A Guide to Berowra Valley Regional Park

PUBLISHED BY:
Friends of Berowra Valley Regional Park, a subcommittee of the Bushland Management Advisory Committee formed under the auspices of the Hornsby Shire Council.

This book revises and extends *A Guide to Elouera Bushland Natural Park* first published in 1983 and reprinted in 1984 by the Elouera Bushland Natural Park Trust of Hornsby.

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COVER ILLUSTRATION:
The northern extremites of the Park viewed from Barnetts Lookout off Barnetts Road, Berowra Heights. The Berowra Valley is at this point a deepening arm of the Hawkesbury River estuary, the largest of the State's eastward flowing rivers. Adjoining major bushland reserves, Muogamarra Natural Reserve and Marramarra National Park, extend the conservation values of the Park over a very large area from within the fringe of Sydney's Metropolitan Area.
PHOTOGRAPH BY PAT PIKE, A MEMBER OF THE FRIENDS AND ONE OF THE *GUIDE'S* AUTHORS, ASSISTED BY JACKY GIBBS.

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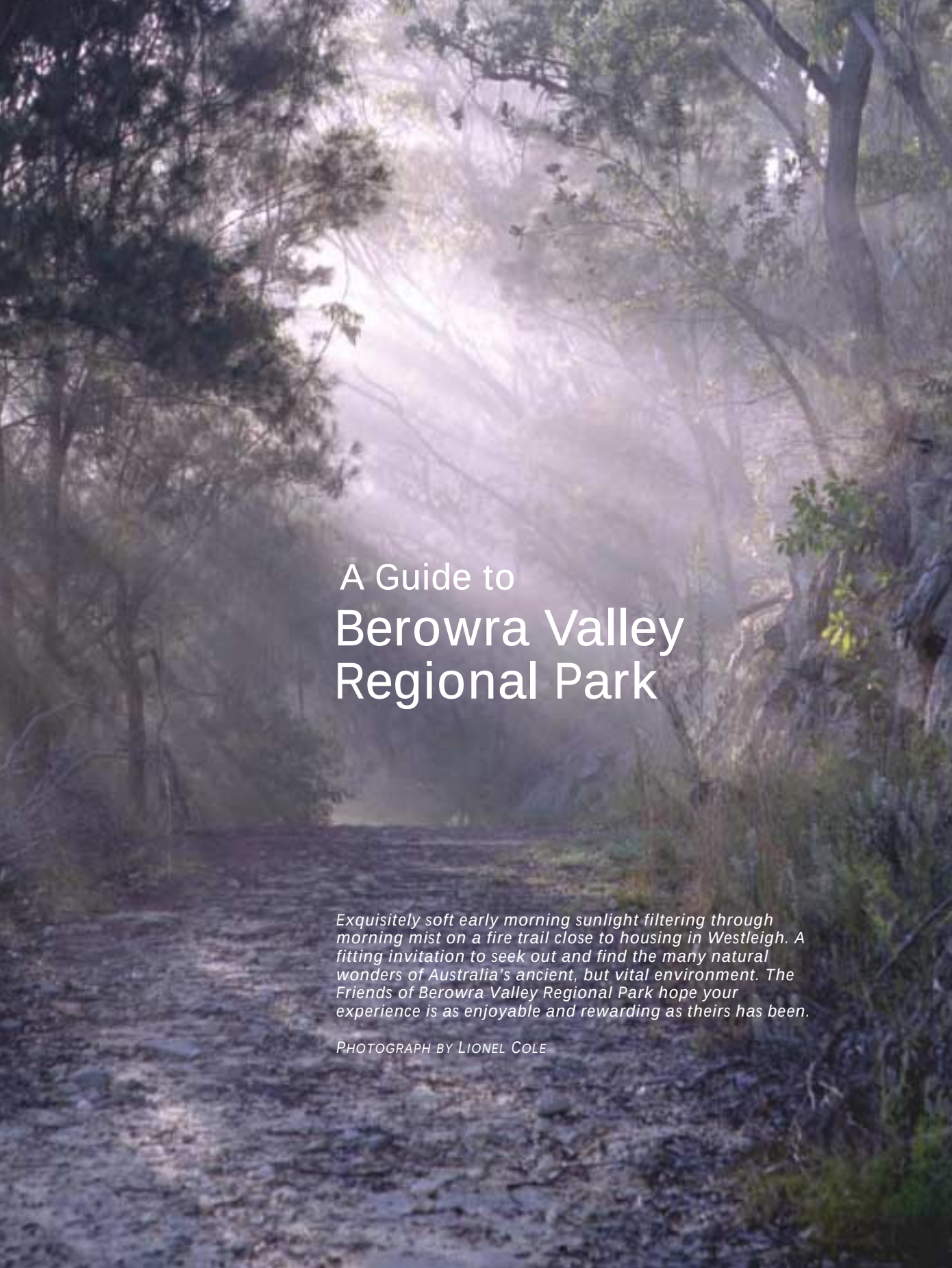

A Guide to Berowra Valley Regional Park

Exquisitely soft early morning sunlight filtering through morning mist on a fire trail close to housing in Westleigh. A fitting invitation to seek out and find the many natural wonders of Australia's ancient, but vital environment. The Friends of Berowra Valley Regional Park hope your experience is as enjoyable and rewarding as theirs has been.

Photograph by Lionel Cole

Guide to Berowra Valley Regional Park

Compiled and edited entirely as voluntary community service by

facilitated with major support from

and supplemented by contributions from
Berowra Catchment Management Committee
Hornsby Conservation Society
Make a Difference

BOTANICAL NOTE

The names of plants used in this book are found in Harden, G. J. 1990-93 Flora of New South Wales, (Vols 1-4 UNSW Press, Kensington.

Who are the Friends?

The Friends of Berowra Valley Regional Park is a group of volunteer members of the community interested in making the Park more accessible to the community. The Friends group was officially established at an ordinary meeting of Hornsby Shire Council on 21 April 1993.

In 1983, the former Elouera Bushland Natural Park Trust published *A Guide to Elouera Bushland Natural Park*, an 80 page A4 illustrated introduction to the parklands, as one of its activities. In due course this publication went out of date.

In about 1995 the Friends decided to produce a new edition, and the present project—the *Guide to Berowra Valley Regional Park*—is the result. Now the *Guide* is published, the Friends will turn their attention to other ways of bringing the Park to the community, for example by developing bushwalks, holding public awareness events, and providing information directly and through printed and other media.

Without the administrative support provided by Hornsby Shire Council through Jamie Slaven as Secretary and meeting chairman and practical help provided by the National Parks and Wildlife Service, the project could not have advanced.

Funding to cover the printing cost was received as a grant of $20,000 from the Berowra Valley Regional Park Trust, and supplemented by additional contributions from Berowra Catchment Management Committee, Australian Plants Society (North Shore Group), Hornsby Conservation Society and the MAD Make a Difference group.

The Friends of Berowra Valley Regional Park may be contacted through Hornsby Shire Council or the National Parks and Wildlife Service, Lower Hawkesbury District Office.

November 2004


Berowra Valley Regional Park
Berowra Waters
BERRILEE
Crosslands
MT KU-RING-GAI
Lyrebird Gully
Calna Creek
MT COLAH
GALSTON
McDonald Truss Bridge
Galston Gorge
Creek
Steele Bridge
F3 FREEWAY
ASQUITH
Rifle Range
Hornsby Quarry
HORNSBY
Pagson Trig
Fishponds Waterhole
Joes Mountain
Creek
Tunks
DURAL
Park Boundary
Creek
WESTLEIGH
Berowra
CHERRYBROOK
Pyes
The Jungo
Remnants Zig Zag Railway
THORNLEIGH

Dedication: Gordon Edgecombe

Gordon Edgecombe

This book is dedicated to one of the bushwalkers and conservationists who first recognised the values of the Berowra Valley: Gordon Edgecombe (1914–97). Gordon was one of the first Trustees of the Elouera Bushland Natural Park, which was formed to protect the upper valley in 1964. He not only walked in the park but devoted a large amount of his time and energy to protecting, improving and enlarging it.

Gordon Edgecombe was born in Musselburgh, Scotland, in 1914, whilst his mother and sister were attempting to return to Australia from Argentina at the outbreak of the First World War. The family was separated from his father for four years until they were reunited in Australia at the end of the war. This early sojourn in Scotland apparently made a deep impression on the young Gordon and left him with an abiding love of all things Scottish, including *uisgebeatha* (the water of life).

Gordon trained as a mechanical and electrical engineer and joined the Post Master General's Department (PMG—later to become Telecom, then Telstra). During the Second World War, because he was in an essential industry, Gordon could not join up. This was fortunate because he was transferred to Melbourne where he met Jean, then an air force flight lieutenant. They were both keen bushwalkers and took every opportunity to escape to the Dandenongs and Sherbrooke Forest. At the end of the war they married and returned to Sydney to raise four children.

In the 1950s they became involved with the fledgling Hornsby Wildlife Conservation Society and joined its management committee. This led to Gordon and Jean becoming part of the struggle to have the upper portion of the Berowra Creek catchment dedicated as a reserve to protect its populations of lyrebirds and wildflowers. When the Society's efforts were crowned with success in 1964, Gordon became one of the members of the Elouera Bushland Natural Park Trust, representing conservation interests. Over the succeeding years he filled many roles on the Trust and was a major contributor to its success.

I met Gordon when I joined the Hornsby Wildlife Conservation Society in 1963 and still remember fondly the early bushwalks he led from Thornleigh down Berowra Creek. It seemed to me that he loved the bush and was never happier than when on a bushwalk. He was involved with a number of early bushwalking clubs such as the Coast and Mountain Walkers, and used to surprise new members by taking them on walks along Berowra Creek. They did not expect to find such rugged country so close to Sydney.

Towards the end of his career with Telecom, Gordon was again transferred to Melbourne for a number of years. During this time he learned to fly. His new skill enabled him on his return to Sydney to take members of the Hornsby Conservation Society to view Berowra Valley from the air, and this probably triggered a new idea. The Society and the Elouera Trust began to press for extensions to the Elouera Bushland, which ultimately led to the dedication of the Marramarra National Park and the Berowra Valley Bushland Park. Once again Gordon was a major contributor to this endeavour.

In recognition of their work for conservation, Gordon and Jean shared Hornsby Shire's

Australia Day Citizen of the Year Award in 1995, their fiftieth wedding anniversary year.

I think the tribute paid to Gordon by his sister-in-law Nancy Hunt (part of which I have taken the liberty of reproducing here) says a lot about the man he was:

He was a man who climbed mountains and loved the Australian bush. When you climb a mountain, no matter how you have to struggle through scrub and around rocks, there is something special about arriving at the top. You get a new perspective, a wider vision and enter a new dimension of experience.

This is what Gordon has done. He has climbed a mountain, sometimes with great difficulty, and seen the view from the top. He has gone on into that new landscape, still exploring, still seeking the lovelier forest, the clearer stream, the brighter birds, and made camp under the singing stars.

Gordon Edgecombe's kindness, patience, humour, enthusiasm and sheer hard work made the bush and conservation a pleasure for a lot of people. He would want us to carry on the job of conserving the Berowra Valley, and it is fitting that this book should be dedicated to him.

Bob Salt, 8 November 1999

Foreword

I extend my congratulations to the Friends of Berowra Valley Regional Park on the publication of this outstanding *Guide* to the Park.

Berowra Valley Regional Park is one of those very special places within the Sydney Basin landscape. It is an area of great natural and cultural heritage importance, and yet is on our urban doorstep. Berowra Valley is not only rich in biodiversity, but also contributes to the quality of living in Hornsby Shire - known to many as the 'bushland shire'.

The Regional Park conserves at least 18 vegetation communities, 10 threatened plant species and 11 threatened fauna species, and is known to contain over 230 vertebrate species - all within 30 kilometres of the Sydney CBD. In combination with the adjoining Ku-ring-gai Chase National Park and Mougamarra Nature Reserve and adjacent Marramarra National Park, this Park contributes to a great network of protected areas in the Lower Hawkesbury River valley.

The Friends have produced an excellent *Guide* that is a 'must have' for those enjoying the many walking tracks, having a picnic, or studying some aspect of the park. With over 77 kilometres of walking tracks, including the Great North Walk, it is a park that is great for either a short day walk or an overnight journey.

The *Guide* draws on both local knowledge and extensive scientific research, and is the culmination of information gathered over many years. The diagrams, photographs and maps make this publication a very informative and user-friendly field guide.

BOB DEBUS
MINISTER FOR THE ENVIRONMENT

It is with great pleasure that I have accepted the invitation by the Friends of Berowra Valley Regional Park to write a preface for this comprehensive Guide to Berowra Valley Regional Park. I would like to commend the Friends on what I consider to be an invaluable guide to the natural and cultural heritage of the Park. The dedication of those who have worked on the book over many years has been outstanding.

I consider the Guide to be an essential addition for the visitor who wishes to know more about the features of Berowra Valley Regional Park. Very few regional or national parks around Sydney, indeed in NSW, can boast such a companion for the day or longer term visitor.

In addition, the Guide will play an important role in educating the community about the wonderful features of the Park, which is a focal point in the Shire for recreational and nature appreciation activities. The Guide also explains how the Park's unique environment can be conserved for present and future generations to enjoy. Each one of us has a role to play. The Council, in particular, has assumed a major role in the Park's ongoing conservation through its partnership agreement under a Memorandum of Understanding with the Department of Environment and Conservation.

I anticipate that sales of this excellent publication will increase over time as the reputation and appreciation of the values of the Park grow.

NICK BERMAN
MAYOR, HORNSBY SHIRE

ACKNOWLEDGMENTS

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Australian Plants Society (North Shore Group)
Berowra Catchment Management Committee
Berowra Valley Regional Park Trust
Hornsby Conservation Society
Hornsby Shire Council
Make a Difference
National Parks and Wildlife Service

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and in particular
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People who helped the authors

Specific assistance to authors has also been acknowledged at the end of the relevant sections.

Other people who helped

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PETER KEMP, Manager, Parks and Landscape Team, Hornsby Shire Council

ROBERT (BOB) SCHOFIELD, former fire control officer for Hornsby Shire Council

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GEORGE FOSTER, local resident, member of FBVRP and former trustee of Elouera Bushland Natural Park Trust, design and print production of this *Guide* and the 1983 *Guide to Elouera Bushland Natural Park*

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Tawny Frogmouths PHOTOGRAPH BY LIONEL COLE

Beauty is said to be in the eye of the beholder.
Use this Guide to look into what may appear to be just an
unremarkable bushland valley quite close to the City of Sydney.
See the history and extraordinary
natural beauty that is everywhere throughout

Berowra Valley Regional Park

Patersonia Lily PHOTOGRAPH BY SANDRA KALNINS-COLE

Members of the Elouera Bushland Natural Park Trust 1964-1987

The Elouera Bushland Natural Park Trust was gazetted on 6th November 1964.
During the 1980s the Trust developed the first *Guide to the Elouera Bushland Natural Park* and also the first formal Management Plan for the Park. It also helped to develop the Benowie Walking Track and initiated moves to control weeds, build better walking tracks and to extend the park. boundaries. The Trust did not have fixed terms, but was augmented as people retired or died. The following members of the Trust served at various times until it was dissolved in 1987 when the Park was enlarged to become the Berowra Valley Park:

Presidents and Officers

The Hon. Max Ruddock MLA
Inaugural President,
Clr Don Evans, President
Clr Gordon S. Curby, President
Mr R.J. (Bob) Salt, President
Mr Charles K. Cook, Shire Clerk of Hornsby,
Inaugural Secretary of Trust,
Mrs Norma Searle, Hon. Secretary
Mr Gordon Edgecombe, Hon Secretary
Mrs Cathy Stevenson, Hon Secretary

Trustees

Dr Joyce Vickery
Dr Lillian Fraser
Mr Ray Dickens
Mrs Norma Searle
Dr Don Adamson
Mr Jim Mitchell
Dr Patricia Selkirk
Mr George Foster
Mrs Mavis Clements
Clr Ron J. Payne, Shire President
Clr G.W. Provost, Council Representative

Members of the Berowra Valley Regional Park Trust 1998-2004

Berowra Valley Regional Park was gazetted on 27 March 1998.
The following members of the Trust served at various times until it was dissolved on 30 June 2004:
Cllr Margaret McMurray, Chair 1998-1999
Cllr Graham Orr, Chair 2000-2004
Cllr Scott Cardamatis
Ms Polly Thompson, Council
Mr Arthur Willis, NPWS Regional Manager
Mr Bob Salt, Community Rep
Mr Peter Butcher, Community Rep
Cllr John Muirhead
Cllr Matthew Benson
Mr Chris McIntosh, NPWS Regional Manager
Cllr Susan White
Ms Stella Whittaker, Council
Mr Gavan Mathieson, Council
Ms Carole Ford, Community Rep
Mr Graham Ireland, Community Rep

Funds for the production and printing of the Guide were donated to the Friends by the Trust at the end of the 1999/2000 financial year.

Bushwalk checkers

Berowra Probus Club
David Butler
Elizabeth Butler
Sue Fredrickson

Photographs

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Robyn Tuft
Karen Thumm
Marc Thumm
Manfred Wagner
Narawan and Ray Williams
Val Williams
Lyndel Wilson
Jamie Wright

Valette Williams

Val Williams, an active member of the Friends of Berowra Valley and one of the major contributors to the *Guide to Berowra Valley Regional Park*, passed away in July 2004. It is very sad that she did not survive to see the book published.

Val was a founder member of the Friends who brought to our meetings not only her great love and vast knowledge of Australian native plants, but also the desire to share it, especially through education.

Val was very active in the North Shore Group of Australian Plants and also took an active interest in the Nature Conservation Council of NSW where she served on the executive and was Conservation Officer. She also cooperated with the Hornsby Conservation Society and many of its members on a variety of projects over the years.

Val was also active in helping to obtain and identify plant specimens for the Jenifer Lewis Herbarium project, now part of Hornsby Library and accessible through the library website.

A tireless worker both for the Guide and for the Park, it was Val who was the backbone of the Friends' detailed and comprehensive submission on the Draft Plan of Management for the Park.

Val was a very private person and few people were aware of the spread of her interests and activities. Even fewer people were aware of how ill she had been in recent times because she did not complain and continued to appear at functions and carry on with her tasks.

Val's expert contributions, firm opinions and dedication to the task in hand will be missed. The conservation movement in general and Australian plant enthusiasts in particular are poorer for her passing.

Bob Salt, 14 August 2004

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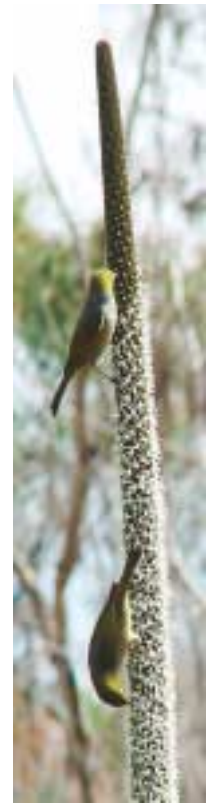
Joyce Vickery, visionary

Elouera Bushland Reserve

Vindicated Vision



Values of the Park

Malcolm Bruce

Berowra Valley Regional Park is one of many natural areas that help make Sydney and its surroundings among the most beautiful urban settings in the world.

The Park not only beautifies Hornsby Shire, but helps clean the air and water, benefiting all the Sydney metropolitan area. The plants in the Park filter the dust and other contaminants out of Sydney's increasingly polluted air, and neutralise and absorb this material into natural cycles. These same plants trap and absorb most of the water-borne nutrients, pesticides, oils and other unnatural substances that wash down from our urban areas. How much more impaired would Sydney's air and the Hawkesbury's water be without the filtering effect of Berowra Valley Regional Park?

The walking tracks and waterways of the Park are used by many thousands each year to escape from the pressures and stresses of modern life. Passive recreation in the Park is growing rapidly as more people from the Sydney region discover the hidden secrets of this remarkable area. What value can be placed on the reduction of stress in this modern world?

Not only is the Park valuable to the people of Sydney, it is a storehouse of our cultural and environmental heritage. Preserved throughout the Park are brief glimpses of the life of its original owners. Such features as rock engravings, axe grooves and paintings help both the descendants of the Aboriginal people and the newer Australians understand how Aboriginals traditionally lived in the Sydney region. There are also signs of early European occupation found within the Park. What value do we place on this nation's cultural heritage?

Also hidden in the Park are populations of threatened and rare plants, animals and other organisms. As well as having their own right to exist, these life forms are a genetic resource of potential benefit to humankind. What life-saving substances might not eventuate if these organisms disappeared permanently from our planet? How do we value the genetic resource found in the Park?

The habitats within the Park range from heath and remnant rainforest through to mangroves and other aquatic environments. So varied are these habitats in this small area of natural bushland that many secondary and tertiary teaching institutions use the Park as a teaching resource. How many cities in the world have such a varied natural resource within 40 km of the centre of that city? Every individual can make his or her own personal estimate of the worth of the Park, for there is something of value to everyone here.

About the Park

How the Park came into being

Elouera Bushland Natural Park

The nucleus of the present Berowra Valley Regional Park is the Elouera Bushland Natural Park, which was reserved in 1964 by the then Minister for Lands 'for public recreation and promotion of the study and preservation of native flora and fauna'. For twenty-four years this Park was managed by a group of honorary trustees appointed by the Minister for Lands. The Park covered an area of some 640 ha of bushland in the southern portion of Berowra Valley. The main watercourse within the Park was the upper reach of Berowra Creek, known locally as Fishponds Creek. The Park lay in the heart of Hornsby Shire, adjacent to Hornsby, Westleigh, Thornleigh, Pennant Hills and Dural. On the western boundary the urban areas continued to expand.

The first President of the Trust in 1964 was the Hon Max Ruddock M.P., supported by Trustees representing Hornsby Shire Council and local conservation groups. These included people like Joyce Vickery and Lillian Fraser, as well as Gordon Edgecombe, Ray Dickens and Norma Searle of Hornsby Conservation Society. Max Ruddock was successful in having Refuge Rock and Zig Zag Creek added to the park in exchange for land on Quarter Sessions Road, opposite the Westleigh Fire Station, isolated when Quarter Sessions Road was straightened.

Berowra Valley Bushland Park

In 1987, Berowra Valley Bushland Park was gazetted as reserve Nº 100 092 to include Elouera Bushland Natural Park.[1] The new Park stretched from Pennant Hills to Berowra down the Berowra Creek valley. Hornsby Shire Council was appointed trustee by the Minister for Lands.

Berowra Valley Regional Park

In April 1997, it was proposed that the Berowra Valley Bushland Park be incorporated into the Berowra Valley Regional Park. The new park was gazetted on 27 March 1998 under the *National Parks and Wildlife Service Act 1974* (NSW), and was established under the National Parks and Wildlife Amendment Bill 1995. It was opened by the Hon. Pam Allan, the NSW Minister for the Environment, on Monday 23 November 1998.

Covering more than 3800 ha of bushland within the Hornsby Shire, and bounded by both urban and rural lands, it extends along Berowra, Calna, Tunks and Pyes Creeks between Pennant Hills and Berowra, and links with Marramarra National Park and Muogamarra Nature Reserve. It was managed until 30 June 2004 by the Berowra Valley Regional Park Trust on behalf of the Minister for the Environment and Hornsby Shire Council. The Minister's interests are represented by the National Parks and Wildlife Service. At the time of publication, new arrangements were being considered by the Minister.

Where the Park is located

The Berowra Valley Regional Park is on the northern limits of the Sydney metropolitan area and some 20 km north-west of the city centre. The Park is a strip of bushland about 16 km long, and from 1–6 km wide, running northwards from Pennant Hills to Berowra Waters. At its northernmost point it is some 10 km from the Hawkesbury River. It follows Berowra Creek, and occupies much of the catchment for that waterway. It lies between the Cattai Catchment on the west and the Cowan Catchment on the east, both being subcatchments of the Hawkesbury-Nepean river system. It is distinct from the Muogamarra Nature Reserve to the north, which also lies within the Berowra Catchment. The Berowra Valley Regional Park is surrounded by rural and urban areas and is almost bisected from east to west by Galston Road.

The climate of the Park

Temperature

The climate of the Berowra Valley Regional Park is temperate, with an average January maximum of 27°C, and an average July minimum of 5°C.

1. *NSW Government Gazette*, September 1997

Rainfall

The 1000 mm annual precipitation isohyet follows the ridges along the Pacific Highway, paralleling the Park's eastern boundary. The mean annual precipitation at Pennant Hills is 1068 mm, indicating that a range of rainfall patterns may be experienced through the Park, perhaps due to orographic influences.[1] The mean annual evaporation is about 1000 mm. The region is subject to protracted droughts or periods of intense rain, leading to high levels of run-off.

Winds

Prevailing winds are north to south-east in summer, and north to south-west in winter (Bureau of Meteorology, 1939-98). Warm, dry weather in summer is associated with north-westerly winds.

Topographical influence

The deeply incised topography gives aspect and vegetation variations, which cause microclimates, the exposed ridges being more subject to extremes than the sheltered valley sides.

Managers and supporters of the Park

Hornsby Shire Council

The Hornsby Shire Council is the local government authority. It has many responsibilities, one of which is bushland management. The area has come to be known as the 'Bushland Shire' because over sixty-nine per cent of its area, or over 35 000 ha, is bushland, including Muogamarra Nature Reserve, Marramarra National Park and parts of Ku-ring-gai Chase and Lane Cove National Park.

The Council's Bushland Management Advisory Committee assists with the management of Council-controlled bush areas within the shire, many of which are adjacent to the Park.

Hornsby Shire Council carries out a share of the day-to-day functions of management of the Park. Website: www.hornsby.nsw.gov.au

National Parks and Wildlife Service

The North Sydney Region of the National Parks and Wildlife Service is responsible for the management of the national parks estate in the Hornsby area, including the Berowra Valley Regional Park. NPWS exercises day-to-day responsibilities in conjunction with Hornsby Shire Council. Website: www.npws.nsw.gov.au

Berowra Valley Regional Park Trust

The Berowra Valley Regional Park Trust was the consent authority responsible for the management of the Berowra Valley Regional Park until 30 June 2004 by agreement on the part of the NSW government, the National Parks and Wildlife Service and Hornsby Shire Council.

The board of trustees, the Berowra Valley Regional Park Trust, consisted of three Hornsby Shire councillors, one staff member from the NSW National Parks and Wildlife Service, one staff member from Hornsby Shire Council and two community representatives. The first meeting of the Berowra Valley Regional Park Trust was held on 22 October 1998 at which then Councillor Margaret McMurray was elected provisional chair of the Trust.

Department of Lands

See Great North Walk

Berowra Catchment Management Committee

The Berowra Catchment Management Committee was a subcommittee of the Hawkesbury-Nepean Catchment Management Trust. It was responsible for the coordination of natural resource management activities in the Berowra Catchment.

Hornsby Conservation Society

The Asquith District Flora and Fauna Society had its beginnings shortly after World War II, as a group of conservation-minded people. There was an even earlier group from before the war with similar aims. In1952 the Asquith Society's name was changed to the Hornsby Wildlife Conservation Society. This name was further changed to its present form, the Hornsby Conservation Society, in the 1970s. At first, their major goal was the preservation of the bushland in Old Mans Valley around the quarry. The Society then began a campaign to preserve bushland in the southern portion of Berowra Valley to protect the lyrebird populations in the area. The continued efforts of the Society have led to the preservation of most of the bushland in Berowra Valley as part of the national parks estate, as described elsewhere in this *Guide*. Its members have contributed extensively to this publication.

1. Orography: 'that branch of physical geography which deals with mountains' (*Macquarie Dictionary*)

Australian Plants Society NSW

The Australian Plants Society NSW Ltd is a non-profit, voluntary organisation, the aims of which are to encourage the appreciation of Australian plants and their use in private gardens, public places and rural areas, and to carry out conservation and educational projects. This is done by the members undertaking projects and by awarding grants. Membership is open to all, and includes those from the professions and many others. The Society publishes two periodicals for members, one being a full-colour quarterly. The Society, part of an Australia-wide coalition of similar societies, consists of twenty-nine district groups, and has 3000 members in New South Wales, six of whom are also members of the Friends of Berowra Valley Regional Park.

Until 1996 the society was known as the Society for Growing Australian Plants.

Friends of Berowra Valley Regional Park

The Friends of Berowra Valley Regional Park provides a community-based connection between the Park Managers and individuals wishing to volunteer their time in order to promote, preserve and protect the Park in accordance with the plan of management.

In 1995 the Friends started work on this *Guide* an updated version of the original *Guide to Elouera Bushland Natural Park*.

MAD: Make a Difference

A local community group, 'MAD: Make a Difference', operated from 1992 to 1995, and donated its residual funds of $75 to the Friends for the publication of this *Guide*.

Further reading

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'Ralph Hawkins discovers earliest reference to Berowra', *Hornsby Bush Telegraph*, 25 Mar. 1999.

Troy, J. 1994, *The Sydney Language*, Australian Dictionaries Project/Australian Institute of Aboriginal and Torres Strait Islander Studies, Canberra.Values of the Park

Dawes' notebook b, page 29, line 12 [b.29.12].

Notebook 'Anon.', c.1.1 and c.1.8

Dawes, b.29.12.

What the names mean

Elouera

'Elouera' is a word of Aboriginal origin traditionally stated to mean 'a fine and beautiful place', and in modern-day conversational Australian is pronounced 'el-*ow*-ra'. The word does not occur in the lists compiled by the First Fleeters and their successors.[1] The *Macquarie Dictionary* gives 'elouera' as meaning 'a stone implement of uncertain use but possibly a scraper'.

Australain Museum

Berowra

The *Guide to Elouera Bushland Natural Park* stated: 'Berowra' is a word in the Dharuk Aboriginal language meaning 'windy place', 'south-west wind', and 'place of many winds'. There is speculation as to what the word 'Berowra' really meant. Aboriginal languages did not have the sound 'ow' as pronounced today. The earliest known reference to present-day Berowra comes from the *Sydney Gazette* of 1804, which mentions 'Perrara on the south branch of the River Hawkesbury' (*Hornsby Bush Telegraph* 1999). It is likely to refer to Berowra as there is no distinction in Aboriginal languages between 'p' and 'b'. The notebooks of William Dawes of the First Fleet, who recorded the Sydney Aboriginal language, contain the following reference:

P to D: *Ngia[1]ngirinara[2]-bao[3]-uwí[1]-nia[4]* berara5

or with modern re-spelling:

ngaya ngayri-nara-ba-wi-nya birara

which he translates as:

'I[1] will[3] go and fetch you[4] some fish hooks (or the shells[5])'.

The origin of 'Berowra' might well be *berara*, for shells, not unlikely given the river there and the many shell middens. This might be more probable than the 'place of many winds', although *Boor-roo-way*, and *Boo-roo-wee* are given as the North and East wind respectively,[2] while *Gwara burawa* meaning 'The wind is fallen' lends some further support to the 'winds' interpretation.[3]

1. Word list compilers cited by Jakelin Troy (1994) include William Dawes, Arthur Phillip, John Hunter, David Collins, Phillip Gidley King, Ralph Clark, Newton Fowell, Richard Johnson, and R.H. Mathews,
2. Notebook 'Anon.', c.1.1 and c.1.8.
3. Dawes, b.29.12.

Dr Joyce Vickery MBE DSc

In 1967 the late Dr Joyce W. Vickery, MBE, DSc, a botanist with the Royal Botanic Gardens, Sydney, donated over 100 acres of privately owned land in the Hornsby Valley for inclusion in the Elouera Bushland Natural Park.

In his annual report for that year the then president of the Elouera Bushland Natural Park Trust, the late Max Ruddock, made the following comment:

> *'During the year the Trust has received a donation of land from Dr J. Vickery for which posterity will be extremely grateful. At the present time this land forms the springboard in the direction of Galston Gorge, Crosslands and Berowra Waters which must ultimately be added to the Park'.*

Joyce Vickery, distinguished visionary

Bob Salt. Based on an article by Alison Holland[1]

Joyce Vickery was a woman of many parts. Born 15 December 1908, the youngest of Elizabeth and George Vickery's four children, she was educated at Methodist Ladies College, Burwood and graduated with a BSc (Honours) in 1931 and an MSc in 1933 from the University of Sydney. During her post -graduate study in the University's Botany Department she published papers on insectivorous plants, researched grasses, and was also president of the Biological Society. With her friend and colleague Lillian Fraser she published joint papers on the community ecology of the Upper Williams River and Barrington Tops in the Proceedings of the Linnean Society of NSW.

Dr Vickery was the first woman ever appointed in a professional capacity to the National Herbarium of NSW, as assistant botanist in 1936. She edited the Flora of New South Wales and carried out research at the Royal Botanic Gardens Kew in London. She became an authority on native grasses, the subject of her PhD in 1959.

Her forensic work helped to solve the notorius Graeme Thorne kidnapping case when she established that plant fragments associated with the crime were from the kidnapper's home.

A conservationist, she supported protection of Kosciusko State Park in the 1960s when it was under threat from grazing and development interests.

In 1964 she received the Clarke Memorial Medal from the Royal Society of New South Wales and became Senior Botanist at the Herbarium. She retired in 1967, but continued her research as an Honorary Research Fellow until 1978. She was a member of the Royal Society and the Linnean Society which she served as honorary treasurer.

Throughout her career Dr Vickery fought to redress discriminatory practices in the work place and sought equal pay for women.

1. A.Holland 1980 'Joyce Vickery' in 200 Australian Women:A Redress Anthology,Heather Radi (ed) 1980, p.277

Dr Vickery died of cancer in 1979. She had remained single throughout her life, declaring as a child that 'she didn't want any man hanging on to her coat tails'.

The following description of the Park was written by Joyce Vickery at about the time she donated her land to the Crown

Elouera Bushland Reserve

Joyce Vickery, MBE, DSc

The Elouera Bushland Reserve provides an excellent example of one of the deep gorges which dissect the Hornsby Plateau, and of the native plant associations characteristic of this district on the Hawkesbury Sandstone formation. The zonal sequence of plant associations, each with its characteristic constituent plant species, can be traced from the plateau top to the creek banks of the valley floor, and provides a model demonstration of ecological principles. While the primary consideration should be the preservation of the natural vegetation for its own intrinsic and scientific interest and value, the existence of such a sanctuary, so accessible to closely settled areas, should make it invaluable as a demonstration area to students at schools and colleges, provided that it can be preserved intact.

The reasons for preservation of adequate samples of bushland areas are at times obscure to those who have given little thought to the matter apart from the more recreational values.

The Hawkesbury Sandstone flora is rich in plant species representative of families which have evolved only in Australia or which reach their highest development here. They are therefore unique and of great interest to scientists all over the world. They provide important clues on evolutionary history. In cases where they have affinities with related families or genera in other parts of the world, in particular South Africa, South America and New Zealand, they are also of great interest for the light they throw upon, and the problems they pose regarding, plant distribution throughout the world and the lines of migration of plant and animal life during geological time. These considerations provide their quota of evidence to such major controversial problems as the origin and prehistory of present land masses, the hypothesis of drifting continents etc., alongside the evidence that is gradually being elucidated by the physical sciences.

There is increasing interest in plant micro-fossils, such as pollen grains, to be found in ancient bogs and in rocks. Indeed the recognition and identification of such fossils is of major importance in dating and relating rock strata at the different sites where they occur. This work has, for instance, an important economic bearing on the current search for oil-bearing strata and various mineral ores. The microfossils in most cases can only be identified by reference to the pollens and other plant parts of present-day plants. It is vital that a source of living plants should always be maintained available for study and comparison when required.

It is often of practical importance to determine the effects of various types of land usage, especially in relation to the soil and agricultural uses. This can only be ascertained by reference to some standard. Primitive undisturbed areas of comparable land are the only standards by which harmful or beneficial practices can be measured. This is especially significant in determining causes of accelerated soil erosion.

The creek draining the Elouera Bushland Reserve bears along its banks a narrow strip of an association of plant species collectively designated as 'gully-flora' and, where the aspect gives adequate protection from drying winds and excessive sunlight, incipient rainforest. The presence of the broadleaved species making up the rainforest is of particular interest. It is evident from coppice-growth and comparative absence of large trees that this element has already suffered from fires in past years, and its hold on the area is somewhat tenuous. It manifestly deserves such protection as can be afforded against further calamity.

The chemical attributes of Australian plants are at present little known. Work of recent years has revealed the uses of such plant products as penicillin and reserpine that were previously unsuspected. Unknown products doubtless await discovery and it is vital that suitable samples of all types of life should be preserved. One cannot say what results may accrue from the application of as yet undeveloped techniques. Neither can it be calculated what loss to human economy could be sustained by

the extinction of plant or animal species before their value is completely understood.

The trees of the rainforest element, together with associated sedges, grasses, herbs and shrubs are currently efficiently fulfilling the function of filtering the water and holding the soil of the stream-banks by their root-systems and overhead protection, thereby delaying siltation downstream. Litter that washes down hill from the slopes above or is carried in the stream during floods tends to be held by them and, under the cool shady conditions maintained, is broken down to humus; this results in improved soil, increased growth of the gully-flora, and filtered, pure water maintained in the stream with a minimum of erosion.

Should chemical effluent be introduced into the creek it is bound to have a deleterious and probably disastrous effect upon the flora of the stream-banks wherever it comes under its influence. The probable succession of consequences can readily be envisaged by any student of plant succession and regression and may be summarised as follows:

- Death of the flora of the stream-banks.
- Opening up of the ground beneath it to strong sunlight, heat and drying winds.
- Decomposition of the roots which hold the soils adjacent to the water-course and oxidation of the humus in these soils, rendering them more friable and subject to erosion.
- Scouring of the stream-bed and carrying away of the present soil accumulations during flash-floods.
- Muddying of flood waters, causing further damage to stream bank vegetation downstream.
- Siltation of lower stretches of the river-system.
- Failure of denuded soils to hold moisture and release it by slow seepage over prolonged periods.
- Rapid drying up of streams during intervals between rainfalls, thereby eliminating permanent watering places for animal wild-life including birds.
- General opening up of the gorge to drying winds and decrease of shelter, causing a drier atmosphere and thereby deleteriously affecting also the adjacent plant communities on the slopes.

Recovery of a stream from such a sequence of events once initiated, even if further interference ceased, would be a very long process indeed and under present circumstances of adjacent human habitation and land usage, virtually impossible.

Invasion by unsightly foreign weeds more tolerant of the new conditions may occur, converting charming bushland into ugly wasteland.

From the aesthetic viewpoint these consequences would undoubtedly detract from the Elouera Bushland Reserve. Continued existence of such dainty attractions as the rock orchid, filmy ferns and umbrella ferns could not be expected.

In its present form the Reserve provides a refuge and watering place for bird life and its trees a shelter for nesting. Quite apart from the enjoyment birds provide to a substantial section of humanity, they are a vital factor in the maintenance of a biological balance between various forms of life. Insect life is a major cause of agricultural losses. Bird life is a most important form of natural control over excessive build-up of insect populations that would otherwise require control by costly, labour consuming and sometimes potentially dangerous insecticides. Undue destruction of bird life, often an inevitable consequence of the destruction of its natural habitats, has not infrequently been succeeded by invasions of destructive insects in pest proportions. Examination of the stomach contents of many kinds of birds has revealed that astonishing numbers of insects are consumed by them each day. Protection of a healthy stream should contribute towards the maintenance of a healthy bird population.

I fully support your efforts to protect all parts of the Elouera Bushland Reserve from contamination consequent upon industrial development.

Joyce Vickery, 1967

Reference

Mitchell, J. et al., 1983, *A Guide to Elouera Bushland Natural Park:* , Elouera Bushland Natural Park Trust, Sydney.

Vindicated Vision

Bob Salt

In 1967 Joyce Vickery contemplated the possibility that chemical effluents could be introduced into the local streams. She predicted that this would cause problems such as loss of native vegetation, stream-bed scouring, sediment-laden floodwaters, downstream siltation and invasion of the bushland by exotic weeds. (Mitchell et al., 1983, pp. 10-13.)

Many of these effects have now manifested themselves in the Berowra Creek Catchment, which includes the Berowra Valley Regional Park. If Joyce was using the term chemical effluents to indicate water polluted with both organic and inorganic substances, her predictions were accurate.

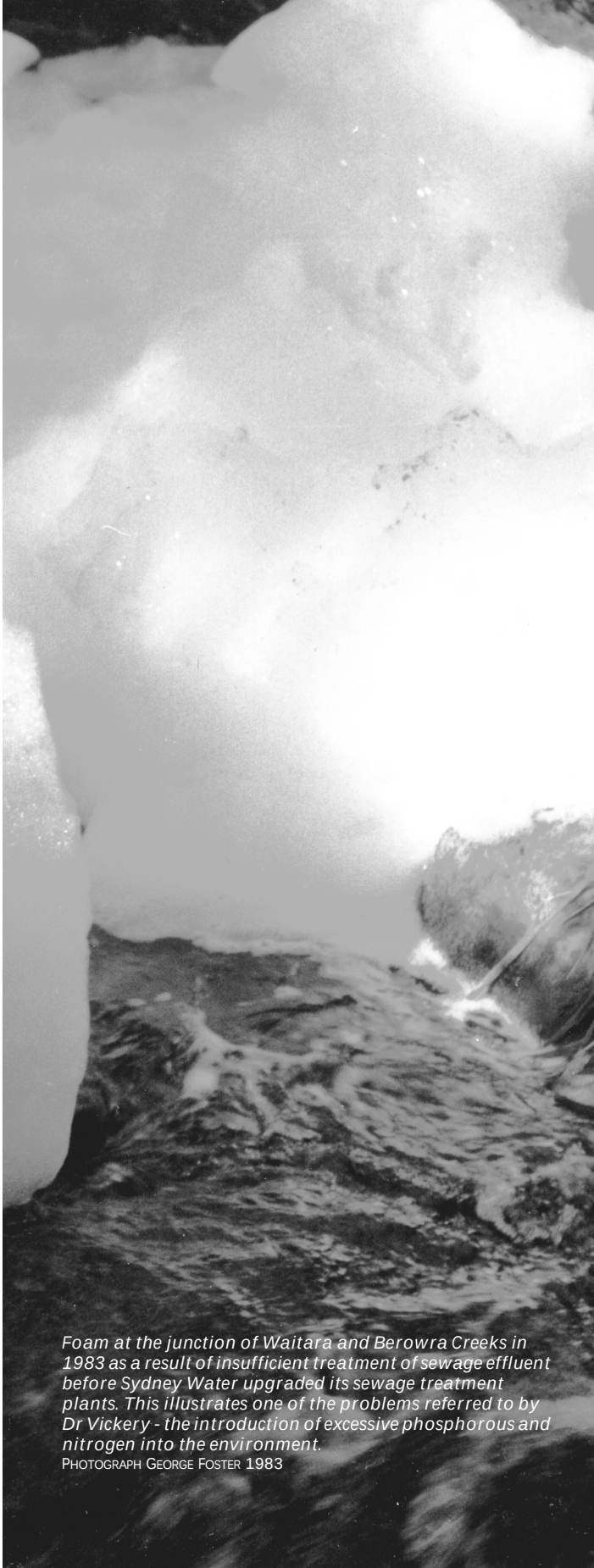
The problems in the Berowra Creek Catchment have been mainly caused by the increasing load of nutrients from anthropogenic sources and silts being carried by the water in the local creeks, as a consequence of Catchment developments.

Increased flows from stormwater drainage from impervious surfaces (roads, driveways, and roofs), discharges from commercial and industrial premises, coupled with major earthworks for sewerage and drainage in the gullies, have caused stream-bed scouring, sediment-rich waters and downstream siltation.

Exotic weeds are overwhelming the native vegetation along the streams. These weeds were carried as seeds into the bush by the run-off from roads and gardens and are now thriving in the nutrient-enriched sediment brought in by the stormwater. The nutrients are also harmful to native plants adapted to the nutrient-poor soils of the sandstone country.

The community is now working to correct these problems at considerable cost in time, effort and monetary levies. How much better it would have been if more attention had been paid over the past thirty years to Joyce Vickery's predictions.

I am sure Joyce would be gratified by the progress that has been made in conserving the Berowra Valley, but would have been even happier if so much effort did not have to go into catchment remediation and bush regeneration schemes to repair past neglect.



Foam at the junction of Waitara and Berowra Creeks in 1983 as a result of insufficient treatment of sewage effluent before Sydney Water upgraded its sewage treatment plants. This illustrates one of the problems referred to by Dr Vickery - the introduction of excessive phosphorous and nitrogen into the environment.
PHOTOGRAPH GEORGE FOSTER 1983

The Story of the Park

Historical overview

Labyrinthodont

Aboriginal people of Berowra Valley

Historic quarry and zigzag railway

Tramways of Old Mans Valley

Calna Creek bridge

Higgins family cemetery

How far do you have to go to see a serene facet of Australia like this? If you happen to be the designer of this Guide, just sit in your Westleigh home office chair and look left! A typical early morning winter mist fills the valley, flowing visibly with the breezes of the warming air.
Photograph, George Foster. View courtesy Berowra Valley Regional Park

Historical overview

Bob Salt

The reservation of Berowra Valley Regional Park consolidates the protection of the bushland along Berowra Creek from Pennant Hills to the junction of the Hawkesbury River. This has been a long and gradual process influenced by the valley's history.

Aboriginal history

The human history of the Berowra Valley begins with the original inhabitants, the Aboriginal people. While no one can be certain for how long the indigenous people occupied the Sydney region, we know that they have been in Australia for at least 60 000 years, and there are relics in the Sydney region dating back at least 22 000 years. It is difficult to determine how long they occupied the Berowra Valley, because prior to the end of the last rise in sea level around 6000 years ago the coastal plain extended 10-20 km out to sea from the present coastline, and the valley was deeper and steeper. It can be surmised that the area was probably visited infrequently, on hunting, trading or ceremonial trips.

As the local population was decimated by introduced diseases shortly after the arrival of Europeans and a major portion of its oral history was lost, we now have only the sparse observations of the Europeans, supplemented by some oral history passed to the Dharuk descendants at Blacktown, rock carvings, cave paintings and shell middens, to tell us a little about their long history. Some of this information has been presented in '*The Aboriginal People of Berowra Valley*' in this chapter of the *Guide.*

Early European influence

Shortly after the Europeans of the First Fleet arrived at Sydney Cove they began to explore the region. In March1788 Governor Arthur Phillip sailed into Broken Bay to examine the Hawkesbury River, and camped at Dangar Island. In April 1788 he made a land expedition and is believed to have crossed the upper reaches of the Berowra catchment near Pennant Hills. In the following year, June 1789, he again explored the Hawkesbury. On 9 July the expedition entered and investigated Berowra Creek, Captain John Hunter charting the course and depth of the creek up to about the Woolwash just before Sams Creek. Captain Hunter noted in his Journal encounters with the natives and the discovery of corpses, possibly the result of smallpox (Hunter, 1968 [1793], pp.109-12).

Broken Bay and the Hawkesbury River estuary surveyed in 1788-89 by Captain John Hunter

In 1802, Governor Philip Gidley King established the colony's second government farm at Castle Hill. It stretched as far north as Forest Glen, but only the southern portion near Castle Hill was developed. By 1804, seven hundred acres had been cleared and the farm encompassed portions of Cherrybrook and Glenhaven. The farm was closed in1810 and the land was granted out from 1818.

The first settlement near the Berowra Creek catchment was the government timber-getting establishment at Pennant Hills, which began operations in 1816 not far from Observatory Park. The convict timber-getters lived on the ridge dividing the waters of Berowra Creek from Devlins Creek. The government bullocks were confined in a paddock at Thornleigh. The northern fence of this government stockyard, roughly in line with Duffy Avenue, marked the

southern boundary of Berry and Wollstonecraft's 1820 timber lease, which stretched north to Cowan Forest (Hawkins 1994, pp. 12-19, 64). Doubtless the convict timbergetters in their quest for Sydney Blue Gums and Blackbutts penetrated the upper reaches of Berowra Creek.

Establishment of Timber Industry

From 1819 onwards, Alexander Berry had a timber lease in Hornsby valley, from which area he cut hardwoods (Hawkins, pers. comm.[1]).

By 1824, Thomas Higgins' quest for timber had brought him to the edge of Berowra Valley Park at Old Mans Valley. For a hundred years the Higgins family continued to log the valley for timber (Hornsby Shire Historical Society 1979, pp. 166, 200-04).

The Yanz family later ran a sawmill above the Blue Gum Valley in the 1920s. Timber was winched up a railway, with the cable being wrapped around a large Sydney Red Gum *Angophora costata* tree at the head of the valley.

A sawmill existed above the southwestern corner of Old Mans Valley, operating until the late 1960s or early 1970s on the site of the dog pound near Warrigal Road, Westleigh. A Higgins family descendant, Ted Angelo, in a personal communication, related that bullock teams originally dragged the sawn blue gum logs up the escarpment to the mill. The Duffy family, who were related to the Higgins family, eventually took over the operation.

In 1829, Assistant Surveyor Govett traced Berowra Creek to its source in the Castle Hill region (Joffe 1992, p. 16). In the following year Patrick Duffy took possession of one hundred acres of land at Thornleigh. His property, Inglewood, was reached by a lane from Pennant Hills Road that is now known as Duffy Avenue (Hornsby Shire Historical Society pp. 142-50).

In 1831, the Pennant Hills timber-getting establishment closed and the bullocks at Thornleigh were sent to Emu Plains. The land on which the stockyard stood was included in a grant of 640 acres made to the Chief Constable, John Thorn (Hornsby Shire Historical Society 1979, p. 78), for his part in apprehending the bushrangers Dalton and MacNamara, associates of 'Wild Colonial Boy' Jack Donohoe. Thorn was assisted by Constable Samuel Horne, who received a grant of 320 acres on Pennant Hills Road, which he called Hornsby Place (Ibid pp. 137-141, 144).

Constable James Bellamy also took part in capturing more bushrangers in 1835. As a boy, Bellamy roamed the timbered country around Pennant Hills, hunting kangaroos with his younger brother John; Bellamy Street, Thornleigh, which forms one of the southern entrances to the park, is named after him (Ibid p. 92).

Between 1830 and the 1840s, shingle splitters worked on Berowra Creek cutting shingles from Swamp Oak *Casuarina glauca* (Hawkins, pers. comm. & 1994, p. 36).

L. Burt 1880 (Hornsby Shire Historical Society)

Crosslands was used by pioneering builders of sailing vessels. Local builders also utilised the resources of the area to supply cut stone and sheoak shingles to Sydney builders.

By 1856, Matthew Charlton had acquired forty-three acres of land on Berowra Creek near Crosslands. In 1860, Burton Crossland was appointed caretaker of Charlton's land, some of which he eventually purchased, building a house on the flat, planting an orchard and constructing a track up to Somerville Road. He was an enterprising and skilled pioneer, building sailing vessels at Crosslands, logging the abundant sheoaks and splitting them to supply roofing shingles for buildings around Sydney. He cut stone for sale, and helped to build the stone church on Bar Island, George Collingridge's stone house and the Fretus Hotel above Calabash Bay. He was also responsible for pioneering a cart road through Galston Gorge to Galston.

Channels and wharves were built at Crosslands to assist the boat building and the

1. pers. comm.': personal communication.

export of stone and timber from the site. One of Charlton's granddaughters, Marjorie Nelson, recalled for writer Mick Joffe that the wallabies at Crosslands were so tame they would come to be fed by hand every night, as would lyrebirds and possums. By 1885, steam launches on pleasure trips were travelling up the creek to Berowra from Sydney. The Crosslands' boat, the White Cloud, was making regular trips up and down the Creek (Joffe 1992, p. 17).

The Galston Gorge bridges in the 1920s. Both bridges used the strong McPherson strut style of construction seen clearly here on the bridge now replaced by a concrete arch.

The bridges at Galston Gorge were built in 1891, before the road was made, by hauling the wooden beams through the bush with horse teams and manhandling them into place with block and tackle (Joffe 1992, pp. 42, 91).[1] The road was formed and opened by 1893.

In 1893 there was a flood on Berowra Creek and the Crosslands family had to escape from an upper window of their house into a rowing boat (Joffe pp. 18, 121).

Jack Smith established a boat shed at Berowra Waters in 1898. However, his request for a four-acre lease was denied, the surveyor finding that 1 rood 38 perches (1972 square metres) was sufficient (Joffe p. 19). The road to Berowra Creek was commenced in 1900 and completed to Arcadia by 1902. Jack Smith put a hand operated punt into service for pedestrians and horse drawn vehicles. By 1903 the Arcadia-Dural orchardists were transporting their produce to Sydney via the ferry and Berowra Railway Station (Joffe p. 19). A shark about 4.3m long was seen near the ferry in 1914 (Ibid p. 19).

Growing environmental consciousness

Through the 1920s and 1930s development continued at Berowra Waters. An early conservationist, John D. Tipper, saw that the Hawkesbury sandstone ridges and gullies were the preserve of unique animal and plant life that was becoming rare elsewhere. In 1934 he leased 250 ha, which he expanded over a period of time to the 3000 acres (1200 ha) Muogamarra Sanctuary (Joffe 1992, pp. 21, 208-09).

The sanctuary was combined with the Sir Edward Hallstrom Faunal Reserve in 1967 to form Muogamarra Nature Reserve. This added 1700 ha of land south of Muogamarra, near Cowan, that had been reserved in 1961 to protect koalas (NPWS 1990). The eastern side of Berowra Creek north of Berowra to the junction with the Hawkesbury River was now secured for posterity.

The advent of the Second World War brought the threat of invasion as the Japanese forces[2] overran countries to Australia's north. Contingency plans led to the Australian Army collecting 2000 boats and impounding them at Crosslands. In 1942 the biggest flood Berowra Creek had seen in the twentieth century swept all these boats away (Joffe 1992, pp. 22. 104). The Berowra Waters road was mined, with army personnel posted in readiness to destroy the road in the event of invasion. During preparatory blasting a fossil fish was uncovered (Joffe pp. 22, 100).

In 1948, more prehistory was uncovered when Geoff Scarrott discovered labyrinthodont footprints in his sandstone flagging quarry near Currawong Road, on the edge of the park overlooking Berowra Waters.[3]

Formation of the Park

By the 1950s, concern about the natural environment was starting to rise as it became

1. From information by Les Geelan

2. See “General Macarthur made his mark as well”, Walk 3 Refuge Rock in this *Guide*.
3. See the section on the labyrinthodont in this chapter of the *Guide*; The Story of the Park, also Joffe 1992, pp. 30-33.

evident that species were disappearing, and in some cases had already disappeared, from the Hornsby area. Local conservationists led by the then Hornsby Wildlife Conservation Society began to campaign for the reservation of some of the land along Berowra Creek to protect the local fauna, and in particular the lyrebirds.

As described in Chapter 1, the Elouera Bushland Natural Park was reserved in 1964 by the then Minister for Lands, the Hon. T. S. Lewis, 'for public recreation and the promotion of the study and preservation of native flora and fauna'. One of the trustees of the Park was Gordon Edgecombe, to whose memory this book has been dedicated. As a member of the Coast and Mountain Walkers Club, Gordon led many walks down the Berowra Valley from Thornleigh following roughly the line of the Benowie walking track.

The dedication of the Elouera Bushland Natural Park meant that the southern portion of the Berowra Valley and the north-eastern portion covered by Muogamarra were now protected. However, the western bank from Berowra to the Hawkesbury was still mainly vacant Crown land, as was the stretch from the Hornsby and District Rifle Range to Berowra and Muogamarra.

Following proposals to mine for sand at Crosslands in the early 1960s, Hornsby Conservation Society, supported by the National Parks Association and the Nature Conservation Council of NSW, began to campaign for the reservation of the vacant Crown Lands along Berowra Creek to preserve the scenery and flora and fauna. In 1971, the Minister for Lands, the then Hon. Paul Landa, announced the dedication of Marramarra National Park, stretching from Calabash Bay to the Hawkesbury River and Wisemans Ferry.

