicker and roughly made, and these have been seen as part of an Australia-wide 'Core Tool and Scraper Tradition' (or 'Large Tool Assemblages') which existed between 15,000 to 5,000 years ago. Around 4,000-5,000 years ago, there is noticeable change in the artefacts produced with the average size decreasing while the total number and density increases significantly. These smaller tools are thinner, specialised and more finely flaked, and have been labelled as the 'Small Tool Tradition' (or 'Small Tool Assemblages'). This transition from large to small stone tools has been linked to the acquiring of new cultural ideas and a probable overall increase in the Aboriginal population in the Blue Mountains in the last 5,000 years.  

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Even so, stone tool technology was only one of the many ways in which the Aborigines made use of the earth. The topography of the Blue Mountains had many advantages as well. Ridgetops and peaks provided lookouts and secure vantage points from which to monitor the movements of game, friends and foes, and send and receive signals. It is likely that parts of the Blue Mountain range also formed natural boundaries between the territories of neighbouring Aboriginal groups. This seems particularly likely considering that across Australia a high degree of correlation has been observed between tribal limits and various ecological and geographical boundaries, such as mountain divides, ranges and waterways.\(^*\)

However, one of the most important advantages of the mountain terrain were the numerous hollows in the earth which provided Aboriginal people with protected campsites. Throughout the Blue Mountains, caves and rock overhangs were used as shelter from the elements, enemies and predators. Large boulders and cave walls likewise provided the main backdrops for Aboriginal artistic expression and ceremonial activities in the Blue Mountains. For example, rock engravings have been identified at over 50 locations in the region, while some 125 cave painting sites have been recorded (see Table 1). As elsewhere in the Sydney Region, most of the rock engravings are simple figurative outlines of vertebrate animals, including kangaroos, echidnas, birds and fish, as well as animal tracks. The method used was to drill a series of holes in the sandstone surface with a pointed stone and link them into a

continuous, smooth groove following the main outline of the design. Single lines were then used to add finer details (such as fingers and ears).\textsuperscript{57}

On cave walls and ceilings, Aboriginal people have also left behind a wide range of paintings. As with the engravings, the main subjects depicted are various animals, including kangaroos, wallabies, snakes, goannas, wombats, koalas, echidnas and platypus. Human figures have also been painted. Stencils, particularly hand stencils, are common in the Blue Mountains. These were produced by blowing or dusting the pigment over a hand (or an object such as a boomerang or axe) which had been placed against the rock wall or ceiling. Some caves, such as the Red Hand Cave near Glenbrook, have many examples of these artworks.\textsuperscript{58} As well as being the canvass, the earth was likewise the source of paint for both Aboriginal artists and participants in ceremonies. From the clay soil was obtained the red, yellow and white ochre which, along with charcoal and ash, was used for painting skin and stone. To brighten the colours of the paint, the earth obtained from areas such as the Burrarorang valley was roasted in a fire before being mixed with animal fat or grease.\textsuperscript{59} Along with engravings and paintings, various stone arrangements have also been found in the Blue Mountains whose purpose and meaning remains unclear. One of these is likely to be the cairn of piled stones near Linden which became known as 'Caley's Repulse' and in the past been erroneously credited to various early European explorers. It appears that the

\textsuperscript{57} E. Stockton, 'Aboriginal Art in the Blue Mountains', in Stockton, Blue Mountains Dreaming, \textit{op. cit.}, pp.64-66.

\textsuperscript{58} \textit{Ibid.}, pp.64-68.

rock engravings, stone arrangements and cave paintings were regularly re-worked and rejuvenated by Aboriginal people as part of on-going ceremonial activities.\textsuperscript{40}

The differences in type and distribution of Aboriginal art sites in the Blue Mountains has been used to suggest that the region was one where cultural/artistic influences from the coastal east and the inland west met and intermingled. This suggests that the area may have formed a shared zone or boundary between coastal and inland Aboriginal tribes.\textsuperscript{41} Although its true meaning remains obscure, Aboriginal art in the Blue Mountains is clearly an example of how Aboriginal people deliberately modified the environment as a means of cultural expression. The images they produced using the earth around them connected them both physically and symbolically with the Blue Mountains environment. This connection with the earth continued even in death as the many documented burial mounds in the region attest.

In addition to the many aspects of their physical relationship with it, the earth of the Blue Mountains must also have possessed strong symbolic and spiritual meaning for Aboriginal people. For example, the terrain provided the stage for the legendary actors of the Dreamtime, and according to Tindale, 'most prominent hills became associated in some way with totemic beliefs'.\textsuperscript{42} While little reliable information has survived on their mythology, there appears to have been a traditional Aboriginal belief that certain rocky features

\textsuperscript{40} Stockton, 1993, \textit{op. cit.}, pp.64–68, 120.
\textsuperscript{41} \textit{ibid.}, p.68. Robertson in Stanbury, \textit{op. cit.}, p.38.
\textsuperscript{42} Tindale, 1974, \textit{op. cit.}, p.64.
of the Blue Mountains landscape (such as Orphan Rock and the Three Sisters) were the remains of legendary characters who had been magically turned to stone. Another local Aboriginal story apparently explained the formation of sandstone from loose sand, while several other legends featured fearsome predatory creatures known as 'Rock Dogs' and 'Gobungs', which were said to inhabit caves and rocky clefts. It is possible that their symbolic connection with the earth was further reinforced when Aboriginal people welcomed visitors to the Blue Mountains. According to Mathews, some Aboriginal groups in southeastern Australia would mix a little earth into a water vessel before giving it to a visitor to drink. The guest was then permitted to consume the food and water available in the territory.

Despite their multi-faceted involvement with it over the millennia, Aboriginal people quite literally only scratched the surface of the earth. With the limited technology available to them, the Aborigines could leave their marks on the earth but few permanent scars. Although long-lasting, their association with the earth of the Blue Mountains was generally delicate not destructive - a touch not a gouge. However, equally important were their associations with the other elements (discussed in the following chapters). In some of these cases, the touch was not so gentle.

While 'reading the earth' has told us much about the Aboriginal occupation of the Blue Mountains in prehistoric times, there is still far too little known for

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certain about this lengthy and significant period in the region's environmental history. At the time of European contact with Australia, it appears that the Blue Mountains area comprised the territories of two distinct Aboriginal language groups - the Dharug in the north and east of the region (whose territory also included the western Sydney region) and the Gundungurra in the south and west (whose territory included the Wollondilly River and the southern highlands area extending to Goulburn). As noted above, it is currently believed that the central Blue Mountains ridge was actually a shared zone utilised by both these Aboriginal groups for both ceremonial purposes and everyday resource use (See Figure 1.3).40

After occupying the Blue Mountains exclusively for many thousands of years, Aboriginal people were eventually confronted with the steady invasion of their mountain territory by a foreign pale-skinned people who first settled at Sydney Cove in 1788. Like the Aborigines before them, these new immigrants came seeking to exploit the earth and claim new ground. Furthermore, they had no intentions of sharing it with the original inhabitants.

**Over the Earth**

The first Europeans to set eyes on the Blue Mountains saw merely a mysterious, blue-tinged mountain range on the western horizon. Within months of the arrival of the First Fleet at Port Jackson, Governor Arthur

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Phillip had named these 'hills', and expressed a desire to shortly 'explore their summits'. But this earlier optimism soon turned to despair when the real nature of the region's terrain became apparent to the new settlers. In July 1789, Phillip's attempt at inland exploration was halted when he reached the foot of the Blue Mountains. Year by year, the Blue Mountains became less of a mystery and more of a problem - a physical and mental barrier to European invasion and settlement. Increasingly, the attention of the European settlers shifted away from the mountains themselves and instead focussed on discovering a viable route through this seemingly 'impenetrable barrier'. Their first objective was to find a way over the earth.

Finding the Way

'...when they returned they would know the difference between walking upon a good road and the Blue Mountains...' George Caley (1804).

Between 1789 and 1812, no less than nine explorations of the Blue Mountains were made by inquisitive Europeans. There were undoubtedly many other 'unofficial' exploratory forays into the region for which no records exist. The published accounts of all nine journeys are unanimous in their

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* For example, Mathew Everingham wrote in 1795 that besides Dawes there were 'many others' who had attempted to cross the Blue Mountains (M. Everingham,
descriptions of the difficulty of most of the terrain encountered. The first known Europeans to actually enter the Blue Mountains were several men under the command of Lieutenant William Dawes, who in December 1789 travelled in a straight line from the Nepean River to somewhere in the vicinity of Linden. For 11 miles of 'unprofitable country', Dawes's party met with nothing but 'ravines that were nearly inaccessible', and their route involved crossing 'a line of high and steep rocky precipices, which required much caution in descending, as well as labour in ascending'. In the company of Watkin Tench and two soldiers, Dawes made another short foray in 1791 to the summit of Bowen Mountain. In 1793 Captain William Paterson led a group well-equipped with small boats, graplins and rope-ladders which explored ten miles of the Grose River Valley apparently to the Junction of Wentworth Creek. According to Peron, 'their difficulties increased at every step' and 'no sooner had one summit been escaladed, than others appeared still more barren and difficult of access'.

'Letterbook' 1795, in V. Ross (ed.), *The Everingham Letterbook*, Sydney, 1985, p.49. Peron wrote in 1809 that between 1791 and 1793 nothing was done to further explore the area 'excepting some few journeys of individuals, not less abortive than the preceding' (F.M. Peron, *A Voyage of Discovery to the Southern Hemisphere etc.*, London, 1809, p.287). It has been suggested that John Wilson travelled up the Warragamba River valley in 1793-1797 and was familiar with the upper Cox River area to the west of the mountains (C. Cunningham, *Blue Mountains Rediscovered*, Kenthurst, 1996, pp.76-77). In 1805, Governor King wrote of a report he had received from exploring 'bushrangers'. He refused to believe their claim to have crossed the mountains (P. King to Lord Camden, 1 November, 1805, *HRA*, Vol.V, p.593). It was also well known that many escaped convicts travelled inland and entered the Blue Mountains searching for a mythical other settlement (see *Sydney Gazette*, 3 July 1803 p.2, 18 August 1804 p.3 and 12 June 1808 p.2).


Other expeditions into various parts of the Blue Mountains region were led by Henry Hacking (1794), Mathew Everingham (1795) and George Bass (1796). 53 Although little is known of Hacking's and Bass's journeys, the accounts of Peron and Collins both greatly stress the difficulties these explorers encountered. Despite claiming to have penetrated 20 miles further than previous explorers, Hacking was still unable to 'pass those impregnable barriers' and the 'wild and inaccessible kind of country'. Although equipped with grappling gear and ropes to ascend and descend the 'horrible perpendicular mountains' and precipices, Bass was also forced to turn back from his 'perilous' excursion after 'fifteen days of fatigue and unparalleled danger'. Peron summed up the contemporary opinion of the Blue Mountains as follows, 'From north to south these mountains formed an immense and impregnable bulwark, most frightfully barren'. 54

In 1795, Everingham and two companions travelled into the area of the Blue Mountains north of the Grose River, apparently reaching Mount Irvine or Tomah before retracing their steps. On viewing the depths of the Grose Valley, Everingham commented that it was frightful to look down the 'dreadful precipice that divided us from the mountains it made the beholder giddy. No mortal I am sure could ever cross it.' Everingham's account also describes

53 John Wilson also led two explorations into the Southern Highlands in 1798. Despite the spurious claims of Whitley (T. Whitley, 'The Reputed Passage of the Blue Mountains in 1798', JRAHS, Vol.1, 1904, pp.186-191) and Cunningham (op. cit., pp.62, 74-85), these journeys cannot seriously be considered as taking place in the 'Blue Mountains'. Wilson pioneered a southern way around (not through) the Blue Mountains, which is now the present day route followed by the Hume Highway. Nevertheless, as both of the 1798 Wilson expeditions clearly took place outside of the boundaries of the Blue Mountains as defined by this study they are not discussed here.

'terrible chasms', 'rocky and barren' scenery, 'lofty and dreadful' chains of mountains, and concludes with his belief that the Blue Mountains 'appear such formidable barriers of Nature'.

Two of the most detailed and interesting accounts of early Blue Mountains exploration are those by Francis Barrallier (1802) and George Caley (1804). These too provide ample evidence of the earthly difficulties encountered. Barrallier's party ventured into the southern area of the Blue Mountains in 1802, exploring several parts of the Burrarorang Valley and the lower Wollondilly River. In one of his attempts to cross the mountains, Barrallier's group also found and explored parts of the Kowmung River and one of its western tributaries. It was here that Barrallier encountered the most difficult and rugged terrain of his travels. Following the narrow, steep banks of the Kowmung and its tributaries, Barrallier's group were often forced at great risk to negotiate steep rocks and jump over precipices. In following the bed of a stream, Barrallier described the scene as follows:

'I could hardly find a passage for my troop through the sharp-edged stones and pebbles which obstructed it on all sides...Our boots were all torn and our feet full of wounds, and it was necessary in that state to pass over waterfalls and frightful precipices.'

56 See F. Barrallier, 'Journal of the Expedition etc.' 1802, in HRNSW, Vol.5, Appendix A, pp.749-825. The precise location of Barrallier's explorations of the Kowmung River area has been much debated and there is still no firm agreement. The latest contributors to this debate are Cunningham, op. cit., and R. Brownscombe, 'Barrallier's Blue Mountains Expedition in 1802: Clearing the Matter Up Finally?', JRAHS, Vol.78, No.1-2, 1992, pp.5-16.
57 Barrallier, op. cit., p.803.
After days of scrambling over some of the roughest sandstone terrain in the entire region, Barrallier was eventually forced to turn back when confronted with a steep waterfall. As he noted, '...the impossibility of passing over it was evident from the aspect of the perpendicular rocks which formed it'.

After carving a St. Andrew's Cross in a nearby tree, Barrallier retreated.

In 1804 Caley's group explored the area north of the Grose River eventually climbing to the summit of Mount Banks before returning. Like Barrallier, Caley was also eloquent in his descriptions of the difficult terrain. On viewing his intended route towards Mounts Tomah and Banks, Caley noted that he was 'thunder struck with the roughness of the country that presented itself between them and us'. As the journey progressed Caley frequently noted 'dreadful' chasms, 'inaccessible craggy rocks' and other places 'which seemed to bid defiance to man'.

His views were shared by his convict companions who agreed that it was a 'dreary dismal country' and stated they preferred the 'worst cell they had ever seen in a prison before it'. Never one to mince his words, at the end of his journal Caley described the toil of the journey as the 'most laborious man ever went to'. In reporting to Joseph Banks a few weeks later, he stated:

"The roughness of the country I found beyond description. I cannot give you a more expressive idea than travelling over the tops of the houses in a town."  

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58 Ibid., pp.803-805.
59 Caley in Andrews, op. cit., pp.43-44, 57, 64, 80, 87.
60 Ibid., pp.84-86, 95.
61 Ibid., p.103.
62 G. Caley to J. Banks, 10 December, 1804, HRNSW Vol.5, p.508.
With the reports in hand of 'those who have made the most frequent attempts in different directions', by 1805 Governor Philip King was convinced that it was impracticable to pass the Blue Mountains in the vicinity of Sydney. King's often quoted assessment was that:

'...persevering in crossing those Mountains, which are a confused and barren Assemblage of Mountains with impassable Chasms between, would be as chimerical as useless'.

King's view of the impassable nature of the region was shared by David Mann, another known explorer who found the Blue Mountains a difficult and 'arduous undertaking' during his excursion into the area in 1807. After four days of ascending the 'perpendicular sides' of 'four or five stupendous acclivities', Mann found that there was seemingly no end to the 'mountainous heights'. In the course of this journey Mann's clothes were torn to shreds from sliding down the steep and rocky slopes.

What is most apparent from all the accounts of early mountain exploration is that in the first 25 years of their encounters with the Blue Mountains the European relationship with the area was largely determined by the rugged nature of the earth. As Hartig has highlighted, in the period 1788-1812 the Blue Mountains were generally perceived as a physical barrier - a barren and impassable 'desert' of no use for cultivation. Despite early curiosity and

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53 P. King to Lord Camden, 1 November, 1805, HRA, Series I, Vol.5, pp.589, 594.
optimism, for the early Europeans the mountains quickly became an obstacle to be overcome, a puzzle to be solved.  

The enigmatic nature of the mountains prior to 1813 is somewhat mystifying, considering that after thousands of years of human use, the Blue Mountains must have had numerous ancient tracks and pathways worn into the earth. Throughout Australia, later explorers are known to have made frequent use of the many tracks and paths kept open by Aboriginal use to find water sources and overcome natural obstacles, such as mountain ranges. Perhaps if more of the 'official' mountain explorers had bothered to ask the locals, the Blue Mountains may not have remained a 'barrier' for quite so long. As far as is known, Barrallier was the only one prior to 1813 to have directly sought Aboriginal advice, but in one of those historical quirks of fate, Gogy, the guide he most relied on was an erratic tribal outcast, which effectively spoiled any chance he may have had of being shown the Gundungarra pathways. Without the intimate knowledge and guidance of the local inhabitants, the European explorers were ultimately forced to 'rediscover' the time-worn ways over and through the Blue Mountains.

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66 With the enormous benefit of hindsight, some writers have recently questioned the actual difficulty of crossing the 'barrier' of the Blue Mountains. It has been suggested that the various routes known to the Aborigines, were also known and used by escaped and ex-convicts, game hunters and other 'bushranging' Europeans prior to 1813 - cf. Cunningham, op. cit., pp.14, 42-45, 154-155. Although this is highly possible, there is currently no convincing proof of this. Certainly, Cunningham's assertions regarding John Wilson are merely speculation as there is no proof that Wilson did anything other than find a southern way around the Blue Mountains (see earlier footnote).

67 H. Reynolds, 'The Land, The Explorers and The Aborigines'. Historical Studies, Vol.19, No.75, 1980, pp.220-221. According to Reynolds, such pathways were 'more common in mountain and forest country or in arid areas'.
The credit for being the first Europeans to solve the 'puzzle' of the Blue Mountains (and for officially proving that they were not impassable) has gone to Gregory Blaxland, William Lawson and Charles Wentworth, who in 1813 led a group comprised in total of seven men, four horses and five dogs across the east-west ridge which runs between the Warragamba and Grose Rivers. Leaving the Nepean River on 11 May 1813, the expedition climbed and followed the ridge until they eventually reached Mount York on 28 May. From here they found their way down into the Kanimbla Valley, which they crossed and then climbed Mount Blaxland on 31 May. They then retraced their route and returned to the Cumberland Plain on 6 June.\(^*\) Although belated in his official praise, Governor Macquarie did acknowledge that the Blaxland group had 'effected the first passage over the most rugged and difficult part of the Blue Mountains'.\(^*\)

The full story of this expedition is very well known and has achieved legendary status in Australian history. Arguably, the most significant factors in their success were environmental. For instance, as shown convincingly by Perry, a combination of environmental factors provided the major impetus for further exploration after 1810 which resulted in the successful crossing of the Blue Mountains.

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\(^*\) It is likely that the Aboriginal inhabitants of the Blue Mountains had good reasons not to share their geographical knowledge with the newcomers especially considering their intention of claiming the earth they 'discovered'.


\(^*\) See Government and General Orders, 12 February, 1814 and 10 June 1815, in Richards, op. cit., pp. 77-79, 119-128.
Mountains. Furthermore, the earth itself also played its part. For it was ultimately by understanding the nature of the terrain and following the lay of the land (rather than travelling in straight lines or along waterways) that the winding and often narrow ridge-top routes over the Blue Mountains were found. While clearly not the first or last to attempt to follow ridges, Blaxland undertook preliminary explorations and acquired as much previous and local knowledge as he could before planning the route of the 1813 expedition. As he later admitted, he became convinced that it was 'practicable to find a passage over the mountains' by following the ridge which ran between the watersheds of the Warragamba and Grose Rivers.  

As well as finding a way over the mountains by following the contours of the earth, the Blaxland, Lawson and Wentworth group also laid the groundwork for the first road. All their journals refer frequently to their efforts to 'cut a road' (in reality a bridle track for the horses) along their ridge-top route. On many occasions the party was forced to spend entire days tediously clearing a rough and crooked path through the rocky ground and 'thick brushwood' of the ridge before advancing further to the west. At one point they even cut a small trench with a hoe to prevent the horses from slipping during their descent from Mount York. It can be seen then that what is particularly noteworthy about the Blaxland, Lawson and Wentworth expedition is that, not

71 The environmental factors are elaborated in later chapters, T.M. Perry, 'Climate, Caterpillars and Terrain', *Australian Geographer*, Vol. 7, No. 1, pp. 3-14.
only were they the first to find the easiest and most direct route across the Blue Mountains, but more significantly they found a way which was possible for hard hooved animals (and the carts and wagons they pulled) to use. The explorers themselves were clearly aware of the significance of their 1813 achievement. Blaxland noted in his journal that they had 'partly cleared, or, at least marked out, a road by which the passage of the mountain might easily be effected', while Wentworth stated in his account that 'we have at all events proved that they are traversable and that too, by cattle'.

The importance of the trail blazed by Blaxland, Lawson and Wentworth's party is demonstrated by the speed which Governor Lachlan Macquarie dispatched Assistant-Surveyor George Evans to confirm and survey their route and to continue exploration further inland. On 20th November 1813 (less than six months later), Evans accompanied by five other men and equipped with horses and dogs left the Nepean River and followed the marked route over the Blue Mountains. Despite some 'disagreeable travelling' and a 'rugged and steep' descent they crossed the Blue Mountains and reached Mount Blaxland in just six days, further emphasising the value of the rough track made by Blaxland, Lawson and Wentworth's group. Evans certainly acknowledged their hard work, noting that 'It was not without much labour, perseverance and fatigue that enabled them to reach thus far'. Evans was also keenly aware of the possibility the route now offered for establishing a road over the Blue Mountains, concluding his journal with the observation that:

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74 Blaxland in Richards, op. cit., p.75. Wentworth in Richards, op. cit., p.114.
'12 men might clear a good Road in 3 Months for a Cart to travel over the Mountains and make the descent of them so easy that it might be drove down in safety.'

Evans was clearly an optimist. It was actually to take 34 men almost six months of hard labour to build the first narrow cart road over the Blue Mountains.

Although by the end of 1813 most of the region still remained unknown and untouched by Europeans, in most accounts of Blue Mountains history the image of the region changes from the 'formidable and impassable barrier' to the 'conquered and vanquished foe' cast aside in the inevitable inland march of European exploration, progress and settlement.

Recently, it has become somewhat fashionable to belittle and scoff at the 1813 journey of Blaxland, Lawson and Wentworth's group, as a response to the blatant hero-worshipping of early accounts of their expedition. However, to focus just on the 'Three Explorers' of 1813 and single out their legendary status for criticism, misses the key point concerning Blue Mountains exploration. The tale of Blaxland, Lawson and Wentworth's 'success' does not exist in isolation to the contrasting 'failures' of their exploring predecessors. They are intrinsically linked as part of the one legend - that of 'The Explorers'.

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76 Ibid., p.32.
Those, like Cunningham, who attempt to debunk the legend of the 'Three Explorers' of 1813, merely perpetuate another larger and far more insidious problem with Australian historiography.

Collectively, the exploits of all the Blue Mountains explorers have been used to create and perpetuate a historical image of human triumph over nature. This view of Blue Mountains history has persisted because the tales of all the individual explorers from Dawes to the 'Dauntless Three' have been obsessively told and re-told ad nauseam. As Reynolds has noted, 'explorers walk tall through the pages of Australian historiography' and nowhere do they stride more forcefully than in Blue Mountains history. 78 Far too much historical attention in the past has centred on microscopic examinations of the explorers' accounts followed by spurious arguments over their 'failure' or 'success' in crossing the Blue Mountains and pendentic debates over the exact routes taken. Unfortunately, this persistent and seemingly never-ending focus on the heroic 'boys' own tales' of the Blue Mountains explorers has generated a extremely distorted version of the region's history, which has served to distract attention away from other aspects far more reaching in their significance and impact. 79 In terms of the European relationship with the mountain environment, the explorers merely pointed the way. The real impact

78 Reynolds, op. cit., p.213.
79 For instance, it is highly questionable whether we really need yet another study of exactly where Barrallier carved his St. Andrew's Cross when, for example, a comprehensive Aboriginal history of the Blue Mountains still remains to be written. This obsessive fascination with 'explorers' also further perpetuates the false concept that the Australian environment was an unoccupied, untouched wilderness waiting to be 'discovered' and settled, see Reynolds, op. cit., p.224.
on the earth of the European arrival in the Blue Mountains was to occur after
1813.

Making Tracks

‘Almost Impassable’ - The Mountain Road

‘...in winter they are impassable sloughs, and in summer the rudest
common earth roads’. Captain B.H. Martindale (1857).\textsuperscript{80}

In late July 1814, a convict gang overseen by William Cox was hard at work
felling trees, grubbing roots and levering boulders as it constructed a narrow
dirt road up the steep slope of the Lapstone Monocline. After Evans' return to
Sydney, Governor Lachlan Macquarie instructed Cox to build a simple cart
road at least 12 feet wide along the route surveyed by Evans. However,
constructing the first ever road in the Blue Mountains was no easy task. With
only simple tools (including axes, saws, hoes, crow bars, chisels and
sledgehammers) and some gunpowder, the first roadmakers were forced to
carve out a rough roadway over and through the tough sandstone of the ridge.

Cox's overall intention appears to have been to make a passable road over the
mountains as quickly as possible and he was not overly concerned with its
quality or durability.\textsuperscript{80} However, in reality the terrain left him little choice. As
he admitted in his journal, in some parts the rocks made it 'impossible to

\textsuperscript{80} B.H. Martindale, 'Report on Internal Communications of NSW', 21 August 1857,
make a level, good road' and he hoped that the road would be improved the more it was used.88 On viewing the steep descent at Mount York for the first time, Cox found it 'much worse than I expected' and believed that it was 'not possible to make a good road to go down and up again without going to a very great expense'. He therefore resolved to:

'...make such a road as a cart can go down empty or with a very light load without a possibility of its being able to return with any sort of load whatever; and such a road will also answer to drive stock down to the forest ground'.89

The building of Cox's road marked the beginning of European settlement of the Blue Mountains and the first major environmental impact on the area by the new mountain inhabitants. Trees and scrub were burnt and roots were grubbed from the stony ground or simply covered over with earth. The road surface itself comprised either rock or soil, depending on the location, and an effort was to made to construct the best gradient by either cutting the natural ground surface down or filling in hollows.90 Some of the roadworks required cuttings into solid rock to form side walls and in places the rocks were so hard that they could not be broken with sledge-hammers and instead the road gangs were 'obliged to turn out of the road a very large quantity of stone'.91 An 'immense quantity of rock' was used as fill for the embankments which supported the ramps and earth 'bridges'. One embankment near Linden was over 100 feet long.92

82 W. Cox, Journal Kept by Mr. W. Cox in Making a Road Across the Blue Mountains etc., 1814-15, in Mackaness, op. cit., pp.40.
83 Ibid., pp.44-45
The most difficult section of the road to construct was the descent down the 'Herculean mountain' at Mount York. This was also the section which required the most massive earthworks including a zig-zag route cut into the steepest part supported by high embankments. Where possible the roadway was cut through the rocks, but according to Cox the 'stone of the mountain' was uncommonly 'hard and flinty' which 'cuts extremely bad, and some of it will not split'. At times gunpowder was used to blow up large rocks which lay in the way of the road. More frequently however, the rocks were dug and 'turned out' of the way with long levers and crowbars or by using block and tackle fixed to trees. Ironically the earth proved both a hindrance and a help to the first roadmakers. While it presented many steep and rocky difficulties to be overcome, it simultaneously provided the stone and soil necessary for the road's construction. Even at Mount York, the massive sandstone rocks which blunted the convicts' tools during the day also provided welcome shelter from the cold and rain at night. To complete the Mount York descent took over a month but by mid December, Cox's road had reached his river (still yet to be named in his honour). With the worst of it over the roadmakers pushed on inland completing their task in mid January 1815. The first and most important route over the Blue Mountains had been created and the future development of the region was now cast in stone.

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58 Cox, op. cit., pp.45-50.
59 See Ibid., p.46.
Governor Macquarie was keen to inspect the new road and more importantly the territory it led to. In April 1815, accompanied by his wife and an entourage of gentlemen, he set out on a one month tour traversing the road which he believed would be of 'the greatest public utility' in opening 'a Passage to the new-discovered Country'.

Macquarie therefore inaugurated the new image of the Blue Mountains as a rugged corridor which must be traversed in order to reach the better lands in the west. Although Macquarie was generally lavish in his praise of the new road, he acknowledged that it was 'as good as the Nature of the Mountainous hilly Country, thro' which it is made, Could possibly Admit'. Even in its original state, Cox's road still provided a rough and 'extremely rugged' trip over the mountains. No place more so than the 'frightful' descent at Mount York. Despite noting in his journal that a 'very safe carriage road' had been formed down the face of the mountain, it was clearly not safe enough for the Governor and his wife, who prudently chose to descend the pass on foot while their carriage, caravan and heavily loaded carts were brought down by hand with some difficulty.

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90 See Government and General Orders, 10 June 1815 (in Mackaness, op. cit., pp.65-66, 73). In this it states that the tour 'over the Western or Blue Mountains' was undertaken 'for the Purpose of being enabled personally to appreciate the Importance of the Tract of Country laying Westward of them'.


92 L. Macquarie to E. Bathurst, 24 June, 1815, HRA, Series I, Vol.8, p.558.

93 L. Macquarie, 'Tour to the New Discovered Country 1815' in L. Macquarie, Journals 1810-1822, Sydney, 1956, pp.92-93, 106-107. Also see Government and General Order, 10 June 1815 (in Mackaness, op. cit. p.68). On the return journey the Macquaries also ascended Mount York on foot while the carts and carriages were 'got up safe, but with much labour and difficulty' (H.C. Antill, 'Journal of an Excursion over the Blue or Western Mountains of New South Wales etc.', 1815, in Mackaness, op. cit., p.88). This was the same road which Macquarie later described to his superiors as 'now perfectly accessible. Not only for Cattle, but also for All Descriptions of Wheel Carriages' - L. Macquarie to E. Bathurst, 24 June, 1815, HRA, Series I, Vol.8, p.558.
In the first years, Macquarie attempted to restrict the use of the mountain road and a military guard was placed at the first depot. Even so, Cox's road was used irregularly to drive stock to and from Bathurst and by various settlers, soldiers, convicts and visitors to the area. Although initially small in number, the human and animal traffic was sufficient enough (along with the weather) to cause significant wear and tear of the narrow road in a short time. For although roads could be chipped from the sandstone and dug from the soil, the earth was not so easily conquered. In the sandstone landscape which dominates the Blue Mountains, the surface of the early road was prone to erosion. It was one thing to make a road but another to keep it passable.

As early as August 1815, parts of the road to Bathurst were already 'very rotten' and 'so boggy that no one could pass', mostly due to heavy rain and snow. Within a few years diversionary side tracks had been made to avoid the boggy and rough patches which made the Blue Mountains the 'most rugged and oppressive stage' of the whole journey to Bathurst.

From 1820 road repair gangs became a regular sight on the road crossing the Blue Mountains, removing obstacles and grading and re-surfacing the worse sections of the road with broken stone. Even so, the state of the mountain road still made the crossing of the Blue Mountains a hardship to endure for most early travellers. Elizabeth Hawkins described the typical difficulties

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54 Government and General Order, 10 June 1815, in Mackaness, op. cit., p.73.
55 R. Hassal to L. Macquarie, 18 August, 1815, Colonial Secretary Papers - Letters Received, ML Reel 6065, p.1
56 A. Cunningham, 'Journey Over the Western or Blue Mountains etc.' 1817, in I. Lee, Early Explorers in Australia, London, 1925, pp.304-305.
faced by early mountain travellers. During her journey in 1822, a wheel shaft was broken and a dray overturned and nearly went over the cliff-edge while travelling down the pass at Mount York (by then colloquially known as 'The Big Hill'). This was despite taking the usual precaution of chaining large logs behind the drays to slow their descent.**

The condition of the Bathurst road encouraged a search for another route over the rugged earth of the Blue Mountains. A new way was found in September 1823 when Archibald Bell Jnr. on his second attempt found a route from Kurrajong to Cox's River by following the ridge which separates the Grose and Colo River catchments.** Bell's 'discovery' was officially surveyed a month later, with the surveyor, Robert Hoddle, agreeing with Bell that the new route was 'superior in every way to the old Bathurst Road'. However, Allan Cunningham found the new track hard going only months later and was forced to retrace his steps beyond Mount Tomah due to a shortage of fodder and injuries to his packhorses from the steep, stony track. Even so, during the following years a rough stock road (thereafter to be known as 'Bell's Line of Road') was constructed, most likely by convict labour.** Despite Bell's enthusiasm, and the shorter overall distance to Bathurst, the steep and rugged road remained primarily a droving route.

**E. Hawkins to A. Bowling, 7 May 1822, published as A Lady's Letter, Parramatta and District Historical Society, 1963, pp.2-6.10.
Meanwhile, further modifications to the first mountain road were made and a new slightly easier descent into the Vale of Clywdd was constructed, which became known as 'Lawson's Long Alley'. In 1824, a new route at Lapstone was built which zig zagged up the hill (now Mount Riverview) before re-joining the old road (see Figure 1.4).\textsuperscript{100} Nevertheless, travellers still found much of the mountain road excessively rough, rocky and 'slippery and difficult for horses and vehicles'. For example, a traveller in 1824 observed a wagon which had 'just been broken by the bad state of the roads'.\textsuperscript{101}

With settlement to the west of the Blue Mountains steadily growing, improving the mountain road became a high priority. The cost and difficulty of negotiating the highland highway was increasingly retarding agricultural development in western NSW. The newly appointed Deputy Surveyor-General, Thomas Mitchell, recommended improving the old mountain road by making a new descent using an 'inferior ridge, or colline which falls gradually' between Mount York and the Long Alley.\textsuperscript{102} Work began on the new descent route in 1829 which became known as 'Lockyer's road'. Midway through construction Mitchell discovered yet another route on the other side of Mount York. In early 1830, he halted work on Lockyer's road and abruptly moved the construction gangs to the new site. What followed was a well known dispute between Mitchell and Governor Darling over which road should proceed, but ultimately Mitchell's choice prevailed. The new route may have been shorter but it

\textsuperscript{100} Croft \& Associates/M. Walker, _Blue Mountains Heritage Study_, Sydney, 1985, p.35.
\textsuperscript{101} R. Lesson, 'Journey Across the Blue Mountains, 1824', in Mackaness, _op. cit._, pp.150-152, 154-155, 163.
\textsuperscript{102} T.L. Mitchell, _Report Upon the Progress Made in Roads and in the Construction of Public Works in NSW from the Year 1827 to June 1855_, Sydney, 1856, pp.4-6.
required massive earthworks and the construction of large buttressed walls to support the road. Over 600 convicts and many barrels of gunpowder were required to complete the new descent, which was named Victoria Pass and opened in 1832 (see Figure 1.5). By the early 1830s, roadwork was also needed at Lapstone Hill. Once again Mitchell found another more direct route and a new road, named Mitchell’s Pass, was constructed between 1832 and 1834 (see Figure 1.4). Here too, convict gangs laboured heavily on the road-cutting, digging, blasting and quarrying a great quantity of sandstone, some of which was used to build an impressive new bridge, designed by David Lennox.103

The construction of both Victoria and Mitchell Pass was an impressive feat of colonial engineering and in terms of their environmental impact clearly dwarfed the earlier earthworks of Cox’s road. Mundy was particularly impressed with the pass at Lapstone Hill, observing in the 1840s that:

"The highway is absolutely carved out of the living rock. Huge slices of the hill side have been blown off by blasting, hurled by convict crowds into the gulph below, or pounded by them into the material now called Macadam."104

However, aside from these major works at either end of the Blue Mountains, most of the mountain road remained in poor condition and steadily got worse. Hundreds of heavily-laden drays crossed and recrossed the mountains, and their hard wheels in particular cut deeply into the sandstone as each dray

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usually carried several tons of wool bales or other goods. On her journey in 1839, Louisa Meredith described the mountain road as 'bad beyond an English comprehension' with 'fearful quagmires and deep holes' and huge slabs of protruding rocks (known 'pleasantly' as 'jumpers') which caused endless jolting and bumping.\textsuperscript{105}

Like most of the colonial roads, the Great Western Road (as the road to Bathurst was officially named) was further neglected during the 1840s due to a shortage of funds and labour. Some repairs were made to the worst sections by the small convict gangs still stationed in the Blue Mountains, but these were tokenistic and short-lived. By May 1845, Mitchell found the mountain road 'out of repair from long neglect' with much of it worn into 'deep water-ruts' and 'muddy pools' due to lack of proper drainage. A report by Captain John Bull in the following year stated that only half the distance between Wentworth Falls and Hartley was gravelled and in 'good repair' and to fix the rest with the few convicts at his disposal would take several years.\textsuperscript{106} Although the introduction of tolls in 1848 provided some additional funds for roadworks, with the end of transportation to NSW in 1840 the use of convict labour on the mountain road gradually died out by 1850.

With the onset of the goldrush in 1851, thousands of hopeful prospectors and their families streamed across the Blue Mountains to the diggings - some on horseback, others driving carts and wagons, the unlucky on foot carrying

\textsuperscript{105} L. Meredith, 'A Lady's Journey to Bathurst in 1839', in Mackaness, op. cit., pp.244-246.
their possessions on their backs or pushing wheelbarrows. The increased traffic devastated the already bad roads. In 1852 the mountain road was 'mostly impassable' and travellers were using sidetracks cut through the bush to avoid the heavy sands and potholes. Others avoided the main road altogether and instead travelled along Bell's Line of Road which likewise soon deteriorated. By 1854 less than £1,000 was spent annually on maintaining the section of the Great Western Road between the Nepean and Coxs Rivers.\textsuperscript{107} Rachel Henning certainly found the mountain road in a 'most awful state' and was 'nearly shaken to pieces' while travelling to Bathurst in 1856. The ascent at Lapstone was 'almost impassable' due to thick mud which was axle deep for several miles. Unlike other unfortunate travellers, her coach driver managed to avoid 'the sea of mud in the main road' by diverting through the bush.\textsuperscript{108}

The appalling state of the mountain road was described in great detail in the reports submitted to Captain Martindale as part of his investigation of the internal communications of NSW in 1857. From Lapstone to Hartley, the road surface was a combination of soft, clay-filled quagmires in a 'truly horrible condition' and 'rocky pinches' from which all the soil and loose stones had long been denuded by the constant 'wear of wheels and water'. Some sections were pure sand, which were only passable 'with heavy dragging', especially in dry weather. Even Victoria Pass had lost its former glory and was now in a

\textsuperscript{106} Mitchell, op. cit., p.16. Report by Captain J. Bull in 'Minutes of Evidence of the Select Committee on Roads and Bridges' NSWLCVP, 1846, Part 2, pp.534-535.
'very bad, nearly impassable condition' which required constant patching of the worst places. The report recommended the expenditure of over £10,000 on the Blue Mountains section of the road (an average of £246 a mile) to cure 'this rapidly accumulating evil'. But once more only minimal and ineffective repairs were made, and the Western Road quickly gained the reputation as the worst main road in the entire Colony. In his report of 1859 Martindale lamented the destruction caused by neglect and 'the want of maintenance' and stated that the current funding, even if doubled, was quite inadequate to properly maintain, let alone reconstruct, a road in such bad condition.\textsuperscript{110}

The mountain road crisis led to the appointment of a Parliamentary Committee in late 1859 to report on the condition, management and construction of the Bathurst Road. The Committee interviewed numerous witnesses (including coach drivers, innkeepers, and rural residents) who unanimously confirmed that the mountain road was in a dreadful state and often almost impassable. After wet weather the road was said to resemble a creek or canal, with large sections comprised of muddy quagmires. Breakdowns, bogged animals and accidents were common, with both horses and people reportedly killed due to the dangerous condition of the road. Efforts to escape or evade the cut-up tracks often left the main road in an even worse state. The miserable condition of the road was attributed to a lack of drainage and insufficient metalling and rounding of the road surface.

Repairs were desultory and irregular, with workers forced to use local sandstone and clay to patch and repatch the road due to the difficulty of obtaining better quality rock and gravel in the Blue Mountains. Unsuccessful trials of timber planking were also used to surface over the worst quagmires between Lapstone and Springwood, but these proved a waste of time and money. In its report the Committee unfairly laid most of the blame for the state of the mountain road on shoddy roadworks due to the mismanagement and inexperience of the local road superintendent. In fact there had never been enough funds allocated by the Government to properly reconstruct the mountain road after the severe damage caused during the height of the goldrush.\textsuperscript{111}

Although the Parliamentary Committee recommended that the Bathurst Road 'should be forthwith put in repair', what was really needed was an entirely new road.\textsuperscript{112} However, by the late 1850s the Colonial Government was clearly reluctant to spend more money on the mountain thoroughfare when plans were underway to replace the disastrous dirt road with a railroad.\textsuperscript{113} Instead of endlessly repairing and repatching the bush tracks to Bathurst, it was decided that a far more reliable, efficient and cost-effective road could be made by laying steel tracks over the rugged earth of the Blue Mountains.

\textsuperscript{112} Estimated to cost £1,500 per mile for the mountain section alone. \textit{Ibid.}
\textsuperscript{113} See Martindale, 1859, \textit{op. cit.}, p.419, \textit{Sydney Morning Herald}, 8 June 1860 p.4.
Steel Tracks and Iron Horses

'The "Iron Horse"...has turned, and twisted, and zigzagged among the mountains in such a puzzling manner, that one is fairly overcome by the evidence of his climbing capacities, his genius for dodging difficulties, and his stern disregard of hills and hollows.' Sydney Morning Herald (1868)\(^{114}\)

For many years the idea of building a railroad over the Blue Mountains was considered an impossibility. Because of the region's rugged terrain, initial surveys carried out during the early 1850s could not find a suitable route through either the valleys or along the narrow, rocky ridgetops used by the roads. Consequently, it was believed that 'no practicable line for either a railroad or tramway from the Hawkesbury to Bathurst exists between the Cox and Colo Rivers'.\(^{115}\) However, the need for a better means of traversing the Blue Mountains was urgent, and both public and parliamentary agitation for a railway between Sydney and western NSW intensified. Horse-drawn tramways were suggested as a cheaper alternative, however newly appointed Engineer-in-Chief of Railways, John Whitton, was convinced that the iron horse was the only form of traction which could cope with the mountain terrain and he ordered more surveys.\(^{116}\)

Originally, four possible railway routes over the mountains were investigated. One was along the Coxs River Valley, commencing at either Picton or Camden or travelling firstly through the Warragamba gorge. The second commenced at Richmond and went through Kurrajong, and the valleys of Little Wheeney and

\(^{114}\) *Sydney Morning Herald*, 2 May 1868 p.7.

Burraval Creek, before joining the ridge followed by Bell’s Line of Road. The third followed the existing mountain road to Mount Victoria and then along the Darling Causeway. The last option was along the Grose River Valley, reaching Hartley via a tunnel under the Darling Causeway. By 1859 the likely routes had been narrowed down to just two - the existing mountain road or along the Grose Valley. However, surveys of the Grose Valley confirmed that this route was impracticable and far too costly.

This left only the mountain road route, and in 1861 Whitton compiled a detailed report for the Government recommending that the western steam railway be carried over the Blue Mountains by the ‘main range which divides the tributaries of the Nepean and the Cox from those of the Grose River’. The Government had previously baulked at Whitton’s earlier estimates of the cost, so after making various cost cutting measures (including narrowing of the line and reducing the number of buildings). Whitton provided a new estimate of £1,110,000 for the 111 mile (178 km) railway between Penrith and Bathurst (or £10,000 per mile).

Left with little alternative, the NSW Government finally approved the extension of the western railway over the Blue Mountains. Construction of a single line railway between the Nepean River and Blackheath began in early 1863 with

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116 P. Belpin and D. Burke, Full Steam Across the Mountains, Sydney, 1981, pp.31-35.
118 For the full story of the railway survey of the Grose Valley, see A. Macqueen, Back from the Brink, Springwood, 1997, pp.55-73.
the earthworks completed by 1866. From October 1865 to June 1868, the wrought-iron train tracks, sleepers and ballast rocks were laid down and along some parts three-rail hardwood fencing erected. In July 1867 the new rail line was opened to the public as far as Wentworth Falls. Between 1865 and 1869 the railway was extended from Blackheath to Mount Clarence, where having climbed steadily for over 50 miles (80 kms) it reached its highest elevation above sea level (3,658 feet or 1,115 metres). In May 1868 the line to Mount Victoria was officially opened, and after the descent to Lithgow had been completed the railway reached Bowenfels in October 1869 before continuing on westward.\textsuperscript{119}

The laying of steel tracks across the Blue Mountains was a massive undertaking. It required the moving of enormous quantities of earth and rock which greatly modified the mountain landscape. In total, over 3 million cubic yards (over 2.3 million cubic metres) of earth was excavated to build the railway from the Nepean River to Wallerawang, more than half of which was solid sandstone. The heaviest earthworks were carried out in the area between Blackheath and the Lithgow Valley, where over 1.7 million cubic yards (1.3 million cubic metres) of earth were shifted, of which over two-thirds was rock.

\textsuperscript{119} J. Whitton, 'Report on Railway Extension', 31 July 1861, JNSWLC, 1861-62, Vol.8, pp.348-353, Belpin and Burke, op. cit., p.38, 51. When completed the actual average cost per mile was £16,000.

Much of the soil and rock removed from the cuttings was used by the hundreds of railway workers to construct embankments. The remaining spoil was simply tipped down the nearby slopes which after erosion soon added significant loads of sediment into local streams.\textsuperscript{121}

In addition to the excavations and embankments, a number of bridges, tunnels and viaducts were built for the mountain railway, along with more than 260 culverts. An impressive seven-arch viaduct measuring 388 feet (118 metres) long and 126 feet (38 metres) high was also built across Knapsack Gully, using some 6,700 cubic yards (5,100 cubic metres) of sandstone quarried a short distance away. At Mount Clarence a tunnel some 1,600 feet (490 metres) long was built which was lined with sandstone masonry set in cement. The broken stone used for the ballast under the rails was obtained from nearby quarries, including one near Pulpit Hill known as the 'Crushers' (the later site of Katoomba).\textsuperscript{122}

Finding a way to lift and then lower the tracks for the iron horse over the steep slopes of the plateau was critical to the construction of the Blue Mountains railway. Like the road builders before them, the railroad builders had to overcome the formidable problem of ascending and descending the

\textsuperscript{121} To gain some idea of the enormous quantity of earth involved - the largest pyramid in Egypt (Cheops) is estimated to have a mass of 3.3 million cubic yards (over 2.5 million cubic metres). Whotton, 1871, \textit{op. cit.}, pp.14-17, J. Rae, 'Report on the Railways of NSW 1866 to 1871', NSWLVAP, 1872-73, Vol.2, pp.494-496, 523-525, \textit{Sydney Morning Herald}, 18 September 1868 p.5.

\textsuperscript{122} Whotton, 1871, \textit{op. cit.}, pp.14-17. Whotton, Supplement 1872-1875, \textit{op. cit.}, pp.48-51, \textit{Sydney Mail}, 7 November 1868 p.9. The first mountain railway platforms were established at 'Wascoe's' (later renamed Blaxland), Springwood, 'Buss's' (later renamed Woodford), 'Blue Mountain' (later renamed Lawson), 'Weatherboard' (later renamed Wentworth Falls), Blackheath and Mount Victoria.
abrupt sandstone escarpments on both the eastern and western margins of the Blue Mountains ridge. Originally, Whitton had planned to use tunnels, but the cost was prohibitive so instead it was decided to construct zig zags at both Lapstone and near Lithgow.¹³³

The Lapstone Zig Zag (or 'Little Zig Zag') was the smaller of the two mountain zig zags and was located a short distance beyond the Knapsack Gully viaduct. Here the single line had two dead-end reversing points between which the trains were shunted in either direction to make the 500 foot (152 metre) high ascent or descent of the eastern side of the Blue Mountains (see Figure 1.6).¹³⁴

The Lithgow Zig Zag (or 'Great Zig Zag') was by far the most difficult section of the entire mountain railway to construct. From the Clarence tunnel the line descended (at a grade of 1 in 42) more than 500 feet (152 metres) to the valley below in little over three miles (almost five kilometres). To make the descent, a zig zag of three terraces was hewn into the side of the rugged mountainside (see Figure 1.7). The construction of the Lithgow Zig Zag involved earthworks on a colossal scale. In most places, the road made for the steel tracks ran along ledges cut and blasted from the sheer side of the rocky ravine by the hundreds of labourers employed on the project. More than twenty large cuttings were formed through the hard sandstone, some had sheer vertical sides over 100 feet (30 metres) high and involved the removal of over 50,000 cubic yards (over 38,000 cubic metres) of rock. In total over 1 million cubic

¹³³ Bentley, op. cit., p.23. The zig zags were lengths of railway line laid in the form of a 'Z', with two reversing points to permit trains to change direction in order to ascend or descend to the next level of the line.
yards (over 765,000 cubic metres) of earth were excavated between Mount Clarence and Lithgow of which around 750,000 cubic yards (about 570,000 cubic metres) was sandstone. Three large stone viaducts were constructed to span gaps on the Zig Zag route (see Figure 1.8). The *Sydney Morning Herald* was astounded by the magnitude of the Zig Zag works and found it 'almost impossible to describe the difficulty of constructing the line'.

While much of the shifting of the earth was done by hand using shovels, hammers and chisels, a large quantity of blasting with explosives was also carried out during construction of the Lithgow Zig Zag. On two occasions in particular, gigantic explosions were used to instantly remove enormous masses of rock. Each of these explosions used over three tons of blasting powder packed into holes drilled into the surface of the rock, and to ensure a synchronised detonation electricity was used for firing (for the first time ever in Australia). The initial 'great blast' was in January 1867 when a protruding spur of a mountain between the two lower viaducts was blasted clear of the route watched by a party of official visitors. In September 1868 a second big blast was fired to collapse the roof of a recently completed tunnel which was found to be unstable and some 40,000 cubic yards of rock and dust was hurled high into the air.

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126 *Sydney Morning Herald*, 7 January 1867 p.5.
127 *Sydney Morning Herald*, 18 September 1868 p.5. Several secondary sources, including Wylie and Singleton (1958 No.252), Belpin and Burke (1981) and Bentley (1988), have implied that the quantity of rock dislodged in this second explosion was larger than the first blast. However, no sources for this claim are provided. The 1868 newspaper article cited here refers specifically to 40,000 cubic yards, *not* tons as claimed by all these authors. Furthermore the length of the tunnel blasted in the
At the time of its completion, the 'Great Zig Zag' was considered a wonder of the age and one of the greatest engineering works in the world. Unsurpassed by any other railway works in the Australian colonies, it quickly became a major tourist attraction, with the Commissioner of Railways reporting in 1871 that:

'...thousands of tourists from all lands have visited these works, and expressed unbounded admiration at the rugged grandeur of the scenery, and the engineering skill and pluck displayed in designing and constructing these stupendous works, which are probably not surpassed on any railway in the world'.\footnote{128}

Meanwhile the triumphant success of the railroad led to the further decline of the main mountain road which was relegated to second place in both funding and status. By 1865 most of the mountain road had again been ballasted with broken rock and was described as in 'tolerable order', with the section from Lapstone to Blaxland even surfaced with blue metal obtained from boulders in the Nepean district. However, many of the best sections of the road were eventually taken by the railway and an alternative route was constructed next to train line. Furthermore, the new railway crossings caused a concentration of traffic which cut heavily into the sandstone road surface.\footnote{129} A report in the \textit{Sydney Mail} in 1867 was particularly scathing of the deplorable condition of the mountain road between Blaxland and Hartley, finding it 'Indescribably

\textsuperscript{128} Rae, Railway Report 1866-1871, op. cit., p.495.
bad' and a 'wretched apology for a main trunk line' that was a 'disgrace to the colony'.

Although some wheeled and hoofed traffic continued to use the mountain road after the opening of the railway, the road steadily fell more and more into disuse as a main thoroughfare between Sydney and the west. The superiority of railroad over dirt road was obvious to all. Prior to the railway (in 1864) it took on average 11 days for goods to be transported by road from Sydney to Bathurst at a cost of over £6 per ton. By railway (in 1871) goods be conveyed the same distance in just 16 hours at a cost of around £2 per ton. Passenger travel over the Blue Mountains was also quicker and cheaper. By the mid 1870s the railway had mostly superseded the road. As they peered from the windows of their swift and comfortable carriages, train passengers now described the 'old' mountain road as all but neglected, with only the occasional heavily-laden dray to be seen lumbering up and down the hills through the deep sands.

In the 1890s the abolition of the road tolls, along with inflated rail freight charges and the effects of the economic depression once more led to an increase in heavy dray traffic on the Western Road. The Mountaineer described the main highway as 'frightfully cut up in every direction' by the numerous

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150 Sydney Mail, 29 June 1867 p.5.
151 Rae, Railway Report 1866-1871, op. cit., pp.513-514. By train the passenger trip from Penrith to Bathurst took just six and half hours (compared with over 19 hours previously by stagecoach), while the fare per mile was half that for making the journey by road.
heavy teams which so frequently passed through the Blue Mountains and played 'mischief with the roadway'. Echoing over 70 years of similar opinion, in 1899, the newspaper called the main road 'a disgrace to any civilised community'.

Nevertheless, while the main mountain roads declined in the late 19th Century, many more minor tracks were constructed in the Blue Mountains following the completion of the steel railway tracks. The coming of the railway was a revolutionary event in Blue Mountains history which led to innumerable changes in the mountain landscape. At the same time that it provided a faster and more efficient means of travelling between Sydney and the west, the railway also made the Blue Mountains a destination in itself. Substantial settlement followed soon after as mountain villages and towns slowly evolved around the nuclei of the railway platforms during the 1870s and 1880s. Criss-crossing through all these centres were new roads and streets, while numerous dirt tracks and bridle trails were formed to provide access to and from mines, logging sites, water supplies, grazing areas and isolated settlements.

The growth of mountain tourism also stimulated the making of many new tracks. For example, in the mid 1880s a bridle track was made from Katoomba to Jenolan Caves. However, this was little used and was soon overshadowed by the completion of a direct road from Mount Victoria to Jenolan Caves (via Hampton) in 1887 (extended through the Grand Arch to...

153 The Mountaineer, 21 September 1894 p.2, 28 September 1894 p.2, 4 August 1899
Caves House in 1896). From the 1870s onwards numerous walking tracks were also constructed throughout the Blue Mountains to permit better access to the region’s scenic spots. Some of the earliest of these ‘footroads’ were privately constructed by the wealthy landowners who settled in the mountains in the wake of the railway. Later the trustees of public reserves in the Blue Mountains also formed extensive, interconnecting networks of walking tracks, both along the escarpments and in the valleys below.\(^{134}\) Construction of this multitude of dissecting minor roads - bridle trails, local streets, mining and logging access roads, tourist footpaths - involved much disturbance of the earth, as stone and soil were cut, shifted and rearranged to make more tracks throughout the Blue Mountains.

However, the late 19th Century was unquestionably the heyday of the iron horse in the Blue Mountains. Steel tracks remained the most important and influential means of traversing the earth during the years between 1870 and 1910. Such was the importance of the locomotive that numerous additions and improvements were made to the mountain railway during this period. All along the Blue Mountains line, new platforms, station buildings, signal boxes, passing loops were constructed, curves straightened and realigned, and additional train water supplies established.\(^{135}\) Like the initial construction of


\(^{135}\) Wylie and Singleton, No.236, 1957, op. cit., p.85, Sydney Mail, 20 July 1878, p.88. Some of the new platforms which were later enlarged into stations included Glenbrook (1874), Faulconbridge (1877), Hazelbrook (1884), Katoomba (1876) and Bell (1875).
the railway, many of these improvements also necessitated heavy excavations of rock and earth to form new cuttings and embankments.\textsuperscript{156}

The first significant deviation of the original line was the construction of a tunnel near Glenbrook to replace the bottleneck of the Lapstone Zig Zag. The Little Zig Zag had outlived its usefulness, as the constant stopping and reversing of the growing number of trains was causing delays and prevented the use of more powerful engines and longer trains. Work was undertaken between April 1891 and December 1892 to complete a deviation (costing over £52,000) which included cutting a new curving tunnel 2,165 feet (660 metres) long (see Figure 1.6).\textsuperscript{157} To cut the long, winding tunnel, large quantities of hard sandstone rock were blasted with explosives. During construction, Arthur Streeton painted the scene of the excavation and provided this description:

\textit{...the ganger cries 'Fire', 'Fire's on'; all the men drop their tools and scatter and I nimbly skip off my perch and hide behind a big safe rock. A deep hush is everywhere - then, 'Holy Smoke!', what a boom of thunder shakes the rock and me. It echoes through the hills and dies away 'mid the crashing of tons of rock; some lumps fly hundreds of feet sometimes and fall and fly everywhere among the trees; and then a thick cloud laden with fumes of the blasting powder'.}\textsuperscript{158}

\textsuperscript{156} For full details of the railway improvements during the 1890s see the articles by Wylie and Singleton, \textit{op. cit.}
\textsuperscript{158} A. Streeton, Letters 1891, in R.H. Croll (ed.), \textit{Smoke to Bulldog: Letters from Sir Arthur Streeton to Tom Roberts}, Sydney, 1946, p.21. Streeton produced two illustrations of the 1891 railway deviation works - a watercolour titled 'Cutting the Tunnel' and an oil painting titled 'Fire's On', both of which are held by the NSW Art Gallery in Sydney.
By 1900, the number of trains using the Blue Mountains line had grown enormously and it had become essential to duplicate the existing single track to increase capacity. It was decided to first duplicate the easier section of the line between Glenbrook and Mount Victoria and this was undertaken in stages during 1902 with the work completed in September at a cost of over £190,000. During the duplication works, the opportunity was also taken to realign and regrade the line, replace dangerous crossings with steel or concrete bridges, and upgrade the existing stations or replace them with handsome new brick buildings on island platforms.¹³⁵

Yet the steep single line sections which remained on either side of the Blue Mountains still prevented any real improvement to the efficient running of the Western Railway. The worst problem was the Lithgow Zig Zag which like its former smaller cousin had become a major bottleneck causing lengthy and costly delays. As early as 1885 it was suggested that the Lithgow Zig Zag should be replaced. In the following decade various new routes were proposed and six deviation proposals were considered by a Parliamentary Standing Committee on Public Works in 1894. All of these involved the construction of tunnels and one proposal was for a route between Mount York and Hartley Vale. But the Committee concluded that a deviation of the Zig Zag was 'not a matter of urgency' and rejected all the proposed schemes.¹⁴⁰ However, in the following years the trains and subsequent congestion increased. The need for

¹³⁵ See articles by Wylie and Singleton, op. cit. for full details of the 1902 duplication works in the Blue Mountains.
the zig zag deviation became more compelling by 1902 and the matter was
again placed before a Public Works Committee. On this occasion the
Committee concluded that 'the time has arrived for the Zigzag (sic) to be done
away with', and readily approved a scheme to replace the Zig Zag with a five
mile (8 km) double track deviation that included the construction of ten
tunnels. The cost of the Zig Zag deviation was estimated to average around
£50,000 per mile and funding was approved by the Government in 1906.141

As with the Zig Zag it replaced, the 'Ten Tunnels' deviation was a major
construction work and an impressive feat of engineering. Work on the
development commenced in June 1908 and was completed in October 1910 at a
total cost of some £350,000. From Dargans Creek, the double line passes
through the first tunnel (1,800 feet or 552 metres long), then descends along
the eastern side of the Reedy Creek gorge. On the way the railway passes
through eight other tunnels varying in length between 260 feet (79 metres)
and 1,300 feet (400 metres). The railway eventually links up with the bottom
line of the old Zig Zag after emerging from the tenth and longest tunnel (2,500
feet or 789 metres long).142

Like its predecessor, the new descent to Lithgow also involved massive
earthworks. Over 637,000 cubic yards (487,000 cubic metres) of earth and
rock were removed from the deep open cuttings, one of which was 130 feet (40
metres) deep. A further 192,000 cubic yards (146,000 cubic metres) of

141 Parliamentary Standing Committee on Public Works, 'Second Report on Deviation
to Avoid the Lithgow Zig Zag', JNSWLC, 1902, Vol.3, p.285-290, Wylie and Singleton,
sandstone was excavated to form the ten tunnels, which were then lined with around 47,000 cubic yards (36,000 cubic metres) of bricks and concrete. To shift the huge amounts of earth and rock, the 1,500 workers made use of cable haulage and electric powered drills and jackhammers, as well as the usual handtools and horse-drawn wagons. And once more vast quantities of explosives were used.¹⁴²

On completion of the zigzag deviation, it was decided to immediately move the construction workers and equipment to the eastern side of the Blue Mountains to build a new double line deviation between Emu Plains and Blaxland. As well as the need to complete the duplication of the railway all the way across the Blue Mountains, problems had been experienced with the Glenbrook tunnel built in 1892. Seepage of water through the ceiling of the long, narrow tunnel was causing heavy trains to slip on the tracks during ascents, while the smoke and steam from the engines were a choking and unpleasant nuisance to both train drivers and passengers. One writer described the much hated tunnel as a 'sulphurous and smothering horror'.¹⁴⁴

Between 1910 and 1913 a new seven mile (11 kilometre) deviation was constructed to replace the single line bottleneck between Glenbrook and the

¹⁴² Ibid., p.154, Belpin and Burke, op. cit., p.111.
¹⁴³ *Sydney Morning Herald*, 5 September 1908 p.4, 8 September 1908 p.6, *Australian Town and Country Journal*, 9 September 1908 p.28, Wylie and Singleton, No.253, 1958, op. cit., pp.171-173. On one occasion, four and a half tons of powder was used to blast the side of a mountain to clear about 10,000 tons of rock from the approach to the second tunnel. Belpin and Burke (op. cit., p.111) state that 35,000 tons of rock was blasted in this explosion but give no source.
Nepean (see Figure 1.6). Once more, heavy earthworks were required to cut a stone shelf along the steep sandstone side of the Glenbrook Creek gorge. Immense rock cuttings over 80 feet (24 metres) deep were made and a brick-lined tunnel 928 feet (282 metres) in length was built through The Bluff. The deviation works included a new brick viaduct, over 350 feet (106 metres) in length and 75 feet (22 metres) high, which straddled Knapsack Creek below the original viaduct.\textsuperscript{145} Although the earthworks carried out for the Glenbrook deviation were seen as yet another stupendous triumph of engineering, like those at Lithgow they also left long-lasting scars in the landscape that were often made worse by erosion. According to a visitor over decade later, debris from the railway works had spoilt the 'once pretty' valley of Glenbrook Creek and left a 'peninsula of rubble and stone' jutting out into the Nepean River.

The excavations were certainly no mere 'scratch on the rock face' of the mountains as a tourist guide of 1915 asserted.\textsuperscript{146}

Nevertheless, both the new deviations and the complete duplication of the mountain railway meant that trains could now traverse the Blue Mountains with greater speed and efficiency than ever before. However as the 20th Century progressed, the railway was steadily eclipsed by a new, more versatile form of mountain transport which was not tied to steel tracks. Instead, the advent of the motor vehicle led to the revitalisation and expansion of the mountain roads and the making of many more new tracks.

The Revival of the Roads

'The problem of good roads has become all the more pressing by reason of the rise and progress of the motor' Blue Mountain Echo (1911)\(^{147}\)

In July 1901 a 'motor car' passed through Blackheath on its way to the western district, which the *Sydney Morning Herald* briefly noted was 'the first that has ever passed over the Mountains'. Just two years later, the 'Mountain Motor-car Company' was running a regular motor car service between Blackheath and the Jenolan Caves. As comfortable and safe as any horse-drawn coach, the new mode of transport had the distinct advantage of speed. Tourists were now able to make the 40 mile (64 km) journey to the Caves in just three and a half hours. Like the iron horse before it, the motor vehicle brought a rapid transformation in travel.\(^{148}\)

However, the introduction of motor vehicles to the Blue Mountains was seriously handicapped by the state of the long-neglected mountain roads. Rough surfaces and steep grades caused enormous difficulties for the early motor cars, which were never intended for mountain climbing. With their greater weights and speeds, the steadily growing numbers of motor vehicles needed a better type of road.\(^{149}\)

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\(^{147}\) *Blue Mountain Echo*, 3 March 1911 p.1.


With the passing of the *Local Government Act* in 1906, the local councils in the Blue Mountains assumed responsibility for the mountain roads, including that part of the 'Main Western Road' which lay within their boundaries. Although in theory the mountain councils were assisted by roadworks grants from the State and Federal Governments, the actual funds provided were mostly inadequate for the task. As found by their road building predecessors, one of the major difficulties the mountain councils faced was obtaining suitable rock to use on the roads in sufficient quantities. In the predominantly sandstone area of the Blue Mountains, there was little choice but to use the hard bands of sandstone known as 'ironstone'. However, after years of use the ironstone supplies were diminishing, so in places the local roadworkers used leftover railway ballast and conglomerate quarried from Emu Plains.  

As well as a better surface, in many places the mountain road needed deviations or entirely new routes to accommodate motor vehicles. This was particularly the case at Victoria Pass which was far too steep to be negotiated by early motor cars. As an alternative route, a new road known as Berghofer's Pass was built in stages between 1907 and 1912.  

After being neglected for decades in favour of the railway, by 1911 the main mountain road had once again become 'an important thoroughfare, carrying large volumes of tourist traffic' according to the local newspaper. To ensure the 'safety of the travelling public', it urged upgrading of the mountain road, including better bridge approaches, a reduction of curves and 'the road

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generally to be widened and improved'. With over 4,400 motor vehicles registered in NSW by 1910, motor vehicles were rapidly becoming a mainstay of the mountain tourist industry.\textsuperscript{152}

Meanwhile Bell's Line of Road continued to languish in obscurity as a declining stock route. After 1907 minor repairs were undertaken by the Colo and Blue Mountains Shire Councils on their respective sections of the road but in general the road remained in a rough condition, as did the connecting dirt roads to Mount Wilson, Mount Irvine and Mountain Lagoon. The first motor car to traverse Bell's Line was reportedly in 1913 but early drivers often had to stop regularly to rebuild sections of the road before proceeding. Despite numerous minor repairs funded by both councils, most of Bell's Line of Road remained in this condition until well into the 1930s.\textsuperscript{153}

By the early 1920s the motor traffic on the main mountain road had increased to such an extent that the mountain councils were simply unable to keep up with the repairs required, let alone carry out works on other local roads. Around 4,000 cars were estimated to be using the main highway each week while each year over £33,000 was spent on maintaining it, less than half of which was provided by the State Government. According to the local press, the deplorable condition of the mountain road had provoked 'clamorous

\textsuperscript{151} Blue Mountains Heritage Study, op. cit., p.37.
\textsuperscript{152} Blue Mountain Echo, 3 March 1911 p.1. The road to Jenolan Caves had also suffered greatly from the surge in tourism and was described in 1912 as 'absolutely horrible in places' - Blue Mountain Echo, 26 January 1912 p.6.
complaints' and an 'epidemic of indignant protest'. Ruts and potholes abounded forcing motorists to zig zag around the worst sections and the state of the main road was raised repeatedly at council meetings.\(^{154}\)

For many years the Blue Mountains Shire Council was forced to purchase blue metal from elsewhere in NSW to maintain the main road, which was delivered to the Blue Mountains by rail. Desperate for a cheaper and more easily obtainable material for roadworks, during the 1920s the Shire eventually turned back to a local source of mountain earth - chert. Shire engineers discovered that local chert (a hardened form of clay shale) was a fine road material which was far more durable than ironstone. So in early 1923 the Shire opened its own chert quarry near Mount Victoria where an 'inexhaustible...mountain of metal' had been found. For many years the local chert was used to resurface much of the main mountain road and other secondary roads and footpaths in the Blue Mountains. However, the constant patching and re-patching with chert was still costly and labour intensive to maintain. The annual cost of maintaining the main road alone was over £250 per mile. A more permanent road surface was still clearly needed.\(^{155}\)

In 1924 a joint deputation from the Blue Mountains councils met with the State Premier and urged that the mountain road be regraded and reconstructed in concrete (to a width of 18 feet). However, the State


\(^{155}\) *Ibid.*, 27 January 1922 p.2, 9 February 1923 p.1, 17 October 1924 p.1, 16 April 1926 p.6, Searle, op. cit., p.49. During the 1920s a private company established another chert quarry in the Kanimbla Valley, the products of which were transported
Government was indifferent to the proposal, finding the estimated cost of a covering the mountain road in concrete too high (over £500,000). Instead, in 1925 the NSW Government established a Main Roads Board to take over responsibility for all main roads in the State, including the section of the Main Western Road which traversed the Blue Mountains. The need for better roads could be no longer ignored as by 1926 the number of motor vehicles registered in NSW had soared to over 140,000.  

When it took over responsibility for the 'Great Western Road', the Main Roads Board found the section between Penrith and Mount Victoria 'in bad order, some of it exceptionally so'. Repairing it was one of the Board's 'greatest difficulties' and larger maintenance grants were immediately made available to the mountain councils, while the Board instituted surveys to plan the 'early reconstruction of the worst portions'. A top priority was dealing with the steep, narrow, winding and dangerous section of the road at Lapstone Hill which Mitchell had first constructed over ninety years before. As widening the existing road was too expensive and would not improve the grade or alignment, the Board decided to make use of the easier route abandoned by the railway in 1913. During 1926 a new road 18 feet wide and four miles long was made along the former line of the railway utilising the original Knapsack
Creek viaduct but avoiding the zig zag section by means of a new side cutting.\textsuperscript{157}

In the following decades further extensive improvements were made to the existing mountain roads, while new roads proliferated to cater for the burgeoning numbers of cars, buses and trucks. The Blue Mountains section of the Great Western Highway (as it was officially named) was steadily reconditioned along its entire length, with a new tar and bitumen surface laid down and concrete strips used in some places to strengthen the edge of the road. Parts of the road was also widened, including the Knapsack Gully viaduct where a cantilevered concrete slab 30 feet in width was fixed onto the old sandstone bridge. Bell’s Line of Road too was gradually improved for use by motor traffic with new deviations made to replace the steepest and worst sections, including the notorious ‘Jacob’s Ladder’. A new direct road was also built between Bilpin and Mount Irvine which crossed Bowen’s Creek.\textsuperscript{158}

During the 1930s unemployment relief funds sparked a revival in walking track construction in the Blue Mountains. These included the Prince Henry Cliff Walk (linking lookouts between Katoomba and Leura) and the Giant Stairway, the building of which required the carving of some 800 steps into the sheer rock cliff-face near the Three Sisters. However these footroads were

\textsuperscript{157} Main Roads Board, First Annual Report, 1926, \textit{NSWPP}, 1926, Vol.2, pp.909-910. In its first year the Board also repaired a particularly bad stretch of the mountain road between Blackheath and Mount Victoria, reconstructing and sealing it with bitumen with the assistance of a Federal grant of £20,000.

easily overshadowed by the new 'cliff drives', built along the escarpments to give motoring sightseers grand panoramic views from their cars, coaches and buses as well as quicker access to the lookouts.\textsuperscript{159}

With the commencement of World War II there was renewed interest in upgrading Bell’s Line of Road to provide an alternative route over the Blue Mountains for defence purposes. Work on improving the road was begun in 1939 but was not fully completed until 1950. In reconstructing the 34 mile (55 km) length of road between Kurrajong Heights and Bell, over 755,000 cubic yards (about 577,000 cubic metres) of rock and earth were shifted using jackhammers, bulldozers, and mechanical shovels.\textsuperscript{160}

In the decades following World War II, existing mountain tracks continued to be upgraded and new roads formed. Although further improvements were made to the mountain railway (most notably the electrification of the line in 1957), the vast majority of trackwork in the Blue Mountains was for the benefit of motor vehicles. On the main mountain roads bends were straightened and new deviations made to remove hazardous sections. For example, numerous works were carried out on the winding section of the Great Western Highway at Linden and Woodford. These included the construction of a deviation 4,000 feet long during the 1950s which eliminated

\textsuperscript{159} Smith, 1998, op. cit., pp.33-36, Sydney Morning Herald, 3 October 1932 p.6, Katoomba Daily, 4 October 1932 p.2. As elsewhere, tourism in the Blue Mountains increasingly became more orientated towards the needs of the motor vehicle.
\textsuperscript{160} Over 490,000 cubic yards (around 375,000 cubic metres) of this was hard sandstone which required drilling and blasting before removal. The Bell’s Line Road (Main Road No.184): History and Recent Improvement. Main Roads, Vol.16, No.1, September 1950, pp.18-26.
two railway overbridges and required the excavation of over 61,000 cubic yards (46,000 cubic metres) of sandstone.\textsuperscript{161}

Throughout the steadily growing mountain towns new local streets were also formed while older secondary roads were resurfaced with bitumen. This ongoing work was carried out by the Blue Mountains City Council using both its own funds and Government grants for roadworks. In fact, increasing private ownership of motor cars during the latter half of the 20th Century enabled the rapid spread of new residential developments in the Blue Mountains. Networks of interconnecting roads were integral to these new housing subdivisions and paved the way for the eventual suburbanisation of many parts of the Blue Mountains.

However, more residents meant even more cars, buses, trucks and motorcycles and by the late 1970s the increasing motor traffic in the Blue Mountains was causing severe congestion on the main mountain roads. By 1984 between 12,000 and 18,000 vehicles per day were using the Blue Mountains section of the Great Western Highway while around 3,500 per day travelled along Bell's Line of Road. To rectify the situation, in 1984 the NSW Government commenced a five year 'Blue Mountains Road Improvement Programme' at a cost of almost $44 million. Between 1984 and 1989 the Department of Main Roads carried out 28 major road projects in the Blue Mountains as well as ongoing road maintenance. The new works included intersection improvements, overtaking lanes, new pedestrian bridges and

\textsuperscript{161} 'Elimination of Hazards on the Great Western Highway Over the Blue Mountains'.

widening almost half the length of the main highway between Emu Plains and Katoomba from two to four lanes. The largest single work was a six lane extension of the Western Freeway (F4) from the Nepean River to Lapstone, the sheer immensity of which would have astounded William Cox, the first roadbuilder to tackle the Lapstone Monocline. In the 1990s major roadworks in the Blue Mountains continued with a further $22 million spent on replacing the notorious 'Woodford bends' with a new four lane deviation, as part of ongoing work to eventually upgrade the entire Great Western Highway between Lapstone and Katoomba to a four lane road.

Like the previous track making in the Blue Mountains, the most recent road improvements have entailed enormous earthworks which have unavoidably resulted in further impacts on the mountain environment. They have also served to progressively widen the north-south divide which the highway and railway has created in each mountain town.

Nevertheless, in the same way that steel train tracks replaced dirt tracks in the previous century, so bitumen roads have come to supersede and encircle the rail road during the 20th Century. But regardless of the type of track, to build, improve and maintain them has nearly always entailed major

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163 Department of Main Roads, *Blue Mountains Road Improvement Programme 1984-1989*, Sydney, 1984, pp.2-8. Department of Main Roads, *Roads 2000: Blue Mountains Region*, Sydney, 1987, npn. During the same period further roadworks were undertaken by the Blue Mountains City Council to improve and maintain the local road network using additional grants from both Federal and State Governments.

165 *Blue Mountains Gazette*, 26 September 1990 pp.48-49. With increasing population the future widening of the entire main highway across the Blue Mountains to four lanes seems inevitable.
earthworks, imaginative engineering and great expense. Yet while track
making has provided the means of traversing the Blue Mountains, the earth
itself has also been fundamental to the increased settlement of the region
since 1813. From the very beginning, the new mountain settlers came intent
on both claiming new ground and exploiting the earthly riches which lay
beneath.

**Taking the Earth**

**Claiming New Ground**

'...where a newly discovered country is to be divided, and taken up, the
book of "rivers, woods, ravines and mountains", has been found to
comprise the whole subject. A map is the most convenient edition of the
Book of Earth, wherein we can study features of countries that
mathematical principles enable us to place in their true proportions in
miniature upon paper...' Thomas Mitchell (1856)\(^{18}\)

As elsewhere in Australia, the European settlers of the Blue Mountains took
possession of the earth piece by piece. Unlike their Aboriginal predecessors,
the new settlers believed in individual ownership of land with the boundaries
of each private property delineated on paper. The first land to be 'taken up' in
the Blue Mountains region was in the early 1820s when several large grants
were made (initially under Tickets of Occupation') for grazing livestock in the
Vale of Clywd and Kanimala Valley adjacent to Cox's River and in the
Burrarorang Valley adjacent to the Wollondilly River. At the same time, small

\(^{18}\) Department of Main Roads, *Blue Mountains Road Improvement Programme*, op. cit.,
pp.2–8, Department of Main Roads, *Roads 2000: Blue Mountains Region*, op. cit.
\(^{18}\) Mitchell, 1856, *op. cit.*, p.3.
parcels of land were made available for the establishment of inns at specific places along the mountain road to service the traffic passing over the Blue Mountains.\textsuperscript{166}

However the boundaries of these early properties were usually vague and ill-defined. Like the rest of the colony of NSW, the actual topography of the Blue Mountains was mostly a mystery. To enable the mountain earth to be possessed more permanently, a more convenient and definite means of placing lines across the landscape was needed. In 1825 the British Government instructed the Governor to have the entire colony of NSW divided up into counties and parishes. Parcels of ground were to be allotted in rectangular blocks, defined mostly by straight lines and measured in square miles.\textsuperscript{167}

In 1828, two of the Land Commissioners appointed to 'apportion the territory' were instructed to recommend the areas within each proposed county which should be reserved for various 'public purposes'. George Meares Countess Bowen was sent to examine the country 'West of the Nepean' and in 1829 he submitted a report recommending boundaries for 'the first County to the Westward of Cumberland' (later named the County of Cook). Bowen's 1829

\textsuperscript{166} T.M. Perry, 	extit{Australia's First Frontier: The Spread of Settlement in New South Wales 1788-1829}, Melbourne, 1963, pp.34-35, 86-88, J. Jervis, 'The Discovery and Settlement of Burragorang Valley', \textit{JPRAHS}, Vol.20, Part 3, 1934, pp.189-193, Blue Mountains Heritage Study, \textit{op. cit.}, pp.36-38. The earliest roadside inns included the Golden Fleece or Collitt's Inn built in 1823 at Hartley Vale, the Pilgrim Inn built in 1826 (near present day Blaxland) and the Weatherboard Inn built in 1826 (at Wentworth Falls).

report also recommended the establishment of several reserves in the area, including a reserve for a village in the Vale of Clywdd (Hartley). Significantly, Bowen included with his report a coloured sketch map which is the earliest known complete map of that part of the Blue Mountains which lies within the County of Cook.\footnote{It appears that the existence of Bowen's 1829 sketch map was previously unknown until it was discovered during research for this thesis. Both the map and the report are held by the Archives Office of NSW. The exact location will be revealed in forthcoming article which will discuss the full significance of the map (as seemingly the first ever map of the County of Cook, and therefore a major part of the Blue Mountains) and hopefully include a full transcription of Bowen's report and a reproduction of the map.}

However, the accurate division of the territory required a larger and more detailed edition of the 'Book of Earth' - a comprehensive new map of the entire colony. From the moment of his arrival in Australia, Surveyor-General Thomas Mitchell had been keenly aware of the value of such a map, and in 1827 he commenced a triangulation survey of eastern NSW, including the region of the Blue Mountains, with the aim of producing the first reliable topographical map of NSW.\footnote{Perry, 1963, \textit{op. cit.}, pp.43-45, 50-51. Andrews, \textit{op. cit.}, p.10.} Mitchell saw this survey, and the map it would produce, as essential for the location of natural obstacles needed to be known, especially the 'sinuosities of mountain ranges, and their deep impassable recesses'. Once a proper map was made the permanent establishment of settlements would more speedily follow. To map the contours of the earth firstly required the interlinking of a series of triangles drawn by measuring the angles between various elevated locations using a theodolite. The Blue Mountains provided several of the key prominent points for Mitchell's map, including Mounts Hay, Tomah, York, Werong, Colong and Jenolan. Next the
topographical details within each triangle were filled in by measuring the principal natural features of the area, such as waterways and mountain ranges, with a chain (measuring 66 feet in length) and circumferentor. This information was then traced and plotted onto paper in scale to produce a map which could be directly linked and combined with other maps of neighbouring areas.170

To fill in the details of Mitchell’s map a team of surveyors and their convict assistants were sent to the Blue Mountains in the period between 1827 and 1833. The first surveys in the Blue Mountains region were undertaken by Robert Dixon in the Burragorang Valley. Following up on the early exploratory survey by Robert Hoddle in 1824, during 1827-28 Dixon traced the course of the Wollondilly River and parts of the Warragamba and lower Coxs River. After surveys in the Kurrajong area during 1829, Granville Stapylton mapped the north side of the Grose Valley between Kurrajong and Mount Banks in 1830. Also in that year, Dixon entered parts of the upper Grose Valley and later climbed Mount Hay to take measurements.171

The survey of the Blue Mountains intensified during 1831 with three groups of surveyors working in the area. From March to October, William Govett surveyed the western section of the central ridge, mapping the area from Mount York to Linden which lay between the Grose and Jamison Valleys. On

the 10 June Govett discovered the scenic 'cascades' which would later bear his name and also astutely observed that the 'mountain feature' was 'more remarkable for its deep hollows, than its heights'. Meanwhile, beginning in June, Francis Rusden surveyed the eastern section of the central ridge from Emu Plains to Linden and between the Grose and Coxs/Warragamba Rivers. About the same time Frederick D'Arcy traced 12 miles of the lower Colo River and explored some of the area to the north of Mount Tomah while attempting to map its upper reaches.\textsuperscript{172}

The mapping of the mountains continued during 1832 and 1833. Rusden completed his eastern section survey in May 1832 and later that year Govett surveyed the Darling Causeway (from Mount Victoria to Bell's Line of Road) and Mounts Tomah and Banks (to correct an earlier error by Staplyton) before tracing the Mount Wilson/Mount Irvine ridge. Govett continued his survey in the northern Blue Mountains during 1833 tracing ridges between the upper tributaries of Wollangambe Creek and later making a quick visit to the Colo River (following on from further mapping of the Colo by D'Arcy between April and July 1833). Meanwhile, another surveyor, Henry White, had been sent to the southern Blue Mountains and during 1833 he surveyed the ranges east of the Kowmung River, including Mount Colong, Tonalli Range, as well part of the upper Coxs River. Govett also carried out surveys in this area in late 1833 tracing some 20 miles of the Kowmung River and parts of Kanangra Creek.\textsuperscript{173}

Like the explorers before them, all the surveyors complained bitterly of the difficulties they faced traversing and measuring the rugged earth of the Blue Mountains. For instance, Stapylton described the area he traced as 'very bad country', while Rusden described the ground he surveyed as 'barren, rocky and scrubby in the extreme' with some ranges 'almost impassable'. After spending three days scrambling on foot in the Grose Valley, Dixon described the 'nature of the gullies' as 'beyond description' and 'thanked God' when he found his way out of them.\\

Govett was particularly eloquent in his descriptions of the 'difficulties of the ground' which he often found both 'most deceiving and difficult of access'. While surveying the ridges between the upper tributaries of Wollangambe Creek, Govett wrote:

'I never before beheld such a distant confusion of rocky ridges which neither word nor pencil can describe...Considering the locality and nature of the ground, it is altogether a most severe duty for one surveyor without more prompt and efficient means...''

Transporting supplies and equipment was especially difficult for the mountain surveyors, as the steep terrain often caused their pack horses or bullocks to fall and be injured. In many places the earth was so steep and rugged that the

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pack animals simply could not be used. In these circumstances, the
surveyors were forced to complete their surveys on foot by backpacking into
the inaccessible areas for days or weeks at a time. The confusion of ridges,
ranges and interconnecting gullies also made the work tiresome and repetitive
as no sooner had one range been traced than the surveyors had to backtrack
to start surveying the next.

As a consequence of the difficult terrain the surveyors faced, delays in
meeting Mitchell's demanding deadlines were common. Furthermore, the
confusing lay of the land, especially the maze of winding creeks and rivers, led
to mistakes in the mapping of the mountains, some of which persisted well
into the 20th Century. It also appears, as shown by Andrews, that in their
despair over the complex nature of the terrain, surveyors such as Govett at
times deliberately used guesswork and 'inexcusable fakery' to fill in parts of
their maps of the Blue Mountains.

Even so, given the enormous difficulties the earth often presented to the
surveyors of the Blue Mountains their detailed mapping of the area (most of
which took place in just four years - 1830 to 1833) was an extraordinary
achievement. Despite his often unreasonable criticisms of them, even Mitchell
acknowledged that his Blue Mountains surveyors deserved praise for their

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176 F. Rusden to T. Mitchell, 4 November 1831, and Monthly Report January 1832, W.
Govett to T. Mitchell, 18 June 1833, cited in Andrews, 1992, op. cit., pp.172, 205,
215.


178 For example, according to Andrews, Govett invented a fictional tributary of the
Colo River (called 'Main Creek') on one of his maps to cover up a previous
mapping of 'one of the most intricate and difficult mountains in the colony'.

The achievements of the surveyors of the Blue Mountains certainly deserve more public recognition than they have received to date, especially given the enormous attention given to the deeds of the mountain explorers who proceeded them. Few would disagree with the statement, attributed to Mitchell, that 'it is to be regretted that the public should know so little of the arduous labours of the surveyors', especially as they were 'so long and silently devoted to procuring geographical materials of a much more perfect description' than that of the explorers before them.

Mitchell's map of NSW was published in 1834. Along with changes to regulations, the new book of earth facilitated a rapid increase in the amount of land made available in the colony which was now sold by auction. In the Blue Mountains small parcels of land on either side of the mountain road were sold during the 1830s and 1840s upon which further inns were constructed. The government also reserved land in the Blue Mountains for military depots and stockades to house the convict roadworkers. During the same period more farming land was leased, and later subdivided and sold, in the Burragorang, Kanimbila and Megalong Valleys.

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181 These included the Valley Inn (near Valley Heights), Woodman's (later Buss's) Inn (at Woodford), Pembrooke's Hut and Blue Mountain Inn (both at Lawson), Shepherd and His Flock Inn (Pulpit Hill), Scotch Thistle Inn (Blackheath) and the Springwood (later Boland's) Inn (Springwood).
To cater to the increased traffic caused by the goldrush, more inns were established along the mountain road during the 1850s. After the opening of the railway the sale of mountain land accelerated during the 1870s and 1880s. Attracted by the natural scenery and climate of the mountains (which could now be rapidly reached in comfort), many of the wealthy and educated elite of Sydney purchased land in the Blue Mountains and built country residences. The railway further led to a surge in temporary visitors to the Blue Mountains and from the 1880s more mountain land was taken up as hotels, guesthouses and other accommodation places were constructed near the railway stations. Shops and more private residences accompanied these developments and gradually the country estates were subdivided as a ribbon of villages and towns steadily evolved along the mountain railway line.\footnote{183}

Piece by piece the mountain earth was progressively advertised and sold, and as each portion of ground was claimed it provided the foundation for new settlements. In many cases, the mountain earth also yielded the building materials for settlement. For instance, local sandstone was used in the construction of many of the grand country homes, hotels and accommodation houses, as well as for their garden walls, wells, steps and pathways. A prominent example was 'Eurama', a large private residence made from mountain sandstone which was constructed in the 1880s near Faulconbridge.\footnote{184}

\begin{footnotes}
\footnote{183}{Blue Mountains Heritage Study, op. cit., pp.36-38, 44, 55-57.}
\footnote{184}{R.A. Smolich and J. Low, Historic Blue Mountains, Katoomba, 1987, pp.18, 20, Australian Town and Country Journal, 20 August 1898, pp.30-31. At Jenolan Caves local mountain limestone was used during the 1890s to construct a new hotel extension (at Caves House), post office and 'handsome bridgetway' leading to the}
\end{footnotes}
However, the earth provided the foundation for Blue Mountains settlement in two other significant ways. Although the railway provided the impetus, the closer settlement of the region during the late 19th Century was actually a consequence of the development of two new local industries - mining and tourism. Both ventures relied on exploiting the earth.

**Unearthing the Black Fuels**

"...on splitting it with a hammer, it is black and hard as ebony...and so inflammable that you may light it easily with a match" C.H. Allen (1870)\(^{185}\)

Beginning with their first tentative forays into the region, Europeans consistently sought mineral riches in the Blue Mountains. Many of the early mountain explorers were keenly interested in the geology of the area and often noted finds of useful rocks in their journals. For example, Blaxland's party examined the earth and attempted unsuccessfully to descend into Jamison Valley in 1813 in order to 'procure mineral specimens which might throw light on the geological character of the country'.\(^{186}\) George Caley was the first to report the presence of an exploitable form of earth in the Blue Mountains, when during an exploration in 1806 he noticed outcrops of 'coals' in the Burragorang Valley. While exploring the course of the Warragamba River in

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\(^{185}\) Allen, op. cit., p.60.

\(^{186}\) Blaxland, 1813, op. cit., p.72. Also see Barrallier, 1802, op. cit., pp.761, 763, 801.
1818, John Jamison also occasionally saw 'rounded pieces of coal on the banks' and surmised that 'considerable beds' existed nearby.\(^{187}\)

These observations confirmed the presence of black fuels in the Blue Mountains, which we now know exist in the layers of earth called the 'Illawarra or Permian Coal Measures' that lie beneath the Narrabean Sandstone. Within the topmost 100 metres of the Coal Measures occur three distinct seams of black fuel, the highest known as the 'Katoomba seam' (a northerly extension of the Bulli seam). Beneath it lie the 'Middle River seam' and further down the 'Lithgow seam'. In the western part of the Blue Mountains the Coal Measures have been unearthed by erosion, although in most places they remain hidden beneath the talus of rocks and earth which have fallen from the sandstone escarpments above. However, in some parts the seams have been exposed at the surface revealing outcrops of coal and carbonaceous shale in the lower slopes of the mountain valleys.\(^{188}\)

In 1824, during construction of the mountain road descent known as Lawson's Long Alley, convict roadworkers unearthed part of the Katoomba seam in the Reedy Creek valley below Mount York and a sample of the 'coal' was forwarded to Sydney. In the same year, Rene Lesson visited the site and reported 'a layer fairly rich in coal or rather in carbonised bituminous wood'.\(^{189}\)


\(^{188}\) Bembrick, op. cit., pp.135-161.

\(^{189}\) G.H. Eardley and E.M. Stephens, The Shale Railways of New South Wales, Sydney, 1974, pp.13-14, R. Lesson, in Mackaness, op. cit., p.154. Lesson collected a sample of the 'coal' which he noted burnt 'with a lively flame'. 
The mineral discovered was actually a form of bitumenised mud or clay known as oil shale (also called kerosene shale or cannel) and this was the first discovery of this valuable material in Australia. Similar to coal in appearance, this other black fuel is much lighter and burns more easily. More importantly, when heated oil shale breaks down into gases and liquids which can be condensed and refined to produce crude mineral oils, including kerosene and gasoline for lighting, as well as paraffin wax for candlemaking, wood preservatives and various lubricating oils and greases. Prior to the advent of electric lights and petroleum, oil shale was a far more valuable commodity than ordinary coal. Although some local settlers collected the loose 'coal' for fuel, the distinctiveness of the Hartley Vale deposit remained unknown for many years.100

With construction of the mountain railway well underway, in 1866 commercial mining of the oil shale at Hartley Vale commenced. Initially the shale was transported by horse-drawn wagons to the railway terminus at Penrith, from where it was sent by rail to the city for refining and use by coal gas companies in both Sydney and Melbourne. The highest quality shale reportedly produced some 18,000 cubic feet of gas per ton with an illuminating power of up to 40 candles. After completion of the mountain railway in 1868, thousands of tons of shale were sent each year to Sydney. By

1871 this plant was producing nearly 6,000 gallons (27,200 litres) of oil per week, the majority of which was kerosene sold under the name of 'Comet Oill' for two shillings per gallon.\textsuperscript{191}

A visitor to the mine in the late 1860s gave the following description of the on-site shale processing. The shale was first:

'...split into small pieces, then crushed and melted in furnaces. The oil flows out thin and yellow; it is then distilled two or three times, at different temperatures, till it becomes as clear and white as crystal, and as thin as water. Indeed, it looks far more like spirit than oil. In this condition it is packed in tins and sent to the railway, and thence to Sydney...'.\textsuperscript{192}

Meanwhile, the opening of the Hartley Vale mine inspired others to scour the Blue Mountains for further viable outcrops of black fuel. The Grose Valley was investigated early on as during the railway survey of the valley in 1859 Henry Quodling of the Royal Engineers had reported the presence of 'a considerable seam of good coal'.\textsuperscript{193} In 1866, two prospecting brothers, John and Walter Mackenzie, discovered an outcrop of the Katoomba seam containing oil shale near Victoria Falls in the upper Grose Valley. However as the shale seam was just 18 inches (45 cms) thick, development of a mine proved uneconomical. Oil shale was also discovered in the Megalong Valley around 1870 where it outcropped in places along the western and southern edges of the Narrow

\textsuperscript{192} Allen, op. cit., p.60.
Neck ridge. This part of the Katoomba seam proved far more extensive and a mine known as the Glen Shale mine was later opened at this location.\textsuperscript{194}

During the 1870s outcrops of coal (also part of the Katoomba seam) were found in the Jamison Valley. In 1879 John Britty North opened the Katoomba Coal Mine at the base of the sandstone cliffs below Malaita Point (near Orphan Rock). Full-scale commercial operations commenced in 1882 after an endless cable tramway over two miles (over 3 kms) long was constructed to haul the coal to the railway line at Katoomba. The tramway included a steep incline from the ridgetop to the valley floor over 1,000 feet (over 300 metres) below (see Figure 1.9).\textsuperscript{195}

In the 1880s the Blue Mountains experienced a veritable boom in the mining of black fuels. Further outcrops of both coal and oil shale were located in the Jamison Valley near the Ruined Castle and prospecting of the area commenced in 1882. By 1885 at least 34 tunnels had been opened in the vicinity and the black fuels were transported to the base of the incline at the Katoomba Coal Mine along a track which ran next to Narrow Neck.\textsuperscript{196} Another coal mine called the Gladstone Colliery was opened in the Jamison Valley in 1885. This was situated below the cliffs between Wentworth Falls and Leura. The coal was hauled to the top of the cliff by an aerial cableway (flying fox) and then conveyed to the railway on an endless tramway over a mile (1.6 kms)

\textsuperscript{194} Sydney Morning Herald, 27 February 1867 p.3, Carne, 1903, op. cit., pp.200-203, Macqueen, op. cit., p.93.
\textsuperscript{195} J.R. Bennett, The Katoomba Coal Mine, Katoomba, 1972, npn., Carne, 1903, op. cit., p.171, BMHS Files.
\textsuperscript{196} Bennett, op. cit., Carne, 1903, op. cit., p.203.
long. However, the mine closed in the following year after only about 200 tons was produced as the ash content was found to be too high and the owners ran into legal difficulties.197

After the closure of the Gladstone Colliery, the aerial cableway was purchased by J.B. North's enterprise (reformed as the 'Katoomba Coal and Shale Company'). It was then reconstructed and extended for over two miles (over 3 kms) across the Jamison Valley between the base of the incline and the Ruined Castle mines to provide faster delivery of the black fuels to the railway. Meanwhile the production of the Katoomba Coal Mine rapidly expanded as a maze of underground tunnels was dug deep beneath West Katoomba that eventually extended as far as the railway line. In 1884 alone around 60,000 tons of coal was extracted (worth on average about 9 shillings per ton), most of which was destined to disappear up the funnels of locomotives and the chimneys of buildings.198

The increase in mining activities led to the rapid growth of Katoomba after 1880 as the town's population was swollen by the influx of miners and their families and those who came to provide services for them. Due to its 'mineral wealth', Katoomba soon earned the reputation as an major mining town whose principal industry was 'the coal trade'.199 Hartley Vale too, developed rapidly during the 1880s after a new refinery and retorting plant was set up

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near the mines to process more of the lower grade shale previously left behind. A considerable mining village soon materialised at Hartley Vale with cottages, shops, hotels and a post office erected and a resident population at its peak of some 600 people.\footnote{Eardley and Stephens, \textit{op. cit.}, pp.13-25, 34, Luchetti, \textit{op. cit.}, pp.6-13.}

In response to the obvious success of the Katoomba and Hartley Vale mines prospecting for black fuels in the Blue Mountains intensified during the 1880s. The Grose Valley especially was a hive of activity as more hopeful prospectors searched for payable outcrops of the Katoomba seam. In 1881 six 'short prospecting tunnels' were driven into an outcrop of the Katoomba seam in the upper Grose Valley near Asgard Swamp to assess its viability for coal mining. Attempts were made a few years later to further develop the site which included the building of a brick kiln to produce coke, however the venture was abandoned after only some 300 cubic metres of coal had been mined.\footnote{J.E. Carne, \textit{Geology and Mineral Resources of the Western Coalfield}, Memoirs of the Geological Survey of New South Wales, Geology No.6, Sydney, 1908, pp.158, 173, 179, E. Higginbotham and R.I. Jack, 'The Asgard Swamp Mine and Kiln Near Mt. Victoria, New South Wales: An Archaeological Report', \textit{Australian Archaeology}, No.15, 1982, pp.54-66, Macqueen, \textit{op. cit.}, pp.94-96. An attempt was also made during the 1880s to establish a small coal mine in Blackheath Glen (then known as 'Coalmine Gully'). Although machinery was lowered to the site and an access track cut and blasted down the mountainside, this mine too proved a failure and was abandoned - \textit{Illustrated Sydney News}, 6 February, 1890 p.23.}

Despite the frenzy of prospecting, by 1890 the mountain mining boom was over. While the mountain earth possessed many riches, they were not inexhaustible. The mining rush at Katoomba ended with a crash. After carrying just 500 tons or so, the expensive new aerial cableway collapsed into
the Jamison Valley and along with it went the fortunes of the Katoomba Coal and Shale Company. In 1890, the mines at Katoomba, Ruined Castle and Glen Shale were acquired by the 'Australian Kerosene Oil and Mineral Company' (the owners of the Hartley Vale mines) but by then the best seams of black fuels were rapidly diminishing. According to a geological report in 1890, the average thickness of the oil shale seam being worked in the Jamison and Megalong Valleys was just 12.5 inches (cms) and all the outcrops were of 'inferior quality', especially in comparison to the shale at Hartley Vale and elsewhere.\(^{202}\)

Despite the poor prospects, the new owners consolidated and upgraded the mining operations near Katoomba, installing new machinery including a double tracked cable tramway to bring the black fuels in skips to the base of the incline. In order to connect their mining sites in the Jamison and Megalong Valleys, a tunnel 10 feet (3 metres) wide (known as the Mt. Rennie Tunnel) was also driven through Narrow Neck. A cable tramway extended to the Glen Shale mines while a horse tramway ran to the Ruined Castle mines (see Figure 1.10).\(^{203}\)

Mining continued in the area for a few more years but the best quality black fuel was soon exhausted. As there was no market for the lesser quality shale (known as 'seconds' or 'trimmings') it was simply stacked near the mine entrances awaiting better times. The price of coal also remained low and in

1895 the Katoomba Coal Mine closed after yielding almost 380,000 tons of coal since its opening in 1882. Over the following two years the Ruined Castle and Glen Shale mines also closed (after yielding at least 79,000 tons of oil shale). Between 1903 and 1905 the stacks of 'seconds' were retrieved from the Ruined Castle and Glen Shale mines and transferred to Hartley Vale, along with the salvageable equipment of the once prosperous mines.\textsuperscript{204}

Meanwhile the output of the Hartley Vale shale mines had also noticeably declined by 1890 and the best quality shale was all but exhausted by the end of the 19th Century. In 1903 the mining of oil shale at Hartley Vale ceased and three years later the site and equipment were sold to the 'Commonwealth Oil Corporation'. According to Carne, between 1866 and 1901 over 382,000 tons of oil shale was extracted at Hartley Vale while over 170,000 tons of coal was mined between 1883 and 1906. In 1913 the owners of Hartley Vale went into liquidation and the entire operation closed. During the following five years, mine shafts were sealed and the once vibrant oil shale industry of the Blue Mountains was gone.\textsuperscript{205}

Prospecting activity resumed into the early 20th Century with some of the earlier prospects revisited to obtain coal for local use. For example, in 1903 a short tunnel was dug at Victoria Falls Creek near Mount Victoria to gather

\textsuperscript{203} Eardley and Stephens, \textit{op. cit.}, pp.79-86.
\textsuperscript{205} Carne, 1903, \textit{op. cit.}, pp.192, 286-287, Carne, 1908, \textit{op. cit.}, p.192, Eardley and Stephens, \textit{op. cit.}, pp.33-37. The mine output figures are underestimates of the total quantities obtained as in the early life of the mine accurate records were not kept.
coal from the Katoomba seam. Two years later, three tunnels 10 metres long
were driven under the cliffs of Evan's Lookout east of Beauchamp's Falls.\textsuperscript{206}

These early ventures failed to live up to expectations, to the disappointment of
those like the Blue Mountains Echo which observed:

\textit{There is a vague idea in the popular mind that the Blue Mountains are full
of coal. So they are. Now and then we hear of a discovery, but nothing
comes of it, and we pass on satisfied there was a hitch somewhere or
other.}\textsuperscript{207}

Nevertheless, renewed efforts were made to establish a new mountain coal
mine during the 1920s. A serious attempt was made between 1920 and 1923
by the Blair Athol Coal and Timber Company, which after drilling a number of
exploratory bores sunk an inclined tunnel 1,500 feet (457 metres) long and
500 feet (152 metres) deep at Victoria Brook near Mount Victoria. It was
estimated that the proposed Blair Athol No.4 Colliery could yield at least 37
million tons of coal at a rate of 2,000 tons (2,032 tonnes) per day. However,
the high hopes of the Blair Athol venture came to nothing seemingly because
the deeper coal was found to be of inferior quality.\textsuperscript{208}

Black fuels were also sought by the Grose Valley Development Syndicate
which was formed in 1924 to exploit 'this great valley of potential wealth'.
According to the Syndicate's propaganda, the Grose Valley contained 'an
almost unlimited supply of the best quality coal', as well as a wealth of oil
shale and timber, all of which lay hidden in the valley's vast expanses 'only

\hspace{1cm}\textsuperscript{206} Carne, 1908, \textit{op. cit.}, p.158, Else Mitchell, \textit{op. cit.}, p.260, Macqueen, \textit{op. cit.}, pp.97-
98, \textit{Historic Blackheath, op. cit.}, p.131.
\textsuperscript{207} \textit{Blue Mountain Echo}, 25 May 1923 p.2.
waiting for the hand of man to exploit it'. Prospecting had revealed 'four and a half miles of coal extending on each side of the river' which could supply an output of 270,000 tons of coal per annum. Seams of oil shale were also found one said to be over seven feet (two metres) thick and yield 56 gallons (254 litres) per ton. As well as coal and oil shale, the Syndicate also claimed that 'many millions of tons' of chert and 'large deposits' of clay shales (suitable for brick-making) were lying in the Grose Valley which would 'prove to be a profitable asset'. In anticipation of a rush of investors, the Syndicate acquired mineral leases covering six square miles (over 3,800 acres) of the Grose Valley.208

However, financial backing for the Syndicate's grand plans failed to materialise and the leases were eventually cancelled in 1932. This was unsurprising considering that the mineral potential of the Syndicate's holdings had clearly been greatly exaggerated. For instance, one of the prospects dug into the coal seam was just a metre deep. The Syndicate's wild and unrealistic claims originated from its Managing Director, Ernest Williamson, who according to Macqueen was either deluded by his obsession with the Grose scheme or a deliberate con artist.210

208 Blue Mountain Echo, 25 May 1923 p.2, Goldberry, op. cit., p.44.
210 Whether Williamson's exaggerations were due to him being just an 'optimist under all conditions' (as stated by a contemporary) or a fraud remains unresolved. Macqueen, op. cit., pp.99-104.
Mining of black fuel did however resume in the Blue Mountains during the 1920s. In 1923 local prospectors inspected the old workings of the Katoomba Coal Mine and found that much valuable coal still remained. Following another inspection in 1925, a cooperative company named 'Katoomba Colliery Limited' was formed by local interests to reopen the mine. The incline tramway was rehabilitated and new tracks laid to the mine entrance using material salvaged from the remains of the previous mine. For the first few years things went well and payable quantities of coal were obtained particularly by using the piles of small or 'slack' coal which had been left behind by the previous miners. Hundreds of tons of this coal were sold to the Katoomba Power station which provided electricity to the local area, and smaller quantities were also delivered to local hotels, boarding houses and residences. Coal was also sent to the railway at Katoomba for transport to consumers further afield - see Table 2.211

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<th>£ Value</th>
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<td>21</td>
</tr>
<tr>
<td>1937</td>
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</tbody>
</table>

1938 - 1940 Katoomba Colliery no longer listed

Source: Appendix XVIII, Railways Commissioners Annual Reports in NSWPP, 1927-1940.

By 1929 the mine was experiencing a number of difficulties and the workforce was reduced. With the impact of the Depression in the early 1930s the demand for coal declined sharply (see Table 2). Although coal mining continued sporadically for a few more years, by 1939 the Katoomba Coal Mine was no longer profitable and during World War II mining operations ceased and the company went into liquidation. Most of the machinery was removed prior to the expiry of the mine’s lease in 1945 which signalled the end of coal mining at Katoomba for the second and last time.212

While the fortunes of the Katoomba Coal Mine were steadily declining, during the 1930s and 1940s some coal was also being mined at other small outcrops in the Blue Mountains to provide a local supply of fuel. For example, coal was obtained near Pierce’s Pass in the Grose Valley and from several sites in the Megalong Valley.213

During the 1950s and 1960s there was renewed interest in the black fuels beneath the Blue Mountains. Geological surveys were carried out in the region including seismic surveys, field mapping and the drilling of exploratory bores near Kurrajong Heights in 1958 and Woodford in 1962.214 The long desired dream to mine the Grose Valley coal finally became a reality in 1956 when the Hartley Main No.4 mine was opened at Koombanda Brook near the head of the Grose River. Initially the operation was small, but after a change of

212 Bennett, op. cit., BMHS Files. The mining tunnel entrances in the Jamison Valley were sealed in 1970 due to safety concerns.
owners in 1960, the mine was fully mechanised and the entire operation greatly expanded during the 1970s and 1980s. At its peak the Hartley Main No.4 Colliery employed around 200 people and produced up to 800,000 tonnes of coal per year much of which was exported. The mine continued operating until 1987 when a downturn in the coal industry led to its closure.\textsuperscript{215}

Meanwhile, during the 1960s other mining interests were keen on exploiting coal in the Blue Mountains region. In 1966 Clutha Development Limited applied for a licence to prospect for coal underground over an area of some 35,000 acres (14,100 hectares) south of the railway line between Linden and Wentworth Falls. The application was refused in 1968 following strong opposition from the Trustees of the Blue Mountains National Park. However, Clutha tried again and in 1970 were granted a licence to explore underground for coal over an area of 134 square miles (346 sq. kms) in the Blue Mountains. A seam of good 'coking coal' was discovered about 1,800 feet (550 metres) below the surface and in 1971 the company applied for a mining lease over an area of around 12 square miles (31 sq. kms) south of the railway between Valley Heights and Wentworth Falls. However Clutha's plans to extract up to 100 million tons of black fuel provoked intense local opposition with fears expressed that the project would lead to the 'rape of the Blue Mountains'. Over a thousand mountain residents attended a protest meeting in Springwood and the issue was raised in State Parliament. Faced with such

\textsuperscript{215} Macqueen, \textit{op. cit.}, pp.105-108, Goldberry, \textit{op. cit.}, p.42, \textit{Blue Mountains Advertiser}, 11 May 1950 p.1. The mine temporarily reopened during the 1990s (as the Canyon Colliery) but has since closed permanently.
strident opposition from the public, council and local members of Parliament, the application to mine was ultimately refused by the NSW Government.\textsuperscript{219}

The vehement rejection of the Clutha proposal well illustrated how much attitudes towards the mining of coal had changed in the Blue Mountains by the 1970s. No longer were the miners welcome in an area which a century before had largely been founded on exploiting the mountain earth for its black fuels. Much of the more recent opposition to coal mining has stemmed from the increasing evidence that extracting the earth often leads to serious environmental impacts.

Underground mining often causes subsidence of the earth, which if carried out beneath or adjacent to sandstone escarpments can cause the collapse of cliff-lines and delicately balanced rock landforms. Although the causes of earth movements are often complex and uncertain, there is strong evidence that mining activities have triggered a number of rock falls and landslides in the Blue Mountains.\textsuperscript{217}

The most well known example is the collapse of the cliff face at Dog Face Rock in 1931. In the previous year, workers in the Katoomba Coal Mine had extracted pillars beneath the cliff-line at Dog Face Rock. By January 1931 a


'gigantic crevice' had appeared along 100 metres of the escarpment edge that steadily widened to over two metres as a huge block of sandstone moved out away from the main cliff. Newspapers at the time suggested that the workings of the coal mine may have 'assisted in bringing about the anticipated fall', which resulted in an estimated 100,000 tons (m) of rock and earth crashing into the Jamison Valley below (see Figure 1.11). Rock falls have also occurred in the Grose Valley in the vicinity of the Hartley Main No.4 Colliery where pillar recovery was also carried out in several areas close to the cliff line. A series of landslides and rock falls have also occurred in the 20th Century above the Nattai North coal mine in Burragarang Valley, above former coal mines at Hassan's Walls near Lithgow, and above an oil shale mine at Newnes. Ongoing monitoring of rockfalls has confirmed that the effects of subsidence on escarpments may persist for many years after the end of mining, which could have serious consequences for future mountain tourism.

Mining induced subsidence also impacts on the flow of groundwater in sandstone landscapes, which can adversely affect the hydrology of local stream channels and swamps leading to ecological changes. According to Macqueen, broad-scale subsidence in the plateau areas above the Hartley Main No.4 mine in the upper Grose Valley has opened up 'cracks in the terrain' and 'allowed seepage of water into the mine' permanently altering the natural drainage over a wide area. Coal mining may also result in pollution of

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\[218\] Sydney Morning Herald, 27 January 1931 p.9, 30 January 1931 p.12. Fells et al., op. cit., pp.380-382. Several further rockfalls have occurred since from above the former mine workings at Katoomba.
local streams. Water draining from coal mines usually contains high levels of sedimentation, sulphuric acid and dissolved iron compounds all of which adversely affect aquatic life downstream. In some cases mine drainage also contains organic compounds (such as hydrocarbons) and heavy metals (such as cadmium, zinc and lead), which have been leached from the coal and are toxic to aquatic life. Like the impact of subsidence, the effects of such pollution can be longterm and persist for well after the mine has closed. For example, the Hartley Main No.4 mine has been named as the most likely source for coal sediment observed in the Grose River in 1982, and the drainage from the mine is reportedly still acidic and high in dissolved iron.\textsuperscript{220}

Although critically important to the settlement of the region, the mining of black fuels has clearly left its legacy in the landscape of the Blue Mountains. However, there were other mineral riches also dug from the mountain earth.

\textbf{Mining Metals}

\textit{\'Vast Austral Giant of these rugged steeps,}  
\textit{Within whose secret cells rich glitt'ring heaps}  
\textit{Thick pil'd are doom'd to sleep, till some one spy}  
\textit{The hidden key that opes thy treasury'} W.C. Wentworth (1823)\textsuperscript{221}

The first gold discovered in Australia was found in the Blue Mountains. In 1839 Count P.E. de Strzelecki collected a small amount of gold near the Coxs River in the Vale of Clywdd, but noted that it was 'insufficient to repay its

\textsuperscript{219} Pells et al., op. cit., pp.359-385, Young and Nanson, op. cit., pp.4-10.  
\textsuperscript{220} Young and Nanson, op. cit., pp.4-10, Macqueen, op. cit., p.107.  
\textsuperscript{221} W.C. Wentworth, 'Australasia', in Richards, op. cit., p.196.
extraction'. Reverend W.B. Clarke also found gold in granite and quartz debris near Hartley in 1841 and concluded that the precious yellow metal would be more widely and abundantly found elsewhere nearby. On learning of the discoveries the Governor George Gipps requested that the information be kept secret to prevent mischief and unrest in the convict colony. Eventually in 1851 large payable deposits of alluvial gold were found near Bathurst to the west of the Blue Mountains, the announcement of which sparked Australia's first gold rush.222

While most gold mining took place further to the west, there were those who also sought for the yellow metal in the Blue Mountains. Throughout the 19th Century prospectors occasionally searched the region for gold but generally to no avail. For many years there were persistent rumours of gold in the upper Kowmung River area which derived from reports by local stockmen. Possibly in response to such stories in 1890, the Department of Mines sent two parties of prospectors to search the country between Jenolan and Wombeyan Caves for 'gold and other minerals' but no discoveries were made. Nevertheless, according to Barrett, at least two miners had begun fossicking in the Kowmung River prior to 1891.223


In 1907 'payable gold' was reportedly discovered in the upper Kowmung River and several claims were established. By 1910 some 14 gold mining leases were held covering an area of 108 acres near the junction of Cedar Creek and the Kowmung River. However, the Department of Mines noted that 'no gold has so far been recovered'. It appears that little if any 'payable' gold was found as prospecting at the remote Kowmung leases ceased within a few years. During the Depression of the 1930s a few hopeful fossickers also tried their luck in the upper Kowmung River area. Most concentrated their efforts around the junction of Church Creek and the Kowmung and the headwaters of Butcher's Creek. Once again, the river banks yielded more disappointments than specks of gold and the area was abandoned by the mid 1930s.

Although the search for payable gold proved futile, another precious metal - silver - was mined far more successfully in the Blue Mountains. The presence of silver was first noted in 1871 when a sample of silver-lead ore (galena) was found in the southern Blue Mountains near Basin Creek, a tributary of the Tonallli River. Intermittent prospecting was carried out in the vicinity during the 1870s and 1880s, but little success was achieved until 1897 when a large fissure lode of silver and lead was unearthed three miles (almost five kilometres) further to the west. Mining commenced at the site in the following year and soon several mines were operating in the area between Basin Creek and the Tonallli River, which became known as the Yerranderie Silver Field. By 1900 over 150 miners were at work in the Yerranderie mines which together

225 Barrett, op. cit., pp.57-60.
that year produced 616 tons of ore containing over 58,500 ounces of silver, 100 ounces of gold and 118 tons of lead, worth £9,125 in total.\textsuperscript{226}

The lodes of silver-lead ore at Yerranderie had formed over 350 million years before when steaming mineral solutions associated with a large volcanic eruption had entered, cooled and solidified inside fissures and fractures in the surrounding igneous rocks (quartz-porphyry). The lenticular lodes were generally discontinuous and varied erratically in width from a thin thread to up to eight feet (2.4 metres) thick. The main silver lead lode at Yerranderie extended in an east-west direction for over four miles (6.4 kms) but there were also various smaller offshoots and parallel veins. Many of the ore lenses were exceptionally rich, some containing up to 200 ounces (5.6 kg) of silver per ton, in addition to smaller amounts of gold. The bulk ore also yielded large quantities of lead, in some cases up to 40% of the total tonnage.\textsuperscript{227}

Usually more than half the ore won was first grade ore (that yielding more than 100 ounces of silver per ton) which was known as 'firsts'. This was bagged for transport by road to the Camden railway station 42 miles (67 kms) away. The second grade ore (or 'seconds') were either left underground or stacked at the mines. Small on-site mills were later established that crushed

\textsuperscript{226} L.F. Harper, The Yerranderie Silver Field, Mineral Resources No.35, New South Wales Department of Mines, Geological Survey, Sydney, 1930, pp.6-12. This report also contains a map showing the locations of the principal mines at Yerranderie.

and treated the piles of lower grade ore and other fine screened material to recover the tiny concentrates of silver, gold and lead. 228

Between 1901 and 1910 mining operations at Yerranderie expanded rapidly. New mines opened up, prospecting increased and miners and their families moved to the area establishing a sizeable mining village. During this decade over 35,000 tons (35,560 tonnes) of ore were raised and sold which yielded 3,177,837 ounces (88,979 kgs) of silver, 7,087 ounces (198 kgs) of gold and 8,333 tons (8,466 tonnes) of lead. By 1909 over 320 miners were employed and eight separate mines were in operation. Mining continued to prosper between 1910 and 1912 largely due to favourable prices for metals but production of ore began to decline in 1913. 229

With the commencement of World War I in 1914 mining at Yerranderie was affected by wartime export restrictions on metals which led to the cancellation of contracts and created an unfavourable market for silver and lead. All of the small workings closed down and the mining population of the area decreased considerably. By 1916 the total quantity of ore mined had slumped to just 1,649 tons (1,675 tonnes) - the lowest amount since 1903. As Harper noted, this was 'a bad year for the field' owing not only to the impact of the war but

also to litigation between various mine owners, labour problems, machinery malfunctions and the flooding of mine shafts.\textsuperscript{230}

Although the war compounded the situation, by far the biggest drawback for the Yerranderie mines was the lack of a railway to transport the ore from the remote mountain mining site. From as early as 1908 mine owners had lobbied unsuccessfully for a railway to be constructed to Yerranderie. The railway proposal was even referred on two separate occasions to the Parliamentary Committee on Public Works – in 1916 and 1921. Surveys were undertaken for a 24 mile (38 km) single rail line to be constructed from near Thirimere Lakes to Yerranderie which would traverse the valleys of Blue Gum Creek, the Little River, Nattai River and Wollondilly Rivers. However on both occasions the Parliamentary Committee rejected the proposed railway, concluding that the line would operate at a loss and its construction could not be justified given the increasingly uncertain future of the Yerranderie mines.\textsuperscript{231}

Even without a railway mining activities at Yerranderie recovered somewhat during the later years of the war. During 1919 and 1920 ore production increased significantly again despite a heavy fall in metal prices following the end of WWI and the constant scarcity of water. But this proved to be only a temporary revival as the known reserves of ore were being steadily depleted.


\textsuperscript{231} Parliamentary Standing Committee on Public Works, 'Report on Proposed Railway from Picton Lakes to Yerranderie', NSWPP, 1916, Vol.5, pp.589-593, Parliamentary Standing Committee on Public Works, 'Second Report on Proposed Railway from Picton Lakes to Yerranderie', NSWPP, 1921, Vol.4, pp.353-358. In 1916 the estimated cost of the railway was over £197,000 (average of over £8,200 per mile). This had risen to over £269,000 (average of over £11,000 per mile) by 1921.
and no additional rich lodes of silver had been located since 1915. By 1920 the total mining workforce had declined to 136 from over 330 prior to World War I. A slump in metal prices, industrial trouble, and continued water shortages led to a decline in mining activity during the early 1920s.\textsuperscript{292}

Between 1923 and 1925 only four mines were still operating at Yerranderie and a geological survey undertaken by the Department of Mines noted that most of the ore reserves might become depleted in a few years. However, the report still concluded that Yerranderie had 'excellent' prospects of maintaining its position as an 'important mining centre for years to come' provided silver and lead prices did not fall appreciably and further prospecting and development work was not neglected.\textsuperscript{293}

This proved to be wishful thinking as simmering industrial unrest at Yerranderie exploded in February 1925. When demands for higher wages, a 40 hour week and sickness and holiday benefits were refused, union mine workers walked off the job and the mines were closed. The strike lasted until January 1926 when after arbitration the employers finally agreed to the workers demands. But a return to work did not bring a return to prosperity for the Yerranderie field. Ore production declined significantly in the following years following a fall in metal prices and further industrial troubles. By 1929 only one mine remained opened which raised just 770 tons of ore. In the

\textsuperscript{292} Parliamentary Standing Committee on Public Works, 1921, \textit{op. cit.}, pp.353-358, Harper, \textit{op. cit.}, pp.11, 41.
\textsuperscript{293} Harper, \textit{op. cit.}, pp.5, 9-12, 41-42, 57.
following year it too closed and production ceased entirely as most mines went into liquidation during the Depression.\textsuperscript{234}

Between 1900 and 1930 the Yerranderie mines in total raised and sold 117,540 tons (119,420 tonnes) of ore which produced 10,582,780 ounces of silver (336 tonnes), 37,924 ounces of gold (1.2 tonnes) and 26,903 tons (27,333 tonnes) of lead. Although the precious metals of silver and gold were the most valuable minerals obtained, in terms of sheer output the 'Yerranderie Silver Field' was actually more of a lead mine.\textsuperscript{235}

While commercial operation of the mines ended in 1930, some small scale mining resumed at Yerranderie between 1934 and 1939. This was carried out by small groups of workers known as 'tributors' who were given permission to gather limited amounts of ore from the former mines and pick through the mullock heaps of leftover material for concentrates. After World War II, small quantities of ore continued to be obtained each year from the old Yerranderie mines, but in 1954 the site was abandoned entirely shortly before the main access road was closed permanently by the rising waters of Warragamba Dam. By the 1980s, Yerranderie had become a remote tourist site with visitors able to admire the wild beauty of the bush that is steadily reclaiming


the mullock heaps, rusty machinery and other decaying remnants of the once productive mines.\textsuperscript{288}

**Sand, Gravel and Stone**

While black fuels and precious metals have been the most important and valuable minerals extracted in the Blue Mountains, other resources of the earth have also been utilised. For instance, in various parts of the Blue Mountains a number of small local quarries have operated intermittently to meet the local need for sand, gravel and stone.

As noted previously, for many years local supplies of chert, sandy clay loam, granite gravel and broken sandstone and shale have been quarried for use on unsealed roads. Further quarries have been established to provide clean sand and quartz gravel for various construction needs including bricklaying, cement making and plastering. Sandstone has also been quarried in several areas of the Blue Mountains for ornamental and construction use by local stonemasons and the manufacture of grindstones and flagstones. Although the mountains are largely made of sandstone, only a small proportion of it is suitable for building and other purposes that require durability. Reports compiled for the local council in 1959-60 recorded the existence of various sand, gravel and loam quarries at Blackheath, Medlow Bath, North and West Katoomba, Wentworth Falls, Lawson, Blaxland and Woodford. Good quality sandstone was also being obtained from quarries at Katoomba, Woodford and

\textsuperscript{288} See Department of Mines, *Annual Reports* 1934-1954, various pages, den Hertog,
Springwood. During the 1980s several large quarries were also established on the Newnes Plateau in the western Blue Mountains to mine friable sand for a range of construction and industrial purposes, such as concrete manufacture and glass making.

Attempts have also been made to exploit the limestone deposits of the southern Blue Mountains, most notably in the late 1960s. Mining of the mountain limestone was first considered prior to World War II but it was not until the late 1950s that three mineral leases were granted covering an area of 75 acres (30 hectares) near the Colong Caves. However, initially these proved too small and inaccessible to be developed.

In the early 1960s bushwalkers discovered that limestone prospecting was being undertaken in the northern section of the Colong Caves Reserve and in 1966 mining applications were made by two cement companies. Despite numerous protests, in early 1967 the NSW Government revoked a large area of the caves reserve and granted another 45 acre (18 hectares) mining lease to Associated Portland Cement Manufacturers (APCM) Limited. The company planned to mine a mountain of limestone over 2,000 feet (690 metres) high named Mount Armour. Up to 50 million tonnes of limestone were to be

\[op. cit., pp.27, 41-42.\]
\[238\] In 1986-87 over 400,000 tonnes of sand was extracted from Newnes with the future reserves of sand estimated to exceed 200 million tonnes. Department of Planning (NSW), Management Strategy for Newnes Plateau Providing for Winning of its Construction and Industrial Sand Resources, Sydney, 1990.
quarried, crushed on site and then transported as a slurry in a pipeline to the cement works situated at Maldon (near Picton) 39 miles (62 kms) away.\textsuperscript{240} The Colong mining proposal aroused strong public opposition as the works involved the destruction of several limestone caves near Church Creek and would cause the desecration of the scenic wilderness values of the area. Public protests intensified after the formation of the Colong Committee in 1968 which was set up to coordinate the fight against the mining proposal. For five years the State Government stubbornly refused to halt the mine and conservationists waged a protracted and persistent campaign to have the mining leases revoked.\textsuperscript{241}

Eventually the constant pressure proved overwhelming. In 1971 ACPM agreed to relinquish its mining leases at Colong in exchange for access to additional limestone areas situated at Bungonia Creek near Marulan, 75 miles (120 kms) south of the Maldon cement works. The Colong leases were cancelled in 1974 and the area incorporated in the Kanangra Boyd National Park.\textsuperscript{242} As one of the first major confrontations between mining and environmental interests in Australia, the Colong Caves issue was a historical event of national importance, which ultimately set the scene for many latter disputes between those who wished to exploit the earth and those who wished to preserve it.

\textsuperscript{240} \textit{Sydney Morning Herald}, 3 October 1966 p.5, 26 December 1967 p.2, Colong Committee, \textit{op. cit.}, pp.9-11. For extracting the limestone from public land the company agreed to pay an annual rental of just $23 and 5 cents per ton of limestone and restore the area to 'as near as possible its native state'.

\textsuperscript{241} For the further details, see Colong Committee, \textit{op. cit.}, pp.10-33. Also 'Colong Caves Reserve' Petition, \textit{NSWPP}, 1967-68, Vol.3, p.1059.
Nevertheless, despite more recent opposition to mining the extraction of black fuels, precious metals and sand, gravel and stone from the mountain earth has been an significant part of the historical relationship between people and earth in the Blue Mountains. But the earth has also been vitally important to the region as a tourist attraction.

**Admiring the Earth**

The mountain earth has always possessed great scenic appeal, with the natural features admired located both above and below the ground.

**Subterranean Scenery**

'Within the mountain the magnificence of the sights passes all description'  
C. Trotter (1888)²⁹⁹

Perhaps the most unique, exquisite and memorable earthly attractions in mountain history were the spectacular limestone caverns of the southern Blue Mountains, most notably the Jenolan Caves.

The Jenolan Caves have been visited and admired for thousands of years.

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²⁹⁹ Colong Committee, *op. cit.*, pp.34-36. Ironically in saving the Colong Caves area, parts of several other public reserves near Marulan were sacrificed for limestone mining including a scenic section of Bungonia Gorge.

Despite past assertions to the contrary, the Gundungurra Aborigines of the Coxs River area were familiar with the Jenolan Caves and the surrounding limestone ridges which were known as 'Binoomea' or 'Binomil'. Aboriginal people not only knew of the underground caverns but reportedly penetrated them as far as the subterranean water."44 Little is known of exactly how Aboriginal people made use of the limestone caves of the Blue Mountains, but it seems highly unlikely that the awe-inspiring features of the caves had special and perhaps significant spiritual meaning for them.45

The first Europeans were apparently attracted to the Jenolan Caves not for its scenery but as a remote hiding spot. A traditional story has persisted that the Jenolan Caves were 'discovered' and used as a refuge by cattle stealers during the 1830s, one of whom was named James McKeown or McEwan.46

It is certain that by the 1840s Whalan's brother, Charles was regularly guiding visitors to the Jenolan Caves then known as the Fish River or Binda Caves. Interest in visiting the caves increased with the discovery of the first

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44 One Aboriginal visitor certainly became lost or fell into the caves over 16,000 years ago, as their lime encrusted skeleton now lies on the floor of one of the deeper caverns at Jenolan. J. Horne, Jenolan Caves: When the Tourists Came, Sydney, 1994, O. Trickett, Guide to the Jenolan Caves, New South Wales, Sydney, 2nd ed., 1905, pp.21, 51, Sydney Mail, 12 December 1896 p.1250.

45 Cave water was certainly revered - see Chapter Two. The caves also feature briefly in the Gundungurra legend 'Gurangatch and Mirragan' which provides further evidence that these and other limestone caves in the region were familiar to Aboriginal people - see J. Smith, Aboriginal Legends of the Blue Mountains, Wentworth Falls, 1992, p.53.

dark underground caves - the Arch Cave (in 1846) and the Elder Cave (in 1848). A newspaper report in 1848 described the caves as 'very spacious' and abounding in 'beautiful stalactites and stalagmitic deposits' which were 'well worth while visiting'.

Excursions to the caves continued during the 1850s as settlers from Bathurst and other places within a day's ride made short visits and conducted 'picnic parties' to the area, sometimes in groups of twenty or more. A correspondent to the Bathurst Free Press predicted in 1859 that 'at no very distant date their fame as the greatest national wonder of Australia will be established'.

What attracted these visitors, and all those since, is the incredible size and variety of the caves and their remarkably beautiful and diverse contents, all of which were formed over millennia by the persistent action of water on limestone. The most obvious features of the limestone landscape are the large open caverns of the Grand Arch, Devil's Coachhouse and Carlotta's Arch, which have always been admired for their impressive size, rugged grandeur and imposing nature. To a visitor in 1848 they were like 'yawning jaws' which were so 'awfully grand and sublime' that it made human visitors appear 'dwarfish and insignificant'. In addition to their aesthetic appeal, the

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247 Bathurst Advocate, 13 May 1848 p.2, Dunlop, op. cit., p.50.
249 The formation of the limestone caves and other karst features in the Blue Mountains is described in Chapter Two.
open caverns also served for many years as the main shelters used by early cave visitors who camped at night beneath their enormous stony cellings.\(^{290}\)

However, it was the beauty of the subterranean scenery which inspired by far the most admiration and adjectives. As Cook observed, the 'more elaborately beautiful objects' were hidden in the 'dark recesses of the enchanted mountain'. Since the caves were first visited for pleasure, eloquent and poetic descriptions have abounded of the underground 'wonderland' at Jenolan, which was said to 'excite surprise or challenge admiration at almost every step'. Most writers have struggled vainly to convey in words the exceptional beauty and variety of the 'fantastic and delightful' underground sights.\(^{291}\)

Trickett has provided one of the best descriptions of the underground attractions at the Jenolan Caves, highlighting their astounding diversity from the 'majestic and massive' columns and stalactites to the 'curiously ornamented' draped shawls, 'clusters of tiny glistening pendants' and 'fragile traceries like filagree work'.\(^{292}\) The awe-inspiring beauty of the cave features, along with their profound silence and intense darkness, often provoked strong emotions in visitors. One guidebook claimed the sheer sublimity of the scenery was more than sufficient to 'charm the artist', 'inspire a feeling of

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\(^{292}\) Trickett, op. cit., p.20.
devotion', 'move the soul of the poet' and 'touch the deepest chords of the human heart'.

While many cave visitors just marvelling at the underground sights, some were so enamoured with the enchanting cave formations that they broke them off and took them home as souvenirs. This practice began very early on with one group of visitors in 1848 admitting that 'we loaded ourselves with the curiosities of this place'. As the number of cave visitors increased there were 'Goths and Vandals' among them who 'did not scruple to remove many a crystal gem from the still unfathomed caves'. Another early visitor to this cave reported that several 14 feet long saplings had been used by previous visitors to 'knock down such stalactites as came within their reach, since scores of them were lying on the floor broken and destroyed'. By the 1890s it was estimated that 'perhaps a quarter of the beauty of the caves has been wantonly destroyed'.

Even local parliamentarian, John Lucas (who was later instrumental in having the area created a reserve) was not adverse to taking a few souvenirs during his visits to the Jenolan Caves in the early 1860s. Lucas admits that on his

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Cook, op. cit., p. 185. As noted by numerous writers, most 19th Century descriptions of the Blue Mountains, including the Jenolan Caves, were strongly influenced by romanticism, especially artistic and literary notions of the sublime. Consequently, these descriptions often focused on features which inspired an emotional response of wonder and awe. See K. Hartig, Images of the Blue Mountains, University of Sydney, 1986, pp.42-43, 60-67. 77-78, J. Horne, 'Favourite Resorts: Aspects of Tourist Travel in Nineteenth Century New South Wales', Ph.D Thesis, University of NSW, 1995, pp.170-175.

Bathurst Advocate, 30 December, 1848 p.2.

first visit he 'broke off a stalactite about a foot and a half long'. After three visits to the caves Lucas admitted to having brought back to Sydney 'some hundred specimens of the crystals, some being four feet long'. Although Lucas was just one of many early plunderers he seems to have been oblivious to the hypocrisy of taking his own souvenirs of the caves whilst preaching that 'it is much to be regretted that visitors are so mischievous as wantonly to destroy these beautiful works of nature'.

Many early visitors to the caves also disfigured the caves and their contents with graffitti. Later cave visitors complained that those before them had scrawled or inscribed their names and other 'odious hieroglyphics' on every available space in the Grand Arch and 'all through the caves', including on some of the most beautiful cave decorations. Some early visitors and guides also risked permanent damage to the caves by playing with the delicate formations. For instance, several of the caves contained groups of stalactites which when struck with a hammer or stone produced 'sonorous musical tones' reminiscent of a chime or 'perfect peal of bells'.

In a somewhat belated attempt to protect the caves from further damage, in 1866 the NSW Government created Australia's first conservation reserve. An area of six and quarter square miles was set aside for 'the preservation of the

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225 Clearly, destruction of the formations was acceptable as long as it wasn't 'wanton' and carried out by politicians rather than 'Goths and Vandals'. Lucas, op. cit., p.3, *Sydney Morning Herald*, 31 May 1864, p.4.
Fish River Caves' and in the following year a local settler, Jeremiah Wilson, was appointed the official 'Keeper of the Caves'. However, it was impossible for Wilson to effectively monitor all of the parties now visiting the caves whose numbers expanded further after the opening of the railway to Mount Victoria in 1868.\(^{259}\) Not all the damage to the caves was deliberate. While admiring the earth, visitors sometimes inadvertently broke or soiled the formations by walking on them or by bumping into them. The caves and their contents were also stained and discoloured in places by the steady accumulation of dust and lint and by the smoke and wax drippings from the countless candles used for illumination.\(^{260}\)

By the late 1870s the unrestricted public access to the caves was viewed by authorities as 'prejudicial to their preservation'. Following several official reports, increased funding was provided from 1880 onwards to allow various improvements and safety measures to be carried out. Most important were the installation of locked iron grates and doors. Wire netting and iron railings was also placed inside the caves to protect the formations, while passages were widened and levelled and pathways cordoned off to prevent visitors walking on the crystal carpeted floors. From 1882 all cave visitors had to be accompanied by a guide and further regulations were issued prohibiting the breaking, defacing, removing or otherwise injuring of any part of the caves. All

\(^{259}\) 'Fish River Caves', JNSWLC, 1866, Vol.1, p.527, Havard, op. cit., pp.30-33, Cook op. cit., p.16.

of these measures eventually put a stop to the vandalism of the underground
caverns which were officially renamed the 'Jenolan Caves' in 1884.\textsuperscript{291}

The rugged natural terrain within the caves made early subterranean touring
through them rough, dirty and exceedingly difficult. As they made their way
into the bowels of the earth, early visitors were often required to clamber up
walls, slip and slide down rocky inclines and crawl on hands and knees
through narrow, muddy passages that demanded 'nerve and caution to pass
through'. In some places, the gaps were so small that visitors had to lie flat
and be drawn through by their heels. One visitor in 1880 wrote of 'crawling,
crouching, slipping, sliding, squeezing' as they laboriously dragged their body
through the 'awful passage'.\textsuperscript{292} Early guide books too warned of the difficulties
and dangers of cave tourism. Some caves were noted as being hard and
exhausting to visit and requiring 'some rather rough work'.\textsuperscript{293} By the 1880s
cave visitors were being advised to bring their 'oldest and shabbiest clothes' or
hire caving overalls as their clothes were likely to be torn by the rocks and
'very much dirtied and disfigured'.\textsuperscript{294}

During the 1880s and 1890s the popularity of the Jenolan Caves grew rapidly
as access to the underground attractions was progressively made easier.

Thousands of pounds were spent on further improvements inside the caves.

\textsuperscript{291} Havard, op. cit., pp.34-41, Trickett, op. cit., p.9, Argus, 10 May 1879 p.9, Horne,
1994, op.cit.

\textsuperscript{292} Argus, 10 May 1879 p.9, Maori, op. cit., pp.169-171, Horne, 1995, op.cit., pp.170-
175.

\textsuperscript{293} J.E.M. Russell, The Pictorial Guide to the Blue Mountains of New South Wales, etc.,
Sydney, 1885, p.47, Foster, op. cit., pp.84-85.
Wire ladders and ropes were replaced by iron staircases or steps hewn from the stone or made with cement. Footbridges were built over crevasses while iron railings and wire rope and netting were installed at other dangerous sections. To prevent further smoke damage and better exhibit the attractions, electric lights were also installed in the principal caves, beginning with the Imperial Cave in 1887.365

The advent of motor transport in the early 20th Century initiated an era of mass tourism at the Jenolan Caves. Visitors could now reach the caves in less than a day from Sydney by taking one of the many motor coaches, buses or cars which plied the route between the caves and the railway stations and hotels in the upper Blue Mountains. As if to match the growing desire to admire the earth, spectacular new caves were discovered at Jenolan in the early 20th Century and later opened for public inspection. These included the River and Skeleton Caves (both discovered in 1903) and the spectacular Temple of Baal and Orient Caves (in 1904), both of which are crammed with some of the most intricate and beautiful formations in the entire cave system.366

The underground scenery of Jenolan Caves were extensively promoted and the caves soon became a major tourist attraction worldwide. Cave inspections

366 Havard, op. cit., p.52, 58-63, Dunlop, op. cit., p.58, Trickett, op. cit., p.7, Horne, 1994, op.cit. New branches of the Right Imperial Cave had also been discovered in the 1890s and named the Jubilee Cave in 1897.
continued to rise, during the 1920s averaging between 60,000 to 80,000 annually until the onset of the Depression in the early 1930s when the numbers fell to between 30,000 to 40,000 per year.\footnote{287}

More visitors meant more improvements and facilities both inside and outside the caves. Below ground, new passages and walkways were formed and old ones repeatedly repaired and altered (see Figure 1.12). After 1945 cave inspections again grew rapidly from about 60,000 to over 160,000 per year by the 1960s, largely due to the increasing private ownership of motor cars. To help relieve overcrowding, more frequent inspections were conducted and a new entrance tunnel (known as the Binoomea Cut) was constructed in 1954 to provide quicker and easier access to the Orient and Temple of Baal Caves.\footnote{288} The extent of the overall modifications made within the Jenolan Caves is well illustrated by the fact that since the 1880s a total of 9,463 steps has been formed in the ten major caves opened to the public (see Figure 1.13).\footnote{289}

By the 1980s, over 255,000 people per year were visiting the Jenolan Caves to admire the subterranean scenery. Mounting concern that this large number of tourists was slowly degrading the caves led to the formulation of a new management plan for the reserve which was adopted in 1989. The plan identified a range of problems which were posing environment threats to the

\footnote{287} Dunlop, op. cit., p.59, Horne, 1994, op. cit., p.44, 49.
\footnote{289} The ten caves and their respective number of steps are: Orient (1,600), Ribbon (1,384), River (1,359), Temple of Baal (1,236), Lucas (985), Skeleton (664), Nettle and Arch (657), Jubilee (608), Left Imperial or Chifley (576) and Right Imperial (394) - see guidebook, Anon., Jenolan Caves (NSW): Nature's Masterpiece, Sydney, nd. (ca.1950), pp.20-21.
the area. These included soiling of the cave formations (from lint and skin shed by visitors), outdated drainage and sewerage systems, and soil erosion and sedimentation threats from nearby unsealed roads.\textsuperscript{270}

While the Jenolan Caves are by far the most well-known of the underground attractions in the Blue Mountains, they are not the only limestone caves in the area which have been sought out by admirers of the earth. In the late 1890s or earlier, local settlers discovered limestone caves near several tributaries of the Kowmung River. After a visit by a government geologist in 1899 they were named the Colong Caves and a reserve of 1,400 acres was gazetted in September of that year for the 'preservation of caves'.\textsuperscript{271} Although inferior in size and variety to the Jenolan Caves, when first discovered the Colong Caves still possessed many beautiful crystalline cave formations.\textsuperscript{272}

However, due to their exceedingly rugged and remote location the Colong Caves have remained far more inaccessible than those at Jenolan. Consequently far less people have visited the Colong Caves, although they have still been explored and admired over the years by many small groups of local settlers, bushwalkers and other adventurous sightseers. Despite the fewer number of visitors, the Colong Caves have still suffered from their carelessness or deliberate vandalism. As early as 1899 it was reported that

\textsuperscript{270} Tourism Commission (NSW) and Department of Lands (NSW), \textit{Jenolan Caves Reserve: Plan of Management}, Vol.1, December 1988, pp.1-45.

\textsuperscript{271} O. Trickett, 'Report on Colong Caves', 9 May 1899, Department of Mines and Agriculture, \textit{Annual Report}, 1899, pp.211-212, Colong Committee, \textit{op. cit.}, p.7-9, Barrett, \textit{op. cit.}, pp.47-50. The main series of caves are situated in limestone bluffs overlooking the upper reaches of Lannigan's Creek. Other caves are located further north above Church and Billy's Creek.
the beauty of some parts of the caves had been marred by writing on the
floors and from dirt and bat dung carried on to the formations by careless
visitors. When Walter Gruse visited the caves in 1922, he found the extent of
vandalism to the caves 'horrifying'. Only after the area was included in the
Kanangra Boyd National Park in 1977 did most of the damage to the caves
cease but by then many of the most beautiful formations had been
permanently ruined.\textsuperscript{273}

Because of the widespread vandalism at the other Colong Caves, the existence
of one small cave known as the Red Cave, was deliberately kept secret for
many years. This cave was first found in the early 1890s and described as
containing 'crystalline reddish and amber tinted dripstone growths'.\textsuperscript{274}
Although for many years considered just a legend, in 1937 the Red Cave was
rediscovered by Walter Gruse. On entering, Gruse found the small cave still
intact and the beautiful pale pink and red formations unharmed. Fearing that
the delicate formations would be quickly destroyed if the cave was more
widely known, in the 1940s Gruse and his three companions sealed up the
entrance of the Red Cave after attaching inside a letter which appealed to any
future rediscoverers of the cave to 'leave its delicate beauty undamaged'.
Sadly the Red Cave remains concealed to ensure its protection from those who
cannot admire the earth without ruining it.\textsuperscript{275}

\textsuperscript{273} Trickett, Annual Report, 1899, op. cit., pp.211-212. Also see C.J. Barnes, 'The
\textsuperscript{275} Trickett, Annual Report, 1899, op. cit., p.212.
\textsuperscript{276} Pemble, \textit{op. cit.}, pp.1-6. In the 1970s Gruse revealed the location of the Red Cave
to members of the Sydney Speleological Society who visited the cave and replaced the
Towering Cliffs, Rock Pinnacles and Ruined Castles

'When flushed with the morning or evening glow, this mighty rampart is a sight worth going far to see' J.E.M. Russell (1885)\textsuperscript{26}

Admirers of the earth have also found many above ground attractions in the Blue Mountains. One of the most striking natural features noted by early visitors were the sheer sandstone cliffs which often framed the panoramic views obtained from various lookout points. As early as 1815, visitors were remarking on the 'stupendous masses of rock' which constituted the foreground to a scene of 'mountains rising beyond mountains' that struck the eye with 'admiration and astonishment'. Early mountain travellers like James Backhouse wrote favourably of the 'lofty, sinuous sandstone cliffs'.\textsuperscript{27}

The massive rock walls and oddly-shaped eroded rocks of the Blue Mountains were also likened by many mountain visitors to the ruins of ancient castles and fortresses. Perhaps the first to make such an analogy, was the mountain explorer Matthew Everingham, who in 1795 described distant sunlit rocks as

\textsuperscript{26} Russell, op. cit., p.44.

\textsuperscript{27} Government and General Orders, 10 June 1815 in Mackaness, op. cit., pp.67-68, J. Backhouse, 'Account of a Journey from Parramatta, Across the Blue Mountains to Wellington, 1835' in Mackaness, op. cit., p.220.
appearing 'to the beholder like Towns & Castles in ruins'. While travelling to Bathurst in 1839 Louisa Meredith also thought the 'fantastic' shapes formed by the broken and fissured cliffs of Hassan's Walls exactly resembled the 'ruins of some mighty mountain-fortress of former days', complete with turrets, 'loop-holes, arches, battlements, and buttresses'. In 1869 an early traveller on the Blue Mountains railway likewise found the perpendicular sandstone walls and their 'broken craigs and pinnacles' reminiscent of the 'ruined cities' of some 'Titanic race', which featured 'castles, temples, and stupendous buildings all gone to desolation and decay'.

By the 1880s, most travellers' accounts and tourist guides had adopted the same Gothic-inspired terminology. For instance, Russell's guide suggested that cliffs in Megalong Valley strongly resembled 'a huge castle, with its great square towers, battlements, buttresses, and turrets, even the lines and joints of masonry being distinctly visible'. The extent of this early obsession with ruins is also well demonstrated by the official naming of a prominent rock formation in the Jamison Valley as the 'Ruined Castle'. By the 20th Century the 'great, gaunt cliffs' had become firmly established as one of the many

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278 Everingham in Ross, op. cit., p.56. According to Bernard Smith, such descriptions were because early visitors to the Blue Mountains were influenced by the contemporary European interest in Gothic architecture - B. Smith, European Vision and the South Pacific, 2nd ed., Melbourne, 1985, p.297.


280 Russell, op. cit., p.44. Also see J. Inglis, Our Australian Cousins, London, 1880, p.208.
scenic attractions of the Blue Mountains which were promoted in tourist literature.\(^{281}\)

With increasing settlement in the late 19th Century came greater familiarity with the specific details of the mountain landscape. Like waterfalls and cliffs, prominent and peculiar-shaped rocks became monumental attractions for the growing mountain tourist industry. The isolated sandstone pillar called Orphan Rock was one of the first prominent rocks to become a tourist attraction, largely due to its close proximity to Katoomba Falls. By the 1880s, this 'immense solitary obelisk' had become a 'favourite' attraction of mountain visitors and was regularly mentioned in early tourist guides. Another early stone attraction was Boar's Head Rock described as 'curiously like the head of an heraldic dragon, with pointed ears and open jaws'.\(^{282}\)

Surprisingly, the now world famous sandstone siblings, called the Three Sisters, were largely ignored as scenic attractions in the 19th Century and did not even rate a mention in many early mountain tourist guides. Even those guides which did briefly mention the 'triplet of rock pinnacles' still gave more prominence to Orphan Rock'.\(^{283}\) According to Burke, the Three Sisters were 'rediscovered' during the first decade of the 20th Century and heavily promoted by local tourist operators in Katoomba in an effort to attract visitors

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to the vicinity of Echo Point. The triple rock pillars rapidly rose to prominence and more than made up for their previous neglect. For instance, a tourist guide of 1912 noted that the 'peculiar trinity of geologic minarets' occupied 'a prominent place in the scene' as they stood in 'pinacled semi-isolation' bonneted in the 'quaintest of shrub millinery'. By the 1920s Orphan Rock had become superseded by the jutting 'threesome mountain' of the Three Sisters, now described as 'one of Katoomba's most famous landmarks'. During the 20th Century the fame of the Three Sisters grew enormously and they became a popular tourist icon of the Blue Mountains - the 'mascot of the Mountains'. They also became one of the most visited and photographed tourist attractions in all of Australia.

Throughout the Blue Mountains many other prominent and peculiar shaped rocks have become tourist attractions, most because of the spectacular views associated with them. Examples include Sunset Rock near Mount Victoria, Olympian Rock near Leura, Edinburgh Castle Rock near Wentworth Falls, and the 'Glant's Porch' near Blackheath.

Curiously, collapsing earth has also been greatly admired as evident by the enormous tourist interest in the landslide at Dog Face Rock near Katoomba in 1931. Early in that year a massive crack in the cliff edge appeared and as the

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chasms slowly widened it became a 'great tourist attraction', with thousands of people visiting the spot in anticipation of seeing the inevitable collapse of the 'menacing cliff. As if embarrassed by all the attention, the tittering rockface refused to budge until most interest in it had waned. It eventually gave way late at night with virtually nobody there to witness the long hoped for event. Ironically, the site of the 'Landslide' soon became more famous than Dog Face Rock had ever been and it has remained a popular tourist attraction ever since (see Figure 1.11). Admiring of rockfalls is destined to again become a feature of tourism in the Blue Mountains, as in time all of the scenic rock pillars, including the Three Sisters, will go the way of Dog Face Rock.

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The earth has provided the foundation for Blue Mountain history in numerous ways. Ancient rocks have formed the setting and provided many of the materials for human habitation. The rugged terrain has hampered exploration and influenced the location and making of tracks, while the digging up, exploiting and admiring of the mountain earth has provided a key catalyst for mountain settlement. However, another element of vital importance has been the liquid element - water.

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286 Blackheath Progress Committee, Blackheath, Blue Mountains, N.S.W., Sydney, 1903, p.63.
Chapter Two

Water

Water is an essential element in both landscape formation and for the survival of life, and consequently history is saturated with its significance. This chapter describes the importance of water in the history of the Blue Mountains.

Sculpturing the Mountains

'Not in impressive heights but in profound depths lies the chief charm of Blue Mountains scenery'. J.E. Carne (1908)

As noted previously, the Blue Mountains are not really 'mountains' at all but rather elevated plateaus which have been deeply dissected by erosion. During and since the uplift of the Blue Mountains, water has been the principal agent of this erosion. Whether in the form of rain, hail, mist, snow, frost or as trickles, streams and rivers, water has always slowly but persistently transformed the landscape of the region.

Water moves constantly around the Earth in an endless hydrological cycle of precipitation, percolation, transpiration and evaporation. As it does so it acts everywhere and at all times, eroding physically and corroding chemically. In a never-ending process, water dropped from the air soaks the Blue Mountains.

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1 J.E. Carne, Geology and Mineral Resources of the Western Coalfield, etc., Memoirs of the Geological Survey of New South Wales No.6, Sydney, 1908, p.11.
Although most is later evaporated, the rest saturates the soil and attacks the exposed rocks, gradually weakening and breaking them down to sand, silt and mud. During icy weather water absorbed in stone expands as it freezes and shatters rocks from within. On the earth's surface, tiny trickles of water gather together following the lines of least resistance. As they flow they merge to become streams which then form creeks. Each stream carries away eroded sand and silt while carving ever-deepening channels along its path. Progressively, the streams and creeks combine to form rivers which grow ever larger as they flow downstream until they reach the sea. As their erosive power increases the creeks and rivers swirl, grind and pulverise rocks, and scour the earth along their courses. Below the earth, subsurface seepage forms groundwater which also dissolves and leaches the ground as it too flows down from the highland ridges to the gorges and valleys below. Given enough time, water has the power to move 'mountains'.

**Carving Canyons and Cliffs**

'...the enormous ravines of the Blue Mountains are not the direct work of earthquakes, earth movements or cataclysm, but the result of running water'. Rev. J. Milne Curran (1898)

The role of water in carving out the deep and spectacular gorges of the Blue Mountains was unknown or underestimated by many early observers in the 19th Century. Many instead attributed the creation of the Blue Mountains to other more stupendous causes. For instance, in 1815 Henry Antill suggested

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that 'a violent volcanic eruption' was involved. In the 1820s Rene Lesson believed that the mountains were rent by 'a very great movement' of the earth, while Gregory Blaxland suggested that 'an earthquake, or some other great convulsion of nature' helped form the gorge of the Warragamba River.²

After his visit to the Blue Mountains in 1836, Charles Darwin likewise thought that the 'magnificent' scenery was hollowed out by 'aqueous erosion' or due to subsidence of the strata. However he questioned how the 'enormous amount of stone' could have been carried away through the narrow gorges and concluded that 'to attribute these hollows to alluvial action would be preposterous'. Darwin instead proposed that the Blue Mountains valleys were the uplifted relics of submarine deposition which had later been worn down by a retreating sea or alluvial action.³

After earlier visiting Australia, American geologist James D. Dana published a paper in 1850 which rejected Darwin's marine explanation and correctly identified 'simple running water' as the agent responsible for the 'stupendous' denudation of the sandstone gorges in the Sydney Basin region. Later Australian geologists, including C.S. Wilkinson, J.E. Taylor and T. Edgeworth David were also convinced that the slow erosive action of water was the

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creator of the spectacular Blue Mountains scenery. For instance, in 1879 C.S. Wilkinson advised readers of the NSW Railway Guide that the outcropping strata of the Blue Mountains ravines were removed not by 'volcanic fire but running water'. In 1896 Edgeworth David provided further convincing evidence (in the form of ancient stream gravels situated high above the Blue Mountains gorges) of the role of river water in forming the region's steep valleys.

The reason that most early observers failed to appreciate the power of water to carve through mountains was because they did not realise that they were looking at a very ancient landscape sculptured over many millions of years. As Wilkinson pointed out in 1879, the force of water has been operating through 'an immense period of time' including eras of much heavier rainfall than in recent times.' While water has been the chief agent of denudation, there is still uncertainty about when the latest era of erosion began. Recent dating techniques indicate that erosion throughout the Sydney Basin was well underway by the early to mid Tertiary period (between 30-60 million years ago).

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7 Wilkinson, op. cit., p.98.
While dates remain unclear, the result of the gradual uplift of the Blue Mountains was to create an elevated and steeper catchment for the region's streams and rivers. Over millions of years this resulted in the now faster flowing waterways cutting deeply down into the slowly rising bedrock and entrenching themselves in narrow valleys. Because of the eastwards tilt of the rocks of the Sydney Basin, the local streams were able to erode down to deeper layers of the earth in the western parts of the Blue Mountains. Here once the streams had sawn through the hard top layers of sandstone, they more rapidly exposed and eroded the softer underlying shales, claystones and coal measures creating wide canyons and broad valleys. The regional differences in underlying geology therefore explain the differences in the shapes of valleys in the Blue Mountains. In the east of the region, the streams are still eroding their way through the hard Hawkesbury sandstone layers and consequently the valleys (such as Erskine and Glenbrook Creeks) are steep, narrow and V-shaped. In the west, valleys like Megalong Valley are wider and broader as the streams have eroded down to much softer rocks below the sandstone. As Edgeworth David pointed out in 1896 the difference in underlying strata is also the cause of the funnelling or 'bottlenecking' of many valleys (such as the Grose Valley) where the valley becomes progressively steeper and narrower in its eastern reaches.⁹

The widening of the valleys in the western Blue Mountains was achieved by water undercutting, undermining and eroding the valley slopes causing them

to recede or 'retreat'. In many areas, the widening of the valleys was enhanced by massive rockfalls that have left behind perpendicular cliffs in the sandstone walls of the valleys (some of which are up to 300 metres high) and below them a sloping talus of fallen rocks and sandy clay soils now clothed with sclerophyll vegetation. Water leads to cliff formation by eroding and severely weakening the overlying sandstone of the plateau edges, fracturing and cutting it along vertical and horizontal joints in the rocks. At the same time water dripping over the cliffs undercuts and saturates the weaker shale, conglomerate and clay layers lying beneath the sandstone at the base of the cliffs.

Eventually, one of two things happens. In some cases large blocks of sandstone on the cliff-face become unstable due to a shift in their centre of gravity from undercutting. The blocks then slip or fracture, break away from the cliff and tumble to the valley floor below. In other situations the saturated layers at the cliff base are no longer able to support the weight and stresses created by the heavy sandstone above, so they disintegrate or 'fall' causing a general cliff collapse (such as that which occurred at Dog Face Rock in 1931). Either way the more water present, the more quickly the sandstone cliffs crumble, leaving behind smooth cliff-faces which will also eventually weather away and suffer the same fate. It has been estimated that the current rate of sandstone cliff retreat is less than 200 metres every million years. By concentrated erosion along vertical joints, water has also been the main agent
responsible for sculpturing cliff-side blocks of sandstone into distinctive rock pillars such as the Three Sisters and Orphan Rock.\textsuperscript{10}

As water has seeped and percolated down through the sandstones of the Blue Mountains it has also dissolved iron and salt from the rocks. The leached iron has accumulated along joints and cracks to form hard bands of ironstone. Where it has been exposed to the air, it has also rapidly solidified as iron oxide which in some places protrudes from overhangs as stalactite-like formations. As the ironstone is more resistant to erosion and weathering than the surrounding rocks, in many locations it has formed protective caps on the sandstone, some of which have eroded into multi-coloured pinnacles known as 'pagodas'. As it seeps through the rock water has also caused chemical etching of the quartz sandstone. This results in salt weathering which has been identified as the main factor creating the many shallow caves in the cliff walls and escarpments of the Blue Mountains.\textsuperscript{11}

Water has also created many other distinctive landscape features in the Blue Mountains. The uplift of the Lapstone Monocline with its accompanying faults and folds has led to the formation of several small lakes on the eastern side of the central plateau, most notably Glenbrook Lagoon and Mountain Lagoon. On the flatter plateaus and ridgetops, the network of small streams and creeks have lightly eroded the surface into broad upland valleys known as 'headwater valleys'. Because of their small catchment areas and gently sloping


\textsuperscript{11} Young and Young, 1988, \textit{op. cit.}, pp.14, 19, Mosley, \textit{op. cit.}, pp.29-30.
grades, the upland waterways have a limited capacity to transport water and debris and consequently the headwater valleys trap and retain much sandy sediment. In these soggy and sediment-choked 'dells', swamps have formed composed of sedgelands and heathlands. These are particularly evident around Wentworth Falls and Kings Tableland. Except after severe storms when much accumulated sediment is flushed downstream, these swamps generally have high water retaining properties (unlike the surrounding eucalypt forest) and form a perched water table in the upland valleys. The swamps therefore provide a low but continuous flow of water along the plateau creeks often even during drought conditions.\footnote{Young and Young, 1988, \textit{op. cit.}, pp.12-13, 17, Mosley, \textit{op. cit.}, pp.27-29.}

Where the plateau streams descend to steeper grades the swamps end as the creeks cut more deeply into the earth. In the western areas of the Blue Mountains underlain by Narrabeen sandstone, the differential erosion of the sandstone and claystone layers along the plateau margins has formed steps or benches in the areas of seepage and erosion. In many parts notches or knickpoints have been incised in the softer claystone layers and worn back to form narrow entrenched valleys within valleys. In some places, the incision along claystone jointlines has been so deep that it has formed extremely narrow 'slot valleys' or canyons such as the Grand Canyon near Blackheath. Because they are perched high above the cliffs, the headwater valleys and the entrenched valley-in-valleys are often called 'hanging valleys'. Where the plateau creeks plunge over the cliffs, the benches formed by the uneven erosion of the claystone layers has also created the two-tier or double
waterfalls so characteristic of the western Blue Mountains. Here waterfalls, such as Wentworth Falls, are also steadily eroding the nearby cliffs through a combination of direct stream cutting and rock saturation from seepage and spray. The persistent seepage of water through the cliffs and steep plateau edges of the western Blue Mountains has also permitted the formation of curtains of sedgeland known as 'hanging swamps'. These occur where water seeping down through the upper Narrabeen sandstone layers strikes the less permeable claystone or ironstone and flow sideways till it emerges through the cliff-face or hillside. In these places (such as at Govett's Leap), hanging swamps have formed where sedges have managed to cling tenaciously to the steep walls by binding small quantities of moist soil with their roots.\(^\text{13}\)

Creating Caves

\textit{’Percolating water is the magic wand which turns this dull rock into gems’}
Cecil Barnes (1928)\(^\text{14}\)

Where water has touched limestone in the Blue Mountains it has created caves, including the scenic subterranean marvels of the Jenolan and Colong Caves. These caves have formed primarily from chemical action where water has dissolved underground channels through the hard, bluish-grey limestone. From the atmosphere and nearby decaying vegetation, rainwater and river water absorbs carbon dioxide leaving the water slightly acidic. Everywhere this water flows it dissolves the limestone rock (comprised mostly of calcium

\(^\text{13}\) Young and Young, 1988, \textit{op. cit.}, pp.12-13, 17, Mosley, \textit{op. cit.}, pp.27-29.
carbonate) by converting it to soluble bicarbonate. On the surface grooves are formed in the limestone rock while below the ground water seeps along cracks, crevasses and joints creating small fissures. Over time these are slowly enlarged and widened by solution eventually becoming narrow tunnels and low horizontal caves along bedding planes. As water widens the caves, it makes room for stream channels to enter which erode the limestone further as suspended sediment, gravel and small rocks are swept downstream through the cave. Eventually the cave floor is deepened while the walls are undercut along the stream edges causing rockfalls and roof collapse. Where this occurs large high caverns are created. As more time passes the underground streams continue to erode and dissolve deeper into the limestone leaving behind successive levels of caves. The size and shape of the caves on each level varies due to historical differences in rainfall and subsequent levels of water flow.

Meanwhile inside the underground caves, rainwater percolating from outside continues to dissolve the limestone as it slowly trickles down the walls and endlessly drips from the ceiling. Although over time much of the limestone is dissolved and carried away downstream, through evaporation of the water and temperature changes some of it is redeposited in the caves. The dissolved carbonate of lime (as well as iron and other leached materials) accumulates and solidifies along driplines to form stalactites, stalacmites, helictites, shawls, columns and a variety other intricate and beautiful dripstone formations. As Cook has observed, it is in these subterranean caves where
'night reigns supreme' that the 'effect of water power is everywhere observable in graceful contours...or in stony efflorescence'.

At Jenolan Caves a magnificent and intricate cave system has formed where several creeks have over an immense period of time eroded through a massive bed of limestone (measuring nine kilometres or more in length, up to 300 metres wide and over 150 metres thick) which lies directly across the narrow upper valley of the Jenolan River. The oldest level of caves, represented by the Grand Arch and the Devil's Coachhouse, are now exposed at the surface and have been widened by subsequent rockfalls and floods. Below the ground the earth has been honeycombed with layers of interconnected and highly decorated caves, the deepest of which are still being dissolved and eroded by 'nature's instrument' - the underground streams they contain.

Limestone caves have also been formed at several places in the southern Blue Mountains area, including near the Tuglow River (Tuglow Caves) and on several tributaries of the Kowmung River (Colong Caves). The Colong Caves occur in outcrop of limestone measuring eight kilometres long and varying between 400 and 800 metres wide and comprise three separate groups of

caves situated around Lannigan's Creek near Mount Colong, Billy's Creek and Church Creek.\textsuperscript{17}

From waterfalls, dells, and hanging valleys to canyons, cliffs and caves, water has been the chief sculptor of the spectacular scenery of the Blue Mountains region. And the wearing down of the landscape continues in an ongoing and never-ending process of erosion. Eventually the slow and patient work of water will crumble and destroy the Blue Mountains, including the highland areas of human habitation.\textsuperscript{18}

**Waters of the Dreamtime**

'\textit{When they heard Gurangatch coming and the water roaring after him like a flood, they ran away up the side of the hill in great terror}'. Gundungurra Legend.\textsuperscript{16}

Without water, people could not have lived in the Blue Mountains. For human survival absolutely depends on water. We need water because we are mostly water. Water comprises between 50-70% of human body weight (the amount varying with age and gender). As Suzuki has put it, we literally have an 'ocean flowing through our veins'. Water is without question the 'elixir of life'. Every day each person needs about 2.5 litres of water to regulate body temperature and replenish the moisture lost through breath, sweat and excretament. Some water we get from food or internal metabolic processes but over half is usually

\textsuperscript{17} O. Trickett, 'Report on Colong Caves' in Department of Mines and Agriculture Annual Mining Report 1899 Report, NSWLAVP, 1900, Vol.4, pp.211-212.

\textsuperscript{18} Mosley, \textit{op. cit.}, p.40.
obtained from the fluids we drink. Deprived of fresh water we quickly
dehydrate and die in less than 12 days.\textsuperscript{20}

The first people to inhabit the Blue Mountains were able to do so because
reliable water was freely available. Permanent supplies of water could be
found in the many creeks, rivers, swamps and rockholes located throughout
the region. For Aboriginal people the proximity to drinking water was always a
key factor in the selection of camping sites. The importance of water is clearly
demonstrated by the location of most known occupation sites in the Blue
Mountains. Aboriginal people camped in both the valleys and highland areas
of the Blue Mountains but always near water. In the valleys, rock shelters
close to rivers and creeks were regularly utilised, as evidenced by the many
sites found close to the Nepean River and in the Capertee Valley. In the
valleys Aboriginal people must also have camped on river flats and other open
sites for which little evidence now remains. Although water may have been
scarcer on the high plateaus and ridges there were still plenty of reliable
sources of water including small creeks, rock waterholes and particularly the
upland swamps. Virtually all of the oldest known Aboriginal occupation sites
in the highland plateaus were also located close to a supply of water. For
example, rock shelters at Walls Cave (near Blackheath), Lyre Bird Dell (near
Leura), Horseshoe Falls (near Hazelbrook) and Springwood Creek are all
located next to the creeks which have formed them. Most other upland

\textsuperscript{19} R.H. Mathews, 'Some Mythology of the Gundungurra Tribe, New South Wales',
pp.59-62.
occupation sites, such as the rock shelter at King's Tableland, are situated close to rock pools.\textsuperscript{21}

The increased availability of water in the last 15,000 years compared to previously may help to explain the apparent increase in Aboriginal use of the upland areas of the Blue Mountains which has been indicated by archaeological evidence. In fact, given their mastery of fire it is far more likely that lack of water rather than cold restricted the extent of Aboriginal occupation of the upper Blue Mountains prior to 15,000 years ago. Much drier and colder conditions prevailed in the Blue Mountains during the height of the last glacial period or Ice Age (between 34,000 and 15,000 years ago). As the climate became warmer and precipitation increased, around 12-15,000 years ago Aboriginal people began to occupy upland rock shelters next to creeks but still under arid conditions much drier than at present.\textsuperscript{22}

From 11,000 years ago, rainfall continued to increase overall resulting in a far greater availability of water throughout the higher plateau areas of Blue Mountains. During the same period, the plateau swamps were also created. Dating of several Blue Mountains swamps indicate that most began to form between 17,000 and 4,000 years ago. As they formed and grew, the water retaining abilities of the plateau swamps would have helped ensure a reliable


\textsuperscript{22} Stockton and Holland, \textit{op. cit.}, pp.46, 50-51, E. Stockton, \textit{Archaeology of the Blue Mountains}, in E. Stockton (ed.), \textit{Blue Mountains Dreaming: The Aboriginal Heritage}, Winmalee, 1993, pp. 37, 42.
source of water. This greater availability of water was clearly a key factor in allowed more widespread Aboriginal occupation of the upland areas of the Blue Mountains including greater use of open sites.23

The universal need for water was central to Aboriginal life in the Blue Mountains. The Gundungurra name for this precious element was 'nadgyung' while the Dharug called it 'bado' or 'bardo'. Both languages also had words referring to drinking and being thirsty, while the better recorded Dharug tongue also had specific words for bathing, washing and soaking in water.24 Across Australia, Aboriginal people have always been highly skilled at finding water even in severe droughts. The locations of perennial water within their home territories were always known and new sources were often found by observing the habits of birds and animals. Where necessary, Aboriginal people also conserved water and managed its use. In the sandstone rocks of the Blue Mountains, Aboriginal people chipped potholes or wells, or widened and deepened natural rockpools, to retain rainwater and increase the local water supply. Sometimes small gutters and channels were carved into the rocks to funnel water into the holes. When water was scarce, stone or log lids were placed over the rock holes to prevent evaporation and use of the holes by animals. It has been suggested that these rock 'wells' were also used on occasion to gain hot water by plunging fire-heated stones into them.25

24 J.L. Kohen, The Dharug and Their Neighbours: The Traditional Aboriginal Owners of the Sydney Region, Blacktown, 1993, pp.228-262.
Examples of Aboriginal rock 'wells' have been found near Hazelbrook in the Blue Mountains. Here a cluster of around 20 wells have been recorded in the sandstone rock which appear to have been artificial made or enlarged. Most are circular and some have small channels connecting them. Many wells are surrounded by axe grinding grooves and a rock shelter has also been found nearby. Stockton has suggested that this was an important transit camp for Aboriginal people (and later early European travellers) making their way along the ridge of the central Blue Mountains. Although no traces now remain, it is also likely that Aboriginal inhabitants of the Blue Mountains occasionally constructed small dams on local waterways to conserve supplies or create favourable habitat for prey.\textsuperscript{25}

Because of the predominance of sandstone in the area, water quality in the Blue Mountains prior to European settlement was generally of a high standard. However, when the water was muddy or too hot, Aboriginal people used sand or grass to filter the water through before drinking. Although bark or wood containers were used to collect and transport water, water was usually drunk directly from the source. Aboriginal mothers in the Blue Mountains also gave water to infants by passing it from mouth to mouth.\textsuperscript{27} On occasion, water was also mixed with nectar bearing flowers such as banksias, waratahs and bottlebrush to produce a sweet 'ancient Australian beverage'.\textsuperscript{28}

Water was used not only for drinking but also for bathing and washing.

Swamps, creeks, rivers and other water bodies in the Blue Mountains were

\textsuperscript{25} Lloyd, op. cit., pp.12-16.
\textsuperscript{27} W. Russell (Werriberry), My Recollections, Camden, 1914, p.10, Lloyd, op. cit., p.16.
also important habitats which provided a wide variety of plant and animal foods (see Chapter Five).

Water also had many other uses for Aboriginal people. It was used in food preparation, including to clean ingredients and to soak and leach toxins from the nuts of the burrawang palm or cycad (*Macrozamia*). Water provided lubrication for the grinding of axes and other stone tools as evident by the location of most grinding grooves near rock waterholes or other water sources. By mixing with coloured clays and charcoal, water was an important ingredient in the production of paints.

Water was further used for healing. In addition to cleaning wounds, the Gundungurra used water to treat snake bites. Victims were taken to the nearest deep water and immersed just over their depth. This not only lowered body temperature but helped prevent the victim from falling unconscious as they struggled to keep head above water. The Gundungurra also believed that the subterranean water found in caves such as the Jenolan Caves possessed great healing powers. Sick people were apparently carried there, often from great distances, and bathed in the cave water.²⁶

Water also played a part in the ceremonial life of Aboriginal people. Stone carvings around many rock waterholes or wells suggest that they were also

²⁶ *Sydney Mail*, 12 December 1896, p.1250.
utilised during various ceremonies, perhaps as 'sacred fonts'. It is likely that the rock wells in sandstone areas of the Blue Mountains were also used to mix special drinks and potions. In some cases, ceremonies required the absolute avoidance of water. For example, Gundungurra boys undergoing initiation were apparently not permitted to enter any water during the ceremony and if necessary were carried over watercourses. Once initiation was completed participants were then permitted to wash off paint and charcoal.\(^{31}\)

Various water features of the Blue Mountains landscape, such as waterfalls, creeks and rivers, clearly had sacred significance and in some cases formed the boundaries between different Aboriginal groups. For example, Stockton has suggested that some of the steep gorges in the eastern Blue Mountains may have formed boundaries between the territories of the Dharug and Gundungurra. Some waterfalls in the area may also have formed tribal boundaries as suggested by one of the Gundungurra legends.\(^{32}\) Furthermore, the Aboriginal inhabitants of the Blue Mountains undoubtedly possessed a very exact nomenclature for important sites within their country, especially those related to water supply. For example, the name of Katoomba is a

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\(^{30}\) *Sydney Mail*, 12 December 1896, pp.1250-51. It is possible that the ancient human remains in the Skeleton Cave at Jenolan Caves have their origin in one of these visits.