Benowie Track and Great North Walk

In 1980 the then NSW Department of Lands, in conjunction with the Elouera Trust and Hornsby Shire Council, began construction of a 25 km walking track from Thornleigh to Berowra. This track was named after what was then believed to have been a clan of Aboriginal people who inhabited the area, a sub-group of the Dharuk, who at that time were believed to have been called the Benowie. Further research has now shed doubt on this name, which does not match other tribal or clan names of the area.

In 1986, the NSW Bicentennial Council announced support for a project developed by two keen bushwalkers, Garry McDougall and Leigh Shearer-Heriot, to construct a walking track from Sydney to Newcastle as a bicentennial project. They adopted the name Great North Walk for this track (McDougall & Shearer-Heriot 1988, pp. 10-12). The Great North Walk incorporated and extended the Benowie Track.

Naming of Berowra Valley Regional Park

Only the area between the Hornsby and District Rifle Range and Muogamarra was still undedicated Crown Land under the control of the Lands Department or Hornsby Shire Council.

Following representations from the Elouera Trust and the conservation bodies, most of this land was added to the Elouera Bushland to form the Berowra Valley Bushland Park in 1988. It was converted into the Berowra Valley Regional Park of nearly 4000 ha in 1997 by the then Minister for the Environment, the Hon. Pam Allan. Thus after 63 years' effort by the conservation movement the majority of Berowra Creek is protected as part of the national park estate.

Further reading

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Graphic incorporating photographs of models exhibited by The Australian Museum Graphic: George Foster

Labyrinthodont

Bob Salt

Berowra's earliest footprints

> *'I walked across the sand and behind me stretched a set of footprints clear and decisive, telling all who might come that I had passed that way–yet by next day the wind had blown and the prints were indistinct. They did not identify me. After a brief shower of rain they were gone.*
>
> *'So it was remarkable that when I split open a sandstone block, along its cleavage line (in Berowra), I found within a perfect set of footprints of some animal who had passed this way long before I was born, before the dawn of history and even unbelievably long before the first primitive man made prints with only two feet upon the earth'.*
>
> (Joffe 1992, p. 30)

This is how Geoff Scarrott began describing to Mick Joffe his discovery in 1948, at his flagstone quarry near the junction of Currawong Road and Berowra Waters Road, of the fossil tracks — later identified as those of a labyrinthodont amphibian from the Middle Triassic period, some 230 million years ago.

Scarrott reported his find to the Australian Museum. The Museum's palaeontologist, Harold Fletcher, was at first sceptical because at that time footprints in sandstone of this age were rare, and previous reports in Australia had been proved false. But inspection revealed that the prints were very clear and numerous. Fletcher stated that labyrinthodont footprints were 'well known from excellent specimens collected in Bavaria and are similar to the impression that would be made by a chubby hand' (Fletcher 1948, p. 249).

Labyrinthodont amphibians were a subclass of early salamander-like creatures that came into existence in the Late Devonian period and that were common during the Triassic (Fletcher 1948, p. 249 & Robert Jones, pers. comm. 23 June 2000). Fletcher considered that the tracks found at Berowra were made by an animal of considerable size. It was estimated to be about six to eight feet (1.8–2.4 m) long. The two lines of footprints were thirteen to fourteen inches (330–355 mm) apart (Fletcher 1948, p. 250).

Labyrinthodonts of this size are believed to have looked and acted like an early crocodilian with a short tail and fish-like scales over most of their body. Labyrinthodonts 'were so called because of the intricate and involved folds in their conical teeth' (White 1984, pp. 255-56).

Scarrott, in a remarkable display of public spirit, expended a great deal of time and effort in uncovering all the footprints and removing the slabs for transport and donation to the Australian Museum, where they were exhibited in the palaeontological gallery. Part of the collection is now on loan to the Newcastle Regional Museum.

The footprints aroused international interest and settled a long-standing controversy about the formation of current bedding in sandstones (Joffe 1992, p. 30).

Other fossils from early times discovered in the vicinity of the park include fish at Berowra, Cowan, Galston, Hornsby Heights, Asquith and Thornleigh (Willis 1997/98, pp. 28-29).

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The tracks in situ at Berowra during their removal to the Australian Museum

Sandstone slab segments removed from the Scarrott Quarry showing tracks made by a labyrinthodont. These specimens are held by the Australian Museum in Sydney.

PHOTOGRAPHS BY HOWARD HUGHES AUSTRALIAN MUSEUM, C. 1948. REPRODUCED WITH THE PERMISSION OF THE AUSTRALIAN MUSEUM

The Aborigines of the Valley relied entirely on the natural environment for their materials. Mangroves, as well as being a location for fishing and food gathering, would certainly have provided many of their implements.

Aboriginal People Of Berowra Valley

Dr Jim Kohen

Prehistory

Aboriginal people believe that in the distant past the landscape was created by the movements and actions of creation spirits. Amongst the Gundungurra-speaking people from the Blue Mountains, who share many of their creation stories with the Sydney tribes, the belief was that a giant part-eel part-reptile called gurungaty, while being hunted by mirrigan, the tiger cat, escaped by digging out all of the rivers and waterways in the Blue Mountains and the surrounding areas. There is an engraving of a gurungaty on the eastern bank of the Hawkesbury River south of Wisemans Ferry, within the territory of the Dharuk people, so it is likely that gurungaty was also the creator of the land of the Dharuk and probably also of their neighbours to the east, the Kuring-gai people. The branch to the south of the Hawkesbury River now known as Berowra Creek was also created during gurungaty's escape.

The period of time that Aboriginal people have lived in Australia is not yet clear, but most people accept that there is good evidence for occupation in northern Australia 50 000 to 60 000 years ago. There are certainly sites in western New South Wales and Tasmania that date back more than 35 000 years, and sites around Sydney extending back more than 20 000 years. Along the Hawkesbury-Nepean River and on Darling Mills Creek there are several rock shelter sites that were first used by Aboriginal people between 10 000 and 15 000 years ago. The earliest occupation of the Sydney area is therefore likely to have been more than 35 000 years ago, although the evidence for that occupation has been destroyed by rising sea levels.

Over the past 100 000 years, the sea levels have risen and fallen in response to changing world temperatures. When the temperatures were cold during the ice ages, much of the water was locked up at the poles in the form of ice, and as a result the sea levels fell, exposing new land and joining areas together. At times of low sea level, New Guinea and Tasmania were both joined to the Australian mainland. For the valley of Berowra Creek, these changes in sea level would have had little direct impact, for although the coastline was as much as 20 km further to the east, the creek would still have flowed through the valley, although the flow rate would have been considerably less. The water would have been fresh, and the Hawkesbury would have been a much smaller river. The surrounding vegetation would have been different because of lower temperatures, which may have been on average as much as 8^{o} C cooler than at present.

A major difference would have been found with the fauna. In addition to the species that are still present in the area such as kangaroos, wallabies, possums and koalas, there was also a large group of animals referred to collectively as the 'Australian megafauna'. They included giant kangaroos up to four metres tall, the diprotodont, a grazing animal the size of a rhinoceros, a marsupial lion, giant emus and goannas. Most of these animals became extinct around 20 000 years ago. Two other more familiar animals would have occurred in the valley. The Tasmanian Tiger, or Thylacine, and the Tasmanian Devil both survived on the mainland until within the last few thousand years. These species became restricted to Tasmania mainly due to competition from the dingo, which arrived in northern Australia less than 4000 years ago.

By around 6000 years ago, the sea levels had stabilised around their present levels. From this time, large numbers of occupation sites, particularly coastal sites, were being used by Aboriginal people for the first time. However even within this period of stable mid-late Holocene sea levels, there are suggestions that perhaps two distinct stages of occupation occurred, one around 4000 years ago and another around 1500 years ago. Most of the archaeological sites in the Berowra Creek catchment are less than 2000 years old.

Aboriginal sites

In the Hawkesbury Sandstone country there are rock shelters, which provided ideal sites for individuals or small family groups to camp. In many of these shelters hand stencils can still be found, identifying those people who had a responsibility to look after and use the land. They signified their ownership by stencilling their hands onto the shelter walls with ochre or

white pipe clay. In other shelters charcoal drawings and ochre paintings were made of animals that were important either as totems or as food items. Sometimes, drawings depicted the creation stories of the area.

In both shelters and on open camp sites, stone tools were manufactured, used for making wooden artifacts or for hunting, and later lost or discarded. The bones and shells of the animals that were eaten were also disposed of in and near the camp sites, and charcoal from the fire places provides a material that archaeologists can use to date the age of the site.

Shell middens form one of the most obvious site types. They range in size from a small number of shells to extensive accumulations covering many square metres. Usually the middens are dominated by the shells of a small number of species that are to be found in close proximity to the site. Along Berowra Creek, cockles, oysters and mussels tend to dominate. The gathering of shellfish was a task carried out by the women and children, while the men would hunt fish, possums and other game.

On the flat sandstone outcrops sophisticated engravings of totemic animals and representations of the dreaming spirits who created the landscape were created by pecking a series of holes around the outline of the image, and then removing the space between them by rubbing with a hard stone. Some of these sites were sacred, and used during initiation ceremonies. Some were used exclusively for men's business, while other sites were places used by the women. Substantial stone arrangements were sometimes associated with religious ceremonies, and other smaller groups or isolated stones positioned in particular ways were used for directing visitors to important places.

From an Aboriginal perspective, it is the engraving and its context in the landscape which is important. Although a rock engraving may have artistic merit, it is not significant just as a work of art. It is significant because of where it is located. To conserve Aboriginal rock art is not to dig it up and remove it from one site and redeposit it elsewhere. It is to conserve the engraving or engravings in the environmental setting where they were created.

A recent study on rock engravings came to the conclusion that there were distinct changes in the art on the opposite sides of several waterways in the vicinity of Sydney. The art is distinct on the east and west banks of the George's River, the Lane Cove River, Mangrove Creek and Berowra Creek. When this is compared with the information on the languages spoken around Sydney, there is a striking correlation. On the eastern side of the George's River were the Dharawal people; on the eastern side of the Lane Cove River and Berowra Creek were the Kuring-gai people; while to the west of these three waterways were the Dharuk. On the north side of the Hawkesbury, Mangrove Creek separated the Kuring-gai in the east from the Darkinjung in the west. Berowra Creek therefore marks the boundary between the Dharuk and Kuring-gai tribes, and, as such, the surrounding Berowra Valley probably played an important role in ceremonies in which both groups would participate.

All of these signs of Aboriginal occupation—shell middens, camp sites, rock shelters, stencils, paintings and engravings—which demonstrated use, ownership and responsibility for the land, were simply ignored by the European settlers, who saw the land as unused and unoccupied, a *terra nullius*.

Tribes and languages

When Europeans first arrived in Australia there were between one and two million Aboriginal people speaking over 600 distinct languages and occupying every single ecological niche right across the continent. From Port Jackson north across Broken Bay and beyond Brisbane Water lived a group of Aboriginal people who shared a common language. That language is known as Kuring-gai, derived from the name which Aboriginal people in south-eastern Australia still use to describe themselves—*kuri* (koori). The termination *-nggai* identifies the possessive form of the word. *Kuring-gai* can be loosely translated as 'belonging to the Aboriginals'. The fact that these people shared a common language identifies them as a tribe, although almost certainly several dialects of that language were spoken. Amongst the Kuring-gai, there were many smaller units called clans, which early European settlers referred to as 'tribes'. There are many accounts of the *Cammeraigal* 'tribe', but it is now recognised that the *Cammeraigal* were a clan of the Kuring-gai. Several other clan names are recorded in

the journals of the First Fleet officers. To the north of the *Cammeraigal* were the *Terramerragal* (*Turramurragal*), while to the east were the *Gayimai* from Manly. In the vicinity of Broken Bay and Pittwater were the *Carigal* (*karee-gal*), while on the north side of Broken Bay were the *Erina*, *Narara*, *Terrigal* and *Wyong* clans, who have been perpetuated in place names. Later blanket lists also record the people at Brisbane Water as belonging to the *Walkeloa* 'tribe'[1]. Each clan would consist of 50-60 people, sometimes more, made up of the men who were born on their clan territory, their wives and children.

When Europeans first arrived in Port Jackson in 1788, they elected to settle on the south side of the harbour. In doing so, they chose the territory of the Dharuk-speaking people. The coastal sub-tribe is sometimes referred to as Eora ('eora' literally 'the [local, black] people'). Port Jackson and the Lane Cove River marked the boundary between the Dharuk and Kuring-gai tribes, although they shared a common economy and attended each other's ceremonies.

In 1790 and 1791, First Fleeters like William Dawes, and to a lesser extent David Collins, Daniel Southwell and others, recorded the language and grammar of the people living near Sydney. They did not give this language a name, and it took them several years before they recognised that many different languages were being spoken in the vicinity of Sydney. Troy (1994) refers to it simply as 'The Sydney Language'. When Europeans travelled to the Hawkesbury River, they found that the Aboriginal people living there spoke a different dialect of the language spoken on the coast — the grammar was the same, some of the words differed, but each group could understand each other perfectly. It has been suggested that these two groups spoke different languages, but a comparison of the 1790s material with the 1791 accounts from the Hawkesbury and later accounts compiled in the early 1800s shows that these were in fact dialects of the same language.

The boundary between the two dialects is relatively easy to define - it was west of Parramatta. The *Burramattagal* clan spoke the same dialect as those at Sydney (the *Cadigal* clan). This dialect was also spoken by the *Wangal* from Balmain to Concord, the *Wallamattagal* along the north side of the Parramatta River west of the Lane Cove River, and probably by the people living between Botany Bay and Port Jackson.

The boundary at Parramatta also corresponded to an economic boundary. Those who lived to the east were referred to as 'coasters', or 'sea people', while those inland were referred to as the 'woods tribes'. These inland people called themselves the *Bediagal-tugagal-tugara*, literally 'the people from the flat cold woody country'.

While this analysis suggests that everyone living from Sydney to the Blue Mountains spoke the same language, some word lists have been found that indicate that the situation on the north side of Port Jackson was different. In the early 1820s, the missionary Lancelot Threlkeld recorded a language 'to the northward of Sydney' which he called 'Karee', undoubtedly an alternative spelling of the word *cari*—the people living near Pittwater and Broken Bay were the *Carigal*. It was a *Carigal* man who speared Governor Phillip at Manly. Threlkeld showed that this was different from the language spoken at Sydney, and also different from the language spoken at Lake Macquarie and Newcastle, the language of the *Awaba* clan. Other wordlists from 1802 and from the 1840s, where the informant was Long Dick, a son of Bungaree, confirmed that a separate language was spoken between the north side of Port Jackson across Broken Bay to the Central Coast.

The Berowra Creek valley therefore has an important role to play in understanding Aboriginal activities in the Sydney area, as it marks the boundary between the Kuring-gai on the east and the Dharuk on the west. As a boundary area, it was undoubtedly a point of contact between the two groups. These contacts would have been essentially friendly, as is confirmed by other accounts of early inter-tribal contacts at Port Jackson, Botany Bay and east of Mangrove Creek.

1. Magistrates were required to issue blankets annually to Aboriginal people living in their district, and they compiled lists of men, the number of wives and children, their 'tribe', and where they were usually located.

Engraving sites required a reliable water supply and were often in places with other desirable features such as views. These fish are beside a deep round depression in rock high above a steep section of the valley. The depression holds water for lengthy periods making the location a site suitable for engraving. Other nearby engravings were lost when the northern area of Westleigh was developed for residences in the 1980s.

PHOTOGRAPH BY GEORGE FOSTER 1984

Marriage, trade and ceremonies

Within both the Dharuk and Kuring-gai, a man would obtain a wife from outside his own clan, and she would need to be of the correct totemic affiliation for the marriage to be allowed. Marriages are also known to have taken place between men and women from adjoining tribes. Most Aboriginal people were multilingual, and could understand the language of the tribe or tribes adjoining them. Certainly Dharuk and Kuring-gai people could understand each other with little difficulty, as the two languages had many words in common.

A man could have more than one wife, and, because two brothers would have the same totem, a widow would often become the wife of her dead husband's brother. A network of close relationships was established linking people from adjoining clans. It was not unusual for members of one clan to visit relatives from other clans, and large gatherings of up to several hundred people took place during ceremonies.

One of the consequences of this social network was that scarce resources could be traded or exchanged. For example, sources of stone for the manufacture of hatchet heads and sharp cutting tools were found only in a few areas. The pebble beds along the foot of the Blue Mountains provided a source of basalt pebbles, which were ground into hatchet heads, and chert pebbles, which were flaked to make woodworking tools, spear tips and barbs. From sources near South Creek and Eastern Creek, silcrete pebbles were traded as far east as Sydney and north to the Hawkesbury River.

For the Kuring-gai people, much of the stone they used came from the north side of the Hawkesbury River. A distinct boundary is found on the east and west sides of the Lane Cove River and Berowra Creek. Silcretes and cherts are common to the west, but on the eastern side of the river most of the stone is local quartz or comes from sources on the north side of the Hawkesbury River. Once again, the archaeological evidence supports Berowra Creek and the Lane Cove River as being major boundaries.

Hunting and gathering

In common with all Aboriginal people across Australia, the Dharuk and Kuring-gai who occupied the Berowra Creek area were hunters and gatherers. While the men hunted fish, possums, bandicoots, wallabies and other animals, the women would collect yams, tubers, fruits, honey and small reptiles. In Berowra Creek they gathered shellfish, which included the Sydney cockles and whelks that were plentiful on the sand flats and mud flats, as well as the rock oysters that were attached to the rocks and mangroves.

The toolkit was relatively simple, but entirely appropriate. Men would carry a range of spears, either multi-pronged fishing spears or barbed hunting spears, a spearthrower or woomera, boomerangs or clubs, and a *mogo*, or edge-ground hatchet. The toolkit of the women consisted of a digging stick, a bowl or coolamon, and perhaps some string bags or baskets. Women fished with hooks and lines. The hook was usually ground down from a turban shell, and was attached to a *currajong*, or fishing line, made from the inner bark of either a kurrajong tree or a fig tree. Both men and women fished with nets.

The mogo was an important tool because it was used to cut toe-holds in trees for catching possums, gliders and koalas, as well as for stripping off bark which was used for canoes and shelters. Each family would have a canoe, which was made from a single sheet of bark heated slowly over a low fire and bent into shape. In the bottom of the canoe, on a base of clay, a small fire would be lit to cook some of the fish that had been caught. The remainder of the fish would be brought back to the shore where they would be shared with other members of the clan.

The diversity in the vegetation around Sydney meant that at any time of the year, a range of food plants would be available. A plant seasonally used by Aboriginal people for food was the Burrawang *Macrozamia communis*, which provided a major source of carbohydrate when the seeds were available. It is poisonous and required extensive preparation by soaking and pounding before the toxins were removed.[1]

The social system that exists in traditional societies contributes to the conservation of resources. A Dharuk or Kuring-gai person would not hunt or harm his or her totemic animal. The Dharuk people used the word *mirriburra*, which

1. For a table of local Aboriginal names for some common plants around Sydney, see Appendices.

literally means 'dog food'. It refers to fruits which have fallen to the ground, and which could be eaten by dogs and children, but not by adults. In many areas, adults were not allowed to pick up fruits that had fallen from the trees. This ensured that that resource would be available in the future.

By using a whole range of techniques, Aboriginal people increased the productivity of their land. They replanted parts of yams, they discarded the seeds of fruits close to the regular camping places, and they built extensive fish traps on the coast and in the larger rivers. Once Europeans arrived on the scene, their land use practices were destructive, and totally different from Aboriginal methods. In the Sydney region, the Europeans cut down the trees, driving away the possums and kangaroos. They used large seine nets to catch all the fish in the small bays, rather than using a hook and line or a spear, and only taking what was needed. They dug up the ground along the banks of the Hawkesbury River to plant their crops, and in the process destroyed the yam beds on which the Dharuk people depended (the word *darug* means yam). For over 30 000 years, Aboriginal people had been practising a balanced control over the environment, and one important tool which contributed to their success was fire.

Fire

Fire has been a component of the Australian biota for a considerable period of time. Much of the Australian vegetation is fire-adapted, or at least fire-resistant. In the Sydney area, when Europeans first arrived they found vast areas which they described as being like parks, with tall trees spaced well apart and a grassy understorey. Governor Phillip recorded that the trees were 'growing at a distance of some twenty to forty feet from each other, and in general entirely free from brushwood'. This environment was created by the Dharuk and Kuring-gai people through regular burning.

Fire was used systematically to 'clean up the country', resulting in areas where the trees were well spaced, and a lush grass pasture grew, sustaining higher densities of kangaroos and wallabies than would otherwise have been the case. Fire along the ridges was used to make travel easier. Fire was used to hunt both terrestrial and arboreal animals, and to clear away snakes from camping sites. Governor Phillip observed 'the natives so frequently setting fire to the country, which they do to catch the opossum, flying squirrel, and other animals'. Although Aboriginal burning may well have been used to catch small game, it also played an important role in the regeneration of some useful food plants.

The regular, low-intensity fires meant that certain kinds of plants were advantaged at the expense of others. Regular low-intensity burns increased the productivity of many lilies and terrestrial orchids, which have edible tubers. However, fire was also used to protect those important food plants which grew in the wet sclerophyll forests and rainforests which lined the rivers and creeks. By burning along the margins of these areas, firebreaks were created, which prevented bushfires destroying valuable resources. In effect, Aboriginal fire regimes were maintaining vegetation mosaics resulting in high species diversity, a rich diversity which could be used to feed and sustain the high Aboriginal populations.

Not all the effects of Aboriginal burning were positive. Hughes and Sullivan (1981) looked at the deposition of silts and sands in many river valleys around Sydney. They suggested that between 4000 and 2000 years ago, there had been a significant increase in valley fills, the deposition of deposits along the river valleys adjacent to the creeks. This, they suggested, was due to an increase in the frequency of fires, which would reduce ground cover and increase run-off and sedimentation, particularly after heavy rain. They suggested that there may have been an increase in the frequency of Aboriginal burning in these river valleys during this time period. Conversely, the firing frequency before about 4000 years ago may have been significantly lower, and the change in burning patterns seems to have corresponded to the introduction of new stone technology in the Sydney region involving the production of spear tips, points and barbs. The implication is that the increased use of fire might be viewed as a component of a new suite of technologies which was related to more efficient hunting of kangaroos and wallabies.

While it is not clear when frequent burning began, Aboriginals were still burning in the Berowra Creek Valley until the 1830s. On Monday 5 August 1833, Mrs Felton Mathews recorded in her diary:

Went up Berowra Creek; this is a very large and deep stream, and in many parts capable of admitting ships of any burthen, but its course is through such a desolate country that it can never be of any avail, nothing but rocky mountains and forests interminable; not a settlement of any description; not a sound to be heard, or living thing to be seen: a silence almost oppressive reigned around, the regular splashing of our oars, alone waked the echoes of the mountains: we rowed about nine miles up this solitary Creek without seeing a vestige of human habitation, excepting the deserted and ruined hut of some Lime-burner, marked by heaps of blackened shells near it. Returning, we heard in the woods the sound of an axe, some shingle-splitter, felling His Majesty's trees, in pursuit of his profession probably: in a solitary bay we saw a canoe, with a fire in it, and emerging from a glen, two Blacks carrying vessels of water, they appeared to have been fishing, and probably secured a supply of fresh water before 'sitting down' for the night: a little further on they had set the grass on fire, which was spreading up the side of the mountain with incredible rapidity, running up the highest trees in a moment. We reached our tent tired and cold, for the wind had set in strong against us, and rendered our return tedious and disagreeable; the weather had been lowering all day, and some slight showers had fallen. (Havard 1943)

This description confirms the method of Aboriginal burning, starting near the bottom of the ridge and allowing the fire to spread up to the ridge top. It also shows that they were burning at a time when the rain would put out the fire. It was this knowledge of the local topography and environmental conditions which allowed the Dharuk and Kuring-gai to control their fires.

As European settlement spread out from Sydney, traditional Aboriginal burning practices ceased. Once this happened, vegetation associations changed, animals which were once common rapidly declined, and in some cases disappeared altogether.

Once the Aboriginals stopped burning, the underbrush returned where none had

Grinding grooves at an elevated site above Fishponds. Ample water is retained by a hanging swamp and marked by the sedge grasses and mosses common in such areas.
PHOTOGRAPH BY GEORGE FOSTER, 1983

previously existed. Benson and Howell (1990) suggest that the growth of Blackthorn *Bursaria spinosa* in the Sydney area in the 1820s was probably related to a changed fire regime associated with the cessation of Aboriginal burning.

History

The history of European settlement of Australia began in 1788 with the arrival of the First Fleet. However, as a result of the Mabo decision of the High Court of Australia in 1992, there is now legal recognition of what Aboriginal people have always known — that a complex system of land tenure had existed across Australia for thousands of years, and was still in existence when white settlers declared Australia a *terra nullius*, suggesting that there were no legal owners of the land. Yet in the Sydney region in 1788 there were literally thousands of Aboriginal people. Governor Phillip estimated that there were 1500 Aboriginals living along the coastal strip between Botany Bay and Broken Bay. To this should be added the thousands who lived west of Sydney extending across the Cumberland Plain into the Blue Mountains. As early as 1770 and again in 1788, there are descriptions of 'villages' housing up to sixty people in Botany Bay.

It is clear that the total Aboriginal population around Sydney numbered several thousand. However, the arrival of Europeans at Port Jackson in 1788 marked the beginning of a period of dramatic change for the Kuring-gai and Dharuk. It was the Dharuk initially who faced the immediate threat, for within a few weeks of the British flag being raised, large areas of land were being cleared; a major source of fresh water, the Tank Steam, could no longer be used; fish were becoming scarce because the Europeans were catching large numbers in seine nets; and larger animals were being driven away.

Although initial contacts were friendly, it was not long before convicts began to steal Aboriginal fishing equipment and destroy canoes. At least one Aboriginal man was killed without provocation, and as a consequence some spearings took place in retaliation. The contacts between the settlers and the Aboriginals became rare.

In April 1789, a disease believed to be smallpox was observed amongst the Aboriginal people in the Sydney area. It was apparent that the local population had no resistance, and that this disease was having a dramatic impact. Bodies were observed floating in the harbour and left to decay in the rock shelters along the shores of both Port Jackson and Broken Bay. The Dharuk and Kuring-gai tribes both suffered, with the death rate estimated at somewhere between 50 per cent and 90 per cent. A conservative estimate is that between 500 and 1000 Aboriginal people died on the coastal strip bounded by Botany Bay and Broken Bay within eighteen months of white settlement.

At least some Kuring-gai clans remained intact. Men from the *Cammeraigal* clan attended initiation ceremonies at Farm Cove in 1795, and their *karadjis* (clever men) supervised the 'tooth evulsion' (knocking out the left front tooth). The *Gayimai* clan in the Manly area were severely affected, and the last references to the *Terramerragal* clan date to the 1790s. It must be assumed that their numbers had declined to the point where the remaining members joined with other clans, probably the *Carigal* at Pittwater and West Head.

Because the traditional territory of the Kuring-gai extended across the mouth of Broken Bay as far north as Tuggerah Lake and possibly to the southern shores of Lake Macquarie, the remaining Kuring-gai population tended to congregate around two major centres, Sydney and Gosford. In 1816, Governor Macquarie established a farming settlement at George's Head, which acted as a focus for many of the Kuring-gai. The 1828 census shows that there were clans still living at Parramatta, Richmond, Liverpool, Mulgoa, Burragorang, Cowpastures, Nepean, Portland Head (Wisemans Ferry), and First Branch (MacDonald River) between Parramatta and the Blue Mountains, and along the Hawkesbury at Mullet (Dangar) Island, Mangrove Creek, Northeast Arm (Brisbane Water), Broken Bay, Erina, and Narara. This suggests that there were no traditional owners living along Berowra Creek, or at least that Berowra Creek was one of the areas used only occasionally by the Kuring-gai.

By the 1830s, records from blanket lists suggest that the total Kuring-gai population consisted of fewer than 100 people, and that there was a great mobility between Gosford and

Sydney. There are several accounts of Kuring-gai people travelling from Broken Bay to Port Jackson. One old resident of the north shore recalled the time when Kuring-gai people would travel from the Lane Cove River at a point near Burn's Bay to Cowan, camping near Pymble overnight. As late as the 1880s, the missionary Daniel Matthews describes Aboriginal people living on the north shore of Port Jackson and at Manly who travelled to Sydney to receive their rations. When in Sydney, they stayed at the Government Boat Sheds at Circular Quay.

By the turn of the century many Aboriginal people had been displaced from their traditional country by missionaries or the Aborigines Protection Board. In the early 1880s, over forty people were taken from Sydney and Gosford to Maloga Mission on the Murray River. Many of these were Dharuk and Kuring-gai people. The traditional owners of the Kuring-gai lands could well be living in the country of the Yorta Yorta people near the Victorian border.

Contemporary Aboriginal populations

While the numbers of Aboriginal people around Sydney declined dramatically, thousands of people can claim to be the descendants of the Dharuk, and a smaller number have ancestry which can be traced back to the Kuring-gai.

Several organisations exist representing the traditional owners of the Sydney area. Many people are descended from those Aboriginal people who were forced to live on the Sackville Reserve. Others are the descendants of those who moved to settlements like La Perouse and Botany. In many cases, it has been possible to trace Aboriginal ancestors back to the early nineteenth century, and in some cases to the 1790s. Under the *Aboriginal Land Rights Act 1983* (NSW), local Aboriginal Land Councils have the right to claim unused crown land, as do traditional owners under the *Native Title Act 1993*.

Aboriginal people are starting to have a greater role to play in management of National Parks.; their custodianship and cultural heritage is finally being recognised.

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Historic quarry and zigzag railway

The text and illustrations in this article are based on work by James Mitchell, from notes by Ralph Hawkins, which appeared in the 1983 edition of A Guide to Elouera Bushland Natural Park. *The assistance of notes made by D. B. King (March 1969) is also acknowledged.*

Near the end of De Saxe Close in Westleigh is a quarry in the sandstone, first worked during the 1880s to procure white metal — metamorphosed sandstone — used as ballast for the northern railway line then being constructed largely as a means of getting horticultural products, particularly stone fruit, to the Sydney market. The quarry eventually fell into disuse probably at the time the more accessible sandstone quarry north of Quarter Sessions Road was opened up in about 1920.

The quarry was connected to the main northern railway line by a zigzag railway, one of only three built in New South Wales.

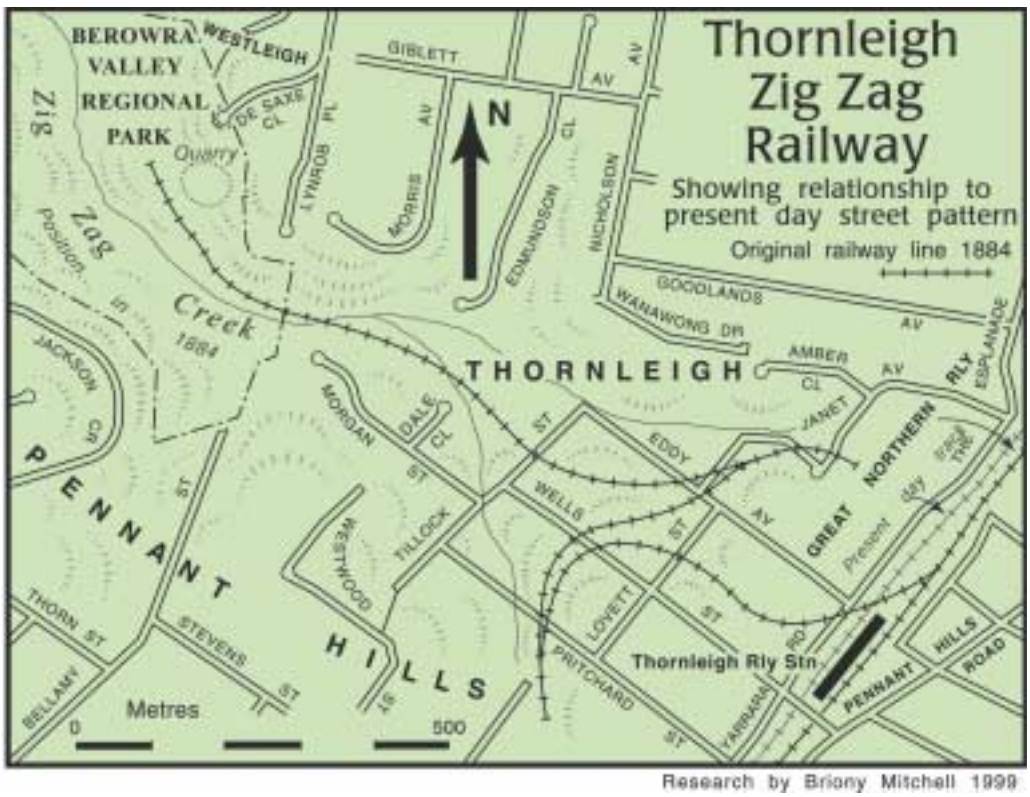
In March 1969 D. B. King of Thornleigh provided some notes and a map of the zigzag:

This little-known line was remarkable for its zigzag. This branch was constructed by Amos & Company for the purpose of obtaining ballast for their new construction work, the use of sandstone being standard practice at that period. A large quarry was opened out. three-quarters of a mile from the site of Thornleigh Station but at a lower level of 100 feet of more. The only way to obtain rail access in such a short distance was by the use of the zigzag. After the completion of Amos & Company's contract, the line lay idle for some years until revived by Angus and Monie, contractors for various duplication works. Weekly notices of 1891 mention contractor's trains running from Thornleigh to Clyde and Liverpool.

Halls Camps

Associated with the zigzag railway was a railway settlement known as Halls Camps. The settlement has vanished. Only broken glass and china found on the site of the housing development near the Bellamy Street entrance to the Park tell of its former existence. A writer described the scene in 1888 as follows:

Facing down the gully is the deep back of the quarry and many scores of navvies are toiling in



the bright sun and clear air feeding the greedy hoppers of a steam-driven crushing machine. The machine pours out hourly tons of rubble and in a separate heap is a sort of 'tailings dam' or accumulating heaps of siftings. Below again the very heart of the depression between the thickly wooded hills is the 'camp', primitive and hurriedly erected canvas and bark dwellings appear. There is here such a pure loveliness in the surroundings and such an air of Arcadian freedom and peace in the neighbourhood that one is almost tempted to believe that no truer happiness could here be found. There are pretentious-looking buildings perhaps wholly built out of galvanised iron whereupon the signs such as Boarding House or General Store hang out and there are all and sundry the mysterious ever-differing dwellings down to the ordinary calico tent.

(Cumberland Mercury 28 Nov.1888, cited in Pioneers of Hornsby Shire, p. 155)

Road access

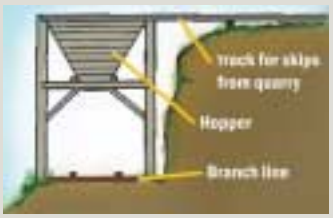
Stone was taken out of the quarry not only by rail but by bullock carts. Evidence of the first road into the quarry, built in the 1890s, can still be seen in the bush track at the de Saxe Close entrance to the Park. About half way down the log steps, just beside the concrete channel, traces of an old track can be made out, running parallel to the fire trail below. The fire trail itself, leading to Timbarra Road, follows the line of the 'new' sandstone cobbled road formed in about 1912, which became necessary as the quarry got deeper. The track was covered by the construction in 2004 of a concreted cycleway. The new track also serves as an emergency roadway during the bushfire season. (For more information see "Enjoying the Park" Chapter 6, Elouera Walk). The two routes converge at the entrance to the quarry.

The quarry

During World War II the local militia used the quarry as a firing range for small arms. Around the early 1980s it was developed by the Park Trust as a form of amphitheatre and picnic area, including timber benches and central fireplaces. From the quarry, across the cycleway, a rough track descends steeply down the hillside to Zig Zag Creek, and the waterfall that featured on the cover of the first, 1983, edition of the *Guide to Elouera Bushland Natural Park*.

Goods steam locomotives of the time were used on the zigzag branch line by contractors who built and duplicated the Main Northern Line and other lines in the south west of Sydney.

PHOTOGRAPH COURTESY OF THE LITHGOW ZIG ZAG RAILWAY HISTORICAL SOCIETY



The Historic Quarry, the site of the railway and hopper, and the line of bullock tracks of 1880 and 1912

Traces of the hopper and railway

In 2001 the quarry was still unambiguously what it had been at the outset: a quarry, although long disused. At first sight there is no evidence at all of the railway.

Warwick Madden

The trackbed of the railway is clearly evident east of the bridge across Zig Zag Creek after a 2004 controlled burn.

What must have been the site of the hopper can still be identified, in the position indicated in the historic quarry illustration. It would have been fed by small rail skips and/or a chute and stood on a flat section of the hillside, straddling the branch line track. This track would have had to extend a train's length beyond in order to allow the last wagon to be loaded from the hopper. Close inspection will reveal that the terraced shelf on the hillside continues on in the thick undergrowth in the direction of Timbarra Road and that sections of the dry stone-wall embankments, which had been built to support it, still remain.

The hillside is steep with heavily overgrown undergrowth. While a precise route is not obvious beyond the vicinity of the quarry, about halfway down the fire trail there is landscaping evidence of what might have been the rail trackbed running off to the left. While no sleepers or railway relics remain visible, what appears to be a trackbed can be found to continue through the overgrown bush without interruption by significant obstacles other than trees that have grown up since the track was removed. Substantial works to instal sewerage reticulation would have disturbed the area prior

to 1970. Just before Zig Zag Creek, formerly Halls Creek, there is a cutting several metres high through the rock, on the alignment of the track. Two creek crossings are shown in the Thornleigh zigzag railway map. A timber trestle bridge appearing to have been constructed across the creek close to the rock cutting.

The actual zigzag section

According to D. B. King, the section of the zigzag route at the quarry end was still well preserved in 1969, through cuttings, embankments and a stone-filled culvert.

It was not possible to identify the path of the zigzag between the creek and the main line because of private housing. However, D. B. King had provided a map showing four sections of the route in the vicinity of Tillock, Pritchard and Wells Streets, and Janet Avenue, that were still clearly recognisable in 1969. Thirty years later, the whole area was covered with housing. Even so, in Pritchard, Wells and Eddy, three parallel streets on a slope running north-west of Thornleigh Station, the slope remains interrupted by flat sections. These suggest where the zigzag crossed them, which observation can be matched against the route shown on the zigzag railway map.

Zigzag bushwalk

It is hoped that a Council-approved bushwalk with appropriate interpretative markers may be developed tracing the Thornleigh zigzag railway branch line route.

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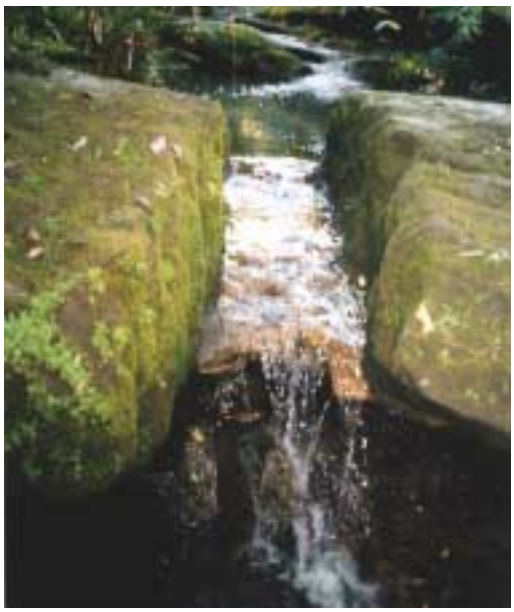
Briony Mitchell

Worked stone track bed of the railway line, above, adjoining the site of the branch line's long gone trestle bridge over Zig Zag Creek. Shallow cuttings in the sandstone hillside further mark the track beyond this point.

A 450 mm-wide channel in the creek bed near the site of the second of two trestle bridge.s that crossed the small creek. Foundation recesses in the sandstone edges of the creek are also clearly visible.



Briony Mitchell

Tramways of Old Mans Valley

Malcolm Bruce

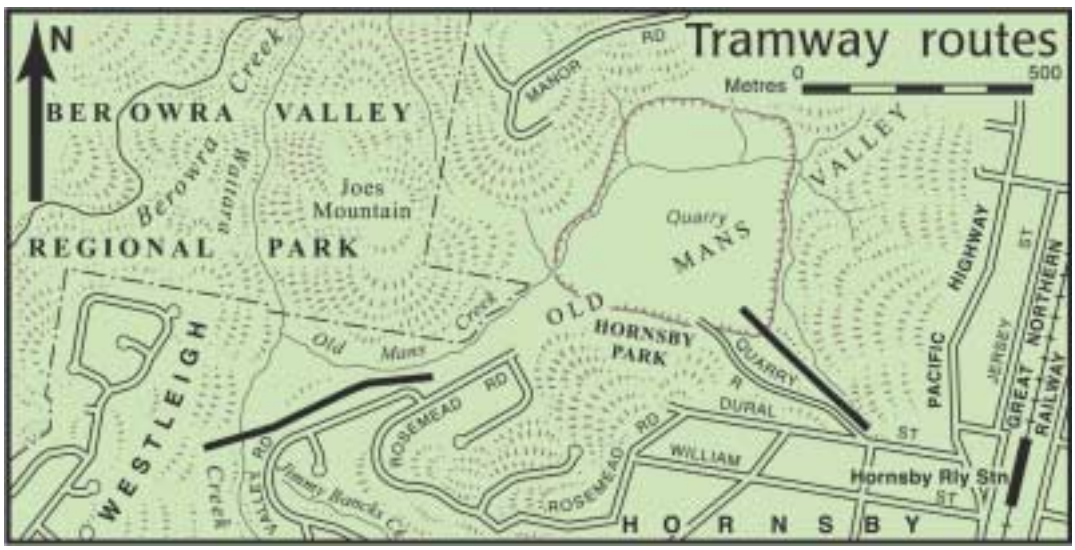
Two small tramways were constructed in Old Mans Valley. The older, near Valley Road, is believed to have been built by the Higgins or MacKenzie families to assist them move baskets of fruit from their orchards to the packing sheds. It was probably horse drawn and more than likely had wooden rails, although the presence of light gauge steel rails, discarded at the present junction of Jimmy Bancks and Waitara Creeks, indicates that at some stage some or all of the tramway may have had steel tracks.

The exact location of this tramway is now covered by the West Hornsby Sewage Treatment Plant. During the construction of this the courses of both Jimmy Bancks and Waitara Creeks were changed. Waitara Creek was moved 15 m to the west and Jimmy Bancks Creek was shortened, entering Waitara Creek 30 m upstream of their original junction. The land on the east side of Waitara Creek was then raised by 15 m of spoil, totally obliterating any trace of the orchard and the route where the tramway may have run. Members of the Higgins family are unsure of even the location of the tramway and when it fell into disuse, but believe that this was before World War II.

Steam traction engines were a major source of power for rural, extractive and many other industries. It is most likely that a similar engine drove a rock crusher at the railway ballast quarry on the Thornleigh zigzag branch line.

The second tramway was near the south-eastern edge of the quarry, behind Dural Street, terminating behind the Hornsby Aquatic Centre. It was a cable-drawn tramway and was used to bring crushed blue metal from the quarry to hoppers for delivery to road trucks. There was originally a steam traction engine driving the winch, which was replaced in turn by a stationary steam engine, a diesel engine, and an electric motor. The traction engine was used in the quarry for many years and was seen all over Old Mans Valley, even in the orchards.

The tramway was constructed by the original quarry owners and the author can remember seeing it operating in late 1969. It is believed that the tramway was removed in 1972 when a new road was constructed into the quarry after its takeover by Farley & Lewers.



Calna Creek Bridge

John Read

The builders of the Benowie Walking Track had a dilemma. Walkers faced a detour of two kilometres or more upstream unless a bridge with a seventeen-metre span crossed Calna Creek near its junction with Berowra Creek. A suspension bridge and other options were considered but finally, because of the sandy eastern shore and foundation limitations, it was decided to construct a simple bridge consisting of two power poles bolted together abreast, topped with decking.

The longest power poles, from Wauchope, had to be used. At twenty-three metres long and weighing over seven tonnes each, their weight was a major problem. To transport the massive poles to the site by water would require a floating crane on a barge to lift them in place, as well as a high tide. This was impracticable and outside the limited project budget. It was decided to invite Harry Edwards, then local Federal member, to seek the help of the Australian Army. Through the Minister, Edwards succeeded in persuading the army to undertake the lift as a military exercise, at no cost. Because of the great weight, the army's large two-rotor Chinook helicopter had to be used.

The helicopter was arranged for Friday 24 October 1980. Concrete and stone abutments were built beforehand to ensure that the bridge would be above high tide. The poles, because of their length, had to be jinkered overnight, and were then bolted together at Crosslands Reserve. A 20 man crew from the Lands Department was recruited to assist the Chinook crew to settle the bridge into position.

On the Friday morning it was wet, delaying the arrival of the helicopter until the rain lessened. Because the logs had to clear the nearby hill and trees, the longest sling available was used. This made the intended bridge very awkward, and difficult to manoeuvre. Consequently the bolted logs were first lowered into the nearby salt marsh to steady them. Then twelve men, six hanging onto straps on each side, alternately skidding across the marsh and running to get out of the way, attempted to steer the back end of the bridge onto the near or eastern abutment.

Jeremy Steele

The Calna Creek twin-log bridge. This is crossed as part of Walk 10. Walk 8 passes it without crossing.

As the fifteen tonnes of oscillating logs approached the creek, trees or anything else in the way were swept aside. At the same time, as the bridge was lowered onto the western abutment, the crew at the far side of the creek were ducking in and out of the water as the logs swung overhead, trying to steady them into position. The whole exercise was a tricky operation, taking a number of runs and many attempts. Finally the bridge was manoeuvred into position and secured by the ground team.

The Calna Creek Bridge installation benefited from the use of a military aircraft on a relevant training exercise. Given the high costs associated with heavy-lift helicopters, such exercises are unlikely to be seen again in the Park.

Robert Salt/George Foster

A photo-montage of how Australian Army engineers used their heavy cavalry to airlift the 15 tonne twin log bridge to allow the Great North Walk to safely cross Calna Creek north of Crosslands. The crew of the large twin-rotor Chinook helicopter had to manoeuvre close to the ridge to lower the poles into the entrance to Calna Creek on the left of the photograph.

Higgins family cemetery

E.D. (Ted) Angelo

The first expedition to explore the north shore districts of Sydney Harbour was led by Governor Phillip in April 1788. Other journeys along the Hawkesbury River and its tributaries from 1788-1791 explored the northern boundaries of what is now Hornsby Shire. Settlement followed arteries formed from the rough bullock tracks of the early timber-getters of the area.

In 1824 Thomas Edward Higgins received a grant of 250 acres of land in the Parish of South Colah. Higgins was the first permanent settler in the Hornsby area. The grant was sited near the Peat's Ferry–Cowan Sawyers track, now the Pacific Highway. It had vast stands of eucalypt and Red Cedar *Toona ciliata* growing in the rich volcanic soils of the valley. Ironbark, Turpentine *Syncarpia glomulifera* and Red Cedar were harvested to enable the establishment of orchards, producing apples, oranges, plums and persimmons, and of market gardens producing potatoes, tomatoes, cauliflowers, cabbage, peas and beans.

The Higgins' land grant was probably named 'The Old Mans Valley' either because the valley was visited regularly by a family of 'old man' kangaroos, or because Thomas Higgins was himself an old man.

The resources of the valley supported four generations of the Higgins family. By the 1880s a small cemetery had been established in the valley to meet family requirements. Supplementing an estimated 22-23 recorded burials is an undetermined number of unrecorded interments of stillborn children. The earliest recorded burial was that of Harrold Higgins who died on 14 May 1879, aged 14 months, while the earliest dated inscription on a headstone is for Ann Elizabeth Harrington who was buried in the family orchard, the stone being a memorial and not a grave marker.

The last recorded burial was the infant Loretta Jansson in 1931. New State laws regarding burials, and the advent of motorised funerals led to the termination of active use of the Higgins cemetery.

The National Trust has recognised the importance of the 'Old Man's Cemetery' as a valued heritage site recording the early settlement of pioneering families over more than a hundred years.

Vandalism in the cemetery during the 1950s and again in 1969 resulted in the destruction of most of the cemetery furniture, including headstones, surrounds and statues. The old Higgins house was demolished in 1970 and a monument erected on the site. In November 1991, the Higgins family, who during the 1990s met each three months to maintain and preserve the site, commissioned a conservation plan to determine conservation and maintenance procedures for the restoration and preservation of the cemetery. These procedures have been adopted and the restoration work has been completed. Assistance and encouragement by Hornsby Council and CSR Readymix, within whose boundaries the cemetery was located, is greatly appreciated by the family.

Restored headstones record the names of some of the earliest European settlers in the Berowra Valley

Source

Lavelle, Siobhan/Godden Mackay Pty Ltd Feb. 1992, revised June 1992, *The Old Man's Valley Cemetery Conservation Plan*, report prepared for the Higgins Family Association, [Sydney].

Further reading

Angelo, Ted 1999, *Memories of Old Mans Valley*, private publication. Copies can be found in Hornsby Library.

The calm green quietness of Berowra Creek close to Fishponds has drawn many photographers to record the subtle play of light, shadows and moving water through solid sandstone softened by lichens and mosses.

PHOTOGRAPHS BY MARK MINARD, AN ENTRANT IN HORNSBY SHIRE COUNCIL'S 2004 PHOTO COMPETITION

Landscape

Geology, topography and soils

Volcanic explosion

Hornsby Quarry

Creek names

Geology, topography and soils

John Hunt and Malcolm Bruce (geology), and Bob and Melissa Salt (soils)

The types of vegetation in the Berowra Valley Regional Park are strongly influenced by the underlying rocks. Different kinds of rock weather to form different drainage patterns, topography and soil types. These geological factors, combined with climate, fire regime and historical biogeography, are the major factors that have produced the native plants and native animal habitats found in the Park today.

Berowra Valley Regional Park is situated within a geological feature known as the Hornsby Plateau, which is part of a larger geological structure called the Sydney Basin. The Hornsby Plateau has two main sedimentary rock strata: Hawkesbury Sandstone, composed mainly of sandstone, but containing some shale lenses, and the overlying Ashfield Shale of the Wianamatta Group. In some deep valleys, interbedded sandstone and shale of the Narrabeen Group rocks are exposed beneath the Hawkesbury Sandstone. There are also minor volcanic intrusions throughout the area.

The sedimentary rocks

Hawkesbury Sandstone is a sedimentary rock that was laid down in the Middle Triassic period between 180 and 220 million years ago (Herbert & Helby 1980). The Hawkesbury Sandstone consists of massive and cross-bedded sheet bedforms with minor (less than five per cent) siltstone and mudstone beds, which contain fish fossils in some locations. It was deposited mainly on a vast riverine floodplain within the geological feature of the Sydney Basin. The crossbeds were formed by lateral accretion on sandbars within channels of the river system. The quartz-rich, nutrient-poor, sandy sediment was derived from the older continental area southwest of the Sydney Basin. A thick blanket, up to 274 m, of this quartz-rich sediment was deposited over the area.

The Ashfield Shale forms a cap, up to 60 m thick, to the Hawkesbury Sandstone in the central Sydney Basin. It is the lower of several shale units that form the Wianamatta Group of Middle Triassic age (Crawford et al. in Herbert & Helby 1980, and Herbert 1983). It was deposited in a freshwater lake and contains insect and vertebrate fossils (Herbert & Helby 1980). Fig. 1 shows what the Sydney Basin may have looked like during deposition of the Ashfield Shale.

The Ashfield Shale was probably derived from a volcanic source to the east of the Sydney Basin. This accounts for the different chemical properties of the nutrient-rich soils formed from the shale, compared with the nutrient-poor soils formed from the underlying sandstone. The shale is generally highly eroded and deeply weathered, changing from its dark grey colour to brown and red. Good exposures can be found in rail cuttings from Hornsby to Beecroft and Hornsby to North Sydney.

The present day surface of the area consists of alluvial soils and sands deposited on the weathered sandstone, with clayey soils developed on the weathered shale.

Volcanic rocks

Intrusive volcanic rocks, which occur in generally circular features called ‘diatremes’ or ‘volcanic necks’, are sparsely distributed in the Sydney Basin. There are about 150 known and inferred diatremes in the Sydney Basin. In and around the Park, two small diatremes are found at Pyes Creek, Dural, and Cabbage Tree Hollow, Galston. The Pyes Creek intrusion produced what was known as ‘white metal’. White metal is really metamorphosed sandstone, probably produced when the original sandstone was heated and then slowly cooled, forming blocks. The geological term for this metamorphic rock is prismatic sandstone. Another large diatreme occurs in Old Mans Valley at Hornsby.

Most diatremes are circular or oval in plan although some are dumbbell shaped. Most are less than 500 m in diameter, with some as small as 50 m across. Long dimensions up to 3 km are known. The Hornsby diatreme, about 1.5 km long and up to 400 m wide, is made up of three distinct bodies, each separated by a sandstone bridge. Quarrying for ‘blue metal’ in the largest body has produced a marvellous geological cross-section. A graphic account of the origin and formation of this type of volcanic intrusion is found in the section ‘Volcanic explosion: Hornsby diatreme’, and a photograph

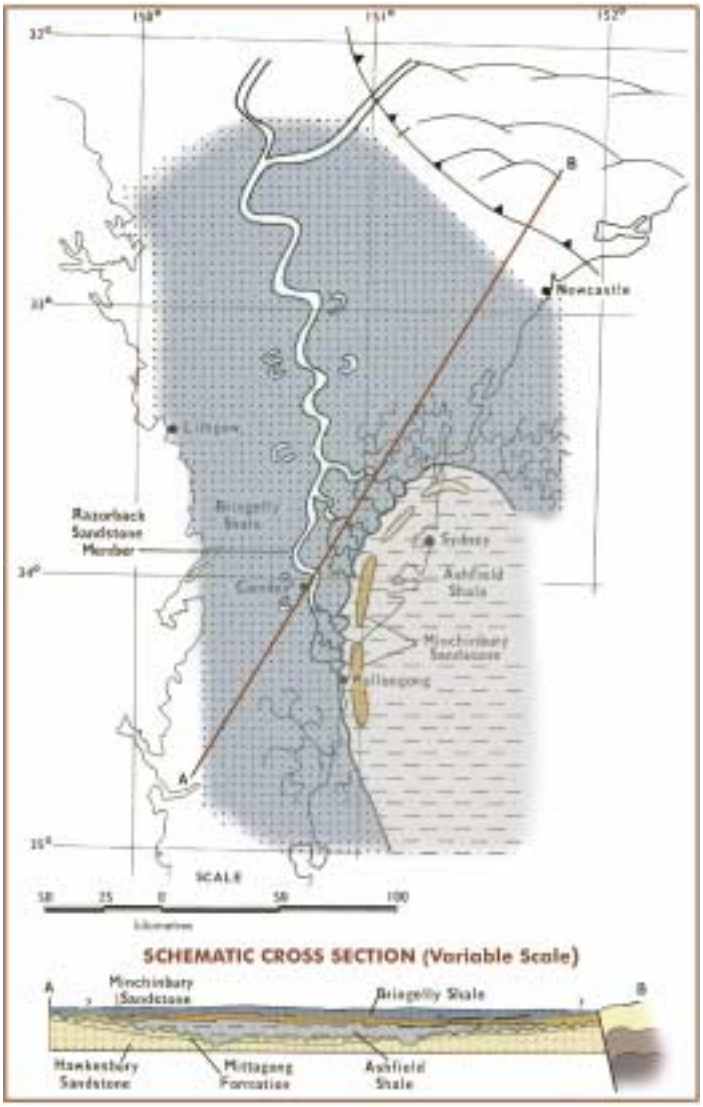
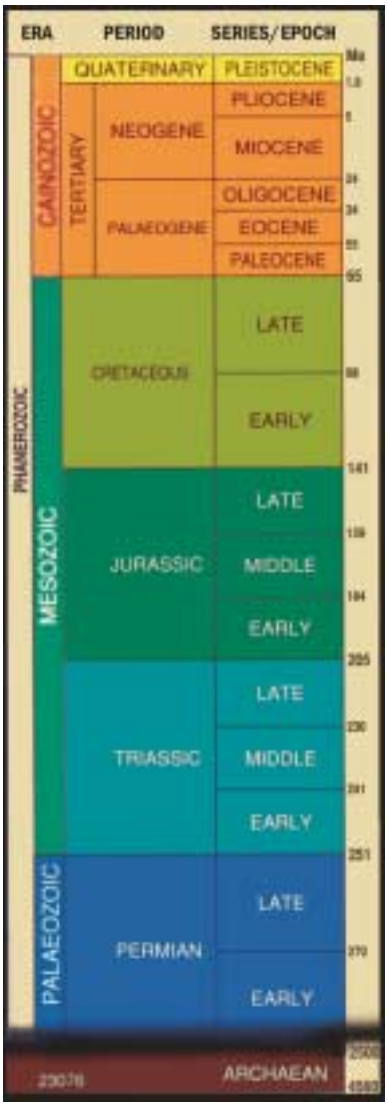


Fig._1 Following deposition of the Hawkesbury Sandstone on a vast riverine plain, the area was flooded and the Ashfield Shale deposited in an extensive lake or inland sea. Coastal barrier islands formed at the water's edge were replaced inshore by swampy estuarine deposits, with alluvial deposits further to the north-west.

This diagram shows a geologist's interpretation of the geography of the Sydney Basin area during deposition of the Wianamatta Group shales, which overlie the Hawkesbury Sandstone.

Reproduced by permission of the Department of Mineral Resources from 'A Guide to the Sydney Basin', Herbert, C. and Helby, R., eds (Bulletin 26).



THE IMMENSE SCALE OF GEOLOGICAL TIME

The partial scale shows the 'periods of geological time stretching back more than 270 million years. Therse periods are those most appropriate to the develkopment of Austraia. Note that the full scale extends to some 4 500 million years.

Extracted from *Australia through Time* (Australian Geological survey Organisation & Geological Society of Australia 1998)

in the section 'Hornsby Quarry', in this chapter of the *Guide*.

Fig. 2 shows a stylised cross-section of a diatreme. During the development of the volcano, surrounding older wallrock has slumped or sagged back into the vent owing to faulting and fracturing. In the top of the vent, older bedded pyroclastic rocks have also slumped back into the vent.[1] In the core of the vent, younger pyroclastic vent debris is found interbedded with remnants of country (i.e. surrounding) rock. Intrusive volcanic rocks are present in the base of the volcano. The length (L) and height (H) scales are equal.

The Old Mans Valley quarry produced 'blue metal' from volcanic breccia.

Topography

The topography of the area was influenced by the uplift at the end of the Triassic period and subsequent erosion. The widespread volcanic activity in New South Wales and eastern Australia in Jurassic and Tertiary times possibly further influenced the topography and geology of the Sydney Basin.

The present topography of the Hornsby Plateau was produced by erosion over a long period of time following uplift of the area about eighty million years ago, associated with rifting and opening of the Tasman Sea. The plateau has been eroded by fresh water streams, which have cut a maze of deep V-shaped valleys with intervening rocky ridges into the Hawkesbury Sandstone. A few remnant shales of the Ashfield (Shale) Group occur on the ridges in the area, but most have long since been eroded. The shale ridges produced richer soil and supported richer vegetation. Hence they were attractive to the original agricultural settlers, and most of these areas are now covered by urban development.

The drainage pattern was determined by lines of weakness in the Hawkesbury Sandstone, which were exploited by incipient watercourses. As streams cut deeper into the plateau they began undercutting the sandstone walls of the valley, and blocks of sandstone fell away leaving cliff lines. Vegetation helps this process: plant roots exploit lines of weakness in the rock, mechanically levering off blocks of stone and aiding in chemical erosion as well. A cartoon showing this sequence of events is shown in Fig. 3. Berowra Creek and its tributaries are typical of this type of topography. The process can be seen in action at the end of the track leading off from the Elouera Road Pumping Station, Westleigh.

The Berowra Valley has been subject to several dramatic changes in sea level beginning 200 000 years ago. The final stage in the development of the present topography of Berowra Valley was the rising sea level, which occurred as the Pleistocene glaciation waned about 12 000 years ago. A series of changes began in the relative levels of the land and the sea. These reduced the sea level, which moved the coastline many kilometres offshore, caused the rivers to cut down into their beds, lowering them towards the sea level, thus deepening the coastal gorges. The returning sea rose to a higher level than previously, drowning the river mouths. About 6000 years ago these changes stabilised to produce the present topography. The Hawkesbury River and Berowra Creek are, like Sydney Harbour, typical examples of these drowned river valleys.

Soil and vegetation

The type of parent rock found in an area has a major influence over the soil types in that locality. However, many other factors such as the location, climate and erosion also affect the type of soil in an area. Within the Park most of the soil has been formed from the decomposition of Hawkesbury Sandstone. This sedimentary rock is mainly composed of quartz but also contains about twenty per cent clay. The predominance of quartz results in sandy soil types such as Yellow Earth and Siliceous Sand. The moderate clay content of the sandstone has also resulted in soil types with a duplex texture trend (i.e. sand over clay) such as Yellow Podzolic soil. The clay and organic agents that bind the sandstone provide the initial soil fertility; however, these soil types are typically strongly acidic and deficient in phosphate, nitrogen, calcium and trace elements such as molybdenum. The soil types associated with the Hawkesbury Sandstone are collectively referred to as the Hawkesbury soil landscape (Chapman & Murphy 1989).

Within the Hawkesbury soil landscape the soil types on the tops of the plateau and ridges

1. Pyroclastic: 'composed chiefly of fragments of volcanic origin, as agglomerate, tuff, and certain other rocks' (*Macquarie Dictionary*)

SYDNEY BASIN STRATIGRAPHY

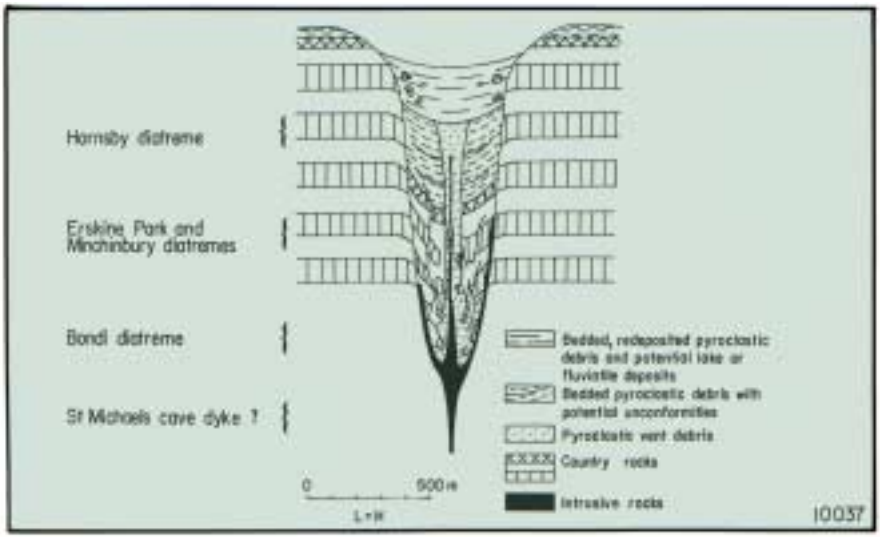


Fig. 2. This diagram shows an interpretative composite cross-section through an extinct maar-diatreme volcano, based on features of several diatremes in the Sydney Basin. It is adapted from Lorenz, V. 1975, 'Formation of phreatomagmatic maar-diatreme volcanoes and its relevance to kimberlite diatremes', in *Physics and Chemistry of the Earth*, vol. 9, eds L. H. Evans, J. B. Dawson, A. R. Duncan, & A. J. Erlank, Pergamon Press, Oxford and New York, pp. 17-27. Reproduced by permission of the Department of Mineral Resources from Herbert, C. & Helby, R. (eds) 1980, *A Guide to the Sydney Basin*, Department of Mineral Resources, Geological Survey of NSW, bulletin no. 26.

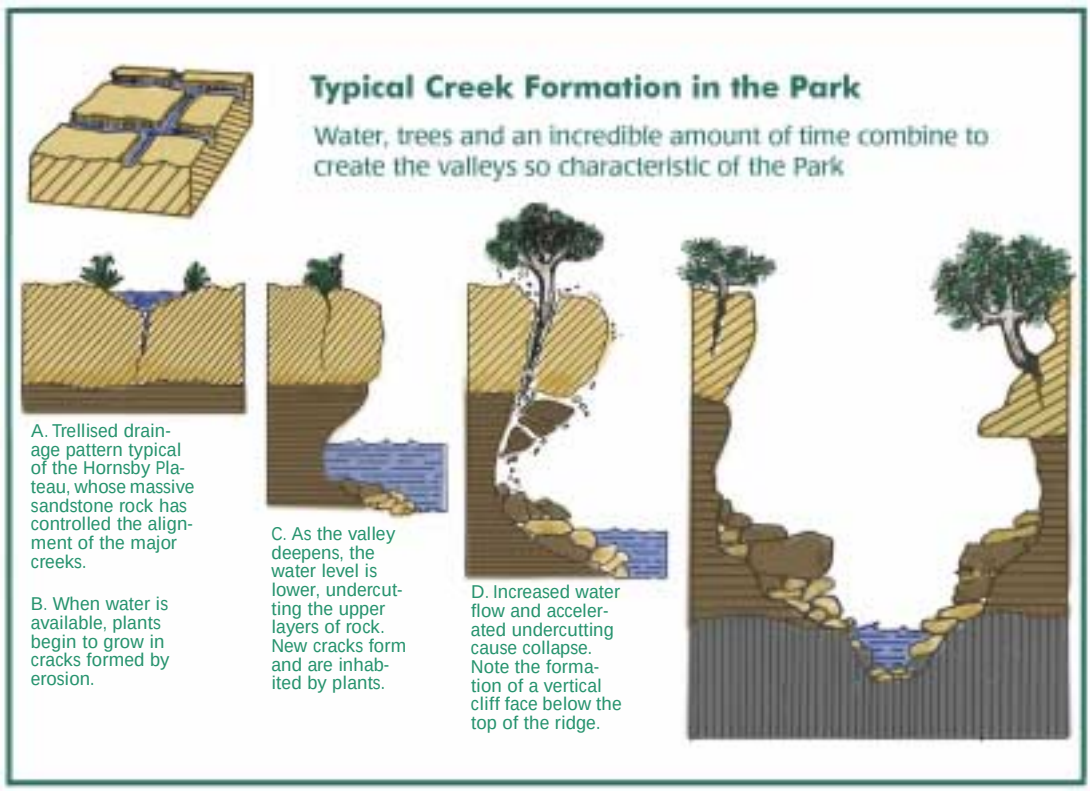


Fig 3, These illustrations are not to scale and represent the physical processes as a stylised and exaggerated artist's impressio

are generally lithosols, which have low fertility and are usually less than 500 mm deep (Fig. 4). These are associated with lower open woodland containing Red Bloodwood *Corymbia gummifera*, also known as *Eucalyptus gummifera*, Narrow-leaved Stringybark *Eucalyptus sparsifolia*, Broad-leaved Scribbly Gum *Eucalyptus haemastoma*, Brown Stringybark *Eucalyptus capitellata* and Old Man Banksia *Banksia serrata*.

On the side slopes and benches the soil and vegetation slowly change. The soil is discontinuous, and sandstone outcrops and boulders may cover fifty per cent of the ground surface. In this area the uniform sand soil types such as Yellow Earth and earthy sand are interspersed with the Duplex Yellow Podzolic soil. Soil depth is usually less than 70 cm, but along joint lines it can exceed two metres. On the more sheltered side slopes a dry sclerophyll open-forest predominates. This forest contains Silvertop Ash *Eucalyptus sieberi*, Sydney Peppermint *Eucalyptus piperita*, Sydney Red Gum *Angophora costata* and Black Sheoak *Allocasuarina littoralis*.

Within the landscape, drainage lines are either on bedrock or have deposits of gravel or loose quartz sands. In sheltered gullies, deep and moderately fertile Yellow Podzolics and Earths are associated with wet sclerophyll closed forests of Blackbutt *Eucalyptus pilularis*, Sydney Blue Gum *Eucalyptus saligna,* Water Gum *Tristaniopsis laurina*, Coachwood *Ceratopetalum apetalum*, and Black Wattle *Callicoma serratifolia*. In some locations, Common Ground Fern *Calochlaena dubia* and/or Bracken *Pteridium esculentum* forms a closed scrubby understorey.

This understorey can be seen along the Blue Gum Track on the western side of Old Mans Valley. The natural ecosystem around the drainage lines, however, has been altered. Development on the ridge-tops has led to nutrients being washed into the drains and creeks from soil erosion and rubbish, fertilisers, sewage and other pollutants. These pollutants have enriched the soil along watercourses and drainage lines, allowing the exotic weed seeds carried by the water to establish and flourish. Many creeks are now infested with a vast army of invading exotics.

Old Mans Valley contains not only the Hawkesbury soil landscape but a range of soil types and vegetation. One such variation is the Hornsby soil landscape (Fig. 5), which was produced by weathering of the Jurassic volcanic diatremes in Old Mans Valley, Pyes Creek and Cabbage Tree Hollow. This landscape contains soil types which are generally deep, clayey and moderately to highly fertile and can support a richer flora than can be supported by the Hornsby landscape. Yellow and Red Podzolic soil and Yellow-Brown Earth predominate in this area where tall to tall open-forests (Specht 1970) are dominated by Sydney Blue Gum *Eucalyptus saligna*. Additionally, Blackbutt *Eucalyptus pilularis*, and the rainforest species Coachwood *Ceratopetalum apetalum* and Rough Treefern *Cyathea australis* can also occur. These associations can be seen on the Joes Mountain section of the Blue Gum Track.

Other soil landscapes such as Lucas Heights, Faulconbridge and Lambert are found on the ridge-tops and upper slopes around the park. These soil landscapes support varied dry sclerophyll vegetation ranging from heath to tall open-forest. Species include *Banksia*, *Angophora*, Turpentine *Syncarpia glomulifera* and Grey Ironbark *Eucalyptus paniculata*. These associations may be found in the area of the Quarry Road fire trail.

Further details on all of these landscapes and their associated vegetation can be found in the Soil Landscapes of the Sydney 1:100 000 Sheet, a map and book produced by the Department of Land and Water Conservation (Chapman & Murphy 1989).

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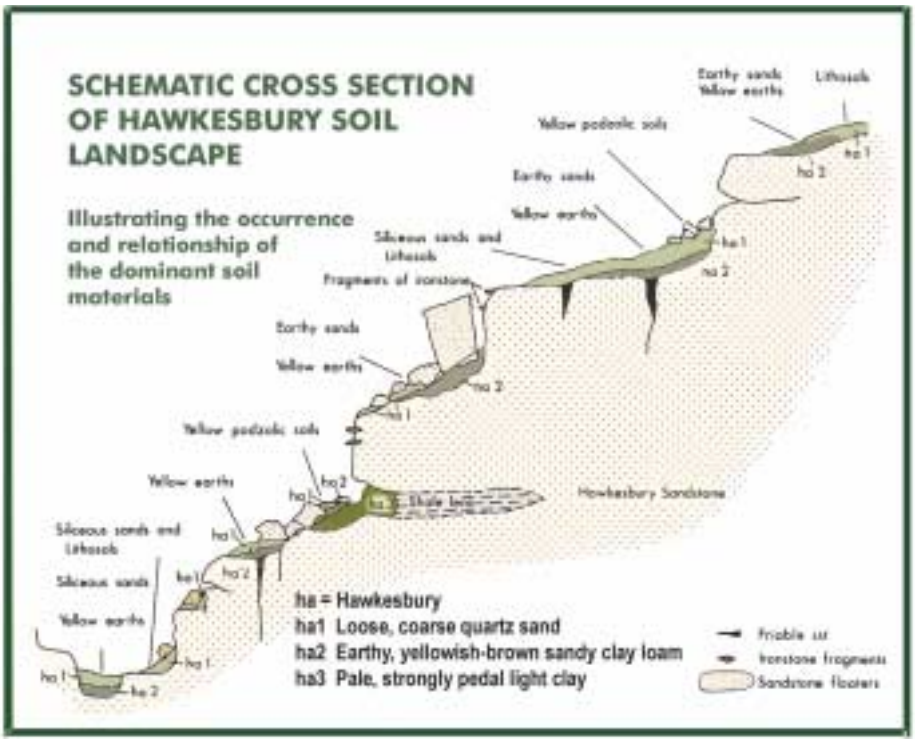
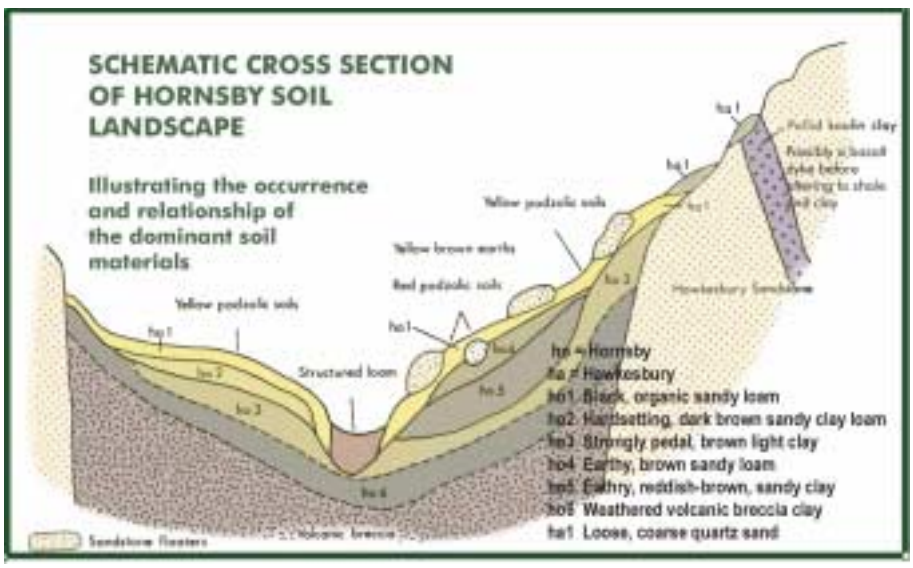


Fig 4 (above) and Fig.5. Adapted from G.A. Chapman and C.L. Murphy Soil Landscapes of the Sydney 1:100 000 Sheet (Soil Conservation Service of NSW, 1989). Reproduced with permission.



Soil terminology for New South Wales

Podzolic soil: acidic, non-saline, non-sodic, duplex (sand over clay) soil;
Lithosol: skeletal shallow stony soil, usually with the 'A' (the top) horizon directly overlying weathered rock — rock outcrops are common;
Saline: where the total amount of water-soluble salts in the soil exceeds a critical level (approx. 4 dS/cm), though the critical level for affecting plant growth will vary with the species grown;
Sodic: where one or more layers in the soil have a exchangeable sodium percentage (i.e. the proportion of sodium compared to all exchangeabl positive ions) of 6 per cent or more.
NSW soil types and their classification are describe in Charman & Murphy (1991).

Volcanic explosion

Hornsby diatreme

David Roots

Diatremes are relatively rare and most unusual volcanic structures. They are only found where hot magma has risen into horizontal sedimentary layers that contain groundwater. Vertical jointing is a likely prerequisite as well, as the famous diatreme areas in Germany, Australia and South Africa all have this common pattern.

For diatremes to form, magma must enter horizontal sedimentary layers, encountering water. Diatremes develop as hot magma flashes groundwater to steam, and the steam finds a way through the joint system to the surface. Once the steam begins to escape at the surface, the temperature along the escape path progressively increases. Accelerated weathering occurs along the narrow vent path, breaking down the country rock, allowing particles to move upward, increasing the cross-sectional area of the vent. The vent path may have started as an irregular alignment of joints, poorly connected between superimposed sediment layers. However, as the steam flow increases, abrasion increases the size of the vent, and straightens out the kinks.

Rock fragments are stripped from the side of the vent, and rattle upwards to escape at the surface. The movement of such rock through the vent abrades the sides, progressively increasing its diameter, and shaping the mouth of the vent like that of a trombone. Steam now roars out of the vent, and rocks are flung high into the air accompanied by an extremely loud noise.

The shape of the vent mouth determines how much can escape from the pipe. Much of the material that is ripped from the sides and flung upwards will leave the vent moving vertically only to fall back into the vent again. Some, however, will fall just outside the vent, creating a ring of debris called a maar ring. What falls back into the vent is then flung out again and again. A very turbulent situation develops with a vast amount of material being recycled in and out of the vent. This would be a fearful thing to witness, but even worse to hear. In addition to bedrock debris being ejected from the vent, magma is being introduced at the bottom of the vent, and is mixed in with the rest.

The power and the life of a diatreme depend upon the temperature of the magma and on the water supply. The water supply is probably the limiting factor, being controlled by the permeability of the surrounding bedrock. When the diatreme starts to form, the nearby sandstone is saturated with water, providing a considerable local reservoir. As the process proceeds, this local water is consumed. Additional water arrives only after travelling an increasing distance through the sandstone of restricted permeability.

When the water supply diminishes to the point where the system begins to dry out, the steam pressure drops and the circulating debris in the diatreme vent starts to settle down to fill the bottom of the vent. At the same time molten magma may enter the bottom of the vent without encountering water, but coming into contact with broken up (brecciated) diatreme material. The magma will intrude into the accumulating debris in the bottom of the hole and solidify, plugging the bottom of the vent. This marks the end of the diatreme as an active entity. Water will slowly seep into the half-sediment-filled diatreme and turn it into a maar lake. The sediment that settles into the bottom of the diatreme will progressively compact, more in the middle than at the edges, producing the typical basin shape of diatreme fill.

Fig. 2 in the Geology, topography and soils section in this chapter of the *Guide* shows a geological interpretation of the internal layering in a hypothetical diatreme. It was made by combining observations made at several diatremes. The Hornsby diatreme shows features in the upper part of the cross-section.

Some 25 diatremes are shown on the Sydney 1:100,000 geological map, which covers the eastern part of the Sydney Basin from about Parramatta in the East, Botany Bay in the South and Northern Broken Bay in the North. The diatremes range in area from less than 1 ha to 44 ha in the case of the Hornsby Diatreme. They are spread from Lugarno in the South to Patonga Creek in the North. Most of the diatremes are located in the bottom of valleys where they are poorly exposed and deeply weathered. Quite a few of them have been covered by urban development or playing fields.

Reference

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Hornsby Quarry

Ron Bush,
Development Manager, CSR Construction Materials

Hornsby Quarry was operated by CSR Construction Materials (formerly Readymix) from 1959 to 2003. The quarry commenced operation in 1905 and was operated by Hornsby Shire Council during the 1920s. It operated under the existing use rights provisions of the *Environmental Planning & Assessment Act 1979*.

CSR owned the two properties covering the quarry by freehold title. These are the Jones property of 28.45 ha and the Howes property of 7.689 ha. Both were part of an original land grant to Thomas Edward Higgins of 250 acres during February 1836. Both are zoned 'Open Space A (Public Recreation—Local)' under *Hornsby Local Environmental Plan* 1994. The Higgins family cemetery is located within the south-eastern corner of the Jones property, the graves dating from about 1875.

The quarry is located wholly within the Hornsby diatreme, which is a large oval-shaped structure with dimensions of about 1.5 km in the north-east —south-west direction and 500 m in the north-west—south-east direction. It exhibits distinctive bedding within the eastern face of the quarry owing to subsidence when the diatreme was formed. It is extensively jointed with well-developed faulting and shear zones within the quarry. Some wedge-shaped failures have occurred within the northern face during past quarry operations, and these have been removed and stabilised through extensive rock bolting.

Rock reserves remaining within the northern and western faces of the quarry were estimated in 1993 at 2.8 million tonnes, and if extraction had proceeded in accordance with the 1993 Development Plan, about 2.5 million tonnes would have been extracted over the years to 2020 at an average extraction rate of 110 000 tonnes per year.

The quarry is 120 m deep at the southern face. In 1997 it was being operated on a periodical basis for several weeks every two three months. During these production periods, material was extracted from the quarry and hauled to the plant for crushing and screening. The material was then stockpiled for sale until the next production period. The rock was processed into road base and aggregate products for sale to local markets.

The eastern face of the quarry has exposed a vertical cross-section of the volcanic diatreme and subsidence bedding. The face is of geological and scientific interest owing to this exposure.

Although the quarry had reserves sufficient to last until 2020, the development of the Old Mans Valley Master Plan prompted CSR to consider possible end uses and restoration strategies. These included securing the site and leaving the quarried area as a void, filling the void to various levels, and rehabilitating the final level and using it for a range of community, recreational and open space uses. A filling restoration strategy was seen as a way to considerably shorten the life of operations on the site and to dedicate the restored void for community uses under the current site zoning.

Major Council Acquisition of Quarry Site

After negotiations broke down between CSR and Hornsby Shire Council to use the quarry to receive clean fill from the Chatswood to Epping rail tunnels, the company requested Council to purchase the site as required under the zoning provisions. Ownership passed to Council in 2003 after a price of $26 million was established through the Land and Environment Court.

Council employed consultants in 2004 to investigate the site and develop a Master Plan for its future use. Constraints on future use include the heritage listing of the quarry, significant vegetation species on the site, drainage and the stability of large areas surrounding the pit.

Creek Names

Jeremy Steele

The principal waterway in the Berowra Valley Regional Park is Berowra Creek. This stream rises in the vicinity of Boundary Road, Pennant Hills, and flows more or less directly northwards, being joined by many other streams on the way, including Waitara Creek, Pyes Creek, Tunks Creek, Charltons Creek, Still Creek, Calna Creek, and Sams Creek. It is a substantial waterway by the time it reaches Berowra Waters, and larger still when it meets the Hawkesbury River.

Berowra Creek gives the Park its name

Street directories in the 1990s showed other creeks with names, but just as many unidentified and more again not recorded. In 1996 the Berowra Catchment Management Committee completed a project to devise ten new creek names.

The policy of the Geographical Names Board is for the longest tributary of a watercourse to bear the name of the main stream. The creeks concerned, with explanations for the new names, follow.

Nyrippin Creek, West Pennant Hills

Nyrippin is reputedly an Aboriginal word for 'clear', although it does not appear to be from a local language. In their submission for the name of this tributary under stress, Michael Burrough and Ben Scott, students at John Purchase Public School, said 'we want clear water'.

Tedbury Creek, Pennant Hills

Tedbury was a member of the Bidjigal clan (sometimes spelt 'Bediagal'), the son of Pemulwuy (or Pim-el-wi). Both father and son fought as guerillas against the British colony. This resistance began with the fatal spearing by Pemulwuy of John McIntyre, Governor Arthur

The eastern face of the quarry which provides an outstanding cross section of a diatreme. This portion of the quarry is included on the Natural Heritage Listing. This photograph should be compared with the diagram on Page 42 showing the development of diatremes in the Sydney region.

Phillip's convict gamekeeper, who was hated by the Aboriginals, in November 1790. It included attacks on Toongabbie and Parramatta. He was outlawed, with a price for his capture or killing. He was wounded and escaped. A bounty hunter finally killed him in 1802, and his head was sent to London. Tedbury continued the resistance, to be arrested at Pendant (Pennant) Hills in 1805. Tedbury's last appearance in the records was in 1810. His name has been Anglicised and was probably more like Da-ba-ri, or Dada-ba-ri. Name suggested by Denise J. Thompson of Cherrybrook.

Zig Zag Creek, Pennant Hills

This creek flows next to the little known but remarkable Thornleigh zigzag, one of only three such railways built in New South Wales. Name suggested by Lee Macquarie Smith of Westleigh.

Larool Creek, Thornleigh

Larool, the name of a nearby street, is the word for 'laughing jackass' in an Aboriginal language. This is not the Sydney language, for which the word recorded by David Collins, Judge-Advocate on the First Fleet, was 'go-gan-ne-gine'.[1]

Jimmy Bancks Creek, Old Mans Valley

This creek was the route taken by Jimmy Bancks from his home when raiding the Higgins orchard in Old Mans Valley, the bush providing concealment when carrying off watermelons and other fruit. Bancks lived at the top of the catchment, where his father, a railwayman, operated gates at the level crossing opposite where the Hornsby R.S.L. Club now stands. His route in summer extended down to Fishponds for swimming, and 'refreshments' on the return trip. Bancks devised the comic strip character Ginger Meggs to describe his childhood.

Provest Creek, Hornsby Heights

The Provests are a pioneer family of the Hornsby district for five generations. John William Provest settled first at Pearces Corner with his wife Maria in 1881. Their ten children produced numerous descendants, some seventy-seven of whom attended a reunion over a century later. Name suggested by Julianne Reid, great-grand-daughter of John Provest.

George Hall Creek, Galston

George Hall, who died in 1840, was the first pioneering settler in the area, having received a land grant of 600 acres (243 ha) from Governor Macquarie in 1819. He prospered, eventually owning over a million acres (450 000 ha) in New South Wales and Queensland, including farmland around Ebenezer, Pitt Town and Windsor, and acquiring Governor Bligh's 'Model Farm' after Bligh's removal from office. Name suggested by R. G. Mathews of North Epping on whose notes this information is based.

Gleeson Creek, Mt Colah

Bernard Gleeson, 1925-91, environmentalist and humanitarian of Mt Kuring-gai, ran a landscaping business in Hornsby. He was a central figure in the construction activities of the Roman Catholic church in Berowra and Asquith, and similarly assisted the Spastic Centre of NSW at Mosman and Allambie Heights. He frequently led his family of nine, many of whom live in the Hornsby shire, on bushwalks along Gleeson Creek towards Calna Creek and Berowra Waters. Name suggested by John H. Burke of Asquith.

Banggarai Creek, Berowra

A group known as the Berowra Bushrunners crosses this creek as part of its regular Sunday morning activities, occasionally sighting Swamp Wallabies *Wallabia bicolor*, causing them to dub the route 'the wallaby run'. Banggarai (bag-gar-ray, ban-ga-ray, bag-ga-ree, baggory, pagore) is the Sydney Aboriginal language word for swamp wallaby, a species common in the Park although it generally keeps to dense cover and is seldom seen. Name suggested by Paul Gunning, one of the Berowra Bushrunners.

Racemosa Creek, Berowra

The Narrow-leaved Scribbly Gum *Eucalyptus racemosa*, with its characteristic insect-larvae scribbles, favours the sandy and silty soils of the Hawkesbury sandstone, and is common between the Pacific Highway and Berowra Creek.

1. Rendered by modern convention 'guganagina'.

A wide range of honeyeaters populate the Park. The Yellow-tufted Honeyeater is common in the heathland areas
PHOTOGRAPH FROM THE LIBRARY OF DEPARTMENT OF ENVIRONMENT AND CONSERVATION

Biodiversity

Introduction to biodiversity

Fungi of the Park

Flora of the Park
- Identifying common plants
- Mosses and liverworts
- Herbs and Ferns
- Grasses
- Orchids
- Shrubs
- Climbers
- Trees
- Plant communities
- Transects

Fauna of the Park
- Invertebrates
- Freshwater invertebrates
- Some common spiders
- Molluscs
- Estuarine fishes
- Freshwater fishes
- Frogs
- Reptiles
- Birds
- Mammals

Rare and threatened species of the Park

Introduction to biodiversity

Andrew Beattie and Wendy Carter

Biodiversity is biological variation at all levels, including the genetic variation between individuals in a population, among the populations that comprise a species, among the species that make up communities and between the communities scattered across the landscape.

Genetic Diversity found in a population enables it to adapt to local conditions. Also, as each population in a species is genetically slightly different from the others, populations together form a store of genetic information that allows the species to cope with a variety of conditions.

Species Diversity is the total of all species in a given area, such as the Park. At least 517 flowering plant species have been seen in this area as well as 168 bird, 19 native mammal, 38 reptile and 14 frog species - a total of 756 species.

While this total may seem high, it is a small number relative to the total number of invertebrate animal, moss, lichen, fungus and bacterial species in the same area. This total is currently unknown but a conservative guess would be 5000 species. Although most of these organisms are small to microscopic, they are vital to the ecosystem processes such as nutrient recycling, energy flow, pollination, seed dispersal, the disposal of wastes and decomposition that maintain the beauty and the function of the Park.

The Park is home to some very special species that are either rare or threatened (remember, some species are rare naturally and not necessarily threatened). These include the following flowering plant species: *Acacia bynoeana, Boronia fraseri, Darwinia biflora, Darwinia peduncularis, Darwinia procera, Eucalyptus camfieldii, Lasiopetalum joyceae, Leptospermum deanei, Lomandra brevis, Melaleuca deanei, Persoonia hirsuta, Persoonia mollis* subspecies *maxima* and *Tetratheca glandulosa* as well as the Powerful Owl, Masked Owl, Peregrine Falcon, Koala, Red-Crowned Toadlet and the Giant Burrowing Frog. By contrast with these figures from the flowering plants and vertebrate animals, the numbers of rare or endangered species of invertebrates and micro-organisms are unknown. Further exploration of the Park will undoubtedly reveal not only more rare or threatened species, but species completely new to science.

Aside from the beauty and ecological function of each species, it is impossible to tell which ones will be useful. Tea tree is the source of important oil products, a local bull ant the source of a patent for a new family of antibiotic substances, and even the humble leech has yielded chemicals of major clinical importance.

Community Diversity is the variety of natural communities in an area such as the Park. Communities are usually defined by the dominant flowering plants and on this basis there are 17 recognised plant communities. However, within each of these there are smaller communities that may be defined by almost any kind of organisms, including, for example, butterflies, beetles or bacteria. Thus, a widespread plant community harbours a great variety of smaller ones. At the other end of the scale, communities cluster together on any patch of landscape to form an ecosystem.

Ecosystem diversity therefore refers to the different assemblages of communities in an area of land (or freshwater or ocean).

Two hundred years of settlement by Europeans have generated major threats to local and national biodiversity. Vegetation clearing, pollution, over-harvesting of natural resources and unsustainable development have all contributed. All human activities, including economic ones, take place within a natural ecosystem and therefore potentially affect biodiversity. Recent history shows that when environmental management fails, these effects feed back to us in terms of declines in the quality of water, air, soils and human life. Every ecosystem is populated by many thousands of species, most of which are beneficial because their combined activities maintain the ecosystem services that support us.

Further Reading:

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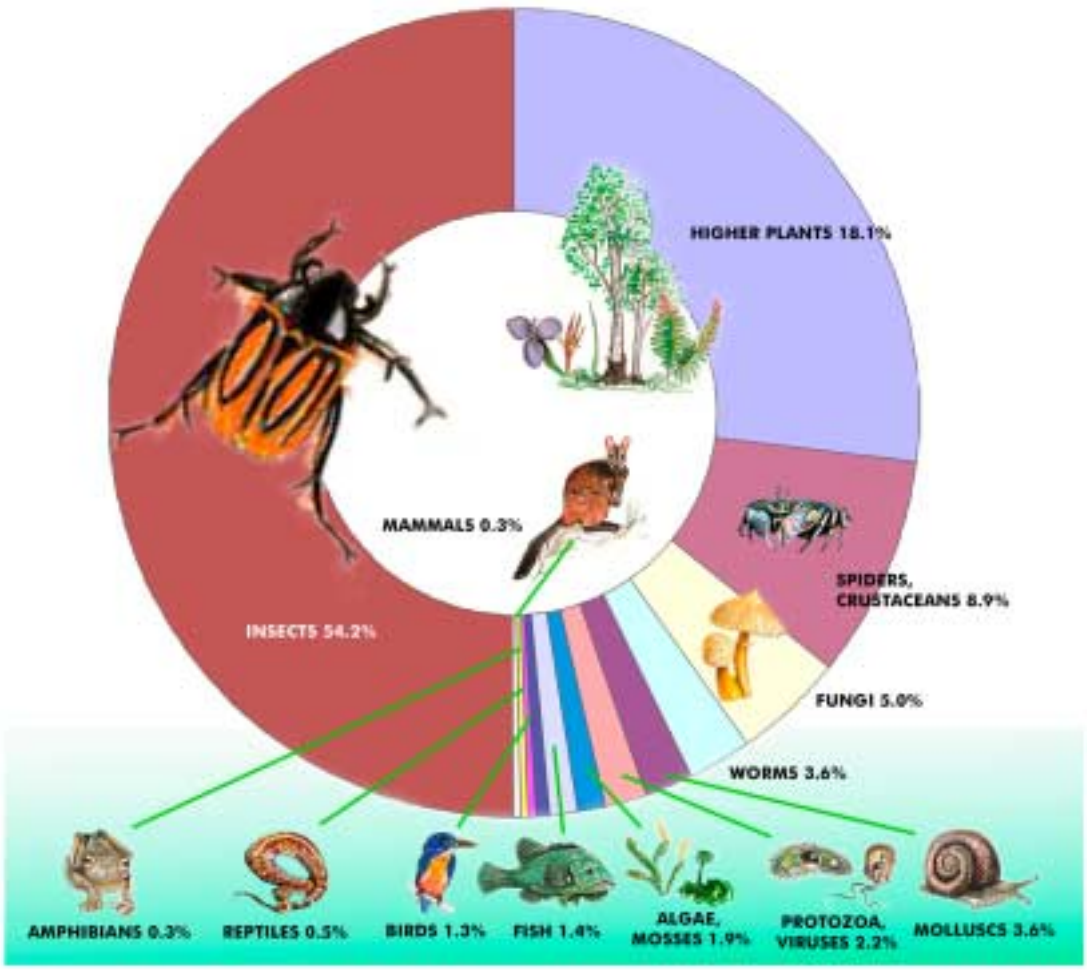
Biodiversity
is all living things



This chapter of this *Guide* describes the accessible parts of the extensive biodiversity of the Park. In the species diversity that makes up our world, insects are the dominant group. The mammals, of which we are part, represent less than one percent. We bear a large responsibility for the extraordinary influence our lives have on all those living things around us.

This diagram is intended to represent graphically an estimation of how the total global number of species is made up. It is based on data found in E. O Wilson, The Diversity of Life, Harvard Press 1992, rev 1999. Illustrations by Lyndel Wilson, Graphic George Foster

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Fungi of the Park

The fungi play an important part in the ecology of the forest. Most fungi are saprophytic, that is, they live on the dead remains of plant and animal tissue. Fungi break down litter on the forest floor, thus allowing the return of nutrients to the soil.

The best time to observe fungi in the Park is during the late summer and in autumn after a few days of rain. The conspicuous part of the fungus is called the fruiting body. Fungi reproduce through spores, not seeds. On germinating, the spores give rise to filamentous cells called *hyphae*. These hyphae form an interconnecting web called a *mycelium* in the soil, in rotting wood or litter, or may even be

Fungi of the Park

Irene van Ekris, Frank Taeker

parasitic in living plants or symbiotic in the case of the mycorrhizas.

Under the right conditions the mycelium gives rise to fruiting bodies, which we commonly call mushrooms or toadstools. The variety of form and colour is enormous.

Ascomycetes (cup fungi and relatives)

This diverse group of fungi produce their spores in microscopic sacs or asci. Fruiting bodies are of many forms depending on the species; disc, cup, cushion and club-shapes are common. They often grow on the forest floor; for instance the earth tongues, Trichoglossum walteri, which grow to 5 cm tall, are club-shaped, black and velvety in texture.

Xylaria hypoxylon has an erect, forked fruiting body, up to 5 cm tall, and appears on tree stumps and rotting wood. The tips are white and powdery on a black stem, hence the common name of Candle Snuff Fungus.

Also in this group are found the caterpillar fungi *Cordyceps*. These fungi parasitise the larvae of some insects that burrow in the ground. The above ground portion of the fungus is club-shaped and variously coloured

Agarics (fungi with gills)

These fungi form a large group that bear their spores on gills. They are often conspicuous and are commonly referred to as ‘mushrooms’ or ‘toadstools’.

Armillaria novae-zelandiae is a parasitic species on trees. It grows in groups and can be seen on living and dead trees.

The genus *Agaricus* contains the common Field Mushroom *Agaricus campestris*, and the Horse Mushroom *Agaricus arvensis*, both of which can be found in grassy areas; they usually have a whitish cap and gills which are first salmon-pink turning to chocolate-brown, as the spores mature.

The ‘milkcaps’ *Lactarius* group are distinguished by the fact that they exude a milky sap when cut or damaged.

Gymnopilus is a genus which is mainly golden brown to brownish-yellow and grows on wood.

The Fly Agaric *Amanita muscaria* is a poisonous member of the so-called ‘death caps’. It is usually seen growing in association with introduced pine forests. The cap is bright red to orange in colour with white scales; the stem is white. This fungus grows up to 10 cm in height and is the well known toadstool of children’s fairytale books. The genus *Amanita* is distinguished by scales on the cap, a stem with a ring and a swollen base arising from a cup or ‘volva’.

Boletes (fleshy pore fungi)

The Boletes are similar in appearance to the agarics, with medium to large caps and a central stem; however, the undersurface consists of pores, not gills. In the Park one might see representatives of the *Boletus* and *Boletellus* groups.

Clavarias (coral fungi)

The 'coral fungi' are named for their coral shape and are often beautifully coloured. The genus *Clavaria* can be single, forked or even branched, whereas *Ramaria* is always branched.

Individuals can grow up to 15 cm in height and are terrestrial. *Ramaria ochraceo-salmonicolor* is a commonly found species with a stout stem and many dividing branches of a bright pinkish-orange colour.

Hydnoid fungi (tooth or spine fungi)

In this group the fertile surface consists of spines, warts or granules on the underside of the cap.

The Hedgehog Fungus *Hydnum repandum* grows in groups on the forest floor. The cap can be up to 10 cm in diameter, pinkish in colour with pale cream to pink spines on the underside. The stem is excentric, that is, not centrally located with respect to the cap.

Polypores (woody pore fungi)

This group is commonly referred to as the bracket fungi. They are found on wood, both living and dead, and some are important parasites of trees.

A very large representative of the polypores is *Piptoporus portentosus*. This species can grow up to 30 cm across and occurs as single brackets, often growing high up in eucalypts and other trees. The upper surface of the bracket is smooth and cream coloured, the underside spongy and pale yellow covered with small pores. It is parasitic, causing destruction of the wood.

The *Trametes* are smaller individuals, growing in groups on fallen logs in the forest. *Trametes versicolor* is a common species. The upper side has many concentric zones in different shades of grey and brown. Individuals may grow up to 6 cm wide. Also common is *Pycnoporus coccineus*, which forms prominent orange-red brackets up to 4 cm wide on fallen logs.

Thelephores (leather fungi, shelf fungi)

Stereum hirsutum has been collected in the Park. This fungus grows in thin tiers on dead wood. Caps are tough and leathery and may reach 8 cm in extent, but are thin, with a smooth, spore producing lower surface and a hairy upper surface

Gasteromycetes

In this group the spores are formed within the fruit body itself. When it ripens the spores are released, either through a pore which forms

Psathyrella species:

A common species often found growing in groups on buried wood in soil. Other representatives include the ink-caps Coprinus species: these fungi occurring on dung have black gills that disintegrate into an inky mess upon ageing. This 'ink' was used in former times for writing.

JT van Ekris

Typical *Amanita* species:

In the early stages of development the Amanita appears as a 'ball' in the earth. The outer 'skin' ruptures and then the 'button' stage emerges. Upon maturation, the stem elongates and the cap expands to reveal the gills on the underside. In this illustration the button stage is shown lying on its side to expose the under surface. It would normally grow in an upright position.

JT van Ekris

Tjamie Wright

Coral Fungi:
Ramaria ochracea-salmonicolor

F Taeker

Hydnum repandum

F Taeker

Scleroderma cepa. Ruptured earthball exposing the spore mass for distribution by wind and rain.

F Taeker

Trichoglossum walteri
Earth tongues grow to 5 cm and have a black velvety appearance

F Taeker

Gymnopilus junonius

at the apex or through a rupture in the enclosing body as it disintegrates. The puffballs, *Lycoperdon* species, are an example of the former; the earthballs, *Scleroderma* species, are an example of the latter.

The Earthstars *Geastrum* species appear similar to puffballs when young, but, upon ripening, their outer wall breaks open in a star-like manner to reveal the inner sac that contains the spores.

The Phalloids or stinkhorns also first appear as egg-shaped objects on the ground. As these fungi mature, a spongy stem arises from the 'egg', capped by a layer of evil-smelling slime. This slime bears the spores, which are dispersed by flies attracted by the odour.

The Bird's Nest Fungus *Nidula emodensis* has a unique spore dispersal system. The fruit body is a 5 mm cup with a little protective 'cap'. Groups of these small fungi can be found in damp situations growing on fallen wood. Each cup contains tiny 'eggs', which are full of spores. Raindrops falling into the 'nests' dislodge the 'eggs', thus facilitating dispersal of the spores.

Further reading

Fuhrer, B.A. 1985, *A Field Companion to Australian Fungi*, Five Mile Press, Canterbury, Vic.
Shepherd, C.J. & Totterdell, C.J. 1988, *Mushrooms and Toadstools of Australia,* Inkata Press, Melbourne.
Young, A.M. 1982, *Common Australian Fungi,* UNSW Press, Kensington, NSW.

Mushrooms appeal to kids and for that matter, to many people for their extraordinary shapes, colours and variety. The very brightness and often odour carries a natural warning - DON'T EAT ME! Growing bought spores at home in a commercial carton is the safe way.


Banksia

Flora of the Park

The vegetation that covers Berowra Valley Regional Park is significant because it remains in its natural state.

These plants have an ancient heritage. Their ancestry goes back to a time when the continents of the southern hemisphere were united in a supercontinent called Gondwana. After the continents drifted apart, the Australian flora continued to evolve and today almost all the plant species naturally occurring in the Park are found only in Australia. These include the most common trees, the eucalypts, which are almost exclusive to this country. Native plant species in the Park number around seven hundred, a great diversity, including some occurring in the Park and nowhere else. All the world's major plant groups are represented — algae, mosses, liverworts, ferns and fern allies, cycads, conifers and the flowering plants. Of these, the flowering plants are by far the most numerous, and include such familiar Australian plants as wattles *Acacia, Banksia*, *Grevillea*, Waratahs *Telopea speciosissima*, *Eucalyptus*, Flannel Flowers *Actinotus helianthi,* and Christmas Bells *Blandfordia nobilis*. There are many species from the plant families Proteaceae (*Banksia, Grevillea*), Myrtaceae (gum trees, Lilly Pilly), Fabaceae (peas, wattles), Poaceae (grasses), Orchidaceae (orchids), and Cyperaceae (sedges) plant families.

Most of the plants belong to the Hawkesbury Sandstone flora, named after the geological formation in the Sydney Basin. This is a diverse and beautiful natural botanical area, rivalling rainforests in the number of species present. It is one of the reasons Australia is called a 'megadiverse' continent.

As well as the woodlands and heath of the Hawkesbury Sandstone flora, other kinds of bush (known as 'plant communities') occur in different habitats in the Park — mangroves and salt marsh along Berowra Creek, Blue Gum High Forest on fertile ridgetop soils, gully vegetation along the upper creeks, and sedgeland in poorly drained areas.

A bushwalk in the Park at any time of the year will reveal plants in flower, fruits and many different kinds of leaves and bark.

The plants offer food and habitat to a wide range of animals; they supply oxygen for the air we breathe, and they moderate the climate.

Where to see the plants

Examples of most of the flowers in the Park have been dried and can be seen in Jenifer Lewis's *Herbarium of Plants in Hornsby Shire*, a collection of over twenty volumes of plant specimens, in Hornsby Library.

The Herbarium is also available on-line as part of Hornsby Shire Council's Virtual Library: www.hornsby.nsw.gov.com.au/index.cfm

Click on the link to Virtual Library Database and, on the following page, to Herbarium.

Flora of the Park

Val Williams

Further reading

Benson, D. and McDougall, L. 1993-2001 (continuing series), *Ecology of Sydney Plant Species*, parts 1-8, *Cunninghamia* 3 (2 & 4), 4 (2 & 4), 5 (2 & 4), 6 (2 & 4), 7 (2), Royal Botanic Gardens, Sydney.
Howell, J. and Benson, D. 2000, *Sydney's Bushland: More than Meets the Eye*, Royal Botanic Gardens, Sydney.

Identifying common plants

The following texts are recommended as guides to identifying native plants of the Sydney region:

Baker, M., Corringham, R. & Dark, J. 1989, *Native Plants of the Sydney Region*, rev. edn, Three Sisters Productions, Winmalee.
Fairley, A. & Moore, P. 1989, *Native Plants of the Sydney District: An Identification Guide*, Kangaroo Press, Kenthurst.
Harden, G.J. (ed.) 1990–93, *Flora of New South Wales*, vols 1–4, UNSW Press, Kensington.
Robinson, L. 1994, *A Field Guide to the Native Plants of Sydney*, rev. edn, Kangaroo Press, Kenthurst.
Sainty, G., Hosking, J., Abell, P., Jacobs, S. & Dalby-Ball, M. 2000, *Burnum Burnum's Wildthings*, rev. edn, Sainty & Associates, Potts Point.


The moss Funaria

Mosses and Liverworts

Mosses and liverworts are often overlooked in Australian ecosystems. Although they are small, these miniature plants play an important role in Australian environments. We usually associate them with moist, sheltered gullies and rainforests, but they also occur in woodlands, forests, heath, and even in semi-arid and arid areas of Australia. They play a vital role in soil conservation, particularly in dry areas, where they stabilise and enrich the soil, and in the process reduce soil erosion by wind and water. In rainforests, mosses and liverworts act as sponges, absorbing massive amounts of water from mists, fog and rain. This not only reduces run-off and minimises erosion, but humidifies

Biodiversity

Mosses and liverworts

Alison Downing and Ron Oldfield

the atmosphere for long after rain has fallen or fogs have cleared.

Moss and liverwort species occur throughout the Berowra Valley. Often they become established on surfaces that are difficult for ferns and flowering plants to colonise. These surfaces include tree trunks, rocks, fallen logs, compacted soil, even the leaves of other plants. Some species typically grow in dry woodland on the top of sandstone ridges and plateau; other species can be found only in moist situations in shaded and sheltered valleys.

Bryophyta

Mosses, liverworts and hornworts together make up the three classes of the Division Bryophyta of the Plant Kingdom.

Mosses have well developed stems and leaves, and produce spores in capsules at the top of wiry stalks (setae).

Liverworts can be thallose or leafy. Thallose liverworts are probably the most easily recognised, as they have a flattened body (the 'thallus') that is not differentiated into stems and leaves. In contrast, leafy liverworts have well-developed stems and leaves, and the leaves are often ornamented with complex lobes, lobules and fine filaments. Spores are produced in globular capsules at the top of short-lived, pale, fragile, succulent stems. In sheltered gullies, 'mossy logs' are often covered with leafy liverworts rather than mosses. Leafy liverworts include some of the most beautiful miniatures of the plant kingdom.

Hornworts have flattened, thallose plant bodies, somewhat similar to those of thallose liverworts. However, they are usually dark green, almost black, as a result of the colonies of *Cyanobacteria Nostoc* that live in cavities within the thallus. Spores are produced in green, elongated capsules that look rather like short, twisted, grass stalks.

Cosmopolitan and introduced species

Cosmopolitan species are those that have a world-wide distribution. The mosses *Bryum argenteum*, *Ceratodon purpureus, Funaria hygrometrica*, the thallose liverwort, Lunularia *cruciata* and the hornwort *Phaeoceros laevis* are examples. Although they are recorded as occurring naturally within the Sydney region, they are often associated with disturbance of some kind and would not normally be collected in undisturbed Eucalyptus woodland on sandstone. *Funaria hygrometrica* and *Ceratodon purpureus* are often present after fire. Introduced species are, as their name indicates, those that have been introduced into Australia. *Barbula unguiculata* and *Pseudosclero podium purum* are two such species that have been collected from the Berowra Valley.

Mosses and liverworts in undisturbed bushland

In the Sydney area, very few mosses and liverworts grow on the exposed sandstone of plateaus and ridges. However, although there may be only a few species present, they may cover a considerable area. Rock platforms often have broad expanses of moss turf, often bordering rock pools and adjacent heath. In Berowra Valley, *Campylopus introflexus* and *Campylopus clavatus* are common in this situation. *Sclerodontium pallidum* is often abundant on sandstone boulders and the liverwort *Lophocolea semiteres* can be found on a wide range of substrates, from ridge-top to valley bottom. The presence of few species can be an indication that an area has not been disturbed by urban development.

The number of species increases towards the lower portion of valleys, particularly along sheltered creek banks. The hornwort, *Phaeoceros laevis*, can be found on damp clay or very moist sandstone rock at the edge of streams. Many unpolluted and undisturbed creeks in the Berowra Valley have particularly diverse and beautiful assemblages of leafy liverworts. It is difficult to predict how long these natural assemblages of bryophytes can survive. Epiphytic mosses and liverworts grow on the trunks of Coachwood, Water Gum and Black Wattle in sheltered gullies.

Mosses and liverworts in disturbed sites adjoining urban development

There are significant changes in moss and liverwort assemblages in areas where urban development adjoins natural bushland. Many species, such as *Barbula calycina, Rosulabryum billarderi*, *Bryum argenteum, Weissia controversa* and *Barbula unguiculata* can be found along the edges of roads, fire trails, backyards of houses, where they would not normally grow if the area had remained undisturbed.

In creek beds affected by urban run-off and along storm water channels, *Bryum dichotomum, Philonotis tenuis* and the liverwort *Lunularia cruciata* flourish, and appear to overrun the naturally occurring moss and liverwort species. It is important to understand that these 'weedy' mosses and liverworts are not introduced species, but native species that would not normally occur in such abundance if it were not for the presence of higher than normal nutrient levels, low light and increased humidity in dense thickets of Privet and other introduced plant species. The combination of nutrients, shading and high humidity, enables many mosses and liverworts, more usually associated with forest in deep gullies, to grow on otherwise exposed ridges and plateaus.

Species lists

For species lists of Berowra Valley mosses and liverworts see Appendices in this *Guide*.

Further reading

Beever, J., Allison, K.W. & Child, J. 1992, *The Mosses of New Zealand*, University of Otago Press, Dunedin.

Catcheside, D.G. 1980, *Mosses of South Australia*, Government Printer, Adelaide.

Jarman, S.J. & Fuhrer, B.A. 1995, *Mosses and Liverworts of Rainforest in Tasmania and South-eastern Australia*, Forestry Tasmania, and CSIRO, East Melbourne.

Scott, G.A.M. 1985, *Southern Australian Liverworts*, Australian Government Publishing Service, Canberra.

Scott, G.A.M. & Stone, I.G. 1976, *The Mosses of Southern Australia*, Academic Press, London.

Ron Oldfield

Found in moist shady gullies, Hypnodendron is a tall and elegant moss that looks like a miniature tree. (1x)

Ron Oldfield

Dawsonia polytrichoides is a moss with an upright stem, wiry leaves, and a colourful capsule cover. (2x)

Ron Oldfield

The minute blue-green liverwort Telaranea grows as a complex weft of delicate stems and leaves. (4x)

Ron Oldfield

Phaeoceros is a hornwort, often overlooked because of its grass-like appearance.

Pat Pike

Large-flowered Flannel Flowers, a plant that ususally appears after a disturbance such as a fire.

Biodiversity

Herbs and Ferns

Val Williams

Jenifer Lewis

Unusual shot of Christmas bells showing the two coloured forms, red and yellow, growing together.