English corruption of the Gundungurra word 'Kedumba', which referred to the region of 'falling waters' which tumble over the cliffs into the Jamison Valley.\textsuperscript{33}

Reflecting its importance in everyday life, water was also an important element in the mythology of the Aboriginal inhabitants of the Blue Mountains. In fact, many Aboriginal legends from around Australia provide explanations for the creation of various water features such as waterholes, soaks, lakes, rivers and coastal sea channels.\textsuperscript{34} Similar legends existed to explain the formation of the Blue Mountains waterways, most notably the Gundungurra legend of 'Gurangatch and Mirragan'. This is apparently one of the few authentic Aboriginal legends of the Blue Mountains which has survived. It tells the dreamtime story of Gurangatch, a mythical creature (part fish and part reptile) who was said to inhabit the deep waterholes in the southern Blue Mountains region. While being pursued by Mirragan (the tiger cat), the legend explains how Gurangatch tore up the ground with rushing waters to form the river channels of the Wollondilly and Cox Rivers and several of their tributaries (including Kedumba Creek and Harry's Creek), as well as series of deep waterholes.\textsuperscript{35} As well as being part of their spiritual beliefs about the formation of the landscape, the legend of Gurangatch and Mirragan is also a 'mind-map' which gives the locations of reliable waterholes, as well as providing travelling directions and other key ecological information. Such oral traditions were clearly essential for a people without writing or signposts and

\textsuperscript{33} Sydney Mail, 12 December 1896, pp.1250-51.
\textsuperscript{34} See J. Isaacs, Australian Dreaming: 40,000 Years of Aboriginal History, Sydney, 1980, pp.100, 108-127.
show how spiritual beliefs were often closely interwoven with practical knowledge.⁵⁶

Some local legends also allude to terrifying water creatures. For example, the Gundungurra and Dharug apparently believed that many large waterholes in the Blue Mountains (including both Bent's and Norton's Basins on the Nepean River) were inhabited by evil spirits of the water which would seize and swallow unwary people.⁵⁷

The waters of the Blue Mountains sustained the lives of Aboriginal people for millennia, satisfying both physical and spiritual needs. But with the arrival of Europeans in the Blue Mountains came a new and ever-growing thirst for the liquid element. Satisfying the water needs of this new mountain society was to result in significant changes to the environment of the region.

**Mountain Water**

**The Essential Fluid**

'I looked much for water before I was able to find any. On meeting with it we were greatly enraptured' George Caley (1804).⁵⁸

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Finding water was an understandable obsession for the first Europeans to venture into the Blue Mountains. The journals of Blue Mountains explorers frequently mention water for without it they could not travel far. Lloyd has even suggested that the lengthy delay in finding a way across the Blue Mountains is partially explained by the unwillingness of early Europeans to venture far from assured water supplies, leading them to favour routes along streams and ravines rather than the ridgetops.⁵⁹

Whatever route was followed, the lack of water clearly hampered most explorations of the Blue Mountains. For instance, an expedition led by George Bass in 1796 found 'these barren mountains' afforded them no means of supply and they were 'reduced to a state of the most devouring thirst'. To survive, Bass and his companions had to suck moisture through their handkerchiefs from moist earth and mud lying in rock holes.⁶⁰ On his exploration to Mount Banks in 1804, George Caley and his convict companions also frequently suffered from lack of water and several times varied their route specifically to search for water. Despite crossing many creeks, the exertion of climbing and descending successive rugged ridges during a hot November often left them 'choking with thirst'.⁴¹ As well as being indispensable for survival, water was often an important refreshment and morale booster during explorations in the scorching summer sun. For

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⁶⁰ F.M. Peron, A Voyage of Discovery to the Southern Hemisphere, etc., London, 1809, pp.289-290. The route taken by Bass remains unknown however Peron's comments are a key indication that Bass must have mostly travelled along the plateau ridges where water is less plentiful than in the gullies. 1796 must also have been a drought year as Bass reportedly travelled during winter (June) when water is not normally so scarce in the Blue Mountains even on the plateaus.
example, Barrallier compelled his men to undertake 'frequent bathing in the river' on very hot days which he noted 'benefited them very greatly'.

Locations of water nearly always determined the campsites of exploration parties. The known routes of every Blue Mountains explorer, from Barrallier to Caley to Blaxland, Lawson and Wentworth, show that most nights were spent near a source of water. Even on the occasions when water sources were not easily available, much precious time and energy was spent every evening finding and retrieving whatever water could be found. For example during their successful crossing of the central ridge of the Blue Mountains in 1813, Blaxland, Lawson and Wentworth's group camped at 15 different locations. 12 of these were next to good sources of water in the form of swamps, streams and springs. At the other 3 sites it was necessary for them to fetch water from several miles away or descend into the nearby steep gullies, one of which was 600 feet deep. Sometimes the search for water even proved beneficial to exploration, as according to Blaxland they actually discovered the best way to descend Mount York when 'the want of water put them on the alert'.

Finding supplies of good water was additionally a key objective of the 1813 expedition. In fact, the lack of water on the Cumberland Plain due to severe droughts in the preceding years was a crucial stimulus for the Blaxland,

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Lawson and Wentworth exploration. On reaching Cox's River, Lawson described the scene as 'the best watered country of any I have seen in this Colony' while Wentworth also attributed the superiority of the newly discovered lands over the mountains to 'the abundance of excellent water which is everywhere to be found'. Even on the high plateau of the Blue Mountains Wentworth noted that despite the barren soil, water was still good and abundant in most places, describing the mountains as everywhere pervaded by 'innumerable small streams'.

During construction of the first road over the Blue Mountains in 1814-15, William Cox also regularly recorded the locations of 'good water' and the best places to 'drive stock to water'. He even appended to his journal a memo for 'watering and feeding stock' which gave precise directions to water supplies along the new route over the mountains. The first road builders also located their depots in some of the same well-watered locations used by Blaxland, Lawson and Wentworth. For example, Cox deliberately positioned his second depot 'close to a stream of excellent water' where he had constructed the first building on the Blue Mountains (a weatherboard hut now the site of Wentworth Falls). When Archibald Bell discovered the alternative route over the Blue Mountains in 1823, the availability of water was also one of the chief observations noted in his journal. In supporting the superiority of his new

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* An equally important stimulus was the need for grass (see Chapter Five). T.M. Perry, 'Climate, Caterpillars and Terrain', *Australian Geographer*, Vol.7, No.1, 1957, pp.3-14.
route over Cox's Road, he especially emphasised the 'great quantity of water with which this road is supplied on both sides of the way'.

It is clear that water determined the location of the first permanent settlements in the Blue Mountains, as it did for most European settlements in Australia including Sydney. After Cox's road was completed, early travellers over the Blue Mountains continued to stop where there was good water and military posts were also set up in some of the same places. The former camping sites used by roadbuilders therefore soon became the standard stopping points by all those using the mountain road. As Lesson observed in 1824, the necessity of 'good drinking water has resulted in the careful selection of the most favourable stations' along the mountain road. Governor Macquarie set the standard later followed by others when he first travelled across the new road in 1815. His entourage camped only at places where there was abundant excellent water, all of which had been used previously by Blaxland, Lawson and Wentworth as well as the roadbuilders. Water was responsible not just for the locations of the first Blue Mountain settlements but also some of their names. For example, during his 1815 journey Macquarie camped at 'pretty wooded' site located 'near a spring of very good fresh water' which he therefore named 'Spring-Wood'. John Jamison also gave the name of Glenbrook to 'a rill of constantly running water' which he

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8 R. Lesson in Mackaness, op. cit., p.151.

9 L. Macquarie, Journals of his Tours in New South Wales and Van Dieman's Land 1810-1822, Sydney, 1956, pp.90-91. Antill in Mackaness, op. cit., pp.77-78. Antill recorded that the spring 'issued from a rock' in a nearby glen and the water had 'something of mineral quality'.

passed during his exploration of the Warragamba River in 1818. However, before this name was officially applied to the area in 1879 Glenbrook was originally known as 'Watertank' on account of its role as train watering spot. Water also featured in the original name of Lawson, once called 'Christmas Swamp'.

As traffic on the mountain road increased, inns were established at the main watering sites to cater to travellers. These early buildings formed the nuclei of the later mountain towns at Springwood, Lawson, Wentworth Falls and Blackheath. However, early travellers also made use of mountain water wherever it could be found. The 1832 post office directory noted that after Springwood the only things that broke the monotony of the mountain road for many miles were 'one or two small huts along the road at watering places'. One of these was probably the site known as 'The Wells' - a group of waterholes cut in the rock beside the road between Springwood and Woodford which were subsequently buried by the construction of the railway.\textsuperscript{31} While travelling over the Blue Mountains in 1846, Mundy also observed encampments of horse and bullock-drawn drays 'wherever nature or the last thunderstorm had supplied a rill, a spring, a water-hole, or even a puddle, however muddy'.\textsuperscript{32}


Access to water remained critical for determining the location of the convict stockades which housed the later workers on the mountain road. As William Govett noted water was 'most necessary where so many men are collected together in a limited space'. During the construction of Victoria Pass in the early 1830s, the stockade was located in the valley below next to a swamp. Even so, the water supply was erratic and according to Govett 'very often the men were badly off for water in the dry seasons'.

For those who came to live in the Blue Mountains, rather than just pass through them, water was even more essential for the longterm survival of themselves and their imported animals and plants. Although mountain water was often abundant it still depended on reasonable rainfall which at times did not eventuate. As early as 1824, it was noticed that the water from Springwood's spring was often scarce in dry weather. By the 1840s, the drivers of bullock teams crossing the Blue Mountains were sometimes forced to carry water in kegs between each resting place. However, until the 1860s the natural supplies of water in the streams and swamps of the Blue Mountains were generally sufficient for the small numbers of people living in or travelling through the Blue Mountains. But the coming of the railway brought with it a substantial new thirst for mountain water.

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24 Lesson in Mackaness, op. cit., p.150, S. Stanger, 'A Journey from Sydney over the Blue Mountains to Bathurst Forty Years Ago', 1841, in Mackaness, op. cit., p.258.
Watering the Iron Horse

Water was absolutely essential for the operation of steam locomotives in the Blue Mountains. Furthermore a large and frequent supply was required due to the steep grades of the Blue Mountains railway and the small tender capacity of early train engines. Places to 'water' trains were identified early and incorporated into the construction of the mountain railway in 1867-68.  

The first train watering stop was near Glenbrook where water from the lagoon (enlarged by the building of an earth wall) was gravitated down to a tank next to the railway for replenishing the train engines. The second railway watering place was at Lawson where water was pumped from an earth dam constructed in 1867 in a gully near the station. The train water was originally stored in 'two stone tanks or reservoirs'. In 1881 the dam wall was raised to increase the supply. Water was next obtained from a dam on Jamison's Creek near Wentworth Falls which was pumped to storage tanks at the train station. A series of dams were ultimately built at Wentworth Falls for supplying the railway, the largest later becoming Wentworth Falls Lake.  

Trains next stopped for water at Blackheath where a dam was constructed in a nearby swampy gully (now Memorial Park) and the water pumped to a cast iron tank at the station. Increasing demand led to the dam being enlarged in

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1884, with a second concrete dam constructed downstream a few years later to extend the total storage capacity to two million gallons (over nine million litres).\textsuperscript{57} Water was also required for trains using the steep Zig Zag section of the railway between Bell and Lithgow. Initially, water was obtained from a stone dam built across a small creek flowing near the top level of the Zig Zag. Further down, a natural waterfall was also utilised where the railway builders had seen the 'elements of a tank', according to a visitor in 1869. Here a 'lovely' grotto had been walled in to retain the water from several small falls. The result left the visitor convinced that train engines 'were surely never watered from such a "tank" before'. These water sources were eventually superseded by a deep dam with a capacity of three million gallons (over 13.5 million litres) that was constructed on Dargans Creek near Newnes Junction as part of the works for the Zig Zag deviation in 1910.\textsuperscript{58}

The limited water catchments along the mountain railway line and the steadily increasing train traffic often meant that the normal water supplies in the Blue Mountains ran dry during drought conditions. For example, during droughts in the 1870s and 1880s, water had to be brought from Eskbank by train to replenish the railway supplies at Clarence, Blackheath, Lawson and Glenbrook. In 1905 the dams at Blackheath once more ran dry and water was again brought by train from Lithgow. Water trains were again required in the


summer of 1926-27 when the dam at Wentworth Falls went dry. 89 To overcome such problems it was found necessary to augment the water supply in several places. For example, two water storage tanks (combined capacity of 30,000 gallons or 135,000 litres) were constructed at Linden in 1885 which were supplied by a new concrete dam on Bulls Creek. A much larger dam was constructed downstream on Woodford Creek in 1927. At Blackheath, an alternative source of railway water was obtained from a weir built on Govett’s Leap Brook in 1906. The Lawson railway dam proved so unreliable that eventually in 1907 a larger earth dam was constructed at Wentworth Falls which as well as significantly boosting the local railway supplies, also permitted water to be piped down along the railway line to Lawson. The capacity of the Wentworth Falls dam was progressively increased to around 66 million gallons (300 million litres) so that other areas including Linden and Valley Heights could also be supplied. 90

Continual improvements to train technology (including larger capacity tender tanks and superheating) and the provision of reticulated town water supplies led to the progressive abandonment of most of the railway watering spots in the Blue Mountains during the 20th Century. Eventually, the need for watering trains ceased entirely in 1957 when the railway over the Blue Mountains was electrified. Aside from Wentworth Falls Lake and a few disused dams and tanks, little physical evidence now remains of the critical

and long-standing importance of water to the running of the steam railway in the Blue Mountains.  

**Wells and Tanks**

>'Houseowners, lay on more tanks; in the hour of abundance, you should be provident, as tenants must have water, or they cannot exist'. Katoomba Times (1890)

As more and more permanent settlers arrived in the Blue Mountains in the wake of the railway there was an ever increasing need to supplement what nature had provided. While creeks and swamps were still utilised, early mountain settlers also dug wells, made small dams and collected rainwater from building roofs which was stored in tanks. Usually enough could be collected for most domestic needs except regular bathing. The ubiquitous corrugated iron tanks soon became a basic attribute of every rural dwelling in Australia, including those in the Blue Mountains. In the valleys where water was usually plentiful some early settlers used horse-drawn containers to transport water from creeks and swamps to homesteads. Bernard O'Reilly's family made use of a fifty gallon cask mounted on horse-drawn slide that each day was used to transport water from Long Swamp Creek to the family home in Kanimbla Valley. This daily chore later became unnecessary when a new house was constructed complete with two 1,000 gallon (4,500 litres) rainwater tanks.

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83 Katoomba Times, 8 February 1890 p.2.
85 B. O'Reilly, Green Mountains and Cullenbenbong, Brisbane, 1952, pp.68, 77.
From stringybark hut to majestic mansion, a good water supply was a fundamental feature of every Blue Mountain residence. Every one of the grand and stately homes built in the Blue Mountains during the late 19th Century boasted a dependable supply of water. To give just one example, the mountain home of Sir James Martin (‘Numantia’) was well supplied with water from two wells excavated in the garden. Furthermore, virtually the only completed sections of Martin’s unrealised plans for a grand mansion (also to be named ‘Numantia’) were two excavated rock tanks for the water supply which measuring 25 feet by 6 feet and 10 feet deep (7.5 m by 1.8 m and 3 m deep), and another reservoir known as ‘Lady Martin’s Bath’ which was instead used as watering hole by passing travellers. The mansion itself may have been an unrealistic and overly extravagant concept but the provision of a sound water supply was certainly no folly.\(^6\)

Hotels and boarding houses in the Blue Mountains also needed to ensure a good source of water. In the 1880s the Carrington Hotel obtained its water from a well which was sunk to a depth of 120 feet (36 metres). The water was pumped to the surface using a windmill and stored in a 60 foot (18 metre) high iron tank which could hold up to 10,000 gallons (45,000 litres). The drinking water was said to be ‘carefully filtered’ before use.\(^7\) The provision of outdoor water supplies was also vitally important to mountain tourism. From the 1880s, the trustees of the mountain reserves constructed various receptacles to store drinking water for users of the walking tracks. These

included wells cut into the rock or made from stones which collected natural seepage or water flow from small streams or falls. In some instances, metal cups attached by chains were provided.69

As mining developed in the Blue Mountains during the late 19th Century, water was further needed to help 'work' the earth. Early prospectors for gold in areas like the Kowmung River sifted through sediment and slate using panning dishes or sluicing boxes to filter out the valuable metal grains. At the various coal, shale and silver mines, water was required for the boilers of the steam engines to drive machinery, including the Incline tramway at South Katoomba. Water was often also a hindrance to mining as it seeped into and sometimes flooded the underground tunnels. 'Dewatering' was therefore a critical component of most mine operations. Special drainage shafts and tunnels were sometimes sunk into the rocks near the mine workings to release banked up water. At the Yerranderie silver mines, anywhere between 600 and 6,000 gallons of water a day accumulated in the mineshafts. This was gathered in a 'well-hole' and continuously emptied by water tanks lowered on rails. The underground water was then used in boilers and for other mining requirements.69

By the 1890s the expansion of settlement in the Blue Mountains had outgrown most of the natural water supplies and many homes and tourist

67 Nepean Times, 1 May 1886 p.2. 20 April 1889 p.3.
houses now relied exclusively on rainwater tanks. In late 1894, the
Mountaineer recorded that 'water for household purposes was becoming
rather scarce on the Mountains'. The dry conditions continued and by mid
1895 residents in Springwood were forced to purchase their water from the
railway which was delivered to them in water carts. Water was also 'very badly
required for domestic purposes' at Lawson that year.\textsuperscript{70} Even so, by 1899
neither the Katoomba Council or the local paper felt that the time was ripe 'to
entertain any scheme of water supply' for the town.\textsuperscript{71}

The Want of Water

In the 20th Century, the want of water was increasingly felt throughout the
Blue Mountains. As their populations grew, each of the mountain towns in
turn clamoured for a permanent water supply. Prior to the 1940s, the supply
of water in the Blue Mountains was the responsibility of each local
government authority and consequently each made its own arrangements for
securing a reliable source of the liquid element.

\textit{Katoomba 1900-1939}

'\textit{Why should a place like Katoomba depend on a casual storm for its water
supply. It was an absurdity}'. Alderman Goyder (1904)\textsuperscript{72}

\textsuperscript{70} J.R. Bennett, \textit{The Katoomba Coal Mine}, Katoomba, 1972, n.p.n., S. den Hertog, \textit{The
Yerranderie Silver Field, Burrarorang Valley}, Camden, 1988, pp.29, 35, J. Barrett,
\textit{Koumung River: Discovery, History and Development}, Glenbrook, 1993, pp.57-60.
\textsuperscript{71} \textit{The Mountaineer}, 30 November 1894 p.2, 5 July 1895 p.2, 9 August 1895 p.3.
\textsuperscript{72} \textit{The Mountaineer}, 30 March 1899 p.2.
Due to exceptionally dry weather in the summer of 1901-02 a scarcity of water 'never before known' led Katoomba Council to conclude that a permanent water supply for the town was now imperative. Most aldermen agreed that a water supply was urgent because the town had grown so much that it could no longer depend only on tanks and rain and the want of water was deterring visitors. Not all councillors agreed however with one instead urging landlords to install more tanks and for visitors to refrain from having a 'full plunge bath'. Nevertheless it was decided in 1902 that negotiations should be commenced with both the State Government and representatives of other mountain centres for a comprehensive water supply for the Blue Mountains.\(^7\)

A combined scheme was soon seen as impractical and instead in 1903 the Department of Public Works proposed a water supply system for the Katoomba Municipality alone comprising a dam on Cascade Creek from which water would be pumped to a storage reservoir and then reticulated throughout Katoomba and Leura. Because of Katoomba's situation high on a ridge, the options for providing a water supply were limited. Local catchments were few and only those which drained to the north of Katoomba (and were therefore unpolluted by the town's drainage) could be considered.\(^4\)

Throughout the year, the proposed water scheme 'agitated the minds of Katoomba's councillors' with the local press strongly in favour of a water supply. The *Mountaineer* claimed that for many years 'the great complaint on

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\(^7\) Quoted in *The Mountaineer*, 23 December 1904 p.7.

\(^4\) *The Mountaineer*, 5 January 1900 p.2, 28 February 1902 p.3.

\(^7\) *Blue Mountain Gazette*, 27 February 1903 p.6.
the Mountains has been the want of water with many boarding houses left unoccupied or having to refuse baths to patrons during dry seasons. Its rival the Blue Mountain Gazette stated:

'The pressing need of an adequate water supply for the town is a matter of grave concern. Every summer, and that of last year in particular, Katoomba approaches a water famine too close a degree to be pleasant...The time has gone by for placing dependence in the supply obtainable from the antediluvian tank, and in a town like Katoomba - which is regarded as being up-to-date - it is rather surprising to find that in these days of progress the people are compelled to trust to providence for sufficient water to make a pot of tea.'

A water supply scheme was put to a referendum of ratepayers held in October 1903. However, due to bickering within the Council and the proposed cost involved, the scheme was soundly defeated by a large majority despite the fact that only around half of those eligible bothered to vote. Having received such a 'powerful set-back', the entire matter was subsequently dropped by the Council.

However the want of water continued to cause anxiety in Katoomba, especially in a town that also prided itself as a 'premier health resort'. In December 1904 during the throes of yet another dry summer, the previous proposal was dusted off and once again placed before the Council. However, opposition to the idea within the Council remained strong. Several aldermen still saw the scheme as premature and 'high-flown' with one stating that he would sooner

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75 The Mountaineer, 4 September 1903 p.5.
76 Blue Mountain Gazette, 11 September 1903 p.2.
77 Blue Mountain Gazette, 23 October 1903 p.2, The Mountaineer, 23 October 1903 p.3.
hang himself than vote for it. After trading insults, the proposal was again voted down by the Council.\textsuperscript{78}

Savage bushfires raged through the Blue Mountains only weeks later and this, combined with the continuing dry weather, led \textit{The Mountaineer} to again issue a 'cry for water'. The newspaper reported in November 1905 that water carts were in great demand and the 'want of a water supply' was again making itself felt 'with increasing reality', due to 'the uncertainty of the rainfall' and increased visitor demand for water. Katoomba Council now moved swiftly to establish a permanent water supply. After further discussion, in December 1905 the Council unanimously agreed to a scaled down and cheaper version of the original water proposal.\textsuperscript{79}

Work began in the following year and was completed by March 1907 when the Katoomba Water Supply was officially turned on by the State Governor to the loud cheers of local residents. Costing over £16,000, the completed water system comprised a curved concrete dam 20 feet (6 metres) high and 300 feet (90 metres) wide built on Cascade Creek which could hold over 5.5 million gallons (25 million litres) (see Figure 2.1). Water was pumped from the dam to a cement reservoir 50 feet (15 metres) in diameter (with a storage capacity of over 300,000 gallons or 1.3 million litres) located on Essendene Hill (the highest point in Katoomba). From here water was reticulated by gravitation to


\textsuperscript{79} \textit{The Mountaineer}, 3 November 1905 p.5, 1 December 1905 p.6.
every part of the municipality through over 14 miles (22 kms) of water mains.\textsuperscript{80}

For a couple of years, residents of Katoomba were amply supplied with water while those in other mountain centres nervously watched their tanks drain away each summer. However Katoomba's aquatic joy proved short-lived. By March 1915 dry weather and heavy consumption had so reduced the Cascade Creek dam that only less than 10 days supply was left. This water scare prompted the Council to immediately double the height of the dam wall to 50 feet (15 metres) increasing the storage capacity to 35 million gallons (159 million litres). However, consumption of water during heatwave conditions often exceeded the capacity of the pumps and the supply cut out several times even though there was water in the dam.\textsuperscript{81}

In early 1919, the situation worsened when drought and over consumption caused the level of the dam to drop significantly in a matter of weeks so that only two days supply remained. The Council urged the 'utmost care' with water, and one alderman even recommended watching bathrooms and carefully examining cisterns for 'over-flushings'. These measures were successful in conserving the meagre supply until late April when the 'floodgates of heaven opened and loosed a deluge'. As the dam rapidly filled, the local paper noted that 'great was the joy in municipal circles' as now the 'happy householder may wash in comfort' and hose the lawn and garden

\textsuperscript{80} Katoomba Water Works, Souvenir of the Opening, Katoomba, 1907, BMCL, Sydney Morning Herald, 14 March 1907 p.7.
without fear of penalty. However, the close monitoring of consumption during the crisis had shown that Katoomba's growth had again exceeded its water supply. The *Blue Mountain Echo* predicted that in the very near future a second dam would be required.

Plans for a second dam came swiftly. Due to the 'growing requirements of Katoomba', in 1920 the Department of Public Works drew up plans to augment the town's supply. The Department's view was that in future 'It would be necessary to utilise the waters of the Grose River by constructing a storage dam below the junction of Mount Victoria Creek' however this was currently beyond the financial resources of the Council. Instead as an immediate solution it recommended the construction of another larger dam on Cascade Creek 2,000 feet (600 metres) downstream of the existing dam to catch the overflow and impound around 90 million gallons (400 million litres). Because of its large cost, in November 1920 the proposal to augment Katoomba's water supply was referred to the Parliamentary Standing Committee on Public Works to evaluate.

The Parliamentary Inquiry took place during 1921 and included a visit to Katoomba in March, where evidence was taken from local aldermen and council officers and the proposed dam site inspected. The pressing need for

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the second dam was unanimous amongst those questioned by the Committee, especially as Katoomba’s population was now estimated at around 12,000 with a summer tourist increase to over 20,000. Over 1500 houses in the municipality were connected to the water supply from a total of 2200 premises. The Inquiry concluded in August 1921 with the Committee recommending that the proposed works be carried out.\textsuperscript{55}

A change of government and bureaucratic inertia delayed work on the second dam and in October 1922 Katoomba and Leura were once more threatened with a serious water famine. With only 14 weeks supply left, the \textit{Blue Mountains Echo} stated that the grave water situation had submerged the municipality in a wave of disappointment and disgust, and urged the ‘severest castigation’ on those responsible for the calamity. By late November the situation had become more desperate with predications that the dam would be empty by the end of January. The local newspaper became increasingly more frantic, if not hysterical, in its headline calls for immediate action to avert the impeding calamity which ‘only Providence can prevent, as it has done for the last 3 years’.\textsuperscript{56}

However in March 1923 a team of Council workers led by the Mayor established a temporary emergency dam on Katoomba Creek (situated below the original dam) from which thousands of gallons of water were pumped to

the main dam. The Blue Mountain Echo now reported with satisfaction that 'the spectre of water famine has been banished', and in the following winter construction at last began on Katoomba's permanent second dam.  

The construction of large dams like those at Katoomba resulted in massive changes to the local environment as rocky narrow creekbeds were converted into artificial lakes brimming with water for human use. An idea of the changes wrought can be gained from a newspaper description of the dam construction on Cascade Creek in 1923. A correspondent from the local paper noted that only weeks before the 'primitive' steep sides of the gully were clothed with stunted eucalyptus and scrub while in the creek bed tall Mountain ash rose out of 'the riot of lush, reedy growth'. However, the use of the firestick by the dam builders had transformed the scene to one where 'charred sticks' and 'little black mounds' replaced the scrub and reedy grass, while 'criss-cross in all directions lie the whitish boles of Mountain ash'. In addition, slopes had been 'scarred and seamed' by rough access roads, great cast-iron pipes lay strewn about, and here and there the earth had been turned up.

The second Cascade Creek dam was completed in 1925. It comprised a 70 foot (21 metre) high earth and stone dam with a reinforced concrete core capable of storing up to 70 million gallons (over 310 million litres), mostly overflow from the first dam. To further enhance the supply, a cutting was

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57 Blue Mountain Echo, 30 March 1923 p.3.
58 Blue Mountain Echo, 8 June 1923 p.2.
made in the western side of the second dam to allow water to be diverted into it when required from a small concrete weir placed on Whipcord Creek (see Figure 2.2). The combined capacity of both dams now amounted to over 100 million gallons (over 450 million litres) which was said to be sufficient for the municipality's needs for the next 10 to 15 years. With the dams now full to the brim, the Blue Mountain Echo reported with reassuring pride that all danger of a water shortage had dissipated and 'nothing short of a miracle could place the town in danger of a water famine'.

For the next eight years the two dams did met Katoomba's needs, but inevitably the growth of the area once more necessitated an increase in the water supply. Between 1920 and 1930 the annual consumption of water increased by over 70%, and by 1933 water was being supplied to over 2000 premises in 124 streets throughout the municipality. With an eye to the future, Katoomba Council began discussions with the Public Works Department in 1933 on how best to augment the strained water supply. A proposal was formulated to construct a third larger dam on the Cascade Creek catchment above the first dam to impound an additional 400 million gallons (1,800 million litres). The need for the third dam became imperative when dry conditions in the summer of 1936-37 again led to water restrictions being imposed by the Council.

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[^27]: Katoomba Daily, 30 October 1936 p.1, 13 November 1936 p.3, 27 November 1936 p.1, Blue Mountains Times, 5 March 1937 p.2. As an emergency measure the Council supplemented the dam supply by pumping water from a spring-fed source on Katoomba Creek called the 'Blue Hole' (despite some concerns over its purity after wet weather).
During early discussions of the proposed third dam, Departmental officials indicated that with the increased storage Katoomba would have sufficient water to also supply other towns in the central Blue Mountains. So when financial arrangements for the new dam were finalised and construction began in 1937, the Katoomba and Blue Mountains Shire Councils entered into agreement whereby Katoomba would supply bulk water for reticulation to the area from Wentworth Falls to Woodford.\textsuperscript{29} This proved to be a monumental blunder, as during the following year (as work on the third dam neared completion) it became abundantly clear that Katoomba would now need all the available water for itself. Consumption soared and water restrictions were again imposed in the summer of 1938-39. From the outset the local newspaper, the \textit{Katoomba Daily}, opposed the 'hare-brained scheme' of supplying the Shire asserting that the 'Shire's water supply should be its own concern'. Bowing to the inevitable, in 1938 Katoomba Council belatedly advised the Shire that it would be impossible for it to supply the water as planned.\textsuperscript{30} The third Cascade Creek dam was finally completed in early 1939 (see Figure 2.2). As the nation headed into war, Katoomba Council now commenced a desperate search for another source of water to meet it own expanding needs and fulfill its obligation to supply part of the Shire.\textsuperscript{31}

Water was clearly one of the key elements in Katoomba's rise to become the 'Queen City of the Hills' in the early 20th Century. As the first mountain town

\textsuperscript{29} \textit{Katoomba Daily}, 17 October 1933 p.1, 8 February 1935 p.2, 5 November 1937 p.2.
to install a reticulated water supply (and a sewerage system for dealing with waste water) Katoomba was able to leap ahead of other mountain centres in the race to attract tourists to the Blue Mountains. As the Blue Mountain Echo observed in 1927, Katoomba provided 'those essentials of civilised life' lacking in its sister towns, the foremost of which was 'a continuous flow of town water'. The Katoomba Daily was of the same view, noting a decade later that of all the numerous factors which have pushed Katoomba into the forefront of tourist resorts 'water probably comes an easy first'. To emulate the success of Katoomba was a central goal of the other Blue Mountains towns, and this required nothing less than a reliable water supply.

_Supplying the Shire 1900-1939_

_The Blue Mountains must have water throughout their length...Let not the lesson of the drought be forgotten; there is too much at stake!_ Blue Mountain Echo (1926).

With every dry summer, the existence of a permanent water supply in Katoomba and Leura made those towns the envy of other Blue Mountain residents who were still reliant on tanks and wells. However, during the early 20th Century those mountain landholders that could afford it were making their own water supply arrangements. For instance, to provide water to the newly constructed Hydro Majestic sanatorium at Medlow Bath, a dam (with a capacity of one million gallons or 4.5 million litres) was formed in the

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95 Blue Mountain Echo, 5 August 1927 p.4, Katoomba Daily, 5 November 1937 p.2.
96 Blue Mountain Echo, 17 December 1926 p.4.
Kanimbla Valley in 1903 from which water was electrically pumped up to storage tanks at the hotel. 97

Despite the smaller number of residents in the area, since the early 1900s the Blackheath Progress Association had also been lobbying for a reticulated water supply for Blackheath and Medlow Bath. In expectation that the district would soon be made a municipality, in 1907 the Department of Public of Works constructed a 60 foot (18 metre) high concrete dam across nearby Adams Creek (see Figure 2.3). The stated purpose of the 67 million gallon (300 million litre) dam (now called Lake Medlow) was 'for the water supply of Blackheath, as well as Medlow and any future settlement in the neighbourhood'. 88 Unfortunately for the residents of Blackheath gaining access to the water impounded in this dam was to prove a lengthy and frustrating process.

The Blue Mountains Shire Council was also keen for a permanent water supply to be established throughout its area. After persistent lobbying by the Shire Council, in 1909 the Department of Public Works undertook preliminary investigations of possible sources of water for all the mountain towns and villages (excluding Katoomba). However, the Department soon reported that a general reticulated water supply for the rest of the Blue Mountains was 'practically out of the question', as the 'scattered nature of most of the settlements' together with the 'considerable distances between the towns' 99

97 Sydney Morning Herald, 22 December 1903 p.3.
made it impossible for an affordable scheme to be formulated. But the residents would not take no for an answer and the Shire continued to appeal to the Department. After further investigation, the Department suggested in 1911 that water for the mountain villages between Wentworth Falls and Glenbrook could be obtained from two sources - Wentworth Creek (for the central Blue Mountains towns) and Linden Creek (for the lower Blue Mountains towns). The Department noted that the catchments of both creeks had recently been reserved and plans were underway to survey and gauge the water flows.  

However, while the Department could plan and survey all it liked, it was not legally possible for it to provide a water supply to the other Blue Mountain settlements at this time. Under the existing legislation (Country Towns Water and Sewerage Act) the Department could only construct public works in a municipality and not in a shire area. As the Department noted in its 1911 Annual Report, an amendment of the Act was required before a water supply for the Blue Mountains Shire could be 'favourably considered'. This legality not only prevented the Department from building further dams in the Blue Mountains but also explains why it took almost 20 years for Blackheath to obtain access to the unused water held in the Lake Medlow dam.

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99 Public Works Department letter to Blue Mountains Shire Council, 20 February 1909, BMCC Listed Archives Box 13.
Nevertheless, the want of water meant that local agitation for a permanent
supply continued. The *Blue Mountain Echo* commented in 1913 on the 'stigma'
created by the lack of a water supply for mountain residents outside of
Katoomba and Leura who still remained dependent upon 'primitive' rainwater
tanks and underground wells. Given the increasing numbers of wooden
buildings being constructed, the paper also warned of the 'tremendous risk'
posed from an outbreak of fire if the 'means for its extinction' were limited to
tank water. The Blue Mountains Shire convened a public meeting at Lawson
that year at which the assembled ratepayers and residents decided to form a
Blue Mountain Water Supply League to urge upon the Government 'the
necessity of providing an adequate water supply for all Mountain centres'.
Meanwhile, under a personal financial guarantee by Mark Foy, the owner of
the Hydro, some water was eventually made available from the Lake Medlow
dam during 1913 to supply Medlow Bath and the increasing needs of the
Hydro Majestic Hotel. However the rest of the Shire area was still left high and
dry.

By 1914, a summer shortage of water again drew attention to the problem.
The *Sydney Morning Herald* observed that the tourist population of the Blue
Mountains had grown enormously in the previous decade and the time had
now come for the region to be 'relieved from the constant apprehension of
drought'. Even the Department of Works now noted that the increase of

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102 *Blue Mountain Echo*, 11 April 1913 p.2, 25 April 1913 p.3.
settlement in the mountains rendered the 'question of a permanent water supply a matter of considerable importance'.\textsuperscript{104}

Demands by Shire residents for a proper water supply intensified after serious bushfires swept the area in November 1915. Over the next few years further public meetings on water were held in several mountain towns including Lawson and Springwood. The local paper noted that the need for a permanent water supply was growing 'more acute each successive summer' and called for the damming of local streams rushing by 'within a stone's throw of many of the towns'.\textsuperscript{105} In August 1916 a delegation of Blue Mountains councillors and residents led by the local Member of Parliament met with the Minister to lobby for a mountain water supply. Once again this was unsuccessful largely due to the inability of the Shire to pay for a supply and the Government's reluctance to subsidise the cost.\textsuperscript{106}

At war's end the Shire Council resumed its efforts to secure a permanent water supply for the rest of the Blue Mountain settlements. Amendments to the \textit{Local Government Act} in 1919 at last allowed shires to be catered for by the Public Works Department. (Ironically, Blackheath finally achieved its own municipality status in December of that year as well). By now several water schemes had been proposed by the Department for consideration by the Shire

\textsuperscript{104} \textit{Sydney Morning Herald}, 1 January 1914 p.6. Department of Public Works, Annual Report 1914, \textit{NSWPP}, 1914-15, Vol.5, p.348. Due to cost, the Department now favoured one large supply for the entire Blue Mountains from a dam (with a capacity of over 400 million gallons) in the upper Grose Valley from which water could be hoisted to Mount Victoria and then gravitated all the way down to Glenbrook.

\textsuperscript{105} \textit{Blue Mountain Echo}, 17 December 1915 p.3, Bentley, \textit{op. cit.}, p.54, Historic Blackheath, \textit{op. cit.}, p.161.
Council. The Council was faced with the equally expensive alternatives of either creating a major scheme in the Grose Valley (to supply the entire Shire) or constructing a series of dams throughout the Shire to provide local supplies to various towns. It was also now clear that Blackheath would be best supplied from Lake Medlow. This left Mount Victoria, where it was proposed to obtain a local supply from a 300 million gallon (1,300 million litre) dam on Waratah Creek, and the towns stretching eastwards from Wentworth Falls to Glenbrook. To supply these centres, three separate schemes were proposed involving dams on Wentworth Creek (to supply Wentworth Falls to Valley Heights), Linden Creek (to supply Springwood and Faulconbridge only) and Woodford Creek (to supply Linden to Valley Heights). Of these options the Shire Council initially chose the Wentworth Creek proposal, however disagreements broke out between representatives from different parts of the Shire area over which water scheme should commence first.\(^{107}\) The mixed messages subsequently sent to the State Government, along with ongoing concerns over the cost to the Shire Council, ensured that none of the schemes to supply the Blue Mountains Shire area proceeded at this time despite repeated lobbying.

Meanwhile the new Municipality of Blackheath moved quickly to secure its long sought after water supply. In April 1921 Blackheath Council approved and accepted the liability for a proposed scheme to pump water from Lake

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\(^{106}\) "Blue Mountain Villages Water Supply - Proposal", 15 August 1916, BMCC Listed Archives Box 13.

Medlow to a reservoir for reticulation throughout Blackheath. The high cost of the works saw the proposal referred to the Parliamentary Standing Committee on Public Works in November 1922. The Parliamentary Inquiry took place during 1923 and as they had with the earlier Katoomba proposal, the Parliamentary Committee visited the area to inspect the site and take evidence from Blackheath councillors, staff and residents. Again the need for the scheme was undisputed as Blackheath's population (2,000 in winter increasing to over 5,000 in summer) had clearly outgrown its ability to rely only on rainwater tanks and local springs and a permanent water supply was needed for the 700 or more premises in the area. Unsurprisingly, the Committee approved the construction of the Blackheath water supply in October 1923.106

After the inevitable government delays the Blackheath water supply was completed and opened by the Minister for Local Government in October 1926. The final scheme comprised the construction of a new electric pumping station at Lake Medlow from which water was conveyed through 1.5 miles (2.4 kms) of pipe to a concrete reservoir (capacity of 500,000 gallons or 2.2 million litres) situated at Bridges Street. From here water was reticulated throughout Blackheath. The new works also included an upgrading of Medlow Bath's water supply capacity.106

Spurred on by the progress made at Blackheath and Katoomba, the Blue Mountains Shire Council continued to press the State Government during the 1920s for a water supply for the eastern part of the Shire. Various alternative proposals floated backwards and forwards between the Council and the Department of Public Works but no firm agreement could be reached.  

By 1929 it was clear that the only way the Blue Mountains Shire was going to get its water was in a piecemeal fashion. At a meeting in January between the Minister of Public Works and a delegation of 40 representatives from the lower Blue Mountains it was proposed that the towns from Faulconbridge to Glenbrook obtain water by enlarging the new dam on Woodford Creek recently built by the Railway Department. Completed in 1927, this dam had a capacity of 33 million gallons (150 million litres) but was designed so that a doubling of the height of the dam wall could increase the storage to 315 million gallons (1,400 million litres). The Minister visited the site in April and was favourably impressed with the idea. Negotiations then commenced between the Railway Department, Public Works Department and Shire Council to transfer control of the dam to the Shire which would then provide the railways with its annual water requirement of 26 million gallons (118 million litres).  

After much prompting, the Railway Commissioners finally agreed to the transfer in late 1930, however lack of government funding during the Depression prevented any work beginning until 1935. To provide the new water supply, the dam

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wall at Woodford Creek (now Lake Woodford) was raised eight feet (2.4 metres). The entire work was completed in 1937 and the mountain towns of Linden, Faulconbridge, Springwood and Valley Heights were at last connected to a permanent water supply.\textsuperscript{112}

However the central Blue Mountains towns from Wentworth Falls to Linden still needed water. Although the construction of a dam on Wentworth Creek had been discussed for many years, in the end the Shire Council entered into an agreement with Katoomba Council in 1937 to obtain the water for these towns from the Cascade Creek dams (via a concrete reservoir in Leura). To distribute the anticipated water from its neighbour, the Shire Council spent £100,000 building new reservoirs at Wentworth Falls, Bullaburra, Lawson and Woodford and laying down water mains. But now needing all its water for itself, Katoomba Council reneged on the deal in 1938 and the Shire's new pipes lay empty.\textsuperscript{113}

Desperate for water from anywhere, the Shire Council next pinned its hopes on another comprehensive scheme for the entire Blue Mountains (and other areas to the west including Lithgow) which was then under consideration by the State Government. Originally suggested by the Shire President, this proposal was to build a huge concrete arch dam on Wollangambe Creek near


\textsuperscript{113} \textit{Katoomba Daily}, 16 December 1938 p.1, 23 December 1938 p.2. It should be noted that some previous accounts (e.g. Bentley, op. cit., p.55, and Old Leura and Katoomba, op. cit., pp.142-143) have claimed that water was first supplied to the central Blue Mountain towns in 1938 including some reluctantly provided by Katoomba Council. This is incorrect. No reticulated water was supplied to this area
Mount Wilson from which water would be pumped to a high point and gravitated down to all the mountain towns as well as supplied elsewhere to the west. However, such a massive scheme was costly and could only be feasible if the entire Blue Mountains water supply was unified.\textsuperscript{114}

\textit{Amalgamation 1940-1947}

Water was the determining factor in the amalgamation of local government in the Blue Mountains in the 1940s. The idea of amalgamation was first raised in the 1930s in the context of combining the separate water supplies (and possibly other public utilities) in the name of greater efficiency. As early as 1935, local alderman had suggested that the councils should meet to discuss the formation of a water and sewerage board. The concept of a mountain county council or water board continued to be raised at regular intervals over the following years by councillors, Ministers and departmental officers, especially in 1939 during consideration of the comprehensive Wollangambe Creek proposal. Due to great expense involved, the Wollongambe proposal was eventually rejected by the State Government in 1941, but the idea of a Blue Mountains county council persisted.\textsuperscript{115}

While discussion on amalgamation was continuing, from 1939 Katoomba Council persevered with its urgent search for an additional water source so

\textsuperscript{114} \textit{Blue Mountains Daily}, 9 May 1939 p.1.

that it could augment its increasingly inadequate supply and provide the promised water to the Shire. Over 2,200 premises were now connected to water in the Katoomba Municipality which annually consumed well over 200 million gallons (900 million litres). After consideration of another small dam at Rocky Creek on the Cascade catchment, eventually eyes were cast further to the north. In March 1940 during the grip of another serious drought it was decided to tap into the abundant catchment area supplying Blackheath by building a dam on Greaves Creek below Lake Medlow. This dam would collect the overflow from Lake Medlow and hold up to 68 million gallons (300 million litres) for use by both Katoomba and Blackheath.\textsuperscript{118}

With financial support from the State Government, work on the dam commenced quickly during 1940. By November, Katoomba Council was able to start pumping water from the new dam (Lake Greaves) into its Cascade Creek storages to augment the town's supply. Some water was also at last now piped to the Shire's reservoirs to supplement its temporary emergency supply. This had been established in 1940 by the Department of Public Works and consisted of a small pumping station on Wentworth Creek. A meagre supply of 250,000 gallons (1.1 million litres) per day was obtained from this source and used to provide a partial water supply to the central Blue Mountains towns. Work on the Lake Greaves storage was finally completed in November 1941 and the new dam officially opened by the Minister for Local Government and Housing. During World War II other mountain centres were

\textsuperscript{118} Blue Mountains Advertiser, 19 January 1940 p.1, 1 March 1940 p.2.
also supplied with reticulated water for the first time including Mount Victoria in 1941 (which was supplied from Lake Medlow via the Blackheath system).\textsuperscript{117}

However, even with the increased storages now available the severe drought conditions of the early 1940s still left most of the dams well below capacity. Water restrictions were again put in place throughout the Blue Mountains during the summer of 1941-42 and not lifted until late 1943.\textsuperscript{118} Like those elsewhere, during the war mountain residents were also warned to be prepared in case the water supplies were cut or contaminated through 'enemy action'.\textsuperscript{119}

Ironically, it wasn't enemy action which ultimately affected the water. The hasty construction of the third dam on Cascade Creek in 1938 had left a serious erosion problem. To obtain the necessary earth fill to construct the dam, large quantities of soil and rock had been excavated from around the edges of the storage which had left the catchment severely 'torn about' and 'ravaged' according to observers in the late 1930s. Before long, heavy winter rains caused severe erosion of the bare surface leading to siltation and sedimentation in the new dam which affected water quality. Working with the

\textsuperscript{117} Blue Mountains Advertiser, 1 August 1941 p.2, 28 November 1941 p.2, 10 July 1942 p.2, Historic Blackheath, \textit{op. cit.}, p.166.
\textsuperscript{118} Blue Mountains Advertiser, 19 December 1941 p.1, 9 January 1942 p.3, 6 February 1942 pp.3, 6, 8, January 1943 p.2.
\textsuperscript{119} Blue Mountains Advertiser, 2 April 1942 p.6.
Soil Conservation Service, in 1941 Katoomba Council planted trees, shrubs and grasses to revegetate the area and stop erosion.\textsuperscript{120}

Meanwhile by 1942 ongoing squabbling between the Katoomba and Blue Mountains Shire Councils over the water supply and finances led to an inquiry by the Department of Public Works. In its report, the Department again strongly urged the setting up of a county council to cover the water supply administration for the entire Blue Mountains area. In July the Minister put the issue beyond doubt when he advised all three mountain councils that the State Government would not subsidise any further water supply works in the Blue Mountains unless they amalgamated or established a county council. Eventually, at a special meeting in December 1943 delegates from all three councils agreed to the formation of a county council to take over the administration of all essential services in the Blue Mountains (including water supply, sewerage, electricity and gas). The Blue Mountains County Council became a reality in July 1944 and commenced operations on New Year’s Day 1945.\textsuperscript{121}

From the outset the new Blue Mountains County Council moved quickly to extend reticulation of water to all those areas of the district which were still without a permanent supply. During 1945 and 1946 reticulated water was extended for the first time to the rest of the central Blue Mountains area and to over 370 premises in Warrimoo, Blaxland and Glenbrook. New pumps and

reservoirs, as well as larger water mains, were also installed in various parts of the Blue Mountains to overcome water shortage problems which had necessitated more restrictions during the summer months. The obvious success of the County Council led inevitably to the complete amalgamation of local government in the Blue Mountains into a single entity. This occurred in October 1947 when the Blackheath, Katoomba, Shire and County Councils were all combined to form the Blue Mountains City Council (BMCC).

**Augmenting the Water 1948-1988**

From 1948 the BMCC carried on with the work begun by the County Council to consolidate and extend the mountain water supply. After amalgamation the Blue Mountains water supply system consisted of four distinct zones within the combined council area. Zone 1 consisted of Mount Victoria, Blackheath and Medlow Bath (supplied from Lake Medlow), Zone 2 covered Katoomba and Leura, and Zone 3 the central Blue Mountains from Wentworth Falls to Woodford (both supplied by the three Cascade Creek dams and the small Wentworth Creek pumping station). Zone 4 comprised the lower Blue Mountains from Linden to Glenbrook (supplied by Lake Woodford).

Following good rains, by mid 1948 the dams in the Blue Mountains were full and overflowing with two years of water supply safely held. The average yearly consumption of the entire Blue Mountains City area was now almost 650

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121 Blue Mountains Advertiser, 10 July 1942 p.4, 3 December 1943 p.1.
million gallons (2,950 million litres) of which over 60% was supplied to the Katoomba zone. The vast majority of mountain properties (over 90%) used less than 100,000 gallons (450,000 litres) per year. High on the agenda of the new council was finding a major new source of water to augment the existing supplies and cater to the expanding needs of mountain residents. Yet again the Grose and Wollangambe Rivers were considered however a much larger and cheaper supply was available from outside the Blue Mountains. During World War II a dam had been constructed on the Fish River near Oberon to supply Lithgow and nearby industries. A proposal was formulated in early 1948 for a bulk supply of water to be piped from the Oberon Dam for use in the Blue Mountains. By raising the Oberon dam wall, a supply of up to 1,200 million gallons (5,400 million litres) could be made available for mountain consumption. The Council formally agreed to the Fish River proposal in early 1949.  

However, securing adequate funding for the Fish River water augmentation scheme and the required local works remained a problem for the BMCC for over a decade. Because of the ever-expanding settlement in the Blue Mountains, during the 1950s most of the available funds were required for extensions of the reticulation network to supply new properties. Between 1946 and 1959, almost £700,000 was spent on water supply infrastructure in

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123 Searle, op. cit., p.58. 
124 Blue Mountains Advertiser, 23 July 1948 p.8, BMCC, Report on Improvements to Local Reticulation, Supplementary to Fish River Scheme, City Engineer’s Department, 31 October 1949, p.2. 
the mountains, predominantly on seven new storage reservoirs and approximately 60 miles (100 kms) of new pipeline. Much of this was to supply the increasing number of water connections, especially in the central and lower Blue Mountains, which between 1948 and 1960 grew by 60% in the central mountain towns and over 120% in the lower mountain towns (See Appendix 2).

The growing number of connections placed additional strain on the mountain water supply which resulted in ongoing complaints, particularly in the lower Blue Mountains. Poor water pressure during times of high demand often left residents with barely a trickle while summer restrictions remained a enduring feature of mountain life. As in the past, the 'deplorable water service' was further viewed as a contributing factor to the widespread destruction caused by the 1950s bushfires (see Chapter Three). Furthermore, many residents in outlying areas of the Blue Mountains were still not connected to the supply. During extended droughts, many were forced to cart water in buckets from the local dams when their household tanks ran dry.

Eventually, in the early 1960s work on the Fish River augmentation scheme commenced and the supply to the Blue Mountains was completed in 1964. To reach the Blue Mountains, water from the Fish River flowed through some 38 kms of concrete lined steel pipes which ran from the main Wallerawang supply line through a tunnel over a kilometre long beneath the Great Dividing Range, across the Kanimbla and Megalong Valleys, before climbing steeply up

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a cliff at Narrow Neck where the water was pumped to Leura. To facilitate the use of the new Fish River supply, during the 1960s the BMCC undertook various ancillary works throughout the Blue Mountains. These included several new storage reservoirs (including a 5 million gallon/22 million litre reservoir at Leura to receive the Fish River water), pumping equipment and new and enlarged water mains. Work was also undertaken by the BMCC over the following years to interconnect the dams and storage reservoirs of each separate zone, eventually allowing water to be sent when required all the way from Lake Medlow to Glenbrook (see Figure 2.4). By the end of 1968 there were over 14,000 water connections throughout the Blue Mountains.

With the additional water from the west, the Blue Mountains water supply was mostly adequate for many years. But inevitably, as had occurred so many times before, the population of the area progressively outgrew the mountain water supply. In fact, in many ways the increased housing development in the region during the 1960s, especially in the lower Blue Mountains, was a direct outcome of the greater availability of reticulated water from the Fish River supply. This is well illustrated by the fact that between 1960 and 1967 the number of water connections in the upper and central Blue Mountains increased by only 6% and 19% respectively, while those in the lower Blue Mountains jumped by 62%.

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130 See statistics in BMCC, Town Planning Scheme, reports of 1967 and 1968.
By the mid 1970s, the BMCC once again needed to augment the city's water supply. Water deficiencies and low pressure continued to be experienced in the lower mountains towns, and to make more water available a treatment plant was built at the Lake Woodford dam in 1976. At the request of the Council, between 1975 and 1977 the Department of Public Works prepared reports outlining several alternative proposals for augmenting the Blue Mountains water supply. These included boosting the overall supply from the Fish River scheme (by constructing a larger dam on the Duckmaloi River), creating dams on the Grose River or pumping water from either Warragamba Dam or bores on the Nepean River.\(^{131}\)

After the destruction caused by the 1977 bushfires, public pressure increased on both the Council and State Government to urgently improve the patently inadequate water supply in the lower Blue Mountains. Initially both authorities favoured the Duckmaloi River option, which was further promoted as the most cost effective solution by speakers at a conference on 'Blue Mountains Water Resources' held by the Australian Water & Wastewater Association at Leura in March 1979.\(^{132}\) But in a surprise move the NSW Government announced in September 1979 that it had decided to transfer responsibility for the Blue Mountains water supply and sewerage system to

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the Metropolitan Water, Sewerage and Drainage Board (MWSDB). The Government maintained that taking more water from inland sources would cause hardship to farmers, while in contrast the transfer to the MWSDB would reduce the costs of water for local ratepayers and be 'of great and lasting benefit to the Mountains residents'. The Blue Mountains City Council readily agreed to the idea (before it later fell into disarray and was dismissed by the State Government) and despite some lingering local opposition the transfer went ahead on 1 July 1980.\footnote{NSWPD, Session 1979-80, Vol.148, pp.885-886, Blue Mountains Gazette, 26 September 1979 pp.1, 5-6, 3 October 1979 pp.1, 14, 10 October 1979 pp.1, 9.} The transfer of water control meant that the additional water the Blue Mountains urgently required would now come from the east rather than the west. It also meant that in respect of its water supply the Blue Mountains had officially become an extension of Sydney.

With its larger resources the MWSDB (commonly known as the Water Board) was able to make rapid improvements to the lower Blue Mountains water supply. And they were needed urgently, as the transfer of responsibility for mountain water coincided with a severe drought period in eastern Australia. Dams everywhere were seriously depleted and water consumption in the Blue Mountains increased substantially during 1980. Within months of assuming control the Water Board imposed further restrictions on water use in the mountains including a complete ban on washing vehicles and the use of any hoses and sprinklers unless used to fight bushfires.\footnote{Blue Mountains Gazette, 8 October 1980, pp.1-2, 27.} To overcome the mountain water shortage, in 1981-82 the Water Board established an
emergency scheme to tap the supply from Warragamba Dam. This involved setting up a temporary pumping station at Emu Plains from which water was pumped through a new 60 cm rising main to a reservoir at Mount Riverview. Another temporary pumping station at Mount Riverview then sent water through another new pipeline to a reservoir at Springwood.135

While the temporary scheme was being established the Water Board also commenced work on a permanent solution to the Blue Mountains water problem. This involved the construction of a larger pumping station at Emu Plains to pump water to the Blue Mountains from the Bringelly Road water treatment works near Penrith. A further nine minor pumping stations were also constructed in the Blue Mountains to allow Warragamba water to be sent as far west as Katoomba if needed and remove the sole dependence on the Fish River supply. The new works were completed in late 1983 and with further good rains water restrictions were progressively eased until in March 1985 all remaining restrictions were lifted. In some parts of the Blue Mountains this was the first time in over a decade that residents had been free of water restrictions.136

As well as providing a new supply of water to the Blue Mountains, during the 1980s the Water Board also spent tens of millions of dollars upgrading the local water storage and reticulation system to improve water quality. This included the roofing of over 20 open storage reservoirs in the Blue Mountains

(to prevent pollution from airborne dust, debris and bird droppings), cleaning, flushing and relining old water mains, constructing water filtration plants and introducing fluoridation to all mountain supplies.\(^{107}\)

Given the nature of their historical relationship concerning water, the eventual linking of the water supplies of the mountains and the metropolis was somewhat of an ironic event. For well before their respective supplies were actually joined in the 1980s, the Blue Mountains and Sydney had an enduring, though one-sided connection concerning water. As Sydney grew it constantly needed more fresh water to satisfy its enormous thirst, and the Blue Mountains has always been seen as a fine place to get it.

**Quenching A Giant Thirst**

'I have always thought we ought to get the water from the mountains, beyond the Nepean or the Hawkesbury.' J.H. Atkinson (1867)\(^{110}\)

In its early years, Sydney's water supply was obtained nearby. Firstly from the Tank Stream and later from the Lachlan Swamps (now Centennial Park) via a tunnel known as Busby's Bore. By 1850, Sydney's population was nearing 50,000 and a new source of water was needed. A Board of Inquiry was appointed by the Governor in 1852 to report on the best means of obtaining a supply of 'pure water' for the city of Sydney. Giving evidence to this Inquiry,

the Sydney City Surveyor, Francis Clarke, suggested that for a permanent water supply 'it will be necessary to go to the Blue Mountains'. Clarke proposed that the waters of the Grose River or some of the tributaries of the Nepean 'might be dammed up to a sufficient elevation, and an inexhaustible supply secured by gravitation'. However, a closer supply was preferred and ultimately a scheme was developed to take water from the Botany Swamps which was completed in 1859. The use of Blue Mountains water had also been suggested earlier by P.E. de Strzelecki. In 1845 he proposed using the waters from the Grose and Warragamba Rivers, (as well as the Hawkesbury and Nepean) for irrigation of the County of Cumberland with 'the aid of cheap wooden aqueducts'.

Sydney's population grew substantially in the wake of the Gold Rush and this combined with further droughts meant that by the mid 1860s both the Botany and Lachlan Swamps were no longer sufficient for the city's needs. Several more governmental water inquiries ensued with little effect. In 1867 the situation deteriorated to the point where water restrictions were imposed and the supply cut off completely during the night. Several correspondents to the *Sydney Morning Herald* suggested that a new supply for the city could potentially be obtained from waterways in the Blue Mountains including Wheeney Creek and the Grose River and its tributaries.

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139 'Report from the Board of Inquiry into a Supply of Pure Water to the City of Sydney', Appendix, NSWLCVP, 1852, p.1081, Lloyd, *op. cit.*, pp.24, 34, 128-133.
In response to the crisis, a Royal Commission was appointed in 1867 to inquire into the supply of water to Sydney and its suburbs. Over the following two years the Commission extensively investigated a number of alternative sources of water for Sydney. Those examined in the Blue Mountains region were the Grose River and its tributary Burrbalow Creek, the Colo River and its tributary Wheeny Creek, and the Warragamba River. On the Grose it was suggested that a dam 60 feet (18 metres) high and 700 feet (210 metres) long (with a capacity of 2,700 million gallons or 12,700 million litres) could be constructed just below the junction with Govett's Leap Creek which would feed another smaller dam further downstream. However, the Commission found that despite the 'excellent quality' of the water, the site was 'not well fitted for the construction of a masonry dam' due to the underlying strata, and this along with the estimated cost (between £1,000,000 and £1,400,000) proved 'fatal to the scheme'. At Burrbalow Creek, the Commission considered the building of a 60 foot (18 metres) embankment to enclose upwards of 3,000 million gallons (13,500 million litres). However, both Burrbalow and Wheeney Creeks were ultimately rejected due to their small catchment areas and because the expense of conveying water to Sydney 'would be as great as in the case of the Grose'. The Colo River was also briefly considered but 'the want of altitude' compelled the Commission to set it aside, as to achieve the elevation required to supply Sydney by gravitation the dam had to be located 'a long way into an impracticable country'.

The idea of constructing a large dam on the Warragamba River had first been suggested in 1866 by Thomas Woore, one of the Commission members. His idea was to form a 'great dam' 170 feet (50 metres) high (consisting of a masonry wall core surrounded by well-packed rock and stones) which would be built across the Warragamba just above its junction with the Nepean River.145

The Commission extensively examined the Warragamba proposal but ultimately the rest of the members concluded that Woore's concept was unworkable mainly because the dam required would need to be at least 200 feet (60 metres) high (to allow for gravitation to Sydney and to hold floodwaters) and the cost of the entire scheme would be around £2 million. Commission members were also deeply concerned that the proposed dam would fall during floods unleashing 'an immense body of water' which would 'carry destruction down the valley of the Hawkesbury'. An acrimonious debate then erupted within the Commission as Woore angrily refused to accept the 'wild' and 'prejudiced' criticisms from his fellow Commissioners and their decision not to fund a full survey for his scheme. Disgruntled and unrepentant, Woore eventually submitted a minority report that opposed the official recommendation of the Commission, made in October 1869 for a supply from the upper Nepean River, and instead maintained that the Warragamba scheme was the best future source of water for the 'great city' of Sydney. Woore prophetically stated that to proceed with the Upper Nepean
option would bequeath a 'barren legacy' for future generations as the catchment area was too small to meet the 'enormously increasing demand that will undoubtedly be made on any work for supply'.

The lack of consensus and the return of high rainfall saw the matter of a new water supply for Sydney shelved for several more years. To keep its options open the Government created a reserve in December 1875 covering the watershed of the upper Grose River to provide for a possible future water supply for the city of Sydney. The existence of the water reserve restricted development in the upper Blue Mountains (north of the railway) for many years later.  

After another severe drought in 1876 the Colonial Government decided to seek the advice of an overseas expert, an English engineer, William Clark. Clark re-examined the proposals considered by the Commission including the Blue Mountains options of the Grose and Warragamba Rivers. After visiting the Grose, Clark confirmed the Commission's conclusion that a supply from that source was 'impracticable', especially as over 50 miles (80 kms) of pipeline (exposed to falling rocks) would be necessary. Clark also considered the Warragamba but although noting the 'undoubtedly very great advantages' of the scheme, Clark agreed with the Commission's previous judgement that this

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option was both too risky and too expensive.\textsuperscript{146} Clark further examined a new proposal to make use of Erskine Creek in the lower Blue Mountains, which involved a 50 foot (15 metre) high dam four miles (six kilometres) from its junction with the Nepean which would store up to 60 million gallons (270 million litres).\textsuperscript{147} However, in the end, Clark confirmed the conclusions of the 1869 Royal Commission and he too recommended that water be obtained from the upper Nepean catchment area. The Government accepted the recommendation and construction of the Upper Nepean scheme began in 1880. The new city supply was finally completed in 1888 - the same year that a Board of Water Supply and Sewerage was established in Sydney.

Over the next 20 years both the population and urban area of Sydney expanded substantially. Consequently, the annual consumption of water more than trebled between 1888 and 1908 from over 3,000 to over 9,000 million gallons (13,000 to 40,000 million litres) while the total length of water mains in the city increased from 570 to 2,300 kms. The increasing demand for water was temporarily met by amplifying the supply from the Upper Nepean (as recommended by yet another water Royal Commission in 1902), especially by the construction of the Cataract Dam which was completed in 1907.\textsuperscript{148} However, Sydney's thirst for water was insatiable and providing for the city's future meant that water from the mountains must come sooner or later.

\textsuperscript{148} W.V. Aird, \textit{The Water Supply, Sewerage and Drainage of Sydney}, Sydney, 1961, p.263.
In early 1908 residents and councils throughout the Hawkesbury area resumed agitation for an irrigation and town water supply which led to the formation of the Warragamba Water Conservation and Irrigation Association. In June, at the request of the Minister, a Chief Engineer from the Public Works Department (E.M. de Burgh) compiled a detailed report advocating the use of the Warragamba River as a cheap water supply for the entire County of Cumberland. De Burgh was confident that using modern construction techniques there would now be 'no difficulty in constructing a masonry dam' at least 225 feet (68 metres) high, along with a safe floodwater weir, 'in the gorge of the Warragamba'. His report concluded, 'That the waters of the Warragamba will be impounded ...is, I think, beyond question'.

De Burgh's report sparked renewed interest in both press and Parliament. Preliminary surveys of the site were undertaken and the now resurrected Warragamba scheme was eventually referred to the Parliamentary Standing Committee on Public Works in 1910, as part of a wider inquiry into the amplification and improvement of Sydney's water supply. The Committee made a two day inspection of the Warragamba site and took evidence from several witnesses regarding the Warragamba project (estimated to cost almost £3 million). Water supplies from Erskine and Glenbrook Creeks, and the Grose and Colo Rivers were also suggested to the Committee. Acutely aware that Sydney's growth was inevitable, the Committee recommended to the

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149 E.M. de Burgh, The Warragamba River and the Water Supply of the County of Cumberland, Sydney, 1 June 1908, pp.1-7.
Government that more dams were needed 'on the existing catchment area, or on the Warragamba or Woronora Rivers'.

Over the next few years the Warragamba proposal was extensively discussed and considered by the Government and more detailed surveys undertaken. A visit was made to the site of the proposed dam by the Premier and his Cabinet colleagues in 1914 and in the following the year the Warragamba scheme was specifically referred again to the Parliamentary Standing Committee on Public Works for advice, along with a an alternative scheme to build a dam on the Cordeaux River. No inquiry into the Warragamba actually took place, for it was quickly decided by the Government to proceed with the cheaper option of the Cordeaux Dam, construction of which commenced in 1918 (and completed in 1926) and plans were soon made for a dam on the Avon River. Undaunted, E.M. de Burgh again argued for the necessity of a Warragamba Dam in another exhaustive report he produced in September 1918. De Burgh noted that Sydney's annual water consumption had reached more than 15,000 million gallons (67,000 million litres) after increasing at the rate of 5.3% per annum over the previous decade. To meet future requirements (from 1928 onwards), de Burgh convincingly argued that even after completion of the Cordeaux and Avon dams, further augmentation of the city's water supply

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would still be required. Furthermore, he concluded that 'the Warragamba is the proper and only available source of such increased supply'.

In response to De Burgh's second report, the State Government immediately set up a departmental 'committee of experts' in an attempt to obtain a consensus opinion regarding the future water supply for Sydney. For several years, various compositions of this expert committee repeatedly grappled with the Sydney water issue. While construction of both the Avon Dam (built between 1921 and 1927) and the Nepean Dam (built between 1926 and 1935) were recommended, there was ongoing disagreement amongst the 'experts' over if and when the Warragamba scheme should proceed. In 1924, an alternative proposal was put forward to dam the upper Wollondilly River (instead of the Warragamba) and convey the water through a 26 mile (41 kilometre) tunnel to the Upper Nepean catchment.

In January 1927, after yet more investigations, a new expert committee (appointed by the Water Board in 1926) recommended that the Warragamba scheme should definitely be carried out over a period of ten years at a cost of over £4 million. However, in the meantime interest had arisen in the possibility of supplying Sydney with water from the Snowy River. Official

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153 E.M. De Burgh, 'Report on Sydney Water Supply', 16 September 1918, Department of Public Works, Annual Report 1919, NSWPP, 1919, Vol.4, pp.32-46. De Burgh now proposed that a lower dam (220 feet high) could be built 7 or 8 miles further up the Warragamba gorge - see p.42.


155 The Grose River was also again considered as a possible source of supply for Sydney and the Hawkesbury district, resulting in further surveys of the river during the 1920s. Sydney Morning Herald, 16 February 1924 p.20, 19 March 1929 p.12, Blue Mountain Echo, 3 April 1925 p.3.
approval of the Warragamba proposal was again deferred until the Snowy option was fully investigated. Reluctant to commit to either of the expensive schemes, the Water Board continued to dither over the matter until 1929 when the world plunged into financial depression. During the Depression years, work on the uncompleted Nepean and Woronora Dams was suspended and all thoughts of new dams forgotten.\footnote{Daily Telegraph, 3 March 1927 p.9, Sydney Morning Herald, 14 December 1928}

\textit{Damming the Warragamba}

While a human-caused disaster delayed yet again the use of mountain water for supplying the metropolis, ultimately it was a natural disaster that finally made a dam on the Warragamba a reality. Commencing in 1934, a severe drought struck eastern Australia which was to last for eight years. Sydney's yearly water consumption had now reached over 34,000 million gallons (153,000 million litres) and by late 1936 Sydney's dams had sunk to such a critically low level that in desperation the much maligned 'No Water Board' finally turned to the Warragamba for salvation. In March 1937 the Board began urgent work on an emergency supply from the Warragamba River. The scheme consisted of a 50 feet (15 metre) high weir which impounded around 580 million gallons (2,600 million litres) of water (see Figure 2.5). After excavation of 3000 cubic metres of sandstone, an underground pumping station was built that pumped up to 40 million gallons (180 million litres) per day from the weir through a 48 inch (120 cm) pipeline to Prospect Reservoir, 16 miles (25 kms) away. The emergency scheme was completed in May 1940.
and for the first time water from the Blue Mountains was supplied to Sydney. During the following two years the drought intensified and unrealistic suggestions were made to obtain more emergency supplies from the barely flowing Grose and Colo Rivers, and even the Snowy River. Eventually the rains came in October 1942 but without the supplementary supply of mountain water Sydney may have run out completely.  

Ultimately, Sydney's gain was the Warragamba's loss, as a wild and scenic river was changed forever. Even the dam builders sentimentally noted the inevitable changes wrought to the landscape, with one recalling that on arrival he saw 'a scene of unspoiled beauty' featuring:

'...Wildflowers in profusion; a glimpse of rock wallabies; the Warragamba Gorge disappearing into the blue haze; tall trees which owed their very existence to the inaccessible nature of the area as protecting them from timber getters over the years. Before the din of construction frightened them away, an odd platypus would be seen where the river lapped its banks.'

The success of the emergency scheme and the impact of the prolonged water crisis prompted rapid development of the Warragamba supply. In early 1941 the Water Board announced that construction of a large dam on the Warragamba would begin. This would require the sacrificial flooding of one of the valleys of the Blue Mountains - the Burragarang Valley (now Lake Burragarang). For many years the residents of Burragarang had feared the

p.12, 14 January 1929 p.22.
worst and now that the dam was definite most refused to go quietly. Protest meetings were held and a 'Burrarorang Valley Defence League' was formed to oppose the dam construction that would require the eviction of over 170 families. The League produced a detailed booklet calling for a Royal Commission which argued that around 12,000 acres (4,800 hectares) of the 'wealth producing' valley would be submerged. This would end the valley's production of coal, timber and agricultural goods (estimated at over £250,000 per annum) and destroy viable farms, guesthouses, and a wildlife sanctuary. However, the Board steadfastly maintained that the flooding of the valley was 'unavoidable' as 'the water supply requirements of the growing population of Sydney must take precedence over private farming and commercial interests'.\textsuperscript{159} The \textit{Sydney Morning Herald} agreed, stating that Burrarorang residents had to 'make way in the remorseless path of progress' for Sydney had too much experience of water famines to place their concerns before 'dire necessity'.\textsuperscript{160} Intermittent protests continued during the next decade, however the needs of the metropolis remained paramount.\textsuperscript{161}

Construction of Warragamba Dam began slowly because of wartime restrictions on labour and material. Exploratory drilling confirmed that the original site near the emergency weir was unsuitable due to the presence of a thick band of weak shale deep below the riverbed. Consequently, it was decided to place the dam some 1.2 kms further upstream. With the war over,

\textsuperscript{160} \textit{Sydney Morning Herald}, 4 October 1946 p.2.
construction began in earnest in 1946 with the press observing that the formerly deep, silent canyon now resounded with 'the chatter of pneumatic drills, the roar of machinery, and clatter of concrete mixers as man turns the mute forces of nature to his own use'.

The building of Warragamba Dam was an enormous undertaking and at the time of its construction an impressive engineering achievement. Over 3,000 people worked on the project which was to take another 14 years to complete at a cost of some £35 million. Three million tons of concrete were used to build Warragamba Dam, which measures 350 metres wide and 137 metres high and can store over 450,000 million gallons (2 million megalitres) of water - more than four times the quantity in Sydney Harbour (see Figure 2.6).

To safeguard the catchment of the new dam, the Water Board spent around £800,000 purchasing or resuming all land within two miles of the stored waters and other affected lands which totalled over 37,000 acres (15,000 hectares). All buildings, fences and other structures were demolished and removed prior to the drowning of the valley. Around 17,000 acres (6,880 hectares) of the catchment area was also cleared of vegetation to prevent rotting timber and plant material from discoloring and polluting the water or blocking and damaging the dam outlets and turbines. Ahead of the steadily...

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163 MWSDB, Warragamba Dam: Official Opening, Booklet, Sydney, 14th October 1960, pp.6-14, 21, 27, Sydney Morning Herald, 14 June 1956 p.2. Ironically, work on the dam which was to save Sydney from drought was delayed several times by major floods, particularly in 1952 and 1956.
rising waters, the 220 miles (350 kms) of foreshores were left looking as if 'cleanly shorn by giant shears'.

In front of a large crowd of invited guests, dam workers and their families, Warragamba Dam was officially opened by the State Premier in October 1960, almost a century after Woore first suggested the mountain river supply the metropolis. In his speech the Premier wryly noted that Sydney's water supply had 'come a long way from the Tank Stream'.

However, the completion of Warragamba Dam did not end consideration of the Blue Mountains as a further source of water for Sydney. Even before Warragamba Dam was completed, proposals to dam the Grose and Colo Rivers (or their tributaries) continued to surface, mostly to provide a joint supply to the city and Hawkesbury district. From the late 1950s onwards the Water Board also made plans for additional future sources of water for the burgeoning city. Some of the options considered included dams further upstream on the Wollondilly River or Coxs River, and at least four sites were investigated for placement of dams over 200 feet (60 metres) high. Supplies were also once more considered from the Grose and Colo Rivers or Erskine Creek. Instead, during the 1970s the Board decided that the only practicable new source was the Shoalhaven River. A series of new dams and water

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184 'Burragorang Valley', *Sydney Water Board Journal*, Vol.8, No.3, October 1958, pp.81-90, MWSDB, *Warragamba Dam: Official Opening*, op. cit., p.19. Some of the better timber was sent to sawmills but most was merely stacked and burnt while still green.


infrastructure was progressively developed and linked to the Upper Nepean network.\textsuperscript{187}

Even so, proposals to dam the Blue Mountains streams persisted. For example, in 1978 the NSW Electricity Commission planned a dam on the Colo River to supply a new power station, while two years later the planners of the Penrith Lakes Scheme considered a 55 metre high dam on the Grose River (near Burrarow Creek) as a supplementary source of water for the lakes. Even as late as 1985 the NSW Water Resources Commission was still proposing to build two dams on the Colo River (one 70 metres high, the other 200 metres high).\textsuperscript{188} Yet by 1999, no more dams had eventuated and nearly all the Blue Mountains rivers and creeks were included in National Parks. However, history indicates that regardless of this protection further mountain waterways may one day need to be sacrificed to quench the giant and evergrowing thirst of the neighbouring metropolis.

\textbf{Waste Water}

'\textit{The sanitary condition of the Blue Mountains should at all times be studied...if we wish to keep our good name some provision must be made for the removal of offensive matter}'. Katoomba Times (1890)\textsuperscript{189}


\textsuperscript{189} Katoomba Times, 25 October 1890 p.2.
After its consumption and use by people, mountain water has never merely disappeared but ultimately is excreted and discharged as waste water. Loaded with visible and invisible wastes of all kinds, in the Blue Mountains this impure water has always eventually drained into the local waterways. Since non-nomadic settlement of the Blue Mountains began in the early 19th Century, disposal of waste water (and the pollution frequently caused in the process) has been an ongoing and increasing problem for mountain inhabitants.

Generally, throughout the 1800s the human population in the Blue Mountains was so small and scattered that the disposal of waste water caused only minor and temporary pollution of mountain streams. In all early mountain homes and inns, waste water from kitchens and bathrooms as well as human wastes were simply thrown from the backdoor, buried or drained into the street. These combined wastes (colloquially known as 'slops'), along with wastes from outhouses, stables and animal pens, often seeped into wells and nearby streams steadily contaminating the household water supplies. Furthermore, some of the creeks and streams in the Blue Mountains valleys were undoubtedly polluted with chemical residues from the regular washing or scouring of sheep and fleeces to remove dust, grease and grass by early settlers. Even so, when the Royal Commission into Sydney's water supply tested several Blue Mountains streams in 1867 it found the mountain water pure and of excellent quality. For example, the Grose River was described as

\[\text{\textsuperscript{170}}\text{ Lloyd, \textit{op. cit.}, pp.66-67. As Lloyd has also pointed out, the frequent contamination of wells and local streams helps explain the rapid popularity of iron rainwater tanks in rural Australia.}\]
'unsurpassed' in purity which was 'never likely to be polluted by the accompaniments of human industry'.

However, as permanent settlement of the Blue Mountains grew after the building of the railway, the problems caused by waste water disposal progressively arose. Undoubtedly, localised pollution of streams was a constant feature of the 19th Century coal and shale oil mining activities in the region however this mostly occurred in remote locations. A more obvious and pressing need was to deal with the growing problem of waste and waste water disposal in the mountain towns. This was reinforced by the fact that in the late 19th Century threats to public health from contaminated water were receiving increasing attention in Australia. 'Sanitation' became a popular buzzword as authorities everywhere became keenly aware of the link between pollution caused by waste water and various diseases including typhoid, cholera and dysentery.

The 'Boon' of Sewerage

In the Blue Mountains, which prided itself of being a major health resort and Sydney's 'sanatorium', sanitation quickly became a local obsession. By 1890 mounds of accumulated filth were frequently seen in the yards and back streets of Katoomba which after heavy rain were flushed into the streets or fermented into 'hotbeds of disease'. The Katoomba Times urged mountain

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171 'Sydney Water Supply: Report of the Commission', op. cit., pp.25-30. Burralow Creek, Wheeney Creek and the Colo River also had 'excellent water'.
172 Lloyd, op. cit., p.276.
residents to avoid casting rubbish and sewerage matter on the streets or near their premises. The newspaper also suggested that a 'scavenger' be appointed to undertake a monthly pickup all 'house refuse' and a sewerage system of some kind be adopted for 'as the population increases in number so must the sewerage matter increase in quantity'.  

To deal with the fast rising sanitary problem, after much debate the recently formed Katoomba Council opted to construct a crematory which incinerated sewage collected in pans (known as nightsoil) and other household refuse gathered from local premises (see Chapter Three).

Nevertheless the problem of waste water drainage in Katoomba persisted, particularly from the larger accommodation houses like the Carrington Hotel. In 1891 the Council formed a 'Sewerage Committee' which recommended that a reward of £10 be offered for the best drainage proposal. No suitable suggestions were made so in the following year the Council sought Government funding for a proposal to install drains in a portion of central Katoomba only (centred on Main and Cascade Streets). The designing engineer reported that some parts of the Municipality were in a very unsanitary condition and a system of drainage was 'badly needed' to 'get rid of the house slops' which would endanger public health and cause a great nuisance in the summer heat. The recommended scheme comprised over 5,600 feet (1,700 metres) of stoneware pipe drains laid two feet underground which would convey the sewage downhill from the connected houses into settling tanks with a combined capacity of over 100,000 gallons (450,000 litres). The

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effluent would then be treated and run off through filter beds made up of sand and gravel six feet (1.8 metres) deep.\textsuperscript{174}

The proposal provoked strong opposition from many Katoomba residents and ratepayers who saw the expensive scheme (costing over £1,400) as merely a Council subsidy for the benefit of the few large and wealthy establishments in the town (who were causing most of the pollution). Public meetings were held and the \textit{Katoomba Times} campaigned vigorously against what it called the 'sewerage fad', distributing a petition for submission to the Colonial Secretary opposing Government funding for the 'idiotic proposal'. Ultimately the agitation proved successful as several aldermen reversed their positions in early 1893 and the 'tinpot sewerage scheme' was dropped. The local paper rejoiced at 'the defeat of the movement' maintaining that an expensive drainage system was not required in Katoomba for at least 20 years.\textsuperscript{176}

With the arrival of a new century, along with increasing numbers of tourists, the sewerage issue again bubbled to the surface in Katoomba. Many premises continued to allow their slops and drainage to run into the streets and over vacant land to the annoyance of both residents and visitors alike. In mid 1900 a public meeting on sewerage was held in Katoomba. Although some opposition to the cost of sewerage continued, recent false reports of typhoid in Katoomba had convinced many locals of the merits of a proper scheme and it

\textsuperscript{174} \textit{Katoomba Times}, 4 July 1891 p.2, 18 November 1892 p.2.
\textsuperscript{176} \textit{Katoomba Times}, 4 July 1891 p.2, 16 September 1892 p.2, 24 March 1893 p.2. During the 1890s some efforts were made to improve the sanitary condition of Katoomba through kerb and guttering, expansion of the weekly night soil pan service
was agreed to urge the Council to take up the matter as a necessity. At the request of the Council, later that year the Public Works Department reported on a general gravitation sewerage scheme to cover all of Katoomba.\textsuperscript{177}

However unable to obtain enough support for the complete scheme, the Council asked the Department to recommend a smaller alternative. In July 1901 the Department proposed two new schemes to sewer the central business portion of the town centred on Katoomba Street. One involved drainage southwards to two septic tanks which after treatment discharged effluent into Katoomba and Leura Falls. The other scheme involved drainage to a single septic tank situated on the north side of the railway from which the effluent would be discharged into Katoomba Creek. The northern proposal was preferred because it was cheaper and discharged to a watershed away from the scenic attractions of Katoomba and Leura Falls where there may be 'sentimental objections' to a scheme despite the 'harmlessness of the effluent'. The new proposals were discussed at a public meeting in August but legal uncertainties, the cost and the lack of a permanent water supply again stalled any firm action on sewerage.\textsuperscript{177}

By 1903, the streets in the town centre of Katoomba stank so badly that the Council urgently needed some sort of temporary drainage for the worst affected area. A hasty decision was taken in May to proceed with a scaled and regular street cleansing with chloride of lime - \textit{The Mountaineer}, 8 March 1895 p.2.

down version of the northern scheme costing just £300. However the plan to
divert sewage 'away from the natural watershed' and across the railway line
caused immediate outrage amongst residents of North Katoomba, who
objected to the 'offensive fluid' and 'nuisance' being dumped on their locality.
Protest letters and a petition signed by over 100 ratepayers were presented to
the Council and concerned residents packed the next municipal meeting.
Although unrepentant at first, eventually the Council bowed to the mounting
pressure and in August put the sewerage proposal to a referendum of
ratepayers where it was soundly defeated.178

Katoomba's odorous waste water problem lingered on and in 1905 the Council
established a small temporary sewerage scheme which drained the central
part of the town (east of Park Street) into a sewerage pit at the corner of Vale
and William Streets. The Mountaineer expressed concern that Leura Falls
would become contaminated and warned that if visitors knew or imagined
that 'the waters of Leura Falls or any of the Mountain creeks are
contaminated' then 'disaster is sure to follow'.179

The provision of a permanent water supply in Katoomba in 1907 at last
permitted the rapid establishment of a comprehensive sewerage system. With
the arrival of reticulated water, use of the liquid element escalated and this
required improved drainage to dispose of the excess waste water. Plans to
sewer the entire municipality south of the railway were quickly drawn up by

177 The Mountaineer, 2 August 1901 p.6, 9 August 1901 p.4.
May 1903 p.3, 7 August 1903 p.3.
the Department of Public Works and readily agreed to by the Council. Work commenced on the first section of the sewerage scheme in early 1909 and by the end of 1910 central and east Katoomba were connected. At the request of the Council, work was continued over the following years to extend the sewerage system to Leura (completed in 1912) and west Katoomba (completed in 1915). At a cost of over £50,000, the completed scheme provided sufficient capacity for a population of 4,800. It comprised a network of earthenware sewer pipes laid six feet deep which gravitated the sewage to four concrete septic tanks. Two were located in the area above Katoomba Falls (now Katoomba Park) and the other two in the gully above Leura Falls (now Leura Park). After biological treatment in the tanks to break down the solid organic matter, the effluent was carried over the cliff-edge in two cast-iron pipes to filter beds in the Jamison Valley (see Figure 2.7). At the filter beds the effluent was released by sprinklers and further treated by exposure to the natural cleansing agencies of sunlight, fresh air and soil.

Initially the new system worked well but the provision of reticulated water and sewerage encouraged a rapid growth in housing development in Katoomba and Leura. By 1913 the resident population had reached around 8,500 and the sewerage system was overloaded by the increased waste water created every time the chain was pulled. In the following year the Department recommended spending £19,500 to add additional septic tanks and enlarged

176 The Mountaineer, 27 October 1905 p.3.
filters to provide for 15,000 people. However, pollution caused by the existing system had by now convinced the Council that the septic tanks were a 'public nuisance' and should be re-positioned below the cliffs in the Jamison Valley. Even so, the prohibitive cost and the intervention of the First World War meant that little improvement took place between 1914 and 1918.  

As more and more houses were connected to the already over-stretched system the situation went from bad to worse. The overloading of the septic tanks meant that the usual treatment by bacteria did not occur, resulting in raw sewage flowing down and clogging the mains and filters with sludge. The blockages caused foul smelling gas and fluids to leak from the pipes and overflow from ventilation shafts. The subsequent stench was found 'very objectionable' and became a nuisance to tourists. For example, in 1916 a regular mountain visitor complained in disgust to the local paper that Leura Cascades was polluted both by coal tar from the gas works and the overflow of 'putrid matter from the septic tank' in the vicinity, which caused visitors 'to hasten past while holding their nostrils'.

After considering several alternatives, in 1919 a new proposal was formulated to discontinue the use of the ridgetop septic tanks and instead construct new treatment works in the valley below well away from any settlement and the regular haunts of tourists. The proposed amplification scheme comprised a

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new treatment works capable of treating sewage from 30,000 people, along with two new sewer mains with a combined capacity for 100,000 people. The treatment works would consist of three large septic tanks and percolation filters (each 364 by 132 feet or 110 by 40 metres) situated in the Jamison Valley half a mile east of the Three Sisters. The new sewer mains (each over 6,000 feet or 1,800 metres long) would convey the sewage in a combination of tunnels, trenches and concrete and cast-iron pipes from the existing reticulation network to the new works (see Figure 2.7).\textsuperscript{184}

The proposed sewerage scheme was quickly approved by Katoomba Council but due to the high cost involved (£78,000) in October 1921 the Minister referred it to the Parliamentary Standing Committee on Public Works for appraisal. As with its water supply investigation only months before, the Parliamentary Committee visited Katoomba in November to inspect the existing sewerage works and take evidence from locals including the Mayor, Town Clerk and aldermen. The Committee quickly found 'ample proof' of the inadequacy of the existing system, agreeing that the septic tanks had become merely chambers of crude sewage and were 'a public nuisance and a danger'. This was hardly surprising considering around 1,150 premises were now connected to the sewers in Katoomba and Leura (containing a total of 1,600 water closets), although 600 houses (mostly on the north side of the railway) still used a pan service for nightsoil and many others had their own septic tanks. With no feasible alternative available, in December 1921 the

\textsuperscript{184} Ibid., pp.949-953, 957-960, 964, Blue Mountain Echo, 27 October 1916 p.6.
Parliamentary Committee recommended adoption of the sewerage amplification scheme.\textsuperscript{186}

Although an enabling Bill for the scheme was prepared in 1922, government approval was not forthcoming for over a decade - apparently due to financial instability within the Council and competing priorities. But eventually in 1931 the Katoomba sewerage augmentation scheme was dusted off, revised and approved. Work commenced in 1933 utilising unemployment relief funds and was completed in November 1935 when the South Katoomba augmentation works were officially opened by the Minister for Public Works and Local Government (at a cost of over £100,000).\textsuperscript{187} By the late 1930s, sewerage had also become a necessity on the other side of the railway line and in 1938 an additional gravitation sewerage scheme was constructed for North Katoomba. This included new reticulated sewers connected to a separate treatment works (with a capacity for 3,000 people) which discharged effluent into Katoomba Creek, a tributary of the Grose River.\textsuperscript{187}

\textsuperscript{186} Blue Mountain Echo, 24 October 1919 p.6, Parliamentary Standing Committee Report, 1921, \textit{op. cit.}, pp.941-942, 947-948. The scheme also included a further three miles of sewer reticulation in the municipality.

\textsuperscript{187} NSWPD, Session 1921, Vol.84, pp.1180-1181, Blue Mountain Echo, 14 November 1919 p.7, 11 November 1921 p.1, Parliamentary Standing Committee Report, 1921, \textit{op. cit.}, pp.944-945, 954, 958. For a detailed description of the operation of the nightsoil pan service in Katoomba (which is typical of that used in other Blue Mountains towns prior to sewerage installation), see the Blue Mountain Echo, 26 February 1926 p.1.


Meanwhile during the 1930s sewerage also arrived in Blackheath. Like other smaller centres in the Blue Mountains, previously Blackheath had relied on natural drainage as well as a system of private septic tanks and a pan service for Nightsoil collection. In 1930 the Department of Public Works undertook a preliminary investigation of a sewerage scheme for the town east of the railway. Originally it was proposed for the chlorinated effluent to be discharged into Horseshoe Falls Creek but as this drained into the tourist area around Govett’s Leap the outfall location was changed. More detailed surveys followed in 1934 and with Council approval construction commenced during 1937 and was completed a year later. The finalised Blackheath scheme included another new treatment works (with a capacity for 5,000 people) which discharged its effluent northwards into Hat Hill Creek, another tributary of the Grose River.\textsuperscript{168}

Between 1938 and 1948 an increasing number of mountain homes were connected to sewerage. In Blackheath sewerage connections grew from 450 to 750, while those in South Katoomba rose from 1,770 to 2,098 and in North Katoomba from 160 to 316. Soon after its creation in 1945, the Blue Mountains County Council investigated other potential locations for sewerage in the mountain towns. A preliminary survey noted that the scattered population and peculiar topography of the ridgetop urban areas made further sewerage extensions expensive and difficult. This was because each town was effectively divided in two by the slope of the land which meant either

construction of separate sewerage systems on either side of the railway (as at Katoomba) or extensive tunnelling to transfer sewage to just one side for treatment and discharge. The review concluded that neither Mount Victoria, Medlow Bath or Bullaburra warranted sewerage at that time but recommended detailed surveys be carried out for Springwood, Wentworth Falls and Lawson. As urban development was most pronounced at Springwood, it was nominated as the top priority for future sewerage installation.¹⁹⁸

Plans were drawn up during the 1950s to sewer Springwood, Lawson and Wentworth Falls but nothing eventuated until 1957 when work on sewerage Springwood at last commenced. Construction lasted until 1961 when Springwood's reticulation was complete and then continued for another year to extend the sewers to Faulconbridge. The treatment works comprised a conventional trickling filter plant (with a capacity for 4,000 people) which discharged the effluent into Fitzgerald Creek (which drains into the Nepean River).¹⁹⁹ Between 1961 and 1965 a combined sewerage scheme was also constructed to service Lawson, Bullaburra and Hazelbrook. Over 30 miles of reticulated sewer mains were laid down and a new treatment plant (similar to Springwood) built at Hazelbrook with a capacity for 5,000 people. Effluent

from this plant was discharged northwards into Hazelbrook Creek, a tributary of the Grose River.\textsuperscript{191}

During the 1960s the policy of the Blue Mountains City Council was to press on with the extension of sewerage to all areas where it was possible to utilise gravitational schemes. The need for more sewerage extensions was clearly evident as by the mid 1960s only about 40\% of the houses in the Blue Mountains with a permanent water supply were connected to the sewers and therefore had adequate means to dispose of their waste water. Although by 1968 the total number of seweried properties in the Blue Mountains exceeded 6,500, over 2,300 more mountain premises still relied on the nightsoil pan service, most of these located in the lower Blue Mountains. Many other properties also used their own septic tanks.\textsuperscript{192}

Eventually persistent demands for more mountain sewerage prompted subsidies from both State and Federal Governments and the decade between 1969 and 1979 saw a proliferation of new sewerage systems in the Blue Mountains. Thousands more homes were progressively connected to a maze of new interconnecting sewer pipes supported by around 80 pumping stations. To deal with the extra waste water, six new sewerage treatment plants of varying sizes were also constructed - Wentworth Falls in 1969 (servicing Wentworth Falls and east Leura), Mount Victoria in 1970, Mount Riverview in

1973, Glenbrook in 1975 (servicing Glenbrook, Blaxland, Lapstone and Warrimoo), North Springwood in 1976 and Valley Heights in 1977. By the end of the decade the area from Mount Victoria to Lapstone was served by 11 separate sewerage systems which in total discharged some 5,000 megalitres of effluent per year into local waterways (see Appendix 3 for additional details of the sewerage systems).\footnote{For more detailed descriptions of each of the Blue Mountains sewerage treatment plants see, R.W.T. Chong, 'Blue Mountains City Council Sewage Treatment Works -}

**Fouling the Water**

The widespread provision of sewerage for waste water disposal, along with an abundant water supply, ultimately came at a cost to the natural environment of the Blue Mountains. During the 20th Century water quality declined sharply as the waste water discharged by a growing residential population steadily found its way into mountain streams. The pollution originated from three main sources - the sewage treatment plants, individual septic tanks and stormwater run-off.

Although the arrival of sewerage in the more populous parts of the Blue Mountains was generally seen as a boon for sanitation, ultimately the sewage treatment plants became a significant source of water pollution in the region. This was because at best they only ever provided very basic treatment of sewage. The process involved the removal of large material by screening and

the breakdown of organic solid matter in sedimentation tanks. The resultant sludge was then removed from the tanks for disposal on land while the liquid effluent flowed to filters for biological treatment. The filters consisted of packed beds of stones over which the effluent was distributed. As it trickled downwards, the liquid sewage was converted by the natural action of various micro-organisms and then drained away through the soil into local waterways. In theory, the final end product was meant to be mostly harmless but more often than not the treatment was incomplete due to overloading of the system or various defects such as leaky pipes. Furthermore after heavy rain, large quantities of stormwater usually entered the sewerage networks (through cracks and illegal connections) severely overloading the systems and causing the breakdown of pumping stations. To prevent the resultant pressure from bursting the pipes or forcing raw untreated sewage back out of toilets, at various parts in the systems sewer overflow points released the excess waste water into unoccupied land. The inevitable result was that either raw sewage or incompletely treated effluent was repeatedly discharged into Blue Mountains creeks.

As with the treatment plants, the numerous individual septic tanks in the Blue Mountains were also prone to leaks, blockages and wet weather overflows, causing the discharge of raw sewage or inadequately treated effluent into the nearby vicinity. Intermingled with the discharges from sewage

treatment plants and septic tanks was the diffuse pollution caused by
stormwater run-off from the mountain settlements. As elsewhere, increasing
urbanisation of the Blue Mountains has progressively replaced the natural
porous ground surface with hard, impervious surfaces, such as roads, paths
and buildings. Instead of absorbing rainfall, these artificial surfaces deflect it
into gutters and drains permitting much larger and faster volumes of water to
run-off into local waterways. This increased run-off causes erosion and carries
with it a variety of debris, litter, sediment and other polluting substances.\textsuperscript{165}

For decades the combination of waste water discharges from treatment plants,
septic tanks and stormwater run-off fed large quantities of various pollutants
into the once pure streams of the Blue Mountains. These included high
concentrations of faecal bacteria, excess salts and nutrients (especially
phosphorus and nitrogen), oil, grease, silt, chemicals, detergents and
household garbage and litter. High levels of ammonia, aluminium, copper and
zinc were often also present downstream of sewage treatment plants. The
effect of all this pollution was to gradually render most of the mountain
streams downstream of settlements unfit to drink and make some a serious
health hazard. Some of the environmental impacts of the pollution (which
often extended for many kilometres downstream) included odours, turbidity,
discoloration and foaming of the water caused by the increased water flows
and sediment loads. Excessive nutrients also led to changes in the abundance
of some aquatic species (such as small flies and beetles), the spread of

introduced weeds, and excessive growth of algae and the depletion of dissolved oxygen (a process known as eutrophication).\textsuperscript{186} The inevitable pollution of the Blue Mountains waterways was actually foreseen as early as the 1920s, when the \textit{Blue Mountains Echo} predicted that the Grose River 'must become polluted' due to the inflow of 'street drainage' and advent of the 'boon of sewerage' in each of the mountain towns.\textsuperscript{197} In fact, some local streams were already significantly degraded not long after the turn of the century. For example, by 1907 the Lett River was reportedly so polluted by the 'discharge of refuse from an establishment on its banks' that fish could not live in it.\textsuperscript{188}

The pollution became more noticeable by the 1950s. For instance, in 1953 disgusted bushwalkers reported that Kedumba Creek was so polluted by the South Katoomba sewage treatment plant, that the water was vile smelling and discoloured for a distance of ten miles down to its confluence with Coxs River.\textsuperscript{189} Similar complaints continued through the 1960s. For example, in 1969 a bushwalker from Sydney complained to the \textit{Sydney Morning Herald} that their party experienced 'violent stomach trouble' after hiking near


\textsuperscript{187} \textit{Blue Mountain Echo}, 3 April 1925 p.3, 2 November 1928 p.4.

\textsuperscript{188} Board of Fisheries Annual Report 1907, NSWPP, 1908, Vol.2, p.19, \textit{Sydney Morning Herald}, 21 March 1907 p.7. The 'establishment' concerned was most likely a shale mine.
Blackheath (presumably in the Grose Valley). The writer claimed that this was not a rare occurrence and suggested that enjoyment of the mountain scenery would soon be rendered impossible by the danger of being poisoned by the 'foul water'. The complaint drew a defensive 'damage control' response from the Director of the Blue Mountains Tourist Centre who claimed that 'mountain water is among the world's best and purest'. He patronisingly suggested that 'most people are upset by a change of water from one district to another' and advised bushwalkers to boil their water or obtain it from a 'spring gushing out of the rocks'.

However, as the 1970s progressed urban development continued unabated and further evidence of water pollution in the Blue Mountains emerged. In 1977 the State Pollution Control Commission carried out a cursory survey of the Grose River and found that during wet weather the water was contaminated by silt and faecal bacteria from the run-off from nearby mountain towns. But based on just four samples taken over two days, the study also concluded that during dry weather the water quality was 'excellent' for recreation and did not affect aquatic life. Furthermore, all that was required to make the water drinkable was to boil it or treat it with chlorine tablets.

Despite such official assurances, many Mountain residents continued to report pollution problems. For example, those in unsewered areas often complained of the stench and excessive ground dampness caused by septic tank overflows. In addition, according to Smith, the Valley of the Waters Creek became undrinkable and 'noticeably polluted' in the period between 1974 and 1980, largely due to run-off from spreading housing estates upstream. Smith also documented pollution of Jamison Creek in 1979 by raw sewage overflowing from sewer pipes and septic tanks which was later confirmed by the Council.  

A study by Harris also found that the upper reaches of Blue Gum Swamp Creek near Winmalee was contaminated with faecal bacteria, ammonia and foam caused by street run-off and septic tank effluent. By the late 1970s signs had been erected at Wentworth Falls Lake banning swimming due to bacterial pollution, while a study of Glenbrook Lagoon found that although overall little pollution was observed, the water was not safe for drinking due to sewage contamination.

To deal with the water pollution problem in the Blue Mountains required major expenditure, particularly on upgrading most of the 11 sewerage systems, fixing leaks and faults, and extending sewerage reticulation to unsewered areas to reduce the number of septic tanks. Such expenditure was well beyond the resources of the Blue Mountains City Council and the

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Inability of the Council to grapple with the problem was a significant factor in the State Government's decision to transfer responsibility for mountain sewerage to the Sydney Water Board.

When the Water Board took control of Blue Mountains sewerage in 1980 it found that it inherited 'an ageing sewerage system...much of which was in need of renewal and amplification'. Although around 46,000 mountain residents were now connected to sewerage, many sewers needed repairs and the effluent treatment from most plants was sub-standard and causing severe pollution of receiving streams. Many urban areas also remained unsewered (containing some 14,000 residents dependent on septic tanks) and a backlog of urgent sewerage works had developed. Between 1980-1988 the Board spent over $28 million on upgrades, extensions and new sewerage works (including a new treatment plant at Winmalee) to address the most urgent problems notably raw sewage overflows.204

However, a longterm solution to the waste water problem in the Blue Mountains was also needed and in 1984 the Board commenced a major investigation of the issue. Engineering studies were undertaken to assess the status of existing sewerage facilities and develop options for overcoming operational deficiencies and meeting future demand. A sampling program was also carried out over several years to determine the water quality and environmental condition of the 11 mountain streams receiving sewage

effluent. These studies found that in total some 90 kms of receiving streams were affected by sewage effluent. In most cases, full assimilation of the effluent did not occur until approximately 10 kms downstream of the discharge point.\textsuperscript{206}

Such results were hardly news to most mountain residents, who during the 1980s increasingly worried over the impact of water pollution on tourism. In 1982 local Alderman John Dundas stated that every river and creek in the area was polluted, including major mountain attractions like Wentworth Falls. He also said that there was 'nowhere in the mountains now where campers or bushwalkers can go without taking their own water'. Furthermore, according to the National Parks and Wildlife Service by 1988 only 45\% of the Blue Mountains National Park comprised 'pristine catchments' with drinkable water.\textsuperscript{207}

On completion of its investigations, in 1987 a new 'effluent management strategy' for the Blue Mountains was produced by the Water Board. This proposed the upgrading of most mountain sewage treatment plants from secondary to tertiary treatment, as well as new facilities to disinfect the effluent and in some cases to remove nutrients. In addition, some plants would be decommissioned with their flow diverted to Winmalee, while others would be enlarged to cope with increased demand. Further works were also

planned to upgrade, renew, amplify and extend the sewerage pipelines and pumping stations throughout the area. The total cost of the mountain sewerage strategy was $125 million to be spread over 20-25 years. (Further details of the strategy are provided in Table 3).\(^{207}\)

<table>
<thead>
<tr>
<th>Proposed Works</th>
<th>Details</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upgrading of sewage treatment plants</td>
<td>1) Tertiary treatment at Hazelbrook, Wentworth Falls, Blackheath, South and North Katoomba plants.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2) Nutrient removal facilities at Winmalee, Glenbrook and Mount Riverview plants.</td>
<td>$26.5 million</td>
</tr>
<tr>
<td></td>
<td>3) Disinfection of effluent and operational upgrades at all plants.</td>
<td></td>
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<td></td>
<td>4) Decommissioning of Springwood, North Springwood and Valley Heights plants.</td>
<td></td>
</tr>
<tr>
<td>Amplification of sewage treatment plants</td>
<td>Hazelbrook, North Katoomba, Mount Victoria, Blackheath and Winmalee.</td>
<td>$53.5 million</td>
</tr>
<tr>
<td>Upgrading and amplification of sewerage systems</td>
<td>Sewer extensions and renewal of defective items in all areas.</td>
<td>$45 million</td>
</tr>
<tr>
<td><strong>Total cost</strong> (over period from 1987 to 2010)</td>
<td></td>
<td><strong>$125 million</strong></td>
</tr>
</tbody>
</table>


The Board approved the strategy after a series of meetings and consultations were held to gather community feedback. Works then commenced to extend sewerage to hundreds more properties in Winmalee and Springwood, and

after diversion of their flows to the Winmalee treatment plant the two Springwood plants were closed during 1988-89.\textsuperscript{208}

It soon became apparent that diverting mountain sewage downhill to Winmalee was the most cost effective and environmentally beneficial means of dealing with the Blue Mountains water pollution problem. So in May 1989 the State Government announced that the Water Board had revised its strategy. Plans to upgrade most of the Blue Mountains sewage treatment plants were abandoned and instead the Board constructed a 29 kilometre long tunnel from Katoomba to Faulconbridge (at a cost of $83 million) to divert most of the mountain effluent to Winmalee for treatment. This enormous three metre wide sewer main allowed the successive closing down of the sewage treatment plants at Hazelbrook, Valley Heights, Wentworth Falls, North and South Katoomba by the late 1990s. To cope with the increased load of waste water, the Winmalee treatment plant was upgraded in stages to a total capacity for 60,000 people, with the installation of advanced treatment facilities including nutrient removal to prevent downstream eutrophication in the Nepean River.\textsuperscript{208} Additional works have also been carried out by the Board to decommission the sewage treatment plants at Glenbrook and Mount Riverview (with sewage diverted to a larger treatment plant at Penrith), while plans exist to close the plants at Blackheath and Mount Victoria in the early 2000s.\textsuperscript{210}

\textsuperscript{208} Water Board Annual Report 1988, NSWPP, 1988, p.35.
\textsuperscript{210} Another option being considered is to upgrade both the Blackheath and Mount Victoria treatment plants. An EIS has been produced but the issue remains unresolved.
By early in the 21st Century virtually all the urban areas of the Blue Mountains will be sewered. Furthermore, the combined sewage produced by nearly all the mountain towns will flow downhill to Winmalee or Penrith, where after complex treatment the waste water will eventually be released into the Nepean River. The construction of the giant mountain drain, along with sewerage extensions to thousands more properties and the decommissioning of almost all the sewage treatment plants, has already eliminated the vast majority of sewage effluent discharges from the mountain towns. This has significantly improved the water quality of many Blue Mountains streams during the 1990s. However, the mountain water in most streams will never again be pure enough to drink. For after every storm, the streams still inevitably receive the contaminated run-off of waste water from the ever-growing towns now sprawled across the central ridge of the Blue Mountains.

**Admiring The Water**

'Wherever one turns there is water - leaping, splashing, dashing, foaming, eddying, swirling - it careers down rocky beds, hurls itself over cliffs, makes a sober passage among mosses and ferns, and otherwise disports itself as only the clear, limpid, saltless Blue Mountains streamlets can'. Blue Mountains Encyclopedia (1926-27)

In the history of the Blue Mountains, water has maintained a significance which surges well beyond its consumption and disposal. Water too has been

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highly important to both recreation and tourism in the mountains, supplying a venue for relaxation as well as providing many of the main scenic attractions of the region.

Waterfalls were the very first tourist attraction in the Blue Mountains. The sight of water tumbling over cliffs has always provided the most spectacular 'water views' admired by visitors to the Blue Mountains. As Low has said, there is something timeless about the flow of water which has appealed deeply to generations of mountain visitors and residents. Governor Macquarie's party were seemingly the first non-Aboriginal people to admire a Blue Mountain waterfall when in 1815 they discovered and viewed Wentworth Falls, which Macquarie named 'Campbell's Cataract'. Macquarie wrote of the 'awful grandeur' of the thousand foot high waterfall, while his companion Henry Antill noted that despite the great height of the falls the water flowing over it was 'very inconsiderable'. Governor Thomas Brisbane was also reportedly 'highly delighted with the sight of this grand and terrific cascade' which he visited in 1825. The *Sydney Gazette* advised 'intelligent curioso' to take a charming 27 mile ride from Emu Plains to see the 'waters run with astonishing grandeur down a tremendous precipice', where the 'wind scatters them to an immense distance' and all the colours of the rainbow are 'engagingly exhibited'.

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While surveying in the mountains in June 1831, William Govett discovered another spectacular water view. Near Blackheath, Govett found a point where a creek fell abruptly into the Grose Valley and there was 'a grand view of two cascades'. The place soon became known as Govett's Leap, and the discoverer later boasted proudly that the entire fall of the water (which he estimated at some 1200 feet) gave 'this cascade a grandeur worthy of notice'. Only a year later both Wentworth Falls and Govett's Leap were being mentioned as places for travellers to visit in one of the earliest Australian guidebooks. In the *New South Wales and General Post Office Directory* of 1832 it stated that a short distance to the south of the Weatherboard Hut there was 'a fine stream which forms a cataract' which was 'well worth the traveller's attention' while a mile or two from Blackheath there was 'another fine cataract'.

By the mid 1830s visits to the waterfalls at Wentworth Falls and Govett's Leap were becoming a regular event. Especially Wentworth Falls, which as Govett wrote in a magazine article in 1836, was visited 'by almost every traveller that crosses these mountains'. One of these was Louisa Meredith, who in 1839 specifically 'set forth on foot to visit a waterfall' (Wentworth Falls) where she observed the 'bright waters of the mountain stream' pour over the rocks of a 'tremendous precipice' in 'one smooth, glassy, unbroken torrent'. Another, and perhaps the most famous, of these mountain travellers was Charles Darwin who journeyed over the Blue Mountains in 1836 visiting both Wentworth Falls

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and Govett’s Leap. However, Darwin was far more impressed with the 'extremely magnificent' views and 'stupendous character' of the 'immense' gulfs (and contemplating their geological origins), than the waterfalls formed by the 'little' streams.\textsuperscript{218}

The influx of visitors to the Blue Mountains after the completion of the railway were increasingly drawn to the region's scenic wonders, especially its 'grand waterfalls'. As a colonial showpiece, they were regularly visited by official visitors, including Prince Alfred in 1868. For the Prince's visit a road was even constructed from the railway station to near Wentworth Falls so that he could obtain a royal view of the falls from the lookout named in his honour.\textsuperscript{219} Visitor accounts varied on which was the most beautiful and impressive - Wentworth Falls or Govett's Leap, while the sheer majesty of the sunlit waterfalls frequently inspired such poetic descriptions of them as a 'waving veil of silver lace' or an 'incessant shower of silver coins melting into rain'.\textsuperscript{220} Lang's 1875 description of Wentworth Falls even depicted the falling water with its own emotions:

'On gaining the edge of the precipice, the waters of the rivulet seem to shrink instinctively from the frightful leap to which they have been conducted in their course down the valley; each individual drop appearing endowed with a separate volition, and seeming to shift for itself; and the


whole mass of fluid resolving itself into what appears like innumerable particles of frozen snow'.

The growing popularity of the waterfalls led to many of the best being placed in reserves for 'public recreation' during the 1870s. Again both Wentworth Falls and Govett’s Leap were the first to receive attention, with reserves covering the Falls at both locations being gazetted in January 1870. Two more reserves were established near Lawson in 1876 to protect eight unnamed waterfalls situated both north and south of the railway station. In recommending the creation of the Lawson reserves in 1876, Surveyor Deering emphasised the presence of the eight waterfalls noting that they varied in depth from 30 to 120 feet and were 'exceedingly beautiful and picturesque' but not as well known 'as they deserve to be' and therefore 'seldom visited'.

The scenic significance of waterfalls was further highlighted by the fact that one of the earliest conservation controversies in the Blue Mountains concerned Katoomba Falls - a curious omission from Deering's reserve recommendations. A dispute arose in 1880 when the Falls and surrounding land (described as a 'gem' of the mountains) were granted to a private individual (Edward Neale) instead of being placed in a reserve for public enjoyment and recreation. Although the land around the Falls was later resumed and gazetted as a public reserve, not everyone was enamoured with the charms of the mountain scenery, with one member of Parliament

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221 Lang, op. cit., p.205.
222 Now known as Fairy Falls, St. Michael’s Falls, Frederica Falls, Adelina Falls, Cataract Falls, Junction Falls, Federal Falls and Leslie Falls.
223 The Echo, 7 October 1876, in Deas-Thompson Papers, Vol.4, ML, p.894.
responding that 'he would not give a pound-note for the whole of the Blue Mountains'.

Such views were a minority however, and throughout the late 19th Century growing numbers of tourists arrived in the Blue Mountains intent on a visit to the region's famous water views. Many were clearly influenced by the numerous tourist guidebooks that appeared complete with detailed and highly embellished descriptions of the stupendous mountain scenery, particularly the waterfalls. One of the earliest was the Railway Guide of New South Wales (first published in 1879) which encouraged 'adventurous' tourists to visit the numerous waterfalls near Lawson, the 'far famed Waterfall of the Weatherboard' and the cascades of Govett's Leap. Visitors were repeatedly invited to seek out those places where 'the clear cold waters of a mountain stream leap headlong into an abyss'. To entice the railway excursionists, the Guide contained illustrations and numerous elaborate descriptions of the mountain waterfalls, including three detailed accounts of Govett's Leap. One referred to the snow-like 'descending mass of water' which swayed to and fro in the wind like the 'veil of a bride' embraced by a rainbow. The vast height, contrast of colour and undulating motion was said to impart 'a very singular and most charming effect'.

Blue Mountains guidebooks proliferated through the 1880s and 1890s and glowing references to waterfalls (along with illustrations) remained a constant

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feature, sometimes blatantly plagiarised from earlier publications. The now 'tourist Meccas' of Wentworth Falls and Govett's Leap continued to receive much of the attention. However increasingly more and more mountain towns were portrayed as having waterfalls within easy walking distance (including Hazelbrook, Lawson, Katoomba and Leura). By now, the aesthetic appeal of mountain water had spread well beyond just the 'orchestras' of falling water to other water attractions, such as babbling brooks, crystal streams, mirror-like pools and moist dripping grottoes. This is clearly demonstrated by the water related names bestowed on many of the mountain scenic spots, including Meeting of the Waters, Weeping Rock, Valley of the Waters and Water Nymph's Dell. Increasingly, networks of walking tracks were established to provide access to the water attractions and Burke has suggested that the opening of tracks along the valley floors also fortuitously led to the discovery of a series of new picturesque waterfalls, which were soon added to the list of 'must see' mountain water views.

As scenic emblems for the region, the water views of the Blue Mountains continued to attract more and more admirers during the 20th Century. As noted by the Blue Mountain Echo, the waterfalls remained one of the most enticing lures for 'those in search of aesthetic pleasure'. Waterfalls and other water related scenery became a popular subject for photography in the Blue

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Mountains and consequently appeared on many mountain postcards and in various promotional literature. Although by now competing with many new non-natural attractions, water views also still featured prominently in Blue Mountain tourist guides. A typical example was the *Official Tourist Guide to Katoomba and Leura*, published by the local Council in 1912. Various waterfalls, cascades and pools were mentioned as sights worth visiting and the Guide was illustrated throughout with numerous photos of 'typical mountain cascades and waterfalls' - as one caption read (see Figure 2.8). In the mid 1920s the *Blue Mountains Encyclopedia* listed no less than 18 waterfalls as scenic spots between Hazelbrook and Mount Victoria. It further remarked that the chief glory of Wentworth Falls was its 'profusion of water' and the town had won fame 'for the beauties of its watercourse and waterfalls'. The Valley of the Waters was also described as 'a veritable maze of creeks, cascades, miniature falls, rushing burns, and other forms of restless water activity', the tumultuous cadence of which 'make music of a timbre almost divine'.

In addition to its visual appeal, the water of the Blue Mountains was also greatly admired for its purity and supposed health-giving properties, particularly in the 19th Century. Early visitors were everywhere encouraged to drink from the fresh mountain springs and various water receptacles were

provided for bushwalkers. Mountain water was also seen as good enough to
bottle. In 1887 mineral waters 'of remarkable health-giving properties' were
exploited by a Sydney firm that set up premises in both Katoomba and
Blackheath to manufacture cordial and aerated water. An advertisement
claimed that these were made from 'the mountain mineral waters so famed for
its health-giving properties'. By 1891, a well had been sunk and tanks and
pumps erected at Katoomba, and the firm was reportedly 'almost daily
sending the water to the Metropolis'.

Cordial and aerated water continued to be manufactured at Katoomba during
the early 20th Century. An advertisement in 1903 stated that everything
produced was made with 'the very best of the renowned Blue Mountain Spring
Water', the 'unusual purity' of which had been proved by Government
analysis. Belief in the health-giving properties of mountain water persisted
into the 1920s, with the Blue Mountain Echo trumpeting that it was the 'best
water on earth'. However, inevitably the former healthy reputation of
mountain water was steadily destroyed by the pollution which accompanied
the expansion of settlement and the installation of sewerage. As discussed in
the previous section, during the 20th Century the water in the streams of the
Blue Mountains became increasingly assailed rather than acclaimed.

\[201\] The Tourists' Guide to the Blue Mountains, Penrith, 1887, p.17, The Blue Mountain
(ed.). Guide to the Health Resorts in Australia, Tasmania, and New Zealand, Sydney,
\[202\] A Mountain Souvenir of the Blue Mountains, NSW, Australia, Sydney, 1903, n.p. The
water was pumped from a 'splendid well' 170 feet deep.
Despite the significance of mountain water to tourism and health, a constant theme in the history of the Blue Mountains was the perceived lack of water in the landscape. This was because most of the early visitors were British or European, who viewed the Blue Mountains (and the rest of Australia) with moisture-laden eyes more used to the wetter environments of their homeland. Those who preferred the lusher, greener European scenery clearly believed that water greatly magnified the beauty and grandeur of a landscape. George Bennett, a Blue Mountains visitor in 1832, spoke for many later tourists when he noted that there was a 'deficiency of water in the view, an element which adds so much to the natural beauties of all landscape scenery'. The most common complaint centred on the feeble flows of the waterfalls, which proved a constant disappointment to many mountain visitors. For example, a visitor in 1827 noted sarcastically that to call them cataracts was 'absurd' as an equally good one could be made with a tea-kettle. In 1846 Mundy described the waterfall at Govett's Leap as a 'slender thread of water' that waved in the wind and soon dissipated into 'mere mist'. This traveller could not help but be left with the impression that 'Australian waterfalls are indeed but sorry affairs'. Another visitor in 1892 observed that all the mountain waterfall 'made but a poor show, from the deficiency of water'. By the 1880s some Blue Mountains guidebooks had even become defensive over the issue and felt the need to apologise in advance for the usual paltry contents of the mountain

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232 Blue Mountain Echo, 10 February 1922 p.1, 30 March 1922 p.3.
235 Mundy, op. cit., pp.182-183.
236 C.R. Sail, Farthest East, and South and West etc., London, 1892, p.158.
waterfalls. For instance, one 1888 tourist guide noted that to 'forestall
disappointment' it was necessary to realise that the marvel of the mountain
cascades 'lies not in the volume of the Fall but in the depth of its descent'. The
reader was then informed that:

"The Mountain streams are too numerous, too rapid, and too swift, to hold
(except immediately after heavy storms) any great volume of water. It is
not, therefore, the size of the torrents, but the bewildering depth of their
plunge, and the colossal size and wondrous charm of their surroundings
which earn from all who see them the ready tribute of wonder and the
richest adjectives of laudatory description." 24a

The Mountaineer was also compelled to regularly explain the reasons for the
lack of water and even encouraged visits to the waterfalls when 'heaven's
floodgates are open'. To see them at their best, the newspaper helpfully
advised in 1899 that visits should be made 'when the rain is teeming down at
its hardest'. 24b In fact, the Blue Mountains during rain had a certain
captivating charm for some admirers, such as the Sydney Morning Herald
correspondent who wrote in 1911:

"Everywhere the witchery wrought by the coming of the water! Water, in
the waterfalls and in a hundred rills and gliding streamlets, water in the
mists, and in the rain that comes and goes in playful intermittence." 24c

Nevertheless, to improve on nature, many efforts were made to put more water
into the landscape of the Blue Mountains. For instance, small dams were

24a Horrocks, 1888, op. cit., pp.4-5. These exact words were still being used in some
Blue Mountains guidebooks over 50 years later - see The 'Mountaineer': Illustrated
Tourists' Guide to the Blue Mountains and Jenolan Caves, Sydney, n.d. (ca.1930s),
24b The Mountaineer, 30 March 1899 p.2.
constructed throughout the Blue Mountains to provide pools of water, both for private and public bathing and for their aesthetic appeal. One of the earliest pools was at the 'Fairy Dell' near Mount Victoria where in the early 1880s an early landowner created a large bathing place for tourists by damming up the waters at the base of a waterfall. Other pools created by damming local streams were formed at Lodore Falls, Jamison Creek, Wilson Glen, and in the grounds of the Hydro Majestic. Many early local landowners also constructed swimming baths on their properties, although most had to resort to using stone or concrete rather than natural settings.241

The tradition of pool making continued into the 20th Century with the construction of public swimming pools in several of the mountain towns for the enjoyment of both locals and visitors alike. In 1913, public baths were constructed between Katoomba and Leura (at a cost of £9,000) by damming a local stream above the Meeting of the Waters. As one tourist guide put it, this was done 'to further beautify an already beautiful place' while at the same time 'put it to good public use'.242 In some towns, such as Lawson and Blackheath, disused railway dams were converted into public swimming pools. These were replaced by modern swimming facilities in the 1960s and chlorinated swimming pools were also established at Katoomba, Springwood and Glenbrook during the latter half of the 20th Century.243

240 Sydney Morning Herald, 18 February 1911 p.7.
As well as forming new bodies of water, on occasion, deception was also used to add more water to the mountain landscape. Early line drawings of Blue Mountains waterfalls often depicted them with more substantial flows of water, while photographs of the falls were sometimes taken after rain or were enhanced by touching up with a brush or the later use of time lapse photography. According to Burke, the tell-tale marks of the brush were most obvious in the colour photographs of the 1940s that made the water look like cotton wool. Another example of deception is the cement ridges (coloured to resemble the natural sandstone) which were placed on the Weeping Rock at Wentworth Falls. These were installed to divert the water so as to maintain and enhance the flow of 'weeping' water over the rock. 244

Perhaps the most outlandish proposal to add more water to the Blue Mountains landscape has been the suggestion that artificial scenic lakes be created. Like the paltry waterfalls, a lack of lakes has at times been perceived as a serious flaw in Blue Mountains scenery. In the 1880s an idea was mooted by early landowners to construct a dam in the valley above Katoomba Falls to form a large lake (20 to 30 feet deep) in which tourists could 'disport themselves' in hot weather. A picture of the proposal was even produced that showed the valley behind the Carrington Hotel converted into 'a beautiful lake, with sailing boats disporting themselves gaily on its surface'. Although the illustration caused 'considerable merriment' at the time, the concept of

creating mountain lakes persisted for many years afterwards. In 1895 the Mountaineer suggested that artificial scenic lakes could be formed in several parts of the Blue Mountains by building dams at the heads of various waterfalls. This would create 'magnificent' sheets of water, large enough for small boats and fishing, that would greatly enhance the beauty and attractiveness of the natural mountain views. The lakes would also have the added advantage of storing water, which could be released to artificially enhance the volume of water flowing over the waterfalls. As the newspaper noted, more water was recognised as something needed to 'add to the sylvan charms of our beauty spots'. The idea of a scenic lake in Katoomba was revived again in 1901. A syndicate was reportedly formed to convert a 'splendid natural basin' containing a 'useless' marshy swamp into a large lake. Ultimately, nothing came of the proposal.

However, a large mountain lake did eventually become a reality when the former railway dam at Wentworth Falls evolved into Wentworth Falls Lake after the electrification of the Blue Mountains railway in 1957. The long and winding lake formed by Warragamba Dam also became a new 'water view' in the Blue Mountains region, to the delight of those like Griffith Taylor who still believed that the beauty of the Blue Mountains valleys would be enhanced if they contained lakes like those so common in 'other well-watered countries'.

347 Blue Mountains Courier, 10 January 1957 p.1, G. Taylor, Sydney's Scenery and How it Came About, Sydney, 1958, p.146. Although Warragamba Dam created a new water view, recreational use of Lake Burrarorang has remained severely restricted to protect Sydney's water supply.
Nevertheless, in more recent times perceptions of the mountain landscape have changed. The water views of the Blue Mountains are still greatly admired, but now more so for what they are than for what they should be.

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Like the myriad of creeks, swamps and rivers which criss-cross the mountain environment, water flows everywhere in the history of the Blue Mountains. Water has sculptured the landscape, and its supply, disposal and aesthetic attractiveness have been vital to human habitation and enjoyment of the region. Still, the significance of water in Blue Mountains history has been more than equalled by another key element - fire.
Chapter Three

Fire

Throughout history fire has been both friend and foe. No more so than in the Blue Mountains. For in one way or another, fire has always been an essential and dramatic element in the region's past. This chapter describes the multifaceted role played by fire in the history of the Blue Mountains.

Forging the Mountains

Fire has helped forge the Blue Mountains. Some of the first fire to do so was fire from the earth - volcanic fire. The earliest and most significant evidence of vulcanism in the Blue Mountains is at Yerranderie where a large eruption over 370 million years ago has left behind a massive, part-buried crater measuring some 40 square kilometres.¹ Further volcanoes existed around 200 million years ago which created volcanic pipes or vents (known as diatremes) in the surrounding sandstone. The eroded remnants of these diatremes have formed depressions and hollows in the sandstone rocks at places such as Euroka and Sun Valley in the lower Blue Mountains. The most recent volcanic fire took place between 14-17 million years ago. At this time molten lava erupted and spread over a wide area of the underlying Sydney Basin rocks. As the flaming rocks cooled they formed a hard layer of basalt which has since been mostly eroded away. The remnants now form the basalt caps situated on the highest
peaks of the Blue Mountains, including Mounts Banks, Hay, Tomah, Wilson and Irvine.²

As well as volcanic fire, wildfires have also swept across the Blue Mountains since they came into existence. Most were ignited by lightning strikes from thunderstorms which for millions of years have rolled over the mountains as they still do today. But some fires were undoubtedly lit by the hot lava and ashfalls from volcanoes and earthquakes or ignited by the spontaneous combustion and slow burning of coal seams of which there are many in the region.³

Wildfires have been an important agent in the formation of the Blue Mountains landscape. The flames and heat generated by fires weaken and help break down rock, especially the sandstone which is so common in the region. Studies have shown that strong fire not only causes pitting and pock-marking of the surface, but actually bakes and softens the rocks. By burning away any algae growth and weakening the natural cement holding the sedimentary grains together, direct flames hasten the inevitable crumbling of the stone to sand, silt and clay particles. In some situations, fire will crack and fracture the outer layers of the sandstone causing flakes up to two centimetres thick to fall away. Up to six kilograms of rock per square metre

may be flaked from the surface in this way. The newly exposed sandstone is also far more vulnerable to the weathering effects of wind and water erosion.⁴

The destructive effect of fire on stone is even more severe when the rocks are located near accumulated fuel, for example, where fallen logs and branches have been burnt. In these cases the slow burning of fallen timber over days or weeks allows a significantly higher level of heat to penetrate deeper and break down more of the underlying sandstone. Over millions of years the entire surface area of the Blue Mountains sandstone would have been severely baked and fractured many times by fallen log fires of this type.⁵

Fires bake soil as well as stone, and in the process facilitate further landscape changes. By eliminating organic matter, fires change the structure, texture and permeability of the soil. Bushfires also further expose the soil to rain splash and surface runoff by removing the protection provided by vegetation and leaf litter. Both these effects greatly increase soil erosion, especially where heavy rain occurs not long after fire and before the vegetation has time to regenerate. In such circumstances several centimetres of sandy topsoil can be rapidly eroded away, eventually accumulating in valleys or washed downstream and out to sea. Soil erosion is also particularly severe in steep, rugged terrain as occurs throughout the Blue Mountains.⁶

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⁵ Ibid., pp.29-31.
Natural fire has been active in shaping the Blue Mountains for many millions of years. However, there is little direct evidence of wildfire in Australia prior to the Quaternary (the last two million years). In some localised sites, fossil charcoal deposits and the thermal alteration of rocks confirm that wildfires were a feature of the prehistoric environment. However, their frequency, intensity and true extent remains unknown. Most of what we know of ancient Australia's fire history has been surmised from the study of climatic and vegetation changes over the last 65 million years. This is because the prevalence of fire is broadly determined by climate, especially rainfall. Hot, dry environments burn more frequently and fiercely than cold and wet landscapes.\(^7\) For fire to thrive, rainfall must be sufficient enough to allow plants to grow and thereby accumulate fuel, but not extensive enough to prevent fire from igniting and spreading.

Climatic studies and fossil pollen samples indicate throughout most of the Tertiary Period (65 to 2 million years ago) the southeast of the Australian continent, including the Blue Mountains, was an area of high rainfall covered in temperate broadleaf-conifer forests (see Chapter Five). Under such humid conditions fires could not have been common but those that did occur would have burned intensely and ferociously due to the high accumulation of bark, leaves and other fuel. In response to a gradual climate change from 15 million years ago, much of Australia's flora was forced to steadily adapt to increased aridity and consequently more frequent fire. When and how quickly these

\(^6\) Ibid., p.29, P.J. Hughes, 'The Impact of Bushfires on Soil and Soil Erosion', in P. Stanbury, 1981, op. cit., pp.33-34.
\(^7\) Kemp, op. cit., pp.4-9.
traits developed is not known but the widespread occurrence of fire adaptation in Australia's plant life indicates a prolonged symbiosis between fire and flora. In all evolution there are winners and losers. As Pyne has observed, some plant species declined and died out while others adapted, accommodated or learnt to tolerate the drier conditions. A lucky few, led by the eucalypts, actually flourished. The reason they did so was because, along with their adaptation to lack of water and poor soils, these flora species developed an acceptance of fire. In many situations, the 'pyrophytes' (as Pyne has dubbed them) actually promoted more and more fire which sped up the process of vegetation change.\footnote{Ibid., pp.3, 13-14.}

However, as Gill reminds us, it is important to recognize that Australian flora species are not adapted to fire per se. No plant likes to be burnt. Instead some species of plants make the most of the situation and depending on the frequency and intensity of fire have learnt to accommodate fire in a variety of ways.\footnote{S.J. Pyne, Burning Bush: A Fire History of Australia, Sydney, 1991, pp.26-27, Kemp, op. cit., p.14.} Although incredibly diverse at the species level, the fire adaptations of the eucalypts and other pyrophyte plants can be split into two broad categories which significantly reflect the role of fire as both foe and friend. (Some species employ a combination of both types of adaptations). Firstly, many species have developed defences against fire which protect them against the worst ravages of the flames and allow rapid regrowth afterwards. These include thick layers of bark which protect the internal wood (or cambium) and

substances such as resin or kino which resist heat penetration. Some species (including most *Eucalyptus*) also possess underground lignotubers which enable new shoots to develop straight from the soil or make use of dormant buds which produce epicormic shoots along the main trunk and branches following defoliation caused by fire. It is also likely that the high flammability of some eucalypt wood (due to its volatile oil content) and the habit of mature trees to drop their lower branches, are adaptations to encourage the fire to burn past more quickly while preventing it from reaching the thicker canopy above.\textsuperscript{11}

Secondly, fire can rejuvenate and some plant species use the opportunity which fire presents to increase their chances of regenerating successfully. Most commonly this is done by flowering after fire (e.g. grass trees *Xanthorrhoea australis*) and producing large quantities of seed which are often protected by hard, woody capsules (e.g. many species of *Banksia*). These either build up in the soil beforehand, opening and germinating in response to the heat, or are released by the plants after the fire. Species employing this strategy make good use of the ideal environmental conditions which fires leave behind. Fires usually fertilise the soil. Provided it is not blown or washed away, the ash left over releases nutrients (such as nitrogen and phosphorus) into the soil which were previously accumulated in the leaf litter or living plants. Fire also temporarily 'cleanses' the soil and the immediate

environment by removing harmful insects and microorganisms, competitors, disease and browsing animals, all of which can hinder seedling growth. Moreover, fire improves the microclimate by removing the dead litter and lower branches and allowing more sunlight and rainfall to reach the ground. Fire also consumes the available fuel ensuring no repeat burns during the critical time in which young plants are trying to become established.\textsuperscript{12}

Obviously those plants which can withstand and survive fire or best take advantage of the post-fire environment will have a significant edge over their competitors.

The fire-favouring evolution of Australia's flora necessitated complementary adaptations by Australia's fauna. While clearly far less attention has been paid to the relationship between fire and fauna, Australian animals also exhibit various behavioural adaptations to a fire prone environment. Although individuals may perish, most fauna species can survive fire. A few invertebrate species even seem specifically adapted to the smoke and heat which fires bring.\textsuperscript{13}

In general, fauna employ similar fire-coping strategies as flora - taking some sort of defensive action and then making good use of the post-fire landscape. The major difference is mobility which, depending on the fire's speed and intensity, allows many fauna to avoid the fire completely or find insulated

\textsuperscript{12} Recher and Christensen, \textit{op. cit.}, pp.140-142, Christensen et al., \textit{op. cit.} pp.377, 385-387, Pyne, \textit{op. cit.}, pp.27-29.

in the Blue Mountains. According to the explorer Barrallier, the Gundungurra
hunted kangaroos in the following manner:

'When the natives assemble together to hunt the kangaroo, they form a
circle which contains an area of 1 or 2 miles...They usually stand about 30
paces apart, armed with spears and tomahawks. When the circle is
formed, each one of them holding a handful of lighted bark, they at a given
signal set fire to the grass and bush in front of them. In proportion as the
fire progresses they advance forward with their spear in readiness,
narrowing the circle and making as much noise as possible, with
deafening shouts, until, through the fire closing in more and more, they are
so close as to touch one another. The kangaroos, which are thus shut into
that circle, burn their feet in jumping on every side to get away, and are
compelled to retire within the circle until the fire attacks them. They then
try to escape in various directions, and the natives frightening them with
their shouts throw their spears at the one passing nearest to them. By this
means not one can escape.'

Although it is not certain if Barrallier actually witnessed this hunting method,
during his 1802 expedition Barrallier did observe several times the
Gundungurra 'set the country on fire' while hunting for 'bandicoots, lizards,
snakes, kangaroo rats etc.' He further describes how the Gundungurra
hunted native rats, by lighting fires in the holes in the ground or tree trunks
in which they sheltered and then catching the fleeing animals with their
hands. During his exploration of the Cox's River in 1818, Thomas Jones also
observed places where the Gundungurra had set fire to the grass apparently
during hunting.

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26 F. Barrallier, 'Journal of the Expedition, undertaken by order of His Excellency
Governor King, into the Interior of New South Wales'. 1802. in HRNSW, Vol.V.
Appendix A, p.751.
27 Ibid., pp.757, 789, 813, 819.
28 J. Jamison, 'Journal of the First Excursion up the Warragamba', 1818, in The New
shelter, usually in burrows, holes or under rocks. Various studies have shown that Australian birds, mammals, reptiles and amphibians all respond to fire in this manner. Like plants, many animals also apparently benefit from the after-effects of fire. The profuse regeneration of vegetation and the accompanying increase in insect numbers temporarily provides abundant food for some species, particularly birds that feed on foliage insects or flowering plants. This may lead to increased nesting success in the seasons immediately following fire. Other animals which initially decline in abundance after fire may benefit over time as the area of suitable or preferred habitat increases following changes in the structure and diversity of the vegetation brought on by fire. Although there is much diversity in approach, most of Australia’s plants and animals have clearly become accustomed to fire. As Pyne puts it, a pattern of fire has come to be the expected norm for many species.15

The evolution of Australia’s flora and fauna to accommodate fire, drought and impoverished soils was a lengthy process. It was further enhanced by the increasingly drier climatic conditions which occurred during the last few million years. Like elsewhere in Australia, the vegetation of the Blue Mountains became increasingly dominated by the fire and drought tolerant sclerophyll (hard leaved) plants. The ancient broadleaf forests and their fauna were gradually replaced in most parts of the mountains by dry sclerophyll eucalypt forests and their pyrophyte partners, while the fire sensitive,

14 Such benefits may take several years to become evident however. Recher and Christensen, op. cit., pp.142-159, Christensen et al., op. cit. pp.379-384.
15 Pyne, op. cit., p.32.
moisture loving species disappeared or clung on only in small sheltered pockets (see Chapter Five). These changes in vegetation led to a new fire regime for the Blue Mountains - wildfires were now far more frequent but generally of a lower intensity as there was less opportunity for fuel to build up between blazes.  

Although waxing and waning in response to climatic changes, the new prevalence of fire continued throughout most of the Quarternary. The earliest continuous record of fire history in southeast Australia dates from 350,000 years ago. In an area not far from the Blue Mountains, pollen and charcoal studies at Lake George have provided evidence of prehistoric changes in vegetation and fire frequency. Although interpretation of the results has been much debated, it appears that between 350,000 and 128,000 years ago, the dominant vegetation apparently alternated in response to climate. During the cold, dry conditions of glacial episodes, grasslands and other open temperate vegetation covered the area. Fires occurred at a low level due to the lack of fuel. During the warmer, wetter interglacial periods, the vegetation consisted of sclerophyll forests and woodlands dominated by casuarinas. Fire frequency was higher but still well below that of eucalypt dominated landscapes.  

Then something strange occurs in the Lake George records between 120,000 and 60,000 years ago (estimates of the actual date vary). Under warm interglacial conditions apparently no different from those which preceded it,  

the more fire-sensitive species decline in abundance, while the remaining pockets of rainforest disappear completely. In their place the eucalyptus and other more fire-adapted plants grow to dominate the open woodland and forests. Despite further cool and dry periods over subsequent millennia, the eucalyptus and other fire tolerant species remain a major component of the vegetation up until the present day. Allied with the vegetation changes around this time the amount of charcoal increases dramatically. Furthermore, it remains continually present in the records from then on, often in far greater quantities than previously (See Figure 3.1).  

If these unprecedented changes were not merely in response to climatic change then what agent was responsible? Only one species can ignite fire. In fact, our ability to ignite and utilise fire is one of the main things which distinguish humans from all other lifeforms on Earth. While firm archaeological evidence remains elusive, it cannot be just a coincidence that the evidence of increased fire in this area begins around the same broad period of time that the first people may have occupied Australia. Regardless of when it occurred, with the arrival of Aboriginal people in the Blue Mountains fire began to play a far more prominent role in the history of the region.

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19 Head has speculated that the increase in charcoal may simply reflect increased preservation of charcoal in the sediments. However, she does not offer any explanation for why better preservation occurs at precisely this part of the Lake George sample core. See L. Head, 'Prehistoric Aboriginal Impacts on Australian Vegetation: An Assessment of the Evidence', Australian Geographer, Vol.20, No.1, 1989, p.39.
Burning the Bush - Aboriginal Fire in the Blue Mountains

The native fires are frequently seen on the tops of the mountains, where the air in winter must be very sharp; Governor Arthur Phillip (1790)²⁰

People have been using fire forever. So when the first Aboriginal people came to the Blue Mountains, they carried fire and the secret of its ignition with them. From that time on fire has been a necessity of life for all those who have inhabited the region.

To make fire, Aboriginal people used friction. Pieces of wood were rubbed together or drilled into each other, or two iron pyrite stones were struck against each other to produce a spark. Once heat was generated, dry tinder made from small pieces of bark, fur, feathers or dung was used to initially fuel the fire. Producing fire in this manner was often time consuming and difficult in wet conditions, so more frequently slow-burning firesticks were carried from one location to the next.²¹

Fire was absolutely essential to the Aboriginal inhabitants of the Blue Mountains. Fire provided warmth and comfort - most welcome in the chilly mountain air.²² In the Blue Mountains, where sandstone overhangs and caves were frequently used as shelters, the hearth was usually placed against the

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²² As homeostatic animals, humans must maintain a constant core temperature of about 37ºC to survive. Fire was the main external form of energy used by Aboriginal people to maintain the 'fire within'. D. Suzuki, The Sacred Balance: Rediscovering Our Place in Nature, Vancouver, 1997, p.107.
back wall to radiate heat outwards. Ceilings blackened by smoke are the tell tale indicators of the longevity of these shelters’ use. Fire likewise illuminated the night, chasing away the demons of the dark and giving to Aboriginal people extra time for social interaction. Whether sheltering under stone or sleeping under the stars, the fire provided a social focus, with groups both large and small gravitating around their own hearth. Fire and smoke were also the first fumigators, being used to clear campsites of dangerous and annoying pests, including snakes, leeches, ants, spiders and mosquitoes. Fire was essential for the preparation and cooking of food. The flames removed the fur, scales and feathers of all kinds of animals before roasting the flesh, while ashes and hot stones were utilized to bake vegetables, cakes and open hard fruits. Differing fuels were used to delicately control the temperature of these basic bush stoves.

One of the most important uses of fire was for gathering food. Across Australia two general methods were utilised by Aboriginal people. Firstly, fire was used directly as a hunting tool. By burning parts of the bush, Aboriginal hunters improved their visibility and frightened game out into the open where they could be killed more easily. The tracks of fleeing animals were also more clearly seen after fire. Fire and smoke was likewise employed to flush animals out of burrows, tree hollows or caves. Hunting with fire was used extensively

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The other food gathering strategy involving fire was more subtle and indirect. This entailed the intentional use of fire to encourage and enhance favourable habitat conditions for prey species of animals and plants. By regularly burning the bush, Aboriginal people encouraged re-growth of new shoots which benefited the grazing marsupials they hunted. Likewise, fire encouraged flowering and therefore greater productivity of certain food plants, including cycads, bracken and yams. This deliberate and skilful manipulation of the environment with fire has become known as 'fire-stick farming'. To be successful, the use of fire in this manner needed to be skilfully controlled and managed. Factors such as seasonal influences, species behaviour and terrain all needed to be taken into account before burning was initiated. Controlled fire use also meant that there were areas which Aboriginal people avoided burning. These included places such as rainforest, swamps, along watercourses and others areas which held edible but fire-sensitive plants.\textsuperscript{29} Blainey has questioned how 'controlled' such fire use really was, asserting that Aboriginal people in pre-European times never put out any fires they had started and enjoyed the 'delights of incendiarism'.\textsuperscript{30} However, if this had been true, Aboriginal people would certainly not have survived. Nobody 'delights' in burning their home or larder.

Nevertheless, fire use was widespread in every facet of Aboriginal life. Wooden weapons and tools such as digging sticks were hardened in the flames, while resin and wax were softened for use as glue.\textsuperscript{31} Fire itself was even used as a

\textsuperscript{29} Nicholson, \textit{op. cit.}, pp.63, 68-69, Pyne. \textit{op. cit.}, p.95.
\textsuperscript{30} Blainey, \textit{op. cit.}, p.76.
\textsuperscript{31} \textit{Ibid.}, pp.71-72, Pyne, \textit{op. cit.}, pp.90.
weapon. By lighting fires upwind of their enemies, Aboriginal people could attack directly with flames or destroy key food resources of their opponents - the original application of the 'scorched earth' strategy. Blue Mountains Aborigines certainly displayed their opposition to Barrallier's intrusion into their territory in 1802 by burning down his huts. In retaliation Barrallier's guide, Gogy, set the country they were passing through on fire 'to avenge ourselves on the natives who had burnt our huts'.\textsuperscript{32} However, fire was used to heal as well as harm. Aboriginal people utilised fire and heat for a range of medicinal purposes including to reduce pain, stem the flow of blood and treat wounds such as snake bites. Moreover, ash was used to cleanse and dry newborns.\textsuperscript{30} Fire and smoke were also used as aids in travel and communication. In many parts of Australia, fire and smoke signals provided a long distance 'bush telegraph' to indicate sources of food and water or indicate the direction of travel. Setting fires further helped to keep tracks and pathways open and make travel easier, particularly in heavily timbered areas such as the Blue Mountains.\textsuperscript{34}

The many and varied ways in which fire was critically important to Aboriginal people was further reflected in their language. Many groups possessed

\textsuperscript{32} Barrallier, \textit{op. cit.}, pp.807, 817. Given the long human history of using fire in battle it is clearly no coincidence that today we still speak of 'firearms' and 'firing' weapons.

\textsuperscript{33} Pyne, \textit{op. cit.}, p.91.

\textsuperscript{34} J. Flood, \textit{Archaeology of the Dreamtime: The Story of Prehistoric Australia and its People}, Sydney, 1983 (Revised ed. 1995) p.250, N.B. Tindale, \textit{Aboriginal Tribes of Australia}, Berkeley, 1974. p.65, Blainey, \textit{op. cit.}, pp.72-75. On observing fire blackened tree trunks near Springwood in 1819, Quoy, Gaudichaud and Pellion attributed this to 'the natives liking to set alight the grasses and brushwood obstructing their way' (in G. Mackaness (ed.), \textit{Fourteen Journeys Over the Blue Mountains of New South Wales 1813-1841}, Sydney, 1965, p.95). Given that they were on the main western road, it is far more likely that what they observed were the
different words to distinguish between various types of fire, such as hearths or wild fires. For example the Dharug had separate words for fire (gwee-ang and several other phonetically based spellings), to set on fire or burn (cannadinga) and firestick (ger-rubber).35

Given its importance in everyday life, fire also assumed ceremonial and ritual significance for Aboriginal people. Corroborees and large gatherings were centred around massive fires, while fire was used in initiation ceremonies (e.g. for scarring bodies) and for cremating the dead. The Gundungurra of the Burrabororang valley apparently set fires in the forks of trees during their ceremonies and used smoke and ash during mourning.36 As Nicholson notes, many aspects of fire, including torches, firesticks, fire throwing, smoke, charcoal and ashes were often used as props in ceremonies and rituals and in the production of art.37

Fire equally had mythological and spiritual significance. Aboriginal people across Australia believed that fire and smoke would 'clean up the country' and chase away the spirits of the dead, who were unable to possess this vital element. According to Isaacs there are a numerous Aboriginal legends and myths relating to fire, the most common theme being that a bird or animal hid

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37 Nicholson, op. cit., p.65.
The Burning Question

The ecological impact of Aboriginal fire prior to European arrival in Australia remains a hot topic of debate despite decades of discussion. Some have argued that in comparison to climate, Aboriginal fire had little or no impact. Others suggest that the impact was severe enough to cause extinctions and radically modify species distributions and their habitat."

In any evaluation of ecological impact, we need to firstly take account of the problems presented by the evidence itself. Evidence of prehistoric fire in Australia has been provided by examinations of charcoal in sediments laid done over thousands of years. For example, charcoal records in the Blue Mountains have shown that fire has been an important environmental factor in the region for at least the last 34,000 years." However, the Interpretation of these deposits is a difficult dilemma.

The levels of charcoal preserved in the sediments may not necessarily provide an accurate record of the extent or frequency of fire in that locality. For example, records of high charcoal deposits may merely reflect increased rainwash rather than increased fire." There is also the problem of the 'charcoal catch-22'. In studies from different parts of Australia, records of

the secret of fire from others until it was revealed or stolen by others.\textsuperscript{58}
Although few reliable accounts survive of the myths of the Blue Mountains
Aborigines, fire does feature in some of the Gundungurra stories so far
documented. An unpublished legend, titled 'Bunberan and How He Stole the
Fire' provides an explanation of the origin of fire. Another story relates how an
Aboriginal woman magically thwarted the attentions of the chief of another
tribe, which led to the origin of bushfires and the ability of plants to germinate
after fire.\textsuperscript{59} Like other Aboriginal groups in southeastern Australia, the
inhabitants of the Blue Mountains may also have believed that during pursuit
prey animals could be made hot, tired and confused by dropping hot coals
into their tracks.\textsuperscript{60}

Given such widespread and abundant use of fire over many millennia, it is
inconceivable that Aboriginal people did not significantly alter and transform
the environment of the Blue Mountains. Although fire was already a feature of
the landscape, Aboriginal people brought more frequent and more extensive
fires to an already fire-prone zone.

\textsuperscript{58} J. Isaacs (ed.), \textit{Australian Dreaming: 40,000 Years of Aboriginal History}, Sydney,
\textsuperscript{59} J. Smith, \textit{Aboriginal Legends of the Blue Mountains}, Wentworth Falls, 1992, pp.27-
30 and Jim Smith \textit{pers. commun.} Another Aboriginal legend exists which supposedly
describes the volcanic eruption of Mount Wilson, however this is obviously a fake
myth given that the last evidence of vulcanism in the Blue Mountains occurred
millions of years before the arrival of people. Despite its clearly dubious nature, this
myth has been used as evidence of the durability of oral traditions in several popular
\textsuperscript{60} R.H. Mathews, 'Ethnological Notes on the Aboriginal Tribes of New South Wales and
increased charcoal has been used as evidence of both increased Aboriginal fire (because more frequent fires led to more charcoal) and decreased Aboriginal fire (because an absence of more frequent low intensity Aboriginal fire allowed larger fires to occur which generated more charcoal). With the historical evidence so open to interpretation, caution must clearly be exercised in attributing changes in charcoal abundance to the effects of Aboriginal fire.

Another major flaw in the discussion to date of the impact of Aboriginal fire in pre-European times has been the lack of consideration of local and regional differences. Most contributors to the debate have blithely extrapolated specific local evidence (both for and against Aboriginal burning) across the entire continent. However, as Clark and McLoughlin have stated, Aboriginal burning would have varied regionally and locally depending on the environmental zones involved, the resources able to be obtained from them, and possibly cultural reasons. To gain a genuine assessment of the impact of Aboriginal fire clearly requires an examination of the evidence at the local scale. The following sections examine the available evidence to determine if Aboriginal fire in the Blue Mountains resulted in any significant environmental impacts.

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Fire and Flora

The ecological impact most commonly attributed to Aboriginal fire prior to European arrival is changes in vegetation. It has been suggested that over many millennia Aboriginal burning altered the distribution and abundance of certain types of plants by eliminating or shifting the boundaries between vegetation types. The long term impact of Aboriginal fire on vegetation may have manifested itself in many ways. For example, the frequency at which fire occurs can alter the structure of the vegetation, reducing or increasing the overall density of plant species in the understorey of forests. The season of burning is also critical. In the southeast of Australia, autumn fires generally burn hotter than spring fires. Long term changes in fire frequency or season of burning will benefit some species at the expense of others.46

Evidence for prehistoric changes in vegetation in Australia have been derived from examining fossil pollen left behind in sediments extending back over many thousands of years. However, as with charcoal, the amounts of fossil pollen preserved in the layers of sediment may also not truly reflect the state of the vegetation at that time.47 Despite these problems, there is broad agreement that major changes in vegetation have occurred in many parts of Australia since the arrival of Aboriginal people. The controversial question

46 Christensen et al., op. cit., pp.376-377.
47 For example, plant species produce pollen in differing amounts and the pollen of some species may travel further and more widely than other species. The preservation of pollen also varies greatly, with some species more easily represented in the deposits as a result. J. Kirkpatrick, A Continent Transformed: Human Impact on the Natural Vegetation of Australia, Melbourne, 1994, pp.26-27. Clark, op. cit., pp.32-37, Head, op. cit., p.38.
which remains is to what extent Aboriginal burning contributed to these changes.

Although the evidence is minimal at best, it is likely that the regular fires lit by Aboriginal people led to a more open vegetation by helping to restrict the distribution of rainforest, closed forests and particular forest species (e.g. *Nothofagus*) which prefer moist, cool conditions and are vulnerable to fire. Where such vegetation was already being stressed by a drying and warming climate, Aboriginal burning may have contributed to local and regional extinctions of some species or hampered their recovery and recolonisation of former habitat when climatic conditions for them improved.™ Frequent Aboriginal fires would also have greatly encouraged the more rapid spread of open sclerophyll forests, comprised mostly of eucalypts and other more fire tolerant species. This effect would have been particularly pronounced in areas like the Blue Mountains which contain many ridges and spurs exposed to strong winds capable of spreading fire over large distances.

It is important to recognise that Aboriginal fire and its impacts were not unchanging over the period of their long occupation of the Blue Mountains. There is widespread evidence of an increase in the Aboriginal population in southeastern Australia (including the Blue Mountains) over the last 5,000 years and therefore a more intensive use of the environment including more fire. Kohen has argued that the increased burning was needed to maximise

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™ According to Head, Aboriginal fire was the main factor responsible for the reduced abundance and distribution of certain types of dry temperate rainforest trees which are now restricted to small patches in Australia. Head, *op. cit.*, p.40.
the suitable grassy habitat for large species (such as kangaroos and
wallabies) to provide sufficient food for larger groups of people. In turn, this
more intensive use of fire 'promoted certain species to the disadvantage of
others, but generally on a local scale'.

There is certainly some evidence for local differences in the impact of
Aboriginal fire on vegetation. By examining the biology of Hawkesbury
sandstone vegetation, Clark and McLoughlin have shown that many plant
species of the Sydney region require fire at very specific time intervals for
successful reproduction. They have suggested that in the pre-contact era
Aborigines of the Sydney region burnt ridge tops more frequently (at one to
five years intervals) than gullies or valley sides (which were burnt at seven to
15 year intervals). Given that a large portion of the Blue Mountains contains
similar sandstone vegetation, it is likely that Aboriginal fire was applied in a
similar fashion and probably had similar local effects on the vegetation of the
region.

In contrast, evidence from a study of swamps in the Blue Mountains would
appear to support the proposition that climate change had a greater influence
on vegetation change in the Holocene (last 10,000 years) than Aboriginal
burning. Chalson identified a trend of increased charcoal volumes with a
more dense tree cover indicating fire frequency was linked closely to the type
of vegetation. This suggest that overall fire frequency was more determined by

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46 Clark and McLoughlin, op. cit., pp.101-112.
climatic influences on vegetation (e.g. more rain promoted more denser vegetation) than Aboriginal burning.\textsuperscript{51}

Even so, in the period from 6,500 years ago to 500 years ago, Chalson records several fluctuating changes in the vegetation near the swamps and this is assumed to be the result of erratic changes between wetter and drier climate conditions. However, as other studies have indicated that this was an era of generally increased precipitation, the fluctuations in vegetation detected could equally be a response to Aboriginal burning which on the local scale was operating against the prevailing climatic trend in this period.\textsuperscript{52}

\textit{Fire and Fauna}

Aboriginal fire must also have impacted on the fauna of the Blue Mountains. Although Australian fauna have generally evolved and adapted to survive and recover from fire, fires of all types can kill individual animals both directly and indirectly. However fauna species generally persist in area after fire unless the population is small or isolated.\textsuperscript{53}

\textsuperscript{51} Chalson, \textit{op. cit.}, pp.283, 306.
\textsuperscript{52} \textit{Ibid.}, p.301. Chalson dismisses the notion that the vegetation changes recorded are a response to 'anthropogenic changes in the fire regime' claiming that the scatter in the results obtained is 'probably due' to differences in the local topography, aspect and microclimate of the study sites (pp.325-326). While this may be true, the pollen evidence is clearly open to interpretation on this point.
\textsuperscript{53} In fact, after an initial decline in numbers most vertebrate species inhabiting dry sclerophyll forests usually return to regenerating areas within 5-6 years, sometimes in greater abundance than prior to the fire. Christensen \textit{et al.}, \textit{op. cit.}, p.379, Catling and Newsome, \textit{op. cit.}, p.304, Recher and Christensen, \textit{op. cit.}, pp.142-159.
The main long term impacts of fire on fauna result from changes to their habitat which affect the availability of food and sites for shelter and breeding. Changes to vegetation brought about by Aboriginal fire will therefore have led to changes in fauna distribution and abundance. For example, as with fire-sensitive plant species, more frequent fire will also have resulted in fauna species which prefer moist habitats (such as rainforests) becoming rarer.\textsuperscript{54}

Changes have certainly occurred in Australia's fauna during the occupation of the continent by Aboriginal people, especially the extinction of around 50 species of megafauna (see Chapter Five). It has been suggested that the use of fire was one of the ways in which Aborigines may have contributed to the extinctions of these megafauna by disrupting their food supplies, breeding cycles and habitat requirements. Unfortunately, knowledge of megafauna biology and ecology is too little to reach any firm conclusions on the impact of Aboriginal fire.\textsuperscript{55}

It can be concluded however that the long term impacts of Aboriginal fire on the Blue Mountains vegetation must also have had some consequent impacts on the region's fauna, particularly at a local scale. While some species may have been driven to extinction locally, others are likely to have increased in abundance. Certainly modern studies show that the larger mammals of southeastern Australia (such as grey kangaroos, brush wallabies and

\textsuperscript{54} Catling and Newsome, \textit{op. cit.}, p.303.
wombats) prefer habitat which contains recently burnt areas where new green feed is available.\(^ {56} \)

Furthermore, although the seasons of Aboriginal burning in southeast Australia are unknown, it is generally believed that Aboriginal fire was usually frequent but of low intensity. Catling has argued that such a fire regime (if conducted in autumn in southeastern Australia) will generally advantage those mammal species which favour open, grassy habitats. In most cases, these are the larger native mammals (including kangaroos, wallabies and wombats) which must have been high priority prey for Aboriginal hunters.\(^ {57} \) Regular low intensity fires also tend to leave the upper canopy of the forest relatively unscathed and help prevent the likelihood of high intensity fires which scorch and destroy the canopy. Aboriginal fire, if applied in this manner, would therefore have had only minimal impacts on the fauna of the forest canopy and their shelter and breeding sites in the upper branches. These include arboreal mammals (such as possums and gliders) and the larger canopy birds, which were also important sources of bush tucker for Aboriginal people.\(^ {58} \)

\(^ {56} \) In part this is due to the increased availability of nitrogen following fire, which is a critical requirement of many fauna species which inhabit dry sclerophyll forests. Christensen et al., op. cit., p.382.


\(^ {58} \) Christensen et al., op. cit., p.384.
Aboriginal fire also apparently had significant impacts on the physical landscape of the Blue Mountains. Based on several geoarchaeological studies, Hughes and Sullivan have argued that Aboriginal fire in dry sclerophyll-forested hilly landscapes in eastern Australia (including the Blue Mountains) led to slope instability and increased rates of soil erosion and deposition during the late Holocene, which exceeded those caused by natural wildfires. They attributed these landscape changes to an intensification of land use by Aborigines as their population increased.²⁹

In a study of sandstone rockshelters in the Mangrove Creek catchment north of Sydney, Hughes and Sullivan found that the majority of the shelters had accumulations of sandy soil which contained stone artefact deposits throughout. Excavation showed that when the sites were first occupied about 8,500 years ago there was little or no sandy sediment on the shelter floors. However, over the following millennia, during which the shelters were used by Aboriginal people, up to a metre of sediment accumulated in the shelters. The shape and physical layout of the shelters indicates that only a fraction of the total sediment would have been trapped and preserved in the shelters.³⁰

Hughes and Sullivan concluded that systematic Aboriginal burning of the eucalypt vegetation in the vicinity removed the grasses, shrubs and organic litter which protected the ground. Aboriginal fire therefore allowed increased quantities of sediment to be stripped from the steeper slopes and deposited on the lower slopes, in rockshelters or be transported to the valleys below.\textsuperscript{61} Modern studies certainly confirm that severe soil erosion can occur after fire in the sandstone environments of the Sydney Basin, particularly when heavy rain occurs not long after. For example, a study of post-fire erosion in the 40 hectare catchment of Campbells Creek in the Royal National Park estimated soil losses of up to 48 tonnes per hectare after heavy rain (a total of 16,000 tonnes removed from the entire catchment).\textsuperscript{62}

Further evidence of the geomorphic impact of Aboriginal fire has been provided by excavations of sandstone rockshelters in the Capertee River valley. This study concluded that Aboriginal burning was probably responsible for changes in slope stability which also led to the accumulation of up to two metres of sediment in the shelters and on the adjacent slopes since Aboriginal occupation of the area began around 7,000-8,000 years ago.\textsuperscript{63}

\textsuperscript{62} G. Atkinson, 'Erosion Damage Following Bushfires', \textit{Journal of Soil Conservation}, NSW, Vol.40, No.1, 1984, pp.4-9. However, fire-induced erosion is likely to be much less in areas with shale and basalt soils which because of their higher clay and organic content are more stable and less easily eroded. Sullivan and Hughes, 1983, \textit{op. cit.}, p.124
Aboriginal fire must also have had significant impacts on soil erosion in the Blue Mountains as much of the region contains sandstone slopes similar to those of the Mangrove Creek and the Capertee River valleys. In fact, in many places in the mountains the slopes are much steeper which would have accelerated the downhill movement of sediment. Furthermore, as Hughes and Sullivan have concluded, the erosion impacts of Aboriginal fire would have been greatest in hilly landscapes which are comprised of sandstone rocks and soil (which are easily eroded), with a cover of dry sclerophyll vegetation (which is particularly fire-prone), and are subject to high intensity rainfall events throughout the year.\textsuperscript{44} The vast majority of the Blue Mountains region fits this criteria exactly.

As well as increasing erosion rates, Hughes and Sullivan further suggested that the increased hillslope stability and erosion from Aboriginal burning may have led to the late Holocene alluvial sedimentation recorded in the Mangrove Creek valley and valleys elsewhere in both the Sydney Basin and eastern NSW.\textsuperscript{45} Other researchers however have argued that the observed valley fills are not the result of Aboriginal burning and may be due to other causes such as climate change, local changes in the watercourse which increase trapping of the sediment, or that the apparent dates of the valley fills are incorrect due to poor charcoal preservation or mixing of the sediments.\textsuperscript{46} However, studies of

\textsuperscript{44} Hughes and Sullivan, 1986, \textit{op. cit.}, p.129.

\textsuperscript{45} Radiocarbon dating indicates that rapid sediment accumulation in the valleys near Sydney began around 7,000 years ago which have since laid down almost six metres of sediment. Significantly, the sediments also contained abundant charcoal. Hughes and Sullivan, 1981, \textit{op. cit.}, pp.123, 277.

historical fire regimes in other parts of Australia seemingly confirm that there is a distinct connection between increased fire and increased catchment sedimentation in mountain terrain.\textsuperscript{87}

All in all, Aboriginal fire impacted on the Blue Mountains environment for millennia in ways both subtle and significant. Its overall effects were closely related to the size of the Aboriginal population at any given time. There is substantial evidence of an increase in the Aboriginal population in the Blue Mountains over the last few thousand years. Increased people meant increased fire. On a local scale Aboriginal fire was probably very significant in its impact on the vegetation of the Blue Mountains and created a mosaic of different habitats which benefited some species of both flora and fauna to the disadvantage of others. The widespread use of the fire-stick over thousands of years is also likely to have had a substantial physical impact on the easily erodable landscapes of the Blue Mountains.

The arrival of Europeans in the Blue Mountains created a new regime of more frequent and ferocious fire, while simultaneously bringing new ways of making use of fire. The new mountaineers also had to come to terms with fire as both friend and foe.

\textsuperscript{87} For example, research in East Gippsland, Victoria has shown that increased fire use by squatters and timber-getters between 1830 and 1940 led to much higher sedimentation in the Delegate River. See P.A. Gell and I.M. Stuart, \textit{Human Settlement History and Environmental Impact: The Delegate River Catchment, East Gippsland, Victoria}, Monash Geography Publications No.36, Department of Geography and Environmental Science, Monash University, Melbourne, 1989.
Friendly Fire

'The air was fresh, so we made an immense fire' Rene Lesson (1824)  

As it was for the former Aboriginal inhabitants of the region, fire was also a necessity of life for the settlers of the Blue Mountains in the 19th and 20th Centuries. As Blainey has observed, although the ways of life of the Aboriginal and European settlers of Australia were far apart 'they were united by a dependence on fire'. The ancient craft of using fire continued in the Blue Mountains but in the service of different masters.

Fire - The Servant

From explorers to settlers to bushwalkers, those venturing into the Blue Mountains since 1788 have always needed and used fire. In numerous fundamental ways, fire was employed to ensure survival. In it most basic form, fire generated heat to warm and comfort both visitor and settler alike. Early travellers in the Blue Mountains huddled around large fires to ward off the cold, often placing fires at their feet. In 1815, Antill described how each party in Governor Macquarie's entourage had their own fire, without which it was 'impossible to sleep in comfort' due to the coldness of the nights. Antill's own fire was 'large enough to roast an ox', yet the biting winds often made him so uncomfortable that he was obliged to 'get up frequently to mend our
fires'. Fires were also a sign of human presence, whether friend or foe. The campfire and hearth provided protection and a focus for social interaction. A blazing fire was usually a welcome and reassuring sight for early travellers in the Blue Mountains. For example, three French visitors in 1819 remarked how they were glad to warm themselves at the 'great fire' made by the military guards at Springwood which penetrated them with its 'salutary warmth'.

As always, fire was essential for preparing and cooking food in the Blue Mountains. The fire or stove was the earliest domestic appliance which no mountain home could do without. It baked damper and vegetables, roasted and smoked meats, and boiled the billy innumerable times. Fire also heated water for bathing, to clean dishes and to wash clothes and linen. It also heated the flat-irons used to rid the garments of wrinkles. Like Aboriginal fire, European fire was also employed to harden and make various tools. However, now blacksmiths created tools from metal not wood - iron spikes and horseshoes rather than digging sticks and spears. Equally, fire remained a potent weapon, but after 1788 increasingly it was projected via the medium of 'firearms' rather than merely as scorching flames.

In its many forms, friendly fire provided illumination as well. All through the 19th Century the principal means of obtaining light were candles (made from tallow, shale oil and sperm whale oil), lanterns and oil lamps. Later acetylene,

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70 H.C. Antill, 'Journal of an Excursion over the Blue or Western Mountains of New South Wales etc.', 1815, in Mackaness, op. cit., pp.76-77, J.R.C. Quoy. C. Gaudichaud and A. Pellion, 'Excursion to the Town of Bathurst 1819', in Mackaness, op. cit., pp.95, 100
71 Shaw, op. cit., p.28.
kerosene and gas pressure lamps were used at first mainly outside inns and as street lighting. In many rural parts of the Blue Mountains the domestic use of candles and lamps continued until well into the 20th Century. Fire not only provided the artificial light necessary to see at night but also to go beneath the earth. Early miners in the Blue Mountains hacked away at the earth in the flickering glow of candles and lamps. At Jenolan Caves, candles were used initially for exploring and inspecting the underground chambers and illuminating the cave attractions. Special candleholders with saucer-shaped guards were later supplied to visitors to avoid dripping of wax while admiring the formations. By the 1870s, cave guides began burning strips of magnesium wire which they held aloft to illuminate items of special interest. The 'glowing glory of the magnesium wire' reportedly burned with 'dazzling gleam' and 'great brilliancy' and proved a brighter and more efficient manner of lighting up the dark recesses of the caves.

The process of settling land in the Blue Mountains depended on fire as well. As Pyne has noted, fire was everywhere on the Australian frontier and without it pioneering could not take place. Surveyors used fire to measure and map. For example, while working on the Colong Range in 1833 Surveyor Henry White found the scrub so thick that it was impossible to survey without first

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72 Shaw, op. cit., p.28, Local Studies Files, BMCL.
'setting it on fire'. Mineral prospectors in the Blue Mountains also undoubtedly used fossicking fires to remove obscuring vegetation as was done in other parts of Australia during the 1800s.  

Fire was an essential tool for clearing the land and blazing the way for settlement. Even the construction of the very first road over the Blue Mountains in 1814 involved the use of fire to burn the vegetation cleared from the route.  

"From then on, fire was universally used in the Blue Mountains region to establish farms, grazing runs, towns and the railway. The standard procedure utilized was 'slash and burn' - a deforestation technique used throughout the world. Bowen provides a good description of this technique in use at Mount Tomah in the 1830s. After the trees were ringbarked and felled, and as soon as the leaves had dried 'running fires were sent through the fallen timber'. The tree trunks were then cross burned or sawed into lengths. The timber was next piled into heaps and 'every evening set on fire, illuminating the darkness of the night'. In 1880 Ingls observed similar land clearing techniques near Faulconbridge where 'huge log fires' were 'blazing all over the allotment'."

Early agriculture needed fire as well. In the valleys of the region, early settlers learnt from observing Aboriginal fire that grasslands could be maintained and

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"H. White to T. Mitchell, 27 February 1833, 2/1592, AONSW, Pyne, op. cit., pp.192, 244.

"W. Cox. 'Journal Kept by Mr. W. Cox in Making a Road Across the Blue Mountains etc.' 1814-15, in Mackaness, op. cit., p.41."
yields improved by regular burning. The burning off of dead and dried out pasture became a standard agricultural practice in Australia as it promoted regrowth of the more palatable native grasses by releasing stored up nutrients and preventing regrowth of scrub and trees. In areas where crops and hay were grown, the straw and stubble left over after harvesting was also commonly burnt to enrich the soil. Fire was used in a similar manner in forestry, particularly in plantations of conifers. After harvesting of timber areas were routinely burnt before replanting and low level fires were used to reduce fuel loads to protect mature trees. As will be discussed later in this chapter, friendly fire was also used to fight bushfires through backburning and the creation of firebreaks to protect settlements, crops and forest plantations.

Fire was also put to use to control various pests. For example, selective burning of pastures was carried out to remove noxious weeds, such as blackberries, and to temporarily expel blowflies and other insect pests. Fire and smoke were further utilised in a variety of ways to combat infestations of rabbits. In addition, early campers often burnt bush areas to rid them of snakes. The first to do so in the Blue Mountains was probably the explorer Barrallier who in 1802 burnt the bush around a campsite to deter snakes. Many others followed including the members of Eccleston Du Faur's artists

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79 Ibid., pp.217-219, 232, 236.
camp in the Grose Valley in 1875 who 'fired the bush in several places to clear the track of these venomous beasts'.

Fire was a efficient destroyer of unwanted materials as well. A wide variety of wastes, including domestic rubbish, dead livestock, sawmill and timber offcuts, were all routinely incinerated. Many municipal tips, including those in the Blue Mountains, regularly disposed of garbage by burning it. In 1890 the Katoomba Council even built a special state-of-the-art crematory for the disposal of nightsoil and household wastes which operated until around 1909. Using the heat generated by two large furnaces the crematory destroyed the 'noxious' materials and gases, leaving behind only inoffensive fumes (emitted from a 60 foot or 18 metre high chimney) and a residue of manure which was sold for fertiliser.

As it had for Aboriginal people, fire has also had a ritual and ceremonial significance for the later inhabitants of the Blue Mountains. Bonfires and fireworks displays were frequently held to mark special occasions and celebrations. While individual families lit bonfires and fireworks to celebrate birthdays and marriages, whole towns often joined in communal fire celebrations for special annual events, such as Empire Day. The bigger the event, the bigger the fire. For instance, in 1913 the Centenary of the first crossing of the Blue Mountains by Blaxland Wentworth and Lawson was celebrated with fireworks, chinese lanterns, coloured electric lights and a

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chain of bonfires stretching from Parramatta to Orange. For weeks prior to the event, volunteers had scaled all the most prominent peaks in the area and constructed on their summits 'huge pyramidal stacks of inflammable material' which 'awaited the firestick' to form a chain of blazing beacons. At nightfall on 28 May 1913, the fires were duly lit after the signal was given by firing a rocket skywards from Mount York. Unfortunately, as reported by the Blue Mountains Echo, the thousands of onlookers gathered at Katoomba and places to the east to admire the pyrotechnical display were disappointed as the 'Maid of the Mists threw her mantle over the hills, effectively diminishing the glory of the fire king'. Areas to the west of Katoomba had better luck however, with the bonfires presented an awe-inspiring and magnificent spectacle as all the well-known peaks appeared 'like miniature volcanoes, belching forth fire and smoke' while the further ones became 'mere points of light of intense brilliance'.

Forty years later, the coronation of Queen Elizabeth II in June 1953 was also celebrated throughout the Blue Mountains with 'monster' bonfires, barbeques and the firing of hundreds of fireworks.

*Feeding the Fire*

No matter how it was used, fire needed something to burn. Where it was not used to destroy, the use of friendly fire required fuel. As in the Aboriginal era, in the early days of European settlement wood was the only fuel, and it was

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* *Blue Mountains Advertiser*, 11 June 1953 p.2.
freely obtained locally to feed the many fires of the frontier. With the advent of the 'Steam Age' in the latter half of the 19th Century, there was an increasing need everywhere for a more efficient fuel to feed the insatiable furnaces, boilers and steam engines. In conjunction with the construction of the steam railway across the Blue Mountains in the 1860s, the need for fuel provided a strong impetus for the mining of coal and shale oil in the Blue Mountains (see Chapter One). Although most of the products of this mining were transported out of the region, the exploitation of the earth also provided new and better fuels for local use in the form of coal, kerosene, oil and gas. Although its early use in the Blue Mountains was limited, the advent of gas lighting and gas stoves began the progressive transition from the open fire and wood-burning stove to other more cleaner, smokeless and instant forms of energy.