Lomandra brevis

Herbs

Herbs are low-growing, non-woody plants. Along with the orchids, grasses, rushes, sedges and ferns they form a diverse ground cover on the forest floor.

Flannel Flower
Actinotus helianthi

Flannel Flower, which grows up to 1 m high, has grey hairy, lacy leaves and large white daisy-like flowers. It is often photographed and used in art and craft, and is thus easily recognised. It flowers in summer.

Sundew
Drosera spatulata

The Sundew is a very small carnivorous plant, which forms a rosette of red leaves flat on the ground, and is only 30 mm wide. The flowers are white and form on an upright stalk in spring and summer. The leaves secrete a sticky substance that traps midges and mosquitoes, and is also a digestive fluid. A close look at the leaves will reveal the remains of insects. The Sundew is found most often in intermittently damp areas with lots of light.

Christmas Bells
Blandfordia nobilis

In summer or after fire, Christmas Bells, with their cluster of red and yellow bells well known from art and craft, may be seen in some areas of the Park.

Native flag, fringe lily and flax lily

Patersonia, Thysanotus and *Dianella* species

These native flags and lilies all have purple to blue flowers with three petals and strappy leaves.

Native flag *Patersonia* has large rich purple petals.

Fringe lily *Thysanotus* has petals that are conspicuously fringed.

Flax lily *Dianella*, which usually has deep blue petals with intensely yellow anthers in the centre of the flower, forms blue fleshy fruits.

Lomandra

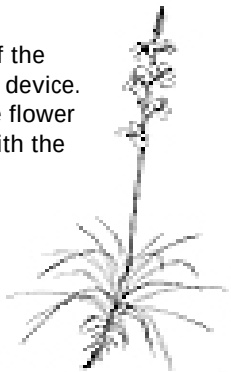
Lomandra are tufted herbs with tough narrow leaves. Out of thirteen species in Sydney, eleven are found in the Park.

An example of *Lomandra* is Spiny-headed Mat-rush *Lomandra longifolia,* a large tufted and common plant, found in a variety of habitats. The leaves are strong and straplike, up to 500 mm long, with the tip toothed. The male and female flowers are produced on different plants. In spring, a Spiny-headed Mat-rush produces branched clusters of small cream fragrant flowers in a large spiky head. Seeds ripen in December, and are dispersed away from the parent plant by ants attracted by the net-like food body enclosing the seed.

The Aborigines used the leaves to weave bags and mats, and ground the seeds for flour.

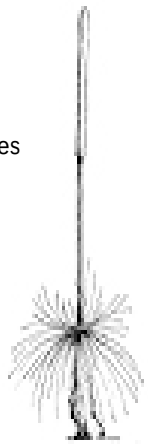
Triggerplant
Stylidium species

The bright pink flowers of the triggerplant have an unusual device. When an insect lands on the flower it is whacked on the back with the style, which deposits the flower's pollen on the insect.[1] The insect then flies off with it to another flower, so providing a pollination service for the triggerplants.



Grass trees
Xanthorrhoea species

Growing up to 2 m tall, grass trees often occur as a trunk covered with dead leaves with a burst of long, narrow, green leaves on top. When the grass tree flowers, a tall spike of white flowers grows upward from the top of the trunk. These attract insects and birds looking for nectar and pollen.



1. Style: '*Bot.* a narrow, usually cylindrical, and more or less filiform extension of the ovary, which, when present, bears the stigma at its apex.' (*Macquarie Dictionary*)

Umbrella Fern

Ferns

The complete list of known plant species in the valley includes many ferns. The following are some of those likely to be seen during any visit to the Park.

Bracken
Pteridium esculentum

Bracken is perhaps the best-known fern, up to 1 m tall, tough and dark green. It grows only in acid soil, in harsh conditions on dry hillsides. It is considered a weed on farmland because it is toxic to stock.

Common Ground Fern
Calochlaena dubia

Common Ground Fern is similar to Bracken, but needs more shaded, protected sites. It differs from common Bracken in its paler green colour, and different ends to the fronds.

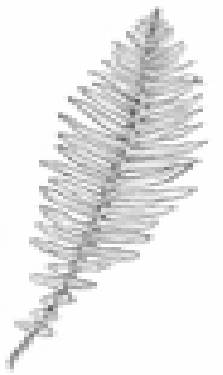
Common Maidenhair
Adiantum aethiopicum

Common Maidenhair is a popular fern grown in gardens in hanging baskets. Fronds are to 350 mm long. Stems are reddish-brown to almost black, with soft green, nearly round, leaf segments 3-8 mm long. In the bush, this fern prefers moist sheltered sites.

Carol Roach illustrations

Rasp Fern
Doodia aspera

Rasp Fern is dark green in colour, with 'fishbone' fronds up to 450 mm long, and the base of stems rough to touch. Young fronds are shades of pink.



Pouched Coral Fern
Gleichenia dicarpa

Pouched Coral Fern forms dense large mats more than 1 m deep, in creek beds or on moist sandstone cliffs. Its leaf segments are 1.5 mm long, with edges that curl down to form pouches underneath.

Grasses
Pat Pike

Lacy Wedge Fern
Lindsaea microphylla

Lacy Wedge Fern is a small, delicate fern, pale green in colour, usually occurring as isolated individuals, and less than 500 mm tall. This fern grows along the streams in the low bank - high bank position/s.

Gristle Fern
Blechnum cartilagineum

Gristle Fern is a large fern with 'fishbone' shaped fronds up to 1 m long. Young fronds are often pink.

Umbrella Fern
Sticherus flabellatus

Umbrella Fern forms dense colonies, 1 or 2 m deep, in moist gullies and along creeks, and has dark green umbrella-like fronds.

Further reading

Jones, D.L. & Clemesha, S.C. 1989, *Australian Ferns and Fern Allies,* rev. edn, Currawong Press (Reed Books), Frenchs Forest.

Kangaroo Grass

Grasses

Grasses belong to the family Poaceae, which is one of the largest families of flowering plants. Worldwide there are 650 genera and about 10 000 species. In Australia there are 210 genera and more than 1000 species. Thirty per cent of these are introduced.

Grasses are characterised by having a leaf made up of an open sheath, which wraps around the stem, a ligule or collar at the junction of the sheath and a leaf blade with parallel veins. Leaves are arranged in two rows when viewed from above. The stems are hollow, except for the joints or nodes, which are solid. The top of the stem seasonally bears the flower head containing a number of spikelets — the structures in which the tiny grass flowers are found. The flowers have no petals as they rely on wind for pollination.

Kangaroo Grass
Themeda australis

This forms a dense tussock to 1 m tall. Leaves are light green but turn a characteristic red-brown as they age.

In summer the dense clusters of seed heads change from a bluish green with their black shiny awns to a rich copper colour.[1] Kangaroo grass is an indicator of fertile soil.

Tufted Hedgehog Grass
Echinopogon caespitosa

This is a slender upright grass to 1 m tall. The rough stem bears a short dense bristly seed head, which is cylindrical in shape.

Tall Speargrass
Austrostipa pubescens

Formerly known as *Stipa pubescens,* this is a tufted grass to 1 m tall. It has a loose seed head, which bears numerous single spikelets on slender stalks. The seeds have a sharp point, a long, fine bristle or awn, which becomes spirally twisted and bent when the plant is mature.

1. Awn: 'a bristle-like appendage of a plant, especially on the glumes of grasses.' (*Macquarie Dictionary*)

Weeping Meadow Rice Grass
Microlaena stipoides

A slender grass 150-700 mm high. It has graceful, arched, drooping seed heads with numerous solitary spikelets which have a minute tuft of white hairs at the base and two husks with long straight bristles. *Microlaena* seeds may be dispersed by walkers' socks.

Wallaby Grass
Austrodanthonia species

Formerly known as *Danthonia*

These are usually fine-leafed tufted grasses. The flowering spikelets have numerous white hairs, which often form distinctive white tufts. The hair patterns on the back of the husks are used in their identification.

Barbed Wire Grass
Cymbopogon refractus

A tufted grass to 2 m tall; the tall rigid stems bear branches of seed heads in the axils of the upper leaves. As the spikelets mature their branches turn downwards at varying angles so that they resemble the points of barbed wire.

Oat Speargrass
Anisopogon avenaceus

A tall erect tufted grass to 1.5 m tall; the stiff unbranched stems bear nodding seed heads with large spikelets, which hang down from slender stalks. The spikelets have a long bristle surrounded by two shorter finer bristles.

Further reading

Wheeler, D.J.B., Jacobs, Surrey, S.W.L. & Norton, B.E. 1990, 2nd edn, *Grasses of New South Wales*, University of New England, Armidale.

Pat Pike

Kangaroo Grass
Themeda australis

Pat Pike

Wallaby Grass
Austrodanthonia tenuior

Hornsby Shire Council

Weeping Meadow Rice Grass
Microlaena stipoides

Pat Pike

Gregor Newton

Tufted Hedgehog Grass
Echinopogon caespitosa

Jenifer Lewis

Tall Speargrass
Austrostipa pubescens

John Noble

John Noble

Barbed Wire Grass
Cymbopogon refractus

Pat Pike

Rock Lily Dendrobium speciosum

Flying Duck Orchid Caleana major

Gregor Newton

Biodiversity

Orchids

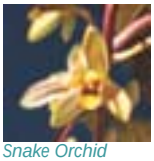
Noel Rosten

Tartan Tongue Orchid Cryptostylis erecta

Noel Rosten

Waxlip Orchid Glossodia minor

Ross Doig



Snake Orchid

Orchids

Orchids are herbaceous plants. More than thirty species have been found in the Park. At least seven species use trees or rocks as hosts (epiphytes). They use their host only as support, not for food. The remainder are orchids that grow in the ground (terrestrials). Spring is the main flowering time but every month will find one or two in bloom.

Large Tongue orchids
Cryptostylis

Two species are found in the Park, Tartan Tongue Orchid *Cryptostylis erecta* and Large Tongue Orchid *Cryptostylis subulata*. These are ground orchids. The erect lanceolate leaves grow from underground stems. From the base of the leaves the flowers arise on erect stalks. *Cryptostylis erecta* has a pale hooded flower with many red veins. It blooms in November–December.

Cryptostylis subulata has a 20-30 mm tongue-like flower, yellow-green with red towards the tip. In October–November the scent of this flower fools male wasps into mating with it (pseudocopulation), thereby fertilising the next orchid they visit.

Dotted Sun Orchid
Thelymitra ixioides

The ground orchids *Thelymitra* are found in sunny spots in the spring. They are called sun orchids as the flowers open fully only in bright sunlight. Blooms are pale blue to purple, up to nine to each stem rising from a single basal leaf. Each flower has many dark spots towards the centre, and the name has been taken from the South African Blue-flowered Corn Lily *Ixia*.

Waxlip orchids
Glossodia species

Two species, Waxlip Orchid *Glossodia major* and Small Waxlip Orchid *Glossodia minor*, occur in the Park.

Glossodia major is larger in all parts. The flower is purple with a white spot in the centre.

The single bloom arises from a stem with a single hairy leaf.

Glossodia minor is similar, but without the white spot. It is smaller, and the flower is pinky-mauve.

Both species flower in spring.

Rock Lily
Dendrobium speciosum

The large swollen stems of *Dendrobium speciosum* have dark-green broad leathery leaves 100-300 mm long at the top. These have beautiful long sprays with many yellow to white blooms in August and September. Once common in the Park, *Dendrobium speciosum* is now rare owing to the activities of collectors. Those that remain are found in inaccessible places on cliffs, usually facing east.

Tongue Orchid
Dendrobium linguiforme

The Tongue Orchid is very common, growing on rocks in shady places in the valley. Its leaves are thick, tongue shaped, and able to store moisture; in dry weather they shrivel until the next rain. The small white flowers are in sprays of up to twenty, and occur in late September and October.

Jeremy Steele

Snake Orchid
Cymbidium suave

The orchid *Cymbidium suave* with its strap-like leaf clumps grows from hollows high in trees. Its roots feed off the rotten wood, and travel a long way. Hanging sprays of fragrant green flowers develop in October and November. While these plants usually grow on eucalypts they have also been found on *Allocasuarina*.

Further reading

Bishop, A. 1996, *Field Guide to the Orchids of New South Wales and Victoria,* UNSW Press, Kensington.

Mountain Devil fruit

Shrubs

This section is for those who are interested in recognising some of the common shrubs in the Park. They have been chosen to illustrate the diversity of the flora. A complete list can be found in the Appendix 'Plants of the Berowra Valley'.

These shrubs are found in heath, scrub, woodland or open-forest, in sandy soil. Many of Sydney's most characteristic and beautiful wildflowers are also found in the shrubby understorey. Many shrubs have small hard leathery leaves of varying shapes to enable them to survive drought conditions and predation. See further details in the botanical

Shrubs
Pat Pike

texts listed in the bibliography.

Mountain Devil
Lambertia formosa

A prickly shrub to 2 m high; leaves to 50 mm long, linear, hard, paler below with rolled in margins and a sharp tip. Red tubular flowers are in a tight cluster of seven, surrounded by long red bracts. The woody fruit has a short 'beak' and 'horns', hence the common name.

Crimson Bottlebrush
Callistemon citrinus

A bushy shrub to 3 m tall with lance-shaped leaves; bright red flowers are in a spike to 120 mm long. Found in swampy areas or along creek banks.

Waratah
Telopea speciosissima

A slender erect shrub to 4 m tall with toothed leathery leaves. Spectacular terminal flower

heads consist of many small flowers densely packed in a globular head surrounded by a ring of red bracts. Flowers in spring. The Waratah is the floral emblem of New South Wales. Its botanical name *Telopea* means 'seen from afar', and *speciosissima* means 'most beautiful'.

'Waratah' is a word from the Sydney Aboriginal language.

Teatree
Leptospermum polygalifolium

A medium sized shrub to 2.5 m high; the small leaves have one vein and numerous oil glands and when crushed smell of lemon. Masses of white flowers with green centres are produced in spring to early summer. Often found in damp places.

Pink Waxflower
Eriostemon australasius

An erect shrub to 1.5 m tall with grey-green foliage; leaves are lance-like with an inconspicuous midvein. Pink flowers with five petals are produced along the branches in spring.

Scaly Phebalium
Phebalium squamulosum

A shrub to 2 m high with small brown scales on the stem; narrow leaves with oil dots and silver to brown scales below. Terminal clusters of bright yellow flowers are produced in spring.

Darwinia fascicularis

A shrub to 2 m high with many branches; small cylindrical leaves crowd the stem. Bundles of terminal flowers are produced in winter–spring. Flowers are white changing to red with age. Stamens are like pins in a cushion.

Flannel Leaf
Astrotricha floccosa

An erect slender shrub to 3 m tall; soft pale green leaves to 200 mm long with small star-shaped hairs on the undersurface, giving a felty appearance.

In spring it produces a towering flower head with many branches. The flowers are small and grey-white. It can be seen on the slopes above Berowra Waters, Galston Gorge and Crosslands. It is a maligned plant as it is often mistaken for the weed Wild Tobacco Bush, and is pulled out. Wild Tobacco Bush has a characteristic pungent odour, blue flowers and round orange fruits.

Kunzea ambigua

A spreading shrub to 4 m tall with small crowded narrow leaves to 1 cm long. Masses of honey-perfumed white flowers with conspicuous stamens are produced on the upper sections of the branches in spring.

Pinnate Boronia
Boronia pinnata

An upright shrub to 1 m with soft fragrant leaves divided into 5-9 leaflets. Rose-pink flowers with four petals are produced towards the ends of the branches in spring.

Oval-leafed Mintbush
Prostanthera ovalifolia

Oval-leafed Mintbush is a bushy shrub to 2 m high with narrow strongly aromatic ovate leaves. Clusters of purple-mauve flowers are produced at the ends of the branches. In spring the flowers are conspicuous on the rocky hillsides in Berowra.

Snow Wreath
Woollsia pungens

A medium-sized shrub to 2 m with sharply pointed stem-clasping leaves. White heath-like flowers are borne on the upper part of the stem. Flowers have a strong fragrance. Flowering occurs mostly in autumn to spring.

Sydney Golden Wattle
Acacia longifolia

A large shrub to 4 m high with linear leaf-like phyllodes which have two veins and a small gland on the upper margin near the base. Masses of bright yellow flower spikes are produced from late winter.

The small flowers have five lobed sepals and five petals. Numerous conspicuous yellow stamens, rather than the petals, attract insect pollinators.

Narrow-leafed Drumsticks
Isopogon anethifolius

An erect shrub to 1 m with leaves that are divided into needle-like segments. New growth in winter is a red-tan colour. Heads of yellow

flowers are produced in spring and summer. After flowering globular cones remain.

Pine-leaved Geebung
Persoonia pinifolia

A tall shrub to 4 m tall with pine-like foliage; small bright yellow flowers are produced at the ends of spreading branches in late summer to autumn. Clusters of red-green fruits hang from the tips of branches like bunches of grapes.

'Tyibung' (geebung) is a word from the Sydney Aboriginal language.

White Dogwood
Ozothamnus diosmifolius

A tall shrub to 2 m with small crowded leaves with rolled edges; leaves are dark green above and white below. White flower heads are in terminal clusters. and are surrounded by papery white bracts. Flowers in spring–summer.

Slender Rice Flower
Pimelea linifolia

A small slender shrub to 50 mm tall with small narrow opposite leaves. A terminal head of small white flowers with orange stamens is produced in spring. The flower head is surrounded by two rows of leaf-like bracts.

Common Correa
Correa reflexa

A small shrub to 1.5 m tall with opposite heart-shaped leaves, which have a rough surface owing to short star-like hairs. Hanging tubular green or red flowers with yellow tips are produced in spring.

Pink Spider Flower
Grevillea sericea

A shrub to 2 m high with tough narrow leaves, which have a pointed tip and silky hairs on the undersurface. Clusters of pink flowers with hooked styles are produced in spring.

Fuschia Heath
Epacris longiflora

A straggling shrub to 1.5 m high, which has red tubular flowers with white tips. Flowers are up to 2 cm long and the tip has five curled-back

RD: Ross Doig, PP: Pat Pike NR: Noel Rosten, JW: Jamie Wright, VW: Val Williams

Pink Spider Flower PP
Grevillea sericea

Narrow-leaved Drumsticks RD
Isopogon anethifolius

Pink Wax Flower NR
Eriostemon australasius & Bee Fly

Pinnate Boronia PP
Boronia pinnata

Waratah RD
Telopea speciosissima

Sydney Golden *Wattle RD*
Acacia longifolia

Pine-leaved Geebung PP
Persoonia pinnifolia

Mountain Devil VW
Lambertia formosa

Flannel Leaf PP
Astrotricha floccosa

Heath-leaved Banksia GN
Banksia ericifolia

River RosePP
Bauera rubioides

Tick Bush
Kunzea ambigua

AppleberryRD
Billardiera scandens

Fuschia HeathRD
Epacris longiflora

Red Kennedy PeaJN
Kennedia rubicunda

Old Man's BeardJN
Clematis aristata

Sweet SarsparillaGN
Simlax glyciphylla

Wonga Wonga Vine PP
Pandorea pandora

lobes. Flowers hang down on one side of the upper leafy stem. Flowers during winter and spring. The small tough leaves are heart-shaped with a sharply pointed tip.

Needle Bush
Hakea sericea

Prickly shrub to 3 m high with needle-like leaves; clusters of white flowers are produced along the branches in late winter to early spring. It produces a globular woody fruit with a warty surface which splits open to release two black-winged seeds.

Heathy Parrot Pea
Dillwynia retorta

This 'egg and bacon' plant is a straggling shrub to 1.5 m high with small narrow twisted leaves. In spring it produces terminal groups of bright yellow pea flowers with red centres.

Climbers

False Sarsaparilla
Hardenbergia violacea

A climber with tough narrow oblong leaves and prominent veins; in spring, along the trailing stem it produces clusters of small purple pea flowers that seem to glow in dim dawn or dusk light.

Red Kennedy Pea
Kennedia rubicunda

A twining plant; the leaf is divided into three oblong leaflets which have rusty hairs on the lower surface. In spring to summer it produces red pea flowers with black markings.

Love Creeper
Glycine clandestina

A slender climber; the leaf is divided into three small narrow leaflets. In spring to summer clusters of small mauve pea flowers are produced in the upper leaf axils.

Appleberry
Billardiera scandens

A slender twiner which has soft lance-like leaves with wavy margins. In spring it produces

RD: Ross Doig, JN: John Noble, PP: Pat Pike,
GN: Gregor Newton; JL: Jenifer Lewis, VW: Val Williams

yellow bell-shaped flowers. The fleshy green cylindrical fruits hang from the ends of branches, hence the common name.

Climbing Guinea Flower
Hibbertia scandens

A vigorous climber with glossy lance-shaped leaves; it produces large open flowers, 50 mm across, with five yellow petals and numerous stamens. Flowers most of the year. Fruit splits open to release orange-red seeds, with a food body attractive to ants and birds.

Old Man's Beard
Clematis aristata

A strong climber that often adorns the crowns of forest trees. The leaves are divided into three leaflets, each having three parallel veins. Young leaves are oval with pale markings around the veins. In spring to summer it produces masses of white star-like flowers which turn into clusters of fluffy-bearded fruit.

Wonga Wonga Vine
Pandorea pandorana

A woody climber; leaves divided into two to four pairs of leaflets with a terminal leaflet. In spring it produces clusters of cream tubular flowers with red or purple markings inside.

Wonga wonga is a Sydney Aboriginal word for the Wonga Pigeon *Leucosarcia melanoleuca*.

Love Creeper
Comesperma volubile

Slender twining creeper with few leaves. In spring it produces terminal sprays of rich pink-purple flowers.

Wombat Berry
Eustrephus latifolius

Wombat Berry is a vigorous climber with thin and broad lance-shaped leaves spaced along the twining stem. The leaves are glossy green, with longitudinal veins. In spring it produces fringed white-mauve flowers in clusters in the leaf joints. Fruits are orange-yellow berries, which are succulent and edible.

Sweet Sarsaparilla
Smilax glyciphylla

Sweet Sarsaparilla is a wiry scrambler; the stiff leaves have three prominent parallel veins and a pair of tendrils at the base of the leaf. Young leaves have a sweet taste and were used to make tea in colonial days. In spring–summer it produces a cluster of small greenish-white flowers in the leaf axils. Fruits are bunches of hanging globular black berries.

Mistletoes and devil's twine
Dendrophthoe vitellina, Muellerina eucalyptoides and Cassytha species

Mistletoes and devil's twine are partly parasitic plants that draw water and minerals from the host tree but carry out their own photosynthesis.

A mistletoe, *Dendrophthoe vitellina,* is commonly found on *Eucalyptus* and other trees in the Myrtaceae family. The leaves are similar to those of the host plant. The flowers are very different, being red and yellow, up to 50 mm long and of a narrow tubular shape.

Cassytha species look quite different from their host plants. They are aptly called devil's twine as they form a dense tangled mass of narrow stemmed vine.

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Australian trees exhibit many adaptations to specifc challenges of the continent's environment. Vigorous new growth over the whole trunk of a eucalypt ensures survival after fire. Australian hardwoods also generally add a new growth ring after periods of rain. After higher than average rainfall, these specially adapted trees can even add multiple growth rings each year. It is this mechanism that allows the trees to grow quickly and dominate the plant community.
PHOTOGRAPH JAMIE WRIGHT

Trees

These notes are intended as a guide to the identification of the most common trees in the Park. The trees have been grouped into categories:

- smooth barked trees;
- trees with only lower portion of the trunk covered with rough bark;
- trees in which the rough bark extends to the tips of the branches and twigs.

Two of the most common larger shrubs have also been described.

The descriptions are based on bark appearance, on leaves and fruit (sometimes it is not possible to reach leaves and fruit but they can often be found by searching on the ground around the trees), and habitat. Locations of good examples of some of the species are given.

Smooth bark

Sydney Red Gum
Angophora costata

Greyish-pink to pink-orange bark shed in spring or after fire; curving branches; opposite leaves; fruit distinctly ribbed with teeth on upper rim. Widespread on slopes and in gullies.

Broad-leaved Scribbly Gum
Eucalyptus haemastoma

Smooth creamy-white to whitish-grey bark, usually covered with insect scribbles, and shed in spring; alternate leaves. Found on upper slopes of gullies or ridge-tops. Old trees often have partly burnt-out trunks, forming interesting shapes and hollows.

Narrow-leaved Scribbly Gum
Eucalyptus racemosa

Distributed on the higher ridges within the Park, as well as being found in numbers around Quarry Road, Dural. It is also found around the Stewart Avenue fire trail, on the verges approaching Galston Gorge Road and the upper sections of Galston Gorge.

Grey Gum
Eucalyptus punctata

Widely distributed in the Park, mainly on the deeper soils, but usually as a single tree or a few; usually found in association with *Eucalyptus piperita, Angophora costata* or *Eucalyptus haemastoma*. Often has patches of smooth salmon-coloured bark.

Water Gum
Tristaniopsis laurina

Formerly known as *Tristania laurina*. Smooth pale bark; alternate leaves; yellow flowers. Found along rocky creek beds and on adjacent banks.

Rough bark at base

Trees with rough bark at the base and for varying distances up the trunk but upper trunk and branches smooth.

Silvertop Ash
Eucalyptus sieberi

Classified as an ironbark but does not occur in this form in the Park. Often stunted with rough bark at base. Most distinguishing features are the bright shiny red branchlets and twigs at periphery of major branches and the silvery canopy. Widespread, usually on upper-slopes and in poorer soils on ridge-tops.

Blackbutt
Eucalyptus pilularis

Rough fibrous bark on lower part of trunk dark brown but often coloured black after fire; upper trunk and branches have whitish bark; alternate leaves, paler on one side. Occurs in sheltered (south to south-east facing) gullies and on Joes Mountain.

Sydney Peppermint
Eucalyptus piperita

Short fibrous bark often blackened by fire on lower trunk and branches. Upper branches are smooth with long ribbons of bark hanging from them. Alternate leaves when crushed smell distinctly of peppermint. Widespread on slopes from near ridge-top to gully bottom. Sydney Peppermints are a much shorter tree than the blackbutt, with more distorted trunk and branches. The bark has a subtle-to-distinct spiral pattern around the trunk. The fibrous bark does not reach the smaller branches.

Sydney Blue Gum
Eucalyptus saligna

Rough flaky bark forming a short stocking at base of trunk. Smooth bark above has a distinctly blue-grey appearance; alternate leaves paler on one side. Found only on better soils, notably Kitchener Road area, Joes Mountain and (outside the Park) on the eastern slopes of Quarter Sessions Road below the Rural Fire Service Station.

The Sydney Blue Gum is a tall. impressive and good looking tree that is also found in nearby residential areas.

Early European settlers quickly recognised the tree as a prime source of building timber and rapidly reduced its presence in the colony.

Trees
Malcolm Bruce

Rough bark

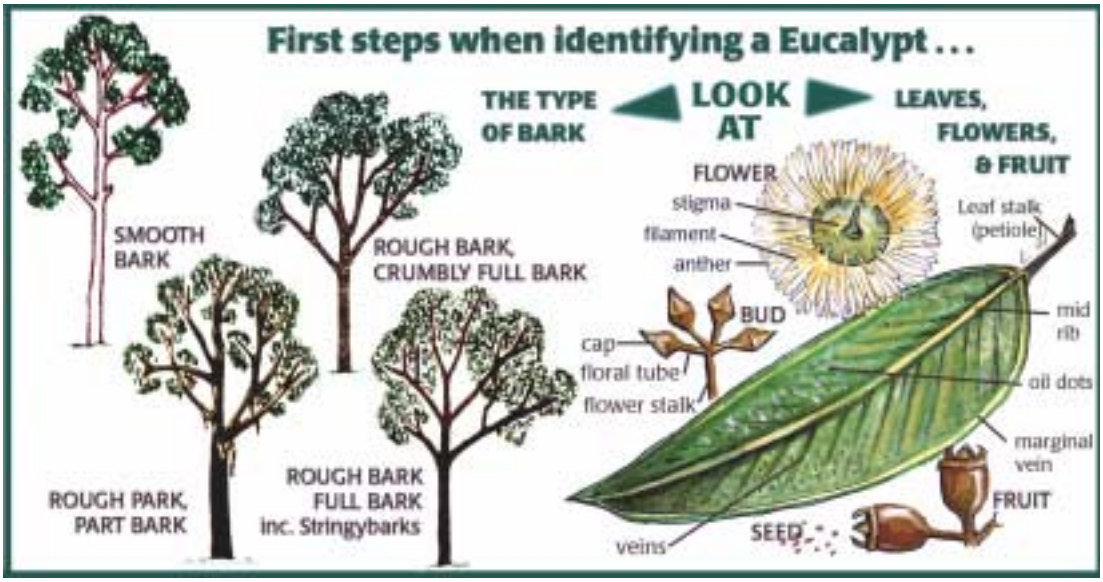
Trees with rough bark on trunk and branches with possibly only the newest formed branches smooth.

Blueberry Ash
Elaeocarpus reticulatus

Small tree with some scattered red leaves, covered in early summer by white to pink flowers that are distinguished by petals with an attractive lacy fringe. The flowers are followed by blue berries, about 8 mm in diameter. The leaves are lance shaped, and the leaf veins have a visible reticulated pattern. Commonly found in sheltered valleys and slopes on deep sandy soils with a clay base.

Old Man Banksia
Banksia serrata

Gnarled and twisted with very rough bark, stiff serrated leaves and yellow-green flowers in summer. The old fruits remain on the tree for years.



Coachwood
Ceratopetalum apetalum

Smooth greyish bark (but rougher than smooth barked gums) often covered in light coloured patches of lichen growth (pale blue green in colour); leaves opposite with 'toothed' edges. Characterised by a small projection at the base of the leaf blade. Found on creek banks and in gullies.

Narrow-leaved Apple
Angophora bakeri

Rough dark bark; leaves opposite, narrow spear-shaped; fruit distinctly ribbed with teeth on upper rim. Fairly restricted distribution on slopes west of the Jungo and trails from Laurence Street, Pennant Hills, and Gumnut Road, Cherrybrook.

Rough-barked Apple
Angophora floribunda

A gnarled tree similar to *Angophora bakeri* but with more oval leaves. Distributed in the valleys with deeper more fertile soils, such as in Old Mans Valley and Crosslands Reserve; found in association with *Eucalyptus saligna*. Seems to prefer locations with fertile soil, and can colonise after disturbance.

Black Sheoak
Allocasuarina littoralis

Deeply ribbed black bark; apparently without leaves but branchlets modified to resemble pine needles, distinctly ribbed; toothed, modified leaves at each node (junction); six to eight teeth in each whorl; fruits chestnut brown in colour. Widespread, particularly below Silver Crescent, Westleigh.

Heart-leaved Stringybark
Eucalyptus camfieldii

Bark scaly and fibrous; alternate adult leaves shorter than broad, juvenile leaves heart shaped or round; fruit crowded into globular heads. Small tree or mallee (multi-stemmed form) may be present as prostrate form. Uncommon species with distribution restricted to the end of Stewart Avenue, Hornsby Heights.

Yellow Bloodwood
Corymbia eximia

Formerly known as *Eucalyptus eximia* (see Hill & Johnson 1995). Bark on trunk scaly or flaky to touch with distinct yellow-brown colour often beneath a surface blackened by burning; alternate leaves with yellowish tinge and sometimes paler on one side, may be very large, particularly when regenerating after fire; buds yellow, fruit shaped like an urn. Distribution wide but uncommon, usually on the edge of the Park's escarpments.

Red Bloodwood
Corymbia gummifera

Formerly known as *Eucalyptus gummifera* (see Hill & Johnson 1995).

Brown bark in flakes, with horizontal and vertical cracks; often with wounds that weep red-brown gum; juvenile trees have smooth red-pink bark with rough bark developing; alternate leaves paler on one side; fruit urn-shaped. Widespread distribution from ridge-top to gully bottom.

Common Sandstone Stringybark
Eucalyptus oblonga (see Brooker & Kleinig 1999)

Bark of this species is long and stringy; juvenile leaves may be toothed or wavy along the margins; adult leaves alternate; fruit crowded into globular heads; smallish leaves.

Red Mahogany
Eucalyptus resinifera

Bark long and stringy; alternate leaves; valves within gumnuts sharply pointed. Fairly restricted distribution on better soil.

Turpentine
Syncarpia glomulifera

Tall tree, often over 40 m high with fibrous bark; oval opposite leaves with pale undersurface, edges curved under. Prominent flowers, creamy-white filaments; fruit in a globular head, with spiky valves. Occurs on better soils to south of Park and in sheltered gullies.

Less common trees

Eucalyptus squamosa, Eucalyptus sparsifolia, Eucalyptus agglomerata, Eucalyptus globoidea and *Eucalyptus botryoides* all have small distributions within the Park with Grey Ironbark *Eucalyptus paniculata* growing in the more fertile soils mainly derived from Ashfield Shale on the edge of the Park.

Small trees

A number of small trees are found in the Park of which three are mentioned below together with Christmas Bush. See also the sections above, 'Biodiversity', and 'Shrubs'.

Jeremy Steele

The trunk of a Eucalyptus haemastoma showing the lines and scribbles created by burrowing insect larvae.

Jeremy Steele

Bark peeling off the trunk of a Sydney Blue Gum Eucalyptus saligna but leaving the signature stocking of bark at the base of the tree.

Jeremy Steele

The common name for this tree is Yellow Bloodwood. The yellow flakey bark gives part of the common name of Corymbia eximia.

Gregor Newton

The large nectar filled flowers of Red Bloodwoods (Corymbia gummifera) are important food sources for many animals in the bush.

Gregor Newton

The needles of Allocasuaria littoralis are not leaves, they are modified stems called cladodes.

Gregor Newton

It is sometimes difficult to tell the difference between the flowers of a Eucalypt and an Angophora. These look very much like a Yellow Bloodwood, but are those of a Dwarf Apple Angophora hispida.

Dwarf Apple
Angophora hispida

Large sprays of cream gum blossom; bark flaky; opposite leaves heart shaped and stem clasping; new growth densely covered with reddish hairs; fruit large (15 mm diameter) with prominent ribbing and teeth around the upper rim. Widespread, particularly on upper slopes and ridge-tops.

Heath-leaved Banksia
Banksia ericifolia subspecies ericifolia

Leaves are small (10–15 mm long) and narrow with margins curled underneath, often notched, leaf colour a bright green; flowering spike elongated into the typical *Banksia* candle which is golden orange when young, and gold and red when buds open.

Water Gum
Tristania neriifolia

Flowers similar to, but plant much smaller than, *Tristaniopsis laurina* (also called water gum). Found along creek beds and banks.

Christmas Bush
Ceratopetalum gummiferum

A tall shrub or small tree to 4 m high, with rough bark. Leaves have three leaflets, with small-toothed margins. Clusters of small white flowers appear in early summer. After pollination, the calyx (outer bracts) enlarge and turn pink to deep red in the Christmas season, hence the common name.

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Sydney Blue Gum

Plant communities

Most of the tall open-forest on the clay-capped ridge-tops (mainly Blue Gum High Forest) was cleared first for timber, then for agriculture and finally for housing. Hornsby Shire has very little Blue Gum High Forest remaining, and there are only two small remnants on the fringe of the Park.

The Park mainly contains plant communities associated with Hawkesbury Sandstone soils. This vegetation has survived clearing partly because the infertile soil made these areas unsatisfactory for farming, and the rugged topography made sandstone country too difficult and expensive for development. However, in recent years, modern building techniques have enabled the sandstone terrain to be developed for housing.

The variety of habitats provided by the rugged sandstone topography has resulted in the evolution of diverse plant communities with a rich array of species, which are adapted to survive the often harsh conditions.

The diversity in this landscape has been aptly described by Doug Benson and Jocelyn Howell of the Royal Botanical Gardens, Sydney:

Vegetation patterns on sandstone landscapes respond strongly to a variety of local habitats. Topography affects available soil moisture; steeper slopes tend to be better drained than gentler ones, and slopes facing north and west receive more sunlight, drying out faster than those facing south east. South-facing slopes are generally steeper than north-facing ones. Deeper soils accumulate down slope, less exposed to the drying effects of the sun, providing more moist and often more fertile conditions for plants.

Lenses of shale, interbedded among sandstone layers, weather to pockets of clay-rich soils, with higher fertility and better water holding capacity than sandstone soils. Shale strata may also concentrate water, providing locally wetter conditions in springs and soaks. (Benson & Howell 1990, p. 23)

Plants are found in areas where their requirements for growth and reproduction are met. Groups of species having similar requirements will grow together and form plant communities. Some species with special requirements are found only in a particular area whereas others with less-specialised requirements are more widespread. A complex of factors will determine the vegetation in a particular area. It will involve the interaction of plants, the fauna, fungi and bacteria, and a number of environmental factors such as soil, topography, climate and fire regime.

Classification

The most common system used to describe vegetation is based on structure. It was developed by plant ecologist Ray Specht in 1970, and was modified in 1981. This system is based on the following three factors:

- growth form of the tallest layer of vegetation. There are three types of growth form - trees, shrubs and herbs. Trees are usually single-stemmed woody plants while shrubs are woody plants with many stems; and herbs are non-woody plants.
- percentage of sky covered by the foliage of the tallest layer. For example, if you look up and the leaves block out half the sky, the foliage cover is 50 percent.
- height of the tallest layer of vegetation.

Plant communities can be further described by adding:

- plant species in the tallest layer of vegetation, as in 'Blue Gum High Forest';
- habitat, as in 'Sydney coastal river-flat forest';
- geology, as in 'sandstone swamp'.

The plant communities listed below are based on those documented and described by Smith & Smith (1990). Eleven of the eighteen plant communities in the Park are described, and their distribution and main plant species are indicated on the transect diagrams below. (Alternative names based on Benson & Howell (1994) are included where appropriate.) The boundaries between communities are not clear cut; they will overlap as tolerance to changed environmental conditions varies.

Tall open-forest

Blue Gum High Forest is an example of tall open-forest, and is listed as an endangered ecological community in the *Threatened Species Conservation Act 1995* (NSW). Less than one percent of the original forest remains on the ridges of Sydney's north shore. Tall open-forest has trees up to thirty metres or more in height, and a foliage cover of thirty to seventy per cent. The understorey includes small shrubs and climbers with groundcovers of ferns, grasses and herbs.

Tall open-forest is found in areas of high rainfall on nutrient rich soil. Such soil in the Park has two origins. It may be derived from Wianamatta Shale, a remnant of which occurs on the southern edge of the Park at the Boundary Road entrance, West Pennant Hills. This supports the endangered ecological community mentioned above.A second origin is volcanic rock from a diatreme in Old Mans Valley, Hornsby, giving rise to what is often called a 'glen forest'.

Another tall open-forest occurs on alluvial flats along the banks of the Hawkesbury River and Berowra Creek. It can be seen along Berowra Creek south of Crosslands.

Open-forest

Open-forest has a foliage cover of thirty to seventy per cent, with trees less than thirty metres high. It usually occurs on sheltered eastern and south-facing slopes, or on valley floors where there is fertile alluvial soil. It is often called 'gully forest'. Open-forest is very common in the Park. It has a rich species understorey. The composition is influenced by soil origin.

Woodland

Trees in woodland areas are ten to thirty metres high with a foliage cover of ten to thirty per cent. The open nature of the canopy results in a dense and diverse shrub layer with many wildflowers that are characteristic of sandstone country. Woodland is found most often on ridge-tops and exposed north- and west-facing slopes of hillsides. The soil is often shallow and infertile, most of the nutrients having been washed downhill. The structure and composition of woodland varies in response to such environmental conditions as aspect, topography, soil, rainfall and the length of time since the last fire. There may be other trees present (apart from those listed under the transect diagrams) such as *Eucalyptus sieberi* and *Angophora bakeri*. Woodland is very common in the Park. Examples can be seen on the Refuge Rock walk and south of Pogson Trig on the Heritage Bridges walk.

Low open-woodland

Low open-woodland occurs on shallow soils on benches and ridge-tops. An example can be found on the northern end of the former Pennant Hills Pony Club site and on the north-eastern edge of the Department of Health land off Schofield Road, Pennant Hills.

Rock platform heath

Rock platform heath does not feature on the transects as it is usually too small to map. Heath is made up of shrubs less than two metres high, and its density and floristic composition vary depending on local conditions. The plants are characterised by their small hard leaves. They grow in shallow infertile soil or where the drainage is poor. Smith and Smith (1990) describe rock platform heath as consisting of 'pockets of heath with occasional low trees in depressions and fractures on large flat sandstone outcrops, interspersed with areas of bare rock' (Smith and Smith p. 19). Sometimes there may be islands of shrubs with a dense ground cover of moss. The largest example of this community is found at Refuge Rock.

Sandstone swamp

Sandstone swamp, which may consist of sedges with scattered shrubs, heath or ferns, occurs in poorly drained sandstone soils. A large patch of sedgeland can be seen east of Pogson Trig on the Pogson Trig walk.

Warm temperate rainforest

Warm temperate rainforest is a closed-forest with a foliage cover that blocks out seventy per cent or more of the light. It forms a narrow strip along many creek lines in sheltered gullies on Hawkesbury sandstone. It is often called 'gully rainforest'. Where the soil is less fertile, the plant community is replaced by scrub or low forest, often with dense patches of fern lining rocky creek banks.

Casuarina glauca closed-forest

Casuarina glauca closed-forest is found on swampy, saline, alluvial flats along the Hawkesbury River, Marramarra Creek and Berowra Creek.

Salt marsh

Salt marsh may contain sedges or herbs and may be sparse or dense. It is restricted to a few patches on the intertidal mudflats along Berowra Creek near Crosslands and at the Calna Creek junction on the Saltmarsh Walk No 10.

Mangroves

Patches of mangroves occur on the intertidal mudflats along Berowra Creek between Crosslands and Berowra Waters. The taller Grey Mangrove *Avicennia marina* forms a closed-forest on the water's edge, whereas the River Mangrove *Aegiceras corniculatum* forms a closed scrub on the landward side and upstream. The Grey Mangrove can be recognised by its pneumatophores. These are fingerlike aerial roots that project upwards from the mud and enable the roots to breathe at low tide. The tangled root system traps silt and prevents erosion of the banks.

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The mangrove cycle

Lifestyle mud!

A mangrove crab feeds on detritus on the edges of the water, and small marine invertebrates feed on detritus in the mud and river bed. Detritus is the broken down matter from fallen leaves, sticks, dead organisms and algae. It provides enriched food matter for many animals such as shrimps, mangrove snails, crabs, beachworms and pippies. Fish feed on the marine animals and detritus within the seagrass beds. Water birds like the White Faced Heron in this diagram feed on worms, fish, small crustacea and other marine animals. The river mangrove grows along the banks and drops leaves into the sea bed to continue the cycle.

About mangroves

There are two species of mangroves in the Berowra Creek catchment. These are the Grey Mangrove *Avicennia marina var. australisca* and the River Mangrove *Aegiceras corniculatum*. The River Mangrove is less common than the Grey and is located in less saline water, usually upstream and inland from the Grey Mangrove.

Mangroves have to be special in order to survive the harsh environment along the edge of the tidal zone. They have developed leaves with thick waxy coatings, which are able to withstand salt, wind, intense sunlight and dryness. Fallen mangrove leaves, together with algae and plankton growing in and around the trees, are the major contributor of energy and organic matter in the local ecosystem. Mangroves are the key component in a basic estuarine food chain of utmost importance to the coastal prawn and fishing industries. This ecosystem is supported partly by its own high natural fertility and partly by the protection afforded by the shallow and tangled roots of the mangrove forests.

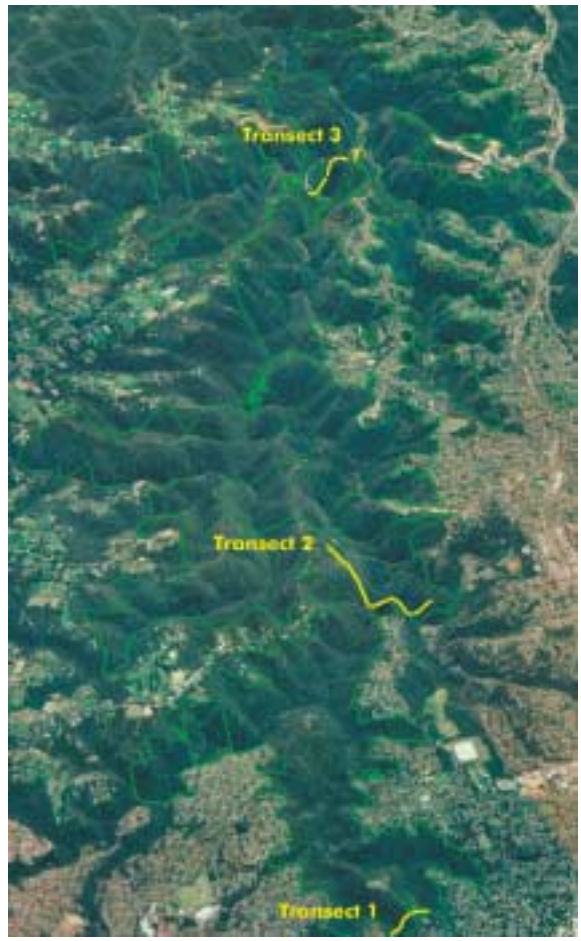
The mangrove root system is extensive and shallow, and in places the aerial roots, called pneumatophores, grow up out of the oxygen-deficient mud in order to breathe.

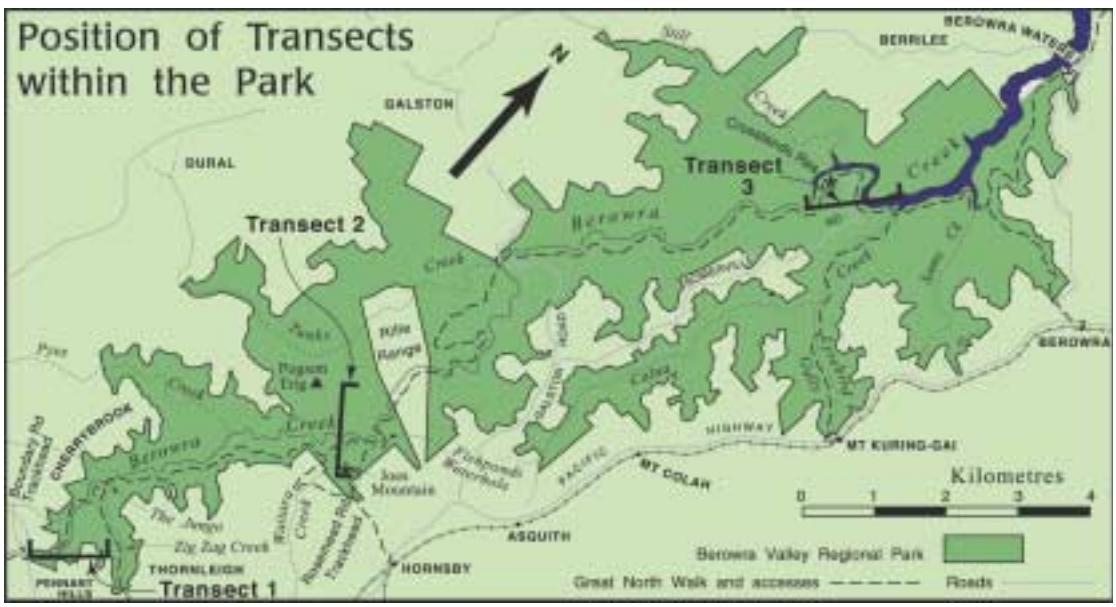
Transects

Sylvia Douglas & Pat Pike

Three transects across parts of Berowra Valley Regional Park show the diversity and distribution of plant communities within the Park. The prefix letters (e.g. J Tall open-forest) are those used in the source reference, Peter Smith and Judy Smith *Vegetation and Fauna of Berowra Valley Bushland Park* (1990).

The plan below shows the actual postion of each transect. Their approximate position and contours are illustrated on the adjoining 3D modified aerial photograph of the Park. The vertical scale is exaggerated to highlight the topographical features.





Transect 1: Boundary Road to Thorn Street

Main plant species

J Tall open-forest
Eucalyptus saligna
Eucalyptus pilularis
Syncarpia glomulifera
Angophora costata

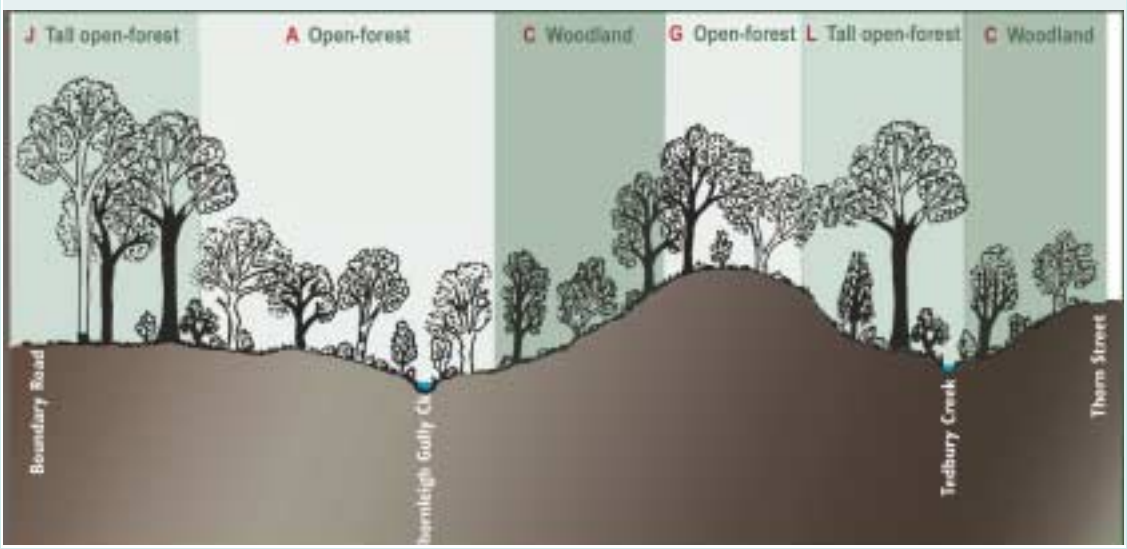
A Open-forest
Eucalyptus piperita
Angophora costata
Corymbia gummifera
Eucalyptus sparsifolia

C Woodland
Corymbia gummifera
Eucalyptus haemastoma
Eucalyptus sparsifolia

L Tall open-forest
Eucalyptus pilularis
Syncarpia glomulifera
Angophora costata
Corymbia gummifera
Eucalyptus resinifera

VARIABLE RELATIONSHIPS OF ORIGINAL DIAGRAMS FOR EACH TRANSECT

Horizontal level	1cm =	62.5m
Elevation:	1cm =	15.0m
Tree height:	1cm =	5.0m



Transect researched and drawn by Sylvia Douglas

Transect 2: Near Pogson Trig to Joes Mountain

Main plant species

G Low open-woodland
Eucalyptus haemastoma
Corymbia gummifera
Angophora hispida
Banksia ericifolia

I Sandstone swamp
Lepidosperma filiforme
Xanthorrhoea resinosa
Lepyrodia scariosa
Schoenus brevifolius

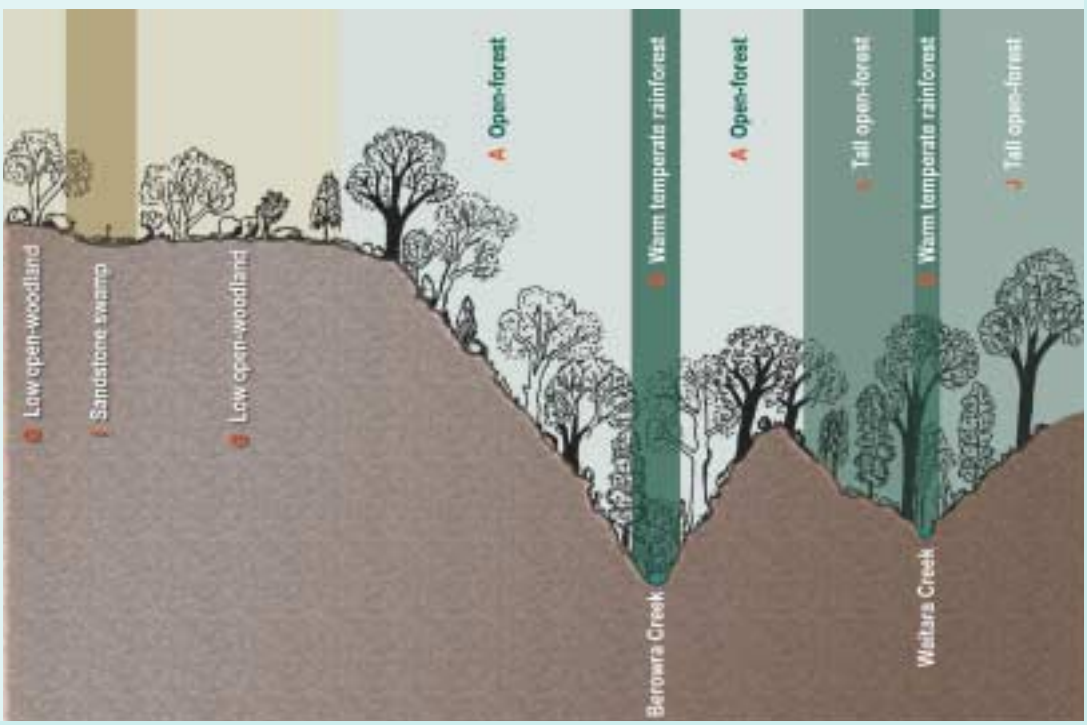
Baeckea imbricata
Callistemon citrinus
Banksia oblongifolia
Banksia ericifolia
Hakea teretifolia
Leptospermum squarrosum

A Open-forest
Eucalyptus piperita
Angophora costata
Corymbia gummifera
Eucalyptus punctata

O Warm temperate rainforest
Ceratopetalum apetalum
Tristaniopsis laurina
Callicoma serratifolia
Acmena smithii
Lomatia myricoides
Pittosporum undulatum
Backhousia myrtifolia
Elaeocarpus reticulatus
Austromyrtus tenuifolia

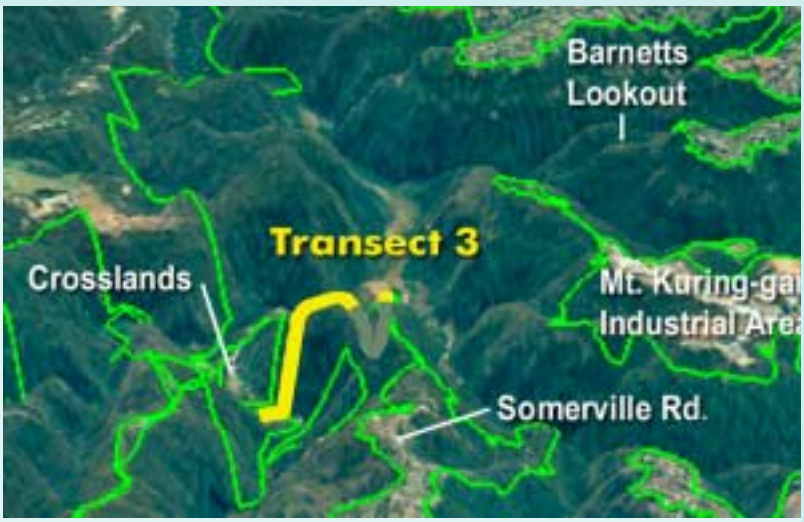
L Tall open-forest
Eucalyptus pilularis
Syncarpia glomulifera
Angophora costata
Corymbia gummifera
Eucalyptus resinifera

J Tall open-forest
Eucalyptus saligna
Angophora floribunda



Transect researched and drawn by Sylvia Douglas

Transect 3:
Crosslands to opposite the confluence of Berowra Creek and Calna Creek



Main plant species

P Tall open-forest
Eucalyptus pilularis
Angophora floribunda
Allocasuarina torulosa
Glochidion ferdinandi
Syncarpia glomulifera

Q Open-forest
Angophora floribunda
Allocasuarina torulosa
Eucalyptus piperita
Eucalyptus punctata

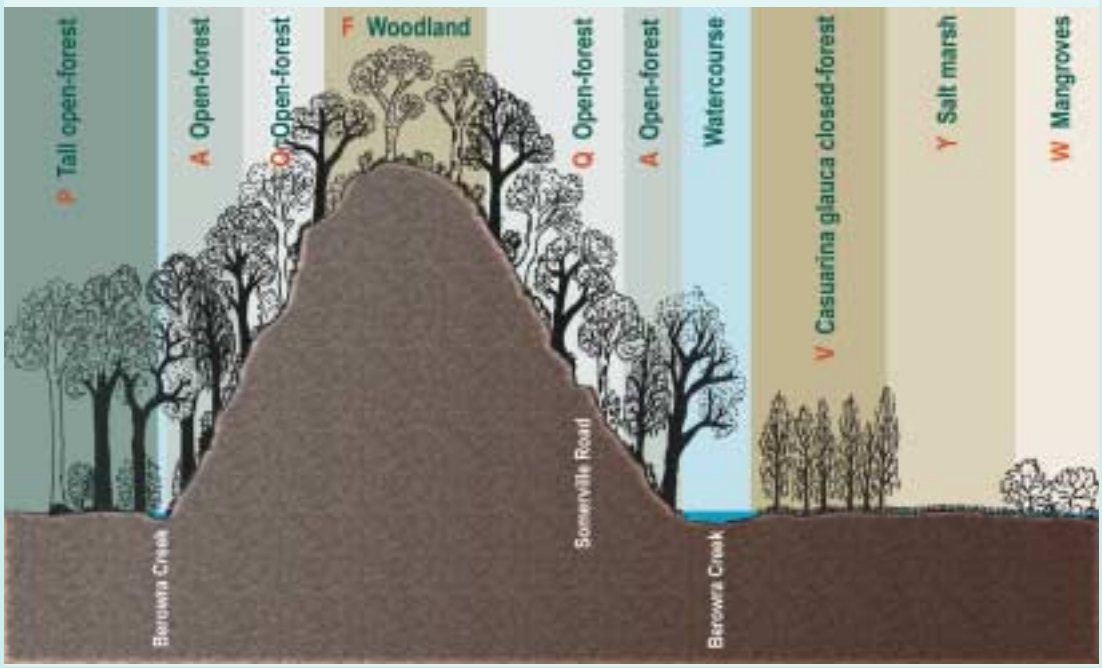
A Open-forest
Eucalyptus piperita
Angophora costata
Corymbia gummifera
Eucalyptus punctata

F Woodland
Eucalyptus racemosa
Corymbia gummifera
Angophora costata
Allocasuarina littoralis
Corymbia eximia

V Casuarina glauca closed-forest
Casuarina glauca
Juncus krausii
Phragmites australis
Sporobolus virginicus
Baumea juncea

Y Salt marsh
Juncus krausii
Sarcocornia quinqueflora
Suadea australis
Sporobolus virginicus
Tetragonia tetragonioides
Baumea juncea
Samolus repens

W Mangroves
Avicennia marina
Aegiceras corniculatum



Transect researched and drawn by Sylvia Douglas

Pygmy Possum

Fauna of the Park

Berowra Valley Regional Park is located among the deep dissected valleys of Berowra Creek, one of the many tributaries of the Hawkesbury River. Over millions of years this creek has eroded away the surrounding rock, creating a range of habitats that is reflected by the many different vegetation communities and plant species that are found in the Park.