However, gas too had its disadvantages and during the late 19th Century, a new more sophisticated, portable and efficient form of energy made its appearance in the Blue Mountains - electricity. Although still reliant on coal powered steam engines for its creation, in the following century this modern source of friendly fire was to rapidly dominate all other forms of energy and revolutionise the lives of people everywhere. Where once the crackling naked flame had provided heat, light and power, it was progressively replaced by the hum of the dynamo and the steady glow of the bulb. Fire was now ignited with the flick of a switch.
The White Light of Progress

'...this is an age of electrical wonders' Katoomba Times (1892)\textsuperscript{84}

The very first electricity in the Blue Mountains arrived in 1859 when low voltage electrical impulses were used to transmit the first telegrams along the newly opened Western Electric Telegraph line as it snaked its way across the Blue Mountains between Penrith and Bathurst.\textsuperscript{85} Difficulties in efficiently generating electricity constrained its further use until in 1880 the Margherita Cave at Jenolan Caves was temporarily lit by electric lights. The success of this trial subsequently led to the permanent installation of electric lights in the principal tourist caves beginning with the Imperial Cave in 1887 and the Lucas Cave in 1894.\textsuperscript{86}

Gas Vs. Electricity

Ultimately, the transition from open fires to electricity in the Blue Mountains was not a smooth one. As in other areas, the ongoing struggle for pre-eminence between gas and electricity was also played out in the Blue Mountains. In the late 19th Century gas had the upper hand and was initially

\textsuperscript{84} Katoomba Times, 6 May 1892 p.2.
\textsuperscript{85} NSW Government Gazette, 30 December 1859, p.2881.
favoured as the choice for lighting the streets of the growing tourist district at Katoomba and for installation in the Carrington Hotel.  

By 1891, the Council was still considering how best to light the district. The appeal of electricity was increasing with every passing year. The *Katoomba Times* believed it now 'greatly superseded gas'. In the following years the debate over gas or electricity continued apace with the local press becoming increasingly more strident in its support of electricity. For the *Katoomba Times* the advantages of electricity over the 'ancient system' of gas were obvious:

'...press a button, the room is lighted, touch it again, you are in darkness. No matches, no escape of unpleasant effluvia, no metre to try and swindle or to be kept from swindling, and not so much fear of an explosion'.

Nevertheless, no firm decision was made and as an interim measure Katoomba Council decided in 1895 to install kerosene street lamps that were capable of being later adapted to gas. However by 1902 these had become too expensive to run. After several more years of argument between the local advocates of gas and electricity, Katoomba Council held a referendum of ratepayers in 1905, the vast majority of whom opted for gas. Meanwhile in 1903 the first electricity was quietly installed in the mountains during the building of the Hydro Majestic Hotel at Medlow Bath. In 1907 Katoomba

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88 *Katoomba Times*, 13 November 1891 p.2.
89 *Katoomba Times*, 6 May 1892 p.2.
91 *Sydney Morning Herald*, 22 December 1903 p.3.
Council signed a seven year contract with the Katoomba and Leura Gas Company which quickly constructed a coal-fired gas works midway between Katoomba and Leura.\footnote{Official Tourist Guide to Katoomba and Leura, Sydney, n.d. (ca. 1913), pp.27-28, Sydney Morning Herald, 12 June 1912 p.19.}

On the expiry of the gas contract in 1913, debate resumed on whether to extend or municipalise the existing gas works or replace it entirely with electricity. In the meantime a private electric lighting firm commenced installation of electric lights in a number of Katoomba businesses including the Carrington Hotel. Eventually, in June 1914 the Katoomba Council finally resolved to go electric and a 10 year contract was signed with the Katoomba Electric Supply Company to provide electricity, with a provision for the council to take over the running of the electrical supply on expiry of the contract.\footnote{Blue Mountain Echo, 5 June 1914 p.3, Sydney Morning Herald, 9 June 1914 p.10.} In July 1915, Mayor James officially switched on the electricity supply to Katoomba declaring the town 'well and effectively lighted'.\footnote{Blue Mountain Echo, 5 June 1914 p.3, Sydney Morning Herald, 9 June 1914 p.10.} It was inevitable that electricity would eventually eclipse gas as the preferred modern source of fire. Electricity was much cheaper and easier to install and at its point of use did not give off any fumes or create stuffy air as gas often did.

*Illuminating the Blue Mountains*

While the gas vs. electricity controversy raged in Katoomba, inhabitants of the other Blue Mountain towns were also seeking to obtain the latest source of
friendly fire. After several unsuccessful attempts since 1910, the Blue Mountains Shire Council eventually turned to the Katoomba Electric Company for its electricity, which connected the new power source to Mount Victoria and the central mountain towns from Leura to Woodford in 1918-19. 85 Residents of the lower Blue Mountains meanwhile were incensed at being left in the dark while other smaller centres in the area were illuminated. At Springwood a Lighting Committee was formed in 1917 which tried unsuccessfully for several years to have a system of public lighting installed in the town. 86

In 1923 the Blue Mountains Shire Council purchased the Katoomba Electric Company's electrical works and power lines located within the Shire's boundaries. By now residents and ratepayers throughout the Blue Mountains were clamouring for the wonders of electricity. Electricity from the Katoomba power station was extended to the Blackheath Municipality in 1923 and in October 1924 the 'white light of progress' was also finally switched on at Faulconbridge and Springwood. 87

In 1925, the Katoomba Council purchased the remaining electrical works of the Katoomba Electric Company, municipalising the town's electricity

84 The electricity was generated by a coal-fired power station (initial capacity of 350 kilowatts) located behind the Carrington Hotel. Blue Mountain Echo, 9 July 1915 p.7, 27 August 1915 p.6, 3 September 1915 p.3.  
85 Initially, the electricity was used for street lights and some business and residences in the main roads. Sydney Morning Herald, 29 January 1910 p.13, Reports by J.E. Donoghue, 1914, Listed Archives, Box 12, BMCL, Blue Mountain Echo, 4 December 1914 p.5, S.J. Bentley, "Christmas Swamp": A History of Lawson, Springwood, 1986, pp.52-53.  
86 Springwood Lighting Committee Report, 16 April 1918, Listed Archives, Box 12, BMCL.
generation and supply. Meanwhile, electrical poles and wiring continued to
spring up all over the Blue Mountains. To meet the growth in demand, in
1925 a new and larger power station was built in Katoomba.** Meanwhile, to
the delight of local residents, in June 1929 the 'brilliant splendour' of
electricity was at last extended to Warrimoo, Blaxland and Glenbrook
completing the installation of electricity to all the mountain towns between
Mount Victoria and Glenbrook.***

Before long the brilliant rays of the new white light were also illuminating the
above ground tourist attractions of the Blue Mountains. In 1932 Katoomba
Council installed floodlights at the Three Sisters, Katoomba Falls and
Cascades, and Leura Creek and Cascades.** The *Sydney Morning Herald* was
glowing in its praise of the magical transformation brought by the electric
light, describing the scene at Leura Cascades as follows:

>'Between overhanging trees the sparkling water like molten silver danced
on its way over varied tinted rocks, emerald, amber and brown. Over all
the moon looked down upon a fairyland shut in by massive boulders and
towering cliffs.'**

*'Live Better Electrically'*

Meanwhile throughout the 1930s all the Blue Mountains councils were keenly
promoting the use of electricity - especially for domestic use. This was not

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**Blue Mountain Echo, 24 October 1924 p.6, Bentley, *op. cit.*, pp.52-53.
**The new Katoomba power station commenced operation in 1926 and was initially
fuelled by coal from the re-opened Katoomba coal mine - see Chapter One.
***Blue Mountain Echo, 3 April 1925 p.1, 9 April 1926 p.1, Blue Mountain Star, 15 June
1929 p.4, Sydney Morning Herald, 11 June 1929 p.12, BMHS Files.
merely to exalt the wonders of the new energy source but to reduce the expense to local authorities. To encourage women to use more electricity in the home, councils supplied power to domestic consumers at a cheaper rate and ran advertisements in the local newspaper specifically aimed at the 'lady of the house'. These extolled the many virtues of using electricity around the home, which included saving money, saving time, keeping a happy marriage and making wash days 'happy days' (see Figure 3.2). The Council suggested that no home 'with any pretensions to modernity' should be without electricity.\textsuperscript{102}

During the 1940s, Blue Mountains residents continued to embrace electricity in ever growing numbers. Further outlying areas, including Mount Wilson, were connected to the mains. At the beginning of 1945 the control and administration of electricity throughout the Blue Mountains area was combined and transferred to the newly established Blue Mountains County Council (later absorbed by the Blue Mountains City Council). The new local authority was now responsible for supplying electricity to the 7,000 consumers within its area. In February 1947 the Katoomba power station was put out of commission and from then on the electricity supply for the whole Blue Mountains was provided by the Railways Department (and later by the NSW Electricity Commission).\textsuperscript{103}

\textsuperscript{100} Katoomba Daily, 14 April 1932 p.1, 11 June 1932 p.3, 6 December 1932 p.1.
\textsuperscript{101} Sydney Morning Herald, 5 December 1932 p.9.
\textsuperscript{102} Katoomba Daily, 16 June 1936 p.2. Ads appeared in numerous issues of the Katoomba Daily in the late 1930s - see Figure 3.2. Blue Mountains Echo, 4 July 1939 p.1.
\textsuperscript{103} Blue Mountains Advertiser, 6 July 1945 p.7, 11 January 1946 p.3, 14 February 1947 p.2.
Electricity continued its meteoric rise throughout the following decades. Consumers everywhere were being urged to 'live better electrically' as the number of dynamo-driven appliances multiplied spectacularly. 104 Kerosene lamps and wood-fired stoves generally became a thing of the past except for those who preferred to retain a more rustic existence. Electrification of the railway across the Blue Mountains commenced in late 1956 and the entire line to Lithgow was opened by the end of 1957. 105 By 1971 there were 16,624 electricity consumers in the Blue Mountains served by 609 substations and over 500 miles (800 kms) of both high and low voltage overhead mains. 106 On 1 January 1980, as part of a Statewide reorganisation of electricity distribution, the administration of electricity in the Blue Mountains was transferred from local control to the Prospect County Council. 107

In the modern era friendly fire now mostly flows quietly through wires. Despite its many new and fancy guises, fire remains as it always has, a necessity of life in the Blue Mountains. But fire has not always been friendly in the Blue Mountains. The fire history of the Blue Mountains is also a tale of death and destruction.

The Fire Fiend

The Mountains are as yesterday; fired in all directions' George Evans (1814)\textsuperscript{109}

From its Inception, the European settlement of Australia was confronted with the significance of wildfire. In his very first despatch from Sydney in 1788, Governor Phillip noted:

\textit{In all the country thro' which I have passed I have seldom gone a quarter of a mile without seeing trees which appear to have been destroyed by fire.}\textsuperscript{109}

Since that time the new colonisers of the continent have struggled to cope with a land prone to burn intermittently and persistently. Like everywhere else they encountered, the Blue Mountains was a place where the threat of bushfire remained ever present.

From the moment when Europeans first ventured into the Blue Mountains, bushfires have been recorded in the region. Appendix 1 provides a list of bushfires recorded in the Blue Mountains between 1800 and 1950 compiled during the course of this study.\textsuperscript{110} Though far from complete, these records show that bushfires have been an important and persistent feature of Blue Mountains history.


\textsuperscript{110} Reports of bushfires in the Blue Mountains since 1950 have not been included in Appendix 1 as they are numerous and well documented elsewhere - see Note 4) in Appendix 1.
The Destructive Element

The first bushfire in the Blue Mountains recorded by Europeans was that seen by Barrallier during his expedition into the southern Blue Mountains in December 1802. Barrallier reported seeing 'great volume of smoke' to the west of his position. It was so large he was unsure if it was caused by a volcano or an Aboriginal ignited wildfire.\textsuperscript{111} In 1804, the men who accompanied Caley on his exploration to Mount Banks accidentally started a bushfire. Near Burralow Swamp, one of the party lit a fire which soon got out of control. Caley was astounded at the speed with which the fire took hold which then increased and spread so rapidly that the party were forced to flee the flames. As Caley noted, 'I was afraid of the fire overtaking us; and that if this should happen in the night, we might fall victims to that which we had made'. By doubling back during a brief lull in the fire, Caley and his companions had a narrow escape. As he noted in his journal, they had not long escaped before 'we saw the flames increase with unabated fury at the place we had just left'.\textsuperscript{112}

By nightfall the fire was still burning across the ridges and Caley described the scene as follows:

\textsuperscript{111} Given the 'violent' westerly wind he also experienced that day, this is likely to have been a large bushfire perhaps originally started as an Aboriginal hunting fire. Barrallier, op. cit., p.823.
...the sight looked both awful and grand; every now and then a tree would fall, and sometimes one tree would knock down others, whose noise was equal to that of a great gun.\textsuperscript{113}

The irony of starting a bushfire on Guy Fawkes Day (5 November) was not lost on Caley who was still able to joke that their bonfire was 'superior to all others'.\textsuperscript{114}

After the successful crossing of the Blue Mountains, reports of bushfires in the region become more frequent. On his return journey from his inland exploration in January 1814, Evans found the Blue Mountains had been recently ravaged by fire. He recorded, 'The Mountains have been fired; had we been on them we could not have escaped'. The flames had raged with such violence through the thick underwood that they had 'consumed the foliage from the highest trees'. While surveying the return route over the Mountains, Evans's party became covered in black soot and had their clothes torn by the blackened remnants of the bush.\textsuperscript{115} In the following year, a fire destroyed the 'first depot in the Blue Mountains' situated on Cox's new road.\textsuperscript{116}

Bushfires were frequent enough occurrences in the Blue Mountains to be noticed by many early visitors. In 1823 both Archibald Bell and Allan Cunningham noted signs of recent fire in the vicinity of Mount Tomah.


\textsuperscript{113} \textit{Ibid.}, p.48.

\textsuperscript{114} \textit{Ibid.} p.48.

Cunningham recorded that 'the recent fires' had 'destroyed every kind of vegetation'. William Govett was troubled by bushfire and smoke while surveying on Darling's Causeway in late 1832. He reported that 'the ranges of the mountains have been raging with fires', and wryly observed that 'a man may as well sleep as survey where he cannot see'. In January 1833 bushfires were still raging in the Blue Mountains, with a traveller noting:

'It is a grand and magnificent spectacle to observe the fire spreading itself on the sides and summits of the mountains: on the Blue Mountains, when this was the case, the effect was similar to that caused by a volcano'.

James Backhouse reported bushfires in the lower Blue Mountains in 1835 stating that in some parts of the forest he travelled through 'fire was raging with fury'. In 1836 while approaching Mount York on the return leg of his trip to Bathurst, Darwin passed through 'large tracts of country in flames' with 'volumes of smoke sweeping across the road'.

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116 This is likely to have been a bushfire (or possibly Aboriginal resistance) as three soldiers were subsequently paid £15 compensation. See Government and General Order, 4 November 1815, in Colonial Secretary’s Papers, ML Reel 6038 p.152.
119 H.W. Breton, Excursions in New South Wales, Western Australia and Van Dieman’s Land, During the Years 1830, 1831, 1832 and 1833, London, 1833, pp.291-293.
120 J. Backhouse, 'Account of A Journey from Parramatta Across the Blue Mountains to Wellington, 1835', in Mackaness, op. cit., p.200.
121 C. Darwin, 'Journey Across the Blue Mountains to Bathurst in January, 1836', in Mackaness, op. cit., pp.234-36. The perceptive naturalist also recorded in his journal that 'in the whole country I scarcely saw a place without the marks of fire'.

In 1839 Louisa Meredith also noted the effects of recent severe bushfires on
the Blue Mountains after several years of drought, providing this vivid image
of the burnt eucalypts:

'All bore the marks of fire far up their branches, blackened stems, and in
many places the burning had been so recent, that for miles the very earth
seemed charred, and not even a stunted shrub had sprung up again. The
trees, huge masses of charcoal to all appearance, had no branches till very
near the summit, and these bore only a few scattered tufts of rusty
leaves...'. 122

Droughts occurred in the summers of 1842-43, 1847-48 and 1849-50 and it
is likely that bushfires in the Blue Mountains accompanied them. During
January 1850, bushfires backed by hot winds were 'raging throughout the
country' and a correspondent from Camden reported that a 'halo of bushfires'
was 'discernible in all parts of the horizon'. 123

Although dry weather conditions made the bush more likely to burn,
mountain bushfires were clearly not all naturally ignited. Early travellers over
the mountains often had a reckless attitude to fire if Stanger's account
reflected the norm. While camped on the mountains in 1841, wind blown
sparks from her party's fires 'soon communicated with the bush' across the
road setting it on fire. The travellers were 'amused by seeing it spread and
blaze to a considerable extent'. Stanger then ironically notes that 'It is not

122 L. Meredith, 'A Lady's Journey to Bathurst in 1839', in Mackaness, op. cit., p.243.
123 Sydney Morning Herald, 12 January 1850 pp.2-3, also see 24 December 1875 p.6
for drought records.
unfrequently that in dry seasons the bush takes fire, spreading destruction for miles, burning down everything before it'.

While travelling towards Blackheath in 1846, Mundy also observed 'thousands of acres of thickly-timbered land' on fire, with 'fallen log and flourishing tree, fresh sapling, flower, and shrub and herb all blazing and blackened and smoking'. He suggested this was the 'vast result perhaps of a spark from a stockman's pipe, or the cast-away cigarette end of a thoughtless mail-passenger'. In 1850, the *Sydney Morning Herald* also suggested that the stockman's pipe, bullock-dray fire, fragments of glass bottles strewn throughout the bush or the 'wilful incendiarism of kangaroo-hunting aboriginals' may explain why the bush is 'so frequently exposed to the destructive element'.

Given the cavalier and careless attitude to fire displayed by many travellers, the advent of the Gold Rush in the 1850s must have led to an increase in bushfire occurrence in the region, especially during droughts. Certainly, reports from Bathurst in December 1854 noted that 'extensive bush fires' illuminated the mountains in all directions. Another in January 1858 stated that bushfires could be seen from Bathurst raging at many different points on the horizon.

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124 Hardly surprising if the bush is given some human assistance to 'take fire'! S. Stanger, 'A Journey from Sydney over the Blue Mountains to Bathurst Forty Years Ago', in Mackaness, *op. cit.*, p.260.
Drought reports: 24 December 1875, p.6.
of the railway are limited, most likely due to the then lack of settlement in the region and the fact that bushfires occurred mostly in uncleared, unused and unwanted bushland. Like unfavourable weather, bushfires were mostly viewed as an inconvenience and usually only noted in newspapers of the time when they threatened property and agriculture.\(^{128}\)

While, as Cunningham has noted, there is only a tenuous connection between droughts and bushfire seasons, fires are far more likely to occur under severe dry conditions. Although records are scarce, large bushfires did take place in the Blue Mountains during the early 1860s, specifically in the lower Grose Valley and near Mount Tomah.\(^{128}\) Fire frequency in the region undoubtedly intensified with the building of the railway over the Blue Mountains in 1867-68. Escapes were likely to have occurred from fire used in the construction of the railway and sparks from early steam locomotives were also prone to ignite bushfires.\(^{120}\) The completion of the railway also brought many more people to settle or visit the region and every new settler, tourist or traveller was a potential source of bushfire. Furthermore, because of the increased threat they posed to property and people, the advent of the railway made bushfires

\(^{128}\) C.J. Cunningham, 'Recurring natural fire hazards: A case study of the Blue Mountains, New South Wales, Australia', \textit{Applied Geography}, Vol.4(1), 1984, p.15
\(^{120}\) The extensive logging undertaken to obtain railway sleepers, firewood and construction timber may have contributed to greater flammability of the local vegetation. This is because logging opens the forest canopy allowing more light and air to accelerate the drying of ground litter and humus. P.H. Edwards, 'Historical and Cultural Background to the Fire Problem on the Blue Mountains', \textit{The Living Earth}, Vol.17, No.2-3, 1974, pp.7-9.
in the mountains far more economically and socially significant and therefore newsworthy events.\textsuperscript{131}

Between 1870 and 1874 the Sydney Region enjoyed generally above average rainfall but December 1875 was once more a time of serious bushfires throughout NSW. The \textit{Cumberland Mercury} reported 'great bush fires on the Blue Mountains' that month. The fires were so extensive and the wind so strong that large quantities of ash, smoke and even whole blackened leaves were blown into western Sydney. Many of the leaves were identified as being from tree species which only occurred in the Blue Mountains.\textsuperscript{132}

Drier than average conditions again prevailed throughout New South Wales during the early 1880s and the summer of 1884-85 was a bad bushfire season, particularly in the lower Mountains. In late December a correspondent from Glenbrook reported that bushfires were 'raging all over the mountains, and are doing an amount of damage hardly credible'. Fires burned between Euroka and Erskine Creek, and they were 'still raging' in early January.\textsuperscript{133} Fears were held not only for the hazard to the growing number of tourist properties but also to the threat to the Mountain's scenic attractions. During the 1884-85 bushfires, concern was expressed that the fires would 'somewhat interfere with picnic parties...as some of the loveliest

\textsuperscript{131} The railway also facilitated better communications with Sydney, allowing more detailed reports to reach the city. C.J. Cunningham, 'Fire History of the Blue Mountains', in J. Powell (ed.), \textit{The Improvers' Legacy: Environmental Studies of the Hawkesbury}, Berowa Heights, 1998, p.43.


\textsuperscript{133} \textit{Nepean Times}, 27 December 1884 p.2, 3 January 1885 p.2.
flowers have been destroyed, and some nice shady nooks have been converted into miserable blackened holes'.

In 1888, during the grip of one of the worst droughts on record, the *Sydney Morning Herald* reported on 26 November that Sydney was shrouded in smoke from extensive inland fires. After citing this one article, Cunningham has suggested that these reports 'lend some support to a word of mouth tradition among Blue Mountains firefighters that the 1888 fire swept from Katoomba to Parramatta in a single run'. However, by conducting some basic historical research there is no need to rely on mere oral traditions or speculation. Several records are available which confirm the severity of the November 1888 bushfires in the Blue Mountains.

The fires began early in November 1888 with a correspondent in Bathurst reporting that 'bushfires can be seen on the mountains'. By Tuesday 13 November, several bushfires fanned by a strong westerly duststorm were 'raging on the highlands', the glare at night presenting 'a terrible appearance' to those at Windsor. The next day, the paper reported from Penrith that:

'Bush fires are raging all round the district from Glenbrook right away to Mount Victoria. Several houses had narrow escapes...Most of the country between Camden and Richmond has been burned...The country around is enveloped in smoke'.

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124 *Nepean Times*, 27 December 1884, p.2.
126 These were found by simply searching through other issues of the *Sydney Morning Herald* for the month of November 1888.
128 *Sydney Morning Herald*, 16 November 1888, p.8.
The *Nepean Times* also confirms the extent of the November 1888 bushfires, with a correspondent from Mount Victoria noting that 'bush fires have been raging all round, whilst at Blackheath and Lawson, considerable damage has been done to property'. Thunderstorms brought rain to most districts on 30 November which 'effectively put out the bush fires that had been burning for some time past'.

Although the 1888 bush fires were widespread and reported to have cause 'considerable damage' to property in many areas, amazingly they seem to have missed the few buildings in existence at this time, despite a few 'narrow escapes'. According to newspaper reports, 'nothing beyond grass, fencing, and timber' was destroyed, although bushfires had prevailed 'all through the mountains'. Contemporary responses to the 1888 blazes displayed two opposing attitudes towards bushfires in the Blue Mountains, reinforcing the view of fire as friend and foe. While some people lamented the subsequent scarcity of the mountain flowers and ferns, farming folk, noted that 'the old grass, which contained very little nourishment, will hardly be missed'.

The early 1890s were years of good rainfall in eastern NSW but by 1894 dry conditions had returned and with them once more came bushfire. In

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141 Unless otherwise stated, references to rainfall records and drought years in this chapter are taken from J.C. Foley, *Droughts in Australia: Review of Records From Earliest Years of Settlement to 1955*, Melbourne, 1957.
November bushfires were burning in the gullies below Lawson and near Blackheath but kept away from the settled areas. The frequency of the fires led the local newspaper to blame negligence or even malicious intent by 'sautnerers through the bush' who were either careless or 'wilfully set on fire for the fun of the thing'.

More serious bushfires returned to the mountains in the following Spring. Beginning in late August 1895, the 'fire fiend' blazed near Katoomba, Blackheath, Leura and in the Kanimbla Valley but besides loss of pasture no damage was done. In early September the bushfires increased intensity, and driven by a strong westerly winds, swept up and around the mountain towns bringing the first recorded damage to buildings in the Blue Mountains.

Cottages were burnt to the ground at Mount Victoria and Springwood and the first accommodation house at Jenolan Caves was destroyed. Much damage was also done to fences, fruit trees, pastures and railway sleepers. The 1895 fires were so widespread that the local newspaper commented that it seemed 'from Mount Victoria to Penrith the country was one mass of flame'.

The widespread and dramatic fires of 1888 and 1895 were significant events in Blue Mountains history, which seemed to point to the evolution of a new fire regime for the region by the end of the 19th Century. The likely cause is

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142 This appears to be the first in the line of media commentaries which have since attributed Blue Mountains bushfires to pyromania. *The Mountaineer*, 16 November 1894, p.3.

143 *The Mountaineer*, 30 August 1895, p.3.

144 *The Mountaineer*, 13 September 1895, p.2. It should be noted that Cunningham has wrongly asserted that there was 'no mention' of property damage in the late 19th Century bushfires and the 'first recorded property loss' in the Blue Mountains was in
the ecological changes brought about by the progressive removal of Aboriginal burning and its replacement by European fire use.

It is generally accepted that most Aboriginal fire was of low intensity and applied on a regular enough basis to reduce heavy build-ups of fuel. It is likely that frequent low intensity fires helped to maintain the open grasslands in the Burrarorang, Kanimbla and Hartley Valleys. These new green pastures, which were so admired by the explorers, were in all likelihood part-artefacts of Aboriginal fire. Governor Macquarie noted likely evidence of Aboriginal burning of grasslands in the Cox’s River Valley in 1815. In his Journal, Macquarie wrote 'the grass near our last ground here being all burnt during our absence'.

However, as European settlers moved into the valleys of the region they displaced the original inhabitants and actively discouraged Aboriginal firing of the grasslands and open woodlands. Europeans brought with them a vastly different cultural outlook concerning wildfire. Unlike the Aborigines, who were usually skilled enough to avoid bushfires, Europeans feared fire for the destruction it could wreak to their new 'property' - grass, livestock, fences and buildings. The suppression of Aboriginal burning led to an apparent increase in the growth of shrubs and trees and a greater accumulation of fuel.

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1909! See Cunningham 1998, op. cit., pp.44-45. Cunningham has also overlooked the houses destroyed in 1901 and 1905 - see Appendix 1.
147 In fact, the European efforts to prevent and eliminate Aboriginal fire wherever they could were a major factor in the decline of traditional Aboriginal society during the 19th Century. Nicholson, op. cit., p.65, Blainey, op. cit., p.76.
particularly in the open woodlands of southeast of Australia. This meant that when bushfires did occur they burnt further and more fiercely than before.

Although such changes seem to have occurred in the valleys of the Blue Mountains, it is uncertain if a modified fire regime also applied to the high sandstone plateau areas. Most early accounts give descriptions of the scrubby and bushy vegetation which still exists today on the sandstone ridges. This suggests that overall the sandstone plateau vegetation has not changed significantly since European arrival.\textsuperscript{147} However, a study of Blue Mountains swamps has found that charcoal quantities transported into the highland swamps increased dramatically with European settlement of the region which provides evidence that fire regimes changed significantly at this time.\textsuperscript{148} Furthermore, Barrett has suggested that some plateau areas in the Blue Mountains such as Narrow Neck and Kanangra Walls were used frequently as Aboriginal travel routes and therefore kept open by regular firing.\textsuperscript{149}

Nevertheless, even if the overall vegetation changes were not as widespread on the ridges, a changed fire regime in the valleys is likely to have allowed fire to spread more easily up the slopes to adjacent highland areas.\textsuperscript{150}


\textsuperscript{148} Chalson, op. cit., p.328.

\textsuperscript{149} This maintained an open and grassy landscape which was still partly evident in the early 1890s according to contemporary descriptions. J. Barrett, \textit{Narrow Neck and the Birth of Katoomba}, Glenbrook, 1996, n.p.

The fires of 1895 were also a significant turning point in the attitudes of people in the Blue Mountains. Previously, although bushfire was feared, it was generally viewed as little more than a nuisance, misfortune or even a spectacle. However, after the extent of property damage in 1895, the attitude of Blue Mountains residents to the 'fire fiend' significantly toughened. Words like 'menace', 'evil' and 'fiend' become more commonplace in contemporary descriptions of bushfire.\textsuperscript{181} The reason for this change in attitude in the late 1890s was because increased settlement, particularly the building of new houses, shops and tourist accommodation, created a greater risk to property from bushfires than ever before. Furthermore, the growing reliance on tourism in the region meant that bushfires could seriously threaten the economic base of the mountain towns by disfiguring picturesque sights and locations used for recreation. In 1899 The Mountaineer warned that the fire fiend could result in 'our beauty spots being made blackened gaps' as well as cause discomfort to tourists. The paper stated:

\begin{quote}
'The smoke and the heat are stifling and those who were here to get away from the heat of Sydney did not relish the change. Much of that sort of thing and the Mountains would be ruined'.\textsuperscript{182}
\end{quote}

The changed attitudes towards bushfires by the 1890s is also displayed in the first evidence of major efforts by local volunteers to fight fires. For example, houses threatened at Blackheath in the 1895 fires were only saved after the

\textsuperscript{181} Ibid., p.2. Also see The Mountaineer, 13 September 1895 p.2.
\textsuperscript{182} The Mountaineer, 20 January 1899, p.2.
'timely intervention of a number of willing hands' who beat back the flames after a 'severe battle' lasting several hours.'\[^{155}\]

As had occurred in previous years, people severely affected by bushfires looked for someone to blame. The apparently growing 'evil' had to have a cause which could be identified and stamped out like burning embers. The local Blue Mountains press were convinced that 'nine out of every ten' bushfires were caused by 'ignorance, carelessness or wantonness' and the careless picnicking public were seen as a chief culprit.\[^{154}\]

**The Red Mountains**

>'In a few months they will be red - the Red Mountains. Then we will be in the month of the bushfires' Sydney Mail (1910)\[^{158}\]

In the 20th Century, bushfires intensified in their extent and impact on the lives of Blue Mountains residents, and so did the community response to fire - the all-devouring element. The ever-present reality of the wild and uncontrollable bushfire became one of the defining features of recent Blue Mountains history.

\[^{155}\] At the height of the blaze at Springwood, the church bell was also 'violently rung to summon the able bodied to the rescue' who promptly beat out the flames threatening a number of buildings. *The Mountaineer*, 13 September 1895, p.2.

\[^{154}\] In response, by-laws and regulations were made during the 1890s to restrict the lighting of fires in parks and recreation reserves in the Blue Mountains. Signs were put up ordering that fires be kept to the provided fireplaces and 'extinguished before leaving the spot'. Offenders were subject to a fine of up to £10. *The Mountaineer*, 20 January 1899, p.2, *NSW Government Gazette*, 1893, Vol.3, pp.3598-3599.

Like so many years before and after it, the year of Australia’s Federation was a year of fire in the Blue Mountains. In November 1901, small fires occurred at a number of scenic spots near Katoomba but the worst outbreaks happened in December when in one day bushfires raged in ‘every direction on the mountains’. Cottages, outhouses and stables were burnt at Springwood with one house reduced to ashes in a few minutes. Drought conditions brought the return of severe bushfires to the Blue Mountains in the summer of 1904-05. In December fires burnt near Katoomba, Leura and Wentworth Falls but apart from some narrow escapes there was no loss of life or property. The most serious fire occurred at Medlow Bath which threatened the Hydro Majestic. The fire broke out in the Kanimbla Valley and assisted by a stiff breeze burnt rapidly uphill towards the recently opened luxury sanatorium. The threat was eventually averted after the ‘superhuman efforts’ of the owners, Mr and Mrs Foy, and their fellow firefighters, who included over a hundred men from Blackheath, Katoomba and other centres (promised payment of 2s per hour).

While the Hydro had a lucky escape that summer, the settlers of Megalong Valley were not so fortunate. On New Year’s Day 1905, another fire burning in the Kanimbla Valley spread with lightning like rapidity into neighbouring

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156 Sydney Morning Herald, 30 December 1901, p.8, The Mountaineer, 29 November 1901, p.3, 3 January 1902, p.3. Serious bushfires also occurred at Hazelbrook, Leura, Wentworth Falls and Lawson, where a navvies boarding-house and tents were burnt.
Megalong. Inflamed by hurricane like winds, this now legendary bushfire scorched everything in its path completely destroying at least six houses and a local church, along with all their contents. Woolsheds, stored wool, equipment and fences were also burnt and over 3000 sheep and cattle killed. Water storage tanks were reportedly left 'boiling like great kettles' and even the creeks in the fire's path were said to have boiled dry. According to *The Mountaineer*, by the time the fires were out over 25 square miles (65 square kms) of the once 'beautifully fertile valley' had become a 'blackened ruin', swept clean by the terrible and 'devastating element'. While Megalong burned, bushfires were also raging elsewhere throughout the mountains including at Lawson (where two houses were lost), Mount Victoria, Katoomba Falls, Glenbrook and Kurrajong Heights. In all places, many houses had narrow escapes, while fences, orchards and livestock were lost.  

After such widespread and severe burning throughout the region it was several more years before bushfires returned to the Blue Mountains. In December 1908, bushfires with flames a hundred feet high advanced at 'racehorse speed' at Glenbrook and Wentworth Falls, eventually destroying a cottage, several outhouses and an apiary. In December 1909, bushfires enflamed by hot gales again ignited throughout the Mountains. Considerable

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197 *The Mountaineer*, 9 December 1904 p.4. Although the Hydro itself was narrowly saved, its grounds were ravaged, leaving behind a 'desolation of charred timber'.
199 *Sydney Morning Herald*, 2 January 1905 pp.7-8, *The Mountaineer*, 6 January 1905 p.5. Fires also occurred that summer in the Burragorang Valley and Yerranderie which destroyed buildings and equipment at the Silver Peaks mine and several miners huts.
damage was done to sheds, crops and fencing throughout the Mountains and houses and cottages were burnt down at Hazelbrook and Leura.\textsuperscript{160} 

A series of bushfires occurred in different parts of the Blue Mountains during the following decade (see Appendix 1). Houses were lost at Blackheath and Valley Heights in 1911 while bushfires threatened newly erected cottages at Hazelbrook in 1912. In the summer of 1913 it was Lawson’s turn with many houses threatened with ‘paying their toll in ashes to the all-devouring element’ as the \textit{Blue Mountain Echo} so eloquently put it.\textsuperscript{161} However the bushfires of November 1915 were the most destructive seen in the Blue Mountains up until that date. According to newspaper accounts, the fires raged for weeks from one end of the Mountains to the other, and a total of 16 properties were reduced to ashes in Lawson, Hazelbrook and Wentworth Falls.\textsuperscript{162}

Several major bushfire seasons also occurred in the Blue Mountains during the 1920s (see Appendix 1). A serious outbreak was in December 1923 when fires burnt out of control for a week in the lower Mountains destroying a sawmill at Glenbrook. Three cottages were left in ruins at Faulconbridge and over 30 houses were threatened at Blackheath.\textsuperscript{163} But the summer of 1928-29 was by far the most serious bushfire season of the 1920s which coincided

\textsuperscript{160} 'The melting wax from the beehives reportedly 'ran down the hill in sheets of flame'. \textit{Sydney Morning Herald}, 1 January 1909 p.5.
\textsuperscript{161} \textit{Sydney Morning Herald}, 16 December 1909 p.6, \textit{Blue Mountain Echo}, 18 December 1909 p.3.
\textsuperscript{162} \textit{Sydney Morning Herald}, 13 November 1911 p.9, 18 November 1911 p.17, \textit{Blue Mountain Echo}, 16 February 1912 p.6, 5 December 1913 p.7.
\textsuperscript{163} Many other houses had narrow escapes during the peak of the fire. \textit{Sydney Morning Herald}, 16 November 1915 p.8, \textit{Blue Mountain Echo}, 19 November 1915 p.3, Cunningham 1984, \textit{op. cit.}, p.16.
with one of the driest periods on record in the Sydney region. In October 1928 bushfires broke out at various points on the Blue Mountains. Five houses were destroyed at Woodford and the smoke and flames caused havoc on the roads. By early January 1929 bushfires backed by the inevitable strong westerly winds were raging all over the Blue Mountains region, including in the Hartley and Jamison Valleys and around the Wollondilly River near Jenolan Caves. A late change in wind direction saved several mountain towns from more serious consequences, however another house was burnt down at Katoomba before the summer was over.\footnote{Blue Mountain Echo, 17 November 1922 pp.5,9, 29 December 1922 p.1, 5 January 1923 p.8, 14 December 1923 pp.3,7.}

In the years between 1930 and 1934 generally good rainfall ensured that only isolated outbreaks of bushfires occurred in the Blue Mountains. However, beginning in 1935 an extensive drought period occurred which dried out the regrowth and again brought severe and regular bushfires to the Blue Mountains over the following decade. In November 1935 fires completely surrounded Woodford and the town was saved largely due to the intervention of over 100 firemen from all over NSW who happened to be staying in Katoomba at the time.\footnote{In an astonishing quirk of fate the owner of the house, Mr. J. Rance, was fighting bushfires elsewhere in Katoomba at the time, while his wife and three children were viewing bushfires from Echo Point. Sydney Morning Herald, 8 October 1928 p.11, 9 October 1928 p.11, Blue Mountain Echo, 18 December 1928 p.2, Blue Mountain Star, 2 February 1929 p.1.}

However the fires of November 1936 set a new record in property damage in the Blue Mountains, destroying over 30 houses and cottages in the area. In \footnote{In the end only one cottage was lost. Daily Telegraph, 23 November 1935 p.5.}
early November, fires which had been burning for some time in bushland adjacent to the mountain towns, menaced Springwood on three sides. The threat was eventually checked by a large band of firefighters, two of whom were injured. On 6 November the onset of intense westerly winds fanned the fires into new life and sent them sweeping across ten miles of country between Faulconbridge and Glenbrook leaving a trail of burnt homes and homeless people. The fire first hit Valley Heights but most damage was caused in Glenbrook and Warimoo where 27 houses were destroyed. At 10 am flames described as up to 100 feet high leapt up from the gullies behind Glenbrook. The fire flamed burnt through the town consuming everything in its path and leaving behind what the *Sydney Morning Herald* described as 'a blackened waste' with burnt homes 'scattered among ruined gardens, gaunt burnt trees and still smouldering fences'. Bushfires also occurred that same week near Katoomba and Wentworth Falls (where two cottages were lost and over 30 others endangered), while other fires swept out from the Grose Valley to Kurrajong Heights and Bilpin destroying houses.\textsuperscript{167}

Although not as extensive as the fires of 1936, bushfire again plagued parts of the Blue Mountains in the summer of 1938-39 destroying cottages at Hazelbrook, Wentworth Falls and Katoomba. However, in the hot, dry summer of 1939-40 when much of NSW was enveloped in major bushfires for once the Blue Mountains was spared from any serious bushfires. This was because the

widespread fires of 1936 had extensively removed the available bushland fuel - a point not lost on firefighting authorities.\textsuperscript{168}

Even so, like those which had preceded it, the 1940s proved to be another decade of fire in the Blue Mountains. Severe drought conditions affected most of NSW throughout the early 1940s in January 1942 fires occurred on a wide front throughout the Blue Mountains keeping local brigades busy for several days at numerous outbreaks. Two buildings were lost at Wentworth Falls and minor damage occurred at Govett's Leap kiosk.\textsuperscript{169} However the fire fiend returned with renewed vigour in the summer of 1944-45 which yet again set a new record in devastation in the area. The first fires of the season broke out near Glenbrook in early November 1944 and threatened the Lapstone Hotel before being brought under control. A week later a series of new outbreaks occurred at Lawson, Bullaburra, Springwood and Linden. A timely thunderstorm helped check the flames but the fires continued to burn in the valleys for several days. Newspapers reported that most mountain towns were ringed with fire and covered in dense smoke.\textsuperscript{170}

On Friday 17 November 1944 the fires at last took their toll. Sweeping up from Wilson's Glen, a fierce bushfire caught firefighters offguard and raced through Woodford completely destroying 22 houses in under two hours. Most occupants had only moments to flee and then could do nothing but seek

\textsuperscript{169} Blue Mountains Advertiser, 9 January 1942 pp.1,4, Sydney Morning Herald, 1 April 1940 p.10, 7 November 1940 p.9, 22 October 1941 p.12.
shelter or stand by helplessly watching as the massive flames fanned by a strong westerly leapt from house to house. Throughout that long, hot day large bushfires also blazed at several other locations between Blackheath and Glenbrook. Telephone and telegraph communications between Sydney and western NSW were disrupted and the power cut off, leaving the Blue Mountains that night in a darkness broken only by the red glow of the still burning fires.171

Over the following few days the fire fiend smouldered in the Jamison and Grose Valleys and the *Sydney Morning Herald* prophetically observed that there was still plenty of dry unburnt scrub and 'more hot westerly winds might bring further dangers'.172 In December 1944 the bushfires again blazed fiercely for several days throughout the Blue Mountains. A total of seven cottages and houses were lost in this outbreak along with a dairy, store and timber mill. Again the fires burnt large numbers of telegraph and electricity poles, blocking the railway and once more causing a complete blackout throughout the Blue Mountains. Unfortunately the New Year of 1945 brought no cheer or relief. On New Year's Day, another raced up the cliffs into Leura. While residents ran for their lives the fire fiend destroyed a further eight houses.173

170 *Sydney Morning Herald*, 6 November 1944 p.4, 14 November 1944 p.4, 15 November 1944 p.4, 16 November 1944 p.3.
173 *Sydney Morning Herald*, 11 December 1944 pp.1,4, 2 January 1945 p.3.
The end of World War II brought a brief respite from the 'red terror'. However, the 1950s proved to be the most pivotal decade in the ongoing saga of bushfire in the Blue Mountains.

*Bushfires 1950 - 1988*

'...unless strict vigilance is kept by the public in these times times of fire precaution, the fire fiend will surely leave a trail of disaster in this district that will probably be without equal.' Blue Mountains Echo (1928)*\(^{174}\)

The bushfires of the 1950s were a defining moment in both Blue Mountains and Australian history. Their repercussions were felt throughout the nation and the events of 1951-52 and especially 1957 became seared into popular memory.

For the Blue Mountains the decade got off to a bad start. In November 1951 bushfires ignited across NSW and burned virtually non-stop over the following months, especially in the Blue Mountains where they were closely shadowed by firefighters. The worst single day for the Blue Mountains came on 'Black Thursday', 6 December 1951 when a large fire whipped up by a hot, westerly gale burnt from Springwood through Valley Heights, Warrimoo, Blaxland to Glenbrook. A total of 64 homes were destroyed along with Warrimoo railway station, several vehicles and miles of telephone wires and fencing. Hundreds of other properties were scorched or damaged. Once again a new decade had brought a new record in property damage in the Blue Mountains.

Furthermore, the fire fiend claimed its first reported Blue Mountains victim
when an 80 year old woman died while fleeing the flames at Springwood. A particularly fierce fire also menaced Blackheath on 3 February 1952 eventually burning down five houses on the town’s southern outskirts.

Newspaper reports confirm that bushfires also occurred in the Blue Mountains in the later months of 1952, 1953, 1955 and 1956. Because these fires were smaller and less destructive they have been mostly forgotten or ignored in previous historical accounts of Blue Mountains bushfires creating a distorted view of the fires of the fifties. Nevertheless, those that did occur during the mid 1950s were clearly insufficient to reduce the steadily accumulating bushland fuel and as the years passed both fuel loads and complacency grew.

Then came 1957. For the Blue Mountains this was a year of fire, death and destruction. The year began badly and steadily got worse. Even as the new year turned, bushfires were burning in the lower Mountains near Springwood after having plagued various parts of the Blue Mountains throughout late 1956. On 15 January 1957 a bushfire which started at the municipal garbage tip raged from North Katoomba to Wentworth Falls destroying four houses. After a brief respite over winter the fire flared returned to the Blue Mountains in the following spring. In October bushfires driven by strong winds appeared.

174 Blue Mountains Echo, 18 December 1928 p.1.
176 This fire was reportedly so severe that it threatened to engulf the town ‘nearly every man, woman and child in the town battled to hold it back’ using anything they could lay their hands on. Sydney Morning Herald, 4 February 1952 p.1.
177 See various issues of the Sydney Morning Herald for these summers. The same distorted view of bushfire occurrence equally applies to the 1960s, 1970s and 1980s.
at Mount Victoria, Lawson and Wentworth Falls where a cottage was destroyed. It was the beginning of a long, hot and tragic summer.\footnote{Blue Mountains Courier, 17 January 1957 pp.3, 5, 19 September 1957 p.5, 3 October 1957 p.1.}

All through November 1957 the fire fiend continued its rampage throughout the mountains destroying around 20 houses. For week after week mountain firefighters and residents raced from one outbreak to another constantly striving to prevent further damage from the fires which seem to spring up everywhere in the dry bush. On the last day of the month tragedy struck, when a group of young bushwalkers became trapped by a bushfire in the Grose Valley and four boys were killed attempting to escape the flames.\footnote{Blue Mountains Courier, 17 January 1957 pp.3, 5, 19 September 1957 p.5, 3 October 1957 p.1.}

And then came the single worst day in the entire history of bushfire in the Blue Mountains - Monday 2 December 1957. During the oppressive midday heat, a fire started in or near the North Katoomba tip and backed by a gale force westerly wind soon became a raging inferno. The bushfire split in two - one arm headed east towards Wentworth Falls, the other headed southeast to Leura. Firefighters were rushed to the scene but only had time to order an evacuation of the entire area as the fire jumped the highway and railway and swept through Leura's main street, The Mall, destroying everything in its path. Over 170 buildings including homes, shops, churches and schools were completely destroyed and many others severely damaged. Some houses reportedly exploded in flames, while many more were burnt after flying embers entered open windows and doors setting the buildings on fire. The fire
continued on to Wentworth Falls where it linked up with the other arm and destroyed a further 28 buildings before eventually dying out in a previously burnt out area. It was the most devastating bushfire in NSW's history, although miraculously no one was killed.\textsuperscript{180}

After such widespread and severe bushfires it took another decade of mostly good rains and steady fuel build up before the Blue Mountains next became seriously engulfed in fire. The next major bushfire season was the summer of 1968-69. The first fires began in October 1968 and local brigades battled almost non-stop to keep them under control for several weeks, but not before they claimed the lives of three local firefighters at North Springwood on 29 October.\textsuperscript{181}

After several days of hot weather and low humidity, in the morning of 28 November a bushfire fanned by strong northwest winds leapt out of the Grose Valley near Faulconbridge. It jumped the highway and railway before rapidly sweeping through the southern outskirts of Springwood, Valley Heights, Warrimoo, Blaxland, Glenbrook to Emu Plains. The huge 'tornado-like' flames and flying embers destroyed 123 buildings mostly homes, as well as the Blaxland shopping centre, garages and cars. Two men died and hundreds of


\textsuperscript{180} Sydney Morning Herald, 3 December 1957 p.1, Blue Mountains Courier, 5 December 1957 p.1.

residents were evacuated (see Figure 3.3). Yet again another decade had brought a seemingly inevitable bushfire disaster to the Blue Mountains.

The 1970s proved to be no different. After almost another decade, major bushfires reappeared in the Blue Mountains in the summer of 1976-77, the most serious of which were on the lower Grose River and near Mount Hay where over 65,000 hectares were burnt. However, the most devastating fires of the decade came in December 1977. On 16 December two bushfires broke out near Bullaburra and on Kings Tableland. Fanned by strong westerly winds the blazes spread through the bush gullies to Lawson, Hazelbrook, Woodford, Linden and then on to Faulconbridge and Springwood. 48 houses were destroyed, a further 30 damaged and a 15 year old girl was killed when her home in Lawson was engulfed by fire. The fires combined and continued to menace the lower Mountains for several days, at one point surrounding Springwood and threatening hundreds of homes. However the efforts of hundreds of firefighters brought the inferno under control but only after another two houses were burnt down. In an eerie reminder of the bushfires a century before, during the 1977 fires some of the suburbs of Sydney were showered in blackened leaves from the mountain blazes.155

Between 1978 and 1988 only two serious bushfires occurred in the Blue Mountains. In December 1979 bushfires blazed in the Grose Valley across a 10 kilometre front. Six homes were destroyed at Mount Tomah and one at Bell and a total area over 90,000 hectares was burnt. In late November 1982 another Grose Valley fire posed a serious threat to the Blue Mountains towns before being controlled. It burnt over 50,000 hectares and claimed the life of an American bushwalker but no serious property damage resulted.  

In every decade of the 20th Century major bushfires have swept the Blue Mountains. However a certain mythology has grown up surrounding Blue Mountains bushfire history which focusses almost exclusively on the big fire disasters of 1905, 1915, 1929 (often wrongly stated as 1926), 1936, 1944-45, 1951-52, 1957, 1968 and 1977. This over-emphasis on the major destructive fires may be a natural response to disaster but it has helped to obscure and prevent public recognition of the many lesser bushfires which have also occurred since the turn of the 20th Century. The significance of bushfire in Blue Mountains history is not solely restricted to those fire events which have killed people and destroyed homes. Although major bushfires have occurred on average about once every 7 to 10 years, a detailed fire history of the Blue Mountains (see Appendix 1) confirms that bushfire in the Blue Mountains is far more conspicuous by its presence than its absence. The ever presence of bushfire is reflected in the way people in the mountains have responded to the fire flend.

Fighting Fire

Beaters to Brigades

The prevalence of bushfire throughout the history of the Blue Mountains has meant that in one way or another the whole community has been involved in dealing with the bushfire threat. Throughout the 20th Century, many Blue Mountains residents (men, women and children) have been directly involved in fighting bushfires, willingly volunteering to fight the fire fiend in order to save both their own and their neighbours' homes. In fact on several occasions (including in 1929, 1957 and 1968) local residents were elsewhere in the Blue Mountains fighting bushfires while their own homes were being destroyed by the flames.185

A truism often clearly evident during bushfire emergencies in the Blue Mountains was that tragedies bring out the best in people. When bushfires threatened the mountain towns, those joining the fight came from all walks of life. Everyone from bank managers to bricklayers, police to postal workers, hairdressers to housewives, stopped work or left their homes to battle the fire fiend. Residents also made their private vehicles available to transport firefighters and equipment, provided shelter and food to people who had lost their homes, and provided refreshments and other support to the firefighters.

December 1982, Local Studies files, BMCL.

185 By the 1970s it was recognized that residents (who were not members of a brigade) could actually do more to prevent or restrict property damage if they stayed and helped defend their own properties during severe bushfire threats. See Luke, op. cit., p.4.
Often during extreme emergencies (such as in 1936, 1951 and 1957) local churches rang their bells to summon every available person and businesses closed their doors to allow their staff to take part. Nor was fighting fire merely man’s work. Throughout the century local women played an important role keeping the firefighters supplied with food and drink and assisting with communications and surveillance of fires. However, women were frequently in the frontline as well, beating the flames side by side with the men or keeping watch with buckets of waters and green bushes to put out any small fires started by flying embers. In fact in 1936 one male firefighter observed how the woman next to him ‘worked as hard as any man’ and ‘drank her beer when it came round too’.

Battling bushfires was usually tough and dangerous work (see Figure 3.4). When fighting the flames, strong winds were prone to change the direction of the fire erratically and sometimes drive the firefront onto the firefighters. Firefighters also had to endure tremendous heat and the suffocating effects of smoke and dust. To counter the effects of smoke and dust it became common practice to mask the face with a scarf or other piece of material. Even so, injuries to firefighters were common, especially from smoke inhalation, cuts and burns. Many mountain firefighters also suffered extreme exhaustion after

136 Sydney Morning Herald, 13 November 1911 p.9, Blue Mountain Echo, 17 November 1911, p.5, 16 February 1912 p.6, 5 December 1913 p.7, Katoomba Daily, 13 November 1936 p.1. As well as helping to defend their homes, from the 1960s onwards women have also served as volunteer firefighters in local bushfire brigades.
fighting bushfires non-stop for days or weeks or end with inadequate food and sleep.\textsuperscript{187}

After every major fire of the century, newspapers praised the courage and tenacity of the mountain firefighters, acknowledging that without their strenuous efforts loss of life and property would have been much higher. By the 1930s the Blue Mountains bushfire fighter was being lauded as an Australian hero whose bravery and unselfishness deserved the Victoria Cross.\textsuperscript{188} Not surprisingly, this tendency intensified during World War II when the battle against the 'red peril' was seen as of equal national importance to that being waged against the 'yellow peril' to the north.\textsuperscript{189}

The firefighting equipment used in the Blue Mountains became increasingly sophisticated as the 20th Century progressed. In the years prior to 1940, attempts to limit the ravages of the fire fiend were greatly constrained by the primitive firefighting equipment and methods used. According to one local firefighter, hand tools such as axes, rakes and hoes were the most effective weapons against bushfires but early mountain firefighters also made use of buckets of water, wet bags, sacks and blankets, green tree branches and 'anything we could use to hit the flames'. As well as battling the flames, hand tools were also used to make hasty firebreaks by scraping away vegetation in the line of the fire. Some settlers in Megalong Valley even found that

\textsuperscript{187} \textit{Sydney Morning Herald}, 13 November, 1911, p.9, O'Reilly, \textit{op. cit.}, pp.61-62. 
\textsuperscript{188} \textit{Sydney Morning Herald}, 7 November 1936 p.17. 
\textsuperscript{189} \textit{Blue Mountains Advertiser}, 9 January 1942 p.1, 1 December 1944 p.6.
repeatedly driving a mob of livestock over the same patch of ground would create a useful bare earth firebreak.  

Following the disastrous fires of 1944-45 the effectiveness of firefighting methods employed in NSW was seriously questioned. The continuing widespread use of bucket-brigades, beaters, rakes and green bushes to fight bushfires was described by the press as 'painfully primitive', 'futile' and 'amateurish'. The war had clearly hampered the fight against the fire fiend by severely restricting imports of the latest firefighting equipment from overseas. Recognizing that the quantity and quality of firefighting equipment needed to be greatly improved, after 1945 NSW fire authorities obtained and distributed new equipment such as specialised fire trucks, powerful pumps and portable knapsack spray units to local councils on a cost-sharing basis. Mountain residents were also urged to donate funds so that the local brigades could buy additional new firefighting equipment. Nevertheless, during the early 1950s the acquisition of modern firefighting equipment was largely a piecemeal affair and contemporary fire-fighting methods were described in State Parliament as not advancing much beyond the bow-and-arrow stage. Many volunteer bushfire brigades in the Blue Mountains and elsewhere remained seriously under-resourced.

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The destruction of Leura in 1957 dramatically changed the situation.

Firefighting equipment in the Blue Mountains had proven woefully inadequate during the 1957 fires with insufficient water tankers and hoses available. A few weeks after, the local council was severely criticised at a public meeting for failing to provide adequate firefighting resources, which according to one resident had 'left Leura to be eaten up by fire'. In the aftermath of the disaster the State Government allocated large sums of money which allowed the local bushfire brigades to be better equipped with modern water tankers, portable pumps and knapsack sprays. Radio communications were also later greatly extended in the following years. During the early 1960s all bushfire brigade tankers were progressively equipped with radios and walkie-talkies. During the 1960s the Water Board also erected fire spotting towers in the Blue Mountains (including one at the end of Narrow Neck) which were staffed continuously throughout the summer bushfire season.

The rugged nature of the Blue Mountains often also placed restrictions on the use of water tankers which could not be taken into steep gullies or other difficult terrain. To help overcome this problem, helicopters were used throughout the 1960s and 1970s in the Blue Mountains to fly in teams of firefighters to remote locations as well as monitor fire progress. For instance, during the major fires of 1977 and 1979, helicopters from the RAAF, Army

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and National Parks and Wildlife Service were used extensively for reconnaissance, mapping and to bring in reinforcements, food and equipment to fire fighters. By the 1980s, use of helicopters for fire suppression in remote areas had become standard procedure for firefighting in isolated locations such as the Kanangra-Boyd National Park. Helicopters and light aircraft were also used on occasion to water bomb bushfires in the Blue Mountains.

The progressive development of better firefighting equipment during the 20th Century was mirrored by the development of better organisation of firefighting efforts. As the century progressed a more professional approach was applied to tackling the fire fiend. It is not known when the first bushfire brigades were established on the Blue Mountains as apparently no records have survived. A suggestion to form local bushfire brigades was made in 1901 when the Mountaineer argued for the establishment of an organised volunteer bushfire brigade at Katoomba with the installation of fire bells at Katoomba and Leura Falls. The first organised groups of volunteer firefighters in the region were apparently set up around 1904-1905 by the trustees and rangers of the mountain scenic reserves.

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197 The Mountaineer, 29 November 1901, p.3.
198 The Mountaineer, 9 December 1904 p.4, 10 November 1905 p.5.
According to Searle, volunteer bushfire brigades were formed at Megalong, Mount Victoria and Bullaburra in 1908-1910. In response to the extensive fires of 1915 more bushfire brigades were apparently set up in the Blue Mountains during the 1920s. For example, in 1920 the Blue Mountains Shire Council asked its engineer to report on a practical scheme for organising volunteer firefighting in the area. In 1923 a public meeting at Woodford also resolved to establish a local bushfire brigade but little is known of its fate.\(^{199}\)

It seems that prior to the 1940s the local bushfire brigades which existed in the Blue Mountains were only sporadically maintained. Even so, better coordination of firefighting efforts in the Blue Mountains was being achieved by the 1930s due to the increasing involvement of experienced firefighting personnel from Sydney.\(^{200}\) After the disastrous summer of 1944-45 a lack of coordination was identified as one of the main problems experienced during the firefighting in the Blue Mountains, particularly when several outbreaks occurred simultaneously at widely separated places. Another major concern was the problem of demarcation between the official Blue Mountains fire district, which encompassed the towns and was the responsibility of the main fire brigades, and the adjacent bushlands, which were largely vacant Crown land and left to the ill-equipped local councils and volunteer bushfire brigades.\(^{201}\) Following a survey of the Blue Mountains area by the Chief Fire Officer from Sydney, a public meeting was held at Katoomba in 1945 at which


It was agreed that more local volunteer bushfire brigades would be formed and coordinated as one unit. Prompted by appeals that 'fighting bush fires was everybody's business', within weeks over 100 local volunteers had signed up to fight fires.\(^{202}\)

However, organisational problems continued to impact on firefighting in the Blue Mountains during the 1950s. In State Parliament it was claimed that utter confusion had occurred during the 1951-52 bushfires when Blue Mountains firefighters were given conflicting orders from different authorities, including those brought in from Sydney. The dual control of mountain firefighting - different organisations responsible for urban and rural areas - was clearly proving inefficient and unworkable in practice. At a conference of local fire authorities in Katoomba in July 1952 it was agreed that the Blue Mountains area would be brought entirely under the central control of the Board of Fire Commissioners, which promised to provide new equipment and additional hose-box points, reorganise the bushfire brigades and set up new fire stations at Glenbrook, Springwood and Blackheath. Although the Blue Mountains City Council was only too happy to hand over all fire control responsibilities to the Board, many local bushfire brigades were uneasy and resentful about the new arrangements which made them now subservient to

\(^{202}\) The brigades were assisted by administrative committees, including a 'ladies committee' which raised funds for the purchase of firefighting equipment. Blue Mountains Advertiser, 26 October 1945 p.8, 30 November 1945 p.1.
the urban based Board. Effectively made redundant, many bushfire brigades in the Blue Mountains were subsequently disbanded.\textsuperscript{203}

The new arrangements proved to be a big mistake and disputes over firefighting responsibility continued. While these disagreements were largely put aside during the 1957 bushfires, the editor of the \textit{Blue Mountains Courier} suggested that the disastrous events of that year should force the Board of Fire Commissioners and the Blue Mountains City Council to 'resolve their differences and get on with the work of preventing, as well as fighting fires'.\textsuperscript{204}

Having been burnt before on the issue of control, local Blue Mountains representatives led by the Mayor insisted on and obtained local control when the new Blue Mountains Fire Prevention Association was established in 1958. A local fire expert was also appointed to head the new body, with the Mayor noting that 'we have a fire problem that is peculiar to these Mountains' and decision making should therefore not be made by 'someone in Sydney'. Under the new scheme responsibility for firefighting in the areas with water reticulation remained with the Board of Fire Commissioners while all other areas were now controlled by the volunteer bushfire brigades.\textsuperscript{205}

Around 11 volunteer bushfire brigades were re-established in the Blue Mountains towns in the following months and by 1959 it was claimed that the Blue Mountains had the best bushfire protection, on a per capita basis, of any


\textsuperscript{204} \textit{Blue Mountains Courier}, 5 December 1957 p.1.
area in NSW. According to the local press, an important ingredient was the new spirit of cooperation between the various fire fighting authorities which had replaced the 'differences of opinion and squabbling of the past'.\textsuperscript{200} Since 1960 better organisation and coordination of firefighting efforts has generally taken place in the Blue Mountains. Fire authorities have worked well together during bushfires and each land management body (such as the Forestry Commission, National Parks and Wildlife Service, Water Board) has taken more clear responsibility for fire protection in the area under its jurisdiction. By 1988 the total number of bushfire brigades in the Blue Mountains region had reached 23, comprising over 900 volunteer firefighters.\textsuperscript{207}

\textit{Pyro Propoganda}

People can both cause fire and prevent it. Whether from cigarettes or camp fires, broken glass or burning off, locomotives or louts, pyromania or population growth, the undisputed fact is that the vast majority of Blue Mountains bushfires have been ignited by humans. The only means available to reduce the incidence of human ignitions has been through developing a greater community awareness of the bushfire hazard. Preventing bushfires

\textsuperscript{200} Both groups of firefighters would also now help each other more in times of need. Blue Mountains Courier, 18 September 1958 p.1.
has therefore remained as important as fighting them, and prevention is best achieved through publicity and fire education campaigns.

The earliest publicity of bushfire prevention in the Blue Mountains was contained in the local newspapers. Editorialists and correspondents consistently warning against careless use of fire and urged residents to clear away all dead brushwood and trees which were a 'constant source of danger to the community'. Since the 1930s State bushfire authorities have also distributed numerous publicity materials promoting bushfire prevention. For example, lengthy fire prevention articles appeared in the Katoomba Daily as early as December 1937. They urged 'every thinking citizen' in the mountains to adopt the slogan 'Put Out That Fire'.

As to be expected the bushfire prevention propaganda also took on a rather militaristic tone during the 1940s. Bushfire became the enemy within - the 'fire demon' who stops at nothing and lurks 'in valley and ridge' waiting to ambush those careless with fire. Preventing bushfires was promoted by the local Blue Mountains papers as an essential part of the war effort, because bushfires caused by negligence were 'every whit as dangerous as one actually lit be enemy hands'. Confirming the military tone of anti-bushfire propaganda,

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208 Quote from Blue Mountain Echo, 18 December 1909 p.3. For other early examples see The Mountaineer, 6 January 1905 p.5, 20 January 1905 p.3, 10 November 1905 p.5.
209 Katoomba Daily, 23 December 1937 p.6, 20 December 1938 p.4.
in 1944 the Bushfire Advisory Committee entitled its annual fire prevention campaign 'The Battle of the Bush'.

Since World War II a continuous stream of publicity material has been circulated to the media and local councils in the Blue Mountains. These included posters, booklets, stickers and a film called 'The Red Terror'. An annual 'Fire Prevention Week' was inaugurated in 1946. The Bushfire Advisory Committee also began publishing the *Bush Fire Bulletin* in 1951 which was distributed throughout the State particularly to bushfire brigades. Since the 1960s, publicity campaigns have tended to focus more on what Blue Mountains residents could do to reduce fire hazards, as it was realised that many houses were still being lost during bushfires because undergrowth and inflammable materials were not removed by householders. In the 1980s the local council commissioned a new strategy for community education to improve bushfires awareness and preparedness amongst Blue Mountains residents. Under the theme of 'Prepare, Protect & Survive', new publicity materials such as pamphlets and booklets were developed by the council and distributed to mountain residents.

A persistent problem with all bushfire prevention campaigns has been the complacency caused by the absence of bushfire. Prevention works best if people are reminded of the hazard just prior to the annual bushfire season.

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However, the fire history of the Blue Mountains shows that as the time since
the last major bushfire grows, so usually does complacency and apathy.
Remembering the past is therefore a key ingredient in preventing the
reappearance of the fire fiend.\textsuperscript{213}

\textit{Fighting Fire with Water}

One of the most important weapons against the element of fire has always
been the element of water. In the early part of the century, water for fighting
bushfires in the Blue Mountains was only available from local creeks and
swamps, or wells and tanks used for household supplies. If there was time
before the bushfire struck, early mountain firefighters doused their houses
and then filled every available water container before positioning at strategic
points around buildings to wet any parts of the building which caught fire.
When whole towns were threatened, often every inhabitant joined a bucket-
brigade which drew on every available source of water in the vicinity. Even
with such basic methods, water was still the saviour of many properties. For
example, during the 1915 bushfires a house at Lawson was only saved after a
firefighter burst open several thousand gallon tanks of water with his axe
which reduced the flames enough to save the house.\textsuperscript{214}

However, throughout the 20th Century firefighting efforts in the Blue
Mountains were greatly hindered by the want of water (see Chapter Two).

\textsuperscript{213} Local Studies Files, BMCL.
There was simply never enough water when it was needed. The fact that bushfires mostly occur during drought periods only accentuated the problem. For example, during the 1936 fires, a lack of piped water supply in the lower Blue Mountains meant that firefighters had to rely mostly on water from tanks, wells and Glenbrook lagoon to fight fires.215

By the 1940s the situation had improved somewhat as reticulated water supplies were increasingly established throughout the urban areas of the Blue Mountains. Certainly many more houses would have been destroyed in the fires of 1944-45 if not for the hose-box points that had been recently set up in many of the mountain towns. However, in several mountain towns (including Faulconbridge and Leura) the reservoirs were pumped dry by firefighters, which left them with no option but to resort once more to manual means of checking the flames.216

Although incremental improvements were made to the water supply, lack of water continued to seriously hamper firefighting in the Blue Mountains during the following decades despite the advent of new equipment such as water tankers, pumps and knapsack sprays. For example, during the bushfires of both 1951-52 and 1957 the drain on the water supply for firefighting lowered the water pressure so much that only a trickle could be obtained through

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hoses which ultimately made no impression on the flames. The problems of inadequate water and lack of water pressure resurfaced once again during the 1968 and 1977 bushfires. In 1968, the supply was so over-stretched that water reportedly ran 'at only a trickle in some areas' and according to one local firefighter many more homes may have been saved 'if we only had a better water supply'. The same series of events took place during the height of the 1977 bushfires when once again high simultaneous water usage led to a lack of water pressure in many areas. Following the 1977 bushfires, the water supply problem in the Blue Mountains was raised in State Parliament where it was claimed that the lack of water pressure in the lower Blue Mountains had hampered the efforts of residents to protect their homes. The Blue Mountains water supply problem was greatly reduced in the 1980s after the connection of the Blue Mountains to the Sydney water supply system (see Chapter Two).

Despite the lack of water, better organisation and equipment, along with increased fire prevention publicity appears to have brought tangible benefits since 1970. For example, although the 1977 bushfires were more severe than those in 1968, less property damage occurred which mountain residents attributed to the better organisation of the area's defences. Certainly overall there was less loss of life and property damage in the fires of 1977, 1979 and

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220 Sydney Morning Herald, 19 December, 1977 p.3.
1982 compared with previous bushfire seasons. However, it appears there were other factors involved.

**Fighting Fire with Fire**

In addition to all the advances in firefighting technology and organisation throughout the 20th Century, increasingly it was found that fire itself was perhaps the most effective firefighting tool of all. Firefighters everywhere have learnt that oncoming wildfires could often be starved of fuel by lighting counter fires or backburns. These 'friendly fires' effectively protected property by creating firebreaks which stopped or diverted the progress of a bushfire. Although using fire itself to combat bushfires had been learnt from the earliest days of settlement, its systematic use in the Blue Mountains appears to have begun with the severe bushfires of 1904-05 when several buildings were narrowly saved by pitting fire against fire.\(^\text{221}\)

In every major bushfire of the century, firebreaks were routinely used in the Blue Mountains to cut off the advancing bushfire and where possible control its spread. Often nothing could be done to actually halt the main fire front so instead firefighters concentrated on burning breaks around properties. For example, in 1911 several cottages in the Blue Mountains were just saved from destruction because at the critical moment 'a break was burnt and the fire stayed'. Burning firebreaks greatly restricted property damage during the severe bushfires of 1915. This use of friendly fire to fight the fire fiend was

\(^{221}\) _The Mountaineer_, 9 December 1904 p.4.
described by the *Sydney Morning Herald* as 'the most primitive of fire-fighting appliances'. By the 1930s burning off vegetation in the path of the bushfire had become one of the main weapons used to protect property. All through the summers of 1936, 1944-45, 1951 and 1957 friendly fire was used successfully to save threatened buildings in the Blue Mountains. A member of the Blaxland bushfire brigade recalled that fighting fire with fire was a 'sound policy based on accumulated experience of past fires'.

In the 1970s and 1980s increased mobility allowed more aggressive fire tactics to be employed against the fire fiend. Rather than just defend hot spots where fires threatened properties, backburning was now implemented more quickly during outbreaks to contain the wildfire within set perimeters. Using strategically placed roads and fire trails, firefighters would attempt to surround the bushfire with other fires by backburning, generally during the cooler night time conditions. Backburning was particularly successful in restricting bushfire damage in 1979 and especially in 1982, when the longest ever backburn undertaken in one night in the Blue Mountains was conducted by firefighters. Known as 'Operation Black Line', this backburn utilised

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existing fire trails, roads and natural barriers to form an extensive 40 km fire break stretching along the northern boundaries of the Blue Mountains towns from Springwood to Blackheath which was successful in preventing any urban property damage during the 1982 fires.  

However, although fire can be a wonderful servant it can also be an awful master. Throughout Blue Mountains history backburning remained a highly unpredictable and hazardous tactic especially if conducted during hot, dry and windy weather. A change in weather conditions could easily turn a controlled backburn into a wildfire, sparking a new bushfire threat for the region. For example, after the 1944-45 fires there were allegations that too many firebreaks were lit and these led to further bushfires because they were not sufficiently controlled or extinguished. Backburning also got out of control during the 1977 bushfires only making the situation worse when the winds strengthened.  

While friendly fire was often used directly against bushfires, it could further be used to reduce the available fuel and thereby minimise the overall threat of wildfire. However, prior to 1950s, in the Blue Mountains there appears to have been little attempt to carry out bushfire hazard reduction in general, let alone through the use of burning precautionary firebreaks. While mountains

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residents were generally quick to respond to the fire fiend, most remained complacent about undertaking hazard reduction between bushfire seasons. As a local Councillor noted in 1920, 'people on the Mountains seemed to cater for bush fires' as undergrowth was allowed to grow right up to the fences and 'every facility was presented for a destructive blaze'. From 1919 local councils had the power to compel property owners to make firebreaks but these powers were limited and there is little evidence that they were exercised in the Blue Mountains.\footnote{Blue Mountain Echo, 12 November 1920 p.1, Bush Fire Bulletin, Vol.8, No.2, June 1970, Sydney, p.14.}

In fact, debate continued for many years over the value and practicality of preventative action and local government in the Blue Mountains was reluctant to compel property owners to form firebreaks. For instance, in 1939 Katoomba Council's health inspector argued that the cost of making effective firebreaks in many cases was prohibitive and even wide firebreaks could not guarantee protection during a severe bushfire.\footnote{There were also major problems with enforcing firebreaks because property owners had to be give a month's notice and could appeal against the council's order. Katoomba Daily, 10 January 1939 p.1.}

During World War II councils were given increased powers to force landholders to make firebreaks but using fire to do so was hindered by a requirement to obtain permits and prior permission from neighbours. The wartime imposition of black-out restrictions also caused evening burning off to be neglected for several years in the Blue Mountains which, according to a local resident, resulted in many properties having dead grass, scrub and other
litter piled up dangerously close to buildings.\textsuperscript{228} The response to the disastrous fires of 1944-45 and 1951-52 was that many more firebreaks were needed in the Blue Mountains. Several participants at a local bushfire conference in 1945 even argued for compulsory hazard reduction in the area, whereby uncooperative landholders would have firebreaks imposed on them by a special 'flying squad' or local brigades.\textsuperscript{229}

Yet again little action was taken, particularly after the Board of Fire Commissioners assumed control of mountain firefighting in 1952. The Board was clearly reluctant to burn firebreaks in the Blue Mountains for fear that they would get out of control and lead to compensation claims. There were also apparently royal reasons for the Board's opposition to hazard reduction burning. In 1953 Inspector McKinnon from the Board expressed concerns that it would not be 'a very attractive scene' if Queen Elizabeth II was 'confronted with wide areas of blackened bush brought about by the burning of breaks' during her visit to the Blue Mountains in the following year. Instead of firebreaks the Inspector put his faith in the reorganised and better equipped firefighting system in the Blue Mountains, confidently asserting that the region 'now had greater fire protection than ever before and no fire should ever get away in future'.\textsuperscript{230}

\textsuperscript{228} This observation was made just two months prior to the disastrous 1944-45 fires. \textit{Blue Mountains Advertiser}, 8 September 1944 p.1.
\textsuperscript{230} My emphasis. \textit{Blue Mountains Advertiser}, 10 September 1953 p.9.
The subsequent events of 1957 undoubtedly undermined Inspector McKinnon's confidence somewhat. In the aftermath, both the Board of Fire Commissioners and the Blue Mountains City Council were roundly criticized for not burning enough breaks, with the local paper asserting that much damage could have been averted 'had preventive action been taken early enough'. Furthermore the value of burning preventive firebreaks was highlighted by the actual behaviour of the 1957 fires. The progress of several bushfires (including the inferno which destroyed Leura) was either stopped or slowed noticeably in areas which had only recently been burnt out by either a previous bushfire or hazard reduction burning.²³¹

A clear lesson of 1957 was that more hazard reduction burning was required in the Blue Mountains. Fire authorities across Australia had come to realise that, of all the physical parameters which govern fire behaviour and its impact, only the amount of fuel could be influenced by human activities. To reduce the destructive potential of bushfires meant reducing fuel loads through hazard reduction in areas close to settlements. If the fire flamed could not be totally prevented at least its impact could be mitigated. It was further realised that firefighting efforts in the Blue Mountains were being hampered by the difficult and inaccessible terrain of the region. No longer was it possible to simply wait until the bushfire emerged from remote, uninhabited bushland and threatened towns. Instead there was an urgent necessity for more fire

²³¹ Blue Mountains Courier, 5 December 1957 p.1, History of the Blaxland Bushfire Brigade, op. cit., pp.9, 32, Local Studies Files, BMCL.
access trails to be constructed in the Blue Mountains to both facilitate hazard reduction burning and allow better suppression of wildfires. 222

In 1958 the Blue Mountains City Council began burning of firebreaks in the off season around some of the mountain towns concentrating first on those areas not burnt during the 1957 fires which still had heavy fuel loads. The Mayor stated that it was a 'mighty job' to protect an area like the Blue Mountains and hoped every person in the community would assist while they were still 'fire conscious'. In the same year the newly established Blue Mountains Fire Prevention Scheme (with funds from the State Government) began bulldozing fire trails and clearing firebreaks in the region. The stated aim of this work was to 'tame areas where fires had previously remained inaccessible' by striking at bushfires soon after they started to prevent them growing into major conflagrations. The fire trails served the dual purpose of both providing access for bushfire brigades to fight fires and acting as a fire break line. By 1963 over 780 kms of new fire trails had been constructed in the Blue Mountains area. 223

The value of the newly constructed fire trails quickly became apparent. In the summer of 1964-65 use of the trails was credited with preventing the Blue Mountains from being devastated by major bushfires as other parts of NSW were that season. The Bush Fire Committee described this as an 'outstanding


success' as 'for the first time in the history of bad summers, this area, one of the most vulnerable in the State, was not devastated by fire'. After the 1968 bushfires, further fire trails were constructed in the Blue Mountains with army assistance. Lateral trails were made to link up to existing ones and new access trails was bulldozed into the Grose Valley (from Evans Lookout), Jamison Valley, and near Mount Wilson. By 1976 over 1,100 kms of fire trails had been built throughout the area.

However the increase in trail blazing in the Blue Mountains during the 1950s and 1960s was not mirrored by a growth in hazard reduction burning. Only token efforts were made in most places (usually burning narrow strips along the sides of roads and fire trails) and the major fires of 1968 showed plainly that the level of fuel reduction in the Blue Mountains was not extensive or wide enough. In fact most of the area burnt by the November 1968 fires had last been burnt in 1957 and was therefore carrying a high 11 year old accumulation of fuel (estimated at around 14-15 tons per hectare).

After 1968 hazard reduction became the primary aim of bushfire prevention work in NSW. The Bush Fire Committee urged the State Government to provide more funding for hazard reduction in unoccupied Crown lands and encouraged State authorities (such as the Forestry Commission and National Parks and Wildlife Service) to intensify hazard reduction in areas under their

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control. During the 1970s further hazard reduction burning was undertaken in the Blue Mountains, particularly along the boundaries between the National Park and urban areas and along 'traditional fire paths'. The Blue Mountains City Council also made greater efforts to compel landholders to clear firebreaks, issuing over 1,500 hazard reduction notices in 1977 alone.

Nevertheless, the pressing need to extend the use of hazard reduction burning to remote bushland saw the advent of aerial ignition in the Blue Mountains and elsewhere in Australia during the 1970s. An Australian invention, aerial ignition involves the remote igniting of hazard reduction fires during the winter season by dropping into bushland incendiary capsules from low flying aircraft. Deployed automatically by a special machine attached to the aircraft, the capsules are generally dropped at predetermined intervals (usually less than 300 metres apart) so that the slow burning fires link up and converge at sundown on the day of the burn and self-extinguish. Where possible natural barriers, previously burnt areas and fire trails are used as perimeters and ground parties patrol the boundaries of the area to make sure no fires escape. When conducted in a mosaic fashion aerial ignition therefore creates a sizeable fire break. The main advantages of aerial ignition are that it is a quicker and cheaper method for burning large areas than if done by ground.

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237 Some of the added advantages of hazard reduction work, particularly hazard reduction burning, was that it provided volunteer bushfire brigades with valuable opportunities to practice and improve their firefighting techniques, test their equipment and become familiar with fire behaviour and the local fire trails.
based parties and it can be applied in rugged and remote locations.\textsuperscript{236}

Pioneered by the Forestry Commission, aerial ignition was first introduced into the Blue Mountains in 1970, with the area burnt generally increasing throughout the decade (see Table 4).

<table>
<thead>
<tr>
<th>Year</th>
<th>Ground hazard reduction</th>
<th>Aerial hazard reduction</th>
<th>Total area treated (hectares)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1972-73</td>
<td>No figures provided</td>
<td>6,880</td>
<td>6,880+</td>
</tr>
<tr>
<td>1973-74</td>
<td>5,540</td>
<td>8,903</td>
<td>14,443</td>
</tr>
<tr>
<td>1974-75</td>
<td>4,700</td>
<td>0</td>
<td>4,700</td>
</tr>
<tr>
<td>1975-76</td>
<td>2,640</td>
<td>24,920</td>
<td>27,560</td>
</tr>
<tr>
<td>1976-77</td>
<td>3,300</td>
<td>29,000</td>
<td>32,900</td>
</tr>
<tr>
<td>1977-78</td>
<td>2,870</td>
<td>33,300</td>
<td>36,170</td>
</tr>
<tr>
<td>1978-79</td>
<td>No figures provided</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1979-80</td>
<td>2,325</td>
<td>5,000</td>
<td>7,325</td>
</tr>
</tbody>
</table>


However, often the duration and effectiveness of both aerial and ground based hazard reduction burning in the Blue Mountains was restricted by variable and unfavourable weather conditions and the difficulties posed by the terrain. For example, cold wet winters frequently frustrated burning attempts while sheltered south facing slopes were notoriously difficult to burn because they received little winter sunlight to dry them out. Consequently, despite the precautionary burning, by 1977 fuel loads were again very high in many parts of the Blue Mountains.\textsuperscript{240}

Even so, the value of hazard reduction burning (both ground and aerial) was again clearly demonstrated during the 1977 bushfires in the Blue Mountains. Fire intensities were notably less than in 1968 and once again the overall

spread of the main fires was retarded substantially in places where hazard reduction burning had been done. In contrast, in areas which had not burnt for 20 years the fire was four times as intense and spread much more quickly. All fire authorities agreed that hazard reduction burning had been instrumental in restricting the loss of life and property during the the 1977 fires. However, property loss had still occurred in 1977 and the suggested solution was still more burning to reduce fuel loads further. Further widespread hazard reduction in strategic areas was duly carried out during the 1980s, along with an increase in the fire intensity of some hazard reduction burning to reduce fuels in steep gullies and improve the mosaic effect.

In using fire to fend off the fire fiend during the 20th Century, we can observe that in the Blue Mountains (and elsewhere) there was a gradual shift in approach. Early in the century a reactive approach applied, whereby bushfires were left to burn in uninhabited areas and friendly fire used only against those wildfires which threatened property. After the catalyst of 1957, a proactive approach took over where precautionary burning was undertaken to reduce fuel levels and create firebreaks before the appearance of the next bushfire. This new approach intensified noticeably after the setbacks of 1968 and 1977. But while the policy of using fire to fight fire has had its successes over the years it has also had its critics.

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The Burning Question...Again

Since it first began, the use of fire to reduce fuel loads in bushland has sparked an ongoing controversy. Questions have been raised over both the effects and effectiveness of hazard reduction burning and criticisms intensified during the 1970s in response to the widespread use of aerial ignition in the Blue Mountains and elsewhere. Many people, including local residents and environmentalists, viewed so-called 'controlled' burns as merely milder forms of bushfires. The broad scale use of fire through aerial ignition has been seen by many as an overly extreme measure and a 'sweeping and unselective' technique involving 'half-blind meddling'.

The main objections to hazard reduction burning have been over the ongoing ecological effects of the practice, the full impacts of which remain unknown. It has been argued that the long term effects of burning might be slow acting and not become apparent for years or decades. Concerns have been particularly expressed over the impact of frequent low intensity fires on the composition and structure of native vegetation. For instance, if carried out over an extended period or during the wrong season, repeated low intensity burning will almost certainly lead to the decline, disappearance and local extinction of plant species which either require intense heat from infrequent

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wildfires to stimulate regeneration or need absences from fire for seeds to 
establish.244

Species which regenerate only from seed are especially vulnerable to frequent 
fires. In the Blue Mountains, these include fire sensitive plants such as the 
Blue Mountain Ash (Eucalyptus oreades). Young trees (under 20 years old) are 
easily damaged or killed by fire so too frequent burning for hazard reduction 
will hinder and eventually prevent regeneration of this species. There is also 
some evidence that other plant species which regenerate from resprouting 
may be adversely affected by frequent fires as their lignotubers and dormant 
buds may become exhausted and depleted.245 Unlike high intensity wildfires, 
low intensity burning for hazard reduction also leaves behind some unburnt 
fuel which increases the chance of another fire occurring in the same place 
before plants have fully recovered from the first. In these situations, newly 
established seedlings and immature regrowth may be destroyed. The season 
of burning is also significant for regeneration. Bartley has concluded that the 
seasonal application of hazard reduction burning in the Blue Mountains

244 J.E. Williams and A.M. Gill, *The Impact of Fire Regimes on Native Forests in Eastern New South Wales*, Hurstville, 1995, pp.44-45. For example, studies of Hawkesbury sandstone vegetation in the Sydney region confirm that repeated fires with an interval of less than 5-8 years can dramatically reduce the abundance of fire-sensitive plant species, including many of those shrub species (such as Proteaceae) that are common in dry sclerophyll forests. See, G.J. Cary and D.A. Morrison, "Effects of Fire Frequency on Plant Species Composition of Sandstone Communities in the Sydney Region: Combinations of Inter-Fire Intervals", *Australian Journal of Ecology*, Vol.20, 1995, p.425.

(mostly in autumn and winter) appears out of step with the fire regime under which the existing plant species and communities have developed.245

Opponents of hazard reduction burning have also pointed out that the accumulation of litter, bark and other fuel in bushland is a natural process which many species depend on. Furthermore, by reducing the humus and litter which retain moisture, frequent fires will dry out lush damp environments making them more susceptible to the effects of future fires. It has been suggested that parts of the Blue Mountains have already become drier and barer since the 1930s due to a thinning of the vegetation and increased exposure of the ground from more frequent fires.246 Frequent burning favours many introduced weeds, which spread and regenerate vigorously after disturbance of bushland by fire.246

Vegetation changes brought about by hazard reduction burning will affect animal life as well. Catling has argued that, by altering the habitat (through reducing shrub cover), frequent low intensity burning in the long term advantages certain mammal species over others and especially favours introduced species (including mice, rats, rabbits, cats and foxes). In contrast many smaller native species will have their favoured habitat steadily reduced to remnant areas (such as along watercourses) making them also subject to

246 Catford, op. cit., pp.10-12.
higher predation. Catling concluded that hazard reduction burning creates
'large tracts of simplified forest habitat detrimental for most native fauna'.\textsuperscript{249}

Critics have also highlighted the impact of hazard reduction burning on soils
and hydrology. Repeated low intensity fires for fuel reduction will result in
increased erosion of soils (and thereby increased siltation of streams) and the
likely depletion and loss of nutrient reserves through combustion and
leaching.\textsuperscript{250} Hazard reduction burning has also been objected to on aesthetic
grounds. Much of the early opposition to hazard reduction burning in the
Blue Mountains has come from newly arrived urban residents seeking a bush
refuge from the city, who often refused to give their consent to burning
because of its impact on bush views.\textsuperscript{251}

Critics of broad scale hazard reduction burning have also questioned its
effectiveness, noting that it still provides no guarantee that an area will not be
burnt in a major bushfire. They argue that to carry out sufficient burning to
ensure complete fire protection would not only be unacceptable
environmentally and socially, but would cost more economically than the
damage caused by infrequent wildfires.\textsuperscript{252}

\textsuperscript{249} P.C. Catling, 'Ecological Effects of Prescribed Burning Practices on the Mammals of
Southeastern Australia', in D. Lunney (ed.), Conservation of Australia's Forest Fauna,
\textsuperscript{250} In the longer term these effects may be more significant than the impacts on flora
\textsuperscript{251} For example, after the 1968 fires in the Blue Mountains it was alleged that
insufficient hazard reduction burning had been undertaken because some local
landholders did not want their properties surrounded by black, burnt patches and
In response to such criticisms, proponents of hazard reduction burning have continued to argue that using fire to fight fire was the only effective and practical way to stop the fire flend. They have also maintained that only a fraction of the available bushland area is actually burnt regularly. Because low intensity burning creates a mosaic of burnt and unburnt areas, it has further been argued that it promotes regeneration and provides a variety of habitats which helps to perpetuate environmental diversity.\footnote{Pyne, op. cit., pp.370, 374, 395, 403. Cunningham, 1984, op. cit., pp.21-22.}

Overall the opposition to hazard reduction burning has clearly frustrated many fire authorities in the Blue Mountains and inhibited its use on many occasions. Critics have been branded an ill-informed minority who stubbornly refused to learn from past experience that firebreaks and fuel reduction were essential to fire control. Moreover, to firefighters there were also safety issues involved. For even if hazard reduction burning does not stop bushfires occurring, it remains a proven method for lowering fire intensity and slowing the progress of a bushfire. This gives firefighters a much better chance of controlling outbreaks, saving property and protecting themselves from danger.\footnote{Richmond in Stanbury, 1981, op. cit., pp.75-83, Report of the Coordinating Committee of the Bush Fire Council for 1972, NSWPP, 1972-73, Vol.1, p.1327.}

While historically much of the debate has centred around which fire regime was best for the environment (frequent, low intensity or infrequent, high intensity), the relationship between fire and ecology is incredibly complex and still remains poorly understood. More ecological studies are clearly needed.
particularly on the effects of repeated burning. However, enough is known to conclude that hazard reduction burning cannot be considered ecologically benign. By the mid 1980s, fire authorities had accepted that the ecological implications of hazard reduction burning could not be ignored or dismissed and they had an obligation to recognize the consequences of their activities. The Bush Fire Council even adopted a policy that 'in the interests of maximum protection and preservation of the natural environment', environmental factors, recreation use and aesthetic appeal should be considered in implementing hazard reduction burning.

In the Blue Mountains, the consequences of burning have been especially important in areas like national parks which have other management objectives besides fire protection. Although fire has been used as a fuel reducing tool in the region's national parks, the National Parks and Wildlife Service has generally attempted to minimise its ecological and aesthetic effects so as not to compromise nature conservation and recreational use.

In the Blue Mountains and Kanangra-Boyd National Parks hazard reduction burning is excluded from high erosion areas and certain natural areas, including rainforests, mallee, heath and swamp habitats.

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257 This is aimed at preserving the life cycles of sensitive and rare species including small marsupials, birds and some plant species (such as orchids and heath banksias) which are adversely impacted by even mild winter and spring fires. A. Jelinek, Fire Management Plan, Blue Mountains and Kanangra-Boyd National Parks, unpublished report, 1981, Blackheath, pp.8, 13, National Parks and Wildlife Service, Blue Mountains National Park: Draft Plan of Management, Sydney, 1988, pp.12-13, Weir, op. cit., pp.25-28.
Nevertheless, the persistent dispute over hazard reduction burning plainly has its basis in contrasting and conflicting objectives - settlement protection versus environmental protection. In the Blue Mountains, this issue is of critical importance because, as Bartley has noted, these often incompatiblable objectives interface along an extensive perimeter. This is exacerbated by the fact that the adverse ecological impacts of hazard reduction burning tend to be most pronounced and noticeable in bushland areas adjacent to urban settlements. Clearly in many parts of the Blue Mountains it will never be possible to fully satisfy both the requirements of fire protection and environmental protection, and some sort of a balance between the two objectives is the best that can be hoped for.

However, history shows that if a choice must be made between the two the protection of people and property has always been given a higher priority than the environment. As Edwards has put it, in the Blue Mountains ecological considerations continue to be 'largely subordinated to a wide-area burning policy ostensibly to protect the central ribbon of settlement'. But while most people would consider some ecological impacts acceptable for the sake of saving lives or property, to what extent should the burning of large areas of bushland be tolerated for the sake of safeguarding distant settlements? Does the sanctity of life and property justify drastic and possibly irreversible modifications of the Blue Mountains natural environment?

228 Bartley, op. cit., p.158, Richmond, op. cit., p.82.
229 Edwards, 1972, op. cit., p.114, Even the National Parks and Wildlife Service has acknowledged in its fire policies that, if life and property are directly threatened by fuel levels in national parks, other management objectives must come second. See, Weir, op. cit., pp.25-28, National Parks and Wildlife Service, 1988, op. cit., p.12.
While the debate continues, it can be observed that the historical use of fire to fight fire has proved somewhat self-defeating. For as more people have settled in the Blue Mountains there has been an increasing need to use more fire to protect those people from fire!

**Blazing the Trail**

The fire history of the Blue Mountains also illustrates that this fire-prone region has had a major influence on the way governments and fire authorities have responded to the fire fiend throughout the 20th Century. Events in the Blue Mountains have had wide ranging significance and led to major changes in government policies and strategies towards bushfires.

In reviewing the history of bushfire prevention efforts in NSW during the 20th Century, the *Bush Fire Bulletin* noted that although gradual progress was made there always seemed a need for 'the stimulus of disaster to spur it forward'. Each disaster provided a further stimulus for renewed efforts to combat the fire fiend. More often than not the 'stimulus' referred to directly involved the Blue Mountains.

After virtually every major bushfire of the 20th Century the devastation caused by the fire fiend in the Blue Mountains precipitated significant changes in government policy towards bushfires. The bushfires of 1901

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compounded growing community concern regarding the fire threat and prompted the newly created State Government to enact a *Careless Use of Fire Act* in 1901. The devastating 1905 fires in the Blue Mountains helped provoke a revision of the Act in 1906 and the passing of the *Local Government Act*, which for the first time provided local shires and municipalities with the power to form official bushfire brigades. Further bushfire damage in the region during the 1920s is also likely to have contributed to the appointment of the Royal Commission on Bush Fires in 1927.

By the 1930s the significance of the Blue Mountains had grown dramatically. Only days after the 1936 fires had swept the region the *Sydney Morning Herald* published a letter from the Rangers League that argued that the 'terrible bushfires' in the Blue Mountains should serve as a lesson to the authorities of the pressing need for a specialised bushfire prevention organisation in NSW. This body should assist with the early detection of fires, provide firefighting equipment and coordinate the organisation of volunteers in every country town. The League stated that the time was ripe as the 'general public has received such a vivid and drastic demonstration of the destructiveness of a bushfire'. Prompted by the League, the State Government organised several meetings in the following year which led to the establishment of the Bush Fires Advisory Committee in November 1937, which was charged with coordinating the activities of the various organisations in NSW responsible for bushfire prevention and control.²⁶¹

While bushfires were widespread throughout NSW in the summer of 1944-45, the property destruction in the Blue Mountains was given much media attention and this was clearly influential on the State Government's response in 1949 when it enacted a new Bush Fires Act. This reconstituted the Bush Fires Advisory Committee into a statutory body called the Bush Fire Committee whose chief aims were to recommend measures to prevent, control and suppress bushfires, foster the formation of local brigades and undertake educational activities. Another important feature of the new legislation was the creation of a bushfire fighting fund from which purchases of equipment could be made by local bushfire brigades. The fund was created and maintained from contributions from councils, the State Government and insurance companies. From just $4000 in 1949 the annual expenditure from the fund on firefighting equipment rose to over $420,000 in 1960 and $1.5 million by 1970.  

The Blue Mountains bushfire disasters of the 1950s also prompted immediate government action. The fires 1951-52 provoked a lengthy debate on bushfire policy in State Parliament in 1952 during which several Members of Parliament criticized the operation of the Bush Fires Act and the inadequate resources directed towards bushfire prevention and control. The Blue Mountains was specifically referred to on several occasions during the debate

the State Government. Its stated aims were to help preserve and protect Australian flora and fauna and prevent and control bushfires. Further details on the League can be found at the Mitchell Library in Sydney (see ML 508.901/R). R.I. Jack pers. comm.  

(Including criticisms of the centralised control of firefighting in the area) and a motion was put that the State Government do more to modernise bushfire-fighting organisation and equipment in NSW.\textsuperscript{282}

After the 1957 catastrophe in the Blue Mountains the NSW Government amended the \textit{Bush Fires Act} and provided more assistance to local bushfire brigades. More importantly through the Bush Fire Committee it also provided £100,000 per annum for five years to set up and maintain nine regional fire prevention schemes of which the Blue Mountains was the first. The purpose of the locally coordinated schemes was to facilitate better access to bushfires and remove fire hazards, and the funds were expended on constructing and maintaining fire trails, clearing and burning firebreaks and improving equipment, communications and fire detection. The Blue Mountains were given particular attention as the Bush Fire Committee considered the region a 'trouble spot area of the State'.\textsuperscript{284} Before long the Blue Mountains prevention scheme was even being touted as a fine example for other parts of NSW to follow. In 1959 the Chief Secretary congratulated the Blue Mountains City Council on the 'magnificent job' it had done in fire prevention work. He commended its actions to other councils throughout the State stating that they might 'take a leaf out of its book'.\textsuperscript{285}

The influence of the Blue Mountains on bushfire policies continued for many years after 1957, with politicians and fire authorities adopting the slogan of

'we must prevent another Leura'.\textsuperscript{265} This catchcry continued throughout the 1960s with the State Government promising in 1962 to do 'everything possible to ensure that the disastrous fire of 1957 in the Blue Mountains shall not occur again'. Even as the 1968 bushfire season began, the local member of State Parliament urged his mountain constituents to be careful with fire so as to avoid a repetition of the 1957 fires.\textsuperscript{267}

After further devastation in the Blue Mountains in 1968, the bushfire problem was once again extensively debated in the NSW Parliament. But this time most of the debate centred around the Blue Mountains. Various complaints were made - that official approval to build a fire trail into the Grose Valley had been unnecessarily held up for six years, that equipment in the area remained inadequate or was too old, and that insufficient back burning had been done along escarpment edges while the fires were still confined to the valleys. The Opposition called for a 'searching inquiry' to completely review firefighting methods in NSW as the 'main problem for future is to prevent a recurrence of these disastrous fires'.\textsuperscript{268}

The 1968 fires also led to more administrative changes. Meetings of fire authorities took place and the \textit{Bush Fires Act} was again amended in 1970. The Bush Fire Committee was reconstituted and renamed as the Bush Fire Council and included local brigade members for first time, while a new

\textsuperscript{265} \textit{NSWPD}, Session 1959-60, Third Series, Vol.28, p.494.
\textsuperscript{266} For example see \textit{Sun-Herald}, 13 November 1960, p.43.
Coordinating Committee was set up and Chief Coordinator appointed to deal with major bushfire emergencies such as that which had occurred in the Blue Mountains in 1968. In 1970 the National Parks and Wildlife Service was also made a bushfire control authority after it had suffered severe criticism in the aftermath of the 1968 fires for not controlling fires burning in park bushland before they emerged and threatened the Blue Mountain towns. The Service also developed a fire policy that accepted and included the use of controlled fire as a management tool in natural areas and subsequently introduced fire management plans for national parks including the Blue Mountains National Park and later the Kanangra-Boyd National Park.\textsuperscript{266}

As well as its influence on government responses, the special nature of the Blue Mountains has also been demonstrated in a number of other ways. For example, the Blue Mountains was influential in having bushfire prevention and protection measures incorporated in town planning schemes across NSW during the 1970s. Leading by example, local government plans in the Blue Mountains during the late 1960s and 1970s included provisions that urban development be confined to land with a slope of less than 10 deg (about 1 in 6) and kept away from escarpments and isolated ridges to provide fire control advantages.\textsuperscript{270}


\textsuperscript{270} Weir, op. cit., pp.25-28. Unfortunately such provisions have not always been adhered to by the region's local government.
Because of its special nature the Blue Mountains has often received preferential treatment in regards to extra State Government funding for bushfire equipment. For example, at a bushfire conference in Springwood in 1945 it was resolved that because the Blue Mountains was a special case the State Government should provide at least £1,000 per annum for bushfire prevention in the Blue Mountains. After the 1977 fires, the NSW Government again gave additional funding of $100,000 to the Blue Mountains bushfire brigades because, as Premier Wran stated in Parliament, the Blue Mountains is 'the most potentially volatile bushfire area' in the State.

Throughout the 20th Century fire authorities like the Bush Fire Council have consistently acknowledged the special situation of the Blue Mountains, noting:

'The Blue Mountains area is one which commands special attention because of its fire history and its vulnerability so far as wildfire is concerned'.

However, it is important to recognize that the special nature of the Blue Mountains in relation to bushfires, both now and in the past, has its foundation in the region's environment.

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271 This was despite the opposition of the Board of Fire Commissioners which argued that the Blue Mountains already received preferential treatment 'at the expense of other areas'. Blue Mountains Advertiser, 11 May 1945 p.7, 18 May 1945 p.7.
Living in a Tinderbox

'...undoubtedly the most terrifying are the infernos which sweep through heavily timbered country such as the Blue Mountains. Fanned by hot gales, flames race across the treetops, and once they are in their stride no human agency can stop them'. Waratah (1946)\textsuperscript{274}

History shows that the Blue Mountains burn. If Australia is the 'fire continent' claimed by Pyne, then the Blue Mountains must surely be one of its most inflammable provinces. The reason bushfire is so prevalent in Blue Mountains history is because of the interaction of four key environmental factors.

The first is the soil. As noted in Chapter One, the soils of the Blue Mountains region are predominantly derived from sandstone and consequently are coarse and large-grained. This, along with its elevated situation, means that the earth of the region is mostly porous and does not retain much moisture. After only a short period of strong sunshine and dry winds, soil moisture is completely evaporated and the ground becomes dry enough to permit bushfires. The poor water retention abilities of the soils also means that bushfires can still occur within days or weeks after heavy rainfall.\textsuperscript{275}

The second key factor is the vegetation of the Blue Mountains. Most of the region, especially the ridges and plateau areas containing the mountain towns, is dominated by dry sclerophyll forest. As noted previously, this type of vegetation is particularly fire prone as it is mainly comprised of tree and shrub species which frequently shed large quantities of bark, leaves and

\textsuperscript{274} Sydney Morning Herald, 5 January 1946 p.2.
twigs. This vegetation is also highly flammable because of its high content of volatile oils, low rate of litter decomposition and generally rapid regeneration after fire. Dry sclerophyll forest also has an open canopy that admits plenty of sunlight and wind circulation which allows vegetation and ground cover to dry out quickly.  

The role of fuel accumulation in the cycle of bushfires in the Blue Mountains has been known for some time. As early as 1912, the Blue Mountain Echo stated:

"For the comfort of those who are nervous of bush fires and their attendant horrors, let it be known that a bushfire seldom revisits the same place under 5 or even 7 years, that is, not until the burnt scrub and undergrowth have grown up again and become dry and inflammable from the heat of several successive summers."

Research conducted in the 1970s confirmed this earlier wisdom, establishing that fuel accumulation in dry sclerophyll vegetation in the Blue Mountains follows a well defined pattern. Studies by Van Loon have shown that in the first 6 to 7 years after a fire the weight of the ground litterlayer (fallen leaves, twigs and bark) increases each year by around 1.7 tonnes per hectare. From then on the annual increase levels off and continues at about 0.3 tonnes per hectare. After 5 years, the weight of the understorey vegetation also increases as regeneration takes place. Taken together, Van Loon estimated that after 7 years of fire exclusion the total weight of fine fuels will be around 14-15

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276 Local Studies files, BMCL.
277 Cunningham, 1984, op. cit., p.9, Christensen, et al., 1981, op. cit., p.369, Local Studies Files, BMCL.
277 Blue Mountains Echo, 16 February 1912 p.6.
tonnes per hectare, increasing to over 18 tonnes per hectare after 14 years without fire.\(^{278}\)

It has been observed that 15 tonnes per hectare is sufficient to carry a major bushfire. This means that in areas like the Blue Mountains there is the potential for another serious bushfire to occur in exactly the same locality within 6 to 7 years of a previous fire. Furthermore, the risk of such a fire increases as more time passes since the last fire.\(^{279}\)

The third environmental factor is climate. Overall the Blue Mountains have a temperate continental or 'Mediterranean' climate, comprised of cool, wet winters and generally hot, dry summers (see Chapter Four). Because of the region's height above sea level and distance from the coast, it is often subject to strong, dry winds which reduce fuel moisture and rapidly propel bushfires.\(^{280}\) Summer rainfall can be erratic and highly variable in the Blue Mountains. Some summers are much drier and hotter than others and it is during these times that there is a high probability of bushfire ignition and spread. As illustrated by Appendix 1, rarely does a year go by when no bushfires at all occur in the Blue Mountains. However some summers can be considered 'bushfire seasons', when outbreaks commence in late winter or spring and continue to occur throughout the summer. It is possible for


\(^{279}\) This risk is accentuated during drought periods which cause curing of litter and stress on plants resulting in heavier leaf fall, bark shedding and wilting of smaller plants. All of which greatly increases the available fuel. Cunningham, 1984, *op. cit.*, pp.14,21, Local Studies Files, BMCL.

\(^{280}\) Cunningham, 1984, *op. cit.*, pp.9-10, Local Studies Files, BMCL.
bushfire seasons to occur more regularly than every 6 to 7 years as fires can and do burn different parts of the region in different years.\footnote{\textit{ibid.}, pp.13-17, 21. While Cunningham concluded that November and December are the months of most critical bushfire hazard in the Blue Mountains, in the period from 1800 to 1977 the number of major bushfires (i.e. those destroying more than}}

After inspecting rainfall records from 1887 to 1980, Cunningham has concluded that bushfire seasons in the Blue Mountains are highly likely in the first dry spring/summer following extended periods of both above average rainfall and absence of fire (which has permitted sufficient accumulation of fuel). Appendix 1 further confirms the earlier conclusion of Cunningham that, although historically bushfires have been recorded throughout the period from August to April, the period from October to February is when most bushfires occur. Appendix 1 also confirms that most major bushfires (and the most property damage) in the Blue Mountains have occurred during the months of November, December and January.\footnote{\textit{ibid.}, pp.5, 10, 13-14.}

Within each bushfire season occur specific days when weather conditions especially favour the outbreak and rapid spread of severe bushfires. These are known as 'blow-up' days, and historically most major bushfires and subsequent property damage in the Blue Mountains have taken place on such days. Blow-up days often occur during spring and summer when a low pressure cell of warm dry air over the centre of the continent becomes trapped between a high pressure cell over the seas east of Australia and an advancing cold front moving eastwards across southeastern Australia. As the cold front
progresses across southwestern NSW it compresses the warm continental air ahead of it creating a flow of hot, dry, northwest winds over the Blue Mountains. In response, temperatures in the Blue Mountains soar to 30-40°C while humidity plummets to less than 20%. High temperatures and low humidity increase the intensity of fires, while strong dry winds supply ample oxygen for combustion and drive the flames forward into fresh fuel. Usually, these extreme weather conditions last less than 1-2 days before the cold front arrives (often in the form of a 'southerly buster') which drops temperatures dramatically, abruptly changes wind direction and usually brings with it thunderstorms and heavy but brief showers.²⁸³

Whether or not the day is a blow-up day, fluctuations in the daily weather conditions in the Blue Mountains can have important consequences during bushfires. Changes in temperature, humidity and wind strength during the course of the day can also affect fuel moisture and fire behaviour. For example, relative humidity and solar radiation are usually at their highest between 1 pm and 4 pm making this a particularly hazardous time for bushfires. It has also been observed during some bushfires that often winds gain in strength in the late morning as the day heats up before tailing off around dusk with the onset of cooler nighttime conditions.²⁸⁴

Although not every bushfire has occurred on a blow-up day, the influence of strong northwesterly and westerly winds on most bushfires in the Blue Mountains is clearly demonstrated by Figure 3.5 which shows the approximate path taken by each major bushfire in the Blue Mountains since 1911. The prevalence of northwest and west winds during most Blue Mountains bushfires was also found by Foley who studied the bushfires in the region between 1915 and 1944.\textsuperscript{585}

The fourth environmental factor governing the prevalence of bushfires in the Blue Mountains is its complex topography. Most of the region, particularly the highland plateau area, has a heavily dissected terrain, which ranges from windswept exposed ridges to deep sheltered gullies. This results in a great variety of slope angles and aspects, as well as microclimates and fuel loads, all of which affects fire behaviour in different ways. For example, because of the prevailing winds slope aspects from west to north are generally the driest and contain the most flammable fuels. Sheltered gullies can also harbour fires allowing them to smoulder and burn slowly for days.\textsuperscript{585}

The steep slopes throughout the region are also an important factor in the spread of bushfires. Fires burning up a slope will rapidly increase in speed and intensity, and the steeper the slope the faster they do so. When backed by strong winds, fires can easily travel from the bottom of a steep canyon to the

\textsuperscript{585} Cunningham, 1984, op. cit., p.17, Figure from p.20, Foley, op. cit., pp.108, 120-126. The only exception is the 1957 fire at Leura which burnt from north to south under the influence of shifting winds as a southerly buster arrived.
ridge top in a matter of minutes. During combustion fires also produce a convective flow of hot air that creates updraughts. Steep slopes accentuate this phenomenon which commonly leads to 'spotting' of new fires. This is when the updraught of the fire lifts pieces of flaming material (such as bark and branches) high into the air which are then blown to another location setting it on fire. The combination of steep slopes and strong winds can lead to spotting of new fires well ahead of the main fire front. For instance, at the peak of the 1977 fires in the Blue Mountains spotting distance was estimated at between 1.5 to 2.5 kms with some firebrands landing up to 3.5 kms ahead of the fire front. 287

The nature of the region's topography has further meant that most settlement has been confined to the plateau and ridgetops which are interspersed and adjacent to steep bushland gullies. As Cunningham has observed, this has meant that most of the urban areas of the Blue Mountains are situated in locations of high bushfire risk. Based on historical records, Cunningham has suggested that two urban locations in particular - the central mountain towns from Lawson to Woodford and the lower mountain towns between Springwood and Glenbrook, have a consistent recurrence of bushfires. 288

However an examination of the locations of bushfires listed in Appendix 1 shows that the upper mountains area has also had a history of consistent bushfire recurrence. In fact, in the period from 1800 to 1950 many more

286 Bartley, op. cit., pp.31, 35.
bushfires have been reported in the upper mountains towns (from Wentworth Falls to Mount Victoria) than elsewhere in the region. However this is possibly just a reflection of the fact that these areas were settled earlier than the central and lower Blue Mountains.

Nevertheless, history confirms that because of their geographical location many mountain towns including Leura, Lawson and Glenbrook are especially vulnerable to bushfires. In fact, the topographical vulnerability of Leura was pointed out as early as 1912, when the local newspaper noted:

"The town is situated at the termination of the neck of an enormous funnel, through which the wind rushes with hurricane force. A fire once started in a block of buildings, and given a moderate wind, it is almost humanely impossible to cope with the same, even presupposing the equipment is the latest and most up-to-date of its kind."

Even within the mountain towns themselves certain dwellings are more precariously situated in regard to bushfires. These include those built on escarpment edges and ridge tops next to steep gullies, and particularly those on northwest and westward facing slopes.

Taken together, it is clear that it is the interaction of the region's soils, vegetation, climate and topography which makes the Blue Mountains so notoriously fire prone - a tinderbox consumed yet also rekindled by fire. Given the nature of the region's environment, bushfires are inevitable. While the bush remains so will the bushfire. As always, the people of the Blue

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286 Blue Mountain Echo, 25 October 1912, p.6.
290 Cunningham, 1984, op. cit., p.17.
Mountains have had no choice but to come to terms with living with the fire fiend.

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The history of the Blue Mountains is inextricably linked to its fire history. Like the blackened scars on a gum tree trunk, the fire fiend has left its mark on both the history and the environment of the Blue Mountains. Fire has forged the landscape and as both friend and foe has shaped mountain history in countless ways. Yet fire is strongly influenced by the other elements, not least the invisible element - air.
Chapter Four

Air

Air is the 'breath of life' and the ever-changing canopy which surrounds many living things, including all people. The mountain air especially has been an important element in the history of the Blue Mountains and this chapter outlines its significance.

The Air - Our Home

'Air is a matrix which joins all life together'. David Suzuki (1997)1

Air is the invisible element within which all people live. Along with other aerobic creatures, humans inhabit the bottom of an ocean of air - a thin layer of mixed gases (primarily nitrogen and oxygen) which surrounds the Earth. Known as the troposphere, this layer of air extends on average just 11 kms above the ground, and every person, every minute of every day, breathes from it. The human need for fresh air, and the life-giving oxygen it brings, is so absolute that without it death occurs in a matter of minutes.

At a microscopic level, humans share the the air with everything that ever breathed. For with every breath each person inhales history, in the form of atoms which were once breathed by other lifeforms. The envelope of air also

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conveys sounds, enabling hearing and speech, and wafts smells of both delight and disgust. The lower layers of the atmosphere further provide a comfortable habitat for all life on the planet, by maintaining a consistent global temperature (averaging 15°C) and forming a shield against the sun's harmful ultra-violet radiation.²

The air within the narrow global envelope is constantly moving, mixing and circulating, bringing with it continual changes in weather. When averaged over time, the movements of air, earth and sun provide each region with a distinctive climate - a broadscale regime of temperature, precipitation and wind.

**The Mountain Climate**

The climate of a region is influenced by factors such as distance from the coast, topography and altitude above sea level. For these reasons, mountains have a very different climate to low lying areas in the same latitude. Typically, mountain climates have lower mean temperatures, as mean temperature falls with increased elevation (at a rate of about 1°C every 100 metres, unless modified by local topography). There is also a greater range of daily temperature in higher areas due to less daytime heating by the sun and more nocturnal cooling. Lower temperatures also result in reduced evaporation, and more dew at night. Due to their height, mountains intercept and create more cloud as the uplift and cooling of air causes condensation. The highest

precipitation occurs on the mountain sides facing the prevailing wind (windward slopes). Mountains also generally have stronger winds than lower areas as wind speeds increase with height above ground.³

However, climates are never completely static and measured in millennia the climate of every region has varied greatly over time. At the time that the Blue Mountains were being uplifted and formed (around 90 to 60 million years ago) the region was splitting from the other fragments of Gondwana and experienced a warm temperate climate with high rainfall. The warm wet conditions persisted until well after Australia became an island continent around 45 million years ago.⁴ Climates worldwide began to fluctuate and gradually cool from around 40 million years ago. Although rainfall in large parts of Australia became more seasonal, due to its northward migration (at about 6 cms per year) most of the continent was little affected by the global cooling. The southeast of Australia, including the Blue Mountains, continued as a zone of high rainfall and warm temperate climate. The global climatic cooling continued and began to affect Australia more seriously from about 15 million years ago. About this time rainfall declined markedly in the northern and central parts of Australia, changing forests to open woodland and grasslands and in time steadily turning some parts of the continent arid. The drying of Australia’s climate intensified during the last five million years.

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affecting all areas including the Blue Mountains and resulting in major changes to the continent's flora and fauna (see Chapter Five).³

During the Pleistocene (between 2 million and 10,000 years ago) the Australian climate fluctuated greatly between cold glacial and warm interglacial episodes many lasting thousands of years. During glacial stages the polar caps expanded enormously, lowering the sea level and exposing most of Australia's continental shelf. The climate of the Blue Mountains was cold, dry and windy with the highest areas experiencing near alpine conditions. In interglacials warmer and wetter conditions occurred, vegetation recovered and sea levels rose again. During one of the glacial peaks around 120,000 years ago the sea level fell by some 200 metres, greatly narrowed the sea lanes between Australia and Southeast Asia.⁴ It is possible that this is when the first people migrated to the island continent.

From 120,000 years ago to around 60,000 years the climate was warmer and similar to the present day. Around 60,000 years another global cooling commenced with generally colder and drier conditions persisting until around 10,000 years ago. The effects of this glacial period began to influence the Blue Mountains and elsewhere in the southeast highlands of Australia around 30,000 years ago, with the ice age peaking about 18,000 years ago. At this time the mean temperatures in the Blue Mountains was up to 10° C colder than at present and the highest ground experienced regular snowfalls and

periglacial conditions (freezing and thawing seasonally). On current evidence it appears that there was at least some Aboriginal inhabitation of the Blue Mountains around 22,000 years ago although possibly only sporadic in the cold, dry climate of the glacial maximum. More archaeological evidence indicates increased Aboriginal habitation of the Blue Mountains from 15,000 years (as the last glacial waned), although this may be just a problem of preservation of older material rather than a response to warming climate. Even so, as noted in Chapter Two, higher rainfall (leading to a greater availability of water) may have been a more critical factor than temperature increase.

A constant theme in the archaeological discussion of Australia's highlands, including the Blue Mountains, has been the likely impact of climate on the Aboriginal occupation of mountain environments. It has been suggested that due to their colder and windier climate, the Blue Mountains were inhospitable and unattractive to Aboriginal people for year-round dwelling. While this may have been true during the peak of the last glacial, in the last 15,000 years the

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* White op. cit., p.229, Linacre and Hobbs, op. cit., pp.190-191. Major glaciations also occurred around 300,000 years ago and again around 185,000 years ago.


* For example, see N. Robertson, 'Aborigines of the Blue Mountains' in P. Stanbury (ed.), The Blue Mountains: Grand Adventure for All, Sydney/Leura, 1988, 2nd ed., pp.38-39, G.C. Nanson, R.W. Young and E.D. Stockton, 'Chronology and
climate of the Blue Mountains overall has become warmer and wetter. Stockton has argued that in terms of contemporary temperature ranges, the Blue Mountains are actually 'more benign for human occupation than the adjacent valleys and plains' which have greater extremes of cold and hot. Furthermore, frosts and snow only occur sporadically in the region and Aboriginal people could have avoided the worst of the cold weather by using rockshelters warmed with fire. Higher average rainfall than on the lowlands may also have ensured a more consistent supply of water.10

It seems highly likely that during their long occupation of the region, the Aboriginal inhabitants of the Blue Mountains became as equally well-adapted to the area's colder climate, as others had to humid coastlines and hot sandy deserts. Those who have suggested otherwise seem to be perpetuating the cultural attitudes of the early European settlers who found 'mountains' inhospitable due to their harsh climate and rugged terrain. It cannot be assumed that Aboriginal people in the past found the mountain climate inhospitable. Certainly the Gundungurra language includes a word for snow (goonuma), which shows that they were familiar with it and apparently did not specifically avoid locations where snow occurred.11 Used to living outdoors all of their lives, it is also likely that pre-contact Aboriginal people had a greater tolerance of climatic extremes than most early Europeans and contemporary Australians. However any comparisons with contemporary susceptibilities to climate need to be made with caution, as there is a danger of both under and

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overestimating the impact of climate on the first inhabitants of the Blue Mountains.\textsuperscript{12}

There is little evidence on what the Aboriginal people of the Blue Mountains themselves believed about the influence of air and the climate on their lives. Certainly many Aboriginal groups in southeastern Australia believed in sky gods and had traditional stories relating to celestial objects, such as the sun, moon and stars. Like others elsewhere in Australia, they must also have had traditional beliefs about the changing seasons, rain, lightning, thunder and clouds.\textsuperscript{13} For instance, the Gundungurra seemingly had legends relating to rainmaking and the creation of the rainbow (formed by a carpet snake). There were also many weather related words in both the Dharug and Gundungurra languages, including cloud, rain, lightning and thunder.\textsuperscript{14} For some Aboriginal people the Blue Mountains were perceived as the source of severe weather. According to Peron, the Aboriginal inhabitants of the Sydney area held a 'religious terror for the Blue Mountains', believing that they were the residence of an evil spirit or terrible demon who 'hurls amongst them from the summits of the mountains, thunder, inundations, and burning winds, which lay waste their territories'.\textsuperscript{15}

\textsuperscript{11} J. Kohen, \textit{The Darug and Their Neighbours}, Blacktown, 1993, p.262.
\textsuperscript{12} Stockton and Holland, \textit{op. cit.}, pp.36-38.
\textsuperscript{14} J. Smith, \textit{pers. comm.} For language details, see Kohen, \textit{op. cit.}, pp.229-244, 259-262.
\textsuperscript{15} F.M. Peron, \textit{A Voyage of Discovery to the Southern Hemisphere etc.}, London, 1809, p.291. Peron was clearly correct in his conclusion that such beliefs had their basis in accurate observations of the climate.
When Europeans first arrived in the Blue Mountains they found a climate similar to the present day. In fact, the overall climate has been broadly similar throughout the Holocene (from 10,000 years ago to the present). Even so, based on a study of swamp sediments in the Blue Mountains region, Chalson has concluded that the mountain climate in the Holocene went through several periods of both change and relative stability. From 11,000 to 8,000 years ago conditions were wetter than previously, while from 8,000 to 6,500 years ago conditions remained stable. From 6,500 to 5,500 years ago the climate fluctuated between wetter and drier before stabilising as wetter in the period between 5,500 and 2,500 years ago. In the last 2,000 years the climate fluctuated again but overall became drier than previously. These results broadly agree with another local study that has postulated a reduction in rainfall about 7,000 years ago and a slightly cooler, drier regime from 4,500 years ago.  

The present day climate of the Blue Mountains reflects a number of factors, most notable its position on the planet and its elevation. The Blue Mountains are situated between 33° 15' S and 34° 15' S latitude and therefore occupy a temperate climatic zone midway between the present day global extremes of equatorial (0-10°) and polar (60°+). The Blue Mountains are also situated more than 60 kms from the coast and display the typical features of an inland mountain climate. As with all highland areas, average temperatures and

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rainfall vary with altitude - see Table 5. Average annual rainfall increases steadily westwards from around 1000 mm at Glenbrook to a peak of around 1400 mm at Katoomba then decreases significantly west of Mount Victoria.

<table>
<thead>
<tr>
<th>Location</th>
<th>Elevation (m)</th>
<th>Average Yearly Minimum Temperature (°C)</th>
<th>Average Yearly Maximum Temperature (°C)</th>
<th>Average Annual Rainfall (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glenbrook</td>
<td>183</td>
<td>n/d</td>
<td>n/d</td>
<td>1000.5</td>
</tr>
<tr>
<td>Springwood</td>
<td>366</td>
<td>n/d</td>
<td>n/d</td>
<td>1067</td>
</tr>
<tr>
<td>Bilpin</td>
<td>610</td>
<td>n/d</td>
<td>n/d</td>
<td>1258</td>
</tr>
<tr>
<td>Wentworth Falls</td>
<td>898</td>
<td>7.4</td>
<td>17.4</td>
<td>1342</td>
</tr>
<tr>
<td>Katoomba</td>
<td>1030</td>
<td>7.9</td>
<td>16.5</td>
<td>1405.3</td>
</tr>
<tr>
<td>Mount Victoria</td>
<td>1064</td>
<td>7.2</td>
<td>16.3</td>
<td>1048.5</td>
</tr>
<tr>
<td>Mount Wilson</td>
<td>1010</td>
<td>n/d</td>
<td>n/d</td>
<td>1274</td>
</tr>
<tr>
<td>Hartley</td>
<td>779</td>
<td>n/d</td>
<td>n/d</td>
<td>922.9</td>
</tr>
<tr>
<td>Jenolan Caves</td>
<td>730</td>
<td>6.1</td>
<td>17.9</td>
<td>950.9</td>
</tr>
</tbody>
</table>

Source: Data obtained directly from the Bureau of Meteorology, Sydney. n/d = no data available.

Rainfall is usually the highest during the summer months with the lowest falls on average in Spring (August and September). On the higher plateaus, fogs are common occurring on average between 50 to 90 days each year, while frosts also occur regularly on average 40 to 60 days each year. Snow occurs infrequently on the highest areas, on average less than 10 times per year, and usually does not stay on the ground for long before melting.\(^7\) Average temperatures in the region also generally decrease from east to west. The highest temperatures are usually in January, with the average monthly maximums varying from 22-25°C across the region. The coldest month is July when maximum temperatures rarely reach double figures and the average

\(^7\) Data from Bureau of Meteorology. Annual frequencies based on Katoomba and Mount Victoria.
monthly minimums are less than 3°C in most areas. In combination, the influences of elevation, exposure to prevailing winds and distance from the coast result in Mount Victoria being on average much colder, wetter and windier than Glenbrook.

Throughout the history of the Blue Mountains the climate (especially the levels of moisture dropped from the air) has been an important factor in the formation of the mountain landscape. Vapour from the skies has provided the eroding water which has sculptured the mountains (see Chapter Two). As Wentworth observed, all the mountain streams, creeks and rivers have their origins in 'the Moisture which the Mountains Inhale from the clouds'. Conversely, when clouds are lacking, the hot dry winds and intense sunshine make conditions ideal for fire to arise and scorch the mountains (see Chapter Three). The presence and absence of airborne moisture, sunlight and strong winds has also strongly influenced the growth and survival of the living landscape (see Chapter Five). For example, gusty winds uproot and blow down trees which in turn disturb the soil. Over thousands of years strong winds can be a major source of both vegetation change and erosion. In the 1880s, one geologist even suggested that air actually formed the mountains. In a paper to the Royal Society of NSW, Reverend J.E. Tenison-Woods proposed an aeolian explanation for the formation of the Blue Mountains.

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18 Data from Bureau of Meteorology.
which suggested that the sandstone landscape was the eroded core of ancient wind blown sandhills.\textsuperscript{21}

Since 1788 the mountain climate has also greatly affected human settlement of the region in countless ways, but its influence has generally gone unremarked except when unusual and unseasonal weather caused property damage, affected agriculture or blocked roads. For example, the first snow seen by Europeans in NSW blanketed the Blue Mountains in the winter of 1815, blocking the newly built mountain road with snow 'so very deep as to prevent the persons stationed there from travelling'.\textsuperscript{22} In July 1910 the heaviest snowfall for over 50 years made the region the 'white mountains, clad in soft, feathery beautiful snow'. The mountain towns were described as a 'world of white' with the snow reportedly shoulder high in some places and 2-3 feet deep on the main road through Blackheath. The heavy snow delighted tourists who found the sight of the trains plunging through the snow a 'picturesque and thrilling experience'.\textsuperscript{23}

Throughout the 19th and 20th Century, many other severe storms have caused damage to local buildings from high winds, and the prolonged absence of rain has on numerous occasions threatened local water supplies and brought devastating bushfires.\textsuperscript{24} However, the mountain air has also


\textsuperscript{22} \textit{Sydney Gazette}, 9 September 1815 p.2.


\textsuperscript{24} For details of droughts and bushfires see Chapters Two and Three. For an example of a recent damaging storm, see \textit{Blue Mountains Gazette}, 7 July 1980 p.2.
influenced the history of the Blue Mountains in another important way - it has provided the region with its name.

**Making the Mountains 'Blue'**

'There is an all-prevalent tint of deep blue resting on every peak and crag, which admirably justified the appropriate-ness and aptness of the name the region bears, the Blue Mountains' J. Inglis (1880)²⁵

It is not known what the Aboriginal Inhabitants of the Blue Mountains called their rugged highland home or if they noticed its distinctive blueness. Undoubtedly, they had a multitude of names for different places throughout the region, most of which were never recorded.

Although the name 'Blue Mountains' was given to the region by Europeans, they were never officially designated as such. In fact, if not for the appearance of the mountain air they may have been destined to be named mere hills. For during an exploration along the Hawkesbury River in 1788, Governor Arthur Phillip actually named the ranges south of the Grose River, 'Lansdowne Hills' and those north of the river, the 'Carmarthen Hills' - in honour of two members of the British aristocracy.²⁶ However, when viewed from a distance in the bright sunshine of a clear day, the mountain range inland from the new settlement at Sydney looked strikingly blue to the first Europeans who saw it - including Governor Phillip.

²⁶ A. Phillip to Lord Sydney, 15 May 1788, *HRNSW. Vol.1*, Part 2, p.133. The use of the word 'hills' shows that Phillip did not think that they deserved the title of
According to John Hunter, Phillip was actually the first person to use the name 'Blue Mountains' although unofficially. Hunter wrote in his journal that a range of mountains could be seen from Port Jackson which were 'called by the governor the Blue Mountains'. Whether or not Phillip was ultimately responsible for the name 'Blue Mountains', it stuck. Almost immediately, the names 'Lansdowne' and 'Carmarthen' Hills became as irrelevant in Blue Mountains history as the men they were named after. By the early 1790s, this still unexplored and unknown region was frequently being called the 'Blue Mountains' by both free-settler and convict alike. The colour of the mountain air ultimately gave the area the name it became commonly known by, and once the name 'Blue Mountains' entered the popular vernacular it never left, providing a small but early example of how the environment of the mountains influenced the history of European involvement with the region. Since 1800, no-one but a few historians have ever referred to the Blue Mountains by their obscure official names - 'Carmarthen' or 'Lansdowne Hills' - a circumstance which few would find a cause for regret.

During the 19th Century, many visitors to the Blue Mountains noticed and remarked on the all prevailing blueness of the mountains. For example, Rene Lesson noted in 1824 that the Blue Mountains were named thus because of

'mountains'. Certainly from where he was standing, they did not look as formidable as they were later to become.

the 'thick haze of a very bluish tint' which enveloped them. However, most descriptions were made by those who visited the region after the opening of the railway. Presumably, the jolting, dust, rain and other hardships of travelling along the mountain road prevented most pre-railway visitors from noticing or appreciating the coloured atmosphere of the region. Nevertheless, as early as 1869, travellers on the newly opened railway were commenting on the 'beautiful phenomenon which has given to this range the name of of the "Blue Mountains", with one visitor remarking that 'no artist can exaggerate - indeed, no artist can approach - that lovely blue that pervades the whole valley'. Another stated that 'the hills look blue at all times, in daylight, moonlight, sunshine, rain...the tone varies, of course, but it always remains blue'.

Mountain visitors often commented that the name Blue Mountains was highly appropriate and 'justly given'. Some found that the distinctive blue atmosphere helped to soften the appearance of the rugged mountain landscape. For instance, one described how the 'haze of the loveliest blue' rested over all in sight 'softening and tinting each harsh outline'. Another found the intense blueness of the 'atmospheric bloom' so 'novel and

29 Sydney Mail, 11 September 1869 p.6.
30 C.R. Sail, Farthest East, and South and West etc., London, 1892, p.158.
surprising’ that ‘even the eucalyptus caught the reflection of this blue shade and lost for once its habitual gray colour’. 33

Although all pervading, some observers noted that the blueness of the mountain atmosphere was everchanging and comprised of many different shades. For example, one early visitor wrote that the ‘inexpressibly beautiful’ blue deepened as the view receded and changed ‘with the hour or the state of the atmosphere into different forms of loveliness’. 34 In 1875, Guillemard noted how:

‘...every far-off gorge and jutting headland of rock, every bluff and peak, has its own distinctive tone of colour. Varying with the position of the sun, the purity of the atmosphere, and with every passing cloud, these tones are now brilliant, now misty, at one moment deep-hued, at another as light and clear as a sapphire’. 34

Another visitor commented that ‘on the mountains blue in all its shades is a predominating force’ which varied from an ‘ethereal’ and ‘tender blue palpitating haze’ to ‘the majesty of far distant indigo that stands out in regal splendour’. 35 Some writers made much of the everchanging variety of blues. For example, one stated that the atmospheric hue was:

‘...a blue that has existed since Creation, and yet it is never quite the same blue for an hour together. Early morn shows a rich sombre hue, which brightens to a happy royal tint with the rising sun. At high noon it is the tenderest azure possible, which deepens and changes as the shades of evening fall’. 36

33 Inglis, op. cit., p.209, G. Verschuur, At the Antipodes, London, 1891, p.68. 33
34 Sydney Mail, 11 September 1869 p.6. 34
35 Guillemard, op. cit., p.124. 35
36 Sydney Morning Herald, 26 January 1901 p.7. 36
Some descriptions of the mountain atmosphere used analogies to try to convey to the reader a better idea of its colour. Guillemand found the depth of colour difficult to describe but compared it with 'the deep clear blue of the open sea'. Bellingham likened the 'peculiar blueish haze' of the mountains to the bloom of 'a bunch of ripe purple grapes'.

Descriptions of the blueness of the mountain atmosphere were also included in Blue Mountains tourist guides, adding it to the list of the region's natural attractions. For example, an 1880s guidebook stated that 'whether near or distant, whether viewed from Sydney or from their own cool heights, they wear the same cerulean garments'. Another helpfully explained that there was no doubt about the origin of the region's name as 'the mountains are called Blue because they look blue from a distance'. Such statements continued well into the early 20th Century, with later tourist guides claiming that 'the rich azure blue in which the whole landscape is bathed is bewitching' and 'this peculiar characteristic atmospheric colouring is a never-ending source of delight to the artistic'. Some descriptions even stretched to the hyperbolic, with one tourist guide claiming that the 'delicate mantle of azure' which swathed the

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37 Guillemand, op. cit., p.130, S.R. Bellingham, Ten Years With the Palette, Shotgun & Rifle on the Blue Mountains, N.S.W., Sydney, 1899, p.15.
mountains was 'famous the world over as the most remarkable manifestation of Natural phenomena in blues known to the artistic world'.

The origin of the Blue Mountains blueness has remained somewhat of mystery. Early observers suggested that the vegetation was responsible. For example, a 1889 tourist guide stated that 'some think the circumstance is due to the blue gum trees, and to exhalations therefrom; but this is, to say the least of it, doubtful'. In fact, this suggestion was almost right. Although the cause of the blueness of the mountains has yet to be scientifically proven, the explanation appears to lie in the optical phenomenon knows as 'Rayleigh scattering'. This visual effect is named after Lord Rayleigh who in a series of experiments found that light with short wavelengths (such as blue light) more easily bounces off small particles in the air (including dust and water droplets) than light with long wavelengths (such as red light). The resulting scattering of the blue light gives a blue appearance to the atmosphere and explains why the sky appears blue when the sun is high in the sky.

Physicists have proposed that the reason the atmosphere in the Blue Mountains appears so blue is because the vegetation enhances the Rayleigh scattering effect. Light is scattered most effectively off tiny droplets of oil, and it has been suggested that the various oil bearing plants in the region

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41. Morris, op. cit., p.270.
42. Conversely, when the sun is low in the sky, the observer is looking through far more air containing far more particles which scatter all the blue light away. This allows the longer wavelength red light to be seen and explains why both sunrises and sunsets appear red. Linacre and Hobbs, op. cit., p.18. T. Ten Brummelaar, pers. comm.
(especially the eucalyptus) disperse large quantities of fine oil droplets into the air. The more oil and water droplets exhaled by these plants, the bluer the air appears. Furthermore, the effects of Rayleigh scattering are more pronounced in mountain areas as solar radiation intensities are greater at high elevations.  

It seems that Guillemard was on the right track when he observed in 1875 that no better location could be desired for 'the study of distance and the effects of light on a landscape'. However, as the oil bearing native plants are not unique to the Blue Mountains, other parts of Australia's eastern highlands also possess a blue appearance when seen from a distance. If the first European settlement of Australia had been located elsewhere on the continent's east coast, another entirely different range of mountains may have become 'blue'.

In addition to its blueness, the clarity of the mountain air was also often remarked on. Early visitors noted that the mountain scenery appeared very clear and every tree could be seen with 'beautiful distinctness'. Distant objects could also be seen more easily. For instance, Inglis noted that on a clear day the white sands near Sydney could be 'distinctly seen' from the mountains. On clear nights, travellers could also see the lights in the Sydney lighthouse and on the harbour 'glimmering in the darkness, 76 miles away'. Some tourist guides also mentioned the clarity of the mountain atmosphere, with one claiming that 'the purity of the air seems to annihilate spaces and makes

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miles appear but feet only'. This allowed the 'veriest details of huge battlements miles away' to be plainly seen and made the 'distant hills appear but - a stone's throw'.

In the 1870s, the air of the Blue Mountains was considered clear enough to carry out several astronomical experiments, including observations of the transit of Venus at Woodford in 1874, during which the air proved 'wonderfully steady and clear'. Further observations of the sun, moon and stars were carried in 1878 to trial the 'observing quality of the mountain air' and the 'gain in clearness over the Sydney atmosphere was very striking'. The solar spectrum was particularly clear in the 'splendid definition of the mountain air' while stargazing also gave 'abundant proof of the good observing quality of the air'. The 'perfect clearness and definition' also provided 'splendid' views of Jupiter and Saturn with 'such an amount of detail that the eye scarcely took it all in'. In 1909 it was even suggested that the Sydney Observatory should be moved to the Blue Mountains so that the Government Astronomer could make his observations free from the distorting effects of the city's smoke, dust, haze and the ever-increasing electric lights.

However, the air of the Blue Mountains was admired for something far more than just its colour and clarity. The mountain air could also work miracles.

45 Inglis, op. cit., p.212, Australian Town and Country Journal, 25 January 1879 p.168. The clearness of the Sydney views may have had more to do with the less polluted atmosphere of the city at this time than the clarity of the mountain air.
46 The 'Mountaineer': Illustrated Tourists' Guide, op. cit., p.25.
Height For Health - The Mountain Air

"The mountain air in Australia is a real miracle-worker" J.Inglis (1880)

In the late 19th Century, the air of the Blue Mountains was viewed as exceptionally healthy in comparison to that of Sydney, which was suffering outbreaks of disease and other health problems as a consequence of its rapid growth and urbanisation. Foul air was believed to carry disease so city residents were increasingly urged to travel to the mountains for a 'change of air' and to escape the humid, dirty and unhealthy atmosphere of the metropolis.

The perception that the mountain air and climate was healthy and hygienic provided an important stimulus to the European settlement of the region, especially after the building of the railway. By the early 1870s, Kurrajong Heights, Mount Victoria and Blackheath had become 'sanitary stations' which afforded 'very fair accommodation to invalids, and to those whose general health requires renovating'. Lawson was also 'much resorted to by invalids' who enjoyed the 'pure, invigorating air'. In 1880, Mount Wilson was also suggested as an ideal site to 'found a sanatorium' or 'convalescent home' which would rival 'hydropathic establishments and sanatoria' in other

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40 Inglis, op. cit., p.335.
countries and 'doubtless attract crowds of inmates' and 'wealthy sufferers'.

Those ' eminent citizens' who built country homes in the Blue Mountains during the late 19th Century also did so partly for the 'reinvigoration of mountain air' which was 'fresh and wholesome, as might be expected at such an elevation'.

From 1880 onwards, the healthiness of the mountain air was widely promoted as one of the prime attractions of the region (see Figure 4.1). The Blue Mountains rapidly developed what Stockton has called a 'fresh air economy', as the local tourist industry and others used the theme of health to lure visitors to the area. It was even suggested that by taking an annual trip to the Blue Mountains 'doctor's bills would be considerably reduced'. For some the healthy air was actually the main attraction of a visit to the mountains. One visitor noted that in the Blue Mountains nature had 'bountifully added the charms of rare scenery to the more solid advantages of a healthy climate'. The scenery kept the 'eye and mind' interested 'while restorative processes are in operation'. By the late 1880s, the 'healthful effects of a trip to the mountains' had reportedly been 'tested by thousands of the population' and Lawson, Springwood, Katoomba, Blackheath and Mount Victoria especially were 'much resorted to by invalids' who sought the benefits of the 'pure, invigorating air'.

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52 Inglis, op. cit., pp.335, 346-349.
53 The Railway Guide of New South Wales, op. cit., pp.38, 43.
Virtually every Blue Mountains tourist guidebook of the late 19th Century mentioned and emphasised the healthy nature of the mountain air. For instance, one urged that visitors should join the 'health-promoting custom' of occasionally visiting the mountain 'and there taking in a fresh supply of ozone, which is so deficient in the crowded centres of the population'. The 'bracing climate' also provided a 'delightful contrast' to the 'humid, enervating atmosphere of the city'. Several mountain districts were described as 'well suited' for invalids and 'destined to be largely frequented by those seeking rest, and a change of air'. Another tourist guide claimed that the 'pure and invigorating atmosphere is both healthful and health giving' and tourists and health-seekers from all over the world 'returned home invigorated' by it.\(^6^7\)

The mountains were generally promoted as a 'marvellous sanitarium' and 'grand health resort' handily located close to Sydney, where the 'jaded denizens of Sydney' and other visitors could experience 'the tonic of sharp air rather than drugs'. After just a short visit business men were said to 'lose all weariness' and 'previously weak' children 'wear the bloom of health'. Horrock's guide described the mountain air as dry, invigorating and as 'inspiriting as iced champagne'. Like the 'cold shower and cooling chamber' after a Turkish bath, the cool mountain air brought back 'vitality which ebbed in Sydney's humid furnace'.\(^6^8\)

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The healthiness of the mountain climate was attributed to several factors. Due to the reduced air pressure at higher altitudes, the air was said to become 'more and more rarified' with elevation, which led to the pressure exerted on the body being 'immensely lessened'\textsuperscript{54}. This permitted both improved circulation of blood and an increased intake of oxygen. As one writer put it:

'...the air of the mountains enables us to use our lungs, compels us to breathe deeply, enlarges our vital capacity, and, by favouring exercise of little-used parts, banishes the tendency to ailment from one of the seats of life'.\textsuperscript{55}

The cooler average temperatures were also seen as beneficial, especially during the hottest part of the year, when by travelling to the mountains visitors could jump 'from the lap of summer into the home of winter'. The lack of moist sea breezes also meant that the mountains only experienced 'dry heat' which did not 'keep one in a bath of perspiration, and thus thin one down'.\textsuperscript{56} The fresh air and cooler night time temperatures on the mountains also meant that a refreshing night's sleep was more easily and naturally attainable with 'corresponding beneficial results'. The 'highlands' were promoted as a place where 'tired nature's soft restorer swiftly returns' for those who had sleep 'denied them in the heat of the metropolis' or chased away by 'the bustle and cares of city life'.\textsuperscript{57} Mountain air was labelled a 'soporific' which not only induced sleep but also provided rest 'very much

\textsuperscript{54} The Blue Mountain Guide, Sydney, 1887, pp.11, 13, Horrocks, op. cit., pp.3-4.
\textsuperscript{55} The Mountaineer, 30 November 1894 p.4.
\textsuperscript{56} Sydney Mail, 8 February 1890 p.300. The 'seat of life' referred to was the lungs.
\textsuperscript{57} The Blue Mountain Guide, op. cit., p.11, Mount Victoria & Little Hartley Progress Committee, op. cit., p.2.
more refreshing than that obtained at lower levels'. Six hours sleep in the mountains was said to be the equivalent of eight hours elsewhere, and unlike in the 'clammy city' one awoke 'so refreshed, so happy, so blithesome'.

Another stated advantage of the cooler mountain air was the absence of mosquitoes and other biting insects. It was often noted that there was no need for mosquito nets on the Blue Mountains as 'here the gentle mosquito chantheth not through the night watches', which was a great advantage to people 'unaccustomed to this prince of Insect fiends'.

 Cooler temperatures and increased circulation also meant that the body required more food and the appetites of mountain visitors were therefore often stimulated by the mountain climate. This in turn caused the body to become 'better nourished' and gain 'in weight and renewed energy'. The 'intensity of this effect' was claimed to be roughly proportional to the elevation, and according to one tourist guide was so pronounced that those 'who could scarcely be tempted to take the daintiest food in the low country soon eat like ploughboys'. Another of the chief cause of the 'wonderful curative effects' of

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43 P. Muskett, cited in Blackheath Progress Committee, Blackheath, Blue Mountains, N.S.W., Sydney, 1903, pp.14-15, Anon., A Mountain Souvenir of the Blue Mountains, NSW, Australia, Sydney, 1903, n.p. However, as at least one writer noted, the cure of a visitor’s insomnia was more likely due to ‘the freedom from the worries and anxieties of city life’ than the mountain air alone - The Mountaineer, 30 November 1894 p.4.


the mountain air was said to be the antiseptic 'exhalations' of the 'boundless eucalyptus forests'.

The combined influence of the mountain air and climate was said to act 'as a general tonic', restoring the health of both mind and body by inducing 'a feeling of well-being and exhilaration' and 'bracing up the whole body'. The mere inhalation of the mountain air gave 'new zest to existence', by 'promoting metabolism', hastening changes 'throughout the system' and replacing worn out tissues with new material. This reportedly made muscles firmer, strengthened nerves, increased mental powers, ensured 'greater regularity' in all bodily functions and brought back 'the glow of health to the colourless face'. The combined effects of an improved metabolism and the 'bracing air' were also considered highly conducive to 'good healthy exercise'. Tourist guides boasted that it was astonishing 'how far persons can walk on the mountains' with 'a minimum of fatigue'. A visitor in 1901 commented that people in the mountains appeared to move more briskly and with greater energy than those in the city.

While it stimulated the body, mountain air also calmed the mind. Many accounts noted that it was 'eminently suited' to those whose brains and nerves were 'weary with the strain of business', the 'ceaseless rattle of tram and bus', and the 'rush and stress of urban life'. Even the mountain mists

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66 Inglis, op. cit., p.335.
were seen as beneficial to the complexion, softening dry skin and producing blooming cheeks, so local young ladies were urged to take advantage of a misty day for an outing.**

As well as generally increasing well-being, the mountain air was also considered beneficial for treating a range of diseases and illnesses. One often cited was consumption (or tuberculosis). According to Inglis, under the influence of the 'bracing mountain air of Australia', the consumptive patient rallied rapidly. Appetite and strength were restored and renewed, the 'hacking cough' ceased and the 'hectic flush' and 'racking pain' were quickly alleviated. By the 1880s it was claimed that the Blue Mountains stood unrivalled as 'a health resort for consumptives and persons with weak chests' and the locality was 'recommended by the most eminent physicians of the day' in preference to European sanatoriums.**

Asthmatics were also said to benefit from the fresh mountain air, with those suffering a 'dreadful cough and oppression of breathing' in the heavy, moist atmosphere of the plains, finding their breath came more freely and easily 'on reaching the summits of the Blue Mountain range'. Other patients which derived 'immense benefit' from removal to the 'dry, light, and pure air of the mountains' included those with dyspepsia (digestion difficulties), thin blood, chronic affections of the liver and intestines, and children suffering from 'mesenteric disease' (abdominal illness). The Blue Mountains were also

**Mount Victoria & Little Hartley Progress Committee, op. cit., p.6, Sydney Mail, 12 December 1896 p.1246, Blue Mountains Gazette, 5 June 1903 p.6.
considered unsurpassed as 'a prophylactic against hay fever or infectious disease.' An 1888 guide to 'health resorts' in Australia also stated that the 'mountain air was 'beneficial in the early stages of Phthisis' (tuberculosis), as well as for asthma, pleurisy (lung inflammation), rhachitis (rickets), nervous and chronic debility, convalescence, epilepsy, hypochondriasis (depression), dyspepsia (digestion difficulties), liver complaints and 'other diseases'. However, the guide also warned that mountain air was 'distinctly disadvantageous' for emphysema, heart diseases, haemoptysis (bleeding lungs) and chronic bronchitis and rheumatism.\(^7\)

The healthiness of the mountain air was given some legitimacy by the statements of a number of medical 'experts'. In 1880, Inglis wrote that the curative effects of mountain air were 'amply endorsed by most of the Sydney medical men of my acquaintance'. One of these may have been Dr. B. Schwarsbach, who in a lecture on the Blue Mountains in the 1880s, noted that mountain climates had 'an invigorating power of their own'. He stated that the beneficial influence of a mountain 'air resort' consisted 'principally in the increased assimilation and change of matter'. This was due to the 'red blood-corputles' changing and replacing at 'a quicker tempo', which in turn 'increased the function of all organs' and led to higher activity 'in the chemistry of our whole organism'.\(^7\) Dr. Prangley of Katoomba also noted that the 'condition of the atmosphere' was the chief 'health restoring influence' in

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\(^7\) Inglis, op. cit., p.335, Mount Victoria & Little Hartley Progress Committee, op. cit., pp.6-7.
\(^7\) Inglis, op. cit., pp.347-348, The Mountaineer, 30 November 1894 p.4.
\(^7\) Bruck, op. cit., pp.147-148.
the mountains. He claimed that 'the general action of mountain air' caused 'deeper and more frequent inspirations', 'greater ease of bodily movement' and 'a freer circulation of the blood'. The heavy rains and strong westerly winds of the mountain climate also contributed to the healthiness of the region by washing and blowing away unhealthy organic matter. However, Prangley cautioned against those who thought that they could not 'breathe too much mountain air' as some illnesses, such as heart disease, kidney disease or rheumatism, could not expect to benefit from the mountain climate.74

A government medical officer, Dr. John Spark, also gave his 'expert opinion' on the subject of the mountain air, noting that it increased chest capacity, and helped sufferers of asthma, bronchial catarrh, some heart troubles and 'convalescents from all prolonged ailments'. He agreed that while these cases could benefit from a sojourn in the mountains, others should avoid it, including consumptive patients which 'show a tendency to sudden and severe blood spitting', people with 'extensive lung trouble and very rapid breathing', and 'elderly persons with degenerated brain vessels, or symptoms of apoplexy'.75 Another expert regularly cited in support of the healthiness of the mountain air was Dr. Phillip E. Muskett, the author of a book on the feeding and management of infants in the 1890s. In his book Muskett stated that 'in many diseases mountain air is a remedy which cannot be surpassed' and 'often superior to all other treatments put together'. Furthermore, that 'a patient inhaling mountain air is being treated by an active restorative' continuously every second of every day and night. According to Muskett,

74 The Mountaineer, 30 November 1894 p.4.
mountain air had 'particular and special chemical and vital qualities which make it conspicuously valuable in the treatment of many diseases'. These he listed as its lower pressure ('more rarified than ordinary air'), its perfect purity (from being 'free from all atmospheric dust and micro-organisms') and the 'relatively large amount of ozone' it contained, which was 'one of the most powerful disinfectants known' and a 'great purifier of the air'. The rays of the 'mountain sunlight' also acted 'chemically on the blood' improving its quality 'by increasing its red corpuscles'.

As late as 1938, another medical figure from Katoomba, Dr. Alex Allan, was being cited in relation to the 'health-giving climate' of the Blue Mountains. Allan largely reprised the views of his medical predecessors, noting that the lower air pressure produced freer blood circulation and 'increased vascularity of the lungs'. The greater ingestion of oxygen meant 'more food is required', so 'appetite is improved' and food is 'better assimilated', resulting in better nourishment, weight gain and increased resistance to disease. Mountain air was again described as 'germ-free' with a higher oxygen content and virtually no harmful organic particles or gaseous substances. Furthermore, the presence of suspended eucalyptol from the myriads of gum trees made the air 'definitely antiseptic'. Those who could benefit from mountain air were listed

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75 Sydney Mail, 12 December 1896 p.1252.
76 Muskett in Blackheath Progress Committee, op. cit., pp.14-15 and in The Mountaineer, 22 May 1896 p.3. Muskett's views on mountain air were republished often in The Mountaineer in the 1890s and continued to be cited regularly in tourist guides until at least the 1930s. For example, see The 'Mountaineer': Illustrated Tourists' Guide, op. cit., pp.22-23, Katoomba Daily, December 1934, Christmas Issue, p.6.
as sufferers of tuberculosis, anaemia, shallow chests, defective circulation, nervous maladies and 'all convalescents from acute diseases'.

While the overall climate of the Blue Mountains was seen as healthy, certain locations were sometimes considered more suitable for specific illnesses. For instance, due to its milder climate, Springwood was viewed as the best location for the most 'feeble and delicate' sufferers. Katoomba and Mount Victoria were said to be suitable for general debility, nervous affections and liver complaints, while Blackheath specially suited 'lung and chest diseases'. Kurrajong Heights was recommended for convalescence and the treatment of nervous disorders, chest diseases and alcoholism (as the nearest hotel was over eight miles away).

The perceived healthiness of the mountain air led to the establishment of several sanatoria in the Blue Mountains in the early 1900s. These included the Queen Victoria Hospital and Bodington Sanatorium at Wentworth Falls, which treated sufferers of tuberculosis with absolute rest and exposure to fresh air. The Hydropathic Sanatorium (later Hydro Majestic Hotel) at Medlow Bath, also offered a healing regime of fresh air, hot and cold baths, mud packs and other 'treatments' such as bowel kneading and centrifugal douching. Many of the private boarding schools established in the Blue

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77 A. Allan, 'Health-Giving Climate', in The Blue Mountains: Australia's Premier Tourist Resorts, Melbourne, 1938, pp.33-34.
79 J. Stockton, in Stanbury, 1988, op. cit., pp.88-89. Another example was the R.T. Hall sanatorium at Hazelbrook. A home for tubercular patients, called Lynton, also operated in Leura in the early 1900s - see paper by E. Robinson, BMHS Files. However, consumptive patients were not always welcome in the Blue Mountains and
Mountains also listed the healthy mountain air as a feature of the area to attract students. For example, it was claimed that the schools at Mount Victoria had the 'special advantage of the pure, healthy atmosphere', which should have 'no small weight with parents' when selecting schools.  

Unabashed promotion of the health-giving propeties of the mountain air has persisted throughout the 20th Century. For instance, a tourist guide in 1903 claimed that the 'salubrious atmosphere' was 'better than doctor's medicine!' and 'better than all the careful nursing in the world', and there was no better means 'for preserving the health' and 'adding years to one's life' than 'by dwelling for a while upon the Blue Mountains'. A visitor in 1910 advised that while the mountain climate might not 'perform a surgical operation on all and sundry', if taken in time it might 'go far to avert the need of one'. As in the previous century, tourists were urged to experience the 'remarkably pure and invigorating character of the atmosphere' and expand their lungs 'with the health-giving oxygen which makes these altitudes the great National Sanitoria'.

By the 1920s, the Blue Mountains had been elevated to the status of the 'greatest holiday and health resport in the Commonwealth', where a course of the 'ozone-laden winds' proved a 'vertiable elixir of life' for those 'debilitated by

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Footnotes:
strenuous work in the cities' or 'suffering with any form of anaemia, nerves or lassitude'. The Blue Mountain Echo maintained that the mountain air was prophylactic, palliative and 'actively curative'. Even the area's low death rate (then estimated at one death per thousand per annum) was presented evidence of the health-giving nature of the Blue Mountains air. However, to get the full benefit 'you must live in it, night and day, breathing no other, till it fills every nook and cranny of your lungs and every other part of your body'.

While much of the glorification of the mountain air dissipated during the late 20th Century, the 'clean, invigorating and bracing air' of the Blue Mountains was still listed as a major attraction for both visitors and the increasing numbers of new residents of the area. Echoing newspapers of a century before, in 1968 the Sydney Morning Herald stated that 'year after year, visitors come back for yet another glimpse of the breathtaking scenery, and the chance to fill their lungs with the pure mountain air'. As late as the 1980s, one of the slogans promoting Blue Mountains tourism was 'Come Up For Air'.

Despite the neverending hype, the mountain air was not always as healthy as claimed. As early as 1915, complaints were being made in Katoomba about the 'nuisance' of coal smoke from the town's electric power station chimney,

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*d* Low, op. cit., p.74.


which was seen as 'incongruous that any nuisance should exist in such a
great health resort as Katoomba'. Prior to electrification of the line, trains
traversing the Blue Mountains were also a major source of localised air
pollution, especially when badly maintained. In the 1950s it was stated that
'all the way along the railway line houses are gradually but surely being
sooted up' by passing trains and concern was expressed for 'the lungs of the
people who live in those houses'. Local residents were also adding to the
pollution, especially during winter when 'hundreds of cottage chimneys' sent
forth black smoke into the air.  

It is not known if air quality in the Blue Mountains has deteriorated overall
since the commencement of European settlement, as virtually no monitoring
data is available. Limited sampling in the 1990s has indicated that, as
eleswhere, the Blue Mountains air is affected by motor vehicle exhausts which
emit airborne lead particles, ozone, nitrous oxide, carbon monoxide and
hydrocarbons. A study in 1992 found that lead levels in the region extending
200 kms around Sydney closely matched motor vehicle density with lead
concentrations highest within 100 metres of busy roads (both in air and soil).
Later sampling has also confirmed that some low level ozone emitted by
vehicles in Sydney is being blown across the Blue Mountains by easterly
seabreezes during summer.  

88 D.D. Cohen, et. al., 'A Twelve-Month Survey of Lead in Fine Airborne Particles in
the Major Population Areas of New South Wales', Clean Air, Vol.28, No.2, 1994,
pp.79-88, Margaret Young, David Johnson, Environment Protection Authority (NSW),
pers. comm. During the 1990s data was obtained from air monitoring sites at
Blackheath and Wentworth Falls (King's Tableland). On a statewide basis, fine
particle lead concentrations in the Blue Mountains were low (50-100 ng m⁻³)
compared with inner Sydney (300+ ng m⁻³).
In general, air pollution in the Blue Mountains remains localised and sporadic, and mostly caused by unusual weather conditions which prevent the dispersal of concentrated motor vehicle exhausts and the smoke from chimneys, hazard reduction burning and bushfires. It is likely that air quality overall will steadily worsen as the number of vehicles in the region continues to increase. By 1997, over 46,000 motor vehicles were registered in the Blue Mountains local government area with the number steadily increasing in line with the population. Even so, most of the air pollution generated in the mountains ultimately ends up contributing to western Sydney's already significant air pollution problem, due to the combined effect of greater exposure to the prevailing westerly winds and the drainage of colder air from elevated regions to lower altitudes (katabatic winds). For these environmental reasons alone, the Blue Mountains will always have better air quality than Sydney and the region is therefore likely to remain an attractive place for city residents seeking 'a change of air'.

Although often considered the invisible element, air is omnipresent in the history of the Blue Mountains and its influence can be clearly seen in a variety of ways. For millennia the mountain atmosphere has influenced landscape and life in the region, while in recent centuries it has given the

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* Roads and Traffic Authority (NSW). While overall exhaust emissions are increasing, lead levels will most certainly decline in future as the use of unleaded petrol becomes more widespread.
mountains their name, and become a source of health, wealth and admiration. However, to complete the environment history of the Blue Mountains requires the examination of one more vital element - the living element.

*Linacre and Hobbs, op. cit., p.146.*
Chapter Five

Life

People do not exist in isolation but share the world they inhabit with a myriad of other lifeforms. Plants and animals are not only our living companions but their existence makes our existence possible. This chapter outlines the significance of the human relationship with other life and its critical importance in the history of the Blue Mountains.

The Living Landscape

Life has always existed in the Blue Mountains. Fossils imbedded in the ancient rocks of the area confirm that for hundreds of millions of years before the mountains were formed, innumerable forms of life appeared, evolved, flourished and became extinct. During the time that the Blue Mountains were being uplifted (from around 90 to 60 million years ago) the area was located in a northeastern peninsula of the southern supercontinent of Gondwana. Fossil pollen, spores and leaves indicate that much of the region was clothed with ancient Gondwanian forests, dominated by southern conifers (Podocarps), cycads, ginkgoes, ferns, mosses, and some early flowering plants, all of which thrived in the high rainfall. The breakup of Gondwana coincided with a global revolution in flora. The ancient forms of plants which had dominated the scene for millions of years were gradually being displaced by the newly appeared flowering plants (or angiosperms), which during the Late Cretaceous were evolving and diversifying into a wide range of environments.
During their radiation around the globe, prehistoric Australia received its share of the 'ancestral Angiosperms', which became an integral part of the ancient mountain flora and in time would come to dominate it.\(^1\)

The 'Age of the Reptiles' also continued during the Late Cretaceous and dinosaurs roamed the newly-forming Blue Mountains. As yet no Cretaceous dinosaur fossils have been found in the Blue Mountains but dinosaurs undoubtedly inhabited the region at this time as they did elsewhere in what is now southeastern Australia. These may have included the carnivorous *Allosaurus*, a small rhinoceros-like ceratopsian, an ostrich-like creature (*Ornithomimosaurs*) and several smaller chicken to dog sized herbivorous dinosaurs (*Hypsilophodontidae*) - the fossilized remains of which have been found in Victoria and NSW. Flying reptiles (pterosaurs), crocodile-like amphibians (labyrinthodonts), and numerous fish and insects were also some of southern Australia's Cretaceous fauna.\(^2\)

A massive wave of extinctions occurred at the end of the Cretaceous that included all of the dinosaurs and other giant reptiles. While the causes are still uncertain and much debated, the result was that the lengthy reign of the reptiles and many non-flowering plants came to an abrupt end. During the following Tertiary Period (65 to 2 million years ago), mammals, birds, insects and flowering plants became the dominant forms of life. As in much of ancient

southern Australia, during most of the Tertiary the well-watered area of the Blue Mountains contained warm temperate broadleaf-conifer forests. The structure of these 'Paleoflora Mixta' forests was open and multilayered and they contained a mixture of plants with abundant conifers, ferns and many broadleaf and sclerophyll (hard, narrow-leaved) species of flowering plants. Two of the most prominent trees were the Antarctic Beech (*Nothofagus*) and Hoop Pine (*Araucaria*), and early representatives of the *Proteaceae* and *Myrtaceae* families were also present.\(^3\)

Around 45 million years ago Australia separated completely from the other pieces of Gondwana, becoming an island continent. Like an enormous ark, as it slowly drifted north it carried with it a 'living cargo' of Gondwanan-inherited plants and animals that in their millions of years of isolation evolved into uniquely Australian species. During the Late Tertiary, the Australian flora developed a number of distinctive characteristics. The most notable was that the sclerophyll flowering plants came to dominant the continent's flora. Sclerophyll plants are those which have developed leaves that are leathery, hard, spiny or reduced in size. This characteristic is believed to be an evolutionary adaption to nutrient-deficient soils which was further enhanced by the continent's increasingly drying climate and more frequent occurrence of fire (see Chapter Three). Of the sclerophyll plants, two genus in particular - the *Eucalyptus* (gum trees) and *Acacia* (wattle trees) - eventually formed the vast majority of the Australian flora.\(^4\)

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\(^3\) White, *op. cit.*, pp.40-45, 188, 195-199.

\(^4\) Australia's lengthy isolation also resulted in high endemism, with some 80% of native plants occurring naturally nowhere else in the world. *Ibid.*, pp.15, 43-47, 187,
As with the flora, Australia’s ancestral terrestrial fauna also evolved into numerous distinctive and endemic forms which inhabited every available ecological niche. In the mammals, Australia inherited a much higher proportion of marsupials (pouch-bearing) and monotremes (egg-laying) than placentals (womb-bearing). The lack of placentals meant that the island continent instead evolved a separate and unique mammalian fauna that included many of the functional types occupied by placentals on other continents. For instance, Australia developed marsupial equivalents of mice, cats, dogs, flying squirrels, antelopes, sloths and rhinos, as well as monotreme versions of anteaters and watermoles. Later, as the Australian continent crept closer to Southeast Asia, small placentals such as bats and rats invaded from the north and took up residence.\(^5\)

Australia’s avifauna also developed distinctively. Certain types of birds were inherited from Gondwana which later gave rise to many unique species. Some of the earliest to occur were penguins and flightless running birds, including emus and cassowaries. Parrots and pigeons were also Gondwanan in origin which in terms of species diversity have especially flourished in Australia. Mound builders, like lyrebirds and megapodes (mallee fowl), and many Australian perching birds (or Passerines) are also unique descendents of


Gondwanan birdlife. Despite the extinction of the dinosaurs, the Australian Ark still retained a large variety of reptiles as well as amphibians, with some of the oldest lineages including the large monitor lizards (goannas), crocodiles, freshwater turtles, boid snakes and ground frogs (Myobatrachids).

Like elsewhere in the world, some of Australia's ancient terrestrial animals were giants, collectively known as 'megafauna'. The vast majority of these were browsing and grazing mammals, which included giant versions of modern day kangaroos (Macropus), wombats (Vombatidae) and echidnas (Zaglossus), some more than double the size of their recent relatives. Others were more unusual in appearance, such as the stocky giant wallabies (Protemnodon) and the giant short-faced kangaroos (Sthenurus, Procoptodon and Simosthenurus). Hunting these herbivores were large predators like the marsupial lion (Thylacoleo) and the killer rat kangaroo (Propleopus). The largest and perhaps most distinctive of the mega-marsupials were the furry, rhino-sized herbivores (Diprotodonts and Zygomaturus) and the tree-felling, sloth-like creatures (Palorchestes), some of which weighed up to two tonnes and possessed short trunks. Australia's ancient fauna also featured several giant birds, including giant species of eagle, mallee fowl (Progura) and an enormous flightless emu-like bird (Genyornis) which weighed around 100 kgs and stood about two metres high. The Australian mega reptiles included a seven metre long gigantic goanna (Megalania), a three metre long terrestrial crocodile (Quinkana), and a huge python-like snake up to six metres long (Wonambi).

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There were also large horned turtles (*Meiolanidae*) weighing up to 200 kgs with spiked club-like tails.⁷

Although to date no fossil evidence of megafauna has been found in the Blue Mountains, it is likely that some megafauna inhabited the region, especially as the region's diverse and dissected terrain must have provided a variety of suitable fauna habitats as it does today.⁸ At least 29 species of browsing and grazing megafauna mammals are believed to have inhabited the forest and woodland habitats of eastern and southeastern Australia, while the giant python (*Wonambi*) seemingly preferred rocky areas like those in the Blue Mountains. However, megafauna abundance is likely to have been the highest in those mountain locations with better soils and abundant water.⁹

Major climatic changes occurred during the late Tertiary Period (from 40 million years ago), however safe within a steady rainfall zone the Blue Mountains was little affected and maintained its mantle of mixed forests throughout the Miocene (from 25 to 5 million years ago). In response to Australia's increasing aridity during the last five million years, the sclerophyll plants (especially the *Myrtaceae* family) spread to every part of the continent,

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⁹ The nearest location to the Blue Mountains where megafauna fossils have been found is the Wellington Caves, located over 100 kms to the northwest. No evidence of megafauna has yet been discovered in any of the caves in the Blue Mountains region. Robert Jones, Australian Museum, Sydney, *pers. comm.*
becoming the dominant flora. The fauna which had coevolved to both the drier conditions and sclerophyll vegetation also became more widespread and abundant. During this process numerous species of plants and animals became extinct or were forced in refuge areas.\(^{11}\)

The Blue Mountains were no longer excluded from these enormous environmental changes. Gradually, over the last few million years the vegetation of the Blue Mountains changed from the ancient mixed broadleaf forests to open sclerophyll forests, dominated by the genus *Eucalyptus*. This process was continual but fluctuated greatly resulting in a shifting mosaic of vegetation. In wetter warmer times, the temperate broadleaf forests and rainforest which had persisted in sheltered refuge sites would recolonise former areas, only to be driven back by the drier loving sclerophyll species when the climate became drier again. At the peak of glacial episodes (such as around 18,000 years ago), much of the higher Blue Mountains was so cold, windy and arid that little or no vegetation survived. Eventually, around 10,000-8,000 years ago, the composition and distribution of the mountain flora came to resemble that of the present day.\(^{12}\)

The dominant vegetation of the Blue Mountains is now open dry sclerophyll forests and woodlands with an understorey of various shrubs and grasses. However overall the plant communities of the region are quite diverse, ranging from stunted windswept heath to lush moist rainforest. Over 2,000 species of

native plants have been recorded in the Greater Sydney region with at least 20 species endemic to the Blue Mountains, including two species of eucalyptus trees, two conifers and numerous sclerophyll shrubs.\textsuperscript{13}

The mountain vegetation varies greatly with soil type, altitude, moisture and terrain. On exposed ridges, open woodlands occur with trees generally widely spaced and low in height (under 10 m). Where shallow sandy soils predominate, the major tree species include scribbly gum (Eucalyptus sclerophylla), red bloodwood (Eucalyptus gunnifera), narrow-leaved stringybark (Eucalyptus oblonga) and smooth-barked apple (Angophora costata). In more sheltered locations with deeper mixed soils, open-forests of taller more closely spaced trees occur (ranging from 10-30 metres in height) with a mixed shrub understorey. Major species on sandy soils include the Sydney peppermint (Eucalyptus piperita) and broad-leaved peppermint (Eucalyptus dives), in company with black ash (Eucalyptus sieberi) in the upper Mountains and red bloodwood in lower areas. Turpentine (Syncarpia glomulifera) and white stringybark (Eucalyptus globoidea) are common on clay-shale soils, while alluvial soils along major watercourses support river oaks (Casuarina cunninghamia) and white gums (Eucalyptus benthamii).\textsuperscript{14}


\textsuperscript{13} For a list of the endemic species and further details on the vegetation of the Blue Mountains, see D.A. Keith and D. H., Benson, 'The Natural Vegetation of the Katoomba 1:100 000 Map Sheet', Cunninghamia, Vol.2, No.1, 1988, pp.107-143.

On the more protected valley slopes with deeper soils, the vegetation is more luxuriant and trees often attain heights of greater than 30 metres. The dominant trees of this tall, open-forest are the round-leaved gum (Eucalyptus deanei), turpentine and several species of grey and white gums (e.g. the mountain grey gum, Eucalyptus cypellocarpa). Tall open-forest also occurs on basalt soils where the more common tree species are ribbon gum (Eucalyptus viminalis), Blaxland's stringybark (Eucalyptus blaxlandii) and brown barrel (Eucalyptus fastigata). In the deepest south and east facing gullies of the region, sheltered from harsh sunlight, dry winds and bushfires, pockets of warm temperate rainforest (or closed-forest) exist, with the largest canopy trees being coachwood (Ceratopetalum apetalum), sassafras (Doryphora sassafras), and lillypilly (Acmena smithii). Beneath the canopy, a lush vegetation thrives in the moist shaded conditions and fertile soils, which includes possum woods (Quintinia sieberi), tree ferns (Dicksonia antarctica and Cyathea australis), and numerous smaller ferns, mosses, fungi and climbing vines.¹³

In stark contrast, heath occurs on the highest and most exposed mountain ridges with shallow, infertile soils. This is comprised of various gnarled, stunted and low-growing shrubs including Blue mountains mallee ash (Eucalyptus stricta), various banksias (such as Banksia ericifolia) and tea trees (including Leptospermum attenuatum). Clinging to the cliff faces, rocky overhangs and steep plateau edges of the region are also a number of hardy and specialised plants, including epacrid shrubs (such as Dracophyllum

secundum). Marshy swamps are also found in the poorly drained headwater valleys on the mountain plateaus. Here the most waterlogged valley bottoms contain sedge swamps, chiefly comprised of button grass (Gymnoschoenus sphaerocephalus) and razor sedge (Lepidosperma limicola). Perched on the steeper valley slopes and cliff edges are shrub swamps (known as hanging swamps) which commonly contain dagger hakea (Hakea teretifolia), blunt-leaf heath (Epacris obtusifolia) and various tea tree species.¹⁶

The extreme ecological changes which took place during the last million years took an especially heavy toll on Australia's terrestrial fauna, including those inhabiting the Blue Mountains. Unable to adapt or migrate, large numbers of species declined and disappeared forever. Worst affected were the megafauna which all became extinct during the last 100,000 years. Over 40 species of large mammals died out including all the diprotodons, marsupial lions and rhinos, tree-fellers and giant kangaroos, wombats and echidnas. Other Australian megafauna species which disappeared were the giant goanna and python, the terrestrial crocodile and the giant emu and mallee fowl.¹⁷ Due to its higher rainfall, it is possible that the Blue Mountains (and other parts of the eastern highlands) provided some of the last refuge areas for the forest-dwelling megafauna. However, by the beginning of the Holocene (10,000 years ago) the megafauna had disappeared completely and the distinctive modern fauna of the Blue Mountains became established.