Matching this plant biodiversity was a widely variable fauna population. A remnant of this fauna population still lives in the bushland of Berowra Valley Regional Park. The decline in the variety of animal species once found in the park reflects the pressures and expectations that we Australians have placed on a diverse and unique environment.

Do we care for the land we now call home?

Australia is different from the many countries we, or our ancestors, came from. Even today, we still try to create little patches of other parts of the world in our gardens. Most Australian animals find it difficult to live in these non-Australian outposts. There are always exceptions. Blue Tongue Lizards, Noisy Mynas and Sulphur Crested Cockatoos will feed and live in our gardens. How many of us have a Lyrebird or a Swamp Wallaby living in our introduced, horticultural gardens? These animals may visit, but they do not stay. The surroundings are foreign.

Berowra Valley Regional Park still has many native animals living within its boundaries, but these are only a small sample of the variety of species that previously lived in the area. The decline in biodiversity started almost as soon as Europeans came to the Hornsby district. It has continued up to the present including periods of somewhat misguided conservation management policies such as those of the 1970s and 1980s. It is only recently with an increase in bushfire, both deliberate and unplanned, that larger Kangaroos and some Bandicoot species have returned to Berowra Valley Regional Park. Unfortunately, many animal species will never return, as there are now houses, farms, rivers, roads and railway

lines between their present bushland homes and Berowra Valley Regional Park. Gone are Wombats, Greater Gliders, Eastern Quolls, Rock Wallabies, Phascogales and a host of smaller animals. Are they gone permnaently? Perhaps not, we are still finding out more about Berowra Valley Regional Park and maybe one of these beautiful animals will be found again, living in or near Berowra Creek.

The animals we are likely to see

Today the Park is home to two groups of animals. One group is the animals that we see during the day and the other group are the animals of the night. During the day, particularly the early morning and the early evening, the bushland echoes with the calls and cries of a huge variety of birds. These range from the smallest Pardalote, in the tops of the tallest trees, to Lyrebirds and Brush Turkeys feeding on floors of forests and woodlands. We know many of the birds, they visit our gardens and the calls of Currawongs wake us on Sunday mornings. We also see many of the lizards scampering about among the leaves or the aggressive ancient Water Dragons guarding the creeks. The diversity of birdlife in Berowra Valley Regional Park is simply amazing, but many of these birds are secretive and are often never seen because most people do not go deep into the bushland where they live.

Animals of the night that we may never see

What most of us do not see are the many nocturnal animals that take the place of the birds and reptiles when the sun goes down. We all see some of them, Brush-tailed and Ring-tailed Possums. We hear the Boobook Owls calling at night. Frogs are often heard near ponds and creeks but how many of us have actually seen the frogs that keep us awake at night? These brief glimpses of the night-time animals are only a small representative of the animals that still shelter and feed in Berowra Valley Regional Park.

We rarely see Bush Rats or the mysterious Antechinus scurrying around the forest. The few Grey Kangaroos that hide in some parts of the Park are seldom seen and who has observed a Koala moving from feeding tree to feeding tree at night in the Park?

Many of the daytime and nocturnal animals are dependent on a large group of animals we mostly do not consider, the invertebrates. No one really knows how many different species of invertebrates can be found in Berowra Valley Regional Park. Many of these insects, spiders, slugs and snails are food for the many different birds, mammals, frogs and reptiles that forage in the Park. Flowing through the gullies of the Park are many creeks. In these creeks are the remnants of both invertebrate and vertebrate fauna that were once found in all Australian waterways. Because we rarely see fish in the creeks, we don't consider them, but it is these aquatic animals that have been greatly affected by our actions, more than those we see on land.

Conserve Berowra Valley Regional Park

Whatever we put down our drains, wash off our driveways or sprinkle on our gardens will eventually end up in Berowra Creek or one of its

Fauna of the Park

Malcolm Bruce

tributaries. When you next wash your car, just think about where the detergent goes and how it may affect the health of some aquatic animal many kilometres from your home.

To conserve what is left in Berowra Valley Regional Park we must not despoil the local bushland by:

- ☐ dumping any garden refuse in it;
- ☐ washing chemicals down stormwater drains and out into the Park;
- ☐ deliberately disturbing any native animal in the Park;
- ☐ failing to confine family pets at night;
- ☐ allowing pets to roam through the Park.

Plant indigenous shrubs and trees in your garden. Maintain fauna corridors across your property by caring for trees and other natural features and when you visit Berowra Valley Regional Park, look and leave.

Invertebrates

The number of invertebrates both globally and in any one area is enormous, and far outweighs the number of vertebrates such as birds, reptiles and mammals, making a full review of the number and variety in the Park a colossal and almost impossible task.

Studies into the functions performed by invertebrates in ecosystems show they are essential in attempts to restore or regenerate native bushland. Without these functions a restored area will not be self-sustaining in the long term. The presence of the correct diversity of invertebrates is essential to restoration plans.

Invertebrates

Jackie Robins

This section highlights the most abundant ground-dwelling arthropods (invertebrates with jointed legs, hence excluding worms, snails etc) in one small area of relatively undisturbed Blue Gum forest, in Old Mans Valley near the end of Rosemead Road, Hornsby. The study involved placing 15 pitfall traps in the ground every six months and identifying all arthropods present after seven days. In the first three sessions a total of 5,643 specimens were caught representing more than 29 orders.

The most abundant groups were ants (2,118 specimens), Collembola (1,700 specimens) and flies (760 specimens), and beetles (228 specimens). The study identifies ants, flies and beetles to a lower level (family or genus), the most common of which are described below. A list of all orders (or similar grouping used) found at this site is in the appendix.

Ants *(Formicidae)*

Ants are placed in the family Formicidae, part of the order Hymenoptera that also includes bees and wasps. However, ants are identified as a separate group for monitoring purposes due to their abundance and importance in the Australian ecosystems. They are found in a wide variety of habitats and are highly social with an extremely complex system of chemical communication. Ants are usually easily recognised as they are so common, but one of their clearest identifying features is the presence of one or two segments joining the thorax to the abdomen. These segments are known as the petiole and post-petiole if two segments are present. It is the presence of these segments that distinguishes ants from bees or wasps. The ants were then identified to genus of which 20 were represented, covering at least 28 species. The most abundant genera were as follows:

Sugar Ants *(Anonychomyrma)***

These comprised 72% of all ants trapped. Anonychomyrma (Sugar ants) were the most common ant in the area. They are general predators, often forage in conspicuous trails and occupy a range of habitats but prefer wooded areas. They are also very common in urban areas. They have 12-segmented antennae with no club (enlarged antennal segments at the end). The petiole is upright. If disturbed, many species can emit a very strong and distinct odour. They are black with few other obvious distinguishing features but the ones here have a very distinctive domed shape to the thorax. They are about 3mm in length.

Pheidole**

These comprised 8% of all ants trapped. These small but very common ants are general predators and scavengers and eat a wide range of foods. The various species of Pheidole found here differed greatly in colour, texture, mesosomal shape and presence (or absence) of spines. The size also varied quite significantly though all were small (less than3.5mm long). Pheidole have a three-segment club at the end of their 12-segmented antennae and two petiole segments. The thorax has a sloping section joining the higher anterior part (mesonotum) to the lower posterior section (propodeum).

Rhytidoponera**

These comprised 8% of all ants trapped. These quite large (10-20mm long), robust, very distinctive and impressive looking ants can be abundant, especially in urban areas. They are normally general predators or scavengers, nest in the soil and generally forage alone. Rhytidoponera can be identified by the presence of a small angular tooth or spine on the side of the leading edge of the pronotum - equivalent to its 'shoulder'. It also has a single square petiole segment. Some have a distinct metallic sheen.

Springtails *(Collembola)*

The class Collembola is commonly known as Springtails. They are very small and can be extremely abundant especially in wet conditions. They are variable in appearance but can be identified by the presence of a lever-like modified appendage folded under the rear of their body. This is held to the body by a hook structure that when released lets the lever flick down, which propels the Collembola rapidly through the air - a very useful and quick escape response.

Flies *(Diptera)*

True flies are members of the order Diptera and are easily identified by having only one pair of wings and the presence of halteres. These are small club-like structures that have evolved from the second set of wings becoming reduced. They serve to provide balance while flying by acting in a gyroscopic manner. Any insect with two pairs of wings (and hence no halteres) will be a member of a different order.

The 760 flies caught represented 18 families and approximately 30 species. Eighty per cent of these flies are from three families, Phoridae, Cecidomyiidae and Sphaeroceridae. The method of trapping used does not provide a representative cross section of the flies present in the area as it is biased towards those that spend most of their time scavenging on the ground.

Phoridae*

These comprised 35% of the flies trapped. Phoridae are very active flies frequently seen running on litter and foliage (which is why they are often caught in pitfall traps). They are

Photograph courtesy of Biotrack Australia

Rhytidoponera C. ants have a distinctive metallic sheen.

Photograph courtesy of Biotrack Australia

Pheidole ants are common, small scavenger predators.

Photograph courtesy of Biotrack Australia

Beetles Coleoptera. The order Coleoptera represented 13 families and approximately 37 species.

Photograph courtesy of Biotrack Australia

Phoidae are the most active flies seen in the Park and identified by their humpback thorax and distinctly vienated wings.

found in a wide variety of microhabitats and are small, ranging in size from 0.5mm to 5.5mm. Most of those found here were towards the larger end of this scale. Identification is by a distinct wing veination and the thorax often has a humpback shape. The wings fold flat over the abdomen when at rest and the legs are strongly developed.

Gall Midges *(Cecidomyiidae)**

These comprised 25% of flies trapped. Cecidomyiidae (gall midges) are a large family of tiny flies, the majority of which have delicate wings and reduced wing veination. Most live in galls on plants, hence the common name, but there is a great variety of feeding habits within the family.The small size of these flies, generally being no more than 1mm long, makes identification beyond family level very difficult.

Sphaeroceridae*

These comprised 20% of flies trapped. Sphaeroceridae are commonly found in all types of decaying matter including dung. They are small (2-3mm in length), stout-bodied and dull coloured, identifiable by distinct wing veination (as well as other attributes). The specimens found here appeared to be of only two morphospecies, differing only by the presence of brown patches on the wings of one.

Beetles *(Coleoptera)*

The order Coleoptera represented 13 families and approximately 37 species. Adults are easily identified by the presence of elytra - hardened wing coverings that have evolved from the anterior pair of wings. These cover the hind wings (that are still used for flying in many cases) and provide protection from damage.

Rove beetle (*Staphylinidae)*

These comprised 48% of all beetles trapped. Staphylinidae is the fifth largest beetle family in Australia and contains a huge number and variety of species. They are easily identified by the short elytra that only cover one or two segments of the abdomen, which curls upwards. Most are small (although the size can vary from 1-20mm, and are found in leaf litter.

Leiodidae

These comprised 17% of all beetles trapped. Like Staphylinidae, Leiodidae is also part of the superfamily Staphylinoidea, but their elytra cover the entire abdomen. The majority of species have a distinctive antennal club consisting of five segments but with the second proximal segment being noticeably smaller than the others. They are commonly found in decaying organic matter, with many being general scavengers and are all small (no more than 2mm long at this site) and generally brown in colour.

Weevils (*Curculionidae)*

These comprised 10% of all beetles trapped. Curculionidae (weevils) has a great variety of species, which are highly varied in form and size, ranging from 2-8mm long. They are generally easily identfied by their elongated rostrum or 'long nose', although in some found here the head and its mouthparts were circular in form and the mandibles looked almost like a small beak. In addition, the specimens found at this site had a hardened exterior and nine-segmented antennae that bent sharply after the long first segment (referred to as geniculate antennae). The majority of Curculionids feed on plants with larvae often feeding on the internal tissues of plants

Zopheridae

These comprised 10% of all beetles trapped. The vast majority of the specimens in this family collected here are from a single species as yet unidentified. They are only 2-3mm long and dull orange in colour with an oval abdomen and long, narrow head and thorax. The elytra have a ribbed texture and the antenna has eleven segments with a three-segmented club. In addition its eyes are large relative to its head and bulge outwards.

Further Reference

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J. F. Lawrence & E. B. Britton, 1991*, Insects of Australia* Melbourne University Press.

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Freshwater invertebrates

Freshwater invertebrates include animals that range in size from single-celled protozoa (e.g. amoebae) to yabbies.

The macroinvertebrates (i.e. those visible to the naked eye) have been identified from nineteen freshwater streams throughout the Berowra catchment (Coad *et al.*, 1998). Over 110 families of macroinvertebrates have been recorded in the Berowra freshwater streams. Apart from small dams, all waters in the Berowra Valley are flowing streams. Most of the streams are perennial (permanently flowing or permanent pools) although some of the upper reaches are ephemeral.

Invertebrates occupy a number of habitats. Those adapted to flow will inhabit rapids or 'riffle' areas. They have adaptations such as suckers (e.g. Psephenid beetle larvae), hooks (e.g. caddis fly larvae) or friction pads (e.g. some mayfly larvae). Where urban stormwater flows are high, animals able to attach firmly to rocks are common. Food is obtained by scavenging from detritus in the water flowing past or grazing on attached algae and microfauna.

Other animals reside in the bottom gravel, sand and mud. These include a variety of fly larvae (including Chironomids, which love organically enriched muds), worms and molluscs.

Aquatic plants and submerged wood also provide shelter and food for a wide range of aquatic invertebrates. Aquatic bugs (Hemiptera) utilise their piercing mouthparts to pierce animal prey, and other animals such as mayfly larvae graze on attached algae. Crustaceans such as shrimp and Cladocerans obtain nourishment through filter feeding.

Carnivorous invertebrates would make frightening actors in a science-fiction film. Dragonfly and damselfly larvae have hinged masks with vicious hooks which are propelled outwards to ensnare prey. Other carnivores include yabbies, adult and larval beetles and some aquatic bugs.

Some invertebrates such as Gerrid bugs use water surface tension and their long legs to skate over the water surface looking for prey.

Robyn Tuft

Tubicid

Robyn Tuft

Mayfly larvae

Freshwater Invertebrates

Robyn Tuft

Robyn Tuft

Stonefly larvae

Peter Coad

Spiny Crayfish *Euasiacus australasiensis*

Individual Berowra streams differ in the nature of their invertebrate communities. Streams with a predominantly undisturbed bushland catchment tend to be highly diverse and contain animals such as mayflies and stoneflies, which are sensitive to pollution. In more urban areas, fly larvae, snails and worms are more common. This difference in pollution tolerance has been used to identify water quality characteristics in Berowra (Coad *et al*., 1998). Macroinvertebrates can be observed by patiently watching a clear section of stream. Streams can be sampled using a fine net swept through vegetation and downstream of disturbed bottom sediments. Many animals can be observed with the naked eye or with a hand lens. All animals should be returned to the water after examination.

Reference

Coad P., Tuft, R., & Caiger, L. 1998, *The Final Report of Project QU.A.C.K.: Quality Assessment & Catchment Knowledge*, Berowra Catchment Management Authority, Hornsby.

Further reading

Hawking, J.H. & Smith, F.J. 1997, *Colour Guide to Invertebrates of Australian Inland Waters*, Co-operative Research Centre for Freshwater Ecology, Albury.

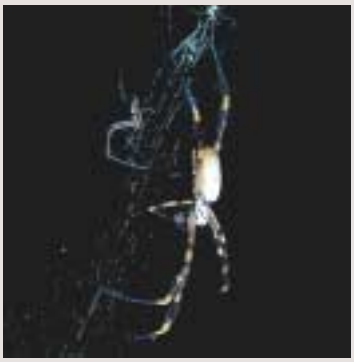
Williams, W.D. 1980, *Australian Freshwater Life*: *The Invertebrates of Australian Inland Waters*, Macmillan, South Melbourne.

Identification keys to genus level are published for most orders of macroinvertebrates by the Co-operative Research Centre for Freshwater Ecology, Albury

A few of the common spiders to be seen in the Park

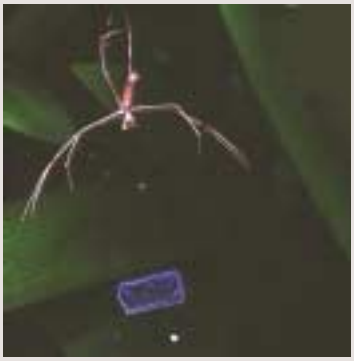
Mike Gray

Garden Orb Weaving Spider Eriophora biapicata



Mike Gray

Golden Orb Weaving Spider Nephila plumipes - female with smaller male.



Mike Gray

Rufous Net-casting Spider Deinopis subrufa - its small net is a highly modified orb web that it holds in the front legs.

Mike Gray

St Andrew's Cross Spider Argiope keyserlingi

J Horsnell

Enamelled Orb Weaving Spider Araneus bradleyi - this species also has beautiful green and yellow colour variants.

Mike Gray

Common Leaf-curling Spider Phonognatha graeffei at entrance to its curled leaf


Golden Orb Spider

Some common spiders

An enormous variety of spiders can be seen in the Berowra Valley region. Some of the more obvious are the orb-web weavers of the families Araneidae and Tetragnathidae.

Garden orb weavers

The most familiar spiders are the large grey to reddish-brown 'garden orb weavers', *Eriophora transmarina* and *E. biapicata*. Occasionally these spiders have a creamy white stripe or spots on the back of the abdomen. Their big wheel-like webs are often seen at night stretched across tracks between shrubs and trees. For insects, these webs are almost invisible and are hard to avoid. Towards morning the spiders usually destroy their webs, except for a few frame lines, by eating the silk. The silk proteins are recycled to the silk glands and used again to make more silk. The spiders shelter among foliage to the side of the web during the day. The sexes are similar in size. The male lures the female from her web onto a special mating thread he has constructed, where mating takes place. Many other orb weavers are found in their webs day and night. One beautiful example, often seen in bushland, is the 'enamelled spider', *Araneus bradleyi*, so called because of its bright glossy abdomen of white, black, red and green. If you see enough of them you will notice occasional striking colour variations of opalescent green or yellow.

Saint Andrew's cross spider

The 'Saint Andrew's cross spider', *Argiope keyserlingi*, is another very colourful spider, whose numerous silvery hairs may help reduce body heating during the day. These spiders make themselves additionally conspicuous by decorating their orb webs with ribbons of bright white silk, in a cross or partial-cross shape (one or more of the four arms of the cross may be missing). These webs are usually found among low tree and shrub foliage. The silk 'cross' is a strong reflector of ultra-violet light, which is attractive to insects, and it probably helps the spider by luring prey towards the web. The variable structure of the silk cross may also help confuse bird predators searching for a juicy spider meal.

Golden orb weavers

The largest and strongest webs are built by the big 'golden orb weavers', of which *Nephila plumipes* is the common species in this region. Their orb webs, built among tall shrubs or slung between trees, have a golden sheen when viewed slantwise. The web is very strong and small birds sometimes become entangled. Webs often have an additional 'barrier' network of silk lines, where the spider hangs its prey, and which provides some protection from predators. When these spiders are very numerous, hundreds of webs may form an interconnected 'colony', as is sometimes seen in mangrove habitats.

In both this and the previous species, the male is much smaller than the female, and mating occurs in the orb web.

Some Common Spiders

Mike Gray

Leaf curlers

These smaller orb weavers leave the upper sector of the web open, and there they place a protective retreat. This retreat is usually a neatly silk-curled gum leaf, even a snail shell. Different leaf curler species can be determined by the distance of the open end of the leaf retreat from the centre of the web. In a common species, *Phonognatha graeffei*, it is placed right at the centre, but in other species it is further out. The webs are found among understorey shrubs.

The sexes are similar in size but a different mating strategy is evident. Males spiders have been found co-habiting in the leaf retreat with immature females; presumably mating occurs as soon as the female matures.

Further Reference

Australian Museum Spiders Website: *www.austmus.gov.au/spiders*
Gray M. 1997, Australian Spiders, Australian Museum Information Disc Series.
Lindsey, T. 1998, Spiders of Australia, Green Guide,

Molluscs

Molluscs represent the largest invertebrate animal phylum after Arthropods, yet their importance in ecosystems is often unrecognised.

Although not obvious at first, molluscs are found in all habitats of Berowra Valley. Molluscs are mostly unseen because most species are small and cryptic. Many people would not know of the dense clusters of small black filter feeding mussels *Xenostrobus securis* that encrust subtidal rocks and other hard surfaces in the estuarine reaches of Berowra Creek upstream from Berowra Waters or the millions of tiny snails that graze algae off rock and weed surfaces in freshwater areas. Even in bushland,

Molluscs

Michael Shea

tiny snails feed on decaying leaf litter and detritus. Other species burrow in sand and mud, bore through submerged timber, chew fungus, scavenge dead animal matter and even prey on other molluscs.

Some eighty-one species of molluscs are at present known from the Park. These include both living and locally extinct species.[1]

Terrestrial and freshwater molluscs

The freshwater mollusc fauna has undergone considerable change. The subdivision of the Berowra Creek catchment for residential development has caused artificial nutrient enrichment along creek lines and general pollution from run-off. As a result, most native freshwater molluscs have declined or disappeared and the fauna is now overwhelmingly dominated by exotic pollution-tolerant species.

Native terrestrial molluscs (land snails and slugs) have fared better and are present throughout bushland areas, particularly in the detritus of Aboriginal shell middens and in vine thickets. Of particular interest is a native slug *Triboniophorus*, which may be endemic to the sandstone outcrops of the Park and adjacent areas. Its grey 'granular' skin surface with bright orange triangle and foot border separate it from other *Triboniophorus* found in eastern Australia. The wriggly zigzag feeding trails it leaves on sandstone rock surfaces are a feature of the area.

Shell midden fauna

Of the thirty-three estuarine molluscs so far recorded from the Park, about ten species apparently no longer exist upstream from Berowra Waters. These species represent a locally extinct molluscan fauna, which are today preserved in Aboriginal shell middens along the shoreline and lower valley slopes. This localised extinction was possibly due to a decrease in salinity associated with advancing sedimentation in the Berowra creek delta since the end of the last Ice Age.

Most of these locally extinct molluscs represented an intertidal epifauna dominated by the Sydney Rock Oyster *Saccostrea glomerata* (of which the bulk of the middens are composed), with smaller numbers of the large intertidal and subtidal infaunal bivalve *Anadara trapezia*, commonly known as the Sydney Cockle or Mud Ark. These species exist today in the more saline conditions further downstream in the Hawkesbury Estuary.

The present-day estuarine fauna of the Park is dominated by the gregarious epifaunal bivalve *Xenostrobus securis*, which is found in large aggregations on hard surfaces along with the infaunal bivalves *Nausitora* (shipworm), *Soletellina alba, Laternula marilina* and *Tellina deltoidalis*. These species are either rare or absent in the midden fauna and are more tolerant of conditions of lower salinity.

Shell middens are also important habitats for terrestrial molluscs (snails). The hyper-alkaline micro-environment of the middens makes them an important refuge for small snails within the lime deficient sandstone environment. Shell middens have become 'hotspots' for snail diversity and abundance in Berowra Valley.

A five-to-six litre sample of fine sediment from one particular midden yielded 1626 tiny snails averaging about 2 mm in size, comprising

1. See Appendix: *Molluscs of Berowra Valley Regional Park* in this *Guide*.

eighteen species. This one site represented more than half of the snail species known from Berowra Valley.

Further reading

There are numerous works on Australian molluscs. The following books and publications include some identification guides with more extensive bibliographies. Unfortunately there are no comprehensive illustrated up-to-date works that cover all the molluscs in the Sydney area.

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Acknowledgments

Thanks are extended to Dr Winston Ponder, Dr Bill Rudman and Ian Loch (malacology) and to Val Attenbrow (archaeologist) from the Australian Museum; to Jeff Bradford (co-ordinator, Metropolitan Local Aboriginal Land Council), and to Bronwyn Conyers (formerly Cultural Heritage Manager, Sydney Zone) NSW National Parks and Wildlife Service, for their assistance. .

George Foster

Those squiggly white trails on rocks throughout the Park are made by the native slug Triboniophorus graefii

European snail found in freshwater areas of Berowra Creek Physella acuta, 4mm to 12 mm

Small black filter feeding mussel Xenostrobus securis common upstream of Berowra Waters

Egilomen lirata, a terrestrial snail from Washtub Gully midden, 2 mm

Elsothera sericatula, a terrestrial snail from Washtub Gully midden, 3 mm

Gastrocopta strangeana, a terrestrial snail from Washtub Gully midden

Bradybaena similaris, an Asian terrestrial snail from Washtub Gully midden

Tornatellinops jacksonensis, a terrestrial snail from Washtub Gully midden, 2.5mm

Paralaoma caputspinulae, a terrestrial snail from Washtub Gully midden, 2mm

Photograph courtesy of Crawford House Press

Yellow-finned Bream Acanthopagrus australis a common species popular with anglers. Recruits are often found in seagrass beds and adjacent habitats.

Biodiversity

Estuarine Fishes of Berowra Creek

David J. Booth

Photograph courtesy of Crawford House Press

Fanbelly leatherjacket Monacanthus chinensis rely on seagrass beds for survival. They shelter among seagrass blades, consuming epiphytes, associated fauna and even the blades themselves.

Leather Jacket

Estuarine Fishes of Berowra Creek

Berowra Creek estuary supports a wide diversity of fishes, some of which are of commercial importance. Dusky Flathead *Platycephalus fuscus* and Yellowfin Bream *Acanthopagrus australis* are popular commercial and amateur angling species.

However, many smaller species inhabit Berowra Creek estuary, forming assemblages in shallow or deep water, in seagrass beds, among mangrove pneumatophores, or in shallow sandy areas. In a recent survey over two years and among six sites, thirty-four species of fishes were collected, including juveniles of twenty-one commercial species (Booth and Schultz, 1997, 1999). Some species are restricted to small areas of habitat, such as the leatherjackets found in seagrass *Zostera* species beds, while others move about within the estuary.

Threats to estuarine fish biodiversity include overfishing and habitat destruction through siltation, sewage and agricultural run-off, and disturbance through boating. Seagrass patches within Berowra Creek are limited, so presumably any losses of these could have serious consequences to the fishes relying on the beds.

Descriptions of common species

Smooth Toadfish
Tetractenos glaber

Very common in shallow mud or sand flats. Strong parrot-like beak crunches on snails and crabs in the sediment. Contain strong tetrodotoxin, and can kill wildlife if consumed. For example, an observation was made at Calabash Point of a goanna that ingested a toadfish and died soon after (Roger Campbell, pers. comm.).

Leatherjackets
Family *Monacanthidae*

As common and family names suggest, these fish have a tough skin and a dorsal spine that locks erect if disturbed. *Zostera* seagrass beds are favourite haunts, with small (<40 mm) fish eating algae from seagrass blades, while larger fish chomp directly on the blades.

Flat-tail Mullet
Liza argentea

Common surface-schoolers of small to large individuals, these scavengers are of some commercial importance.

Glassfish
Ambassis species

Small, silvery, scissor-tailed fish that move in large schools, and are likely of importance as prey to larger commercially valuable fishes.

Yellowfin Bream
Acanthopagrus australis

Popular commercial and recreational species; juveniles common in shallows, particularly around seagrass beds and mangrove roots.

Observing estuarine fishes

Many of the fishes mentioned here are not immediately obvious to the casual fisher—most are too small or cryptic or do not take a hook. Some can be observed by wading in the shallows, or by using a glass-bottom 'look box'. Alternatively, snorkelling over seagrass beds can reveal a range of fish life.

Management

Fishes in Berowra Creek are managed by NSW Fisheries, which regulates the number and sizes of commercial fishes that can be caught, as well as stipulating gear types and fishing seasons. The importance of habitat to fish populations is also recognised in NSW Fisheries Fish Habitat Protection Plans (#2 Seagrasses, #3 Hawkesbury-Nepean River System). The latter highlights the importance of total catchment management in order to sustain fish biodiversity and commercial and recreational catches.

Sampling results

For tables of sampling results, see Appendix: *Estuarine fishes of Berowra Creek: Sampling results* in this *Guide*.

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Various species of mullet Family Mugilidae thrive in Berowra Creek. Large schools of poddy mullet or adults are often seen grazing on detritus.

Photographs courtesy of Crawford House Press

The Port Jackson glassfish Ambassis jacksoniensis is a small but important member of the fish assemblage in Berowra Creek estuary.

Bullrout

Freshwater fishes

The status of many of the freshwater fishes formerly found within the waterways of Berowra Valley Regional Park is now questionable.

The most recent survey (Tuft 1997, pers. comm.) found only one species of small native freshwater fish in the Park. This was a *Philypnodon* species — probably the Dwarf Flathead Gudgeon *Philypnodon* species — and was found in limited numbers in the less polluted creeks. Tuft also trapped elvers of one of the eel species normally observed in the Park's waterways. Although this survey was limited to selected sites, in some of the more pristine streams other native freshwater fish

Freshwater Fishes

Malcolm Bruce

species should have been detected. The survey methods designed by Tuft were not specific for catching and trapping fish, but during the survey Eastern Gambusia *Gambusia holbrooki* and Feral Common Goldfish *Carassius auratus* were both caught and observed. In 1987 the author carried out limited surveys around Waitara and Pyes Creeks, identifying several native species. These included:

- Australian Smelt *Retropinna semoni*
- Bullrout *Notesthes robusta*
- Cox's Gudgeon *Gobiomorphus coxii*
- Flathead Gudgeon *Philypnodon grandiceps*
- Nepean Herring *Potamalosa richmondia*
- Southern Goby *Pseudogobius olorum*

In a survey in 1992 by students from Sydney Institute of Technology, Ultimo, a population of Fly-specked Hardyheads *Craterocephalus stercusmuscarum* was located below Rocky Fall Rapids in Galston Gorge. As Fly-specked Hardyheads are not normally found in the Sydney region, this population may have been the result of aquarium releases.

The presence of native freshwater fishes was noted and exploited by the original European families living in the area. The name of the popular waterhole Fishponds was a corruption of Perch Ponds, this name being given to the location by the Higgins family (Ted Angelo and Les Higgins 1996, pers. comm.). As late as 1997, the author observed large fish at Fishponds. These may have been Australian Bass *Macquaria novemaculeata*, locally referred to as perch, but may also have been Introduced Carp *Cyprinus carpio*.

Eels have often been observed in most creeks and waterways in the Park. These are most likely to be either the Shortfinned Eel *Anguilla australis* or the Longfinned Eel *Anguilla reinhardtii*. The author has observed both species as recently as 1997 in creeks within the Park. Most of the eels observed carried ulceration and scarring, the cause of which is unknown.

Pollutants, introduced fishes and fish diseases, and the poisoning effect of privet leaves, have had a disastrous effect on native freshwater fishes. Casual observation and the most recent surveys suggest that, in many freshwater streams within the Park, small- to medium-sized native fishes may be extinct. This circumstance has been confirmed by licensed aquarium enthusiasts in personal communications (Buckle, Duncan, 1997) with the author, although Cox's Gudgeon was reported in 1997 in Sams Creek, Berowra. The decline of small- to medium-sized native fishes has been rapid and dramatic, and reflects the reduction and disappearance of native vertebrates in bushland. It is harder for native fish to re-establish themselves than bushland animals, which have greater mobility and can relocate more easily. Like their bushland counterparts, these native fishes now have to compete against introduced species, often the result of aquarium dumping.

Five steps must be taken to establish the extent of fish biodiversity, and arrest the decline of native fish in creeks in the Park. These are:

- to carry out a survey in all waterways to establish which species are still present;

- ☐ to improve water quality throughout degraded sections of the creek catchments;
- ☐ .to educate aquarium owners not to dump unwanted fishes in local creeks;
- ☐ to introduce a feral and introduced fish control program;
- ☐ to commence the re-introduction of native fish species in consultation with NSW Fisheries.

Freshwater fishes found in the Park

Fishes believed native to the area in the past

Shortfinned Eel
Anguilla australis

This fish has a snake-like body that is olive-green on the dorsal surface, gradually becoming grey on the belly, with short green fins. It is usually found in deep pools with slow-moving water.

Shortfinned Eels can grow to nearly a metre in length and weigh over 1.5 kg.

Longfinned Eel
Anguilla reinhardtii

Anguilla reinhardtii differs from *Anguilla australis* by the length of the dorsal fin, which in the former starts closer to the head. It is similar in shape to the Shortfinned Eel. The upper body is nearly brown with blotching or spotting on the dorsal region and sides, gradually becoming whiter underneath the tail. The fins are brown except the pectorals, which are yellow. This species is usually found in faster-flowing streams. It is a large fish, around 1.5 m in length and weighing up to 15 kg.

Cox's Gudgeon
Gobiomorphus coxii

The upper body colouration on this fish varies between brown and dark green, with the ventral surface ranging from a tannish yellow to a very light blue. The gills generally have two to three brown stripes, and the fins vary between clear and yellow but with black stripes. This fish likes faster-flowing creeks in and around rapids.

L Shaw Australian Museum

Longfinned Eel Anguilla reinhardtii

ANGFA

Shortfinned Eel Anguilla australis

L Shaw AusMus

Cox's Gudgeon Gobiomorphus coxii

. C. McGrouther AusMus

Dwarf Flathead Gudgeon Philypnodon species

L Shaw Australian Museum

Australian Bass Macquarria novemaculeata

Jenifer Lewis

Australian Bass have been re-introduced to Fishponds in Berowra Creek following improvements in water quality downstream of the Sydney Water Treatment Plant.

E Schlioegf Australian Museum

Bullrout Notesthes robusta

They will leave the water when migrating from pool to pool.

Cox's Gudgeon grows up to 20 cm in length, but is usually seen at about 15 cm.

Australian Bass
Macquaria novemaculeata

This fish a has dark green to grey upper body with a silvery white ventral surface. All but the anal fin are brown to black, the anal fin being white tipped. Bass live in the deeper still pools. Like many of the larger fish they breed in brackish estuaries.

Australian Bass grow up to 60 cm in length.

Bullrout
Notesthes robusta

Bullrouts are a highly camouflaged fish with a mottled combination of blotches and bands of dark brown, light brown, dark yellow and white all over the body. They prefer deep, still, clear pools with gravel bottoms and sunken logs, where they shelter in depressions under the submerged logs.

Flathead Gudgeon
Philypnodon grandiceps

Flathead Gudgeons have a remarkable variation in their colour scheme, which reflects the variety of habitats in which they live. Locally they are usually a light tan with brown or black blotchy stripes covering the body in a pattern similar to a tiger. It is a very common fast-breeding fish inhabiting most areas in a waterway, from still pools to fast-flowing creeks.

The Flathead Gudgeon can grow to between 8 and 12 cm.

Dwarf Flathead Gudgeon
Philypnodon species

A small blackish to dark brown fish with darker stripes across the body, and distinctly striped fins. The ventral surface is much lighter in colour, sometimes nearly white. It seems to inhabit still pools with a muddy bottom and plenty of weed growth for shelter.

Grows only to about 5 cm.

Nepean Herring
Potamalosa richmondia

Herrings have a green dorsal surface, with silver sides and ventral surface. They live in big schools in fast-flowing creeks, preferring the larger and deeper creeks.

This herring grows to about 30 cm.

Southern Goby
Pseudogobius olorum

The Southern Goby has a light-coloured dorsal surface covered in blotchy radiating stripes that merge into the fins, which are usually clear. In some males the fins can develop bright yellow and orange hues. This fish lives in the muddy bottoms of creeks, often sheltering among weeds and rocks. It is a very prolific breeder that has microscopic young that first develop in an estuarine environment.

Grows up to 6 cm in length.

Australian Smelt
Retropinna semoni

This fish is silvery all over, with some darker olive colouration on the back. The fins are usually clear. It schools near the surface of still or slow-moving creeks.

The Australian Smelt may grow up to 10 cm but usually reaches only 5 cm.

Fish believed introduced to the area

Common Goldfish
Carassius auratus

These fish do not look like aquarium goldfish but have developed a grey or bronzy brown colour. They like still, muddy pools.

Common Goldfish can grow up to 40 cm and weigh up to 5 kg.

Fly-specked Hardyheads
Craterocephalus stercusmuscarum

Fly-specked Hardyheads are normally found only in tropical or inland Australia but may have become acclimatised during the recent warmer winters. They are usually grey-green with small black speckles in rows along the body. They prefer warm water.

These fish grow to about 6 cm in length.

Carp
Cyprinus carpio

The Carp is a dark brown fish that likes streams with muddy bottoms.

This fish grows up to a metre in length although usually only 50 cm, and can weigh up to 50 kg, averaging 5 kg.

Eastern Gambusia
Gambusia holbrooki

The Eastern Gambusia is a live-bearing fish: the eggs hatch and the young grow inside the female. This gives this fish an immediate advantage over most small native fish as it is highly fecund. The only regular predators of young *Gambusia* are adult *Gambusia* and Australian Bass. The fish is usually olive-green on the dorsal surface with a lighter ventral surface. The female has a black blotch above the anus, while the anal fin in the male has been modified into a gonopodium or false penis.

Other fishes

At various times in the year other introduced fishes may be caught in the creeks in the Park. The result of aquarium releases, they may include Cichlids, Platys, Mollys, Roaches, and Koi Carp.

Further reading

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Postscript

In 1998 and 1999 Robyn Tuft and Associates surveyed the catchments of bushlands managed by Hornsby Shire Council. During this survey several native fish species were recorded at different sites in the Berowra Creek Catchment. Australian Bass were noted at Fishponds Waterholes, and eels were found throughout the entire catchment. An unidentified *Gombomorphus* was also recorded at Tunks Creek during the Tuft survey. Additionally, on 13 January 2001, the author observed several Cox's Gudgeon *Gombomorphus coxii* swimming in Berowra Creek, just above the Steele Millitary Bridge. The return of these fish species to Berowra Creek and its tributaries may be due to the improved water quality resulting from the many pollution traps now constructed by Hornsby Shire Council and the upgraded sewerage treatment works in the Berowra Creek catchment.

Leaf Green Tree Frog

Frogs

Owing to the high diversity of potential frog habitats within the Park, from ponds to creeks to ephemeral soaks, this area has most of the thirty-six native frog species found in the Sydney Basin.

Habitats

Below is a selection of the frogs most likely to be found within the Park, divided into groups according to the habitats they use.

In this section on frogs, the species identified with a dagger † are listed in Schedule 2 of the *Threatened Species Conservation Act 1995* (NSW) and are considered vulnerable or endangered.

Frogs

Karen Thumm, Jacquie Recsei, Michael Mahony

Those marked with a hatch # are not listed as threatened but are considered by the Frog and Tadpole Study Group of NSW Inc. to be 'of conservation significance' as they are 'little known' or 'in steep decline'.

Frogs found in ponds

Common Eastern Froglet
Crinia signifera

As its common name suggests the Common Eastern Froglet is a very abundant frog occupying most water bodies within its range. It is a variable species, ranging from plain brown through to dull orange or stripy. It is a small frog measuring only 1–2 cm.

Eastern Pobblebonk or Eastern Banjo Frog
Limnodynastes dumerilii

This frog, which is the size of a small orange, makes a 'bonking' sound, giving it the nickname 'Pobblebonk'. It calls from under banks, between plants or in leaf litter on the sides of creeks or ponds.

Eastern Striped Marsh Frog
Limnodynastes peronii

The Eastern Striped Marsh Frog's 'tock' call can be heard from many permanent water bodies including suburban ponds. These frogs appear to be more adaptable to urban conditions than most. The foamy egg mass is usually placed in ponds or dams and rarely in flowing streams.

Dusky Toadlet
Uperoleia fusca

This tiny (2–3 cm) frog has a very loud call, but is still extremely hard to find. It calls from a small distance from the edge of ponds and can be found with other *Uperoleia* species. All *Uperoleia* species have an orange patch midway on the back of the thigh. It is difficult to distinguish the different toadlet species with certainty. The frog has dusky mottling on the skin on the underside of the upper leg.

Smooth Toadlet
Uperoleia laevigata

Like the previous frog, the Smooth Toadlet is very small, very loud and very hard to find. It occurs in the same habitats as the Dusky Toadlet and can often be heard in large choruses. This species has transparent skin on the underside of the thigh.

Broad-palmed Rocket Frog
Litoria latopalmata

Broad-palmed Rocket Frogs are common around dams and ponds in most situations. They sit on the ground in the open, but their brown colouration enables them to blend in with the soil making them well camouflaged.

Freycinet's Frog
Litoria freycineti

This yapping frog is very hard to tell apart from the Broad-palmed Frog to which it is related. It has a series of raised ridges on its back. This feature contrasts with the Broad-palmed Frog, which is smooth on its back. Freycinet's Frog calls from the edges of dams and ponds in a wide variety of situations.

#Green Tree Frog
Litoria caerulea

This is the best-known of all the green tree frogs, perhaps of all Australian frogs. Sadly, many people who live in Sydney and its surroundings have never seen it in the wild. Once common in the dams, ponds and wetlands of the region, the Green Tree Frog is now rarely encountered. It is a large frog measuring 7–9 cm.

Bleating Tree Frog
Litoria dentata

This frog can cause discomfort when heard in large choruses as its call is piercing and penetrating. It can be found typically in flooded grassy areas and swamps after summer rains, but is also heard in back gardens in urban areas close to bushland.

Eastern Dwarf Tree Frog
Litoria fallax

This green or bronze tree frog is relatively small. Adults would sit comfortably on a ten-cent coin. Its 'corkscrew' call can be heard over a long calling season through spring until late summer. It is usually seen perched on reeds or other emergent vegetation on the edges of swamps.

Whistling Tree Frog
Litoria verreauxii

The Whistling Tree Frog is one of the few frogs calling mainly in winter, even when the air temperature is only 9°C. They call from the edge of ponds or on low vegetation. They are moderate in size at 3–5 cm.

Peron's Tree Frog
Litoria peronii

The call of this frog, a series of descending notes, carries a long distance and should be familiar to those who venture near ponds and streams in spring and summer. The frog has little green spots, a cross-shaped pupil and large toe discs, and can be found a metre or two off the ground in trees. It is moderate in size at 4–6 cm, and extremely difficult to distinguish from *Litoria tyleri*.

Ross Knowles

Bleating Tree Frog Litoria dentata
The single call of a Bleating Tree Frog may sound like a sheep, but in a large chorus the calls melt into a high-pitched, shrill and relentless whistle.

Ross Knowles

Eastern Striped Marsh Frog Limnodynastes peronii
The 'tock' call of the Eastern Striped Marsh Frog can be heard in many backyard ponds around the Berowra Valley. It can sound like a dripping tap or a very persistent tennis match.

Ross Knowles

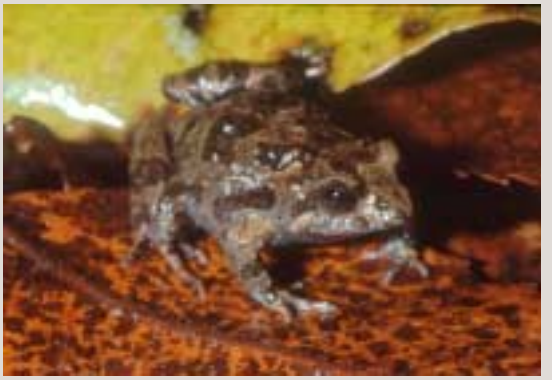
Peron's Tree Frog Litoria peronii
The Peron's Tree Frog is also sometimes called the Emerald Spotted Tree Frog because of the small green flecks on its back. The bright yellow and black markings on the back of its legs, seen when the frog is jumping away, are assumed to scare predators into thinking this frog is poisonous.

Ross Knowles

Leaf-Green Tree Frog Litoria phyllochroa
The Leaf-Green Tree Frog is found calling from the edges of small creeks in the park, often about 0.5 - 1 m above the water, on rushes or low branches.

Ross Knowles

Lesueur's Frog Litoria lesueurii In breeding season males turn a lemon yellow, and contrast with the larger brown female when in 'amplex' (mating embrace).



Ross Knowles

Common Eastern Froglet Crinia signifera
The Common Eastern Froglet is one of the few frogs heard on wet days throughout the year on the edges of suburbia, in places such as the pools forming along railway lines.

Frogs found in large or smaller creeks

The following tree frogs can be found on the edges of rocky creeks.

Leaf Green Tree Frog
Litoria phyllochroa

This small (2–4 cm) green frog has a habit of sitting on the Spiny-headed Mat-rushes *Lomandra longifolia* overhanging streams. It can be distinguished from the Eastern Dwarf Tree Frog by its larger size and squarer snout shape.

Lesueur's Frog
Litoria lesueurii

The male frogs of this species turn lemon yellow in the breeding season and can be observed on the edges of rocky rivers. The females are considerably larger and keep their brown colours. The mating call is not broadcast loudly as it is with most other frogs. One needs to be within 2–3 m of this frog to hear its call. It is moderate in size at 4–6 cm. The Lesueur's Frog in the south of Sydney is considered a different species.

Frogs found in smaller creeks or ephemeral soaks

†Red-crowned Toadlet
Pseudophryne australis

See 'Endangered frogs' in the next section of this Guide, "Threatened Species of the Park".

#Brown Toadlet
Pseudophryne bibronii

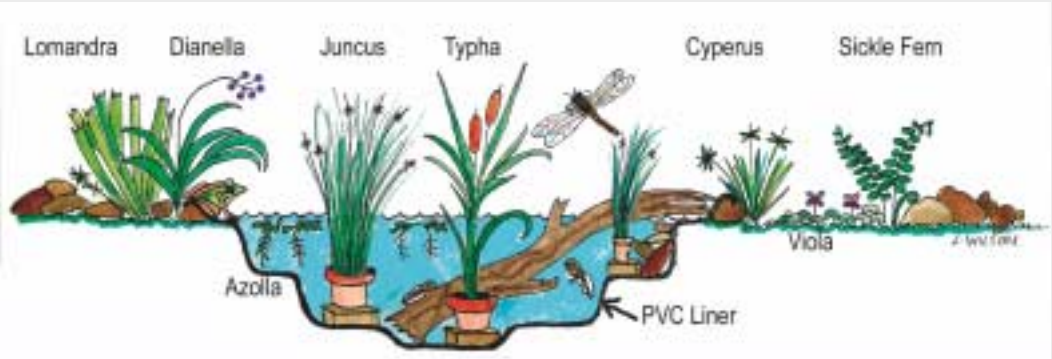
This small brown frog lives in low-lying areas that become inundated after heavy rain. The species has experienced marked declines in the New England tablelands and the Southern Highland in the ACT, and has disappeared from forty known localities around Sydney. The frogs are found over all the south-east of Australia.

†Giant Burrowing Frog
Heleioporus australiacus

See 'Endangered frogs' in the next section of this *Guide*, "Threatened Species of the Park".

Building a Frog Pond

Lyndel Wilson



There are many reasons to build a frog pond in your backyard. You can provide clean unpolluted habitat for many frog species and water invertebrates, and provide drinking water for the many birds, possums and lizards that may also visit your garden.

Generally there is one frog that is most common in Sydney gardens, the Striped Marsh Frog. While this frog is appealing there are many other frogs that may benefit from your frog-scaping.

Frog ponds are best placed in a semi-shaded part of the garden and not directly under trees, to minimise leaf build up. Rain runoff should also be directed away from your pond, to prevent pollution, pesticides and other chemicals from killing your pond life.

A pond is best about 30 cm deep (for safety reasons), with stepped layers so that tadpoles can easily leave the water when they become frogs. Make sure you line the pond hole with soft sand to prevent punctures to the liner. Use a sturdy black PVC liner to make the pond watertight, and secure the edges with rocks or gravel. Water lilies, rushes and reeds can be placed into the pond in their pots on bricks or rocks, and branches or rocks can be placed around the edges as hiding places for frogs, lizards and invertebrates. You can also plant native grasses, groundcovers, small shrubs and sedges around the pond to enhance the pond edge. A filter or fountain can be added to prevent mosquitoes from laying eggs. Small native fish will also solve the mosquito problem.

Go to your local Nursery for local native frog-friendly plants or ask the Council for a frog-friendly plant list.

Further Reading:

Kevin Casey "Attracting Frogs to Your Garden"

Frogs And Tadpoles Study Group of NSW Inc. www.fats.org.au

Recommended reading

Robinson, M. 1998, *A Field Guide to Frogs*, Australian Museum / Reed Books, Chatswood, NSW.

The above book is recommended to identify frogs in the field.

Each frog has a unique call, which can be compared with those on the compact disc *'Frog Calls of the Greater Sydney Basin'* by David Stewart, Nature Sound, Mullumbimby.

Further reading

Griffiths, K. 1997, *Frogs and Reptiles of the Sydney Region*, UNSW Press, Kensington.

Reptiles

Reptiles

Gerry Swan, Karen Thumm, Jacquie Recsei

Snakes

When people think of snakes it is usually the dangerous and venomous varieties that come to mind. These are really the minority and there are many less well-known snakes that are either harmless or only slightly venomous. Snakes are generally very wary of disturbance and try to get away from humans. When a snake is seen it should be given a wide berth and time allowed for it to move on its way. Killing snakes is illegal; furthermore, it is worth keeping in mind that most snake bites occur when people are trying to kill or catch a snake. Bushwalkers should know the first aid treatment for snake bite. If a snake needs to be removed from a garden or house, the local National Parks and Wildlife Service centre should be contacted.

The Green Tree Snake *Dendrelaphis punctulata* (not venomous), which flashes blue from between its scales when disturbed, is found in the Park, and the Brown Tree Snake *Boiga irregularis* (venomous) occurs in rugged cliffs in the northern section.

Blind Snakes *Ramphotyphlops nigrescens* (not venomous), which look like fat worms and exude a strong stench when handled, are not usually seen out in the open but are sometimes brought in by cats. This snake eats ant eggs and pupae, and has a rounded snout.

Yellow-faced Whip Snakes *Demansia psammophis* (venomous) are very quick, slender snakes frequently seen in our bushland by day.

Golden Crowned Snakes *Cacophis squamulosus* (venomous) are generally seen only on warm nights in summer, often on tracks or roads.

The Marsh Snake *Hemiaspis signata* is active usually during the day, and, as its name indicates, is usually found near water.

The Diamond Python *Morelia spilota* (not venomous) occurs in the Park, but it is nevertheless a matter of luck to see one of these slow-moving yellow and black snakes.

The Red-bellied Black Snake *Pseudechis porphyriacus* (dangerously venomous) is most frequently encountered near swamps or creeks where it hunts for frogs and small reptiles. It is not easy to confuse with other species because of its red underside and black back. If seen in suburban gardens it should be left alone to move on of its own accord.

The Brown Snake *Pseudonaja textilis* (dangerously venomous) is not necessarily a plain brown colour, and may be banded when

Graeme Gow

Red-bellied Black Snake

Bob Salt

Diamond Python

Graeme Gow

Golden Crowned Snake

Graeme Gow

Blind Snake

young. Many snakes are brown coloured but are not Brown Snakes.

Tiger Snakes *Notechis scutatus* (dangerously venomous) are found in the Park, as well as Death Adders *Acanthophis antarcticus* (dangerously venomous), but neither is common.

Lizards

Goannas—varanids

Lace Monitors *Varanus varius* can reach considerable size, about 2 m long. They are most frequently seen as they attempt to empty rubbish bins at picnic sites. Although they appear quite tame in this situation, one should not try to handle or feed them as they can inflict serious injuries with their claws and teeth. Usually they will avoid human company, and escape up a tree if disturbed. They lay their eggs in termite nests both on the ground and in trees.

The Heath Monitor *Varanus rosenbergi* is a rarely encountered endangered species, but it is believed to be in the Park. This goanna lays its eggs in termite mounds on the ground, rather than in trees (Swan 1995).

'Dragons' — Agamids

The Bearded Dragon *Pogona barbata* is often mistakenly called a 'frill-neck lizard' owing to its dark 'beard', which is extended when the animal is threatened.

Water Dragons *Physignathus lesueurii* are frequently seen in the Park basking on roads or trees beside creeks. When disturbed, they will jump into the water with a splash and stay submerged for long periods.

Skinks

One of the most common lizards encountered by residents whose houses back on to the Park is the Blue Tongue Lizard *Tiliqua scincoides*. They are often attacked by cats.

White's Skink *Egernia whitii* live under rocks in areas of sandstone, and Copper-tailed Skinks *Ctenotus taeniolatus* can be observed hunting for small insects over rock platforms.

Cunningham's Skink *Egernia cunninghami* occurs in small family groups in rock outcrops. This lizard inflates its body, which is covered in spiny scales, to prevent its being removed from crevices.

Ross Knowles

Blue-tongue lizard Tiliqua scincoides
Blue-tongue lizards are sometimes seen in gardens or on fire trails on the park boundaries.

Ross Knowles

Diamond python Morelia spilota
Snakes seen in the park should never be harmed. All snakes are protected within New South Wales.

HSC

One of Sydneys largest reptiles, the Lace Monitor, commonly called Goannas

Chris Gallard

Leaf-tailed gecko Phyllurus platurus
Leaf-tailed geckoes are frequently found in garages or sheds on the edges of the park.

Bearded dragon

Jeremy steele

Long-necked Turtles, sunning themselves at Fishponds Waterhole

Water Skinks *Eulamprus quoyi* are among the reptiles most likely to be seen near watercourses, and grow to about 25 cm.

Very small lizards running through the leaf litter could be Garden Skinks *Lampropholis delicata* or Weasel Skinks *Saproscincus mustelina*.

Geckoes

One of the most visually amazing geckoes in the area is the Leaf-tailed Gecko *Phyllurus platurus*, usually seen at night in the sandstone layering in cliffs.

Velvet Geckoes *Oedura lesueurii* are found in many similar habitats to those of the Leaf-tailed Gecko.

The brightly marked Thick-tailed Gecko *Underwoodisaurus milii* is no longer common but is always a very exciting find with its striking spots and stripes.

Legless lizards

A walker encountering a Common Scalyfoot *Pygopus lepidopus* is likely to assume that it is a Brown Snake as this lizard may imitate snake behaviour when disturbed, and the features distinguishing it as a lizard (external ear opening, broad tongue) and not a snake are not immediately visible.

Burton's Legless Lizard *Lialis burtonis* is known for its long pointed snout, and occurs in a wide variety of habitats.

Turtles

The most common turtle in the area, even well away from water, is the Long-necked Turtle *Chelodina longicollis*.

Recommended reading

For identification purposes in the field, the following text is recommended:

Swan, G. 1990, *A Field Guide to the Snakes and Lizards of New South Wales*, Three Sisters Productions, Winmalee.

Additional information can be found in:

Cogger, H. 2000, *Reptiles and Amphibians of Australia*, 6th edn, Reed New Holland, Sydney.
Griffiths, K. 1997, *Frogs and Reptiles of the Sydney Region,* UNSW Press, Kensington.

Birds

The native bushland and freshwater creek valleys of the Park and the surrounding urban and rural environments provide the necessary habitats to support a diverse range of birds.

While on any of the bushwalks described in this *Guide* the observant visitor should be able to see one or two dozen different species.

This article is a very brief guide to the types of birds you might see. A full list of birds is included in the Appendices. Excellent books are readily available to assist with identification of birds of the region.

To help distinguish between some of the species, take note of their size, colour and patterns, voice, flying and feeding habits, food and habitat.

No doubt human activities have affected the birds of the Park. The clearing of sandstone ridges for housing, clearing of good agricultural soils for rural activities, change in patterns and frequency of bushfires, contamination of streams by urban and rural activities, and the introduction of feral animals, birds and weeds, have all had their effect.

Some birds have benefited from these changes, and their numbers have expanded in recent decades where they have been able to find suitable living space and food in the altered areas.

Fortunately the protection of the bushland in the Regional Park and improved management of the area should help stabilise changes and restrict future impacts.

Nevertheless, people living around the edges of the Park should be aware of the detrimental impacts they can have on the bird populations by inappropriate choice of garden plants, by the spreading of weeds from backyards, poor control of pets, and unnecessary feeding of native birds.

There are excellent books on acceptable ways to attract birds to our backyards (see *Further reading* below).

Water birds

Along the larger pools and closer to the estuary you might see cormorants, herons, teals, swamphens, ducks and gulls.

Raptors

As in all parts of Australia, the Park has its small populations of feathered hunters.

During daytime, small falcons might be seen perched on dead branches or poles, hovering or swooping onto small mammals or birds. Peregrine, Little or Brown Falcons might be seen in the Park. Closer to the estuary, the White-bellied Sea Eagle is commonly seen; while the large dark brown hawk soaring the thermals emitting its characteristic cry is probably the Whistling Kite. The largest of all, the Wedge-tailed Eagle, is only rarely spotted, high in the air.

Birds

Paul Fredrickson

Nocturnal hunters are rarely seen by day, but their presence at night can be heard from a distance by their strange calls; the ‘mopoke’ of the Boobook Owl; the ‘woo-hoo’ of the rare Powerful Owl; and the monotonous, soft but penetrating ‘oo-oo-oo-oo-oo’ of the Tawny Frogmouth.

Doves and pigeons

Numerous native and a few introduced species of doves and pigeons are seen in the Park. There is the small Crested Pigeon, which flies with a distinctive whistle noise of wings, the Bar-shouldered Dove with its copper-coloured neck and barred wings, and the smaller Peaceful Dove, which is grey-brown coloured with barred wings.

Three large pigeons seasonally visit the Park. The White-headed Pigeon and the Brown Cuckoo-Dove are named appropriately and are fairly easy to identify. The Wonga Pigeon is

Powerful Owl Ninox strenuosa : listed as Endangered under the Threatened Species Conservation Act (1995), this large hawk owl preys on medium sized animals such as possums. Because of its size the Powerful Owl has a large feeding range of about 5 square kilometres. A large range needed means a small population.
PHOTOGRAPH BY NARAWAN WILLIAMS

grey-white, and is occasionally disturbed by bushwalkers as it walks slowly and noisily along the forest floor. All three are seen in backyards close to the Park.

Cockatoos

Groups of noisy Sulphur-crested Cockatoos are a common sight at certain times of the year. These large white birds with a prominent retractable yellow crest have a harsh, raucous screech that can be heard at a distance. Yellow-tailed Black Cockatoos can also be seen at times in groups, casually but noisily flying, or feeding on the seeds of Banksia and Casuarina trees. The rarer Gang-gang Cockatoo is smaller but its voice can be equally raucous. The grey-coloured Gang-gangs (the males have a red head) can be hard to see in the trees but a continuous soft scratchy growl helps identify this bird's presence while they crack nuts and seeds.

Other parrots and rosellas

The Crimson Rosellas, with their characteristic red and blue plumage, are a common sight in groups all year round feeding on seeds and flowers. Eastern Rosellas are of similar size and habit to the Crimson Rosellas. They have yellow breasts and green abdomens. They often fly in pairs and they are perhaps less common. Rainbow Lorikeets are slightly smaller, brighter, multi-coloured and faster flying. They gather in large noisy and conspicuous gangs to feed on flowering trees and shrubs. Male King Parrots are bright green with red heads. Female King Parrots are green, and they are larger than rosellas.

Cuckoos

Cuckoos are another interesting and varied group of birds. They are characterised by their habit of laying eggs in nests of other birds, which raise the young cuckoos as their own. More than eight species of cuckoo have been recorded in the valley.

Perhaps the most notable are the noisy Common Koel and the Channel-billed Cuckoo. These migrate from the north and suddenly appear in spring. The all-black male koel and mottled brown female are

about the size of magpies. Koels have a penetrating repeated 'coo-eee' call, which may become louder and more frantic, and is often heard in the evenings.

The Channel-billed Cuckoo is a larger grey and white bird with long thin wings and massive beak. It has a very loud and raucous call as it flies. Other birds often pester these cuckoos, perhaps because they know about the cuckoos' nest-robbing habits.

Kookaburra

A large bird of about 35 cm with a strong beak, the Laughing Kookaburra is usually seen in small family groups. The rollicking laugh, started by one bird and taken up by the group, is the unmistakable feature of the kookaburra. This carnivorous bird feeds on small animals, reptiles, insects and the young of other birds. It nests in tree hollows, and is found along forest edges and urban areas.

Kingfishers

The beautiful small cousins of the kookaburra can be seen along the tree-lined watercourses diving for water insects or small fish. They grow to about 20 cm. The Azure Kingfisher has a rich blue head and back with orange underparts and a short tail. It is a shy species, which flies fast and straight and calls with a 'peee-peee-peee'. When breeding it is found near sandy or loamy banks in which it drills a nest tunnel.

The similar shaped Sacred Kingfisher is less brightly coloured, with dull green head and back, blue wings and pale buff underparts. It spends more of its time in wooded areas, and nests in tree hollows.

Lyrebirds

Lyrebirds are not uncommon in the Park, often coming to feed near urban backyards. These large birds feed on the ground and roost at night in the trees. They are renowned for their ability to imitate the calls of many other birds. Their presence is evident by widespread disturbance to the leaf litter, which they turn over with their claws looking for insects and worms.

Small insect and seed eaters

Treecreepers and sittellas are often seen spiralling vertically up or down trunks as they search for grubs or insects in the bark of tall trees. The smaller very active flycatchers and fantails are clever acrobatic fliers able to chase and catch small flying insects. Flocks of small finches, wrens, thornbills and silvereyes are often seen darting amongst the thickets in search of seeds or insects.

Nectar feeders

The flowering plants of bush and urban gardens attract numerous types of nectar-feeding birds. The large noisy birds feeding on flowers, and which have characteristic raucous calls, might be wattle birds; these are named after the 'wattle' or flap of coloured skin that hangs from the cheek. There are also the bald-headed friarbirds with their black facial skin. Numerous kinds of smaller honeyeaters and spinebills might also be seen with their characteristic long, narrow or curved beaks.

Black-coloured birds

Apart from the black cockatoos, other large birds that are predominantly black will often be seen in the Park. There is the Australian Raven, which is all glossy black, the Pied Currawong with some white feathers easily visible in the underparts, tail and wings during flight, and the Australian Magpie which has more white on its back, neck and wings. Butcherbirds resemble magpies but are smaller and have more white on the chest or grey shoulders. All these birds have distinctive calls.

Further reading

Dengate, J. 2000, *Attracting Birds to Your Garden in Australia*, New Holland Press, Frenchs Forest, NSW.
Pizzey, G. 1998, *A Field Guide to the Birds of Australia*, Collins, Sydney.
Sainty, G., Abell, P. & Jacobs, S. 1989, *Burnum Burnum's Wildthings Around Sydney*, Sainty & Associates, Potts Point.
Simpson, K. & Day, N. 2004, *Field Guide to the Birds of Australia,* rev. edn, Penguin, Ringwood.
Slater, Peter, Slater, Pat & Slater, Raoul 2003, *The Slater Field Guide to Australian Birds,* New Holland, Frenchs Forest.
Simpson, K. & Wilson, Z. 1998, *Birdwatching in Australia and New Zealand*, New Holland Publishers.

Birds you could see in the Park

Gregor Newton

The Crimson Rosella does have a sreeching parrot- style call, but is also the source of the purest clear whistling call.

Sandra Kalnins-Cole

The Glossy Black Cockatoo returns to the Park each year in the warmer months.

Ross Knowles

Female Satin Bower Bird. The glossy blue-black male is only partly visible as he tends the trinkets in his bower.

Ian Foster

Red-browed finch is a common bird in and around the Park, often in flocks of up to thirty or forty birds working grassland for seeds.

Ross Knowles

The White-bellied Sea Eagle. A large raptor to be seen patrolling over the marine reaches of the Creek and the adjacent Hawkesbury River.

Sandra Kalnins-Cole

King Parrots, this one a juvenile, are common in the Park and famed for their intensely orange-red body feathers. Adults are generally seen in pairs.

Amanda Tarlau

Southern Boobook Owl may not be seen regularly, but is generally heard making its familiar call.

Hornsby Shire Council

One of many small bird species present in the Park, the Spotted Pardalote has a tinkle bell call, and nests underground. Pardelotes can be seen fliting systematically through foliage harvesting insects.

Birds you could see in the Park

Jamie Wright

A bird with attitude, the Tawny Frogmouth in typical camouflage pose, imitating a dead branch.

Jamie Wright

Silvereyes feeding on insects on a Grass Tree spike.

Ross Knowles

Barking Owl. Another Park resident more likely to be heard than seen.

Ross Knowles

Eastern Yellow Robin *Eposaltira australis*

George Foster

The Superb Lyrebird may be seen in bushy backyards raking leaf litter for grubs. The male Lyrebird's performance calls are distinctive - they are much louder than those they mimic.

Ross Knowles

A juvenile Koel, seen in the warmer months as the changeling chick of smaller full-time resident birds of the Park.

Dept of Environment & Conservation

The wonderful colours of a small relation of the Kookaburra, a Sacred Kingfisher, seen most often skimming over ponds or creeks.

George Foster

Brown Cuckoo Dove and White-headed Pigeon, rarely seen together in natural surroundings.

If you feed - do it the safe way!

The only feeding method recommended by wildlife organisations, such as NP&WS and WIRES, is to maintain a native garden

George Foster

Create an attractive pond, or If you wish to provide water in a birdbath, do so only if you clean and fill it regularly.

George Foster

Plant local native shrubs which provide protection and flowers or produce nuts or berries, such as banksias, grevilleas, wattles, lilly pilly, eucalypts.

George Foster

Let's enjoy our wildlife without feeling the need to provide large quantities of food or acting as though the animals exist only to entertain us.

To Feed or not to Feed?

There is considerable debate over the use of food as a way to attract birds and other animals to suburban gardens. Some people see no harm in it, while others strongly disagree. Like most things, feeding native animals should be done with forethought and in moderation. If you enjoy watching native animals eat food you provide you must take the responsibility for the outcomes. The maintenance of a diverse and thriving bird populations in Berowra Valley and surrounding areas is a fundamental role of the Regional Park, but it may not be achieved by inappropriate feeding.

Aussie birds and animals are quite capable of finding their own food. In fact there are numerous recorded problems with the way many people feed native animals:

- Feeding trays are sources of disease transmission. Sick birds are attracted to the easily avaliable food resulting in increased spread of diseases. Trays must be regularly and thoroughly cleaned to remove waste and excrement. Sugary food wastes quickly ferment leading to bacterial and yeast infections in birds. Some foods attract flies and rats. Would you eat from dirty trays?
- Inappropriate food can harm native animals leading to digestive problems, diarrhoea and deficiency diseases. Feeding kookaburras and magpies mince meat without the necessary calcium can lead to bone problems. Some sugary foods are known to harm lorikeets.
- Aggressive bird species will dominate the area if attracted by food, while shy, small birds are repelled or even predated by the increased numbers of large birds
- The attracted animals may become a nuisance to neighbouring residents due to excessive noise, excrement and vandalism (e.g. cockatoos ripping woodwork).
- Some birds may lose the drive to find natural food and then suffer when human food is not provided continuously. Over-feeding may result in overpopulations, competition for nesting sites, breeding out of season and more rapid spread of disease.

Growing native plants in your garden is the safest way to attract native animals to your yard.

Mammals

Known or expected to occur in the Park

In general, the distribution and true status of most of the Australian mammals is poorly known. One of the reasons for this is the nocturnal and cryptic behaviour of many species, which limits their detection to chance sightings unless specific fauna surveys are carried out. Techniques often used include live trapping, spotlighting, scat analysis, and recording the ultrasonic calls of bats. Most of these require specialised equipment, not to mention an array of permits.

Spotlighting is one activity in which interested members of the public can participate, and organised nocturnal walks are conducted by

Mammals

Ray Williams

Hornsby Shire Council and the NSW National Parks and Wildlife Service.

Another difficulty experienced by the general public is the positive identification of mammals. Many species are small and to the untrained eye similar in appearance (e.g. rats and mice versus the marsupial Antechinus and Dunnart). In the case of bats, even experienced researchers, the author included, have been known to make mistakes with identification. It is suggested that any dead animals found, with the exception of the Common Ringtail and Brushtail Possums, be deposited at the Australian Museum or the nearest National Parks and Wildlife Service office for identification.

Published records of mammals in the Park are few and most are the result of a survey carried out for Hornsby Council by Peter and Judy Smith in 1990. These have been included in the following accounts, together with the author's personal observations, particularly from Muogamarra Nature Reserve and reported sightings by the public since the mid-1970s.

Echidna

Monotremes

Short-beaked Echidna
Tachyglossus aculeatus

The Short-beaked Echidna, occasionally seen while searching for its staple diet of termites and ants, sometimes ventures into gardens adjacent to bushland. The Monotremes, which consist of the Echidna and Platypus, are unusual in that they lay eggs rather than bearing live young. Three weeks after mating, the Echidna lays a single egg into a shallow pouch and the egg hatches about ten days later.

The young laps milk, which exudes from pores in the pouch, and grows rapidly, leaving the pouch after three months when the spines start developing. At this stage the young is left in a burrow, the female initially returning once daily to feed it, and then less frequently until it is weaned at about six to eight months old. Two-tothree-month old young have occasionally been found washed out of their burrows following heavy rain.

The Echidna is likely to be widespread throughout the Park, as sightings have been made in surrounding suburbs, Ku-ring-gai Chase National Park and Muogamarra Nature Reserve.

Platypus
Ornithorhynchus anatinus

This small aquatic animal has been reported in the less-disturbed creeks in the Park since 1995. There was a sighting of a juvenile animal in a slightly polluted creek in 1997. As the cleanup of the creeks in the Park takes effect it may be hoped that more Platypus will be seen in the creeks and streams. Records include Peats Crater in Muogamarra Nature Reserve, Milson Island and Cowan Creek in Ku-ring-gai Chase National Park.

Antichinus

Marsupials
Terrestrial species

Brown Antechinus
Antechinus stuartii

The Brown Antechinus weighs about 20-45 g and measures about 10 cm long when adult, with males being larger than females. The Antechinus can be distinguished from rodents by the fact that it has a pointed snout and many sharp small teeth, whereas rodents have two upper and two long lower chisel-shaped incisors. The scrotum in male Antechinus is pendulous and large for the size of the animal and the female has a pouch area that is indistinct when not breeding, but is more obvious in the breeding season.

This species has an interesting life cycle, where the breeding is synchronised within a population so that mating occurs within the same week or two, which is usually in August/ September in the Berowra area. All the males in the population die about two weeks after mating owing to a stress-related reduction of the immune system. More than eight young are born after one month, but as there is a maximum of eight teats available, only the first ones to attach themselves to a teat are accommodated. The young are left in a ball nest constructed of dead leaves about five to six weeks later and are weaned at three months old.

The Brown Antechinus is known to be common, particularly around the numerous rocky escarpments in the Park.

Yellow-footed Antechinus
Antechinus flavipes

The Yellow-footed Antechinus has been reported to occur within the Park by local ecologist Malcolm Bruce in 1999. However, photographs shown to the author and Antechinus expert, Mathew Crowther (Sydney University), could not be positively identified.

The Yellow-footed Antechinus is a common species on the western slopes of the Dividing Range. However, it is rarely encountered in coastal areas of New South Wales except in the north of the State. The closest record known to the author is from Bucketty in Dharug National

Park, where it was found to be inhabiting recently burnt heath on a flat sandy ridge-top.

This species can be distinguished from the common Brown Antechinus by having a more colourful appearance. The head is a grey colour in contrast to the 'pepper and salt' grey/brown of the dorsal part of the body. This colouration is a result of multi-coloured bands on each strand of fur. The flanks are reddish, the feet are white-yellow and tail bicoloured black and brown, with a tuft of black fur on the tip. The prominent white-greyish eye-ring cannot be used as a distinguishing feature as some Brown Antechinus also have an eye-ring.

Common Dunnart
Sminthopsis murina

In 1996 a female Common Dunnart with pouch young was killed by a cat near Waitara Creek, Normanhurst. The corpse was lodged with the Australian Museum and its identification confirmed. Although this area lies within the animal's historical range, there had been no previously reported sightings. Small numbers of this mouse-sized marsupial insectivore have since been found elsewhere in the Park.

Spotted-tailed Quoll or Tiger Quoll
Dasyurus maculatus

See *'Threatened Mammals in the Park'* in the next section of this *Guide, "Threatened Species of the Park"*.

Eastern Quoll
Dasyurus viverrinus

See *''Threatened Mammals in the Park'*in the next section of this *Guide, "Threatened Species of the Park"*.

Long-nosed Bandicoot
Perameles nasuta

The Long-nosed Bandicoot still appears to be widespread in the larger reserves of the Hornsby Shire including the Park and is regularly reported feeding in gardens close to these reserves. A good indication of their presence is conical holes, as deep as 30 cm, that are left in lawns and garden beds as the bandicoots dig for beetle larvae and earthworms. When disturbed or when it finds a tasty morsel of food, the Long-nosed Bandicoot often lets out a loud nasal squeak. Unfortunately, while feeding in gardens, this species is exposed to predation by domestic cats and dogs.

Malcolm Brown

Antechinus

Anne & Ray Williams

Common Dunnart Sminthopsis murina

Anne & Ray Williams

Long-nosed Bandicoot Perameles nasuta

Anne & Ray Williams

This Feather-tailed Glider is still found in Berowra Valley Park. Its glide resembles falling leaves.

Noel Rosten

Generally a nocturnal feeder, the Swamp Wallaby may not be frequently seen, but will be heard by residents close to the Park as it moves through the understorey.

Anne & Ray Williams

The Common Ringtail Possum, is regularly found in urban environment close to bushland.

Swamp Wallaby
Wallabia bicolor

The Swamp Wallaby is the only macropod still naturally occurring in the Hornsby Shire. Studies of Aboriginal middens have revealed that other species such as the Red-necked Wallaby, Wallaroo, Grey Kangaroo and Brush-tailed Rock Wallaby formerly occurred. The Swamp Wallaby still appears to be common in the Hornsby area, including the Park, and specimens are often reported feeding in adjacent gardens.

Eastern Wallaroo
Macropus robustus

Wallaroos were accidentally released into the southern part of Muogamarra during the 1970s and existed for several years. Since 1990 they have not been sighted. Prior to this, some have been reported as road kills and others may have fallen victims to dogs.

Red-necked Wallaby
Macropus rufogriseus

Although present in excavated regional Aboriginal middens and common north of Wyong, the Red-necked Wallaby appears to be now absent or rare in the north Sydney region. Based on descriptions made by early white explorers and the mammal fauna identified in the middens, it is apparent that the vegetation structure has changed since the removal of the Aboriginal people. It has been suggested that the open, grass-dominated ground cover, more suited to the Red-necked Wallaby, has been largely replaced by dense heath vegetation. Reported sightings in the 1990s within the Park may well be members of a remnant population.

Eastern Grey Kangaroo
Macropus giganteus

Grey Kangaroos were released into Peats Crater, Muogamarra Nature Reserve, in 1976 and are successfully breeding there. A small mob was observed around the Pogson Trig sedge swamp during late 1994 and early 1995 with their distinctive tracks still present in early 1996. This small mob may have escaped from the nearby kangaroo orphanage and become extinct owing to attacks from local dogs.

Arboreal marsupials

Common Brushtail Possum
Trichosurus vulpecula and

Common Ringtail Possum
Pseudocheirus peregrinus

The Common Brushtail Possum and the Common Ringtail Possum are regular visitors to garden environments, particularly near bushland reserves, and probably need little introduction. The Common Brushtail Possum is omnivorous, whereas the Common Ringtail Possum is a foliovore (leaf-eater) often feeding on eucalypt leaves, particularly Sydney Peppermint *Eucalyptus piperita* and Silvertop Ash *Eucalyptus sieberi*. They are also regularly seen in trees of the Casuarina family, and have been observed feeding on Banksia flowers. The Common Ringtail Possum constructs nests (dreys) from leaves and bark when dense tall shrubs are available, but will also use tree hollows.

Sugar Glider
Petaurus breviceps

The Sugar Glider is a small grey animal weighing up to 140 g with an off-white belly. These gliders are most often sighted while they are feeding on flowering eucalypts and Banksia, and chewing the gum and other exudates of acacias and eucalypts. Tree hollows are used as nesting sites where small groups of these animals may congregate. These active, agile animals can glide up to 50 m by spreading the gliding membrane that stretches between their wrist and ankle. They are also often heard emitting a nasal yapping call, similar to that of a distant small dog. Although this species was recorded only from scat analysis in the Berowra Valley survey, specimens have been regularly sighted in Muogamarra Nature Reserve and Ku-ring-gai Chase National Park and surrounding suburbs, and are expected to be locally common within the Park.

Feathertail Glider
Acrobates pygmaeus

The Feathertail Glider is the smallest of the arboreal mammals in this area, weighing a maximum of fourteen grams. It is easily distinguished by its characteristic feather-like tail. This species is predominantly a nectivore, which feeds on Eucalyptus, *Banksia* and *Acacia* blossoms, exudates and some insects. Nests constructed of leaves can be found in hollow branches and even telephone junction boxes where several animals can form little colonies. The Feathertail Gliders' toes have enlarged serrated pads that enable them to climb very smooth surfaces of trees and even glass, and they have been recorded gliding up to twenty metres between trees with a gliding membrane that stretches from their elbows to their knees. The status of this species is uncertain in the Hornsby Shire, as their small size and rapid movements make them very difficult to observe.

This species appears to be common in parts of Muogamarra Nature Reserve and has also been recorded from the Brooklyn area, Ku-ring-gai Chase, Hornsby Heights and Elouera Bushland Natural Park in 1961. In the Park, Feathertail Gliders have been observed in Old Mans Valley by Malcolm Bruce (Council bushwalk guide and ecologist), Jeff Gibb (ecologist and former council bushwalk guide) and Dr R. Mason (ornithologist and bush regenerator) in 1995, and near Lyrebird Gully by amateur naturalists in 1994.

Eastern Pygmy-possum
Cercartetus nanus

See *'Threatened Mammals in the Park'* in the next section of this *Guide, "Threatened Species of the Park"*.

Koala
Phascolarctos cinereus

See *'Threatened Mammals in the Park'* in the next section of this *Guide, "Threatened Species of the Park"*.

Placental mammals

Rodents

Bush Rat
Rattus fuscipes

Bush Rats are known to be common in the Park, particularly where there is dense ground cover.

Near urban areas this species is often replaced by the introduced Black Rat *Rattus rattus*. The Bush Rat can be distinguished from the Black Rat by the length of its tail, which is equal to or shorter than its head and body length. The Black Rat has a tail obviously longer than its head and body.

House Mouse
Mus musculus

The House Mouse is another introduced species that prefers disturbed areas and will undergo population explosions following fires, with numbers decreasing again as the bush regenerates.

Swamp Rat
Rattus lutreolus

The dark brown Swamp Rat can be distinguished by its blunt nose, small beady eyes, black feet and a tail much shorter than the head and body. As its name implies, this animal prefers to live in dense moist ground cover, such as reed beds and hanging swamps. It has not been recorded in the Hornsby Shire and may not occur in the Park but has been found in the Narrabeen Lagoon area and Ku-ring-gai Chase National Park.

Water-rat
Hydromys chrysogaster

Although it has rarely been recorded in the region, the Water Rat inhabits the shores of Berowra Waters and is likely to inhabit well-established farm dams.[1] Records occur for Bobbin Head, and a specimen was captured at the Arcadia Water Lily farm after it had devoured a quantity of goldfish. This large aquatic rat is a carnivore that feeds on shellfish, crayfish and aquatic vertebrates such as fish and frogs. The Water Rat is easily distinguished by its large size, dark brown-black fur and its long tail with a white tip.

The introduced Brown Rat *Rattus norvegicus* is smaller, brown in colour and has a short tail but is often found near water and regularly swims, so not all swimming rats are native water rats.

Bats
Recorded in the Park

Megachiroptera-Flying-foxes

*Grey-headed Flying-fox
Pteropus poliocephalus

See *'Threatened Mammals in the Park'* in the next section of this *Guide, "Threatened Species of the Park"*.

Microchirotera-Insectivorous bats

The following bat species are known or expected to occur within the Park. Species known to occur are marked with an asterisk.

Most bats are brown in colour and, unless one is familiar with the species, difficult to identify. General descriptions, approximate weights and forearm lengths are given to assist in identification should a bat be found; however, confirmation should be sought from a bat expert or the Australian Museum. Measurements given are derived from the author's personal knowledge, Parnaby (1992) and Churchill (1998). If a bat is found alive and needs rescuing it should be handled with care, placed in a cloth bag or pillow case and delivered to an animal rescue organisation. Avoid any bites, as there is the remote potential for the transmission of the Bat Lyssavirus.

*Gould's Wattled Bat
Chalinolobus gouldii

This common medium-sized bat often roosts in the roofs of buildings in urban environments. It can be distinguished by the contrasting black head and brown body colour, a forearm length of 40-50 mm and a weight of 10-18 grams.

Chocolate Wattled Bat
Chalinolobus morio

Usually a uniform light brown colour, this small bat weighs about 8 g, has a forearm length of 35-42 mm, and is less frequently encountered than the Gould's Wattled Bat. It is a tree-hollow roosting species but will also roost in roof cavities.

1. A member of the editorial team for this book (Ruth Barcan) made an unconfirmed sighting in 1999 in the water beneath the fish and chip shop at Berowra Waters.

*Little Forest Bat
Vespadelus vulturnus

The Little Forest Bat is one of the smallest Australian mammals, weighing only 3-4 g and having a forearm length of 26-30 mm. This common bat can be frequently observed flying within the tree canopy at dusk and is often the first species to emerge from its roost. Tree hollows are the preferred roost sites for this bat.

*Gould's Long-eared Bat
Nyctophilus gouldi

As its name implies, this species is characterised by having very long ears, which are folded down when the animal is at rest. Gould's Long-eared Bat has been recorded from Berowra and is expected to be common within the Park, especially within the moister habitats. This species often roosts in tree hollows and behind loose bark.

Lesser Long-eared Bat
Nyctophilus geoffroyi

Recorded from Muogamarra Nature Reserve and Ku-ring-gai Chase National Park, this species is expected to occur within drier habitats of the Park, roosting in tree hollows and behind loose bark. It can be distinguished from the larger Gould's Long-eared Bat by a Y-shaped nose leaf, generally smaller forearm length (average 33-38 mm compared to 38-44 mm), a weight of 6-8 g and a pale orange fur colour around the face.

Eastern Broad-nosed Bat
Scotorepens orion

The Eastern Broad-nosed Bat has been recorded from Dural and is expected to occur within the Park. It is generally a tree roosting species, often flying within the mid-upper tree canopy. It has an obvious broad naked nose, a forearm length of 32-38 mm and an average weight of 10-12 g.

*Eastern Horseshoe Bat
Rhinolophus megaphyllus

This species can be easily identified by the presence of an obvious horseshoe-shaped nose-leaf and long, broad ears. The Eastern Horseshoe-bat often roosts in caves but has also been reported roosting in the burnt-out bases of trees and even under double bunks in a bush

Anne & Ray Williams

*Gould's Long-eared Bat Nyctophilus gouldi

Anne & Ray Williams

*Eastern Horseshoe-bat Rhinolophus megaphyllus

Anne & Ray Williams

Gould's Wattled Bat Chalinolobus gouldii

Anne & Ray Williams

White-striped Freetail bat Tarardia australis

Anne & Ray Williams

Eastern Freetail-bat Mormopterus norfolkensis

Threatened Microchiroptera bats known to occur in the Park.

Large Bent-wing Bat *Miniopterus schreibersii*
The Large Pied Bat *Chalinolobus dwyeri*
The Eastern Cave Bat *Vespadelus troughtoni*
The Large-footed Myotis or Fishing Bat *Myotis macropus*
The Greater Broad-nosed Bat *Scoteanax rueppellii*
The Eastern False Pipistrelle *Falsistrellus tasmaniensis*
The East-coast Freetail Bat *Mormopterus norfolkensis*
The Yellow-bellied Sheathtail Bat *Saccolaimus flaviventris*

These species are discussed in the next section of this *Guide, "Threatened Species of the Park"*.

hut. This species is known to roost in sandstone caves along the Berowra Creek escarpments.

*White-striped Freetail Bat
Tarardia australis

This large, predominantly tree roosting species is commonly recorded in the Hornsby–Berowra region. It is a high-flying species that is rarely captured during surveys; however, it is one of the few bat species that has an ultrasonic call with a frequency low enough to be heard by the human ear. The pinging cricket-like noise can often be heard moving rapidly across the sky at night.

The White-striped Freetail-bat is a distinctive species, weighing an average of 33 g, having jowl-like wrinkled lips similar to a bull mastiff dog, a tail protruding from the end of the tail membrane, and white stripes along either side of the ventral body surface.

Eastern Freetail Bat
Mormopterus species

This group of bats is currently undergoing taxonomic revision. Although rarely caught, the Eastern Freetail-bat is most often recorded by the use of ultrasonic bat call detectors. It has been encountered within a wide range of habitats, often flying rapidly above the tree canopy. It weighs about 8-10 g, has a forearm length of 32-34 mm, a characteristic tail extending beyond the tail membrane, and wrinkled lips

References

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Parnaby, H. 1992, *An Interim Guide to Identification of Insectivorous Bats of South-eastern Australia*, Technical Report of the Australian Museum, no. 8.
Strahan, R. (ed.) 1991, *The Australian Museum Complete Book of Australian Mammals: The National Photographic Index of Australian Wildlife*, Cornstalk Publishing (Collins Angus & Robertson), North Ryde.

Further reading

Triggs, B. 1998, *Mammal Tracks and Signs: A Field Guide for South-eastern Australia*, Oxford University Press, Melbourne.

Eastern Pygmy Possum

Threatened species of the Park

Overview

Jamie Slaven

Berowra Valley Regional Park is valuable for recreation, Aboriginal and non-Aboriginal cultural heritage and for the large variety of indigenous plants and animals it contains. It is home to many plants and animals listed as 'threatened species' under the Threatened Species Conservation Act *1995* (NSW) and the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth). A species of flora or fauna is defined as 'threatened' if it is facing possible extinction in the short or medium term. The *Threatened Species Conservation Act* classifies such species into two categories. These are Schedule 1, Part 1: Endangered species; and Schedule 2: Vulnerable species. The Act also lists endangered communities and endangered populations. Simple definitions of these terms are: *endangered* — at serious risk of disappearing from the wild within one or two decades; *vulnerable* — not presently endangered but at risk of disappearing from the wild over a longer period (20–50 years).

Native species may become threatened by numerous factors such as loss or degradation of habitat from urban and rural development. Specific threats include alteration of natural drainage systems; weed invasion; hybridisation with non-indigenous species; increased sedimentation and nutrient levels in stormwater run-off; removal of bush rock; altered fire regimes (frequency, intensity and seasonality); and predation or displacement by feral animals (e.g. foxes, cats and even honey bees). However, in some cases a native species may become threatened owing to its naturally small and/or isolated populations or because of very specific and restricted habitat requirements. Extinction is a natural process and some species were in decline prior to non-Aboriginal settlement. Current concerns about extinction relate to the vastly increased rate and extent of species loss and decline.

In the near future, more native species may be listed as threatened if human impacts and threats are not reduced, or their impacts mitigated. Conversely, the status of some

Manfred Wagner

Darwinia biflora has pairs of green flowers each one surrounded by a red scale.

Threatened species of the Park

Ray and Anne Williams

Vulnerable Southern Myotis or Fishing Bat Myotis macropus in the hands of a researcher

species may be reduced from Endangered to Vulnerable, and some may even be removed from the threatened species lists, should sufficient habitat be conserved and sustained, with other threats being eliminated or adequately reduced. Unfortunately, the trend is towards more species being listed as threatened and for the level of threat to be increased, for example from Vulnerable to Endangered. All members of the public, as well as all levels of government, have a role to play in preventing native plants and animals from becoming extinct, and in promoting the recovery of threatened species.

For lists of rare and threatened flora and fauna species in the Park, including the threat status (endangered or vulnerable), a description of the relevant species, and of its habitat, see the Appendices in this *Guide*.

Further reading

Cropper, S.C. 1993, *Management of Endangered Plants*, CSIRO Publications, Melbourne.

Threatened Flora

Jamie Slaven

The Berowra Valley Regional Park is home to some very rare native plants which only occur in this part of the world. One of these plants is identified as endangered, meaning that if the remaining small populations are not protected they will become extinct in a short period of time.

Persoonia mollis subsp. maxima

What does it look like?

Persoonia mollis subsp. maxima is a tall shrub which grows 2-6m high with soft hairy young branchlets, buds and young leaves. This rare plant has small yellow flowers and produces small green fruit, which become purplish-brown and soft when mature. Mature plants have a single trunk.

Where is it found?

This rare plant, occurring nowhere else in the world, is classified as Endangered under NSW legislation (*Threatened Species Conservation Act 1995*). It is highly restricted in distribution, and known only from three creek catchments in northern Sydney. The Berowra Valley Regional Park and neighbouring bushland support the majority of these populations including the Calna Creek population and Berowra Creek population which adjoin the suburbs of Galston, Hornsby Heights, Mt Colah and Mt Kuring-gai. The habitat for *Persoonia mollis subsp. maxima* is deep gullies and on steep upper hillsides of narrow gullies on Hawkesbury sandstone, which support relatively moist, tall forest consisting of Sydney Red Gum *Angophora costata* and Sydney Peppermint *Eucalyptus piperita*, often with Turpentine *Syncarpia glomulifera*, NSW Christmas Bush *Ceratopetalum gummiferum*, Coachwood *Ceratopetalum apelatum* and Black Wattle *Callicoma seratifolia*. Some isolated records of this species have been on ridge-tops in woodland dominated by Scribbly Gum *Eucalyptus haemastoma* and Grey Gum *Eucalyptus punctata*.

What are its main threats?

The main threats to the remaining populations include wildfires and bushfire hazard reduction, along with weed invasion, reduced water quality and rubbish dumping.

Darwinia biflora

What does it look like?

Darwinia biflora is a small erect or spreading shrub to 80cm high, and is in the Myrtaceae family. The flowers are small and inconspicuous being green surrounded by two red bracteoles. The flowers are in pairs, hence their name “bi-flora”. Flowering occurs mainly in autumn and sometimes throughout the year with mature fruits from May to August.

Where is it found?

This rare plant species, classified as Vulnerable under NSW legislation (*Threatened Species Conservation Act 1995*) is restricted predominantly to northern Sydney in an area between Maroota in the north, North Ryde in the south, Berowra in the east, and Kellyville in the west. Most of the populations occur in the Hornsby Local Government Area. *Darwinia biflora* is found in the Berowra Valley Regional Park with large populations around Hornsby Heights, Mt Colah, Mt Kuring-gai and Berowra. This plant species is found on weathered shale-capped ridges with Hawkesbury Sandstone where the vegetation community consists of Scribbly Gum *Eucalyptus haemastoma*, Red Bloodwood *Corymbia gummifera*, Dwarf Apple *Angophora hispida* and Heath Banksia *Banksia ericifolia*.

What are its main threats?

The loss of habitat is a main threat to this species as the plants grow on ridge-tops which favour urban development. Habitat degradation from weed invasion, inappropriate fire regime (i.e. too frequent bushfires) and illegal track creation are other threats to this rare plant species.

Threatened Fauna

The Berowra Valley Regional Park is also home to some rare native animals. Many of these threatened species are talked about in this section. A complete list of rare and threatened fauna of the Park is found in the appendices at the back of this *Guide*.

Threatened Cockatoo

Jamie Slaven

Glossy Black Cockatoo
Calyptorhynchus lathami

What does it look like?

The adult male is mainly dull black in colour with two bright red panels visible on the tail. The bill, eye ring and legs are dark grey. The female is similar in appearance to the male, but has irregular yellow patches around the neck and head and orange-red panels on the tail. The Glossy Black Cockatoo is 480mm long and differs from the Red-tailed Black Cockatoo in its inconspicuous crest and distinctive soft, wavering and plaintive calls.

Where is it found?

The Glossy Black Cockatoo is found in Victoria, New South Wales and Queensland, scattered mainly along the east coast and in adjacent inland forests. The species is present in the Sydney Region with populations known to inhabit the forests and woodlands of the Berowra Valley Regional Park. The Glossy Black Cockatoo feeds almost exclusively on the cones of sheoaks (also known as casuarinas) including the Black Sheoak *Allocasuarina littoralis*, Forest Oak *Allocasuarina torulosa* and Scrub Oak *Allocasuarina distyla*. It uses its beak and feet to open the tough wooden cones to eat the seeds

Gregor Newton

Vulnerable plant a black eyed susan Tetratheca glandulosa

Gregor Newton

Endangered geebung Persoonia mollis subsp. maxima

Lyndel Wilson

Heart-shaped juvenile leaves of the stringybark *Eucalyptus camfieldii*

Lyndel Wilson

Vulnerable plant Melaleuca deanii.

Jamie Wright

Glossy Black Cockatoo Calyptorhynchus lathami feeding on a sheoak.

Rod Kavanagh

Southern subspecies of the Masked Owl Tyto novaehollandiae

Noel Rosten

Powerful Owl Ninox strenua

inside. Glossy Black Cockatoos are usually seen in small flocks moving through the forest searching for food and roosting areas. Tree hollows provide protected nesting and breeding areas for this rare bird.

What are its main threats?

The main threat to the long term survival of the Glossy Black Cockatoo is the loss of habitat. Habitat loss is usually through land clearing; however bushfires, particularly too frequent bushfires and hazard reduction burning can also cause a loss of food resources, places to roost and nesting sites.

Further Reference:

ESP Ecological Surveys and Planning P/L, 1999, Hornsby Shire Threatened Biota Conservation Plan, Hornsby Shire Council.

Powerful Owl

Threatened Owls of the Park

Stephen Ambrose

The Southern Boobook, Barn Owl, Powerful Owl and Masked Owl and possibly the Barking Owl occur in the Berowra Valley Regional Park. Owls are important indicators of the health of the natural environment because they are at the top of the food chain. They often have specific habitat requirements, such as tree hollows for nesting and roosting, and their continued presence in an area usually means an abundance of prey items and the presence of tree hollows, which may also be used by other hollow-dependent animals. This article focuses on the Powerful and Masked Owls, the two species whose existence is threatened in NSW, but are known to occur in the Park

The Powerful Owl *Ninox strenua* is the largest (600 to 660 mm) of Australia's owls, the males being somewhat larger than the females. It is readily located from its loud “woo-hoo” call, and identified by its large size and bold chevrons (v-shaped markings) on the breast and belly.

Powerful Owls typically live in pairs and have a permanent territory that can be as small as 300 ha during the breeding period

(usually late June to January) and as large as 1500 ha at other times. They are generalist predators, feeding mainly on arboreal mammals such as possums and gliders, but will also take ground dwelling mammals (bandicoots, marsupial mice), flying-foxes and large birds (parrots, cockatoos and waterfowl). A pair of Powerful Owls may only forage in part of the territory at any one time and then utilise another part of the territory once local food supplies have been exhausted.

Natural habitats of the Powerful Owl are open sclerophyll forests and woodlands, sometimes where there are dense forests nearby. They are often seen roosting during the day in old-growth wet forest that has a dense understorey, and often near permanent streams. In the greater Sydney area they are often seen roosting in stands of Coachwood *Ceratopetalum apetalum*. Each Powerful Owl tends to have several favoured roost trees, which it uses year after year. They rotate between these roosts, each roost being used for several days or weeks at a time. Adults usually roost on horizontal, often bare branches, 2 to 20 m above the ground, from which they can look out in several directions, either in the tree canopy or undergrowth. During the breeding period, the male usually roosts in a tree that is very close to the nest site.

Powerful Owls nest in hollows in large old trees, usually in living eucalypts that grow near creeks. The hollows are usually located within or below the canopy and typically, are large vertical hollows such as broken-off tree trunks and, occasionally, horizontal or sloping limb spouts. Pair-bonds are usually life-long and a successful breeding pair will normally produce two young birds to fledging per year.

In Berowra Valley Regional Park, breeding pairs of Powerful Owls have been recorded along Sam's Creek, Still Creek (a good spot is near the junction with a drainage line to the south-west of Charlton's Creek Road, Berrilee), in the Galston Gorge area (especially along a tributary of Berowra Creek, north of the Gorge), and along Pyes Creek.

The Powerful Owl is considered a threatened species in NSW. Its life cycle is likely to be disrupted if:

- large areas of habitat are cleared or modified;
- fire regimes are altered, thus removing vegetation that provides habitat for owl prey;
- predation pressure from introduced feral carnivores (cat and fox) significantly decrease the abundance of ground dwelling mammals (potential owl food) in preferred foraging and nesting sites of the owl and
- mature eucalypts with hollows are disturbed or removed.

The southern subspecies of the Masked Owl *Tyto novaehollandiae* occupies a home range of 5 to 10 km^2 within a diverse range of wooded habitats that provide large hollow-bearing trees for roosting and nesting and nearby open areas for foraging. This can include forests, remnants within agricultural land or almost treeless plains. However, the core range of a breeding pair during the breeding period can be as little as 150 ha.

Masked Owls prey principally on terrestrial mammals, including rodents and marsupials, although possums, gliders, bats, birds, lizards and rabbits may be taken opportunistically.

Masked Owls nest in hollows in trunks and in near vertical spouts of large, usually live, trees. They often nest in prominent trees, either isolated or emergent, in forest, woodland, treed farmland, remnant patches of vegetation and rarely in trees on the edges of towns or suburbs. Heights of nest hollows usually range from 10 to 30 m. Suitable hollows are 1 to 3m deep with the diameter of the entrance being 45 to 100 cm. The usual breeding period for the Masked Owl is March to July, but can last up to September in good seasons. Pairs form life-long bonds and can produced between one and four young, usually two or three, per year.

Roost sites are usually in hollows of large trees, often in riparian forest, and may be the same hollows that are used for nesting. Masked Owls also roost, and less commonly nest, in caves.

In the Park Masked Owls seem to forage mostly on the ridges and upper slopes, and roost and nest in gully areas where there are trees with large hollows. Likely roosting locations are the lower Sam's Creek gully area near Berowra, the junction of Still Creek and the tributary to the south-west of Charlton's Creek Road in Berrilee, the area around The Steele Military Bridge on

Berowra Creek at Hornsby, and along Crosslands Creek.

Habitat clearance is the principle reason for the decline in the range of this species. The reason for the low density of Masked Owls, however, is unknown. Although food does not appear to be limiting on the east coast of Australia, the apparent decline in inland areas may be linked to the decline in the abundance of small mammals. Within forests on the east coast, the availability of nest trees could be declining, but the scarcity of Masked Owls in logged forests is more likely to be because the vigorous regrowth after logging makes the habitat less suitable for foraging.

Further Reading

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Schodde, R. & Mason, I.J. (1980). *Nocturnal Birds of Australia* Lansdowne, Melbourne.

Further Reference:

1.NSW National Parks and Wildlife Service, June 2000, *Persoonia mollis subspecies maxima Recovery Plan*, NSW National Parks and Wildlife Service.

2.NSW National Parks and Wildlife Service, September 2000, *Draft Darwinia biflora Recovery Plan*, NSW National Parks and Wildlife Service.

3.ESP Ecological Surveys and Planning P/L, 1999, Hornsby Shire Threatened Biota Conservation Plan, Hornsby Shire Council.

4.NSW National Parks and Wildlife Service, September 1999, Threatened Species Information – Glossy Black-cockatoo, NSW National Parks and Wildlife Service.

Bushrock Removal

The removal of loose surface rocks or rock outcrops is prohibited from the Park and all lands classified as National Parks and Wildlife Service estates. Bushrock removal is listed as a key threatening process under the *Threatened Species Conservation Act 1995* because it destroys important habitat for many native plants and animals.

Giant Burrowing Frog

Threatened Frogs

Karen Thumm, Jacquie Recsei, Michael Mahony

†Red-crowned Toadlet

Many species are in decline, often owing to the pollutants entering the Park from the surrounding suburbia. Others appear to be less affected, such as the 'tennis-ball frog', more formally known as the Eastern Striped Marsh Frog or *Limnodynastes peronii* and the Common Eastern Froglet, *Crinia signifera,* a small ubiquitous frog found frequently in small puddles on fire trails.

The Park has records, both historic and recent, of the Giant Burrowing Frog and the Red-crowned Toadlet. They are both found in the Park mainly in sandstone areas, with the Giant Burrowing Frog using clean small creeklines for breeding and sandy ridge-tops for foraging and as refuge sites. This frog prefers ridge-tops that are not near suburbia. The breeding habitat for the Red-crowned Toadlets sometimes overlaps with that for the Giant Burrowing Frog, but the Red-crowned Toadlets are usually further uphill near the ridge.

In the Park, the Red-crowned Toadlet appears to prefer the clay patches found below the first sandstone escarpment in a valley. These clay patches are generally derived from small shale lenses in the sandstone.

Although the tadpoles develop in water, the toadlet lays its pea-sized eggs out of water under leaf litter. During heavy rain the tadpoles emerge from the egg capsules and are washed down into the puddles below. These ephemeral puddles need replenishing frequently if the tadpole is to have time to turn into a frog. Their near-ridge-top sandstone habitat is so dry that most people would consider it unsuitable for frogs.

Giant Burrowing Frog

Both the Red-crowned Toadlet and the Giant Burrowing Frog require clean, unpolluted water for breeding. Both species suffer from stormwater degradation of the smaller creeklines at the top of the catchment.

Sedimentation and subsequent weed invasion, a reduction in the amount of bushrock, frequent fire hazard burning or 'turbo-mulching' to reduce fuel, upgrading fire trails with 'blue metal', and spray bitumen erosion control all have a negative impact on the habitat of these two species.

Housing subdivision in the area also reduces the amount of habitat available to them.

Threatened reptiles in the Park

Gerry Swan, Karen Thumm, Jacquie Recsei

While the Rosenberg's Goanna, or Heath Monitor *Varanus rosenbergi,* is seldom seen, it is known to occur in the Park where large areas of heath vegetation and rock exist. The species has been recorded at Mt Kuring-gai and on the Galston ridge. This species is also known from nearby Ku-ring-gai Chase and Marramarra National Parks and around Brooklyn.

The Heath Monitor shelters in rocky outcrops. Termite mounds within the Park are potential, and necessary, nesting sites for this species.

The Heath Monitor is similar to the common Lace Monitor *Varanus varius*, However, it is smaller in size (average length 900mm), has the pale-edge facial stripe, and has a finely spotted (in yellow or white) appearance with continuous narrow dark bars down the tail.

The main threats to this goanna are loss of habitat through land clearing and urban development.

Reports of the Broad-headed Snake *Hoplocephalus bungaroides* in the region are unsubstantiated, and the authors consider it unlikely that the snake occurs here. The broad-headed snake is highly selective in its choice of rock retreats, preferring unshaded rock, lying on bare rock surfaces. Potential habitat is vulnerable due to bushrock depletion and disturbance.

Further Reference:

1.ESP Ecological Surveys and Planning P/L, 1999, Hornsby Shire Threatened Biota Conservation Plan, Hornsby Shire Council.

Ross Knowles

Red Crowned Toadlet

Karen Thumm

The Red Crowned Toadlet lives in typical ridgetop areas like this and has been seriously affected by development.

Giant Burrowing Frogs live a little further downhill, but their preference for the rocky sandy habitat so common beside fire trails, has made them victims of otherwise positive environmental maintenance.

Ross Knowles

Giant Burrowing Frog

Gerry Swan

Rosenberg's Goanna or Heath Monitor Varanus rosenbergi

Anne & Ray Williams

The largest marsupial carnivore in Berowra Valley Regional Park, the Tiger Quoll, is a sectretive species the size of a cat.

Anne & Ray Williams

Eastern Pygmy Possum Cercartetus nanus

Anne & Ray Williams

**Eastern Bent-wing Bat Miniopterus schreibersii*

Anne & Ray Williams

Southern Brown Bandicoot Isoodon obesulus

Koala

Threatened Mammals in the Park

Ray Williams

Spotted-tailed Quoll or Tiger Quoll
Dasyurus maculatus

The Spotted-tailed Quoll is classed as Vulnerable in Schedule 2 of the *Threatened Species Conservation Act 1995* (NSW) owing to a reduction in population numbers and the previously known distribution.

This Quoll is a carnivorous marsupial about the size of a cat and is easily distinguished by numerous white spots on the body and long tail. Although usually terrestrial, this species is also an adept climber of trees. Populations have declined in the past through loss of habitat and destruction by poultry farmers following raids on their stock, but several reports of sightings in the Hornsby Shire may be an indication of recent population increases. Sightings reported in the mid-1990s include Berowra Waters, Mt Kuring-gai and Ku-ring-gai Chase National Park.

Eastern Quoll
Dasyurus viverrinus

A smaller native cat, distinguished from the large Tiger Quoll by the absence of spots on its tail, also used to occur in the area. The last claimed sighting (unverified) was of an animal caught in a rat trap at Dural Street, Hornsby, in the 1960s. This species is now thought to be extinct in mainland Australia.

Eastern Pygmy-possum
Cercartetus nanus

The Eastern Pygmy-possum is another small mammal that feeds primarily on nectar, pollen and insects. This species does not have a gliding membrane and is more terrestrial in its habits as it will move from one shrub to another by running along the ground. Banksia, Mountain Devil *Lambertia formosa*, and the flower spikes of grass trees, the *Xanthorrhoea family,* are known food sources. Following a wildfire in Ku-ring-gai Chase National Park, an Eastern Pygmy-possum was caught near a patch of Sundew plants, the only food source that was available at the time. This species appears to be

locally common in parts of Ku-ring-gai Chase National Park and Muogamarra Nature Reserve.

A local amateur naturalist observed pygmy possums feeding on banksia plants at Fishponds in 1994. The Eastern Pygmy-possum has been listed as vulnerable in Schedule 2 of the Threatened Species Conservation Act.

Koala
Phascolarctos cinereus

The Koala is listed as vulnerable in the Schedule 2 of the Threatened Species Conservation Act, primarily owing to a decrease in distribution and population size through a loss of habitat. It has been infrequently sighted in the Berowra Waters area and Ku-ring-gai Chase and must be considered rare. Although feeding on a variety of eucalypts, the Koala appears to be dependent on the presence of good quality Grey Gums *Eucalyptus punctata* for continued survival in the region. Fire, dog attack, road deaths and further loss of prime habitat are other major potential impacts on the species.

*Grey-headed Flying-fox
Pteropus poliocephalus

Grey-headed Flying-foxes are a regular and well-known visitor to the region where they feed on eucalypt blossom and fruits in forested areas and on cultivated fruits in garden and orchard environments. Most of the bats feeding in the Hornsby Shire fly in from the Gordon colony, which numbers up to 50 000 or more during the breeding season. The Grey-headed Flying-fox has been listed as vulnerable in Schedule 2 of the Threatened Species Conservation Act.

The Little Red Flying-fox *Pteropus scapulatus* also occurs sometimes, but in much smaller numbers.

Southern Brown Bandicoot
Isoodon obesulus

The Southern Brown Bandicoot is listed as an Endangered Species in both the TSC Act and EPBC Act. It has not been recorded in the Park; however, it occurs within the nearby Ku-ring-gai Chase National Park. This species appears to be restricted to closed heath and woodland environments on ridgetops and upper slopes and such habitats occur within the Park. It can be distinguished from the more common Long-nosed Bandicoot by its short rounded ears as opposed to the long pointed ears of the Long-nosed Bandicoot. Possible sightings should be reported to NPWS at Bobbin Head.

Threatened bat species

The following species are listed as vulnerable in the Threatened Species Conservation Act, and may occur within the Hornsby Shire and the Berowra Valley Regional Park, however their current status is unknown.

The Large-eared Pied Bat *Chalinolobus dwyeri*, can be distinguished by its jet-black fur colour and contrasting white ventral stripes extending onto the wing membranes. Roosting in the honeycomb features of shallow sandstone caves in other areas, it is likely to occur within the Berowra Valley. Regional records are known from Palm Beach (1999), Winmalee and the Watagan Mountains (1980–2001).

The Eastern Cave Bat *Vespadelus troughtoni* has been recorded from Ku-ring-gai Chase National Park at West Head (Brad Law, State Forests of New South Wales pers. comm.). Roosting in the twilight zone of shallow sandstone caves, there is potential for this species to occur along the Berowra Valley. The Eastern Cave Bat is a small light-brown coloured species, with an average weight of 6 g and a forearm length of 33-36.5 mm. It is greater in both weight and forearm length than the common Little Forest Bat.