As elsewhere in Australia, the native fauna of the Blue Mountains today comprises a diverse group of mammals, birds, reptiles, amphibians, fish and a galaxy of insects and other invertebrates. Many of the smallest forms of mountain life no doubt remain undiscovered and undescribed. At least 45 species of native mammals occur in the Blue Mountains, inhabiting a range of habitats. Most are marsupial herbivores, although several species of carnivorous or omnivorous marsupials also occur (including quolls, dunnarts and bandicoots). The native mammalian fauna is largely nocturnal and includes tree-dwellers (possums, gliders, koalas and bats), aquatic animals (platypus and water rats), burrowing animals (wombats) and ground-dwellers (kangaroos, wallabies, quolls, echidnas, bettongs, antechinus and native rats).\textsuperscript{18}

Birds are the most conspicuous and abundant animals in the Blue Mountains and the region has an especially rich and diverse avifauna. Over 230 species of birds have been recorded, many seasonal visitors to the mountains. Due to the abundance of nectar-rich plants, honeyeaters are particularly common with over 20 species occurring in the Blue Mountains. Two often seen are the Eastern Spinebill (Acanthorhynchus tenuirostris) and Yellow-faced Honeyeater (Lichenostomus chrysops). Most nesting in the mountains occurs in Spring (August to December), coinciding with the flowering of most nectar-producing plants and greater abundance of insect life. Other common mountain birds include parrots, such as the Crimson Rosella (Platycercus elegans), King Parrot (Alisterus scapularis) and Yellow-tailed Black Cockatoo

\textsuperscript{18} J. Smith and P. Smith, \textit{Fauna of The Blue Mountains}, Sydney, 1990, p.15.
(Calyptorhynchus funereus), as well as the Superb Lyrebird (Menura novaehollandiae), Laughing Kookaburra (Dacelo novaeguineae), Pied Currawong (Strepera graculina) and Peregrine Falcon (Falco peregrinus).¹⁹

The reptiles of the Blue Mountains comprise two species of aquatic tortoises, 37 species of lizards (including goannas, geckos, dragon lizards, legless lizards and 25 species of skinks) and 19 species of snakes (including the Diamon Python Morelia spilota, two tree snakes, the Eastern Blind Snake Ramphotyphlops nigrescens, and 15 species of fanged snakes - many lethally venomous). One species of skink, the Blue Mountains Water Skink (Eulamprus leuraenis) is endemic to the region and occurs only in swamp vegetation in the upper Mountains. 29 species of frog also inhabit the wetter habitats of the Blue Mountains, most found in the lower Mountains. 17 species are tree frogs (capable of climbing shrubs and other low vegetation) while the remaining 12 species are classed as ground frogs. The mountain streams are inhabited by a variety of native freshwater fish, including mullet (Mugil petardi) and mountain galaxias (Galaxias odilus), along with mussels (Velestino spp.), crayfish (Cherax spp.) and short-finned and long-finned eels (Anguilla spp.).²⁰

As well as always comprising an important part of the mountain landscape, life has also played an important role in shaping the environment of the Blue Mountains. Over time the actions of countless generations of plants and

²⁰ Smith and Smith, op. cit., pp.67-68, 72, 85.
animals have altered both the living and non-living landscapes of the mountains in a variety of ways. For instance, in a complex and mutually beneficial interaction, many mountain plants (including banksias, grevilleas, waratahs and many eucalyptus species) provide fruit, pollen and nectar as food for a variety of animals (including birds, mammals like gliders, bats and possums, and numerous insects) which during feeding pollinate the plants or disperse their seeds. In the process both flora and fauna are able to survive and spread.\textsuperscript{21} The activities of plants and animals also affect the non-living landscape. For example, microorganisms and the roots of plants help to crack and breakdown rocks, while the actions of numerous creatures shift and turnover the soil (in a process called bioturbation) which often causes accelerated erosion and litter decay in sloping terrain. Some of the species involved include ants, earthworms, termites, cicada nymphs and beetles, while the digging, scratching and scraping of lyrebirds, echidnas, wombats and bandicoots also shifts significant amounts of soil. One study has estimated that each year lyrebirds alone turnover on average about 63 tonnes of debris per hectare, making them a 'significant geomorphic factor' in sloping sandstone landscapes like the Blue Mountains.\textsuperscript{22}

\textsuperscript{21} White, op. cit., pp.176, 189, 203-204.
Nevertheless, the long term landscape and ecological changes caused by all these lifeforms have been greatly exceeded by the activities of just one species - a recent mammalian immigrant to the Blue Mountains.

**Hunting Life**

**The First Hunters**

*When the meat was cooked Mirigan and his friends had a great feast*  
Gundungurra Legend.\(^22\)

Sometime during the last 500,000 years, a medium-sized, bipedal creature first arrived in Australia. Omnivorous, mobile and highly intelligent, *Homo sapiens* was the third type of terrestrial mammal to invade Australia from the north as the continent drifted ever closer to Southeast Asia. Like its placental predecessors - the bats and rats - this mammal spread rapidly across Australia, and in the process forever changed the marsupial-dominated island continent. When people first arrived in the Blue Mountains they found a wealth of living resources available. Like early humans everywhere, the first mountain inhabitants were 'hunters and gatherers' - primarily of other life.

Of prime importance to all people is the need to obtain food. Human survival depends on the consumption of food from which provides energy, carbohydrates, trace elements, vitamins, fatty acids and other essential

substances. Human life depends on the consumption of other life, both plants and animals.

The First Hunters ate an enormous range of plant and animal life in the Blue Mountains. Every type of mammal was hunted in the Blue Mountains, most usually roasted on a fire or cooked in an earth oven. Barrallier recorded that the Aboriginal inhabitants usually fed upon possums, gliders, kangaroos, wild dogs (dingoes), wombats, kangaroo rats and koalas (called colo). Archaeological evidence found in the region also indicates that possum and swamp wallaby were some of the principal flesh foods consumed in the mountain gorges. Echidnas, platypus, bats, bandicoots, bush rats and mice were also hunted, as were all types of birds, especially the larger species such as emus, ducks, lyrebirds, parrots, pigeons, brush turkeys, kookaburras, bowerbirds and quails.

Every variety of reptile was also hunted in the Blue Mountains, including goannas, lizards, snakes and tortoises, and frogs were also eaten. Barrallier also observed Aboriginal hunting of lizards and snakes in the mountains, some of which were skinned before being roasted and eaten. While he

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described snakes as 'repugnant to eat', the taste of lizard he found preferable to possum.26

A variety of aquatic species were also caught and consumed. According to Barrallier, many of the mountain swamps, rivers and ponds were teeming with 'enormous eels' and 'different species of fish and shells', all of which were eaten by Aboriginal people. Freshwater mussels, which were eaten both raw and slightly roasted, were apparently a 'favourite food' in the region, as they could be gathered easily and quickly in dilly bags often in large quantities.27

The adults and larvae of many types of insects, worms and other invertebrates were also consumed by Aboriginal people (raw or cooked in hot ashes), including wood boring beetles, moths, termites, paper wasps, cleadas and ants. Due to their high fat content, many edible grubs were especially relished. Several observers, including Barrallier, noted that grubs were 'a delicacy of which they never get tired'.28 Ants and their eggs were also considered 'good food' and eaten 'greedily', either raw or mixed with fern roots to make an edible paste. The eggs of birds and reptiles were also prized. Barrallier records that parrot's eggs were collected from nests high up in trees while lizard and turtle eggs were dug from the sandy river banks. Other animal food sources obtained in the Blue Mountains were honey, collected

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from the nests of the stingless native bees, and sugar lerp, a scaly deposit produced by leaf bugs (psylids), which was eaten or added to water to sweeten it.\(^{29}\)

In addition to the wide variety of animal foods, numerous edible plants also formed a significant component of the Aboriginal diet and are likely to have been of much greater importance as a regular staple. Unfortunately, there is far less evidence of Aboriginal plant foods used in the Blue Mountains as little plant material is preserved in archaeological deposits and most plant foods were gathered by women and children, whose activities were usually not recorded in historical accounts.\(^{30}\) Appendix 4 lists over 90 species of edible plants which occur in the region and are likely to have been used by Aboriginal people in the Blue Mountains.

Fruit and berries were collected seasonally from at least 30 types of plants, most found in or near rainforest and sheltered gullies. An Aboriginal informant told the *Sydney Mail* in 1896 that as well as consuming marsupials, fish and ducks, Aboriginal people in the Blue Mountains also 'relied on' a variety of fruits and berries. Edible fruit plants in the Blue Mountains included the 'geebung' (*Persoonia* spp.), 'burramung' (a currant-like plant), 'wild cherry' (*Exocarpus cupressiformis*), the 'quandong' and the


native cucumber vine (called 'muron'). As they were available year round, underground tubers, roots and stems were also a major food source. These were obtained from many different species, including numerous ground orchids, lilies, climbing plants, rushes, ferns and herbs. Fungi, bulbs and the leaves of pepper trees and matrush were also eaten, as were the seeds and kernels of various trees and portions of tree fern trunks, which Barrallier recorded was roasted and eaten.

Due to the abundance of nectar-producing plants in the Blue Mountains, nectar was also an important food source in the region. Nectar was collected from many flowering plants including banksias, bottlebrushes (Callistemon spp.), grevilleas and waratahs (Telopea speciosissima). The flowering season provided an 'annual spree' of nectar drinking for Aboriginal people in the mountains. The flowers were sucked or the nectar obtained by mashing or soaking the flowers in bowls of water. Evidence of nectar consumption in the Blue Mountains was recorded by Blaxland in 1813. At an abandoned Aboriginal campsite in the Vale of Clwydd the explorers found many 'flowers of the honey-suckle tree scattered around' which had been used for food as they were 'very full of honey'.

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32 For details of species see Appendix 4. Barrallier, op. cit., p.803.
Some unusual plant foods were also exploited in the mountains. These included the exuded gum or sap from trees (manna) and the seed kernels of the burrawang palm (or cycad) (Macrozamia communis), which required careful preparation (including leaching and pounding) to remove the poison before eating.**

As well as providing food for the First Hunters, the plants and animals of the Blue Mountains also supplied the raw materials for numerous other items. The clothing of the Aboriginal inhabitants of the Blue Mountains consisted of full-length cloaks or 'mantles' made from marsupial skins (usually possum and kangaroo) sewn together with sinews from kangaroo tails. Plaited belts of possum fur (up to 10 to 12 feet in length) were worn around the waist, with flaps of possum skin attached as coverings and a purse made from an animal bladder. Kangaroo teeth were worn as ornaments, either strung around the forehead or attached to the hair with gum. Dyed possum hairbands were also worn as were necklaces made from reeds.**

Plants and animals also provided most tools and weapons. Wood from eucalyptus and wattle trees was used to make numerous essential items such as digging sticks, boomerangs, woomeras, dishes (coolomon), clubs (whady), shields, canoes and bark shelters. Spear shafts were obtained from the stalks of grass trees (Xanthorrhoea spp.). Animal bone tools were used as chisels and

** Numerous remains of burrawang palm seeds have been found in archaeological deposits in the region suggesting that they were an important item of food, perhaps used as a staple or for feeding large gatherings of people. McCarthy, op. cit., p.199, S. Bowdler, 'Hunters in the Highlands: Aboriginal Adaptions in the Eastern Australian Uplands', Archaeology in Oceania, Vol.16, No.2, 1981, pp.99-111.
for piercing skins, while mollusc shells were used for fishing hooks and sharpening wooden tools. Fibre was obtained from a variety of plants (including kurrajong and matrush) to make string and twine, which was used for binding and hafting and to make string bags, baskets, necklaces, fishing lines, nets and traps. For adhesives, resin and gum were obtained from plants such as wattles and grass trees, and wax was gathered from the hives of native bees.\textsuperscript{36}

Aboriginal people also used plants to harm and heal (see Appendix 4). For instance, certain plants (including wattle bark) contained poisons and narcotics which were used to catch fish and eels, drug animals at watering holes or induce abortions. Other herbs, leaves, roots, seeds and bark were used to cure illness, often involving the extraction of the juice by crushing or boiling. For example, medicinal tonics were made from tree ferns, sarsaparilla (\textit{Smilax glycyphilla}) and sassafras bark. Eucalyptus gum was used as a salve to treat wounds and reportedly possessed 'a very healing quality'. Moss and spiders' webs were also used as wound dressings while bark and leaves provided bandages.\textsuperscript{37}

Plants and animals were significant in the ceremonial life of Aboriginal people as well. As well as in everyday life, items such as animal fat, skins, bones, feathers, leaves, gum, branches and trees were used during traditional

\textsuperscript{36} Barrallier, \textit{op. cit.}, pp.773-775, Govett, \textit{op. cit.}, p.8, Russell, \textit{op. cit.}, p.10.
\textsuperscript{37} Barrallier, \textit{op. cit.}, pp.767, 781, 797, Kohen and Downing, \textit{op. cit.}, pp.1-8. Also see Appendix 4.
ceremonies. For example, in some Gundungurra ceremonies participants apparently wore shoes made from feathers and placed parrot feathers (especially red feathers from the King Parrot) in their hair. Drums made from folded possum rugs were also played to accompany singing. Trees carved with various patterns and designs were also a feature of some mountain ceremonial and grave sites, with the markings often facing east and extending up to 10 feet high. In addition, the imitation of animal movements was most likely an important part of some Aboriginal fireside ceremonies in the Blue Mountains as it is elsewhere in Australia. 36 Whether carved on trees, engraved in rocks or painted on cave walls, animals have also been the most frequent subject of Aboriginal art in the Blue Mountains, with many works thought to represent hunting scenes. 37

Given the critical importance of other life to Aboriginal people it is no surprise that they were incredibly skilled at hunting and gathering the living resources they required. During the thousands of years in which they inhabited the Blue Mountains the First Hunters developed an intimate and detailed knowledge of the mountain environment, especially the location and seasonal availability of different plants and animals. An integral part of this was their ability to read

38 As noted in Chapter One, numerous engravings and paintings of various animals and their tracks have been recorded in the region (including kangaroos, emus, echidnas, wombats, goannas, fish and snakes). E. Stockton, 'Aboriginal Art in the Blue Mountains', in Stockton, 1993, op. cit., pp.63-79.
the landscape. For example, Govett observed that Aboriginal hunters were 'continually on the look out', scanning everything from the ground to the treetops and 'constantly stopping to examine this, that or the other'.

Although some mountain habitats (such as swamps, watercourses and lush forests) generally provided a greater range of living resources, plants and animals were obtained from all over the region and a range of techniques were used to hunt life in the Blue Mountains. Many species were obtained with little trouble, especially plants, mussels and slow-moving animals. Edible grubs and ants eggs in particular required minimal effort, being extracted from tree trunks and rotting timber with the aid of axes and small hooked sticks.

Other living resources were far more difficult to acquire. For instance, group cooperation was often necessary to hunt the larger and swifter animals such as kangaroos and emus, which were surrounded or driven into specially constructed and camouflaged traps. To kill larger animals, Aboriginal hunters generally used spears, boomerangs and axes. Years of practice meant that these were usually deployed with deadly accuracy often over impressive distances. Barrallier was particularly impressed with the Gundungurra's use of boomerangs for hunting, which he likened to a cannonball 'knocking down everything in its passage'. In addition to hand-held weapons, nets and traps

were used to catch birds, fish and eels. Fire too was an important tool for hunting and gathering (see Chapter Three).\textsuperscript{43}

Climbing trees was also an essential hunting technique which observers like Govett, Barrallier and Collins noted required much toil, fearlessness and dexterity. The main method used in the Blue Mountains involved cutting notches in the trunks of trees with an axe, which were used as toeholds during climbing. Once the tree had been climbed, the hunters were able to gather eggs or catch possums, birds and other tree-dwelling animals by enlarging their hollows with the axe before hooking them out of their hiding places with a stick. Hollow branches containing beehives were usually chopped down and split open on the ground to retrieve the sweet honeycomb.\textsuperscript{44} Locating bees nests also required much skill and some methods of finding honey were quite ingenious. O'Reilly describes how Aboriginal people in the Blue Mountains sometimes located beehives by attaching tiny feathers to the bees and then following them back to the nest.\textsuperscript{45}

As well as daring, dexterity and deadly accuracy, Aboriginal hunters were also expert in tracking and stalking prey. For example, to avoid being detected animals were approached from downwind or downstream and sign language was used to communicate. Mimicry and deception was also used to trick and confuse animals. In the mountain streams, Aboriginal hunters caught ducks

\textsuperscript{43} According to Barrallier, kangaroos were caught in the Blue Mountains 'with the greatest trouble' and the hunters were 'obliged to unite in great numbers' to achieve the most success. Barrallier, \textit{op. cit.}, pp.751, 771, 781.
\textsuperscript{44} \textit{Ibid.}, pp.751, 771, 781, Collins, \textit{op. cit.}, p.558.
\textsuperscript{45} Govett, \textit{op. cit.}, p.34, Collins, \textit{op. cit.}, pp.550, 557, Barrallier, \textit{op. cit.}, pp.763, 813.
by disguising their heads with water weeds and then swimming out and
grabbing the unsuspecting birds from underwater.\(^4\)

As well as their importance in everyday life, plants and animals were equally
significant in Aboriginal mythology and spiritual beliefs. While little is known
of the beliefs of the Aboriginal inhabitants of the Blue Mountains, as
elsewhere in Australia, many traditional stories are likely to have featured
plants and animals and hunting and gathering activities. In fact, living
species form many of the central characters in Aboriginal legends, which
frequently provide explanations of their creation, markings or behaviour and
give them human attributes.\(^5\) For example, in the Gundungurra legend of
'Gurangatch and Mirragan', the key characters are a tiger quoll (Mirragan)
who during the Dreamtime relentlessly hunts a large fish/reptile (Gurangatch)
across parts of the southern Blue Mountains forming many landscape
features in the process. Other animal characters appearing in the legend are
Billagoola the shag (cormorant), Goolagwan the diver (grebe), Gundhareen the
black duck and Goonarring the wood duck.\(^6\)

Some other supposed Aboriginal legends from the Blue Mountains have been
recorded. Those relating to plants and animals include stories on the first
kangaroo, the clinging koala, the crushing of a giant emu, the struggle for

December 1896, p.1251.
\(^6\) J. Isaacs, *Australian Dreaming: 40,000 Years of Aboriginal History*, Sydney, 1980,
pp.190-211.
\(^6\) The Gundungurra apparently had other legends relating to many different species
of birds but none of these stories have survived. R.H. Mathews, 'Some Mythology of
supremacy between birds and animals, and several explaining different aspects of the waratah (its creation, colouring, nectar, shape). However as Smith has shown, most of these 'legends' are all of extremely doubtful authenticity. It appears that the Aboriginal inhabitants of the Blue Mountains also believed that certain forms of life had supernatural powers. In 1818 Jamison recorded that the burning of myrtle wood was believed to cause 'incessant rain' and special songs were sung to 'charm away the spell of the insulted myrtle'.

Even so, as noted in previous chapters, practical environmental knowledge was often closely interwoven in Aboriginal spiritual beliefs, and reinforced and extended through various ceremonies. The Gurrangatch and Mirrigan legend provides a good example as it describes several hunting practices, including the use of hickory bark (wattle) as a fish poison, the use of spears to hunt fish, and the technique of using long poles to poke kangaroo rats and other animals from holes or hollow logs.

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48 J. Smith, *Aboriginal Legends of the Blue Mountains*, Wentworth Falls, 1992, pp.17-46, 78-87. There are also several other unpublished legends from the region featuring the exploits or origins of carpet snakes, wallaroos, possums and various birds including kingfishers, crows, eagles and both white and black cockatoos - J. Smith pers. comm.


Overhunting Life?

The Aboriginal inhabitants of the Blue Mountains are likely to have caused significant ecological impacts from their hunting and gathering activities over the millennia. The most controversial and highly debated issue regarding the impact of Aboriginal hunting is the potential role prehistoric hunting played in the extinction of Australia's megafauna during the late Pleistocene. Although this issue is very complex, the central question is whether Australia's First Hunters were directly or indirectly involved in the megafauna extinctions which occurred during the last 100,000 years. It is generally accepted that most of the megafauna became extinct between 30,000 and 15,000 years ago, although some researchers have claimed that certain species persisted into the last 10,000 years. It also appears that in some cases, megafauna marsupials (including wombats, koalas and some kangaroos) did not actually become extinct but instead gradually reduced in size or 'dwarfed' during the last 50,000 years.\textsuperscript{22}

Some researchers have asserted that Aboriginal overhunting drove most of the megafauna to extinction (either rapidly when humans first arrived in Australia - in a faunal 'blitzkrieg' or slowly by gradual attrition) and caused the rest to become dwarfed.\textsuperscript{23} Archaeological evidence certainly confirms that Aborigines and megafauna coexisted for many thousands of years and that the


megafauna were eaten by the First Hunters. Others have argued that increasing aridity caused by the major climate changes which occurred between 25,000 and 15,000 years ago was primarily responsible for the extinctions and dwarfing. It has also been suggested that Aboriginal people indirectly caused the megafauna extinctions by their use of fire or from competition for the same resources. For example, recent studies of fossil eggshells of the extinct flightless bird Genyornis newtoni indicate that it disappeared from the interior of Australia around 50,000 years ago, apparently due to a change in vegetation from shrubs to grass which the researchers propose was the result of Aboriginal burning.

While the megafauna debate lumbers on seemingly without end, too little recognition has been given to the strong possibility that there was no single cause of the extinctions. While grand theories that attribute the blame solely to hunting, climate or fire are academically attractive, they can be misleading and do nothing more than create mega-myths of the megafauna's demise.

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54 For example, at Cuddie Springs in northwestern NSW megafauna bones have been found next to stone artefacts in layers dating from 30,000 to 19,000 years ago. On the edges of the worn stone tools tiny residues of megafauna blood and hair have been identified. Flood, op. cit., pp.189-192.
56 Even subtle ecological changes caused by fire or ecological competition may have disrupted food supplies and hampered breeding success over time, especially if in combination with stresses caused by hunting and worsening climate. J.P. White and J.F. O'Connell, *A Prehistory of Australia, New Guinea and Sahul*, Sydney, 1982, p.94, Blainey, op. cit., p.82.
58 It is far more likely that the demise of the megafauna was actually more mundane, and due to a complex combination of interacting factors including extreme climatic changes, Aboriginal hunting and fire use, disease, inbreeding and other unknown influences. The significance of each factor is likely to have varied with the local
Like the debate over the impact of Aboriginal fire (see Chapter Three), too often contributors to the megafauna debate have extrapolated the significance of localised evidence across the whole of Australia and the entire group of megafauna. In the case of the Blue Mountains, Aboriginal hunting may have been important as the region is likely to have served as a refuge area for the surviving megafauna. Restricted to smaller areas of habitat, the mountain megafauna could quite possibly have been hunted to extinction during the last glacial period by Aboriginal hunters also occupying the same habitat and facing their own stresses from the extreme environmental conditions. Whether the First Hunters 'tipped the balance' remains unresolved and perhaps, as Wright has suggested, the megafauna issue could benefit from 'rather more digging than talking'\textsuperscript{59}.

A more certain ecological impact of Aboriginal hunting practices was the introduction to Australia of another placental companion - the dingo (*Canis familiaris dingo*). Dingoes were brought to Australia sometime during the last 6,000 to 4,000 years and rapidly spread to every part of the continent except Tasmania. Aboriginal people used them not just as aids in hunting, but also as pets, watchdogs, bedwarmers and on occasion as food. According to Barrallier, dingoes were used by Aboriginal hunters in the Blue Mountains to catch kangaroos\textsuperscript{60}. Due to their greater hunting efficiency and faster breeding, the new placental carnivore successfully competed with the larger marsupial

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\textsuperscript{59} R. Wright, Reply to Flannery, 1990, *op. cit.*, p.56.
carnivores - the Thylacine (*Thylacinus cynocephalus*) and Tasmanian Devil (*Sarcophilus harrisii*). Fossils of both these animals have been found in the Jenolan Caves confirming that they once inhabited the Blue Mountains.\(^6^1\)

Within a few millennia the dingo caused their extinction in the Blue Mountains as elsewhere on the Australian mainland, perhaps in combination with Aboriginal hunting of the marsupial carnivores and human competition for the same prey. Predation by dingoes is also likely to have reduced the abundance or distribution of some prey species.\(^6^2\)

In addition to causing animal extinctions, the First Hunters must at times have also greatly modified the vegetation of the Blue Mountains through their widespread gathering of plants. At a localised level, activities such as stripping bark from trees, digging holes for tubers and roots, and collecting and transporting fruits and seeds is likely to have unintentionally assisted the propagation and spread of certain favoured plants while at the same time diminishing others.\(^6^3\)

As noted previously, the overall impact of Aboriginal activities in the Blue Mountains (whether from hunting or fire use) was dependent on the size of the human population. This would have varied greatly at different times in response to a range of factors including abundant food, disease and armed

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conflict. It seems likely that on occasions the local impact of Aboriginal hunting in the Blue Mountains was significant, depleting certain species and at times contributing to extinctions, especially during times of extreme climate, such as the last glacial peak (18,000 years ago), when plant and animal resources were more scarce.

However, Aboriginal societies were able to regulate and reduce their environmental impact through various customs and cultural beliefs. For instance, at birth Aboriginal people inherited a special affiliation with another living entity (commonly called a 'totem') and were generally not permitted to hunt or eat this plant or animal. Oral history accounts suggest that cicadas and red-bellied snakes were important tribal totems in the Blue Mountains. Further restrictions applied to particular age groups, pregnant women or those undergoing initiation. On occasions, the eating of useful items like gum was also prohibited to ensure a sufficient supply was available for other purposes. As noted by Mathews in 1904, these customs served to 'preserve the supply of food by diminishing the number of those in quest of it'. As an extreme measure, Aboriginal groups at times also regulated the size of their population through birth control, abortion and infanticide and by abandoning the old and infirm when moving camp.

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64 Blainey, *op. cit.*, pp.102-111.
Despite the possible significant impacts caused by thousands of years of Aboriginal hunting, it seems that overall some sort of ecological equilibrium was established in the region prior to the appearance of Europeans. But with the arrival of the pale-skinned people came a new more intensive level of hunting life in the Blue Mountains. Like the Aboriginal people they displaced, these new mountain inhabitants also depended on hunting life - but unlike their predecessors the hunger of the new hunters was insatiable and motivated far more by greed than need.

**The Greedy Hunters**

"The European came, he saw and he slaughtered" A.J. Marshall (1966)\(^7\)

The hunting of native plants and animals has been an equally important feature of Blue Mountains history since 1788. Native life has been exploited for sustenance, curiosity, pleasure and profit, with many forms of life providing commodities both essential and trivial.

**Grass**

Grass was one of the first living resources to be exploited by Europeans in the Blue Mountains. In fact, the successful crossing of the mountains in 1813 was actually a hunt for grass. As shown convincingly by Perry, it was primarily a lack of pasture on the Cumberland Plain, caused by years of

overstocking and a series of droughts and caterpillar plagues, which motivated the three graziers - Blaxland, Lawson and Wentworth - to undertake their exploration. Blaxland admitted as much in 1819 when he recorded that his motivation was due to 'the necessity of finding out a further extension of pasturage', as the best native grasses (especially 'oat grass') had all but disappeared from the Cumberland Plain.

The explorers found little grass on the rugged, scrubby sandstone plateau, but on descending from Mount York they discovered a valley containing 'forest land covered with good grass' which their hungry horses eagerly devoured. As they crossed the Coxs River valley, Blaxland noted the 'open meadow land' covered with 'high good grass' from 'two to three feet high', which he believed was sufficient in extent 'to support the stock of the Colony for the next thirty years'. Lawson also recorded in his journal their discovery of 'a fine Grazing Country', as did Wentworth who noted that the 'extensive tract of good grazing land' was superior to any on the Cumberland Plain because it contained an 'abundant crop of grass of an excellent quality'.

Governor Macquarie was equally impressed with the 'good pasture land' in the area he named the Vale of Clwydd in 1815, observing that 'the grass in this

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68 Lack of water was also an important stimulus - see Chapter Two. T.M. Perry, 'Climate, Caterpillars and Terrain', Australian Geographer, Vol.7, No.1, 1957, pp.3-14. The caterpillar involved was apparently the Army Worm (Pseudaletia corvecta).
vale is of good quality and very abundant.' Many later mountain travellers remarked on the refreshing view of the grassy Vale of Clywd compared with the rocky sandstone ridge of the Blue Mountains. For example, a traveller in 1822 recorded that 'the sight of grass again is lovely' and was welcome feed for cattle 'after three days starving on the mountains.'

Not surprisingly, it was these and other areas of native grass like them which were the first parts of the Blue Mountains to be settled by Europeans. The grazing lands in the Vale of Clywd and adjacent to the Coxs River were settled under 'tickets of occupation' from the early 1820s onwards. Around the same time, settlers also commenced grazing in the Burrarahgorang Valley, where fine long grass had been reported by Barrallier as early as 1802 and was confirmed by the surveyor Robert Hoddle in 1824. Over the following years the valuable grazing lands of the mountain valleys were gradually granted or sold to permanent settlers.

Although grass was generally scarce on the sandstone plateau of the Blue Mountains, there were initially a few places along the mountain road which provided sufficient fodder for early travellers. Often these were also the places with abundant water (see Chapter Two), and were therefore used as camping sites by the 1813 explorers and those who followed after them. For example,

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71 L. Macquarie, Government and General Order, 10 June 1815, in Mackaness, op. cit., p.68.
the explorers' second campsite was in the vicinity of Springwood which
Blaxland recorded had 'plenty of good grass and water'. However, less fodder
was available in the upper mountains. The explorers were forced to use the
'scanty fare' of the 'coarse rushy grass' of the swamps and to carry supplies of
grass to feed their horses. Later travellers also made use of the mountain
swamps for fodder, including the explorer Evans who in 1814 noted that he
cut the 'sweet rushes' for his horses.\textsuperscript{74}

After building the mountain road, William Cox, highlighted in his journal nine
places along the new road where 'coarse grass' for stock could be found,
including the vicinities of Blaxland, Lawson, Wentworth Falls and Blackheath.
After his journey over the road in 1815, Macquarie confirmed in an official
announcement that 'a sufficiency of grass are to be found in the Mountains
for the support of such cattle as may be sent over them'. Places with 'good
pasturage' were listed as Springwood, 'Jamieson's Valley' (Wentworth Falls),
Blackheath and Coxs River, at all of which 'the traveller may assure self of
good grass'.\textsuperscript{75} When Bell's Line of Road was discovered in 1823 it was also
claimed that much of the new route had 'excellent grass' which except for a
few miles was superior to that along the old Bathurst Road.\textsuperscript{76}

\textsuperscript{74} Blaxland, 1813, in Richards, \textit{op. cit.}, pp.68, 70-73, Wentworth in Richards, \textit{op. cit.},
\textsuperscript{75} W. Cox, 'Journal Kept by Mr. W. Cox in Making a Road Across the Blue Mountains
etc., 1814-15', in Mackaness, \textit{op. cit.}, pp.61-62, Macquarie in Mackaness, \textit{op. cit.},
pp.71-72. Note that Macquarie's journal actually states that these places had only
'tolerable good feed'. See L. Macquarie, 'Tour to the New Discovered Country 1815' in
\textsuperscript{76} \textit{Sydney Gazette}, 9 October, 1823, p.2.
Although few in number, those areas with grass along the main mountain road were essential to the increasing animal traffic in the Blue Mountains. Recognising this, in 1821 Macquarie recommended a 1,000 acre (400 hectare) Crown reserve at Springwood for use by the passing herds as the area had 'good forage and water'.\textsuperscript{77} In 1829 six more reserves for the 'depasturing' of bullock teams and livestock on the mountains were recommended in a report by G.M.C. Bowen. Each reserve covered four square miles and incorporated as many of the nearby 'grassy hollows' and good water as possible.\textsuperscript{78}

However, despite such measures the oases of grass along the mountain road soon became depleted from overgrazing and trampling. By 1822 the Springwood area held 'little or no grass' according to the appropriately-named visitor, Barron Field. He recommended that travellers take corn to feed their horses as there was 'no grass on the whole of the road over the mountains'. A visitor in 1835 also commented that there were 'no grassy openings to afford pasturage' along the entire length of the mountain road, and the 'little rigid herbage' available was scarce and 'not of a nutritious quality'.\textsuperscript{79} Overall, the areas of good pasture in the Blue Mountains were limited in extent and were soon settled or destroyed by overuse. As those in search of grass looked

\textsuperscript{77} Macquarie, Journal, 1821, op. cit., p.226.
\textsuperscript{78} Report by G.M.C. Bowen, 1829 - see Footnote 168 in Chapter One. The reserves were located at Lapstone Hill, Fitzgerald’s Valley (near Valley Heights), Twenty Mile Hollow (Lawson), near Pulpit Hill (near Katoomba), at the bottom of Mount York, and on the banks of the Coxs River. The reserves were also listed in the New South Wales Calendar and General Post Office Directory, 1832, pp.107-109.
\textsuperscript{79} Field in Mackaness, op. cit., pp.123. Field also criticized Macquarie for exaggerating the true extent of grass available in the Blue Mountains. J. Backhouse, 'Account of A Journey from Parramatta Across the Blue Mountains to Wellington, 1835', in Mackaness, op. cit., pp.201, 221.
further afield, the new inhabitants of the Blue Mountains began to hunt much larger native plants.

*Trees - The Lords of the Forest*

As elsewhere, the European settlers of the Blue Mountains valued trees primarily for the essential commodity they provided - wood. However, as a source of timber, most of the mountain trees were initially viewed as a disappointment. Because of their poor soils and greater exposure, the sandstone plateaus of the Blue Mountains generally had smaller and more twisted trees than those growing in the sheltered gorges and valleys. While some large trees grew in places, such as between Lapstone Hill and the vicinity of Springwood, most early mountain visitors found the trees inferior and depressing. During the 1813 exploration, Blaxland described most of the Blue Mountains ridge as covered with thick, scrubby 'brush-wood' with 'small crooked timber' little of which was 'fit for building'. As Early travellers along the mountain road were equally unimpressed, describing most of the trees they saw as 'stunted', 'diminutive' and 'dwarf'. In 1822, Field labelled the clothing of the hills 'very unpicturesque - a mere sea of harsh trees'.

As most visitors and settlers remained on the sandstone ridges, these negative views of the mountain trees persisted throughout the 19th Century and were reinforced by many of the early tourist guides. For instance, contributors to the *Railway Guide of NSW* (first published in 1879) wrote that 'miserably

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*Blaxland, 1813, in Richards, *op. cit.*, pp.68-75.*
stunted and gnarled timber' and 'wretched and sterile scrub' everywhere
surrounded the tourist on the Blue Mountains, which obscured views and
detracted 'immensely from the interest of the scenery'. Visitors were also
advised that the sparse 'crowns of drooping leaves' of the mountain trees
would provide little comfort to 'the perspiring traveller, panting for shade'.

However, in spite of the negative attitudes towards the mountain trees, many
fine timber trees did exist in the Blue Mountains at the time of European
settlement, mostly in areas with shale and basalt soils and in sheltered
gullies. For instance, the vicinity of Springwood once contained an extensive
forest of tall 'lofty trees' and 'handsome timber', according to early visitors
such as Blaxland, Cox, Macquarie, Antill and Cunningham.

Many large trees also grew along the ridge followed by Bell's Line of Road and
on the basalt caps of Mount Tomah, Mount Bell, Mount Banks, Mount Wilson
and Mount Irvine. 'Excellent timber' was recorded by Archibald Bell during
the discovery of his 'road' in 1823. At Mount Tomah he noted that the trees

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\(^{a2}\) The Railway Guide of New South Wales, Sydney, 1879, p.49, Horrocks's Handy
Guide to the Blue Mountains and Caves of New South Wales, Sydney, 1888, pp.6-7, 53.
\(^{a3}\) Blaxland, 1813, in Mackaness, \textit{op. cit.}, p.68, Macquarie, 1815, in Mackaness, \textit{op.
cit.}, p.67, W. Cox, 'Journal Kept by Mr. W. Cox in Making a Road Across the Blue
Mountains etc., 1814-15, in Mackaness, \textit{op. cit.}, p.38, H.C. Antill, 'Journal of an
Excursion over the Blue or Western Mountains etc.' in Mackaness, \textit{op. cit.}, p.76,
Cunningham in Lee, \textit{op. cit.}, p.176. According to Cox, one of the trees felled at
Springwood during construction of the first mountain road was over 80 feet (24
metres) to the first branch and more than 15 feet (4.5 metres) in circumference. Some
idea of the size and thickness of the original trees at Springwood can also be obtained
from John Lewin's sketch 'Spring Wood' 1815 - see reproduction in K. Hartig, \textit{Images
were 'remarkable' for their thickness, 'prodigious size' and beauty and suggested 'with a little trouble much valuable timber might be got from it'.

In the 19th Century wood was an essential resource for both energy and construction and from the moment that Europeans began to settle in the Blue Mountains they hunted trees, with the tallest and straightest specimens the most highly sought after. The first permanent structures in the Blue Mountains used local timber in their construction. Many large trees were utilised in building the first mountain road in 1814. Logs and wooden planks were used to edge the road and in some places to surface it. Timber was also used for making bridges and to provide the 300 posts and rails used for fencing the road down Mount York. The first buildings on the Blue Mountains were also constructed from local trees. The roadbuilders built several storage sheds along the route, including the store (and latter inn) at Wentworth Falls which was made from wooden 'weatherboards', as were other inns built along the mountain road in the following years.

Timber from local trees was also used to enclose land and erect stockyards. The earliest fences were post and rail but later the rails were mostly replaced by barbed wire. Ironbarks were particularly favoured for fences. Many trees

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**Less substantial structures were made with tree bark tied to wooden frames with small strips of stringy bark. Cox in Mackaness, op. cit., pp.35-42, 50-51, 54-55, Antill in Mackaness, op. cit., p.76, E. Hawkins, A Lady's Letter (E. Hawkins to A. Bowling, 7 May, 1822), Parramatta, p.3.
were also cut down in the vicinity of Mount York by early travellers who chained them to the back of carts and drays to slow their descent down the steep mountain road.\textsuperscript{66} From small kindling sticks to huge sawn logs, local trees also provided the fuel for the friendly fires of mountain settlers. As the human population of the area grew increasing amounts of firewood were obtained locally, which was especially important in the years prior to the availability of coal, oil shale and other fuel sources.

Following the building of the mountain road, timber-getters began to selectively hunt for valuable trees along the main ridge of the Blue Mountains plateau and those in the most accessible places were soon exploited. While wood for fuel and fencing was abundant in the Blue Mountains, good quality timber was often hard to find as many trees were decayed inside or damaged by bushfires.\textsuperscript{67} Even so, by 1832 saw pits had been erected in the upper Mountains where large stands of mountain ash were being cut into planks, as the timber was 'much valued' for the making of cart and gig shafts and for other purposes.\textsuperscript{68}

While some mountain trees were specifically hunted for their timber, many more were felled simply because they were in the way. Huge numbers of trees were ringbarked, cut down and burnt as European settlers progressively

\textsuperscript{66} G.C. Mundy, \textit{Our Antipodes: or Residence and Rambles in the Australian Colonies, with a Glimpse of the Gold Fields}, Vol.1, London, 1852, p.156, Hawkins, \textit{op. cit.}, pp.4, 10, Breton, \textit{op. cit.}, p.81, XYZ (Anonymous) in Mackaness, \textit{op. cit.}, p.178. Hawkins recorded that one tree used as a brake in 1822 was 48 feet (14.5 metres) long.

\textsuperscript{67} Breton, \textit{op. cit.}, p.282.

occupied the Blue Mountains and established roads, farms, houses, towns and mines. Bowen has provided a typical description of early tree clearing in the Blue Mountains which took place on his land grant near Mount Tomah in the 1830s. Using convict labour to 'subdue the earth', Bowen recorded:

'...the axes were plied, the chips flew about, and presently the lords of the forest toppled and fell, crash succeeded crash, until hideous ruin strewn the ground'.

Trees were also cleared in the mountains to obtain better views. The summits of many of the higher peaks were cleared to allow more accurate trigonometrical surveys. Belts of 'unsightly trees' were also cleared in places along the mountain railway, as well as at Wentworth Falls, Mount Piddington and in the Grose Valley, where a group of visitors in 1875 felled trees 'to clear views for the photographer and the sketcher'.

The coming of the railway raised tree hunting to a new level, as enormous quantities of timber were required for its construction as well as for use by rail workers. Wooden fences, gates and signals were built and the steel tracks were laid upon thousands of nine feet long timber sleepers cut from local

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80 G.M.C. Bowen, Autobiography, cited in H.C. Currey, Mount Wilson, New South Wales: Its Location, Settlement and Development, Sydney, 1968, p.16. Bowen also built a sawmill in a nearby ravine but his venture was not successful and few years later he sold his land and left.


trees. The increased settlement of the region which followed the completion of the railway also created a new and ever growing demand for wood as each mountain town was established and expanded. Throughout the mountains trees were cut down, sawn and split to be sold by local timber merchants. The larger trees provided sawn timber planks, palings and shingles, while smaller trees were used for posts, poles and mining props. The best quality timber was reserved for the construction of buildings - everything from houses to hotels, stores to stables and boarding houses to barns - as well as their various contents such as furniture, shelves, stalls and horse-drawn vehicles.

In the more isolated rural areas of the region (including Megalong and Burrarorang Valleys) early farm buildings were mostly made from roughly cut bush timber. Many were 'wattle and daub', comprised of hardwood slab floors and walls with clay used to fill the gaps between. Before galvanised iron became available, ceilings were made of shingles or bark secured with wooden poles or dowels. As saw-milled timber became more widely available in the mountains more substantial weatherboard houses were built.

To facilitate the increasing exploitation of local trees, numerous steam powered sawmills were established throughout the Blue Mountains in the late 19th Century. In fact, the importance of timber trees to the expanding

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92 Many railway sleepers were cut from the forests at Mount Wilson (sometimes illegally obtained from private land) as the line was extended westwards from Mount Victoria. P.W. Spriggs, Our Blue Mountains Yesterdays, Leura, 1962, p.76.
94 Local turpentine trees were commonly used for walls and floors, and to avoid warping, wood from eucalyptus trees was only used for thicker items such as frames, window sills and steps. Morley, op. cit., pp.5, 8, Smolice and Low, op. cit., p.56, F.
settlement of the region is demonstrated by the fact that many of the
mountain towns often had their own sawmills. For example, in the 1880s and
1890s sawmills operated in West Katoomba and in the Jamison Valley below
Katoomba Falls. The latter cut timber for the mines although some was
conveyed to the town on the incline tramway.**

In the 1870s and 1880s logging occurred in many areas close to the mountain
railway, along Bell’s Line of Road and at Mount Wilson. Many of the local
rainforest trees (including coachwood, possum wood and sassafras) were
greatly esteemed by timber merchants and used for carpentry, cabinet work,
handles and other industrial purposes.***

As the more accessible locations were progressively depleted of their finest
trees, timber was sought in more remoter parts of the region. In the early
1880s there were reportedly still many ‘magnificent timber trees’ in the gullies
and ravines bordering the Coxs River which had so far ‘escaped destruction’.
The Kanimbla Valley area was said to possess an ‘immense quantity of
valuable timber’ which was worth millions of pounds.**** After the opening of
the road between Blackheath and Megalong Valley in 1897, timber-getting in

Porteous, 'Climate and Convention: The Archaeology of Blue Mountain Houses', BA
** Douglass, Old Katoomba: Peeps Into the Past, Springwood, n.d. (ca. 1930s), p.9, Croft
& Associates/Meredith Walker, Blue Mountains Heritage Study, Sydney, 1985, p.63,
The Mountaineer, 14 September 1894 p.1, BMHS Files.
*** Hawkesbury Herald, 1 April 1904 p.2, M. Hungerford, Bilpin, The Apple Country: A
Proceedings of the Linnean Society of NSW, Vol.2, Part 1, 1887, pp.6-12, Inglis, op. cit.,
p.345.
**** Australian Town and Country Journal, 18 December 1880, p.1176, Newspaper
Clippings, Vol.77, ML Q981/N, p.62.
the area intensified, with timber cut at a sawmill in Blackheath Glen before being carted to the railway.88

Although a variety of native trees were hunted, by far the most valuable timber tree in the mountains was red cedar (Cedrela australis). The presence of cedar was first noted by Jamison and Jones in 1818, who during their explorations of the Warragamba and Coxs Rivers observed a 'number of considerable sized red cedar trees'.89 However much larger stands of cedar trees occurred in the southwest of the Blue Mountains, particularly along the Kowmung River and its tributaries such as Gingra and Tiwilla Creeks. Commercial logging of the 'red gold' along the Kowmung and at Cedar Creek (another tributary of the Coxs River) commenced in the 1880s with the timber floated and manhandled downstream along the Coxs, Warragamba and Nepean Rivers to Penrith.100

Although less lucrative, elsewhere in the Blue Mountains many more trees (especially ironbarks and grey gums) were felled to obtain railway sleepers. By 1900, a Springwood resident was complaining that all along the Blue Mountains line 'the country has been denuded of the best trees for railway sleepers' and at his mountain property every 'good tree' had been cut down or ringbarked.101 According to Searle, sleeper cutting was an important industry

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at Faulconbridge in the early part of the century and thousands of sleepers were loaded at the railway station throughout the 1920s (see Figure 5.1). Many sleepers were also cut in the Burrarorang Valley and Kurrajong Heights area prior to the 1930s, which were often dragged out of the steep gullies with horses before being carted to the nearest railway station and sold.\footnote{A.E. Searle, \textit{Faulconbridge}, Springwood, 1977, pp.45-46. V. Webb, \textit{Kurrajong: An Early History}, Sydney, 1980, pp.73, 173, Parliamentary Standing Committee on Public Works, 'Second Report on Proposed Railway from Picton Lakes to Yerranderie', \textit{NSWPP}, 1921, Vol.4, pp.353-358.}

Logging of red cedar continued spasmodically in the Kowmung area until 1908 when a new access road was made by Sydney timber company, Goodlet and Smith Ltd. This allowed far more extensive logging of the Kowmung cedar which was now transported to Camden by horse and bullock teams. By 1911 around 160,000 feet of cedar had been cut and delivered to Sydney, with each large tree worth £120. Within a few years nearly all of the cedar was removed from Tiwilla and Gingra Creeks and by 1916 most logging operations had ended. However, some cedar-getting continued intermittently in the upper Kowmung area until the 1950s.\footnote{A.E. Searle, \textit{Faulconbridge}, Springwood, 1977, pp.45-46. V. Webb, \textit{Kurrajong: An Early History}, Sydney, 1980, pp.73, 173, Parliamentary Standing Committee on Public Works, 'Second Report on Proposed Railway from Picton Lakes to Yerranderie', \textit{NSWPP}, 1921, Vol.4, pp.353-358.}

Logging for profit was widespread elsewhere in the Blue Mountains throughout the first half of the 20th Century. In the period between 1900 and 1940 steam powered sawmills also operated at Kurrajong Heights, Mount Tomah, Mount Irvine and Mount Wilson. Together these produced tens of thousands of feet of both softwood and hardwood timber, primarily from coachwood and sassafras trees. The sawn timber was sold in Sydney and
used for joinery, furniture and cabinet making. Wooden boxes and fruit cases were also produced, many sold to local fruitgrowers. Large quantities of firewood was also sent to Sydney for sale, along with tons of wattle tree bark (known as 'Kurrajong Wool') which was used for tanning hides.  

Several sawmills also operated along the central ridge of the Blue Mountains at various times prior to 1940. These included mills at Linden Creek (near Faulconbridge), Blackheath, Medlow Bath and Mill Creek below Mount Piddington. These mills mostly supplied the local construction needs for sawn timber, posts and firewood in the mountain towns, however mountain ash trees were also used for making butter boxes, billiard cues, and tool handles. In the 1920s such large numbers of timber trees (especially mountain ash and blackbutt) were taken from the ridges near Medlow and the Cascade Dam catchment areas that it raised the ire of the local newspaper and many residents. The Blue Mountain Echo labelled the timber-getters 'ruthless', 'reckless' and 'rapacious' and criticised them for exploiting immature saplings and threatening Katoomba's water supply.  

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106 *Blue Mountain Echo*, 28 August 1925 p.1. Also see letter in *Blue Mountain Echo*, 12 September 1924 p.7. In the 1920s the ill-fated Grose Valley Development Syndicate also planned to log the 'magnificent blue gums' of the Grose Valley which had previously 'escaped the ravages of the axe'. However, like its proposed mining ventures (see Chapter One), the Syndicate's plans came to nothing. E.A. Williamson,
During the early 1940s logging activities intensified in the Blue Mountains to supply timber for the war effort. Despite some local opposition, new areas along Springwood and Bedford Creeks were logged and many mountain trees (especially coachwood) were cut wherever they could be reached to make boxes and rifle butts.\textsuperscript{107} In 1942 the Water Board established a large sawmill at Warragamba, which over the following decade was supplied with timber (mostly turpentine, blue gum and blue-leaved stringy bark) from the Warragamba Gorge, and the watersheds of various tributaries further upstream.\textsuperscript{108}

In the postwar period, chainsaws increasingly superceded axes and handsaws, while bullocks, horses and steam powered engines were gradually replaced by diesel powered trucks, winches and crawler tractors. This permitted tree hunting in areas never before logged and even more mountain timber was snigged, jinked and hauled out of formerly inaccessible localities. Throughout the 1950s locally obtained timber was still being widely used to construct new houses in the mountain towns.\textsuperscript{109}


\textsuperscript{108} In 1951-52 alone, over a million super feet of mill logs were harvested from the area around King's Tableland, with much of the sawn timber eventually used in the construction of both Warragamba Dam and the nearby township. 'The Warragamba Dam Sawmill', \textit{Sydney Water Board Journal}, Vol.3, No.1, April 1953, pp.29-31.

To make room for the ongoing expansion of the mountain towns, more trees were knocked down and land cleared, often indiscriminately and wastefully using bulldozers.\textsuperscript{110} Although the creation and expansion of national parks and reserves steadily reduced the areas available to timber-getters in the Blue Mountains, some commercial logging continued during the 1960s and 1970s, particularly on the Boyd Plateau and in other areas in the southwest of the region.\textsuperscript{111} While logging for timber has declined in the region in the late 20th Century clearing for urban development has continued unabated.

Trees and grass were not the only native plants hunted in the Blue Mountains. Others were sought more for their aesthetic qualities.

\textit{Wildflowers and Fern-Fanciers}

\textquote{...visitors may generally be seen wending their way homeward laden with floral treasure.}\textsuperscript{112}

An incredible variety of attractive native flowers and ferns also occur in the Blue Mountains and these have caught the attention of many mountain visitors. Early explorers remarked on the beauty of the wildflowers and ferns

Megalong and Kanimbla Valleys that a sawmill at Blackheath was able to produce each day sufficient timber to construct an entire cottage.


\textsuperscript{112} Blackheath Progress Committee, \textit{Blackheath, Blue Mountains, N.S.W.}, Sydney, 1903, p.67.
and those like Caley and Cunningham began a long tradition of collecting them. For example, despite the difficulties of his journey to Mount Banks in 1804, Caley collected about 30 new plants. Both he and Cunningham (who visited the area in 1823) were also greatly impressed with the numerous tree ferns at Mount Tomah, some of which were 30 feet high.\textsuperscript{113}

After the building of the mountain road, many later travellers took the time to 'botanise' during their journey across the Blue Mountains. A typical example was Barron Field who collected several plants while travelling over the Blue Mountains in 1822, including grevilleas from a swamp at Blackheath and 'an elegant epacrideous flower' from overhanging rocks on Mount York.\textsuperscript{114} In the same year Elizabeth Hawkins and her family also gathered some 'most delicate nosegays' from the flowering shrubs which grew along the roadside. For Louisa Meredith, the shady recesses of Lapstone Hill yielded 'many a new and beautiful flower' during her journey in 1839. She also much admired the 'magnificent flowers' of the waratah but on this occasion 'failed to procure a flower'.\textsuperscript{115}

Many other early visitors were equally delighted by the beauty of the 'multitude of flowers' and 'pretty blossoms' which decked the mountain roadsides and 'diffused a delightful fragrance'. Backhouse was impressed by the 'elegant pink flowers' of the grevilleas and the 'great beauty' of the many


\textsuperscript{114} Field in Mackaness, \textit{op. cit.}, pp.125, 137. This was the shrub \textit{Dracophyllum secundum}. 
other flowering shrubs he observed in 1835. The abundant and spectacular waratah was especially noted and praised by early travellers, with one labelling it the 'principal floral ornament of the Blue Mountains'. Others described the 'splendid' crimson flowers of the waratah as 'majestic', 'noble', 'elegant' and 'magnificent', and agreed the mountain wildflower was well deserving of its title as the 'Queen of the Bush'.

As settlement spread after the building of the railway, more visitors (especially female tourists) began to venture into the moist sheltered gullies where a greater abundance of luxuriant and delicate plants grew, especially tiny flowers; ferns and mosses. As noted by Horne, these activities were often inspired by the widespread popular interest in botany during the late 19th Century, when many books on flowers and ferns were published and admiring and collecting attractive plants was considered a fashionable and respectable pastime for the educated members of society, especially women. In her eloquent and descriptive newspaper articles of the 1860s Louisa Atkinson did much to help popularise the flora of the Blue Mountains and collected many specimens of both flowers and ferns during her various rambles in the region. Her involvement with the mountain flora was so extensive that, as she herself

119 Interest in the mountain ferns was especially great at this time, reflecting the popular craze for ferns in both Britain and Australia and because fern varieties were rare in Europe and sold for high prices. Horne argues that women especially were the driving force behind the popularity of ferns. See J. Horne, 'Favourite Resorts: Aspects of Tourist Travel in Nineteenth Century New South Wales', Ph.D Thesis, University of NSW, Sydney, 1995, pp.156-157. Also B. Smith, European Vision and the South Pacific, 2nd ed., Melbourne, 1985, p.295, J.E.M. Russell, The Pictorial Guide to the
admitted, 'to enumerate all the treasures gathered and observed, would require too great a space'.

Interest in the mountain flora was also strongly promoted by the tourist guidebooks, which highlighted the scenic attractiveness of flowers and ferns with descriptions strongly influenced by the prevailing romanticism of the Victorian era. In the 1880s visitors were told that in the shaded gullies and dells of the district, ferns, lichens, mosses and other moisture-loving vegetation 'everywhere abound', while in spring and early summer 'the Mountains are gorgeous with flowers' as every bush blazed with colour and was 'radiant with blossom'. Several mountain tourist spots were labelled 'Fern Tree Gully' and in these 'haunts of ferns' visitors could walk through 'groves of tree ferns, basket ferns, ferns of all kinds and every tint of green'. These included bird's-nest, staghorn and other parasitic ferns perched in tree forks, as well as a 'bewilderingly beautiful' variety of other dainty and delicate ferns in almost every nook and cranny.

Mount Wilson, especially, was considered a mecca for fern-fanciers. As early as 1879 the NSW Railway Guide promoted Mount Wilson as a place where 'thousands of tree ferns, ranging up to 30 feet in height,' were 'visible in every direction'. Even in areas cleared for settlement the tree ferns were usually left

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Blue Mountains of New South Wales, and to the Districts between Parramatta and Bathurst Including Jenolan Caves, Sydney, 1885 p.21.

118 For further details of Atkinson’s numerous references to mountain flora and her collecting activities in the mountains - see L. Atkinson, A Voice From the Country, Canberra, 1978, (quote from p.16).

as decoration. A visitor in 1880 remarked that the sight of ten acres of 'magnificent tree-ferns' standing in isolation was 'as rare as it was surpassingly beautiful'.\textsuperscript{122} Botanists were even more entralled, with one admitting in 1886 that Mount Wilson contained the greatest variety of ferns they had ever seen in one place, all growing in the 'greatest luxuriance'. This same writer recommended Mount Wilson as a charming and ideal spot for the 'real lover of ferns' and a 'grand field for the naturalist who takes special delight in ferns and allied plants'.\textsuperscript{123}

The railway brought increasing numbers of visitors interested in admiring and collecting the mountain wildflowers and ferns. Many species of mountain flowers were 'great favourites with collectors' including mountain devils, waratahs, and various boronias, banksias and grevilleas. Most visitors picked bunches of floral souvenirs, like the visitor to Wentworth Falls in 1875 who returned to their hotel with a bouquet of blossoms 'fit for a bride'.\textsuperscript{124} Tourist guidebooks promoted such collecting and often helpfully suggested the best places to gather flora. Various places were recommended where wildflowers, ferns and a 'host of other forms valued by collectors' could be 'reaped by the armful' or gathered 'in waggon loads'.\textsuperscript{125} One guide declared Springwood as the best place on the mountains for 'choice ferns and lycopods' and noted that excursionists were often seen returning to the railway platform 'loaded with

\textsuperscript{122} Without the protection of a tree canopy, many of the tree ferns no doubt soon lost their magnificence. \textit{NSW Railway Guide, op. cit.,} p.61, Inglis, \textit{op. cit.,} p.345.
\textsuperscript{125} Russell, 1885, \textit{op. cit.,} pp.21, 27-28.
such sylvan spoils'. Guides to the Jenolan Caves also described the district as a 'harvest field for botanists'.

During the late 19th Century flowers and ferns were also collected for sale to tourists at the mountain railway stations, especially waratahs and the curiously shaped flowers of the mountain devil which were frequently fashioned into novelty ornaments and souvenirs. Due to a shortage of supply closer to the city, by the 1890s wildflowers were also being sent by rail from the Blue Mountains to be sold in Sydney. So much collecting occurred that concerns were expressed over the destruction being caused to the mountain flora. From the late 1880s onwards complaints appeared about the 'ravages of vandals' in the Blue Mountains including the destruction of tree ferns by 'fern-gatherers' who left behind 'truncated stumps'. According to the Katoomba Times thousands of waratahs were often 'idly thrown away' and because of the 'wholesale and reckless destruction' waratahs 'seemed doomed to extinction'. The newspaper also gave a warning to 'fern-fanciers' in 1892 not to pick any ferns in the mountain reserves, suggesting instead that those who wanted ferns could have them procured for them from the nearby gullies for a 'moderate fee'.

The advent of private motor vehicles in the 20th Century allowed quicker and easier access to many parts of the Blue Mountains which inevitably led to the

129 Katoomba Times, 1 November 1890 p.2, 8 January 1892 p.2.
increased exploitation of the mountain wildflowers and ferns. In the 1920s huge bunches of wildflowers, especially waratahs, were reportedly being gathered every Spring weekend both by visitors to the Blue Mountains and for sale in the city. The Blue Mountain Echo regularly complained about the 'annual slaughter', 'rape' and 'murder' of the waratah, reporting that often hundreds of waratah blooms were seen being carried by weekend visitors both on foot and in motor cars. The newspaper stated that it was common to see roadways strewn wantonly with the 'great scarlet heads' of withered waratahs, plucked by 'thoughtless hands' and cast aside when the 'novelty of possession had departed'. As well 'nearly every car on the Bathurst Road' was said to be filled with 'immature buds, rudely raped from the parent stalk' before reaching 'the full glory of flowerhood'.

The hunting of mountain wildflowers and ferns persisted throughout the 1930 and 1940s (see Figure 5.2). Reports continued to appear in the local newspapers of visitors seen coming from scenic spots 'bearing sheaves of waratahs in their arms' and of wildflowers 'becoming more scarce every year'. As well as the plants seasonally collected by tourists, some mountain residents and itinerant hawkers also gathered and sold popular flowers and ferns (often illegally). Some operators in the Blue Mountains reportedly had

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129 Blue Mountain Echo, 24 November 1922 p.8, 3 October 1924 p.2, 9 October 1925 p.4, 8 October 1926 p.4.
lorries 'piled high with staghorns, rock lillies and tree ferns' and 'laden with waratah and boronia flowers' with which they did a 'thriving trade'.

The splendour of the mountain flora continued to be greatly admired by tourists in the postwar period, including Queen Elizabeth II who during her visit to Echo Point in 1954 was presented with a bouquet made from various local wildflowers and ferns. However, over the following decades the picking of the mountain wildflowers and ferns largely declined as fashions and laws changed and admiring living plants in their natural surroundings became far more accepted. Nurseries for growing popular native plants were also increasingly established in the Blue Mountains to supply both cut-flowers and live plants to those who still desired their own floral specimens. The establishment of the Mount Tomah Botanical Gardens also provided a local venue for floral admirers and fern-fanciers who now mostly leave the wild-growing mountain flora unmolested.

*Sustenance and Study*

'*One of the party shot a kangaroo' Gregory Blaxland (1813)*

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131 Bird's nest ferns were also popular and at times large trees were cut in the mountains just to obtain them. *Blue Mountains Echo*, 3 October 1939 p.1. *Sydney Morning Herald*, 5 August 1932 p.3, Macqueen, op. cit., p.163.
133 For example, during the 1960s a nursery named Waratah Park operated near Bilpin which grew waratahs and native orchids - J. Yeaman, *Historical Notes Relative to Blue Mountains National Park Trust*, December 1977, p.58.
134 *Blue Mountains Heritage Study*, op. cit., p.64. However, some illegal collecting, especially of tree ferns, continues in some parts of the region - see *Blue Mountains Gazette*, 21 August 1985 p.8.
135 Blaxland, 1813, in Richards, op. cit., p.74.
Native animals have also been widely hunted in the Blue Mountains since the arrival of Europeans. The first to do so were the mountain explorers all of whom hunted the mountain fauna, primarily birds and mammals (especially kangaroos and wallabies), to supplement their provisions. For example, Barrallier depended heavily on kangaroo and wallaby meat during his exploration in 1802, frequently sending members of his party out hunting. As well as meat, soup was made from the tail and head of kangaroos, several of which weighed 80-100 pounds and were a 'good addition to our provisions'. Barrallier and his companions also shot wild ducks, ringtail possums and eels for food. During his expedition to Mount Banks in 1804, Caley also shot several 'pheasants' (lyrebirds), finding the flesh of younger birds the tastiest. He also killed a 'great number' of 'Lories' (Crimson Rosellas), which made their soup more palatable and helped 'a little towards lengthening our provisions'.

Although the 1813 explorers generally saw few kangaroos and other animals, Blaxland was able to shoot a kangaroo near the River Lett for fresh meat when their supplies were getting low. Evans also hunted kangaroos in the mountains for meat and used their skins to make replacement shoes. William Cox too shot several lyrebirds and kangaroos (one of which weighed 120 pounds or 50 kgs) during the building of the mountain road in 1814. He also

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regularly sent men out hunting so that the convict roadworkers had 'fresh kangaroo at least three times a week'.

As European settlement spread, native animals were routinely killed for fresh meat by all those who who lived and worked in the more remote parts of the mountains during the 19th Century, including railway workers, timber-getters, miners, stockmen and hunting guides. According to the *Katoomba Times*, the local miners liked 'the kangaroo dished up' especially soup made from the tail. Wallaby tail also made 'excellent soup'. For some the flesh of a wallaroo was 'much better eating' than kangaroo or wallaby with the hindquarters a 'very good substitute for beef steak', while the hams of wombat legs were also 'excellent eating' and in flavour resembled ham in flavour. Early visitors to the Jenolan Caves observed that 'the gun will always supply you with plenty of fresh meat', especially from shooting some of the 'hundreds of rock wallabies' around sunrise.

Various birds, particularly parrots, cockatoos, pigeons, lyrebirds and bowerbirds also made 'tasty dishes' and were regularly shot for the table by many remote mountain residents well into the 20th Century. As Caley had discovered, the flesh of young lyrebirds was considered 'good eating' by later

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189 *Sydney Morning Herald*, 5 June 1863 p.3. At times, cave visitors killed the wallabies to feed 'a hind quarter or two' to their dogs - *Australian Town and Country Journal*, 12 March 1870 p.10.
mountain residents while the wonga pigeon was reportedly 'one of the finest eating birds on the mountains'.

As well as hunting for sustenance, many early mountain visitors and settlers also hunted animals to procure specimens for study and satisfy their scientific curiosity. Along with gathering 'pebbles and plants', Barrallier also shot, skinned and preserved native animals he came across in his mountain exploration. Some of the specimens he collected included black cockatoos, lizards, pigeons and a 'small and very pretty bird' with a red head and neck. He also obtained the feet of a koala from some Aboriginal hunters which he preserved and sent to Governor King in a bottle of spirits. Although far more interested in plants, Caley gathered a few glow worms he found on his way to Mount Banks and examined the fangs and poison sacs of some snakes.

Shooting birds to obtain specimens was a particularly common practice of many early visitors to the mountains eager to enrich their natural history collections. The mountain roadbuilder, William Cox, recorded that he 'shot several small new birds' and 'a young cockatoo' of a sort he had not previously seen before. In 1819, the visiting French naturalists, Quoy, Gaudichaud and Pellion, killed many birds along the mountain road, including bellbirds and 'some delightful parrakeets and cassicans' (orioles). They also noted that Springwood was a place 'abounding in game of every

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kind', including 'great flying phalangers' (gliders) and numerous birds such as the 'very brilliant family of parrots' and the 'magnificent Menura' (lyrebird).^142 Specimens of the mountain avifauna were also collected by Lesson in 1824 who shot 'a great many beautiful blue parrots' near both Wentworth Falls and Springwood. Lesson also wanted to obtain a lyrebird in the Blue Mountains but was unsuccessful, noting that it 'had become less common' in some parts due to being 'persistently hunted' for both its meat and spectacular tail of the adult male. Some local naturalists also amassed and maintained collections of native animals in the 19th Century. For example, one early resident of Mount Wilson had 'obtained about 60 species of birds in the neighbourhood' by 1886.^143

Collecting some of the distinctive Australian mammals, including echidnas, koalas and platypus, was also popular with curious foreign naturalists, mountain residents and others. For example, Breton captured a 'specimen' of an echidna in the Blue Mountains in the 1830s. Sometimes animals like koalas and wallabies were captured when they ventured too close to the mountain settlements and were kept as pets. In some parts of the Blue Mountains this practice continued well into the 20th Century, with several residents of Mount Tomah known to have kept pet koalas in the 1920s.^144

In the early 20th Century the Blue Mountains was still considered a fine place to collect scientific specimens of native fauna. In 1928 researchers from the

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^143 Lesson in Mackaness, op. cit., p.150, 155, 163, Trebeck, op. cit., p.492.
Australian Museum in Sydney made several trips to the Colong district to add to the museum's collection. During their outings they collected kangaroos, wallaroos, gliders, marsupial mice, bush rats, bats and a tiger cat. The animals were either shot or caught using traps and nets. After each 'successful day's collecting' much work was then required in 'preparing the skins and skeletons', labelling and recording data on the specimens.\(^{145}\)

**Skins and Sport**

"The woods are resounding with game all abounding,  

Then, oh, for a huntsman, a dog and a gun!" Harry Peckman (1891)\(^{146}\)

As settlement of the Blue Mountains advanced, hunting of animals generally became less of a necessity for sustenance and science and more of a commercial and recreational activity.

Throughout the Blue Mountains native mammals were widely hunted for their skins. Some were used by local inhabitants to make rugs, curtains and other items but far more were killed for profit. All species of kangaroos and wallabies were hunted commercially for their skins. The 'thick soft furs' of possums and playypus were also 'very highly prized' and by the 1880s considered a 'valuable article of commerce'. The skins of the 'prettily-marked'...
native cats were 'also in great demand' as were koala pelts.\textsuperscript{147} In the 1890s high prices were being given for nearly all marsupial skins. For example, large wallaby and wallaroo skins reportedly fetched 2s. 6d. each wholesale. These were principally used to make leather but some skins were used for fur rugs. Possums skins were used mostly for making various fur items, with a good quality rug requiring about 60 skins.\textsuperscript{148}

Lyrebird tail feathers also obtained a good price in Sydney throughout the 19th and early 20th Century and so adult males were usually shot on sight. In the 1890s the \textit{Sydney Mail} reported that lyrebirds were being 'wantonly shot' in the Blue Mountains 'simply for their tails', although some were for souvenirs rather than for sale.\textsuperscript{149} In addition to marsupials and birds, snakes were caught alive and sold by some mountain residents, sometimes fetching up to £3 each. One hunter from Lawson claimed to have frequently sold 20 to 40 snakes in a season, which were sent to 'snake-charmers and museums'. Snakeskins were also sold to overseas buyers. However, in most cases snakes were routinely killed on sight in the Blue Mountains in case they were poisonous. The venom of some species, especially the tiger snake, was known to kill dogs, horses and people within minutes. Even so, many harmless snakes were also killed unnecessarily out of misplaced fear, particularly the

\textsuperscript{147} T.A. Coghlan, \textit{The Wealth and Progress of New South Wales}, Sydney, 1887, pp.120-121.
\textsuperscript{148} As undamaged skins fetched the highest prices, most hunters for profit used guns sparingly and preferred traps to catch animals. Wire noose snares were particularly effective for obtaining animals such as possums and wallabies when set near their usual haunts. Bellingham, \textit{op. cit.}, pp.36, 68-76, 82-83.
diamond python - one specimen killed at the Jenolan Caves in 1895 measured 13 feet long.\textsuperscript{150}

As well as for their skins, many native animals were also killed because they were viewed as pests. To encourage their extermination, from 1880 onwards they were declared 'noxious' and the NSW Government paid bounties for their scalps. As mountain hunters could now make a good living from the combined income from bounties and skin sales, killing of native animals escalated. In the Blue Mountains large numbers of kangaroos and wallabies were shot and poisoned as pests during the late 19th Century as it was claimed they 'did great damage to the farmers and graziers' of the district by 'eating the grass and other vegetation' and destroying crops.\textsuperscript{151}

Dingoes and wild dogs were also branded 'noxious' and hunted widely for their scalps in the Blue Mountains, which worth 5 to 10 shillings or more. Local farmers often welcomed this hunting as wild dogs were known to attack and kill sheep and lambs in grazing areas such as Megalong Valley.\textsuperscript{152} However, over-enthusiasm backfired on three hunters who 'sallied out from Katoomba' in 1889 to rid the world of 'native dogs and other pests that occasionally infest the Blue Mountains'. The local newspaper reported with much mirth that they mistakenly shot a local pet dog, and not only obtained no money for the scalp but had to compensate the owner of the dog. Baits

\textsuperscript{150} Sydney Mail, 12 December 1896 pp.1247-1250, Meredith in Mackaness, \textit{op. cit.}, p.242, Bellingham, \textit{op. cit.}, p.93.

\textsuperscript{151} Bellingham, \textit{op. cit.}, p.73-74. By the mid 1880s over 850,000 kangaroos and 500,000 wallabies were being destroyed each year in NSW. Colghan, \textit{op. cit.}, 1887 edition, p.120.
were also used to poison dingoes. During 1918, 14 dingoes were killed with baits in just one day at Mount Irvine. On occasions native quolls raided mountain fowl yards and were also shot or trapped.\(^{123}\)

Flying foxes were a regular target of angry mountain fruitgrowers who frequently shot them when they raided local orchards, including those at Springwood, Kurrajong Heights, Bilpin and Burratorang Valley. In the 1880s and 1890s thousands of flying foxes inhabited Sassafras Gully near Springwood, which reportedly sallied out on nightly raids during the fruit season 'to ravage the orchards of the district'. In response, the mountain fruitgrowers were often compelled to adopt measures of 'an extreme character'.\(^{134}\) In the 1920s fruitgrowers at Mount Wilson were frequently 'up all night shooting the marauders'. Currawongs were another 'great pest to the orchardist' in the Blue Mountains, as were silver-eyes which were also known to feast on orchard fruit and were shot accordingly.\(^{135}\) As elsewhere in Australia, many wedge-tailed eagles were also 'shot without mercy' in the Blue Mountains by graziers who accused them of attacking young lambs and calves. White cockatoos and other parrots were also frequent targets for bullets and poison because they did 'great damage to the farmers crops'.\(^{136}\)

\(^{123}\) Shaw, op. cit., p.68, Bellingham, op. cit., p.88-89.


In the late 19th Century, hunting animals for 'sport' became popular with many mountain inhabitants and visitors. Because of its more rugged terrain, hunting for sport took longer develop in the Blue Mountains than in the more open areas to the west. Some early travellers hunted for fun while crossing the Blue Mountains. For example, Elizabeth Hawkins records that in 1822 her husband 'shot some birds' for amusement while her boys 'hunted a kangaroo rat'. In the 1860s Louisa Atkinson complained of 'would-be sportsmen' who in parts of the mountains destroyed 'the feathered tribes'. She noted that on a trip to Mount Tomah 'the sportsmen of the party' succeeded in securing a pair of young lyrebirds.\(^\text{157}\)

Sports hunting and fishing in the Blue Mountains became far more widespread in the 1880s and 1890s following the development of the mountain towns and the growth of the local tourist industry. Early mountain guidebooks listed shooting and fishing as one of the attractions for visitors. Native game advertised included 'Rock Wallaby', 'Scrub (Swamp) Wallaby', 'Wallaroo', 'Wombat', 'Tiger Cat' (Quoll), 'Platypus', 'Possum' and a variety of birds, among them 'Ducks', 'Lyre Birds', 'Cockatoos', 'Parrots' and 'Satin birds' (Satin Bowerbirds). The creeks and rivers of the Blue Mountains were also said to 'abound with fish' including 'perch, black-brim, black fish, eels, fresh-water herrings etc.' Even frogs were hunted on occasions for use as live bait during fishing.\(^\text{158}\)

\(^{157}\) Hawkins, op. cit., p.4, Atkinson, op. cit., pp.8, 16.

\(^{158}\) Horrocks, op. cit., pp.7-8, Bellingham, op. cit., p.108.
A tourist guide in 1887 stated that the Mount Victoria district offered 'ample pabulum to the taste' of hunting sportsmen, as 'marsupials in abundance' abounded in the vicinity which could be captured with dogs or 'fall prey to the gun'. The Kanimbla Valley also offered hunters 'kangaroo, scrub and rock wallaby, and birds in plenty'. Early tourist guides to the Jenolan Caves also advised that 'a gun will be found useful if the visitor is a sportsman' and 'spare time can be filled by shooting the multitudinous wallaby'. A prime hunting location was the ravine above the Devil's Coachhouse where rock wallabies and other animals were often flushed out of the remoter caves before being shot. In the 1880s excursionists along the Warragamba River could also find places along the cliffs where 'a shot may occassionally be got at a rock wallaby or a native bear'. However 'properly constructed nets' were needed to take the 'very abundant' platypus, as they were difficult to shoot on account of being 'so shy and so sharp'. The further reaches of the Grose Valley were also said to provide those fond of sport 'ample occupation for the gun'.

Guided shooting parties were arranged through many of the large hotels in the Blue Mountains. One of the best known local hunting guides was Sid Bellingham, who 'lived by his gun' and was 'familiar with all the sporting secrets of the Mountains'. He charged 15 shillings per day per person to accompany shooting parties in the area and advertised for business in local

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160 Koalas, tiger quolls and birds were also 'plentiful' and provided 'excellent shooting'. Foster, op. cit., pp.72, 85, Horrocks, op. cit., p.70, Bellingham, op. cit., pp.22-23.
161 Australian Town and Country Journal, 18 Dec 1880, p.1176, Plummer, op. cit. However this writer found shooting in the mountains distasteful, suggesting that it was 'little short of sacrilege to disturb the feathered denizens of the far-reaching forest wilderness'.
newspapers and tourist guides (see Figure 5.3). In 1899 Bellingham published his own guide 'to the shooting and fishing to be obtained on the Blue Mountains', which also described his experiences over 10 years of hunting in the 'fastnesses' of the area.

According to Bellingham, the best hunting locations in the mountains were 'along the Coach Road to Jenolan' and along the bridle track from Katoomba to Jenolan Caves 'shooting en route' or making deviations into the bush along the way. Another was along the track from Kings Tableland to the Jamison Valley where 'every description of native game is plentiful, and there is good fishing to be obtained on the Cox's River' and its numerous tributaries. Bridle tracks along the Cox's River, in Burragorang Valley and around the Kanangra area were other good hunting locations. Since the 1860s, sporting shooters from Sydney had regularly visited the Burragorang Valley, largely because the locality was easily reached from the city. By the 1890s, the native wildlife had been 'much shot at' and hunters now needed to go deeper into the adjacent country to find plenty of game. One of the less frequented places was the Kanangra Walls area. Another writer claimed that from 'a sportsman's point of view' this district surpassed most other mountain resorts as 'almost every

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163 S.R. Bellingham, Ten Years With the Palette, Shotgun & Rifle on the Blue Mountains, N.S.W., Sydney, 1899. Originally educated in art, Bellingham was a frustrated painter who took up the nomadic vocation of a hunter - hence the 'palette' in the publication's title. For Bellingham 'one of the principal charms of a sportsman's life on the Blue Mountains' was the 'wild and romantic scenery' as well as the 'excitement of game unexpectedly crossing one's path' - pp.17, 34.
164 Ibid., pp.53-55, 63-67, 108.
165 Ibid., p.61, Sydney Morning Herald, 29 March 1910 p.5.
class of game common to Australia' was 'met with in abundance' and
'splendid fishing' could be obtained on the Kowmung River.\textsuperscript{166}

The shotgun was the principal firearm used by sportsmen in the Blue
Mountains until about 1890 when, according to Bellingham, the rifle was
gradually introduced on account of the game becoming 'harder to approach
from being constantly shot at'. Soft pure lead bullets were recommended
because they had 'great stopping power'. Much hunting was also done using
catapults, especially by boys, whom another longtime mountain resident
claimed were responsible for 'more bird destruction in the mountains than
men with guns'.\textsuperscript{167} Generally, different techniques were used for hunting
different species. Possums and gliders were shot at night often by using
moonlight to target them, while wallabies and platypus were hunted in the
early morning or evening when most active. However, Bellingham considered
the stalking of wallaroos 'the best sport on the mountains' akin to deer
hunting in other countries. The heads of especially large victims were
sometimes stuffed as trophies.\textsuperscript{168}

On occasion sports hunting and pest extermination were carried out
simultaneously. According to Bellingham, 'wallaby drives' occurred constantly
in the Blue Mountains which he described as follows:

\begin{flushright}
\textsuperscript{166} \textit{Newspaper Cuttings, ca.1889, Vol.46, ML Q991/N, p.4.}
\textsuperscript{168} Bellingham, \textit{op. cit.}, pp.68-75, 80, 90, S.R. Bellingham, 'Wallaroo Stalking on the
Blue Mountains, New South Wales', \textit{The Australian Shooting & Fishing Annual}, 1902,
\end{flushright}
'Parties of settlers and farmers would muster at certain places, and those who possessed guns would be stationed at intervals in a line, while the remainder on horseback would encircle a section of the bush, and by dint of much shouting and cracking of whips, drive the frightened game towards the shooters. Hundreds of wallabies would be shot during the day in this manner.'

Many such 'drives' were held on farms in the Kanimbla Valley, including in 1899 when over 40 shooters spent a 'thoroughly enjoyable day' massacring the 'numerous' wallaby driven towards them. The Mountaineer reported that the 'game was plentiful' and 'consequently the fun was fast and furious'. As well as 'furnishing good sport for the visitors' the slaughter was seen as an advantage to the property manager. According to O'Reilly the 'last great wallaby drive' was held in the valley in 1902. Once more about 40 shooters (including members of the visiting English cricket team) took part in blasting the fleeing 'army of wallabies'.

Shooting and fishing for both sport and profit continued in the Blue Mountains during the first half of the 20th Century (see Figure 5.4). Hunting remained popular with many day visitors from the city, such as the 'lurking vandal with a gun' observed in 1906 shooting parrots near Katoomba and sticking the feathers in his hat as a trophy. According to Ward, in the early 1900s many people from Sydney and other nearby townships had a habit of 'going to the mountains to shoot parrots and wallaby', especially during Christmas holidays. The Megalong and Kanimbla Valleys continued to be listed in tourist guidebooks as prime hunting locations, with local guides

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160 Bellingham, 1899, op. cit., p.74.
171 Sydney Morning Herald, 21 April, 1906 p.11, Ward, op. cit., p.6, 8.
readily available 'to supply the sportsman with a few days good shooting'. One mountain visitor in the early 1900s, found the area around Five Mile Hill near the Jenolan Caves a 'sporting paradise' where 'marsupial game abound in great numbers'. This hunter engaged a local guide for 6 shillings a day and was shown 'plenty of game' of which he 'made up a good bag'. Wallabies and wombats were hunted during the day and 'delightful evenings' spent 'hunting opossum and flying squirrels' by moonlight. The Kowmung River area was also promoted as 'ideal holiday country', where given 'decent weather, a gun, a fishing line or two, a few books etc.' one could spend many happy weeks.\textsuperscript{173}

In 1920s rock wallabies remained a favourite target of sports hunters in the Blue Mountains, particularly along the slopes of the Nepean and Warragamba Rivers where at dawn and dusk they were shot at regular drinking places. In some parts of the mountains hunting possums, kangaroos and wallabies for their skins was given a boost during the early 1930s when the State Government declared several open seasons across the State to help those affected by the Depression to 'find employment in obtaining skins'.\textsuperscript{177} An open season was also declared in the Colong and Yerranderie area in 1937 to reduce the 'great numbers of kangaroos, wallabies and wallaroos' which had reportedly invaded the area and become 'a serious pest to residents of the district'.\textsuperscript{178}

\textsuperscript{178} Temporary licences were also issued to some mountain residents in the 1930s to allow them to kill parrots and other birds found in orchards. \textit{Sydney Morning Herald}. 
Throughout the 1930s sports hunters visited the Blue Mountains, especially on weekends. A typical example were the three mountain visitors, who on a Sunday morning in 1930, indulged themselves by shooting 11 birds, including currawongs, jacky winters and red-breasted robins. Both Kanangra Walls and the Burrarorang Valley continued to be advertised in Sydney as localities with 'good shooting'. The Burrarorang Valley particularly attracted many 'lads with pea-rifles' from the city who were accused of frequently causing 'wholesale destruction of bird-life'.

During World War II the hunting of native animals in the mountains generally declined as those fond of shooting found much larger human targets overseas to focus their sights on. Some licences were issued to mountain farmers in the 1940s, especially in the Kurrajong-Bilpin area, to allow them to kill wallabies and native birds which were damaging orchards. However, as with the hunting of flowers and ferns, in the postwar era the killing of native animals for sport became increasingly less fashionable in the Blue Mountains and elsewhere in Australia. While shooting for pest control was still permitted, eventually a change in attitudes and tougher legislation largely halted the long-standing tradition of hunting native animals for meat, skins and fun.

Although the hunting of native flora and fauna has always been vital for the

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178 Blue Mountains Star, 16 August 1930 p.5, Sydney Morning Herald, 22 April 1930 p.12. During the summer holidays of 1934-35, hundreds of people reportedly used 'pea-rifles and shotguns' in the valley, with most camping parties possessing 'at least one gun' - see Sydney Morning Herald, 17 January 1936 p.6.
human inhabitants of the Blue Mountains, the European settlers of the region also depended on another equally important group of plants and animals - those they brought with them.

**Introducing Life**

Whether intentionally or not, European settlers introduced a range of foreign plants and animals to the Blue Mountains. Some were essential for food, fodder, transportation and many other useful commodities while others merely provided pleasure or companionship. Many alien species became 'wild' and flourished so well that they were soon branded 'noxious' and destroyed on sight. However, regardless of their status, in combination the introduced lifeforms rapidly transformed the mountain landscape.

**Crops and Gardens**

'All the hardy annual flowering plants which thrive so well in English gardens, find here the conditions suiting them' J.E.M. Russell (1885)

**Food and Fodder**

The first foreign plants to be introduced to the Blue Mountains were food plants. In 1802 Barrallier sowed four pumpkin seeds and an apricot stone in the rich soil of the Burratorang Valley, clearly hoping to provide some handy

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178 Wildlife Preservation Society of Australia, 'Minutes', 1938-1947, ML MSS 5603. Illegal killing and selling of native animals did however continue in the Blue Mountains for many years and still occasionally occurs.
food for a future traveller.\textsuperscript{178} Whether these seeds matured or not is unknown, but the explorer became the first of many to plant foreign crops in the Blue Mountains.

The earliest crops were grown for subsistence in small gardens attached to the first mountain homes. Vegetables, like potatoes, and sometimes fruit were grown close to some of the military depots and convict roadworker camps situated along the mountain road. The owners of early roadside inns often grew their own vegetables and some fruit to feed themselves and their guests.\textsuperscript{179} Early settlers in the Megalong, Kanimbla and Burragorang Valleys also grew a wide range of their own fruit and vegetables in fenced off gardens and orchards next to their huts and homesteads. The main vegetables grown were potatoes and maize (corn), complemented by a variety of fruit bearing trees including apples, apricots, quinces, peaches, figs, oranges, pears and cherries. By adding sugar bought from the towns, surplus fruit was dried and preserved or made into jams. Paddocks of maize, wheat, oats and hay were also grown for livestock fodder and used both locally and sold to the mountain towns.\textsuperscript{180}

From the 1880s onwards, most of the hotels, guesthouses, boarding schools and private residences in the mountain towns were cultivating their own fruit

\textsuperscript{177} Russell, 1885, \textit{op. cit.}, p.26.
\textsuperscript{178} Barrallier, \textit{op. cit.}, p.767.
\textsuperscript{179} Meredith in Mackaness, \textit{op. cit.}, pp.241, 245.
\textsuperscript{180} Most isolated mountain residents continued to maintain their own gardens and orchards well into the 20th Century so they could be self-supporting in fruit and vegetables. \textit{Newspaper Clippings}, Vol.46. ML Q991/N, p.5, O'Reilly, \textit{op. cit.}, p.68, 73, 87, Shaw, \textit{op. cit.}, p.19, 86, Warliker, \textit{op. cit.}, p.4.
and vegetables. For example, the Carrington Hotel at Katoomba had its own fruit and vegetable garden which was considered 'a very useful and necessary adjunct to a high class hotel'. By 1890 numerous large mountain properties had fruit and vegetables under cultivation, which were producing excellent crops of fruit of 'all those varieties which are so well known in England'. At Mount Wilson, foreign fruits 'of almost abnormal size' (including strawberries, raspberries, gooseberries and apples) were also reportedly growing in great perfection'.

As well as foreign fruit and vegetables, the European settlers of the Blue Mountains also introduced foreign fodder plants to increase the grazing productivity of newly cleared areas of forest and replace the depleted native grasses, destroyed by the hard hooves and voracious appetites of introduced livestock. As early as the 1870s, 'English and Italian grasses' were sown at Mount Tomah, with more than 300 acres of cleared land planted with 'rye, rib or lamb's-tongue, white Dutch clover, and cock's-foot'. By the 1880s imported grasses were also flourishing on cleared land at Mount Wilson. A visitor in 1886 noted that the 'English grasses thrive well' including red and white clover and rye grass. Cocksfoot however was 'most in favour' and produced a 'heavy crop of succulent feed'. Clover and other English grasses were also sown on cleared land at Mount Irvine and at Blackheath, where by

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182 All were 'growing well' particularly the cocksfoot. Australian Town and Country Journal, 3 June 1871, p.682.
1890 they were 'almost knee deep' and 'literally carpeting the ground'. By the 1960s huge areas of the Kanimbla, Megalong and Hartley Valleys contained 'improved pastures' - those sown with introduced grasses and legumes. Some of the foreign species, especially white and subterranean clover, had gone wild and spread into non-cultivated areas.

As well as growing fruit and vegetables for their own use, many mountain inhabitants grew crops for commercial sale. There were three main areas in the Blue Mountains where cash crops were grown - on the alluvial soils of Burragorang Valley, in the area along Bell's Line of Road from Kurrajong Heights to Mount Tomah, and at certain places along the main mountain road (notably Springwood, Medlow Bath, Blackheath and Shipley Plateau).

From the commencement of European settlement in the area, various crops were grown on the rich soils of the Burragorang Valley. Maize formed the 'staple product of the locality' and by the 1890s many miles of the valley's river banks featured 'fields of corn', which often yielded 80 bushels or more to the acre. Pumpkins, oats and vegetable crops were also grown but the lack of good access roads meant that for many years much of the produce could not be sent to market and it was used instead to fatten livestock. By the 1920s, over 6,000 tons of vegetables from ten varieties was also being produced each year by farmers in the valley. However, the difficulty and cost of haulage

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prohibited more intensive growing of crops. After improvements were made to
the road to Camden and trucks replaced horse-drawn carts, market gardening
became an important activity in the valley. A variety of vegetables were grown
for sale, including cabbages, cauliflowers and especially tomatoes, of which
hundreds of tons were sent to canneries during World War II. Growing of
crops in the Burragorang Valley came to an abrupt end in the 1950s when the
valley was flooded to increase Sydney's water supply (see Chapter Two).\textsuperscript{165}

Because of its better quality shale soils, commercial fruitgrowing has taken
place throughout the area along Bell's Line of Road between Kurrajong
Heights and Mount Tomah. G.M.C. Bowen was one of the earliest fruitgrowers
in the district and planted 'a considerable acreage of orange orchards' on his
property near Bowen Mountain in the 1840s. From the 1880s onwards
numerous orchards were established in the area with the fresh produce sent
to Sydney for sale. The main fruits cultivated were citrus fruits (oranges,
mandarins and lemons), apples, pears and passionfruits with vegetables,
such as peas, sometimes grown in between the rows of trees.\textsuperscript{167} At Mount
Irvine and Mount Wilson a few apple orchards were established in the early
1900s and potatoes, onions and turnips were also grown for sale in the
mountain towns. After 1945 apple growing expanded, especially near Bilpin
which rapidly became known as the 'Apple Country'. By 1965 almost 1,500

\textsuperscript{165} 1 bushel = 60lfs or 27kgs. Newspaper Clippings, Vol.46, ML Q991/N, p.5, Sydney Morning Herald, 25 October 1912 p.6.
\textsuperscript{166} Parliamentary Standing Committee on Public Works, 1921, op. cit., pp.380-390, S.
den Hertog, The History of Burragorang Valley From The Records, Camden, 1990,
acres of the district was under apples and chemical sprays were increasingly needed to control black spot and codlin moth. Although fruitgrowing has since declined in some places (such as Mountain Lagoon), it has remained a major land use in the area centred on Bilpin throughout the rest of the 20th Century.  

Some commercial fruit and vegetable growing also occurred in areas along the main mountain road. In the 1880s there were several orchards at Blackheath where 'English fruits' reportedly grew to 'perfection', reaching a 'magnificent size' and possessing a 'peerless flavour'. On one five acre farm 300 'young fruit trees reared their exotic heads' while potatoes, cabbages and other vegetables all 'flourished in green parallels'. Another farm at Blackheath grew many acres of flowers, fruit and vegetables of the 'choicest varieties'. By the 1890s, large orchards had likewise been established at Springwood, which was described as a 'rich and prosperous fruitgrowing district' possessing some of the 'most valuable fruitgrowing land on the mountains'. Around this time numerous market gardens were set up near some of the early mountain towns including Mount Victoria, Blackheath and Katoomba, which supplied fresh produce to both the local and Sydney markets well into the 20th Century.  

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In 1912 the *Sydney Morning Herald* noted that the growth of the mountain towns had 'led many people to take up land with a view of turning it into orchards or vegetable gardens'. A large area of land had been placed 'under apples and pears', with 'some very fine orchards' at Blackheath and Bilpin and gardens at Katoomba were successfully growing cabbages and cauliflowers for sale in Sydney. Some of the mountain farms in existence at this time were large undertakings. For instance, 'Westmeath Farm' near Medlow Bath covered 40 acres and contained 2,000 apple trees, 1,000 pear trees, 500 plum trees, 500 cherry trees, 200 quince trees, 100 lemon trees and 7,000 gooseberry bushes. In between the trees grew acres of vegetables including potatoes, cabbages, tomatoes, onions, lettuce, beans and peas.\(^{191}\)

Although fruitgrowing was relatively widespread, many of the smaller orchards in the Blue Mountains did not survive the combined impact of the 1930s Depression and the increasing prevalence of fruit diseases and insect pests. One area which did prosper was the Shipley Plateau near Blackheath which from the 1930s onwards became widely reknowned for its orchards of apples, cherries and other fruits. By the 1950s about 10,000 cases of apples were being produced each year with most sold locally and to mountain visitors. Since the 1970s the orchards at Shipley have declined and urban development has increasingly encroached on the Plateau.\(^{192}\)

\(^{191}\) However to produce such abundant crops in the sandy mountain soil, tons of lime and the 'street sweepings of Sydney' were added to the soil each week, and chemical sprays were required to prevent 'fruit pests'. *Sydney Morning Herald*, 25 October 1912 p.6, *Blue Mountain Echo*, 15 November 1912 p.6, 24 December 1915 p.3.
Pleasure Plants

As settlement of the mountains developed in the late 19th Century, many other foreign plants were introduced to the area purely for their aesthetic attractiveness. These pleasure plants included flowers, shrubs and trees which were imported from throughout the Northern Hemisphere but especially from Europe. Horticulture became a passion of many of the wealthier of the new mountain settlers. Neatly arranged gardens of introduced plants were seen to improve the harsh untidy appearance of the native mountain vegetation. In their attempts to impress neighbours and visitors, many early mountain landowners spent large amounts of money preparing land and planting a variety of exotic plants to recreate the ideal English garden. 189

An enormous variety of annual and perennial flowering plants were planted in the Blue Mountains from the 1880s onwards, including rhododendrons, camellias, lilacs, laburnums, azaleas, gladioli, daffodils, dahlias, hyacinths, hydrangeas, roses, wallflowers, tulips, daisies, violets and lilies. Creepers such as wisteria, jasmine and ivy were also established. Numerous evergreen and deciduous trees were planted as well so that mountain residents and visitors could enjoy their dark green foliage and the autumn colours of their falling leaves. These included various pines (including larch, cypress, oregon and sequoia), beeches, birches, elms, ashes, poplars, planes, oaks, hollies.

189 Blue Mountains Heritage Study, op. cit., p.64, Warliker, op. cit., pp.5, 38, Blue Mountains City Council, Town Planning Scheme, op. cit., p.38, BMHS Files.

188 Much of the development of the larger mountain gardens was undertaken by professional landscape gardeners who worked in the Blue Mountains from the 1880s onwards. Low, op. cit., 1991, pp.120-123.
chestnuts and maples. Pines were additionally planted not just for their appearance but to provide shelter from the strong and often bleak westerly winds. Some pines planted along fence boundaries at Blackheath had attained 'substantial proportions' as early as 1890. Evergreen shrubs (such as laurel and hawthorn) were often used to form hedges, while willow trees were also planted along watercourses apparently to improve their appearance.  

Mount Wilson especially was radically transformed by the introduction of foreign pleasure plants which thrived in the rich basalt soil and cool, moist climate. By the 1880s most residences had established impressive gardens of English shrubs, trees and flowering plants which added 'colour and perfume' to the spot. Along the local roads were also 'long avenues of chestnuts, walnuts, elms, and other English forest trees, all of which are growing in the greatest luxuriance. The transformation in the landscape at Mount Wilson was so extensive that one visitor in 1913 felt 'transported as it were by the wand of a magician to English scenes and woodlands'.

Tourist guides noted that in most of the mountain towns along the railway 'all the hardy annual flowering plants which thrive so well in English gardens' found conditions which suited them. Visitors could inhale the fragrance of familiar favourite flowers which not only gave 'variety to the garden' but also afforded a pleasing contrast with the indigenous flora. Most mountain residences, hotels and other accommodation places established gardens. For

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example, the Carrington Hotel was surrounded by impressive gardens which supplied roses, gladoll and a variety of blooms for the decoration of visitors' rooms and tables.\textsuperscript{185} Many mountain residents took great pride in their exotic gardens and often shared new plants with their neighbours.\textsuperscript{187}

As well as for private enjoyment, attractive foreign flowers were also grown for profit throughout the mountains. By the mid 1890s several large flower nurseries had been established in the Blue Mountains which each season grew blooms for sale in Sydney. One of the largest was at Wentworth Falls which in 1895 had 'half an acre of lovely hyacinths, half an acre of lilies, 250,000 glorious daffodils, and 10,000 crowns of lily of the valley' all growing 'stronger and more lovely than their European ancestors'.\textsuperscript{186} In 1912 'thousands of flower blooms, especially daffodils' were being sent from the Blue Mountains to the city and it was predicted that the 'output must increase each season'. The mountains were viewed as an ideal location for growing flowers as 'almost any seedling takes root'. By the 1920s flower shows had become a regular event in many of the mountain towns, usually organised by the newly formed local horticultural societies and garden clubs. Daffodils were especially popular during the 1920s, with the local newspaper stating that 'almost every garden on the Blue Mountains is crowned with a glory of

\textsuperscript{185} Suttor, op. cit., p.176, Trebeck, op. cit. p.492, Sydney Morning Herald, 10 September 1913 p.10.
\textsuperscript{187} Blackheath Progress Committee, op. cit., p.10. O'Reilly describes how his father regularly collected seeds, cuttings and roots from other homesteads while travelling and planted them in the home garden - O'Reilly, op. cit., p.66.
\textsuperscript{188} As with food crops, to achieve such large-scale production from the poor sandy soils required regular irrigation and fertilization with large quantities of lime and
daffodils'. This 'deluge of daffodils' included an annual display of the yellow bulbs at Wentworth Falls. In the 1950s and 1960s several more annual garden festivals were established in the mountains, notably the Blackheath Rhododendron Festival (first held in 1953).\footnote{Sydney Morning Herald, 25 October 1912 p.6, Blue Mountain Echo, 17 September 1920 pp.2, 4, Low, op. cit., p.123. By the 1960s over a thousand varieties of rhododendrons were reported to be growing at Blackheath - Sydney Morning Herald, 31 October 1966 p.12.}

Foreign pleasure plants were widely planted in public spaces as well, including parks, reserves, railway stations and roadsides. In the 1880s and 1890s, various ornamental trees and shrubs 'deemed suitable for adding to the attractiveness of the scene' were planted in public parks and other 'fitting positions' throughout the mountain towns and near Caves House at Jenolan Caves, where they found 'a congenial home'. Planting of foreign plants increased after World War I as many more municipal parks and gardens were created by each of the local mountain councils.\footnote{Major new parks included Memorial Park at Blackheath and Hinkler and Kingsford Smith Parks at Katoomba. Russell, 1885, op. cit., pp.26, 29, The Mountaineer, 1 September 1894 p.2, Australian Town and Country Journal, 18 February 1893 p.10, Low, op. cit., p.123.}

Local enthusiasm for planting exotic trees intensified in the mid 1930s. To further 'beautify the district', the 'tree-minded' municipality of Katoomba planted 5,000 trees (mostly exotics) over two years along 24 miles (38 kms) of local roads and reserves. Not all the plantings were successful and some residents complained that native trees should have been used instead. Nevertheless, the Council pressed on regardless and in July 1939 the Mayor

\textit{\textbf{manure. R. MacMillan, Australian Gossip and Story, Sydney, 1895, p.128, The Mountaineer, 19 October 1894 p.3.}}
advocated the planting of a million trees in the municipality over the following five to ten years, again mostly exotics. However, the ambitious scheme was thwarted by the commencement of World War II and significantly less foreign trees were planted in the ensuing decades.\textsuperscript{201} The planting of exotic trees steadily declined as the Blue Mountains City Council became increasingly concerned over the cost of constant pruning, its liability for fallen trees, and the impact of roots on gas, water and sewerage mains and footpaths. Although now viewed unfavourably by some mountain residents and visitors, by the 1980s many prominent exotic trees in the Blue Mountains had become registered heritage items and protected by tree preservation orders.\textsuperscript{202}

\textit{Pines for Profit}

Soon after its formation in 1916 the NSW Forestry Commission decided to establish plantations of foreign pine trees to meet future demand for softwoods. One of the first areas selected was the western fringe of the Blue Mountains and in 1928 plantations of Monterey Pine (\textit{Pinus radiata}) were established alongside the road to the Jenolan Caves. By 1933 over 600 acres (240 hectares) of the Jenolan State Forest had been planted with almost 200,000 pine trees set in rows 10 feet (3 metres) apart. These developed so 'healthily and rapidly' that in following years the pine plantations in the


Jenolan district were greatly expanded. By 1970 over 9,000 acres (3,600 hectares) had been planted with exotic pines.\textsuperscript{203}

In the 1920s a visitor 'accustomed to the hum of a circular saw' suggested that thousands of acres of pine plantations should also be established throughout the central plateau of the Blue Mountains. The suggestion was not acted on until the 1960s when over 900 acres (360 hectares) of pines were planted on Radiata Plateau west of Katoomba and 60 acres (24 hectares) in the Lake Medlow catchment area south of Blackheath. The Blue Mountains City Council estimated that some 3,000 acres (1,200 hectares) of land was available for further commercial pine plantations in the upper mountains, including all of the dam catchment areas near Blackheath and Katoomba.\textsuperscript{204}

However these plans for expansion did not take root as by the late 1960s foreign pines were becoming pariahs. Public opinion was increasingly questioning the practice of replacing native vegetation with a monoculture of exotic pine trees. In 1969 the Forestry Commission proposed to expand its pine planting operations in the southern Blue Mountains by bulldozing 5,000 hectares of native forests on the Boyd Plateau and replacing them with pines. As this area had been proposed for inclusion in the Kanangra-Boyd National Park, conservationists were outraged by the plan and for seven years waged a


\textsuperscript{204} \textit{Blue Mountain Echo}, 21 December 1923 p.8, Blue Mountains City Council, \textit{Town Planning Scheme}, op. cit., pp.38-39.
high profile public campaign against the proposal that became known as the 'Battle for the Boyd'.

Eventually, after an inquiry the State Pollution Control Commission recommended in 1975 that the pine planting on the Boyd Plateau not proceed. Battered by the controversy, the State Government immediately accepted the advice and two years later the entire Konangaroo State Forest was incorporated into the Kanangra-Boyd National Park.

Weeds

'A weed is a plant growing where we do not want it'. Sir Edward Salisbury (1961)

Many foreign plants have established wild populations in the Blue Mountains and now reproduce and spread with abandon. Some are plants which escaped the confines of cultivation while others arrived in the mountains by accident. Collectively, these unwanted alien plants have been labelled 'weeds' and in many parts of the region they have become a significant environmental problem.

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Footnotes:

205 For a full history of the Boyd Plateau dispute see, Colong Foundation for Wilderness, Park or Pines: The Battle for the Boyd, Sydney, 1989. The anti-pine protests were led by the Colong Committee which was also campaigning simultaneously against the proposed limestone mines near the Colong Caves - see Chapter One.

206 State Pollution Control Commission (NSW), Report and Findings of the Environmental Investigation into the NSW Forestry Commission Proposal for Pine Planting on the Boyd Plateau, Sydney, April 1975, Colong Foundation for Wilderness, op. cit., pp.35-36. Planting of pines has continued in many areas to the west of the Blue Mountains.
Like other parts of Australia, as settlement of the Blue Mountains increased so did the spread of weeds. Generally, weeds have become well established throughout the region, although some areas of the mountains favour weed growth more than others. These include places where the native vegetation has been removed and the soil recently disturbed. Many foreign plants also prefer areas with high levels of nutrients and are therefore usually found along the edges of creeks and watercourses downstream from urban areas where runoff has enriched the soil. In contrast, exposed locations with sandy soils are more resistant to weed growth and this has helped to contain the spread of most weeds in those parts of the Blue Mountains.

Many weeds are fast growing and quick to colonise new areas. When they invade bushland they frequently thrive at the expense of native flora and may eventually replace them entirely in some places. Significantly, weeds are often found in close company with people. Common locations with abundant weed growth include along railway lines, roadways, fire trails and walking tracks, as well as vacant building sites, rubbish dumps and overgrown gardens.208

As well as those which have escaped from gardens and fields, many weeds were introduced to the Blue Mountains accidently. More often that not people have been the agent of dispersal. For example, in the 1840s Mundy saw a fully grown peach tree beneath Lennox Bridge at Lapstone which he attributed to 'a stone thrown away by a fruit-eating traveller'.209 Sometimes

208 Kirkpatrick, op. cit., pp.82-88.
weeds hitched a ride lodged in shoes and tyres or in the hair and hooves of their introduced animal compatriots. The sowing of foreign pasture plants in the mountains also liberated an abundance of weeds. For instance, in the 1880s several European and Asian weeds (including potato weed and Indian weed) were noted to be rapidly 'following the steps of cultivation' at Mount Wilson. Thistles were another weed introduced early into the Blue Mountains which had spread widely by 1900. On occasions weed seeds were also inadvertently mixed in with fodder, straw packing, wooden boxes, garden supplies and refuse. Once established they usually spread rapidly as their seeds were scattered even more widely by birds, livestock, insects, wind and water.210

Over 500 exotic plant species have been recorded in the Sydney Region.
Appendix 5 lists the most significant of these species which have become weeds in the Blue Mountains. Many of the plant invaders are former pleasure plants, such as gorse, broom, lantana, pines and willows.211 Perhaps the most well known, widespread and persistent plant pest in the Blue Mountains is the blackberry (Rubus fruticosus).

The Blackberry Menace

'Blackberries are other fruits that will run riot in a Mountain environ.' Blue Mountains Echo212

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210 Woolls, op. cit., p.9, O'Reilly, op. cit., pp.65, 74, Kirkpatrick, op. cit., pp.82-88.
Blackberries were originally brought to the Blue Mountains as a food plant in the late 19th Century. In 1890 the *Katoomba Times* described some of those grown locally as the 'best blackberries we have ever seen or tasted'. However, the blackberry found the Blue Mountains an ideal home and soon thrived. In 1911 the *Blue Mountain Echo* reported that the 'menace of the blackberry' had spread 'very forcibly' in the last few years and was 'increasing to such an extent on the Mountains' that it had become a 'general nuisance'. Vines were found in 'luxuriance' in many of the local scenic spots where it had 'made desolate many a nook and corner of sylvan loveliness, transforming it into garish ugliness'.  

However combating the blackberry menace was complicated by the fact that they were also an attraction for mountain tourists. One mountain visitor in 1919 described spending an entertaining morning picking blackberries for jam in a steep gully 'almost overrun with the vines, many of them being over 20 feet high'. By the early 1920s all three mountain councils were debating what to do about the blackberry problem and the issue had become quite controversial. Many private landholders refused to eradicate the weed on their properties unless the local councils also eliminated the blackberry from the council owned public reserves. Destroying blackberries was notoriously difficult and unless all parts of the plant were dug up and burnt, it continued to regrow. Where regular cutting, grubbing and burning was not possible,

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219 *Blue Mountain Echo*, 24 December 1915 p.3.  
councils applied repeated sprayings of caustic soda solution or grazed infested areas with sheep and goats.²¹⁵

Because of its appeal to tourists, throughout the 1920s the mountain councils remained reluctant to officially declare the blackberry a noxious weed and order its complete destruction. The local authorities generally took the view that the blackberry was an asset (if kept within reasonable bounds), as it bore 'luscious fruit of good marketable value' and 'much pleasure was afforded visitors by blackberry picking'. Some also felt that the 'wild abandonment of its growth' added 'picturesqueness to wayside scenery'.²¹⁶

While the local authorities dithered, the 'picturesque pest' continued to overrun the mountain municipalities. In 1923 a newly arrived resident of Katoomba noted with surprise that 'Mr. Blackberry' was a 'permanent resident and a big land owner' who threatened to soon become 'a fully-fledged monopolist'.²¹⁷ The blackberry pest continued to spread 'with appalling rapidity' and in 1927 become frontpage news locally. According to the Blue Mountains Echo:

'There are gorges in almost every centre of the Blue Mountains, where the blackberry has taken complete control and closed the scene against the tourist. Paths have vanished beneath its twining branches. Ferns have disappeared under masses of thorny brakes. In places, whole gullies have been transformed into a tangle of flourishing blackberry...Slowly, but

²¹⁵ Blue Mountain Echo, 8 April 1921 p.8.
²¹⁶ Blue Mountain Echo, 27 January 1922 p.2, 13 April 1923 p.8, 14 September 1923 p.5.
Inexorably, our native ferns and shrubs are yielding way to this lusty importation...\textsuperscript{218}

Blackberries were also thriving in the mountain towns - diving under walls, protruding through fences, infesting cherished gardens and causing 'ruin where once was order and beauty'.\textsuperscript{219} Eventually, to increase its legal powers to deal with the persistent pest, in 1933 Katoomba Council declared the much-maligned blackberry a noxious weed. Blackheath Council followed in 1936 but the more rural Shire Council left matters mostly as they were.\textsuperscript{220}

All three local government bodies stepped up their efforts in the following years to rid the mountains of blackberries. In 1935 Katoomba Council issued over 300 notices to local landowners requiring the destruction of blackberry. An investigation in 1939 by a 'weeds officer' from the Department of Agriculture found that the blackberry problem was still 'very serious' throughout the Blue Mountains with very few blocks of land in the Katoomba area completely free from growth and some private land was described as 'a dense jungle'.\textsuperscript{221}

In the 1940s, on the eve of the amalgamation of local government in the Blue Mountains, blackberries were still being described as a 'big problem' in the area, with Katoomba spending some £400 each year on treating the worst

\textsuperscript{218} \textit{Blue Mountain Echo}, 11 March 1927 p.1.
\textsuperscript{219} \textit{Ibid.}, p.1.
\textsuperscript{220} \textit{Katoomba Daily}, 20 February 1932 p.4, 22 April 1933 p.1, \textit{Blue Mountains Times}, 2 October 1936 p.2. In 1923 the Blue Mountains Shire Council had somewhat tokenistically declared the blackberry a noxious weed within an area of half a mile from the Lawson post office - \textit{Blue Mountain Echo}, 13 April, 1923 p.8.
\textsuperscript{221} \textit{Katoomba Daily}, 10 January 1935 p.1, 4 March 1939 p.4.
affected streets and public areas. Joint action was needed to adequately control blackberry (and other noxious weeds) and weed eradication efforts benefited greatly from the consolidation of all three mountain councils in 1947. Even so, the battle against the blackberry has been a never-ending one and the thorny weed has continued to plague the Blue Mountains throughout the rest of the 20th Century.

Although the most prominent, the blackberry is just one of the many foreign plants which have become weeds in the Blue Mountains. Year by year the number of official 'noxious weeds' grew along with the size of the infested areas. Coping with the the 'weed' problem has been complicated by the contradictory love-hate relationship which many mountain residents have often maintained towards foreign plants. At the same time that some introduced plants (such as blackberry) were being condemned and killed with highly toxic poisons (see Figure 5.5), other exotics were being planted in mountain gardens or praised for providing a 'peerless autumn picture'. And it often took a long time for the inhabitants of the Blue Mountains to recognise the insidious threat posed by many introduced plants. For instance, in the 1940s, the Katoomba Council planted English broom, tree lucerne and a mixture of foreign grasses (including ryegrass and cocksfoot) to revegetate and stabilise the soil around the newly constructed Cascade Dam No.3. The broom

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222 Blue Mountains Advertiser, 8 September 1944 p.2.
223 Sydney Morning Herald, 5 May 1947 p.2.
especially 'thrived' and was soon 'spreading naturally' in the catchment area from its own seed.\textsuperscript{224}

By 1988 over 30 introduced plants had been declared 'noxious weeds' and a further 6 foreign plants were labelled 'undesirable' and 'troublesome' which should be controlled by landowners and occupiers. Most of the upper reaches of the mountain streams were now seriously affected by weeds, especially those closest to urban areas.\textsuperscript{225} With each passing year, the eradication (or control) of weeds in the Blue Mountains has required increasing expenditure and considerable amounts of labour (often voluntary). However, given their persistence to date, it seems unlikely that the region will ever be totally free of its tenacious foreign flora.

**Livestock**

Many species of animals were introduced into the Blue Mountains by European settlers. Appendix 6 provides a list of the foreign vertebrate animals brought to the region and the reasons why they were imported.

\textsuperscript{224} L.G. Kaleski, 'Vegetative Stabilisation of the Katoomba Water Supply Catchment Area', *Journal of the Soil Conservation Service of NSW*, Vol.3, No.1, 1947, pp.50-56. Prior to 1957, the trustees of Blue Gum Forest also planted hundreds of willow seedlings in the Grose Valley in a failed attempt to stabilise river banks, but fortunately these did not become established. However, blackberry, gorse and broom have successfully invaded the Grose Valley. Macqueen, *op. cit.*, pp.265, 273.

\textsuperscript{225} *Blue Mountains Gazette*, 9 November 1988 p.20, Keith and Benson, *op. cit.*, pp.122, 138. Until they were removed in the 1990s, Glenbrook Lagoon was also well covered with aquatic weeds, notably the floating fern (*Salvinia molesta*) - 'Glenbrook Lagoon' brochure, BMHS Files.
Cattle (*Bos taurus*) were the first foreign animals in the Blue Mountains in any great numbers. It seems they first entered and explored the Blue Mountains many years before their former European masters. These bovine trailblazers were descendents of the small herd which escaped from Sydney in 1788 and established themselves at the 'Cow Pastures' near Camden. From here it appears that some cattle found there way into the Burragerang Valley and possibly further upstream along the Coxs River. In 1810 Macquarie saw numerous herds of wild cattle at the Cow Pastures and observed that 'there is some reason for believing that some of the cattle have strayed from thence into tracts of country where they have not yet been traced by Europeans'.

Nevertheless, far more cattle and other livestock entered the Blue Mountains following the building of the mountain road. Cattle were first driven along the mountain road in 1815 not long after its opening and some government owned herds were depastured in the Vale of Clwydd at the foot of Mount York. By 1848, the County of Cook itself contained over 9,000 head of cattle, 14,700 sheep (*Ovis aries*), 2,150 horses (*Equus caballus*) and 2,700 pigs (*Sus scrofa*), while the County of Westmoreland had over 9,800 cattle, 41,780 sheep, 1,500 horses and 623 pigs.

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Flesh Foods

As with plants, most of the earliest foreign animals in the Blue Mountains were brought as a supply of food. Meat was obtained primarily from cattle, sheep, pigs and poultry, with the last named also providing eggs. Cows and goats were also kept throughout the region to provide fresh milk, cheese, butter and cream. According to Meredith, the 'never-failing dish' served to most early mountain travellers in the roadside inns was 'ham and eggs', supplemented with chops (sheep), damper and tea. 228

As well as providing food for domestic use, livestock was also raised for sale in the Blue Mountains. Since the beginning of European settlement of the area, large herds of cattle and sheep have been grazed in the mountain valleys. Sheep provided valuable wool as well as meat. In 1835 Backhouse recorded that sheep were being grazed near the River Lett at a density of one sheep to every four or five acres. In the 1860s, it was reported that each farmer in the Burragorang Valley had 'an extensive herd of cattle' and 'upon this branch of industry appears mainly to depend his living'. Many cattle and sheep were also grazed in the Kanimagla Valley, which by 1880 had been mostly converted into a large livestock station. 229 Commencing in the 1860s, cattle grazing was also carried out in the Grose Valley (sometimes illegally)

228 Meredith in Mackaness, op. cit., p.245. The 'ham' was usually salted. Shaw, op. cit., p.19.
and several stockyards were built. Small numbers of stock continued to be herded in and out of the valley by local cattlemen until the 1940s.\textsuperscript{230}

From the late 1800s onwards, pig raising was also undertaken in the Burragarorang, Megalong and Kanimbla Valleys. By the 1920s about 4,000 pigs per year were being raised and fattened for the Sydney pork market in the Burragarorang Valley and along the lower Cox's River.\textsuperscript{231} Smaller numbers of pigs were also bred at Mount Irvine and Mount Tomah in the early 1900s where they 'ran wild', digging up and eating bracken roots and wallowing in the boggy parts of the gullies. Turkeys (\textit{Meleagris gallopavo}) and chickens (\textit{Gallus gallus}) were also raised throughout the region, especially in the Burragarorang and Megalong Valleys, with both birds and eggs sold in the mountain towns and despatched to the city.\textsuperscript{232}

After the building of the railway, livestock not eaten locally were driven to the nearest train station where they were loaded into carriages for shipment to the city slaughterhouses. During the 1860s and 1870s, the building of the mountain railway provided a ready local market for the mountain farmers. For example, an early farm in the Megalong Valley included a dairy and poultry sheds, from which butter, cheese and eggs were sold to the railway workers.\textsuperscript{233}

\textsuperscript{230} Macqueen, \textit{op. cit.}, pp.83-89.
With the growth of the mountain tourist industry from the 1880s onwards, a new market was created for flesh foods. New farms were established locally to supply meat, eggs and dairy products to the burgeoning number of hotels, guesthouses, boarding schools and private residences. Many small poultry farms and dairies operated on the outskirts of Katoomba and Blackheath (see Figure 5.6).234 One of the small farms at Blackheath raised a variety of livestock including dairy cows, pigs, turkeys, chickens, game birds and ducks. Early dairies also existed at Mount Irvine and Hartley Vale, and a butter factory was established at Lower Burragorang in 1899.235 Many of the larger mountain establishments also raised their own livestock. For example, in the 1890s a visitor to the Oriental Hotel at Springwood noted that 'everything from the roast mutton and poultry to the beautiful fruit, is produced on the premises'. A boarding school in North Springwood also had their own 'well-appointed dairy at the rear of the house' which turned out 'the choicest of milk, butter and cream'.236

Another foreign animal farmed for food in the mountains was the European honey bee (Apis mellifera). Bees were kept in many locations in the region, with some of the largest bee farms located at Springwood. In the 1890s, one of

235 BMHS Files. By 1890 this farm had been abandoned, see Illustrated Sydney News, 20 February 1890 p.29.
the bee farms at North Springwood had over 200 hives, with each containing 'from 10,000 to 60,000 busy bees'.

The raising of livestock remained an important local industry throughout the first half of the 20th Century. In general, the larger flesh foods were mostly produced in the valleys while farming of smaller food sources, especially poultry and eggs, were more common near the mountain towns next to the railway. However, some of the ridgetop farms were quite substantial, for example 'Westmeath' near Medlow Bath, which in 1915 held over 3,000 chickens, 1,500 ducks, 1,000 prize pigeons, 250 pigs and a small herd of milking cows. However, after the end of World War II, many of the livestock farms close to the mountain towns disappeared as the land became increasingly sought for subdivisions and urban development. With improvements in transport and refrigeration, many smaller livestock farms in the mountains also found they could not compete with the cheaper flesh foods now widely imported to the local towns from outside the region. Local mountain dairies also declined following the introduction of regulations which required compulsory pasteurisation of milk.

By the 1960s, the farming of livestock had declined in many parts of the region, although some mixed farming has continued in the Megalong and Kanimbla Valleys especially the grazing of beef cattle, sheep and horses. Most

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237 Ibid., p.10, Horrocks, op. cit., p.12, Blue Mountain Echo, 24 December 1915 p.3, Hungerford, op. cit., p.208. Some mountain residents maintained bee hives primarily to pollinate their orchards, with the honey by-product considered a bonus.

livestock farms on the ridges have been steadily replaced by creeping urbanisation and non-producing hobby farms.\(^{239}\) Where once they were produced by local farms, by the late 20th Century nearly all flesh foods consumed in the Blue Mountains were obtained from elsewhere - usually packaged in plastic and transported in refrigerated trucks.

**Beasts of Burden**

As elsewhere in Australia, two foreign animals, horses and cattle, were brought to the Blue Mountains by early Europeans to provide transport and serve as draught animals - dragging and carrying loads and ploughing fields. Whether ridden or hauling vehicles, horses were the main mode of transport prior to the advent of the railway and motor vehicle. They were also used for mustering and herding other livestock. Cattle were used mostly as draught animals, primarily the castrated males known as bullocks.

From Blaxland, Lawson and Wentworth onwards, horses especially were essential for the successful exploration of the mountains and the rest of Australia. In 1813, Blaxland's group had four horses heavily laden with provisions and their importance to the party is demonstrated by the many days the explorers spent cutting 'a way through for the horses' while crossing the Blue Mountains. Without horses it is highly likely that this exploration of the mountains would have been as unsuccessful as those before it. Evans certainly learnt from the experience and took many horses on his follow-up

\(^{239}\) Blue Mountains City Council, *Town Planning Scheme*, op. cit., p.38.
exploration into western NSW several months later. Archibald Bell also relied on pack horses during the discovery of his alternative route across the Blue Mountains in 1823.\footnote{Blaxland in Richards, op. cit., pp.67-68. Wentworth also recorded that the explorers 'were obliged to cut a road for our horses upwards of 40 miles' - Wentworth in Richards, op. cit., p.112, Evans in Mackaness, op. cit., pp.17-32, A. Bell, 'Diary, 1823', Bell Family Papers, ML. 1706, reprinted in R. Else-Mitchell, 'The Discovery of Bell's Line, 1823: A Note and a Document', JRAHS, Vol.66, Part 2, 1980, pp.92-95.}

From Hoddle in 1823 to Govett in 1834, all of the early surveyors of the Blue Mountains also depended greatly on both pack horses and bullocks to transport their supplies and equipment to remote locations. These hard working animals were essential to the successful exploration and mapping of the region, and were often injured or died in the process.\footnote{For details of the surveyors' use of horses and bullocks in the Blue Mountains, see A.E.J. Andrews, \textit{Major Mitchell's Map 1834: The Saga of the Survey of the Nineteen Counties}, Hobart, 1992.}

From its very inception, the European settlement of the mountains also depended heavily on the labour provided by horses and bullocks. For instance, several teams of bullocks and horses were used during the construction of the first mountain road in 1814, chiefly to haul carts and wagons loaded with provisions, tools and timber.\footnote{For a century or more afterwards, teams of horses and bullocks continued to transport people, provisions and all forms of produce (including wool bales, timber, sacks of grain and boxes of fruit and vegetables) both across and throughout the Blue Mountains (see Figure 5.7). Beasts of burden also helped clear land and shift the earth during the construction of the railway, towns, roads and dams.} For a century or more afterwards, teams of horses and bullocks continued to transport people, provisions and all forms of produce (including wool bales, timber, sacks of grain and boxes of fruit and vegetables) both across and throughout the Blue Mountains (see Figure 5.7). Beasts of burden also helped clear land and shift the earth during the construction of the railway, towns, roads and dams.
In the 19th Century especially, heavily-laden bullock drays and horse teams were a common sight on the mountain roads and were often commented on by early travellers. For example, in the 1840s Mundy noted that 'here and there we met long caravans of drays, drawn by six or eight horses, or ten or twelve bullocks'. Those headed towards Sydney were laden with wool bales and hides, while those travelling west carried tea, sugar, tobacco and other stores 'chiefly for the great squatters of the interior'.

For many working bullocks and horses, hauling loads along the steep and tortuous mountain roads was a living hell. In the years before the railway eased their burden somewhat, many draught animals died of fatigue, thirst and starvation while crossing the Blue Mountains and early travellers often commented on the frequent carcasses and skeletons seen by the roadside. For Meredith, the many 'white skeletons' and hide-covered carcasses of the 'unfortunate oxen' were 'terrible proofs of the poor brutes' sufferings and death' during their 'toilsome journeys over the mountains'. She also sympathised with the 'lingering, protracted misery' endured by the 'wretched animals who survived'.

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232 Cox in Mackaness, op. cit., pp.34-63.
233 Mundy, op. cit., pp.154-155. Also see S. Stanger, 'A Journey from Sydney over the Blue Mountains to Bathurst Forty Years Ago', 1841, in Mackaness, op. cit., p.260.
234 Meredith in Mackaness, op. cit., p.244. Also see XYZ in Mackaness, op. cit., p.178 and Backhouse in Mackaness, op. cit., p.221.
Like their floral compatriots, many livestock also escaped from human confinement or control and established wild populations in the Blue Mountains. These unwanted foreign animals were branded 'feral' and frequently shot on sight.

Many of the cattle and horses grazed in the Blue Mountains were allowed to roam freely in search of feed. In the rugged mountain terrain, many avoided recapture and they and their offspring made new homes in the bush. For example, by 1875 the progeny of the cattle released into the Grose Valley twenty years before were 'running wild' and efforts to muster or shoot them were unsuccessful. During the 19th century, herds of wild horses (or 'brumbies') also took up residence in the Grose Valley and throughout the rugged ranges of the southern Blue Mountains, particularly in the Kowmung River area. By the 1890s they had become so plentiful in some parts of the region that they were frequently hunted for their hides. A hunter known to Bellingham claimed to have shot and skinned 'over a thousand wild horses' in the mountains.\(^{340}\)

Mobs of wild cattle and horses continued to reside in the Grose Valley throughout the 20th Century, occasionally startling or chasing visitors. Although many animals were shot in the 1960s, in 1977 more than a hundred wild cattle and horses were still inhabiting the grassy areas near the junction
of the Grose River and Govetts Creek. Despite periodic attempts since then to eradicate them (including shooting from helicopters), wild horses and cattle continue to roam the Grose Valley, the Kowmung River area and other parts of the Warragamba Dam catchment area.246

In some of the higher parts of the Blue Mountains, feral goats have also run wild. In 1880, Inglis saw free roaming goats while travelling through the upper mountains, which he considered 'fit denizens of such a rocky wilderness'. By the 1940s wild goats were also abounding on the higher ridges near the Kowmung River, and near the Hydro Majestic Hotel at Medlow Bath.247 In the 1950s, wild goats were 'common' in the vicinity of Jenolan Caves and by the 1980s were considered a serious enough pest at the caves to require specific control measures. Numbers have since been reduced, and except for the higher areas in the southwest of the region, feral goats are now rare in most of the Blue Mountains.248

Populations of feral pigs have also become established in some of the higher parts of the Blue Mountains region, including Newnes Plateau and in the

Kanagra-Boyd National Park, especially on Boyd Plateau. By the 1980s feral pigs had become so widespread in both the Blue Mountains and Kanangra-Boyd National Parks that their eradication was considered a high priority. Even the European honey bee has established some wild populations in the Blue Mountains, with adverse effects on some native plants and insects.  

**Pets, Targets and other Pests**

Europeans introduced many other foreign animals to the Blue Mountains. Some served a useful purpose while others were introduced for pleasure or by accident.

Dogs (*Canis familiaris*) were an indispensable companion to the European explorers of the Blue Mountains and the early settlers who followed in their tracks. Barrallier, Caley and Blaxland all took dogs on their explorations of the Blue Mountains, which served as both watchdogs and hunters of native animals for food. For instance, Caley's canine companion in 1804 caught a kangaroo and a possum which were welcome additions to the party's dwindling provisions.  

Blaxland's group had five dogs which killed several kangaroos and chased away dingoes during the 1813 crossing of the Blue Mountains. For example,

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250 Caley in Andrews, *op. cit.*, pp.93, 100. Barrallier had a greyhound, see Barrallier, *op. cit.*, p.815.
when they reached the River Lett, the dogs killed a kangaroo 'which was very acceptable, as the party had lived on salt meat since they caught the last'. Blaxland also credited the dogs with saving them from a surprise attack while in the vicinity of Bullaburra. During the night the dogs 'ran off, and barked violently' driving off what the party believed were hostile Aborigines intent on spearing them by the light of the fire.\(^{281}\)

While building the mountain road in the following year, Cox also regularly sent his men out with dogs to hunt kangaroos for fresh meat. On one occasion Cox saw a large group of kangaroos and emus but noted sadly that 'for want of dogs, killed none'. As settlers moved into the mountains they brought more dogs with them for both companionship and security. Early mountain travellers often noted that they were greeted by barking dogs on approaching the few roadside habitations in the area.\(^{282}\) Many dogs were also working dogs, helping to herd livestock. Numerous dogs were also used by the drivers of bullock teams. These were set upon unwilling and reluctant bullocks to get them up and moving again, usually by constantly barking and biting the noses of the exhausted beasts of burden.\(^{283}\)

Dogs were also essential hunting companions for both recreational and professional shooters in the Blue Mountains, helping to find game and flush them out into the open where they could be shot more easily. Bellingham

\(^{281}\) The only Aboriginal person seen also 'fled at the approach of the dogs'. Blaxland in Richards, op. cit., pp.67-76.

\(^{282}\) Cox in Mackaness, op. cit., pp.46, 58, Quoy, Gaudichaud and Pellion in Mackaness, op. cit., p.97, XYZ in Mackaness, op. cit., p.175.

\(^{283}\) Hawkins, op. cit., p.2, O'Reilly, op. cit., p.70.
advised that dogs were required for shooting elusive animals like wallabies as they hunted 'the game out of the fissures and crevices of the rocks' and were 'very useful in tracking up a wounded animal' and giving 'tongue at any tree, where there may be an opossum in'. However, some hunting dogs needed to be restrained as they were 'apt to worry' a fallen possum (i.e. tear it to pieces) and 'thus destroy the fur'.

Some dogs went wild, often interbreeding with dingoes and becoming a pest to settlers by attacking livestock. For example, in 1889 wild dogs were reportedly creating a nuisance in the Katoomba district by attacking fowlyards. Since then wild dogs and dingoes have remained fairly common in parts of the Blue Mountains region, at times requiring control measures.

As settlement of the Blue Mountains grew, cats (*Felis catus*) were also brought into the region in increasing numbers as pets. Many roamed away from the settlements at night, preying on native birds, small marsupials, lizards and other animals. Some cats also went wild or were dumped in the bush and established feral populations in the mountains. By the late 20th Century, feral cats were common throughout the Blue Mountains and their impact on native fauna is considered severe.

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354 Bellingham, 1899, *op. cit.*, pp.23, 30, 70, 76, 79, 81, 84.
355 Dog trappers and poison baits have been used to reduce the number of wild dogs in the region, especially in national parks and on grazing properties. Smith and Smith, *op. cit.*, p.33, Jackson, *op. cit.*, Tables, 4, 5.
356 Smith and Smith, *op. cit.*, p.33. To reduce their impact on native fauna, since the 1980s the BMCC has promoted 'responsible cat ownership' in the Blue Mountains.
For aesthetic reasons, the European settlers of Australia also imported and released many foreign birds, many arranged by 'acclimatisation' societies.\textsuperscript{257} In the late 19th Century, some of the early mountain landowners, including James Martin, released foreign birds in the Blue Mountains but many did not survive. Small numbers of skylarks, goldfinch, yellowhammers and California quail were released in the Blue Mountains in the 1880s but only the first two species successfully colonised the area. In 1896 sparrows (\textit{Passer domesticus}) were 'numerous about Lawson' and the \textit{Sydney Mail} predicted that 'they at least will do well' as along with rats they 'beat even the British race as colonisers'. By 1923 sparrows were 'common all over the Mountains, keeping close to the haunts of man', starlings (\textit{Sturnus vulgaris}) were 'fairly common and well distributed' and many goldfinch (\textit{Carduelis carduelis}) were also present. All three remain widespread in local towns and farmland.\textsuperscript{258}

Domestic or feral pigeons (\textit{Columba livia}) and spotted turtle-doves (\textit{Streptopelia chilenis}) also established populations in the Blue Mountains during the 20th Century and are now common in most of the larger mountain towns. Blackbirds (\textit{Turdus merula}) also arrived from the 1940s onwards, while small numbers of mallard ducks (\textit{Anas platyrhynchos}) were also released at Wentworth Falls Lake. Red-whiskered bulbuls (\textit{Pycnonotus jocosus}) and common mynahs (\textit{Acridotheres tristis}) also invaded the Blue Mountains from Sydney during the 1950s and 1960s, and are now common residents of the

\textsuperscript{257} \textit{Blue Mountain Echo}, 7 April 1911 p.4.
\textsuperscript{258} \textit{Sydney Mail}, 12 December 1896 p.1250, Chisholm, \textit{op. cit.}, p.214, Smith and Smith, \textit{op. cit.}, pp.49, 62-64.
more closely settled areas along both the main western highway and Bell’s Line of Road.\textsuperscript{299}

Other foreign animals were introduced as targets for hunting. Hares (\textit{Lepus capensis}) were released in NSW in the 1860s and rapidly spread. By the 1880s they had been declared noxious and had invaded the Blue Mountains. Tourist guides advised that ‘hares in plenty can be bagged by a good marksman’ in the Blue Mountains, with ‘good hare shooting’ especially available in the Kanimbla Valley and Cox River area. Because of their ravaging of crops and young fruit trees, hares were also routinely killed by local landowners.\textsuperscript{300}

Although released in Australia decades before, rabbits (\textit{Oryctolagus cuniculus}) seem to have first become a problem in the Blue Mountains in the 1890s, as they migrated into the region from the south and west. In 1901 it was claimed in State Parliament that rabbits existed ‘in thousands at the foot of the Blue Mountains’ near Lithgow. In 1904 the \textit{Blue Mountain Gazette} reported that the ‘bunny has become a permanent resident of the Mountains and is increasing to an extraordinary extent’.\textsuperscript{301}

\textsuperscript{299} Smith and Smith, \textit{op. cit.}, pp.37,41, 51.
\textsuperscript{301} NSWPD, 1901, Vol.1, p.478, 512, \textit{Blue Mountain Gazette}, 11 November 1904 p.3. The local paper also published advice on rabbit traps to ‘assist farmers and settlers in coping with the evil’.
By the early 1900s rabbits were abundant in the Megalong, Kanimbla and Burragerang Valleys, and reached plague proportions after the devastating bushfires in 1905. Pastures were depleted by the invaders reducing their grazing capacity. Rabbit meat (baked, stewed and curried) was added to the local diet and many mountain residents supplemented their incomes by trapping rabbits and selling the skins and meat (see Figure 5.8). According to Shaw, over the years many families in the Megalong Valley purchased their holdings 'with the revenue of the rabbit traps'. A freezing works also operated on Blackheath Creek which during its life processed over a million rabbit carcasses. These were transported to the railway at Mount Victoria by horse-drawn wagons.  

By 1911 the 'rabbit pest' had increased 'with great rapidity' along 'the Bathurst Rd, and on towards Megalong' and its extermination had become 'a local problem'. While some landholders in the mountains were fined for failing to destroy rabbits, professional trappers were reportedly reaping a harvest and 'making good money in the work of extermination'. During the 1920s and 1930s rabbits were described as numerous along watercourses and in most cleared areas of the mountains, although much of the steep sandstone terrain was unsuitable habitat and prevented them from becoming as big a pest as they had elsewhere. Despite ongoing eradication efforts, rabbits have

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203 Blue Mountain Echo, 3 March 1911 p.5, Sydney Morning Herald, 17 February 1912 p.5. In 1920 a parcel of rabbit skins from Megalong Valley sold for 91d. per pound which was the highest price paid in the Sydney market at the time - Blue Mountain Echo, 13 August 1920 p.7.
remained common and widespread in farmland and open grassy areas in the Blue Mountains region, most notably in the areas with better soils.\footnote{Chisholm, op. cit., p.214, Musgrave, op. cit. p.210, Smith and Smith, op. cit., p.28, Jackson, op. cit., Tables 4, 5, Shaw, op. cit., p.68, 84, Mount Tomah Book, op. cit., p.108.}

Another foreign animal introduced for the pleasure of hunters was the red fox (\textit{Vulpes vulpes}). Widely released in the 1870s, foxes seem to have arrived in the Blue Mountains around the end of the 19th Century following the migration of their favoured prey - rabbits. In 1920 the \textit{Katoomba Daily} reported that the 'destructive European fox' was becoming 'alarmingly numerous' and wreaking havoc on 'the property of local poultry farmers'. Within a few years they were numerous enough in Megalong Valley to provide 'good sport' for hunters.\footnote{\textit{Katoomba Daily}, 18 December 1920 p.2, \textit{Blackheath Bulletin}, 1923, cited in \textit{Historic Blackheath}, op. cit., p.136, Smith and Smith, op. cit., p.33.} From the 1920s onwards, foxes were reported in numerous mountain locations, from Mount Wilson in the north, to the Colong area in the south, and along the Nepean and Warragamba Rivers in the east of the region. They were also common at the Jenolan Caves, preying on the local rock wallabies and other native animals.\footnote{Warlaker, op. cit., p.5, Anderson and Campbell, op. cit., pp.207-208, Musgrave, op. cit., p.210, Dunlop, op. cit., p.92.} In the 1930s foxes were described as 'unusually' active at Wentworth Falls with some residents of the town suffering 'severe losses of fowls and ducks' from their fowlyards. One resident at Lawson also lost 20 fowls to the frequent visits of the 'wily fox'. By the late 20th Century, foxes had become a widespread of the Blue Mountains
and are now considered a major pest due to their predation on native animals.  

Foreign freshwater fish were also introduced into the Blue Mountains both to provide 'sport' for anglers and increase the attractiveness of the region to tourists. European brown trout (*Salmo trutta*) were first released in NSW streams in 1888 and some of the first locations chosen included the Wollondilly and Upper Nepean Rivers. Throughout the rest of the 19th Century many more young trout were imported and released each year into the cool, fast-flowing Blue Mountain streams of the Blue Mountains. According to Bellingham, 'about 1890' a group of young trout was placed in Megalong Creek, downstream of Nellie's Glen near Katoomba, and by 1899 'an occasional trout' could be caught in the Coxs River. In 1894 Californian rainbow trout (*Salmo gairdneri*) were placed in several NSW streams for the first time including the Grose River. From 1899 onwards both brown and rainbow trout were also released into the Jenolan River and the Caves House reservoir.

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288 In the early 1890s some trout were also released into 'Medlow Creek' but these apparently 'never came to anything'. *The Mountaineer*, 12 April 1895 p.3, Bellingham, 1899, *op. cit.*, pp.105-106, T.C. Roughley, *Fish and Fisheries of Australia*, Sydney, 1951, p.282.

289 Such was the success of the introductions in the area, that for a short time the State Government considered establishing a trout hatchery (to raise hundreds of thousands of trout fry each year) next to the Jenolan River less than a mile from the caves. Report of Commissioners of Fisheries, 1894, *JNSWLC*, 1894-95, Part 1, p.1147, *Sydney Morning Herald*, 11 September 1900 p.6, 18 March 1902 p.7, 16 May 1914 p.6.
In the early 1900s thousands of young rainbow trout continued to be 'liberated' into the Coxs, Lett, Jenolan, Grose and Wollondilly Rivers, while smaller numbers of brown trout were placed in Blackheath Creek, Long Swamp Creek and Govett's Creek.\textsuperscript{270} Trout were also introduced into Wentworth Falls Lake (then a railway reservoir) as well as the water catchments of Lake Medlow and Cascade Creek.\textsuperscript{271}

By the 1920s, a 'surprising quantity' of trout was observed in the Grose Valley and Lake Medlow was teeming with 'fine rainbow trout'. As many of the mountain waterways were not suitable breeding habitat for trout, constant re-stocking with new fish was required.\textsuperscript{272} In the 1930s the Central Acclimatisation Society and local fishing groups released at least 92,000 trout fry in the Blue Mountains.\textsuperscript{273} Releases of trout continued in the 1960s and 1970s with some 2,000 fingerlings placed into various streams and dams in the Blue Mountains National Park and over 21,000 rainbow and brook trout (Salvelinus fontinalis) released into Wentworth Falls Lake.\textsuperscript{274}

\textsuperscript{270} Sydney Morning Herald, 22 October 1900 p.3, 20 August 1901 p.5, The Mountaineer, 10 August 1900 p.2, 23 August 1901 p.3.
\textsuperscript{271} Within a few years trout had established themselves downstream in Katoomba Creek. Sydney Morning Herald, 24 September 1906 p.6, Blue Mountain Echo, 5 May 1922 p.1.
\textsuperscript{273} Most were brown trout which were placed primarily in the Coxs River near Hartley, however smaller numbers were also released in the Grose River, Lett River, Govett's Creek and Blackheath Creek. For details of releases in the Blue Mountains, see Annual Reports on Fisheries, 1933 to 1939 in NSWPP, 1934-35, Vol.1, 1935-36, Vol.1, 1938-39-40, Vol.2, 1940-41, Vol.1.
As well as those foreign animals which have been deliberately released, many more have arrived in the Blue Mountains by accident. For instance, European rats and mice took up residence in the mountains soon after the first substantial buildings were erected, feeding on crops, stored foodstuffs and human wastes. By the 1920s, black rats (*Rattus rattus*) were found throughout the settled areas of the Blue Mountains and were even viewed as a possible source of plague in Katoomba. In 1928 thousands of rats were reportedly infesting the rubbish tip at North Katoomba. Both the black rat and the house mouse (*Mus musculus*) are now common in the settled areas of Blue Mountains (especially urban areas and farmland), while the brown rat (*Rattus norvegicus*) is much rarer in the region, inhabiting select locations including Lawson and Mount Tomah.\(^{275}\)

An enormous and largely unknown variety of foreign invertebrates have also invaded the Blue Mountains in the wake of European settlement, including the common garden snail (*Helix aspersa*), foreign earthworms (*Lumbricus* spp.) and a range of scale insects, thrips and butterflies, including the cabbage butterfly (*Pieris rapae*). Along with the foreign vertebrate animals have come the house fly (*Musca domestica*), European blowfly (*Lucilia cuprina*), flea (*Pulex irritans*), various cockroaches and an assortment of internal and external parasites, which have spread themselves and disease to native fauna.\(^{276}\)

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\(^{276}\) I. Bowden, notes, BMHS Files.
Loss of Life

Collectively, the hunting of native life, the introduction of foreign life and the other changes made to the mountain landscape during European settlement, have caused a reduction in the abundance of native flora and fauna, and in some cases their complete disappearance from the region.

Decades of unsustainable logging and indiscriminate clearing of trees have resulted in major changes to the natural vegetation in many parts of the Blue Mountains. In the valleys and on the more level terrain with fertile soils, the native flora has been removed entirely and replaced by foreign plants or human structures or left fragmented in small pockets. Where native forests remain, most of the forest giants have been removed leaving a much lower tree canopy and a forest comprised of smaller trees.\(^{377}\) Although wildflowers and ferns are still common in many parts of the region, many smaller native plants have also declined as a result of European settlement. The effects were already noticeable in the 1890s, when several longtime mountain residents, including Billy Lynch, reported that many of the once plentiful 'native fruits' had 'all but vanished in the last 30 years'. By the late 20th Century at least 65 native plants were listed as rare, threatened or locally vulnerable to extinction in the Blue Mountains.\(^{378}\)


Native animals in the region have also suffered from the combined impact of hunting, loss of habitat, predation and competition from introduced animals (both livestock and pests), and from the poisons and traps set to kill the foreign pests.\textsuperscript{279} One of the first to disappear from the Blue Mountains was the emu (\textit{Dromaius novaehollandiae}) which formerly inhabited the grassy areas of the region, including the Megalong and Kanimbla Valleys. In 1813 Blaxland’s group heard an emu calling throughout the night while camped in the vicinity of Springwood. By the 1840s they no longer existed at Emu Plains and had 'almost wholly disappeared' from the Vale of Clwydd district. According to Billy Lynch, by the 1890s an unidentified little grey bird (called 'kutikuti') had also 'vanished from the district'.\textsuperscript{280}

Around the turn of the 20th century at least three species of native mammals also disappeared entirely from the Blue Mountains - the eastern quoll (\textit{Dasyurus viverrinus}), the rufous bettong (\textit{Aepyprymnus rufescens}) and another unidentified bettong species. The abundance of nearly all other native animals in the Blue Mountains has also been severely reduced since the late 19th Century and the populations of many species have yet to recover.\textsuperscript{281} For example, in the 19th Century 'thousands' of grey-headed flying foxes (\textit{Pteropus poliocephalus}) were seasonally roosting in Sassafras Gully, but by 1888 they

\textsuperscript{279} Smith and Smith, \textit{op. cit.}, p.14, Recher \textit{et. al.}, \textit{op. cit.}, p.4, Jackson, \textit{op. cit.}, pp.29-31.
\textsuperscript{281} Smith and Smith, \textit{op. cit.}, pp.14, 16, 21-22, Recher \textit{et. al.}, \textit{op. cit.}, p.4.
were 'not so numerous as in past days of undisturbed seclusion' having become 'considerably diminished' from shooting by local fruitgrowers.\textsuperscript{282}

By the late 1890s, it was reported that there was 'much destruction' of the native birds and beasts and many 'had either vanished or were vanishing from the mountains'. According to Bellingham, years of 'tremendous slaughter' had reduced the numbers of large marsupials, such as kangaroos and wallabies, and 'very few' were now to be seen in areas where they were once 'very plentiful'. By 1899 most of the native game had 'been hunted from the more open country' and hunters needed to 'get well off the beaten track' into the bush to 'obtain good sport'.\textsuperscript{283}

Wallabies especially have declined in abundance in the Blue Mountains. Swamp wallabies (\textit{Wallabia bicolor}) were reportedly 'very numerous up to about 1890' but by the 1920s they had been 'thinned out tremendously'. According to Chisholm, although many deaths were from predation by foxes and wild dogs 'the gun has been responsible for most'.\textsuperscript{284} Hunting and fox predation has also all but eliminated the brush-tailed rock wallaby (\textit{Petrogale penicillata}) from the region. By the 1920s, the populations along the rocky banks of the Warragamba and Nepean Rivers had become 'so reduced in numbers by sportsmen' that they were rarely seen. The rock wallabies at

\textsuperscript{283} Sydney \textit{Mail}, 12 December 1896 pp.1247, 1250, Bellingham, 1899, \textit{op. cit.}, pp.51-53, 57, 60, 73.
\textsuperscript{284} Chisholm, \textit{op. cit.}, p.214, Bellingham, 1899, \textit{op. cit.}, p.73.
Jenolan Caves also suffered a major decline due to hunting and fox predation and by the 1950s only a handful were left.\textsuperscript{285}

Other native mammals which have declined significantly in the region since the late 19th Century include the platypus (\textit{Ornithorhynchus anatinus}) and koala (\textit{Phascolarctos cinereus}). According to Bellingham, in 1899 platypus could be found 'on all the rivers throughout the Mountains' and were 'numerous' in the various waterholes along the Coxs River. Although now uncommon, koalas once inhabited many parts of the region including the area between Mount Tomah and Bell, where in the 1920s they could often be heard calling throughout the night.\textsuperscript{286}

Bandicoots, gliding possums, tiger quolls (\textit{Dasyurus maculatus}) and wombats (\textit{Vombatus ursinus}) have also become much scarcer in the Blue Mountains since the 1890s primarily due to habitat loss. Even the brushtail possum (\textit{Trichosurus vulpecula}), which is still common in the Blue Mountains, appears to have been far more abundant in the past. For example, Bellingham recorded that on two occasions in the 1890s over 50 possums were shot in one night on farms near Hampton and the Little River.\textsuperscript{287}

\textsuperscript{285} Musgrave, \textit{op. cit.}, p.210, Dunlop, \textit{op. cit.}, p.92, Smith and Smith, \textit{op. cit.}, p.22, Recher, \textit{et. al., op. cit.}, p.24. This species is still declining in the Blue Mountains and is now considered threatened.

\textsuperscript{286} Bellingham, 1899, \textit{op. cit.}, pp.60, 67, Hungerford, \textit{op. cit.}, p.198, Smith and Smith, \textit{op. cit.}, p.18. Around the turn of the 20th Century, purebred dingoes were also often seen much closer to the mountain towns, including at Mount Solitary and in the Grose Valley - \textit{The Mountaineer}, 19 October 1894 p.4, 4 January 1901 p.4, \textit{Katoomba Daily}, 18 December 1920 p.2.

Many species of native birds have also declined in abundance in the Blue Mountains. For instance, historical accounts imply that lyrebirds are far less common than in the 19th Century. In the 1880s, they were reportedly so numerous at Jenolan Caves that they could 'be heard all day long on the hillside, and in the creeks'. Others apparently less abundant due to shooting include king parrots, gang gang cockatoos, rainbow lorrikeets, wedge-tailed eagles and yellow-tailed black cockatoos. Prior to the 1890s, black cockatoos were often seen in flocks of up to 150. By the end of the 19th Century, native ducks and cormorants had become a rare sight on some of the mountain streams, such as Cox's River, mostly due to overhunting. Hunting and habitat loss has also caused the decline of many native pigeons and other rainforest dwelling birds in the region. For example, in the 1890s the 'once numerous' bronze-wing pigeons were said to be disappearing, while the 'once plentiful' wonga pigeon had become 'few, and growing fewer'.

Although little is known of the former status of reptiles and frogs in Blue Mountains, it appears that goannas, diamond pythons, death adders and tiger snakes are now far less common in many areas, such as the Cox River valley. According to a report by a local resident, by the 1890s only a few snakes were seen each summer as most had retreated to 'the further gullies and wild country'. Thirty to forty years before they were reportedly 'so thick that you could find one every 10 yards'. In the late 19th Century many of the

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288 Bellingham, 1889. op. cit., p.20.
290 Sydney Mail, 12 December 1896 p.1250. Smith and Smith, op. cit., pp.70, 82, 84, Recher, et. al., op. cit., pp.3-41.
mountain waterways were described as full of fish and eels, however overfishing with nets, the introduction of trout, and the construction of dams and weirs subsequently led to a decline in the abundance and distribution of some native fish (such as Galaxiidae).²⁰¹

Despite the loss of native life since the arrival of Europeans, in contrast to most neighbouring regions the Blue Mountains has still retained a rich and diverse flora and fauna. This has been more by accident than design, as the rugged sandstone-dominated terrain of the region has always deterred widespread settlement, and left the Blue Mountains relatively undeveloped in comparison with those regions with richer soils and flater terrain situated to the east and west of the mountains.²⁰² Even so, an inevitable outcome of European settlement has been that buildings, concrete, roads, gardens, farms and playing fields now cover many areas of the mountains which were once the domain of the lords of the forest and the abundant native 'game' and floral treasure which dwelt amongst them.

Preserving Life

The decline in native plants and animals since European arrival did not go unnoticed. Increasingly, mountain residents and visitors demanded that action be taken to preserve the dwindling native life of the Blue Mountains.

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²⁰² Recher, et. al., op. cit., pp.3-41.
Preserving life comprised two distinct approaches - prohibiting the hunting of life and setting aside areas as sanctuaries.

**Prohibitions**

"*Eyes on and hands off* should be the motto of all Mountain visitors*"

*Katoomba Times (1892)*

The first attempts to regulate the hunting of native flora and fauna in NSW were made in the late 19th Century. An *Animals Protection Act* was introduced in 1879 which gave protection from hunting to a number of 'game' birds (both foreign and native) during their breeding season. In 1881 this was replaced by a *Birds Protection Act* which included seasonal protection for some 'songbirds', but by the 1890s this Act had been amended to outlaw the hunting of some native birds for a five year period, while others received protection only during the breeding season. However enforcement was virtually non-existent, so the hunting of native birds continued unabated in the mountains as elsewhere.

From the mid 1870s, regulations on timber-getting and licensing of logging activities were also increasingly introduced in NSW and a government 'Forest Conservation Branch' was established in 1882. In an attempt to conserve timber, by the end of the 19th Century many species of trees had 'prescribed girths' or size restrictions below which tree-felling was prohibited on Crown

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293 *Katoomba Times*, 8 January 1892 p.2.
lands. Once again, such restrictions were impossible to enforce and overexploitation of trees continued. In the 1890s legislation was also proposed to prevent the destruction of certain species of wildflowers, but a draft Native Flora Protection Act was rejected by the NSW Parliament, mostly due to the strong opposition of the cut-flower industry and organisers of wildflower shows.

By the 1890s concerns were expressed that the mountain birds and animals needed 'much more stringent protection' against 'men who go out with guns in hand and destruction in heart'. Growing community concern over the indiscriminate hunting of marsupials led to the passing of the Native Animals Protection Act in 1903, which gave the first legal protection to native mammals in NSW. Species given early protection through closed seasons in various parts of the State included wallaroos, koalas, wombats, echidnas, platypus, grey kangaroos and some gliding possums. Increased protection was also extended to native birds. A new Birds Protection Act was enacted in 1901 which by 1905 listed over 100 species of native birds absolutely protected for a period of ten years.

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286 NSWPDB, Session 1895, Vol.79, pp.244-254.
287 Sydney Mail, 12 December 1896 p.1246.
Many hunters ignored the new laws so lobbying for increased protection for native animals continued until in 1918 a new combined *Birds and Animals Protection Act* was enacted by the NSW Government which extended improved protection to virtually all native animal species not considered noxious. Meanwhile better protection was also being extended to native plants. After a Royal Commission had confirmed that tree hunting was out of control in NSW, a new Act was passed in 1916 which established a Forestry Commission charged with better regulating timber-getting activities in State Forests. Community concerns over the destruction of wildflowers and other attractive native plants eventually culminated in the enactment of the *Wild Flowers and Native Plants Protection Act* in 1927. During the 1920s, ordinances had also been proclaimed under the Local Government legislation to prohibit the picking of certain wildflowers (such as waratahs and boronias) on public property in the Blue Mountains during the Springtime flowering season. Such prohibitions were strongly supported by many mountain residents. One of the early champions of conservation in the Blue Mountains was Ruth Schliecher who in the 1920s often wrote articles for the *Blue Mountain Echo* appealing for the preservation of the 'rapidly disappearing wildlife' of the region.

Although calls for better wildlife protection continued throughout the 1930s, further action was delayed by the intervention of World War II. A new *Fauna

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397 *Blue Mountain Echo*, 9 October 1925 p.4, 8 October 1926 p.4. Both the local ordinances and State laws were impossible to enforce and there was little effective regulation of wildflower picking in the mountains until after World War II.
Protection Act was passed in 1948 which established a new authority, the Fauna Protection Panel. Over the following 20 years the Panel declared and administered fauna reserves and developed wildlife management and education programmes. However, by the mid 1960s community expectations concerning wildlife protection had intensified, and a need was perceived to consolidate flora and fauna protection with the administration of the increasing number of national parks and nature reserves. This was achieved in 1967 with the passing of the National Parks and Wildlife Act which created a new government authority in NSW (the National Parks and Wildlife Service). The Act also confirmed the complete protection of most native flora and fauna in NSW and prohibited hunting of nearly all native species (except under permit).\textsuperscript{303}

Ironically, while hunting of native species has been largely prohibited in the Blue Mountains by the late 20th Century, hunting of introduced species (especially those considered pests and weeds) has increased. To protect native wildlife from the ongoing impact of European settlement, a relentless campaign of shooting, trapping, poisoning, cutting and burning has been waged in the Blue Mountains against all foreign life considered a threat to both native species and human activities.\textsuperscript{303}

\textsuperscript{301} For examples, see Blue Mountain Echo, 18 November 1921 p.2, 24 November 1922 p.8.
\textsuperscript{302} A.A. Strom, 'Some Events in Nature Conservation Over the Last Forty Years', Parks and Wildlife, Vol.2, No.3-4, 1979, pp.65-73. The Act was revised and strengthened further in 1974. Reptiles were not made protected species until 1973. Native timber trees have remained under the jurisdiction of the Forestry Commission while native fish have stayed the responsibility of the Fisheries Department.
\textsuperscript{303} Jackson, op. cit., p.29-31. Blue Mountains National Park: Draft Plan of Management, op. cit. Areas where eradication of foreign pests and weeds is most intense include agricultural lands, urban areas, timber plantations and national parks.
Sanctuaries

'The Blue Mountains must be converted into a National Park and proclaimed an absolute sanctuary for all flora and fauna' Blue Mountain Echo (1925)\textsuperscript{304}

As well as from prohibiting hunting, preservation of native species has also been achieved by reserving land in the Blue Mountains as sanctuaries.

Aside from the reserve created to protect Jenolan Caves in 1866, the earliest mountain reserves were the 'Blue Mountains Sights Reserves' established in the 1870s and 1880s at various places along the escarpments of the central Blue Mountains plateau. By the 1890s these reserves had by-laws and regulations prohibited the removal, cutting or defacing of plants (including trees, shrubs, ferns and mosses), and the shooting, capturing, destroying or interfering with any animals or birds (or their eggs).\textsuperscript{305} In addition to scenic areas, in the late 19th Century forest reserves were also established in some parts of the Blue Mountains. By 1891 forest reserves covering over 15,000 acres (6,000 hectares) had been declared in the Parishes of Konangeroo and Jenolan. Another 4,600 acres (1,800 hectares) were reserved in the Warragamba and Strathdon areas, as well as 2,500 acres (1,000 hectares) at Kurrajong and Burralow, and around 250 acres (100 hectares) near Mount

\textsuperscript{304} Blue Mountain Echo, 2 October 1925 p.1.
\textsuperscript{305} NSW Government Gazette, 1893 Vol.3, pp.3598-3599, Mosely, 1989, op. cit., pp.82-83. In the 19th Century offenders were subject to removal from the reserve and a £10 fine. In 1947 the administration of many of the sights reserves was transferred to the newly formed Blue Mountains City Council.
Irvine. However these 'reserves' merely reserved timber trees for future use rather than provided them with permanent sanctuary.\footnote{List of Forest Reserves by County, Annual Report of State Forest Administration, 1891, NSWALVP, 1892-93, Vol.8, pp.831, 845.}

In the early 1900s bushwalking became a popular activity in the Blue Mountains (and elsewhere in NSW) and those partaking in this form of recreation became increasingly concerned that the natural areas they visited should be preserved. Most of the mountain scenic reserves were small, and even these were sometimes threatened by logging and other destructive activities.\footnote{For example, logging was proposed in the Mount Wilson reserves in 1914, see Sydney Morning Herald, 19 February 1914 p.8.} A need was perceived for much larger conservation reserves in the Blue Mountains to protect unspoiled natural areas and the wildlife which inhabited them. A pioneering bushwalker, Myles Dunphy, was seemingly the first to fully articulate the concept of large national parks covering most of the Blue Mountains region. However, there were others who had a similar vision. As early as 1914, suggestions were made that the mountain scenic reserves should be 'put upon a national basis' and managed by a central body to 'preserve them untainted for future generations'.\footnote{‘Our Mountain Birthright’, Sydney Morning Herald, 1 April 1914 p.18. Also see the strong conservation plea made by James Criss in his letter to Sydney Morning Herald, 17 December 1913 p.6. M.J. Dunphy, 'The Bushwalking Conservation Movement 1914-1965', Parks and Wildlife, Vol.2, Nos.3-4, Centenary Issue, 1979, pp.54-64.}

In 1925 the Blue Mountain Echo published a large front page article expressing concern that ongoing development would inevitably lead to 'our trees, our animals, our birds, our ferns, our wild flowers, our climbing vines' steadily vanishing in time. The writer argued that the only way of 'inhibiting the process' was for the Blue
Mountains to be converted into a 'Great National Park' with 'absolute sanctuary' proclaimed 'for everything that grows or breathes'.

For several years, Dunphy continued to refine and work on his ambitious plan for the Blue Mountains. In the meantime the bushwalking movement was distracted by the urgent need to stop the imminent destruction of a favourite camping spot in the Grose Valley - the Blue Gum Forest. Preserving this magnificent stand of giant mountain blue gums was ultimately to become the catalyst for the creation of much larger sanctuaries in the Blue Mountains.

During Easter 1931 a group of bushwalkers visited Blue Gum Forest where they happened to meet two local men about to start ringbarking and clearing the tall blue gums on their 16 hectare lease and replace them with introduced walnut trees. After some quick negotiation, the leasee agreed not to proceed with any tree felling until the bushwalkers had a chance to raise funds for the purchase of the area. Despite the Depression, after some intense fundraising the money was eventually raised. After payment, the leasee relinquished his rights to the area and in September 1932 the Blue Gum Forest was gazetted as a Reserve for Public Recreation.

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309 *Blue Mountain Echo*, 2 October 1925 p.1. Although the author of the article is anonymous, from the language used and the use of the expression 'our district' it appears that the writer was a local mountain resident (possibly Frank Walford) and not Myles Dunphy. Whether Dunphy read and was influenced by this article is unknown, but it is possible as some of the suggestions made in the article accord with Dunphy's later published views in the *Katoomba Daily* supplement - 24 August 1934.

310 The story of the Blue Gum Forest campaign has become a legendary and well known event in the conservation history of Australia and has been retold many times, including Dunphy, *op. cit.*, pp.56-64, and P. Thompson (ed.), *Myles Dunphy: Selected Writings*, Sydney, 1986, pp.32-39. For the most detailed account to date see, Macqueen, *op. cit.*, pp.233-257.
Following the success of the Blue Gum effort, in 1932 Dunphy spearheaded the formation of the National Parks and Primitive Areas Council (NPPAC) which in June submitted a detailed map and proposal for the creation of a great Blue Mountains National Park to the Surveyor General and Blue Mountains Shire Council. This envisaged the progressive dedication of three sections of the park - Northern, Central and Southern, and a separate Nattai Park (see Figure 5.9).\(^{311}\) Meanwhile, independently of the bushwalkers proposal, in August 1933 a Blackheath resident, W.J. Baltzer, proposed to the three mountain councils that the entire Grose Valley be declared 'a national reserve for native animals, birds, and vegetation'. Baltzer argued that 'we must reserve an area of land on which the native flora may be preserved and cultivated, and the fauna find a sanctuary'. After a conference, the mountain councils gave the 'Grose Valley Species Park' their full support primarily because they agreed with Baltzer that it would be 'an immense attraction' for overseas tourists.\(^{312}\)

Meanwhile, to publicize and 'arouse local interest' in its much larger 'great Blue Mountains National Park', the NPPAC published (and paid for) a special four-page supplement in the Katoomba Daily on 24 August 1934 and distributed thousands of extra copies. This comprehensive and detailed


\(^{312}\) Katoomba Daily, 15 September 1933 p.1, 14 October 1933 p.1, Macqueen, op. cit., p.236. Although the full reserve did not materialise, subsequently a large part of the Grose Valley was declared a 'district' under the Birds and Animals Protection Act which prohibited hunting of all life not considered noxious.
document not only provided exhaustive arguments in favour of the mountain national park (and wilderness areas everywhere), but also served as a manifesto of the aims and objectives of the emerging conservation movement in Australia.\textsuperscript{313}

Due to the lingering effects of the Depression and then the impacts of World War II, little progress was made with the proposed Greater Blue Mountain National Park. However in October 1937 the NSW Government gazetted an area over 38,000 hectares surrounding Kanangra Creek in the proposed Southern Division of the Blue Mountains National Park, as a reserve for the preservation of native fauna and flora.\textsuperscript{314} During and after World War II attempts by the timber industry to expand their operations into the last of the untouched mountain forests were increasingly opposed by growing community demands that the areas be protected. These rekindled the efforts of local authorities and conservationists to have the proposed 'national reserve' created in the Blue Mountains. By the 1950s the Blue Mountains City Council and local tourist interests were vigorously supporting a national park

\textsuperscript{313} Dunphy asserted that 'this is the Age of Conservation; it follows an Age of Wastefulness' and that 'conservation of scenery and wildlife should go hand in hand'. The Blue Mountains National Park would be dedicated for the 'preservation of scenery', 'conservation of wildlife' and furtherance of non-destructive recreation. Katoomba Daily, 24 August, 1934. Special Supplement, pp.1-4.  
\textsuperscript{314} By the 1940s, a number of Bird and Animal Sanctuaries had also been officially declared in the Blue Mountains region, including parts of the Colong Caves limestone belt, Burragorang Valley and most of the area extending five miles from either side of the mountain railway. Although shooting of birds and animals was banned, there was virtually no enforcement of regulations and they were largely sanctuaries in name only. Significantly they did not prevent timber-getting or mining. Mosley, 1989, op. cit., p.86, and 1999, op. cit., p.39, Sydney Morning Herald, 17 January 1936 p.6, BMHS Files. A few mountain landowners even established their own private wildlife sanctuaries, see Sydney Morning Herald, 26 December 1939 p.5.
for the district, viewing it as good for business. Eventually in September 1959 the Blue Mountains National Park was gazetted which covered most of the NPPAC's proposed Central Division. The *Sun-Herald* stated that the park would provide 'a sanctuary in which shooting or destruction of native plants, animals and birds will be prohibited'. During the 1960s, 1970s and 1980s the total area of the Blue Mountains National Park was expanded by the addition of new areas, including the Blue Gum Forest reserve, Glenbrook Creek and Red Hands Reserve and further areas along the lower Grose River.

Meanwhile the vigorous campaign against limestone mining at Colong Caves (see Chapter One) also provoked the NSW Government to create the Kanangra-Boyd National Park in December 1969 (originally covering some 39,700 hectares of the southern Blue Mountains). The Park area was extended in 1974 (to include the revoked mining leases at Mount Armour) and again in 1977 to include the Konangaroo State Forest on the Boyd Plateau and other additional areas around the Jenolan and Coxs Rivers. After another concerted campaign by conservationists throughout the 1970s, in December 1979 the NSW Government included an even larger section of the

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northern Blue Mountains region in the new Wollemi National Park, as an 'everlasting Christmas present' to the State." By 1980 nearly all of the NPPAC's original proposal of Greater Blue Mountains National Park had been achieved and more. After further additions, by the end of the 20th century a total of over 810,000 hectares of the Blue Mountains region had been included in three large national parks - Blue Mountains National Park (247,840 hectares), Kanangra-Boyd National Park (65,379 hectares) and Wollemi National Park (499,879 hectares).

In addition to establishing sanctuaries and prohibitions on hunting, extra efforts have been made to preserve the rarest native species in the Blue Mountains. For example, since the 1960s attempts have been made to rehabilitate the declining rock wallabies and koalas in the Jenolan Caves Reserve by releasing captive bred animals and eradicating foxes in the area. Eastern grey kangaroos have also been reestablished at Euroka Clearing. From the 1970s onwards, much hard work has also gone into protecting rare and endangered plants in the Blue Mountains. To assist in this effort, by the 1980s the Blue Mountain City Council had instituted tree preservation orders and a register of significant trees.

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520 Mosley, 1999, op. cit., pp.138, 147, 152-158. In the 1990s part of the Blue Mountains region was nominated for World Heritage listing but at the time of writing this has still not been achieved.
531 The most notable rare plants are the Dwarf Mountain Pine (Microstrobos fitzgeraldii), Wollemi Pine (Wollemia nobilis), Faulconbridge Mallee (Eucalyptus burgessiana) and several other rare eucalyptus trees (such as Eucalyptus copulans and Eucalyptus benthamii). See Fauna Protection Panel Report, 1966, NSWPP, 1966-67, Vol.3, p.162, J. Smith, 'The Distribution and Conservation Status of a Rare
Much of the conservation work in the Blue Mountains has been undertaken by the National Parks and Wildlife Service and various local voluntary conservation groups. Following a plethora of planning studies and environmental management plans, since the 1970s significant improvements have also been made in controlling development in the Blue Mountains to prevent indiscriminate tree clearing and other activities which threaten native species.

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Human life in the Blue Mountains has depended absolutely on other life. For millennia the indigenous plants and animals of the mountains have been hunted, while in the last two centuries foreign species have been introduced to the region to supplement the human need for food, pleasure and companionship. Hunting and introducing life has inevitably led to the loss and reduction of many indigenous species. However, by the late 20th Century increasing efforts had been made to preserve the remaining native life of the


Such as the Katoomba and District Wildlife Conservation Society, the Upper and Lower Blue Mountains Conservation Societies and the Wildlife Information and Rescue Service (WIRES). Blue Mountains Heritage Study, op. cit., pp. 136-143, BMHS Files.

However, protection of native species still relies on the development controls being adhered to, which is not always the case. Planning studies and management plans since 1970 include, Urban Systems Corporation, Blue Mountains Strategy Plan (1974), BMCC, Blue Mountains Structure Plan (1975), BMCC, Blue Mountains Local Environment Plan (LEP) No. 4 (1982), Croft & Associates/M. Walker Blue Mountains Heritage Study (1985), Department of Planning (NSW), Blue Mountains Eastern
Blue Mountains through prohibitions on hunting and the creation of sanctuaries.

Conclusion - Environment and History

'...As concern mounts over the quality of environments and human life in the future, the study of past environments - how they were used and how they were changed - provides guidance...Moreover, environmental history instills an appreciation of the complexity of human interactions with nature and in this way contributes to a fuller understanding of history.¹

This thesis has provided the most comprehensive account to date of the environmental history of the Blue Mountains of Australia. In doing so, it has also utilised an original conceptual framework for studying regional environmental history - the 'elemental' approach. All five elements of the past - earth, water, fire, air and life - have been fundamentally important in the history of the Blue Mountains. Each element has played, and continues to play, a significant role in forming the mountain landscape, and each has also greatly influenced the entire human experience with the region. Given the central importance of earth, water, fire, air and life in the human relationship with the environment, the 'elemental' approach to environmental history is clearly an appropriate conceptual framework for use in other regional studies, both in Australia and elsewhere.

While the elemental approach has provided a useful means of conceptualising and explaining the role of the environment in Blue Mountains history, it should be noted that each 'element' is actually interconnected with every other element in a similar fashion to the components of an ecosystem. Earth, water, fire, air and life all intermesh and influence each other in a complex series of

interrelationships. And it is the combined influence of the elements - the
environment in total - which has been such a highly significant factor in Blue
Mountains history. As Smolicz and Low have stated, although subject to
different interpretations and responses, it is the mountain environment which
has been the 'principal element' in the human experience of the Blue
Mountains, and 'here, history is essentially an account of the human response
to a landscape it could not ignore'.

However, the Blue Mountains is not unique in this regard. This history of the
Blue Mountains also provides a case study of the absolute importance of the
environment in the study of history. The role of the environment in shaping
history is far from a new idea. However, early crude attempts to explain
history through environmental factors alone, led to the idea becoming
unfashionable, neglected and shunned by all but a few specialists until well
into the 20th Century. This is certainly the case in Australia, where the often
fundamental role of the environment in history remains largely undervalued
and unacknowledged. While much excellent work has been done, too often in
historical narratives in this country the environment is treated as merely a
background setting or 'stage' onto which the historical actors (whether they be
white, black, male, female, squatter, worker, eminent statesperson or
psychotic criminal) play out their respective roles. Rarely is the environment

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8 The idea that the environment has an influence on history stretches back at least to
the Ancient Greeks. One issue often debated in the past was the possible role of
the environment, particularly climate, in the birth of ancient civilisations. For example, it
appears that the environment was a significant factor in the explanation of why the
first cities arose in the locations where they did - see W. Gordon East, *The Geography
itself seen as an actual agent in history, despite the fact that human history almost always unfolds within the constraints imposed by the environment at a given place or time.

Given the significance of environmental factors in history, it is surprising that environmental history remains well out of the mainstream of academic historical study, especially in Australia. In fact, most of the studies of Australian environmental history have not been done by academic historians. Perhaps the reluctance by many historians to consider the environment more seriously is because environmental influences are taken for granted (i.e. 'let's get back to the real story') or seem to smack of environmental determinism. Perhaps it is a disciplinary demarcation problem, with many historians unsure of whether such studies are more the responsibility of geographers, environmental scientists or other researchers.

Some Australian historians have given consideration to the influence of the environment, but due to the current vogue for cultural history, it is often limited to the perceptual approach - studies of the impact of the environment on human attitudes and thinking and various forms of cultural expression (and vice versa). This is certainly the case with many previous accounts relating to the environment of the Blue Mountains. However, the influence of the environment on history extends far beyond its impact on

* Are not historical explanations based solely on class struggle, economics, gender, ethnicity, culture etc. no less 'determinist'?
human perceptions and culture. While people may be 'creatures of culture', it is often forgotten that we are also creatures. Humans have an absolute need for fresh air, clean water and sufficient food, and require adequate means of obtaining warmth, energy, tools, building materials and waste disposal. How people have satisfied these fundamental basic needs over time, and the impacts this has had on both the environment and human society, is as equally important as what people (weighed down with their cultural backpacks) thought about the environment they encountered - although perhaps not as trendy and easy to research.

Because of the emphasis on historical perceptions of the Blue Mountains environment in other works, this study has focussed more on the history of the mountain landscape itself rather than its influence on the landscape of the mind. Ideally, studies of environmental perceptions, practices and impacts should intermesh and inform each other, but this requires a balance between each approach. Properly understanding the role of the environment in Blue Mountains history demands a multidisciplinary approach, as has been attempted in this thesis.

A common criticism of environmental history is that it is a negative account of history, 'a dismal tale' or, with apologies to Blainey, a 'Green Armband' view of history. However, history is supposedly a search for the 'truth' about the past

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* Of course it can be argued that such conclusions are an example of 'cultural determinism'.

(or at least it should be). Historical accounts are not Hollywood movies - sanitised, cheerful tales with happy endings, intended to make us feel good about ourselves. In the case of the environmental history of the Blue Mountains there may be much to regret about the changes wrought to the landscape by people, but there are also many examples where humans have attempted to minimise their environmental impact and where possible rectify past mistakes. The study of environmental history encourages people to recognise and accept that human societies everywhere make use of the environment and have impact on it, but that people are also far from powerless to change the way they relate to the environment. Furthermore, environmental history highlights that non-human factors must also be considered in any attempt to understand the past.

The old historical cliché (attributed to Winston Churchill) that 'those who forget history are doomed to repeat it' is particularly pertinent in connection with the human relationship with the environment. Given the present state of the global environment, environmental history has enormous contemporary relevance and is not some esoteric endeavour of academic interest to a few individuals. Understanding environmental history will be critical to our environmental future.

For these reasons, environmental history deserves far more attention in Australia than it has received to date. This study of the Blue Mountains has made a contribution to a much neglected area of Australian historiography, which will hopefully also be of use to those interested in the future of the Blue Mountains as well as their past.