The Southern Myotis or Fishing Bat *Myotis macropus* (formerly adversus) roosts under bridges, culverts tunnels and caves close to or over permanent water. It has a large foraging range, often flying low over water feeding on flying and aquatic insects as well as small fish. As a large colony has been recorded at Galston (2002) it is likely that this species occurs in the Park.

The Greater Broad-nosed Bat *Scoteanax rueppellii* is one of the larger insectivorous bats, weighing 25-35 g and having a forearm length of 50-56 mm. Identified from the Eastern False Pipistrelle, by the lack of a minute second upper incisor tooth, shorter ears, broader nose, and, in the case of males, a different penis shape. Although insects make up most of its diet, this species is known to feed on other bats. Very few positive records occur for the region and of those most are old (Bilgola Beach 1982, East Lindfield 1963).

The *Eastern Bent-wing Bat *Miniopterus schreibersii*, formerly known as the Common Bent-wing Bat, is listed as vulnerable in the Threatened Species Conservation Act.

Although these bats are regularly recorded, their habit of roosting in large numbers in suitable caves, tunnels, culverts, drains and occasionally buildings makes them vulnerable to local extinction if their roost is destroyed. Eastern Bent-wing Bats have been recorded roosting during winter in stormwater drains adjacent to the Park, and they undoubtedly forage throughout the Park.

This bat is similar in appearance to the Chocolate Wattled Bat; however, the larger size (weight 10-18 g, forearm 43-48 mm) and wing shape are distinguishing features. The last digit of the third finger is four times longer than the next digit, enabling the wing to be folded back on itself, hence the common name.

The Eastern False Pipistrelle *Falsistrellus tasmaniensis* is another large species similar in size and appearance to the Greater Broad-nosed Bat (see above). The only known record for the local region is from Ku-ring-gai Chase National Park at Kalkari in 1985.

The Eastern-coast Freetail-bat *Mormopterus norfolkensis* has not been positively recorded within the northern suburbs since Hunters Hill, (1936). Roost sites are known to occur in tree hollows and the roofs of buildings, particularly churches. It appears to be most common on the coastal plains, with several records occurring for the Cumberland Plains, the Central Coast and Hunter Valley.

The East-coast Freetail-bat has a larger forearm (36-40 mm) and tail than the Eastern Freetail-bat.

The Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris* is rarely recorded in the Sydney region, although there are old records from Killara (1948) and Hunters Hill (1965). This is a large striking species, with contrasting black dorsal fur and white-yellow ventral fur. The tail protrudes through the tail membrane, hence the common name. The average weight is over 30 g and the forearm length 75 mm.

The Berowra Valley Regional Park is also home to some very rare native animals. Some of these rare mammals, birds, amphibians and reptiles have already been mentioned in other sections of the Biodiversity Chapter.

Key Threatening Processes

Key Threatening Processes are listed in Schedule 3 of the *Threatened Species Conservation Act 1995* and are those which threaten, or have the capability of threatening, the survival or evolutionary development of a species, population or ecological community. They consist of the following:

- bushrock removal ;
- Invasion of native plant communities by exotic perennial grasses;
- Infection of native plants by *Phytophthora cinnamomi;*
- competition from feral honeybees *Apis mellifera;*
- infection by *Psittacine Circoviral* (beak and feather) disease affecting endangered psittacine species and populations;
- importation of Red Imported Fire Ants *Solenopsis invicta* (Buren 1972) into NSW;
- removal of dead wood, dead trees and logs;
- competition and grazing by the feral European Rabbit *Oryctolagus cuniculus*
- alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands;
- clearing of native vegetation;
- loss and/or degradation of sites used for hill-topping by butterflies;
- high-frequency fire resulting in the disruption of life-cycle processes in plants and animals and loss of vegetation structure and composition;
- predation by the Feral Cat *Felis catus;*
- invasion of native plant communities by *Chrysanthemoides monilifera;*
- predation by *Gambusia holbrooki* (Plague Minnow);·predation by the European Red Fox *Vulpes vulpes;*
- introduction of the large earth bumblebee *Bombus terrestris.*

Photograph by Sarah Holmes, an entrant in Hornsby Shire Council's 2004 Photo Competition

The serenity of an understorey dominated by the uniquely Australian Grass Tree Xanthorroea species is an experience to be enjoyed in many locations throughout the Park. At other times the vitality of natural Australian environmental renewal is to be seen after the drama and destruction of bushfire.

Photograph by Westleigh resident, Sandra Kalnins-Cole

Challenges and management

Plan of Management

Pressures on the Park

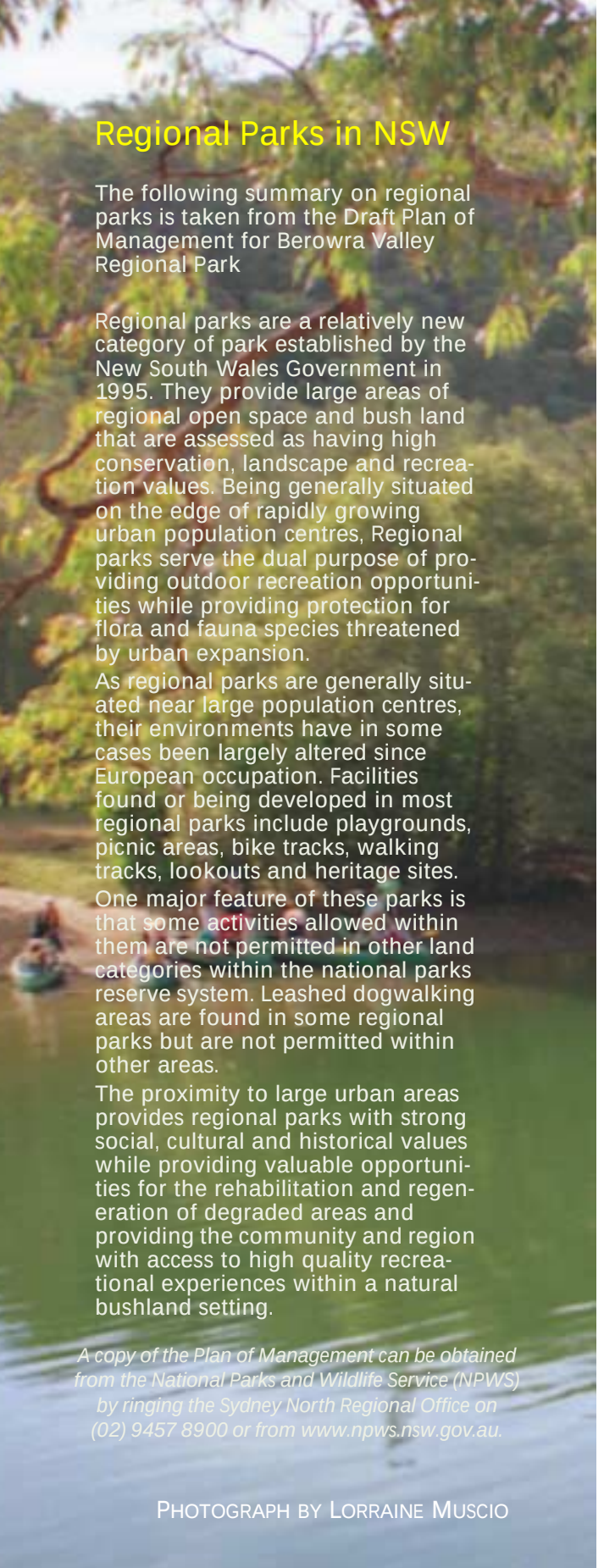
Catchment management

Urban development

Feral animals

Hornsby Rifle Range

How you can help



Regional Parks in NSW

The following summary on regional parks is taken from the Draft Plan of Management for Berowra Valley Regional Park

Regional parks are a relatively new category of park established by the New South Wales Government in 1995. They provide large areas of regional open space and bush land that are assessed as having high conservation, landscape and recreation values. Being generally situated on the edge of rapidly growing urban population centres, Regional parks serve the dual purpose of providing outdoor recreation opportunities while providing protection for flora and fauna species threatened by urban expansion.

As regional parks are generally situated near large population centres, their environments have in some cases been largely altered since European occupation. Facilities found or being developed in most regional parks include playgrounds, picnic areas, bike tracks, walking tracks, lookouts and heritage sites.

One major feature of these parks is that some activities allowed within them are not permitted in other land categories within the national parks reserve system. Leashed dogwalking areas are found in some regional parks but are not permitted within other areas.

The proximity to large urban areas provides regional parks with strong social, cultural and historical values while providing valuable opportunities for the rehabilitation and regeneration of degraded areas and providing the community and region with access to high quality recreational experiences within a natural bushland setting.

A copy of the Plan of Management can be obtained from the National Parks and Wildlife Service (NPWS) by ringing the Sydney North Regional Office on (02) 9457 8900 or from www.npws.nsw.gov.au.

PHOTOGRAPH BY LORRAINE MUSCIO

Plan of Management

Sandra Nichols

The National Parks and Wildlife Act 1974 requires that a Plan of Management be prepared for each park covered by the legislation. Plans of Management are approved for a period of five years from the date of assent by the Minister for the Environment. A Plan must set out management priorities for the Park to maximise conservation of the Park's natural assets and list permissible recreation activities.

The Berowra Valley Regional Park Draft Plan of Management was publicly exhibited in early 2003. Submissions were received from a diverse range of community and government organisations and from individuals with an interest in the Park.

Activities not permitted in the Park

The Draft Plan proposes that some activities should not be permitted anywhere in the Park. These include horse riding, abseiling, parachuting, hang gliding, bungy jumping and off-road vehicles. Recreational activities to be permitted in designated areas include bushwalking, picnicking, camping, cycling, leashed-dog walking, fishing and boating. Up to date information and the legislative basis for which activities are allowed in the Park are set out in the National Parks and Wildlife Regulation 2002. To obtain a copy of the Regulation contact NPWS on (02) 9585 6444, by email at info@npws.gov.com.au, or visit:

http://www.nationalparks.nsw.gov.au/npws.nsf/Content/National+Parks+and+Wildlife+Act+1974

Activities requiring written consent

If you are thinking of planning a commercial or large group (more than 40 people) activity for a school, community or other group, in the Park, you will need to contact the NPWS for activity consent. Contact the Senior Ranger, Lower Hawkesbury Area NPWS phone: (02) 9472 9321 for an application form. A small fee applies for the processing of activity consents.

Group camping inquiries at Crosslands Reserve should be directed to Hornsby Shire Council phone (02) 9847 6603.

Pressures on the Park

Malcolm Bruce

Suburbia

The narrow Berowra Valley is surrounded by developed or developing suburbs, all on higher ground. Water, eroded soil, chemicals and solid wastes move down-slope from these suburbs into the bush.

Rubbish and erosion

Rubbish spilling into the Park along creeks from the edges of ring roads and from adjacent backyards, or left behind by visitors, is an eyesore and a threat. Erosion caused by stormwater from the built-up areas, and siltation from soil washed down from housing developments, are particularly harmful to creek beds. All major creeks have suffered severe damage, and new housing development close to the Park exacerbates this problem.

Weeds

More widespread and serious, yet less obvious to the casual observer, is the fact that much more water enters the Park from the surrounding suburbs than comes from undeveloped land. Every stormwater outlet serving backyards and streets releases water into the Park containing such chemicals as phosphorus that act as plant fertilisers. This water encourages the growth of weeds, which flourish and displace the native plants. Why this happens is because the native plant species in the low-phosphorus and quick-drying sandy soils of the Park, through long adaptation, do best under conditions of low levels of nutrients and a fluctuating water supply. When there is plenty of polluted water around, it is other plants that thrive: the weeds.

The consequences can be seen all around the edge of the Park and along all creeks. Wherever stormwater enters the Park, wherever garden refuse has been dumped, and wherever new soil has come in or fill has been dumped, patches of privet, Honeysuckle *Lonicera japonica*, Lantana *Lantana camara*, Kikuyu Grass *Pennisetum clandestinum*, *Tradescantia* fluminensis, Blackberry *Rubus fruticosus*, Crofton Weed *Ageratina adenophora*, and many other weeds run rampant. The limits of each infestation show precisely how far the increased 'nutrients' or increased water have reached.

Weeds and introduced plants are listed in the Appendix entitled 'Introduced plant species'. While not all of these plants are present in the Park, they have been recorded in the broader Berowra Valley. This list is included in this *Guide* to encourage people to recognise such plants, to remove weeds from their gardens, and to seek Council advice about eliminating weeds from nearby areas. This will help prevent the spread of weeds into the Park.

Fire

The Berowra Valley Regional Park and adjoining land provide a habitat for a wide range of flora and fauna. Carefully planned fire management is essential in protecting the Park and the species found within and around it. For this reason a draft fire management plan was developed and exhibited in 1999–2000, and forwarded to the Minister for the Environment for final approval. The aim of the plan was 'to manage the vegetation of the Park so that bushfire hazard levels do not surpass acceptable risks to surrounding areas, while achieving conservation, recreation and aesthetic goals, and thus conserving biodiversity'.

Fire has an important role in bushland communities. Many plants in the Park are associated with Hawkesbury sandstone conditions and may require fire and/or drought at some stage in their life cycle. Current research suggests that the Aboriginal people of Sydney burnt the bush in a complex series of mosaics, and that they may have chosen the windiest months, August and September, for burning. On the slopes and some plateaus the bush appears to have been burnt at intervals of around ten to fifteen years, whereas the more fertile valleys and ridge tops may have been burnt as frequently as every four years. As the numbers of Aborigines fell, so did their springtime burns decline. This resulted in the massive accumulation of fuels, which led to devastating fires in the late 1890s and through to the present day. Since the 1950s authorities have tried to emulate the Aboriginal use of fire by developing a policy of hazard reduction controlled burning. Such controlled burns were first carried out in the autumn or early winter but, in the light of increased ecological knowledge, they have been held progressively later in the year, in line with Aboriginal practices.

Fire management is necessary also for the protection of both life and property. Owing to prevailing north-westerly winds on high fire-risk days in summer, wildfires have the potential to spread from adjoining bushland to the north and north west of the Park, threatening populated areas on the Park's eastern and southern boundaries. Minimisation of fire risk to residents involves cooperation and coordination with the community, through volunteer bush fire brigades and the responsible actions of residents.

Fire breaks are provided by natural features within the Park: these include streams, exposed rock outcrops, and south facing slopes, which generally have a higher moisture content. In areas of the Park where there are insufficient natural features, fire trails provide fire breaks and also allow access for inspection, hazard reduction and firefighting purposes.

Since 1976, no wildfire has evaded suppression within the Park. Since the 1960s unscheduled fires were controlled using the resources of Hornsby Shire Council and the Volunteer Rural Fire Service. Since the gazetting of the Regional Park in March 1998, these resources have also included those of the NSW National Parks and Wildlife Service.

The Park is assessed for fire hazard on the basis of fuel loads present, the topography, ecology and proximity of residential areas. Hazard reduction burns are conducted, if required, during the cooler months of the year.

The conservation and protection of cultural, scenic, aesthetic and recreational opportunities within the Park are an important part of fire management, and are considered carefully before any action is undertaken.

Further reading

Auld, B.A. & Medd, R.W. 1987, *Weeds: An Illustrated Botanical Guide to the Weeds of Australia*, Inkata Press, Melbourne.

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Parks and Gardens Branch 1990, 'Berowra Valley Bushland Park: Draft Plan of Management Stage 1', Hornsby Shire Council, Hornsby.

Swarbrick, J.T. & Skarratt, D.B. 1994, *The Bushweed 2 Database of Environmental Weeds in Australia*, 2nd. edn, University of Queensland Gatton College.

Water Catchments Team, Environment Division 1996, 'Berowra Valley Bushland Park – Plan of Management Stage 2', Hornsby Shire Council, Hornsby.

Catchment Management

David Booth

Former Berowra Catchment Management Committee

The Berowra Catchment Management Committee (BCMC) was established in July 1994 by the Minister for Land and Water Conservation. The BCMC worked closely with the Hawkesbury-Nepean Catchment Management Trust. The functions of the BCMC were defined in the *Catchment Management Act 1989* (NSW). Primarily, the BCMC was responsible for the coordination of natural resource management activities in the Berowra Catchment, which is the area bounded by the Pacific Highway, Pennant Hills Road, Castle Hill Road, Old Northern Road and the Hawkesbury River. The Berowra Valley Regional Park is located within the Berowra Catchment.

The role of the BCMC was to bring people and agencies together to identify problems and determine how they could be overcome. This was to ensure the conservation of the catchment's distinct character as well as its diverse natural and cultural heritage. The committee brought together people from a range of backgrounds and interests with a variety of skills and knowledge to help make the catchment a better place for all to live and work in, and to conserve for future generations to enjoy.

Pursuit of ecologically sustainable development – a significant management challenge

In September 1993, as a result of long-standing community concerns about deteriorating water quality in the Berowra Creek estuary, Hornsby Shire Council imposed a moratorium on the determination of development applications for waste water generation in the catchment of the West Hornsby Sewage Treatment Plant. In October 1993, to resolve the situation, the Minister for Urban Affairs and Planning convened a technical working party consisting of the Department of Planning, Hornsby Shire Council, Sydney Water Corporation, the Environment Protection Authority, and the Hawkesbury-

Nepean Catchment Management Trust. A Statement of Joint Intent (SOJI), also known as the Community Contract for Berowra Creek, was signed in April 1994. Signatories agreed to work together to achieve the ecologically sustainable development (ESD) of the Berowra Creek catchment, and recovery of the creek's environmental health. It is interesting to note that the Department of Planning signed the Statement, stating that:

it will not introduce any planning measures that are incompatible with the ecological sustainability of Berowra Creek.

Therefore, the SOJI provided a basis for improvements to water quality in Berowra Creek, as well as a basis for the protection of Berowra Valley from the impacts of development.

Whole-of-government approach

The approach taken by SOJI represented a 'whole-of-government' commitment to catchment management in Berowra Creek. It was the first time in New South Wales where State agencies and local government had formally agreed to work together with the local community to start to clean up a waterway. It was a coordinated and integrated approach to natural resource management that reflected the principles of Total Catchment Management (TCM) — the State government's policy for the management of natural resources.

Berowra CMC's role

Consistent with the coordination responsibilities under the Catchment Management Act, in September 1995 the NSW government transferred the ongoing responsibilities of overseeing the SOJI to the Berowra Catchment Management Committee. The BCMC established a SOJI sub-committee, which included representatives from all of the SOJI signatory organisations. The SOJI sub-committee met on a bi-monthly basis at the Hornsby Catchment Centre.

SOJI signatories and the community have remained supportive of the SOJI, which unified agencies and authorities with the community. Unity was enhanced through the coordination responsibilities of the BCMC. The TCM philosophy provided an appropriate and transparently accountable framework through its catchment sustainability and community

Hornsby Shire Council

Artificial wetland

Jacqui Grove

Water sampling by Water Catchment Field Officer above Cowan quarry

Peter Coad

Water sampling at a site in West Hornsby Sewage Treatment Plant

Hornsby Shire Council

Honorary member, Friends of Berowra Creek

Paul Fredrickson

All sewer mains have provision for emergency overflow when blockages occur. Unfortunately illegal stormwater run-off also enters the system during heavy rain, directly polluting Park waterways.

Anthony Collins

Nettech device off Clarinda Street, Hornsby

Bob Salt

Trash rack and sediment basin beside the new bridge over Zig Zag Creek off the end of Bellamy Street, Pennant Hills

participation focus. Under the TCM umbrella, signatories showed a preparedness to work together progressively to achieve the water quality and ESD outcomes being sought.

Advantages of the SOJI

The Statement of Joint Intent provided the following advantages. It

- guided the key relevant activities of the member parties;
- provided a framework for more open communication;
- improved the coordination of activities;
- increased the levels of cooperation; and
- improved the transparency of processes for the community.

SOJI significance recognised

The significance of the SOJI was recognised by the NSW Department of Urban Affairs and Planning in its Draft Hawkesbury-Nepean Environmental Planning Strategy (1996), by the NSW Healthy Rivers Commission in its 'Independent Inquiry into the Hawkesbury-Nepean River System—Final Report' (1998), by the NSW government in its reports: 'Public Inquiry into the Management of Sewage and Sewage By-products in the NSW Coastal Zone—Draft Report' (August 1997), and 'Outcomes of the Review of TCM in NSW' (December 1997).

Conclusion

The SOJI was the first community contract to start cleaning up a waterway, based on a more integrated approach to land and water management. It was also recognised as the first broad-based inter-agency agreement aimed at achieving an ambient target in water quality and at working towards ecologically sustainable development on a catchment basis.

Berowra Catchment Management Committee

In 2000 the Berowra Catchment Management Committee was replaced by the Lower Hawkesbury Catchment Support Committee, a sub-group of the Hawkesbury–Nepean Catchment Management Trust. The Trust, and subsequent Catchment Support Committee, were abolished on 6 April 2001 with its functions to

be absorbed into the then Department of Land and Water Conservation (DLWC).[1] The announcement was made by the Minister for Agriculture and Land and Water Conservation. Under the new arrangements, that department established the Hawkesbury-Nepean Local Government Advisory Group, which gave greater autonomy to local government to be a key player in natural resource management in the Hawkesbury-Nepean catchment.

Stormwater remediation

Anthony Collins

Hornsby Council's Catchments Remediation Program aims to install water quality controls on land within and adjoining bushland reserves and regional and national parks. The controls consist of litter traps, sediment basins, wetland ponds, landfill remediation and creek rehabilitation. These works reduce deterioration of bushland and waterways caused by factors like littering, erosion, sedimentation, nutrient transport and riparian weed propagation.

As at 30 June 2004 the catchments remediation program had constructed nineteen water quality improvement devices in the Park, including a wetland pond, three sediment basins and a range of trash racks, baskets and nets used for collecting stormwater debris, litter and sediment. In addition, one wetland was constructed and one creek remediation project undertaken within the Park boundary at the urban interface. A further five wetlands, two litter traps, two sediment basins and one creek restoration project were completed just outside the Park boundary on stormwater outlets entering the regional park.

Case study: Wallumeda Wetland Project
Boundary Road, West Pennant Hills

The Wallumeda Wetland Project at Boundary Road was commissioned in June 1997 to protect the environment of the area by minimising the amount of litter, sediment and nutrients entering Berowra Creek. Its completion was to the credit of the public, the Hawkesbury Nepean Trust, the Hornsby Shire Council and NSW State government working together. The 138-hectare catchment area of the wetland is home to a regionally significant vegetation community of Blue Gum High Forest. As with other such forest pockets, this was declared a threatened community under the Threatened Species Conservation Act 1995 (NSW). Monitoring of the wetland's performance has shown that stormwater pollutants such as suspended solids, faecal bacteria and total nitrogen have been significantly reduced by the wetland system from entering the regional park.

Community volunteers are involved in ongoing planting and weeding of the wetland; a contract bush regeneration team continues to operate in the adjoining blue gum forest and wetland pond area; and a 'green corps team' worked for two weeks weeding, rock lining the channels, planting and mulching the area.

The Metropolitan Local Aboriginal Lands Council gave its consent for Council to use the name Wallumeda. The Wallumedagal were the subgroup of the Dharuk indigenous community to the north and west of Sydney harbour who occupied and were the traditional owners of the Kissing Point-Ryde region. Their territory may have extended to West Pennant Hills and the surrounding area, including this wetland.

Further information

Anthony Collins, tel. (02) 9847 6860.
Catchment Remediation Mgr, Hornsby Shire Council.

Anthony Collins

Wallumeda Wetland West Pennant Hills

1. For details of the latest responsible body, consult the NSW government website: http://www.dlwc.nsw.gov.au/care/cmb.html

Urban development

Hornsby Landcom ESD Study:a benchmark case

During the mid-1990s Landcom developed proposals for subdivision of various crown land sites at Hornsby Heights, Berowra and Asquith. Most of these bushland-covered sites (Hornsby Heights and Berowra) are immediately adjacent to Berowra Valley. The public expressed concern that residential development of these sites would not be ecologically sustainable because of the potential impact upon endangered flora and fauna, erosion, sedimentation of local waterways, weed infestation of adjoining bushland, bush fire hazard and related matters.

On 17 May 1997, owing to a groundswell of opinion from concerned residents who took direct action by putting themselves in front of bulldozers, the then Minister for Urban Affairs and Planning halted work to allow 'new studies to be undertaken'. Landcom subsequently reached agreement with Hornsby Council and concerned residents to commission an Ecologically Sustainable Development (ESD) study into Landcom's development proposals in Hornsby Shire.

The Total Environment Centre (TEC) was appointed to prepare a study brief and coordinate four separate studies by suitably qualified and experienced consultants. The fifteen residential-zoned Crown land sites consisted of about 47 ha with a potential yield of 554 lots. On 7 November 2000, Landcom notified Council that, in accordance with the recommendations of the ESD report, it considered that only thirty-four lots were financially viable for development. The remaining lots were to be incorporated into the corresponding adjoining Berowra Valley Regional Park, Muogamarra Nature Reserve and Ku-ring-gai Chase National Park, subject to negotiations with the National Parks and Wildlife Service and the resolution of any claims under the *Aboriginal Land Rights Act 1983* (NSW).

Further reading

Total Environment Centre Inc. 1999, *Hornsby Landcom Ecologically Sustainable Development (ESD) Study Berowra Valley*, CD Rom, available from Hornsby Shire Council, Hornsby.

IMPACTS OF URBAN DEVELOPMENT

Photographs: Jamie Slaven

Urban development creates special challenges for the Park managers. New subdivision construction, site clearing and building contribute substantially to water catchment pollution and numerous new impacts on the biodiversity of the Park.

Feral animals

Bob Salt

The arrival of Europeans in Australia and the Sydney Region introduced problems for the Aboriginal people and the native fauna. Not only did each new sailing ship bring humans and domestic animals, it also brought their commensal companions, rats and mice, as well as the ships' cats on board to control the vermin.Some of these animals, which found their way ashore from docked vessels or shipwrecks, proceeded to take advantage of the new environment. In time they were joined by escaped domestic animals or later by deliberate releases of animals organised by acclimatisation societies to make Australia seem more like Europe.

The Park, penetrating as it does into the urban fringes of Sydney, has become home to a considerable number of feral animals. These prey on, or compete for food and for homes with the native wildlife. The feral animal population of Berowra Valley includes the following.

Cats

Felis catus

The Cat is known to have been introduced into south-eastern Australia by the early European settlers. However, it is possible that cats may have been present in Australia for up to 500 years. It is now thought that cats arrived in the west during the sixteenth and seventeenth centuries from Portuguese and Dutch shipwrecks, and in the north from the Macassan traders on fishing trips to the Top End (Wagner 1997, pp. 20-21). Feral cats can kill animals up to 2–3 kg. They prefer mammals up to 220 g and birds less than 200 g, but will take reptiles, amphibians, and invertebrates as well as carrion. Feral cat predation has been linked to the disappearance of thirteen species of mammals and four species of birds from the western division of New South Wales by 1857. Current impacts on native species are most likely in modified fragmented environments and where alternative prey such as rabbits or house mice fluctuate in abundance.[1] Feral cats are wary of humans and are most active at night. They spend most of the day in a shelter such as a rabbit burrow or hollow log.

In favourable habitats the feral cat population may exceed one cat per square kilometre, but feral cat home ranges can extend up to eight kilometres. In most Australian regions feral cat populations are now probably fairly stable (Jones 1991, p. 489).

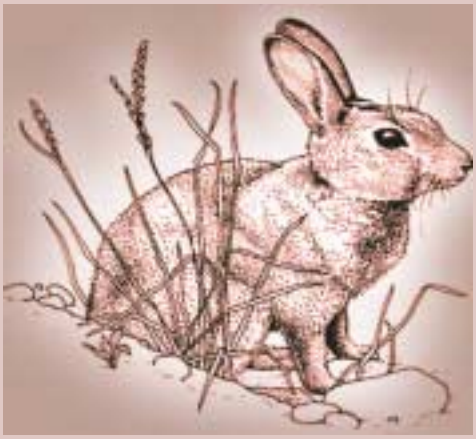
Dept. Environment & Conservation

Cats are well adapted to catch birds. They are fast and agile, can stalk and ambush even the most observant bird. Cats' ability to leap and drag their prey down with their retractable claws makes them a formidable predator of native birds.

Dept. of Environment & Heritage

The animal remains in this photograph were known to be feral cat kills but could easily have been Powerful Owl kills. Powerful Owls tend to eat the head and upper body of their prey, avoiding the rump and tail. Cats prefer to eat the softer tissues in the gut. Foxes, being larger and stronger will consume most of the carcass, leaving only scraps of skin and the larger bones.

1. The NSW Scientific Committee, on 24 March 2000, made a 'Final Determination' to list 'Predation by the Feral Cat (Linnaeus 1758)—*Felis catus*' as a 'Key Threatening Process' under Schedule 3 of the *Threatened Species Conservation Act 1995* (NSW).



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The large rabbit population across Australia has enabled the Feral Cat and Fox to have large population numbers. Foxes and cats then diversify their prey to include most native animals.

Hornsby Shire Council

Although it feeds on animals, such as this Ring-tailed Possum, the Fox will also eat fruit and other vegetable matter. The Fox often feeds on blackberrries and helps spread this weed across its range by depositing the seed in droppings

Hornsby Shire Council.

Foxoff bait, containing the toxin 1080, is deadly to most introduced animals, including humans. Foxoff has an aroma that foxes and dogs cannot resist. Since the use of Foxoff in the Park many rare and interesting animals have returned to make the Park home. Foxoff is buried to hide it from children and some native animals that may find its smell attractive.

Their depredations are augmented by the activities of uncontrolled domestic and stray cats in areas like Berowra Valley.

No research has been done on the impact of feral, stray or domestic cats in the Park. However, one study of domestic-cat predation in Canberra suburbs showed that in one twelve-month period of the study, 214 domestic cats (some of which moved up to 900 m into adjoining bushland) took some 2000 vertebrate prey items representing sixty-seven species. Their main prey consisted of house mice 50 per cent, black rats 7 per cent, and birds 27 per cent. The birds were represented by 47 species, 41 of which were native. Predation beyond suburban edges is most likely to affect birds, arboreal native marsupials (such as sugar gliders) and small ground dwellers (like dunnarts) (Barratt 1998).

The Cat is also a carrier of toxoplasmosis — a parasitic disease — which affects humans and marsupials. The combined effects of competition and toxoplasmosis are believed to have contributed to the decline of the Dasuryid native cats (such as the quoll).

The *Companion Animals Act 1998* (NSW) requires more control and identification of domestic cats, which should reduce dumping of unwanted cats and the number of uncontrolled cats abroad at night.

Foxes
Vulpes vulpes

The Fox was introduced into Australia in the 1860s near Melbourne as a sporting animal. It has now spread to most of the continent except for the tropics and Tasmania. It is the largest terrestrial predator in Australia after the dingo and feral dog. Basically a carnivore, the Fox is, however, an opportunistic feeder and its diet can vary from wild fruit and insects to carrion, small mammals and garbage. Foxes normally have a home range of two to five square kilometres. They are present but seldom seen in most urban areas.

In Europe foxes are a vector for the transmission of rabies, and it would be a major problem if this disease ever took hold in Australia (Coman 1991, p. 486). Foxes are also a vector for spreading noxious weeds including blackberries.

In 1997 Hornsby Council, in conjunction with the National Parks and Wildlife Service, began a fox control program, which in 2000 was extended to the Park as an ongoing annual activity. The success of the program was indicated by the

return of bandicoots, plovers, lyrebirds and brush turkeys to many bushland areas.

Dog owners who regularly walk their leashed dogs in the Park should be aware that the Park is closed to dogs during fox baiting periods as the baits are poisonous to all dogs. Dog owners should refer to signage at track heads for details of times

The Fox was listed as a key threatening process under the Threatened Species Conservation Act in 1999. Unfortunately, many people feed foxes because they look cute or by inadvertently leaving pet food outside, or food scraps on open compost mounds. This encourages foxes into gardens and supports a fox population on the urban fringe.

Rabbits
Oryctolagus cuniculus

Rabbits, common prey of foxes and cats, arrived with the First Fleet. These were most likely domesticated silver-grey meat rabbits. The Reverend Samuel Marsden tried to set up a warren at Parramatta in 1806. In 1827 concern was expressed about rabbit populations in Tasmania. However, wild populations did not thrive on the mainland until a shipment of twenty-four genetically wild rabbits was released by Thomas Austin at 'Barwon Park' near Geelong, Victoria, in 1858. By 1865 these rabbits were well established and they now occupy four million square kilometres of Australia south of the tropic of Capricorn (Croft 1996, p. 33). Rabbits are a major pest in inland areas. Although coastal sclerophyll forests are a less suitable habitat, rabbits will harbour in sclerophyll bushland and feed out onto grassy suburban areas such as lawns, and semi-rural areas and paddocks.

Rabbits occur around the Park, and appeared to decline with increased urbanisation (personal observation), but by 1999 there were increasing reports of sightings of both wild and domestic rabbits in suburban areas.

Myxomatosis and calicivirus may be helping to reduce numbers in many areas, but by 2000 calicivirus had not shown any effects on rabbit populations in the Sydney region.

Genetic studies by Dr Lynton Davies have indicated that the feral rabbit populations in and around Sydney are distinctly genetically different from feral rabbit populations in other areas of Australia (Davis 1998). The reasons for this may be attributed to escapes of pet rabbits into the wild population and Marsden's original rabbits being of French origin. This has resulted in Sydney rabbits having a degree of immunity to calicivirus.

Decline in the rabbit population will mean that integrated pest management measures to balance prey and predators will need to be employed to avoid increased predation on native animals.

Carp
Cyprinus carpio

The troublesome Carp is one of a number of fishes introduced since European settlement. It has become well established in the major river systems and is blamed for contributing to the reduction in native fish populations in the Murray-Darling basin. Its bottom-feeding habits stir up mud and undermine stream banks, increase turbidity, destroy aquatic plant beds and release nutrients into the water that can cause algal blooms (Harris 1994 pp. 65-73). Unfortunately these fishes are now established in the upper reaches of Berowra Creek. Control measures include commercial electro-fishing, but these have not yet been applied in Berowra Creek.

Gambusia
Gambusi holbrooki

The United States Army introduced Mosquito Fish, Gambusia or Eastern Gambusia, in many countries in the 1920s in an attempt to control malaria by reducing mosquito populations. The gambusia were a failure at this task, but reduced native fish populations by predation and competition. Gambusia thrive in fresh or salt water and are present in most streams (Harris 1996, p. 68).

Rats
Rattus rattus & Rattus norvegicus

The Black Rat *Rattus rattus* and the Brown Rat *Rattus norvegicus* arrived with the First Fleet and have thrived near human habitation ever since. The Black Rat has been more successful and has spread around most of the coastal areas, whereas the distribution of the Brown Rat is patchier.

Black Rats can be found in bushland around Berowra Valley in the same areas as the native Bush Rats *Rattus fuscipes*.

Black Rats are usually found along the urban interface in the Park. Population pressures force the older, weaker and younger rats into nearby bushland to forage and nest. Some populations are found in the same areas as the native bush rats *Rattus fuscipes*.

So far there is no evidence that they are having much impact on the native rodents. The Black Rat is, however, a carrier of such diseases as salmonella and leptispirosis, and in Europe it carried the plague bacillus.

The Brown Rat is generally found around buildings and wharves and occasionally along creek banks. It is a larger and much more aggressive animal than either the Bush or Black Rats. Fortunately for the Park, it appears to prefer proximity to human habitation rather than the bush (Watts 1991, pp. 452-54).

House Mice
Mus musculus

The well-known pest, the House Mouse *Mus musculus*, also arrived with the Europeans. It reaches plague proportions in wheat-growing areas. Some twenty mouse plagues affecting twenty per cent of the land have occurred in Australia since 1960 (Newsome 1991, p. 455). In central Australia the House Mouse is believed to have replaced some native species, but apparently this does not happen in coastal habitats. In some areas the House Mouse can become abundant about eighteen months after bushfires when native species are rare, but disappears within three to four years as native rodents become more abundant (p. 455). Hornsby Conservation Society's mammal survey in the 1970s collected one animal some distance from habitation in the Elouera Bushland. While *Mus musculus* is found in both the Park and in houses generally, so far it has become a pest only in the urban situation.

Dogs
Canis familiaris

Dingoes no longer exist in Berowra Valley and there are few if any feral dogs. However, poorly controlled domestic dogs still represent a significant threat to wildlife in the park, particularly if they are allowed to roam free at night. Owners of such dogs should be aware that during fox baiting periods their pets share the same risks as foxes.

According to older residents, most of the original wallaby population around Hornsby was decimated by a pack of beagles owned and exercised in 1966-75 by a now-deceased local resident. As recently as 1996 a rottweiler chased and seized a Swamp Wallaby *Wallabia bicolor* on Waitara Creek. A Swamp Wallaby was subsequently found dead in the vicinity and its skeleton given to the Australian Museum. Dogs should now be better controlled under the provisions of the Companion Animals Act.

Birds

Most of the introduced birds have fortunately had limited success in the Australian bush and have affected native species only in competition for food and nest space.

The Common or Indian Myna *Acridotheres tristis* is one of the most troublesome in areas adjacent to urban development. It competes aggressively for nesting hollows with the smaller parrots.

Feral Mallard *Anas platyryhnchos* are a problem because they interbreed with the native Pacific Black Duck *Anas superciliosa,* threatening its genetic integrity (Slater *et al.* 1986, p. 64).

Bantam Hens *Gallus domesticus* have frequented the Galston Gorge area for years, being the result of someone irresponsibly dumping unwanted birds, rather than as an established breeding population. These birds were brought under control in 1999 and have been eradicated.

Brochures on feral cats, foxes and other threats to wildlife populations are available from Hornsby Council and the National Parks and Wildlife Service offices.

Other unwanted aliens

There are other pests that infest Australia such as pigs, goats and deer. However, there appeared to be no extant breeding populations of these in Berowra Valley in 2000. There have been reports of feral pigs being released by misguided hunters in the Maroota area, and early in 2000 three pigs were reported from the Calna Creek area of the Park. Some goats and

cattle have also been reported from time to time, which will be eradicated as they are located.

Reporting Sightings of Feral or Native Animals

The public can help by reporting sightings or signs of any feral or stray animals to Hornsby Council and/or the National Parks and Wildlife Service. Community provision of information on fox dens or cat lairs would likewise be particularly useful. Reports of feral animal sightings or traces are useful to the Park Managers in helping to control these pests. If possible you should accurately note where and when you saw the animal or animals, record the date, time of day, number sighted and, if possible, the map reference or nearest track location.

Should you happen to sight rare or unusual native animals or birds, such as Koalas, Quolls, Brush Turkeys, Eagles, Powerful or Sooty Owls, Bandicoots, Platypus, or even the Water - rat (distinguished by its white tail tip) this information is also of great assistance to the Managers.

Sightings should be reported to:

The Ranger,
Berowra Valley Regional Park
Lower Hawkesbury Area
National Parks and Wildlife Service
P.O. Box 3056, Asquith, NSW 2077

References

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Strahan, R. (ed.) 1991, *Complete Book of Australian Mammals,* Angus & Robertson, Sydney.

Wagner, P. 1997, 'Tracing the feral feline family tree', *Australian Geographic,* no. 46, April-June, Sydney, pp. 20-21.

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Dept. of Environment & Heritage

There are some feral goats in the Park, usually the result of backyard escapes

NSW Fisheries

Gambusia is a member of a highly evolved group of fish that have live young. and breed very rapidly. Brought to this country to eat mosquito larvae, they became a pest by chosing to eat the eggs and young of other fish instead.

Gunter Schmida

Carp, Koi variety

Gunter Schmida

Goldfish Carassius auratus

Established more than a century ago, the Hornsby & District Rifle Range continues the region's long association with marksmanship and military training. (See Walk 3 Refuge Rock). The safety zone of the range bisects Berowra Valley Regional Park, raising a number of unusual challenges and opportunities for the managers of the Park

The Military, Police, Schools and a number of gun clubs regularly use the facilities of the range.

When you DO have a rifle range in the middle of a major regional park - could it possibly be a benefit to conservation?

Strangely enough, the rifle range does have hidden benefits. The deep valleys and dry ridges within the safety zone contain areas that have rare and endangered species and aboriginal sites. Park managers always face tough choices when developing extensive public wilderness areas for recreational use.
A large area such as the safety zone where regular visitation is potentially dangerous, can be of positive management and conservation value if the significant conservation resources are able to be left largely undisturbed.

Rifle Range Hazard

Hornsby and District Rifle Range

Walkers are advised that the routes of the Great North Walk, Benowie Walking Track and some long established firetrails pass through the safety zone of the Hornsby and District Rifle Range. Diversions have been established to ensure that no formally approved walks pass through the hazardous area. Walkers are strongly advised to heed the posted safety warnings and ensure that they are aware of the potential risks when the range is in use.

The Hornsby and District Rifle Range was reserved in 1858, and was established for training in marksmanship. Prior to federation all men were required to join a militia, as part of national military preparedness for such emergencies as the Boer War of 1890.

The rifle range is on Crown land controlled by the Department of Lands. It is leased to the Department of Defence, the NSW Police Department and various organisations including large-bore and small-bore gun clubs, pistol clubs and schools.

There are two ranges, a 50 m small-bore range and a 600 m heavy or large-bore range. At the end of each range, and also at various distances within the larger range, there are earth butts with internal 120 mm steel plates. Beyond the butts is a safety zone (as marked on street-directory and other maps including maps of the Park). The safety zone was originally set to include such distances as to cover the fall of a 0.303 in. bullet (about 5 miles or 8 km).

All firing in the range is undertaken following rigid protocols and under the strictest supervision. When the rifle range is in operation a red flag is flown from a prominent position on the range, to be visible in all directions. Walkers must be aware that the range is available for operation 7 days a week.

Contact telephone numbers:

Sporting Shooters Association of Australia (NSW) Inc.:	(02) 9833 9444
NSW Shooting Association:	(02) 9552 6349
North Shore District Rifle Association:	(02) 9675 3157

How you can help in the management of the Park

The first steps towards helping in the management of Berowra Valley Regional Park are to become well informed on issues that will affect the Park, to act appropriately, and to contribute to public debate about conservation and development proposals and initiatives.

People can minimise their personal effect on the Park by:

- reducing the extent to which they water and fertilise their gardens, which is commonly done more than the gardens need;
- establishing a bush-friendly garden in which a bush buffer using indigenous species is created;
- avoiding encroachment on bushland reserves, which occurs when gardens and lawns are extended into to the Park;
- washing their cars in a car wash that recycles water;
- disposing of oils and other liquids responsibly—for example, by taking used oil in a container to a recycler, and by not pouring such substances down drains;
- picking up their pets' droppings.

By taking these simple measures members of the public will reduce the level of contaminated run-off from their homes flowing into the Park, the pollution caused, and changes to the natural cycles within the bushland or waterways.

People can also:

- compost all their garden waste, and not dump it in or near the bush to spread and fertilise the weeds;
- have their cats and dogs de-sexed, and keep their pets indoors at night, as domestic dogs and cats are active hunters of native animals especially at night;
- encourage friends and neighbours to follow their example;
- lobby State and local government authorities to install more silt and drainage traps, and encourage them to require land developers to do likewise;
- adopt 'minimal impact bushwalking' as explained in '6.1 Bushwalking code' in this *Guide*.

Members of the community can also become active by:

- joining or starting a volunteer bush regeneration program;
- helping clean the bush and waterways on 'Clean Up Australia' days;
- joining their local volunteer bushfire brigade or forming a council community fire safety group;
- joining a support group such as the Friends of Berowra Valley Regional Park.

Local residents are encouraged to look after Berowra Valley Regional Park — their park — so that future Australians may be able to enjoy the plants, the animals and the scenery, and swim in the creeks as they or their grandparents did when they were children.

Bushcare or bush regeneration

One of the best ways of helping to look after the Park is by joining or starting a bushcare group in the local area. Bushcare, or bush regeneration as it was originally known, is a program of voluntary work to repair bushland that has been damaged by disturbance such as clearing, or polluted stormwater, leading to weed invasion.

Where the original bushland is not too badly damaged, the most effective approach is bushcare, by which the bushland is carefully assisted to repair itself naturally.

The principles of assisted natural bush regeneration originated in the early to mid 1960s with the Bradley sisters, Joan and Eileen. When the sisters removed weeds on their daily walks in their favourite piece of bushland near their home in Ashton Park on Bradleys Head, they realised that the bush began to regenerate itself where they had been working.

After much trial and error over several years, they developed what has become known as the Bradley method of *Bush Regeneration*. This involves gradual removal of weeds from an area working from the best natural bush towards the centre of the weed infestations, so assisting the bushland to expand into and replace the weedy areas (Bradley 1991).

Hornsby Shire council

Bushcare Workshop Program in progress for new and experienced volunteers at Earthwise Cottage.

Hornsby Shire Council

Hornsby Bushcare members in action at the developer-constructed wetland at Clarinda Street.

Hornsby Shire Council

A group of Hornsby Bushcare volunteers doing follow-up weeding as part of a monthly schedule.

The technique was further developed by students of the Bradleys, and a TAFE course was begun for what is widely acknowledged as the most effective form of ecological restoration of natural bushland. A textbook for the course was written by Robin Buchanan (1989).

Hornsby Shire Council has been encouraging volunteer groups to help with regeneration of the Berowra Valley bushland since 1989, and many are working on a weekly or monthly basis depending on the size of the group and the complexity of the site, in and around the Park under Hornsby Council's Bushcare program. The Council provides training, tools and other equipment for volunteers, who work on their chosen site in their own time. The Council's bushcare trainers offer guidance about the best way to approach the problems of each site.

The bush regeneration program enables volunteers to work at their own pace, with tasks to suit everyone, from the young and fit to the elderly or less active. No-one need feel left out. The program has also proved to be an effective way to foster community spirit: people find themselves talking to neighbours they did not know existed.

In 2004 Hornsby Council had almost fifty registered groups of bush carers working in and around the Park, so those interested who live within the Hornsby Shire will probably find a group close by. Council runs training workshops and hosts an annual get-together for all the bushcarers in the Shire.

Members of the community are invited to participate in bushcare, in the first instance by making contact with Hornsby Council's Bushland and Biodiversity Management Team in the Council offices or by telephone on (02) 9484 9572 or 9847 6832.

Further reading

Bradley, J. 1991, *Bringing Back the Bush*,2nd edn, ed. Jones, S., Ure Smith Press, Willoughby.

Buchanan, R.A. 1989, *Bush Regeneration: Recovering Australian Landscapes*, TAFE Student Learning Publications, Sydney.

The National Trust Bush Regenerator's Handbook 1999, 2nd edn, National Trust of Australia, New South Wales.

Bushfire-friendly gardens

Sonali Seneviratne, Bushcare Volunteer

Fire-retardant plants will slow down or help suppress fires. Although nearly all plants will burn when exposed to enough heat, fire-retardant plants will not easily ignite during moderate intensity bushfires. It is this characteristic which can turn fire away from houses or reduce its intensity as it passes by.

Tree and shrub varieties can vary in flammability depending on a number of physical characteristics:

Leaf moisture content: Plants with leaves of high moisture content such as cacti, saltbushes, fruit trees and rainforest trees require more pre-heating before they will burn and therefore absorb energy from the fire, reducing its intensity. Watering plants during the fire season will increase the moisture content of the leaves.

Content of volatile oils and resins: Plants which contain oils or resins such as eucalypts, melaleucas, callistemons, pines and other conifers can burst into flames when heated and increase the fire intensity. Keep the area around these trees clear of fuel so that the foliage of these plants will not be exposed to direct flames or intense heat.

Amount of loose bark and dry twigs: Loose rough bark or bark that hangs in strips from branches allows fire to climb to tree canopies. Many eucalypts and melaleucas are in this group. Paperbarks, teatrees and cypress pines often retain many fine dry twigs which can easily ignite. Avoid these species near houses and property.

Salt content of leaves: Athel pine trees, mangroves and salt bushes are not very flammable because of the high salt content of their leaves.

Fire resistance

Fire-resistant plants have the ability to survive some exposure to fire. Many Australian plants can survive even intense fires; others regenerate readily from seed or buds on the stem or roots following fire.

Fire resistance is quite different from fire retardance. For example, most eucalypts and paperbarks are highly fire-resistant, and can survive even intense fires, but the high oil content of their leaves and loose bark may cause the fire to intensify rather than be retarded.

On the other hand, most rainforest trees are quite fire-retardant because of their high moisture content and low yield of dry fuel. However, many are very susceptible to fire, and may die following exposure to heat from even a mild fire. If you choose plants that are fire-retarding but not fire-resistant (e.g. rainforest trees), then your house may be protected and survive, but the trees may not.

Further Reference

Ramsay, Caird & Rudolph, Lisle, 2003, "Landscape and Building Design for Bushfire Areas"
NSW Rural Fire Service: www.bushfire.nsw.gov.au

TALK TO YOUR NURSERY SUPPLIER ABOUT FIRE RETARDANT PLANTS

There are quite a number of plants that are suitable for use in gardens subject to bushfire risk. Plants from rainforest environments are often suitable because of their high moisture content, thick canopy (heat shield) and low yield of dry fuel. Here are a few fire retardant native plants:

Lilly Pilly Acmena smithii is a small tree with a bushy canopy of leathery oval-shaped leaves.

Sassafras Doryphora sassafras is a medium-sized tree with a dense canopy.

Kidney Weed Dichondra repens, despite its name, is a good ground cover.

Water Gum Tristaniopsis lourina is a small tree with a spreading canopy, attractive flowers and mottled bark.

Enjoying the bush

Bushwalking code

Great North Walk

Bushwalks

Benowie Walking Track
Part of Great North Walk

1 Jungo Walk
Pennant Hills (circuit)

2. Callicoma Walk
Cherrybrook (circuit)

3. Refuge Rock Walk
Cherrybrook (return)

4. Elouera Walk
Thornleigh to Hornsby (one way)

5. Blue Gum Walk
Joes Mountain (circuit)

6. Pogson Trig Walk
Joes Mountain (circuit)

7. Heritage Bridges Walk
Steele Military Bridge, Tunks Ridge, Galston Gorge, McDonald Truss Bridge. Optional Rocky Fall Rapids extension to Crosslands (one way)

8. Lyrebird Gully Walk
Mt Kuring-gai to Berowra (one way)

9. Berowra Waters Walk
Berowra to Berowra Waters (one way)

10. Salt Marsh Walk
Crosslands to Calna Creek and Sams Creek (return)

Picnic places

Bellamy Street, Pennant Hills
Historic quarry, Thornleigh
The Jungo on Berowra Creek
Lakes Reserve, Cherrybrook
Rosemead Road, Hornsby
Top of Galston Gorge
Tunks Ridge
Crosslands Reserve
Barnetts Reserve, Berowra
Berowra Waters

Bushwalking code

Many walkers have adopted the new bushwalking ethic, *Minimal Impact Bushwalking*, to minimise the damage caused by an increasing number of people visiting national parks, regional parks, wilderness areas and other reserves. This new practice reduces the impact on tracks, vegetation, streams, lakes, animals, and on other walkers. Adopting the simple practice of minimal impact will maximise your enjoyment and the enjoyment of other walkers using the Park.

Minimising the damage to the natural environment can reduce the need for restrictions on walker numbers and track closures. Not to follow this practice is to run the real risk of 'loving our natural areas to death'.

The following minimal-impact techniques are recommended to all walkers in natural areas. Some recommendations — in particular those to do with fire — have the force of law.

On the track

Stay on the track even if it is rough and muddy. Walking on the edges and cutting corners on steep zigzag tracks increases damage, erosion and visual scarring, as well as causing confusion about which is the right track. If there is no track at all, a party of walkers should spread out and so reduce the impact on the vegetation.

Avoid sensitive vegetation such as bogs and cushion plants, which are easily destroyed by trampling. Stay on rocks and hard ground wherever possible.

Do not cut or mark new tracks, which can confuse other walkers, destroy vegetation and increase erosion. Do not interfere with steps or with water control devices.

Use appropriate footwear for the terrain: solid but lightweight walking boots are best. Wear sandshoes around campsites.

Fire safety

It is safest not to bushwalk or camp on days of high, very high or extreme fire risk. Bushfires started by walkers and campers can cause extensive damage and endanger life and property, including the culprits' own lives and property.

Because of the high fire risk, only fuel stoves are allowed in the Park. For preference use the camping area facilities at Crosslands, or use a gas fuel stove as this is safer, cleaner, quicker and easier to use in wet weather. Gas or liquid fuel stoves must not be used during total fire ban days.

Bushfire

If you see a bushfire, report it as soon as possible to the nearest fire service (the Rural Fire Service or Fire Brigade), National Parks and Wildlife Service, or the police (see Appendix 1, *Services Directory* in this *Guide* for phone numbers). But *first be sure that you have a safe escape route away from the head of the fire*. The head of the fire is the direction in which it is moving because of wind or slope conditions. *Do not try to cross in front of the head of the fire*.

If you cannot retreat from or avoid a bushfire:

- do not try to out-run it, especially uphill;
- try to move out of the path of the head of the fire and down slope to the back of the fire;
- watch very carefully for changes in wind direction or speed, which will change how the fire burns and could make the flank change into the head of the fire;
- seek protection from the flames and more importantly the dangerous radiant heat, which will dehydrate, exhaust and even kill you.
- find the largest possible clear area — rocks or bare dirt;
- cover yourself, and get low to the ground in a depression or behind rocks until the fire passes.
- you can get into deep pools in clear areas of creeks, but do not get into rainwater tanks (you might boil!) or small pools with nearby vegetation (not enough protection).
- on burnt ground, watch out for burning logs or stumps and falling branches or unsafe trees.

Pack to minimise rubbish

Leave unnecessary wrapping and bottles at home. This also helps to keep the weight of your pack down.

Leave nothing but footprints

If you have carried something in, carry it out again. Make sure you take out everything, including such easy-to-miss items as silver paper, cling wrap, plastic cutlery and orange peel.

Do not burn or bury rubbish. Not only is buried rubbish likely to be dug up and scattered by possums or foxes, it may injure people or animals. As well, digging disturbs the soil and encourages weeds and/or erosion.

If you come upon other people's rubbish, do the bush a favour and take it back with you.

Do not feed animals as it encourages dependence, and can cause high population concentrations, nutritional disorders and aggressive behaviour from some of the larger animals.

Keep soap suds in your bath

Do not wash in streams and lakes. Detergents, toothpaste and soap (even biodegradable types) are harmful to fish and water life.

Do wash at least 50 m from streams and lakes, and scatter the wash water so that it filters through the soil before returning to the stream. Use a scourer or gritty sand rather than soap to clean dishes. Do not throw food scraps into water.

Avoid the gastro attack

Increasing cases of gastroenteritis (diarrhoea and vomiting) and giardia (a human bacterial parasite which causes chronic diarrhoea) in a lot of high-use areas are thought to be due to human faecal waste. So to avoid 'gastro', and to stop the spread of giardia, follow these guidelines.

Use established toilets whenever possible. If this is not possible, bury your faecal waste at least 100 m away from campsites and watercourses, in a hole at least 150 mm (six inches) deep using a hand trowel or a stick. Make sure all of the waste and paper is covered and mixed with soil to aid decomposition and discourage animals. Carry out nappies, sanitary pads, tampons and condoms in a plastic bag.

Flies and small animals are attracted to both faecal matter and food, so cover all food, and avoid putting it directly on surfaces accessible to flies and animals.

Lyndel Wilson

Keeping to formed tracks helps preserve plant and fauna habitats and reduce the spread of weeds.

Jeremy Steele

Pretty to look at, but unfortunately, unsafe to drink. Streams carry water from local streets and gardens.

George Foster

Observe all the commonsense rules regarding fires - and always report even small fires.

Hornsby Shire Council

Remove any litter by carrying rubbish out with you. Litter racks in streams like this would not be needed if we all took care with the rubbish we make.

Bob Salt

Finding even a small amount of litter spoiling a picnic fireplace is disappointing. Taking everything, other than your footprints, out with you, ensures that a day in the Park is a pleasure for everyone.

As the Berowra Catchment is surrounded by urban development, all of the streams should be assumed to be polluted, particularly after rain. Berowra Creek is considered to be unsuitable for primary human contact (i.e. washing, bathing) for at least four days after rain.

All drinking water should be carried in, or collected from taps where available in council parks and at trackheads. It is recommended that at least two to three litres of water per person per day be carried on longer walks. If water is taken from a spring or small stream, it should either be boiled for at least five and preferably ten minutes before use, or one of several proprietary water purifiers available from camping stores should be used.

The best plans

Planning a trip is important. Plan the route and become familiar with the expected landmarks and terrain. Ensure that the grade of walk is suitable for the fitness and experience of all walkers.

Let someone know that you are going bushwalking. Tell them who is going, your route, how long you expect to be away and what equipment you are taking. Let them know when you get back.

Keep the party small (4-8 people is best). Large parties have more impact on the environment, affect the bush experience, and are difficult to control. Keep in touch with other members of the party and avoid splitting up. Have a reliable experienced person as the tailender.

Take a detailed map (at least a 1:25 000 topographic map) and/or a Park information brochure and compass, and check the important junctions and creeks to be sure which way you should be going.

Camp only at authorised campsites. Do not create a new site unless this is unavoidable.

Minimise impact by taking the following items with you, if you are going on more than a day-long walk:

- a gas fuel stove and fuel for cooking;
- good quality tent with sewn-in floor and insect netting;
- hand trowel to bury waste.

It is obviously necessary to carry camping and cooking equipment only if a walk of more than one day's duration, such as the great North Walk, is being attempted.

Always remember that Australia is a hot dry country. Ensure that every member of the party has adequate water or drink for the proposed walk. In the Sydney region in summer *2-3 litres per person per day* is a m inimum.

A first-aid kit and some emergency rations, such as fruit or chocolate, should be carried on all walks.

A mobile phone is a good additional safeguard although it may be out of range in many parts of the valley.

Minimal Impact Bushwalking Code

The Minimal Impact Bushwalking Code was originally developed for the alpine areas of Tasmania's World Heritage Area. This code is now supported by the State National Parks Services of the ACT, NSW, Victoria and Tasmania. This section is based on the brochure 'Bushwalking Code — Minimal Impact Bushwalking', produced by the four state services listed above.

Further reading

Dunlevy, M. 1978, *Stay Alive: A Handbook on Survival*, 2nd edn, Aust. Govt. Publishing Service, Canberra.

National Parks and Wildlife Service 1994, 'Living with fire', brochure, NPWS, Sydney.

Pallin, P. 1995, *Bushwalking and Camping: Paddy Pallin's Handbook on Bushwalking and Camping,* 14th edn, Paddy Pallin, Sydney.

Rural Fire Service 1998, 'Wildfire safety and survival: A guide for firefighter survival', booklet, CFA Corporate Communications (available through Rural Fire Service of NSW).

Great North Walk

Vicky McBride
Department of Land and Water Conservation (Now Department of Lands)

The Great North Walk was developed from Gary McDougall's and Leigh Shearer Heriot's proposal for a 'Sydney to Hunter Track', consisting of about 300km of walking tracks, submitted to the Australian Bicentennial Authority in 1988. Funding was received for development of the track and the Department of Lands accepted responsibility for the project.

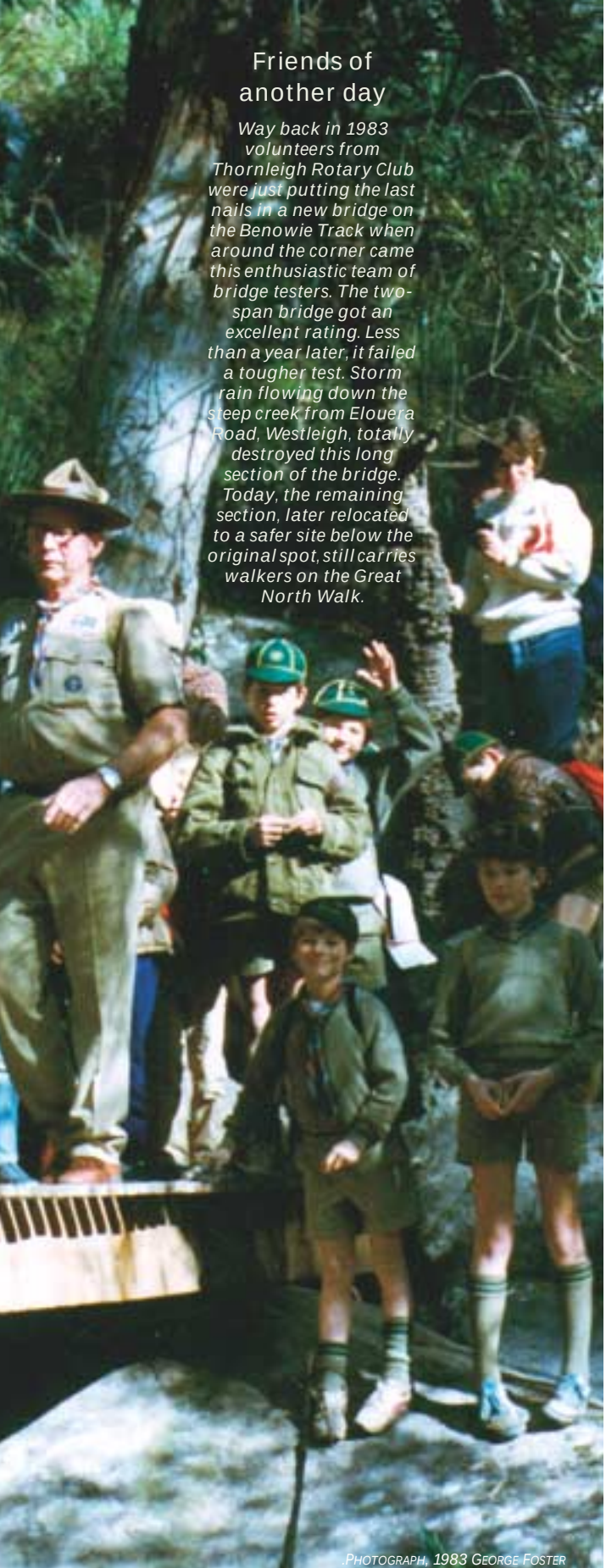
In the Hornsby area the track incorporated the existing Benowie Track which had been mostly constructed with voluntary labour from organisations as diverse as the Scouts, Rotary, Hornsby Conservation Society and the Department of Corrective Services.

A small annual operating grant is made available from the Public Reserves Management Fund for maintenance of the Great North Walk. The Department of Lands maintains overall responsibility for the Walk while other stakeholders including State and local government organisations continue to have a role in managing and maintaining parts of the walk through cooperative arrangements.

Full details of the Great North Walk are given in the Department of Land's *'The Great North Walk -Discovery Kit'* brochures and McDougall's and Shearer Heriot's book *The Great North Walk.*

Department of Lands Walk Ratings

Bellamy Street Trackhead to Jungo Rest Area
1.6km - moderate - 40mins
The Jungo Rest Area to:
Fishponds
5.3km-moderate - 2.5 hours
Cherrybrook Trackhead
1.5km - easy - 30min
Cumberland State Forest
4.6km - moderate/easy - 2 hours
Fishponds to Galston Gorge
5.8km - moderate/hard - 0.5 day
Galston Gorge to Crosslands
7km - moderate/hard - 0.5day
Crosslands to BerowraWaters
7km - moderate/hard - 0.5day
Crosslands to Berowra Station
6.5km - moderate - 0.5day
Berowra Station to Mt Kuring-gai Station 9km - hard - 1day



Friends of another day

Way back in 1983 volunteers from Thornleigh Rotary Club were just putting the last nails in a new bridge on the Benowie Track when around the corner came this enthusiastic team of bridge testers. The two-span bridge got an excellent rating. Less than a year later, it failed a tougher test. Storm rain flowing down the steep creek from Elouera Road, Westleigh, totally destroyed this long section of the bridge. Today, the remaining section, later relocated to a safer site below the original spot, still carries walkers on the Great North Walk.

PHOTOGRAPH, 1983 GEORGE FOSTER

Bushwalks

in Berowra Valley Regional Park

Compiled by Jeremy Steele, assisted by many.

The following walks are a few of the many that are possible in the Park. They sometimes overlap. They have been chosen to give a practical introduction to the Park in general. It is possible to do the walks in either direction.

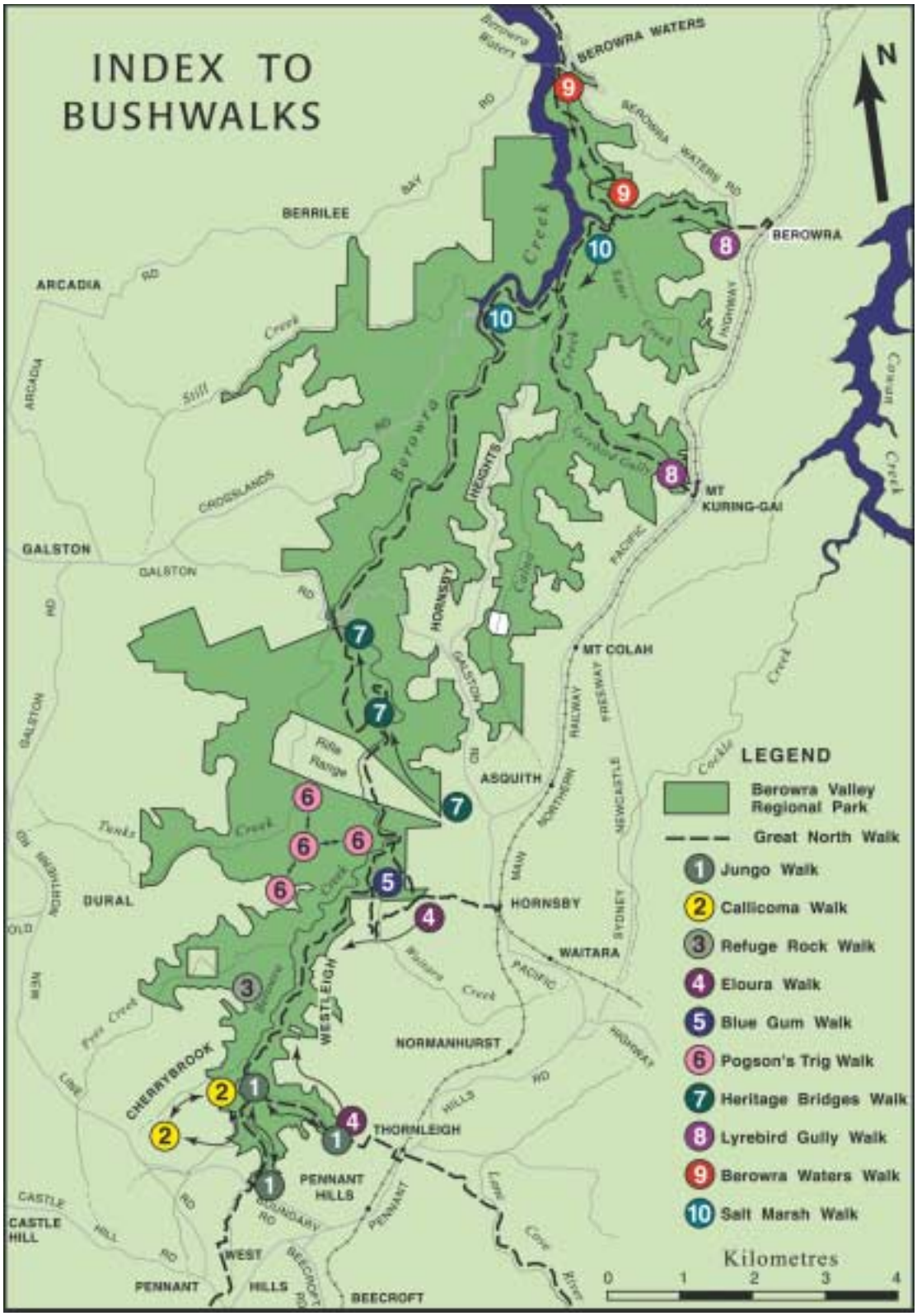
The weather can be warm, or wet, as well as beautiful. Buskwalkers should wear appropriate footwear — such as sturdy enclosed shoes, or boots — and a hat. Useful, too, can be a bottle of water, a compass, a mobile phone, insect repellent, and even salt - effective against leeches, which are common when it is damp. After heavy rain, creeks may be fast moving and swollen, and walkers should not attempt to cross them.

The walks can be a little rough in places and because the bush is a living environment, may differ from the text as written. The walks described in this chapter are for the most part, but not always, tracks maintained by Hornsby Shire Council or the Department of Lands and Water Conservation.

Bushwalks

Benowie Walking Track
Part of Great North Walk

1. Jungo Walk
   Pennant Hills (circuit)
2. Callicoma Walk
   Cherrybrook (circuit)
3. Refuge Rock Walk
   Cherrybrook (return)
4. Elouera Walk
   Thornleigh to Hornsby (one way)
5. Blue Gum Walk
   Joes Mountain (circuit)
6. Pogsons Trig Walk
   Joes Mountain (circuit)
7. Heritage Bridges Walk
   Steele Military Bridge, Tunks Ridge, Galston Gorge. McDonald Truss Bridge, Optional Rocky Fall Rapids extension to Crosslands (one way
8. Lyrebird Gully Walk
   Mt Kuring-gai to Berowra (one way)
9. Berowra Waters Walk
   Berowra to Berowra Waters (one way)
10. Salt Marsh Walk
    Crosslands to Calna and Sams Creeks (return)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The Benowie Track

Section of the Great North Walk

Bob Salt

The 25km Benowie Walking track was included as part of the McDougall and Shearer-Heriot proposal for the Great North Walk because it was an existing track traversing the Berowra Valley from Bellamy Street Pennant Hills to Crowley Road at Berowra, acting as a north-south link for the Great North Walk.

The original Benowie track was constructed in 1980-81 with voluntary labour as a joint project between the Elouera Natural Park Trust, Hornsby Shire Council and the Department of Lands as the initial part of a Lands Department program to open up linking tracks across New South Wales. To improve access to the track from surrounding suburbs, the Elouera Trust and Council, with the assistance of Thornleigh and Pennant Hills Rotary Clubs and other volunteers, constructed or improved additional linking tracks. Its construction gave support to the Elouera Trust's view that all the public lands along Berowra Valley should be incorporated into one national park.

You can get to the track from railway stations at Pennant Hills, Thornleigh, Hornsby, Mt Kuring-gai and Berowra by following the GNW signs and guide posts. It provides three one-day walks from Pennant Hills or Thornleigh to Hornsby, Hornsby to Mt Kuring-gai or Berowra and Berowra to Mt Kuring-gai. Many shorter walks which give access to vantage points (some described in this chapter) can also be undertaken using the link tracks. The complete track is a two to three day leisurely walk, so camping and picnicking areas like Crosslands have been designated as official camping areas and are listed in this Chapter.

Steep sections of the Track may be taxing for some walkers. To plan trips to suit particular walking parties refer to the information given on walking times, distances and gradings given in this chapter.

Natural features of the park include evidence of the original inhabitants, the Kuring-gai Aboriginal people to the east of Berowra Creek and the Dharug to the west. These relics include rock engravings and middens. The track passes close to or through some middens, particularly near the tidal limits of Berowra Creek. Walkers should not interfere with these relics.

Most of the track passes through relatively undisturbed bushland which is home to native animals including Swamp Wallabies, Echidnas and Lyrebirds, so visitors are urged to follow the 'minimal impact bushwalking guidelines' to avoid disturbing wildlife and damaging or destroying natural features.

The track was originally called the Benowie track because it was thought from an early newspaper article that the local clan in the area had been called Benowie. Subsequent research has cast doubt on the existence of this name for a sub-group of the Dharug or Kuring-gai tribes.

The walker's itinerary can be extended by either beginning further south on the Great North Walk on the Lane Cove section at Fullers Bridge near Chatswood or continuing north from Berowra on the Hawkesbury Track to Cowan or Hawkesbury River railway stations.

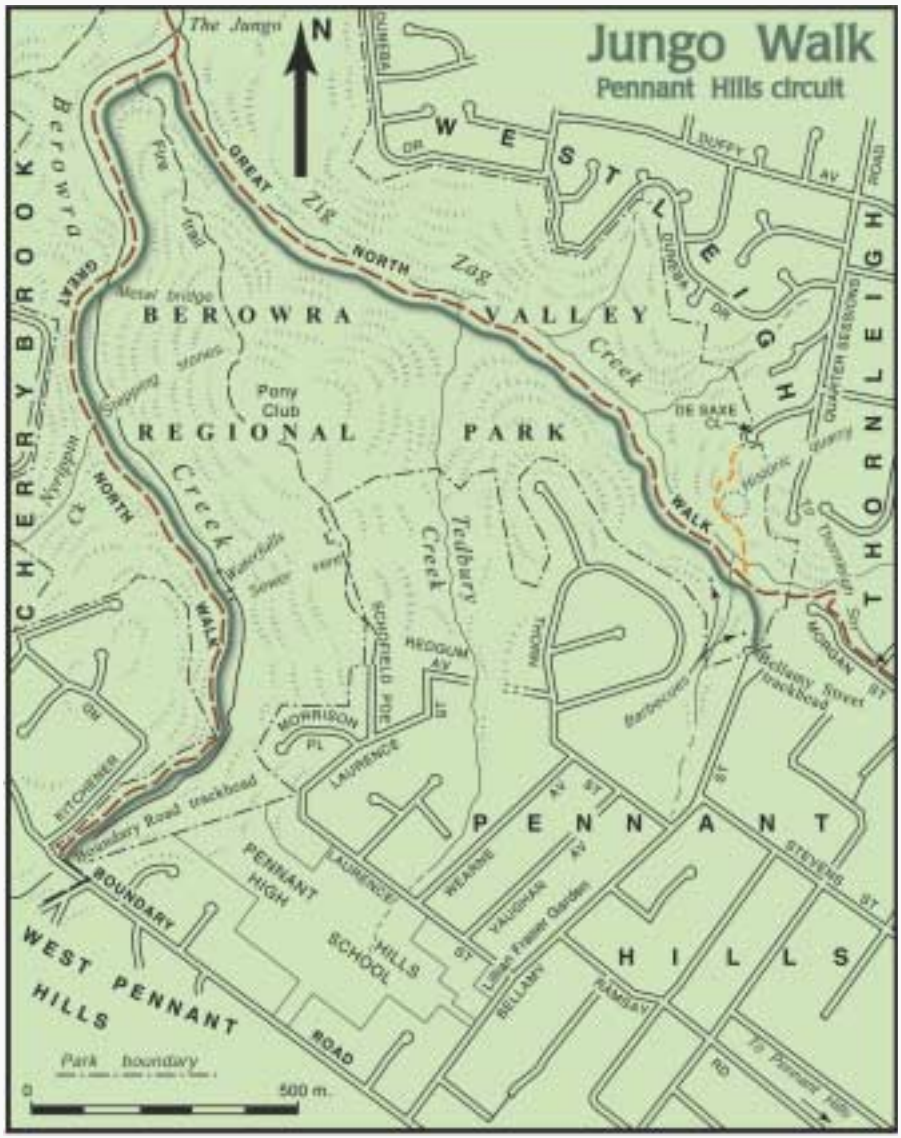
Brochures on the Great North Walk including the Benowie track are available from Hornsby Shire Council, Pacific Highway, Hornsby or Mr P Corrigan, Department of Lands GNW Coordinator, Dept of Lands 437 Hunter Street Newcastle (P.O. Box 2185 Dangar NSW 2309) Ph. 49605155 - Mob. 0428 601 203 or the Department of Lands, Bridge Street, Sydney

Reference

Department of Lands
The Great North Walk Discovery Kit, Sydney

Further Reading

McDougall, G. & Shearer-Heriot, L. 1988, The Great North Walk, Kangaroo Press, Kenthurst, NSW.



1: Jungo Walk

Pennant Hills circuit

Route:	Bellamy Street, Pennant Hills, to the Jungo, to Boundary Road, returning to Bellamy Street by public streets
Distance:	5 km
Grade:	Easy
Time:	About 2 hours
Transport:	Single car, or one car at Bellamy Street and another at Boundary Road; or by train or bus
Track status	Official track, except for optional Morrison Place exit section

Synopsis

The walk, which is part of the Great North Walk, passes through a clearing known as the 'Jungo', and it overlaps sections of Walk 4: Elouera, and Walk 2: Callicoma. The walk is a circuit, the final 1.5 km section being on public streets and through school grounds.

JUNGO WALK GUIDE

Bellamy Street to the Jungo

The beginning of this walk is at the northern end of Bellamy Street, about 1.6 km from both Pennant Hills and Thornleigh stations. There is a water bubbler at the Bellamy Street parking area, and along the walk there are suitable spots for picnics. The distance to the clearing known locally as the Jungo is 1.6 km.

Bellamy Street is named after landowner and special constable James Bellamy (1798-1875).

Close to the end of Bellamy Street is the site of the old zigzag railway settlement of the 1880s known as the Halls Creek camp, and before that known as Slaughterhouse Paddock, both long vanished

Detour to the Historic Quarry

The concrete cycleway to the right replaced the old quarry road constructed about 1912. It re-crosses Zig Zag Creek then ascends to the top of the hill 160 m away. This is the site of the Historic Quarry and the end of the one-time ziigzag railway branch line. (For details see Walk 4: Elouera, as well as the section 'Historic Quarry and Zigzag railway' in this guide.)

George Foster

Zig Zag Creek is a low-volume watercourse typical of sandstone areas in Sydney, but it comes rapidly to life during wet or stormy weather. The waterfall near the Historic Quarry is one of many such impressive water features in the Park This photograph may also be familiar as the cover of the Guide to Elouera Bushland Natural Park.

and now built over by housing. The first of several access points to traces of the old zigzag railway[1] is on the right at the end of the fence of the first house below the Bellamy Street parking area. Zig Zag Creek, as Halls Creek is now known, and the line of the old zigzag railway, may be reached after about 100 m along this side track.

Return to the main concrete pathway and after about 150 m cross a tributary to Zig Zag Creek.

On the higher and drier ground to the left is flora typical of Sydney sandstone. The taller trees are Sydney Peppermint *Eucalyptus piperita* with rough bark on the trunk and smooth upper branches with hanging strips of bark, and the Sydney Red Gum *Angophora costata*, with its pink-tan smooth bark and twisted branches. Under the canopy grow some large Heath-leaved Banksia *Banksia ericifolia*, which from January to May bear spikes about 20cm long of red and yellow flowers.

About 150 m from the ford, at a 15 m high green metal sewer vent, the concrete cycleway branches off to the right and leads to the Historic quarry. For the present walk, carry straight on along the Great North Walk.

Zig Zag Creek to the Jungo

WALK 1: JUNGO AND WALK 4: ELOUERA OVERLAP STARTS HERE

The track leaves the fire trail and becomes a narrow path following Zig Zag Creek. Soon you pass through an extensive patch of *Lomandra longifolia,* herbaceous plants with long straplike leaves.

There are views of a steep sheltered cliff on the right. The sunlight slants down through the canopy of Sydney Peppermints *Eucalyptus piperita* and Sydney Red Gums *Angophora costata* to highlight leaves, plants and rocks in the dimness of the gully. Old Man Banksia *Banksia serrata*, as well as Hairpin Banksia *Banksia spinulosa* and Heath-leaved Banksia *Banksia ericifolia,* all grow along here and can be seen flowering from summer to winter. There are also ferns and grass trees.

After about 300 m and just before a walk-marker-post, a side path to the right descends to the sound of running water, opening onto a 10 m-diameter rocky clearing through which the creek passes, trickling down a broad waterfall cascade into a pool of similar size. This is the waterfall below the quarry and hopper site mentioned in the section on the 'Historic quarry and zigzag railway'.

River Rose *Bauera rubioides*, Graceful Bush-Pea *Pultenaea flexilis* and Handsome Flat Pea *Platylobium formosum*, flower profusely in spring, as do black-centred deep pink Black-eyed Susan *Tetratheca thymifolia*, whose flowers face the ground.

Continue along the main track. Many of the trees have burnt-out trunks where bushfire has reached the central heartwood. When the outer part, the sapwood, survives, so does the tree.

About halfway to the Jungo, just after a pair of 1 m-diameter Sydney Red Gums, you cross a timber bridge over north-flowing

1. For details see Historic quarry and zigzag railway.

Tedbury Creek, which rises in the vicinity of Observatory Park on Penannt Hills Road, Pennant Hills. This bridge and others like it make access easier and prevent disturbance to the plants growing on the banks. Note the soft-leaved fern Common Maidenhair *Adiantum aethiopicum*. Fallen trees and a few large tree stumps along the track remind walkers of the timber-getting era in this area. Eventually the logs decay and add nutrients to the soil, and new trees grow to replace them.

The track rises slightly and you pass through open-forest of Sydney Red Gums and Sydney Peppermints. The valley closes in with the sandstone piling up on both sides, steeper on the right (or north-east); this is one of the prettiest sections of the walk.

Those with sharp eyes may spot a concentric rings pattern on a boulder beside a pair of fallen logs (the left hand boulder of a pair almost opposite one another flanking the track). These boulders are just past another pair of boulders and a large fallen mossy log, cut to clear the track. Some 250 m further on, and 10 m off to the left, a boulder has a hole through it.

WALK 1: JUNGO AND
WALK 4: ELOUERA OVERLAP ENDS

The Jungo

Today the Jungo is an open flat sandstone space loosely covered with sand, grass and a few shrubs, about 20 m across, where the track meets the fire trail to Schofield Parade, Pennant Hills, coinciding briefly with the Great North Walk.

Near the Jungo Rest Area there used to be a popular swimming hole at the junction of Zig Zag Creek and Berowra Creek, both of which flow to the north in the direction of Westleigh, Hornsby and Berowra Waters. Here the water used to be clear and deep but by 2000 it was silted-up and overgrown. The site of the waterhole can be found by following the exposed sandstone in the Jungo picnic area down through the bushes to the creek.

Old Swimming holes

There used to be a number of swimming holes in the Park. Two of these are further downstream and were known as Big Sandy and Little Sandy. These are also now silted up from the combined effects of quarrying and sub-division in the catchment in earlier times.

Trees of interest here include an almost pure stand of Narrow-leaved Apple *Angophora bakeri*. These have contorted limbs and narrow leaves, and generally grow on poor sandy soils or laterite.

At the Jungo, temporarily join Walk 2: *Callicoma*. This is a circular track opened in 1995 from the Lakes of Cherrybrook. A signboard shows that the Lakes are 1.7 km away in the direction of Fishponds and 3.4 km in the direction of the Cumberland State Forest.

Possible derivation of the name 'Jungo'

Early residents affirm that the name *Jungo*, pronounced 'jung-oh', is an Australian slang contraction of 'junction', the junction of the two creeks there. In the first half of the twentieth century it was common Australianism to abbreviate words and to add '-o'. Another explanation is that it is a contraction of 'junction (swimming) hole': jung-ho.

Jungo is also a Sydney Aboriginal word

Another possible explanation is that *jung-o, jungo* and *jungho (dyangu)* are Sydney Aboriginal words for the dog *Canis familiaris dingo* recorded by David Collins, Daniel Paine, and William Ridley (using John Rowley as his source), respectively. Collins also recorded *jungo* as a common name denoting all animals.
David Collins *An Account of the English Colony in New South Wales* (1789)
Daniel Paine *The Journal of Daniel Paine 1794-1797* (with documents 1795-1805)
William Ridley *Kámilaroi, and other Australian languages* (1875)

Information on the English-language explanation of the name was provided by long-time Pennant Hills resident Bob Schofield, who used to swim in the waterhole in the 1940s, and who was Hornsby Council fire control officer for 23 years, from 1970 to 1993.

Gregor Newton

Umbrella Fern Sticherus flabellatus

Lyndel Wilson

A Coachwood Ceratopetalum apetalum seedling rises beside the fallen trunk of an adult tree.

Jeremy steele

Attractive waterfall and former swimming hole on Berowra Creek near Morrison Place in average weather conditions.

Jamie Wright

Graceful Bush-pea Pultenaea flexilis

The Jungo to the metal bridge

WALK 1: JUNGO AND WALK 2: CALLICOMA OVERLAP STARTS

Take the fire trail to the left and follow the track up the slope westwards, rather than the GNW track, which leads downhill over the ford across Berowra Creek. Continue up the hill, leaving the fire trail when it sweeps away to the left.

The walking track goes straight on, dropping down to Berowra Creek beside a rock overhang. In the dimness of a narrow gully, almost rainforest, are Coachwood *Ceratopetalum apetalum*, Black Wattle *Callicoma serratifolia*, and Water Gum *Tristaniopsis laurina*, which block out much of the sky. The Umbrella Fern *Sticherus flabellatus* lines the track and mossy boulders lie in the creek. The track follows the creek, twisting and turning among the rocks.

Follow along beside Berowra Creek, diminishing now in its upper reaches. The track rises steadily then descends by a flight of 25 log steps back to the creek bank. A few hundred metres of shady walking in near-rainforest conditions, mostly beside the stream, leads to marker 5 of the Callicoma Walk, then to a fallen tree forming a log bridge and about 10 m later a narrow single-person metal bridge, which you cross.

Metal bridge
Callicoma Walk Marker 5

The most common tree here is Coachwood with its distinctive grey blotches or lichen spots on the trunks. Coachwood's close relative, Christmas Bush *Ceratopetalum gummiferum*, is also present. Turpentine *Syncarpia glomulifera* can be seen from the bridge.

Long-term effects of weathering on the Hawkesbury sandstone of the Park have resulted in waterfalls and gullies. In the water under the bridge you can see evidence of this process in the grains of sand that are gradually transported away to cause siltation, as at the Jungo downstream.

About 150 m further along the track, on the right, is a natural rock shelter large enough for a dozen adults standing.

Continue until, just after another natural log crossing, Berowra Creek joins Nyrippin Creek, which the path then follows. Almost immediately afterwards, cross Nyrippin Creek by means of log steps and five vertical concrete cylindrical stepping stones.

Twining Guinea Flower *Hibbertia dentata*, a climber with large yellow flowers, grows near the creek.

WALK 1: JUNGO AND WALK 2: CALLICOMA OVERLAP ENDS

Stepping stones to the waterfalls

The path forks on the other side of the crossing, with the Callicoma Walk turning off to the right or south following Nyrippin Creek towards Cherrybrook. Ignore the Callicoma Walk turn off and take the Great North Walk, continuing straight on (south-east), along Berowra Creek.

For several hundred metres the track follows close to the creek, heading upstream. At a 2 m-long sandstone 'paving rock' close to a Sydney Red Gum *Angophora costata*, if you are curious about the sound of water, take the side path to the left. This leads to a waterfall about 8 m in height, with a pool below it.

The track then rises from creek level to the drier gully sides where Graceful Bush-pea *Pultenaea flexilis*, golden in spring, is found.

At the top of the rise, at a flat exposed area with a sandstone outcropping ridge on the right, side paths on the left lead to the site of a heavily silted pool below a second waterfall, once a considerable swimming hole. During heavy rain, this waterfall (6 m wide, 8 m high, with an overhanging rock-ledge) is spectacular. On the far side, a 600 mm hole in the sandstone overhang allows the water to run through. By using a lower side path it is possible with little difficulty to get behind the waterfall curtain. The River Rose *Bauera rubioides* and ferns grow round about.

Just after the waterfall there is a second 15 m-high green metal sewer vent. Continue along the main track for two ways to complete this walk.

George Foster

Waterfall on Berowra Creek near Morrison Place in full storm flow.

Morrison Place exit

By keeping to the left when the path forks, it is possible to reach either Morrison Place or the Boundary Road exit, but as the track may be indistinct these options are best left to those with local knowledge.

Great North Walk exit

This is the preferred, more picturesque and easier route. Avoid the Morrison Place path to the left and continue along the walking track following the Great North Walk signs.

The next feature of note stands several hundred metres after the Morrison Place turn-off: a large Sydney Red Gum beside the path with broadly spreading roots, one of the largest such specimens in the Park.

When the path approaches the creek again, take a turn-off to the left to see another flat sandstone portion of the creek bed. This is about 10 m wide, ending in a waterfall lip, with a modest 1 m fall, scenic after rain.

Piled boulders on the right in the form of massive walls and roof could provide a natural refuge in heavy rain.

After a well-shaded section of bush with many Turpentines (trees with very rough bark with greyish leaves, flowers like a eucalypt and fruits like 'flying saucers), the roar of traffic heralds the walk's end in Boundary Road, just below Kitchener Road.

Black Wattle *Callicoma serratifolia*, is one of the common plants encountered along the track. 'Callicoma' means 'a head of hair', poetically characteristic of wattles in flower. 'Serratifolia' means 'saw-toothed leaf' — an apt description.

A sign in the reserve near the footbridge shows bushwalk distances: Berowra Waters, 27 km; Sydney Cove, 35 km; Newcastle, 218 km.

Returning to a car in Bellamy Street

SIMPLE ROUTE

1. Turn left on Boundary Road.
2. Turn left at the traffic lights into Bellamy Street.
3. Proceed to the far end.

MORE SCENIC ROUTE

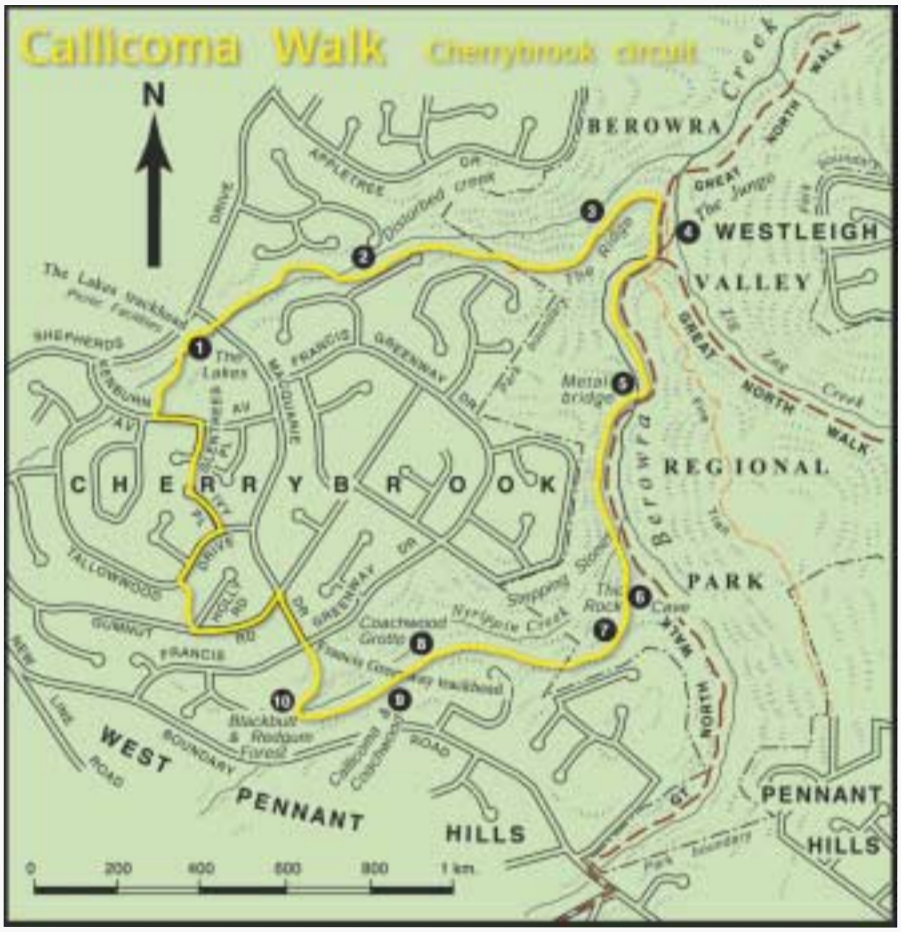
1. Turn left on Boundary Road.
2. Turn left opposite Lutanda Close onto the 1 m concrete footpath leading to Pennant Hills High School.
3. Follow the path past the sports courts and continue straight ahead across an oval.
4. Turn left at the footpath parallel to the power lines beyond.
5. Cut across the oval towards the power pylon.
6. Leave the school grounds at the Tedbury Creek exit.
7. Cross Lawrence Street into Wearne Avenue.
8. At the end of Wearne Avenue, turn right into Thorn Street.
9. Turn left at Bellamy Street.
10. Proceed to the end. Do not continue round into Stevens Street, but go straight on into the 'no through road' section of Bellamy Street to the end.

2. Callicoma Walk

Cherrybrook circuit

This is a circular walk from the Lakes Reserve in Cherrybrook, occasionally touching the street system.

Distance:	5 km
Grade:	Easy
Time:	3 hours
Transport:	Single car or bus
Track status:	Clearly defined. Official track, fire trail, public roads



Synopsis

The Callicoma Walk, opened by the then mayor of Hornsby Shire, Councillor Mick Gallagher, on 9 April 1995, is one of the best-marked walks in the Park. Most of it is in the bush, with a final stretch through the streets of Cherrybrook. It is well signposted, and includes ten points of interest marked along the way by short green posts. These have been used as the subheadings of this description.

CALLICOMA WALK GUIDE

The Lakes to the Jungo

Marker 1. The Lakes

The walk starts at the Lakes Reserve at the corner of Shepherds and Macquarie Drives in the Greenway Estate, Cherrybrook.

The chain of ponds was created by damming the creek for the benefit of farmers. Today it is an attractive picnic and recreation area. As well as being a home to feral and native ducks, the water attracts such birds as Little Pied Cormorants, Swamphens and Kingfishers. Small birds (e.g. Eastern Yellow Robins, Superb Fairy-wrens) are common. It is also the home to a variety of exotic fishes.

The largest trees near the pond are Sydney Blue Gums *Eucalyptus saligna* thriving on deep soil derived from Wianamatta Shale.

Occasional Red Mahoganies *Eucalyptus resinifera* and Turpentines *Syncarpia glomulifera* occur. There are also *Casuarina*, as well as such undesirable exotics as willows and the papyrus water plant, both of which present serious management problems.

Take the pedestrian underpass under Macquarie Drive and enter the narrow strip of bush between the Cherrybrook Girl Guides hall and the creek, leading to the expanses of the Berowra Valley Regional Park. Follow the track signposts. After about 100 m join a fire trail on the edge of housing.

The tree species alter as the soil type changes. Sydney Blue Gum is replaced by Blackbutt *Eucalyptus pilularis*, many magnificent specimens being intermingled with Sydney Red Gum *Angophora costata*, Red Bloodwood *Corymbia gummifera* (formerly known as *Eucalyptus gummifera*) and Red Mahogany *Eucalyptus resinifera*.

In the understorey of the forest are a purple pea flower False Sarsaparilla *Hardenbergia violacea*, a large red pea flower Red Kennedy Pea *Kennedia rubicunda* and Spiny-headed Mat-rush *Lomandra longifolia* clumps with long, strap-shaped leaves that can cut hands badly.

Vegetation near the creek is forest, opening to woodland on the valley sides. The trees are tall and straight with almost completely interlacing canopies. On the slopes the trees are shorter, with contorted branches and the canopy less complete.

Turn right off the fire trail after about 200 m more and cross the creek on ten concrete stepping cylinders. This creek was still, at time of publication, not officially named.

Marker 2. Disturbed creek

A sewer vent and a raised inspection chamber mark a former water authority construction site for the sewer line, since converted to a flat grassed area. The dead trunk of a lightning-struck Blackbutt shows the danger of sheltering under tall trees during electrical storms.

Leave the grassed area at the far end and walk down hill. The concreted track on the left crosses the exposed sandstone creek bed and up the hill opposite through the housing up to Refuge Rock (See Walk 3: *Refuge Rock*). The walk leaves the fire trail, forking to the right, passing a single Broad-leaved Scribbly Gum *Eucalyptus haemastoma* then some dry, cave-like sandstone overhangs. Ferns are abundant in shady places down by the creek.

The track climbs out of the valley to a partly-sealed fire trail and characteristic cliff faces just below the 132 kV Dural to Carlingford transmission line. Skeleton Fork Ferns *Psilotum nudum*, one of the most primitive of land plants, have been seen to grow in one of the cracks of a rock in the cliff face to the right of the fire trail.

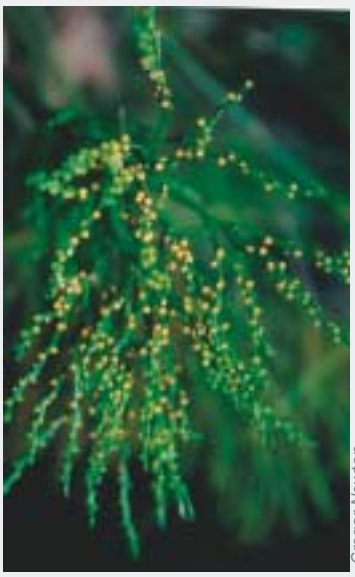
Continuing down the other side of the ridge, fork left after about 50 m and so downhill towards the Jungo. The fire trail on the right leads to a transmission line tower. By this stage the housing has at last receded from view.

Paul Fredrickson

Lakes of Cherrybrook were landscaped in the 1980s by Jim Mitchell, then a Trustee of the Elouera Natural Bushland Park, as part of an adjoining commercial medium density residential development.

Paul Fredrickson

Tall Blue Gums Eucalyptus saligna with the typical dark "stocking" and pale smooth trunks line the picnic area at the lakes.



Gregor Newton

The primitive Skeleton Fork Fern Psilotum nudum has been reported on this walk.

Gregor Newton

The Lesser Flannel Flower Actinotus minor carpets many areas of the Park like a profuse ground cover, but the flower is so small that many passers-by would not realise those tiny white "daisies" are actually a flannel flower.

Gregor Newton

The delicately detailed Slender Rice Flower Pimelea linifolia

Jeremy Steele

Sydney Red Gum Angophora costata shedding bark in company with Christmas Bush Ceratopetalum gummiferum

Marker 3. Sandstone ridge

Dominant trees along this dry sandstone ridge section are Narrow-leaved Apple *Angophora bakeri*, small trees with fine drooping leaves and somewhat contorted branches. There are occasional Broad-leaved Scribbly Gums *Eucalyptus haemastoma*, and a plant understorey of *Banksia*, pine-leaved Geebungs *Persoonia pinifolia*, Slender Rice Flowers *Pimelea linifolia*, egg and bacon pea flowers of *Dillwynia retorta*. The Lesser Flannel Flowers *Actinotus minor* grow profusely in the understorey, but the flowers are so small that they may not immediately be recognised as perfectly formed flannel flowers. A few minutes after the No 3 marker and perhaps half an hour after starting, the main Benowie Track, part of the Great North Walk joins the route from the left. There are many side tracks. Proceed straight on, down the concrete fire trail to the creek. Grass trees *Xanthorrhoea* species are common, under the Sydney Red Gums *Angophora costata*.

Immediately after crossing Berowra Creek you reach the Jungo picnic area.

The Jungo to the stepping stones

Marker 4. The Jungo

WALK 1: JUNGO AND WALK 2: CALLICOMA OVERLAP STARTS

Take the fire trail to the right and follow the Boundary Road branch of the Great North Walk up the slope westwards. Continue up the hill, leaving the fire trail when it sweeps away to the left.

The walking track goes straight on, dropping down to Berowra Creek beside a rock overhang. In the dimness of a narrow gully, almost rainforest, are Coachwood *Ceratopetalum apetalum*, Black Wattle *Callicoma serratifolia*, and Water Gum *Tristaniopsis laurina*, which block out much of the sky. The Umbrella Fern *Sticherus flabellatus* lines the track and mossy boulders lie in the creek. The track follows the creek, twisting and turning among the rocks.

Follow along beside Berowra Creek, diminishing now in its upper reaches. The track rises steadily then descends by a flight of 25 log steps back to the creek bank. A few hundred metres of shady walking in near-rainforest conditions mostly beside the stream leads to marker 5 of the Callicoma Walk, then to a fallen tree forming a log bridge and about 10 m later a narrow single-person metal bridge, which you cross.

Metal bridge

Callicoma Walk Marker 5

The most common tree here is Coachwood with its distinctive grey blotches or lichen spots on the trunks. Coachwood's close relative, Christmas Bush *Ceratopetalum gummiferum*, is also present. Turpentine *Syncarpia glomulifera* can be seen from the bridge.

Long-term effects of weathering on the Hawkesbury sandstone of the Park have resulted in waterfalls and gullies. In the water under the bridge you can see evidence of this process in the grains of sand that are gradually transported away to cause siltation, as at the Jungo downstream.

About 150 m further along the track, on the right, is a natural rock shelter large enough for a dozen adults standing.

Continue along until, just after another natural log crossing, Berowra Creek joins Nyrippin Creek, which the path then follows. Almost immediately afterwards, cross Nyrippin Creek by means of log steps and five vertical concrete cylindrical stepping stones.

Twining Guinea Flower *Hibbertia dentata*, a climber with large yellow flowers, grows near the creek.

WALK 1: JUNGO AND WALK 2: CALLICOMA OVERLAP ENDS

Stepping stones to Francis Greenway trackhead

After crossing the stepping stones take the right-hand fork (leaving Walk 1: *Jungo*, which goes straight ahead, following the Great North Walk sign). The track climbs the ridge with Nyrippin Creek on the right, and generally follows the valley practically to the creek's source.

Almost at once, veer left away from the creek. There is a complete change in the plant types and in the surrounding environment. The lush damp forest is left behind and the climb rises by steps to dry terrain. A modest rock overhang serves as a marker for the impressive sandstone country that follows.

Marker 6. Cave

In minutes a much larger rock cave is reached, perhaps 6 m high. This massive unsupported overhang with its golden sculpted and layered interior could be imagined as a backdrop to a stage from which to praise nature — to a mute audience of grass trees, geebungs and *Banksia*.

The occasional contorted Blackbutt, perched worn and twisted on the rock above the path, testifies to endurance in the face of adversity.

Next, a third rock overhang, about 15 m long, shelters the path. All around are boulders, many virtually rectangular prisms like playthings of trolls.

Marker 7. Rock

At this sandstone-dominated stage of the track the plants become typical xerophytes, dry plants with sclerophyllous or hard leaves including large grass trees, *Banksia*, Needle Bushes *Hakea sericea* and *Grevillea*. Beside the track on the right a boulder has slumped over, the result of seepage down the slope over the ages.

The path soon descends from the sandstone uplands. It crosses a tributary watercourse to the main Nyrippin Creek. A tall vent and pipe mark sewerage operations that will feature along the path for the next kilometre.

Just after veering round the top of a watercourse there is an 8 m high black waterfall rock face on the left beside the track, behind a constructed sandstone torrent calming wall. On the right the creek valley is severely eroded. Housing reappears on the rise on the left as the track enters the return tongue of bushland between suburban

Gregor Newton

Twining Guinea Flower Hibbertia dentata

Jamie Wright

Black Wattle Callicoma serratifolia

John Noble

False Sarsparilla Hardenbergia violacea

Gregor Newton

The aptly named Needle Bush Hakea sericea is an attactive shrub with very sharp hardened points on its leaves to discourage would-be foliage feeders.

Pat Pike

Typical coachwood country, dappled sunlight, mosses and ferns - calm, quiet and peaceful.

Francis Greenway trackhead back to the Lakes

The rest of the walk is mainly through suburban streets, as far as possible traffic-free, back to the starting point.

1. Proceed straight across Francis Greenway Drive at the roundabout, into Macquarie Drive.
2. Turn first left into Gumnut Road.
3. Avoid taking the Holly Road cul-de-sac after passing a large estate on the right; enter the park with play equipment on the other side of Holly Road.
4. At the end of the park turn right into Tallowwood Avenue.
5. Take the second left into Ivy Place cul-de-sac.
6. Take the concrete path in the turning circle, between the houses on the right, to Rossian Place.
7. Cross Rossian Place into Glentrees Place and turn left at the T-junction with Kenburn Avenue.
8. After 75 m turn right into the top end of the Lakes Reserve.
9. Cross the creek by a timber bridge at the top of the upper pond. This lake is linked to the larger lower pond by a cascade.
10. Cross the lake by a second timber bridge to return to the start of the walk.

developments. One hundred metres later follow the Callicoma walk to the right, plunging back into the forest, to Marker 8.

Marker 8. Coachwood grotto

A short side track to the right leads down into a shady glade free of undergrowth, featuring an almost pure stand of Coachwood *Ceratopetalum apetalum*, readily identified by grey blotches of lichens on the trunks. On a bench you can rest for a moment to contemplate the curved rock face and mossy boulders through the slim trees, on the other side of Nyrippin Creek below.

Soon after, a substantial stormwater mollifier—consisting of a rock wall below a stormwater drain, itself below a road embankment—reveals local government work to preserve the bushland in the face of urban effects. (In 2001 this structure was clogged with sand eroded from the areas above.)

Marker 9. Callicoma and Coachwood

This section of the Callicoma Walk along the upper reaches of Nyrippin Creek features remnant temperate rainforest plants. Black Wattle, Coachwood, Christmas Bush, Lilly Pilly (*Acmena* and *Syzygium*) and Turpentine grow in the surrounding bush.

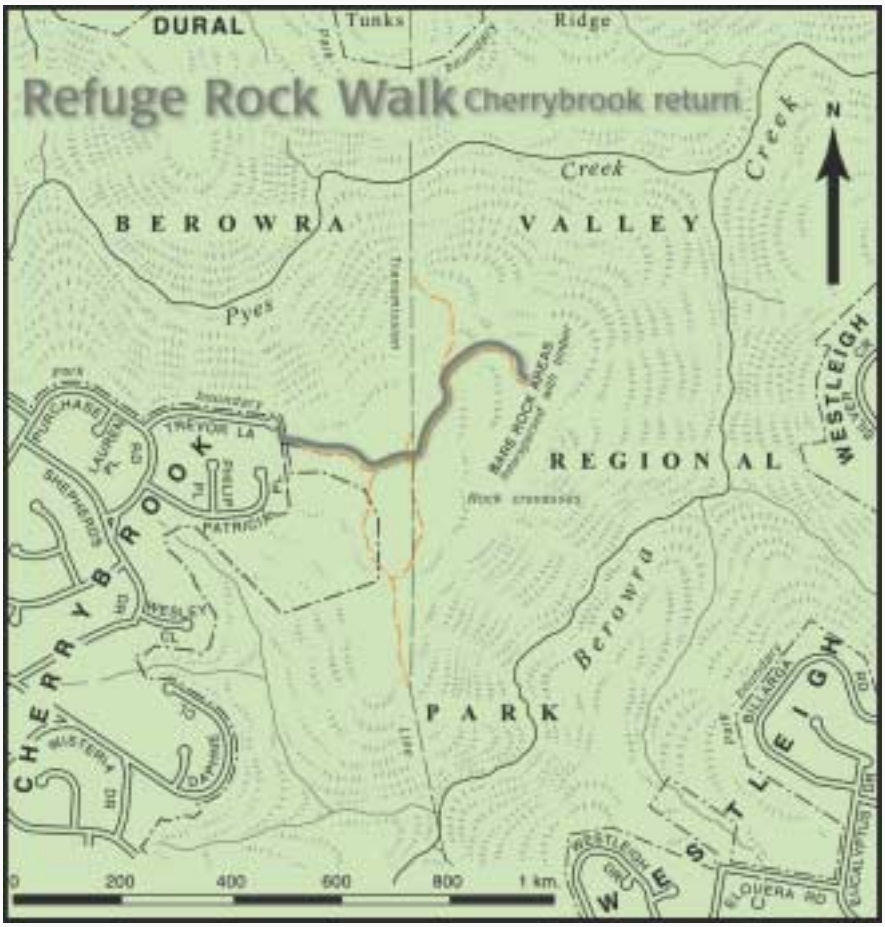
Continue alongside the creek, which is below to the right. Yellow sewer inspection covers dot the way, each identified with a painted number for inspection by helicopter. Fork right when a house looms up on the left, to return to the serenity of the dense tree canopy.

A large smooth-barked Sydney Red Gum *Angophora costata* lies across the creek at the sewer cover. Although the track is dense the sound of traffic is close, a trickling waterfall competing with the rush of invisible vehicles in this otherwise idyllic setting.

At sewer lid 22 the track doubles back on itself, where an unofficial path on the left leads to Boundary Road. The main track crosses the broad exposed sandstone creek bed on stepping cylinders, just below which is a pool and the waterfall cascade heard earlier.

Marker 10. Blackbutt and Red Gum forest

In the final bush stretch, pass a great Blackbutt *Eucalyptus pilularis* on the left on leaving the creek bed, and proceed uphill. At the top of the rise, join the fire trail and continue, turning left away from it 50 m later for the final climb through the Sydney Red Gums *Angophora costata*, and Blackbutts. Houses now make their presence felt all around as you reach a small park and Francis Greenway Drive.



3: Refuge Rock Walk

Cherrybrook return

Route:	Trevors Lane, off Purchase Road, Cherrybrook, to Refuge Rock and return
Distance:	2 km return
Grade:	Easy. Suitable for families and the elderly
Time:	Up to 2 hours
Transport:	Single car
Track status:	Fire trail, a little rough in parts; gentle slope

Synopsis

This is a short walk leading to an extensive sandstone outcrop, which overlooks Pyes Creek and Tunks Ridge. The area through which it passes features tracks made both to service the electrical power lines and their associated towers and to provide access for fire fighting vehicles. The destination of the walk and a good place for a picnic is Refuge Rock, an exposed sandstone outcrop of several hectares largely free of vegetation. This natural feature came to be used as a safe haven by firefighters when carrying out controlled burns—hence its name. A spur track to the rock from an electricity authority trail originally at the end of Purchase Road was formed in the 1970s by the then Outer Sydney Bush Fire Prevention Association to enable firefighters to reach the rock quickly in an emergency.

REFUGE ROCK WALK GUIDE

The track begins at the right-hand side of the turning circle, beside houses at the end of Trevor Lane. Pyes Creek valley is on the other side of the road.

On this walk keep a careful note of which tracks you take as there are a number which leave the main track and some loop around, so a little care will prevent you becoming disorientated.

Go through the fire trail gates after walking about 30 m alongside housing on the right. Turn left after another 30 m and you will enter typical Sydney Woodland.

There are Broad-leaved Scribbly Gums *Eucalyptus haemastoma*, Red Bloodwood *Corymbia gummifera* and Old Man Banksia *Banksia serrata*.

Pat Pike

Banksia spinulosa

Pat Pike

Fhe unusual Whipstick Ash Eucalyptus multicaulis although not common, is present at Refuge Rock.

This section of the Refuge Rock area represents less than a quarter of the extensive open rock surface of a headland with views over the upper Berowra Creek valley and the valleys of several tributaries.

Among the understorey of shrubs are other *Banksia*: Hairpin Banksia *Banksia spinulosa* and *Banksia oblongifolia*. With the rich diversity of shrubs and small plants mixed together there will always be something in flower, and between December and April at least one *Banksia* will be in flower. Look for signs of bushfires on tree trunks, or animal activity on the bark. The small rough-barked shrub with tough green opposing leaves is Dwarf Apple *Angophora hispida*: it has large white 'gum' blossoms in summer, attracting many different kinds of insects that feed on the nectar in the centre of the flower.

After about 100 m, fork left under the power lines where the track divides. Here is a dense stand of Conesticks *Petrophile pulchella*. An occasional Silver Banksia *Banksia marginata* stands among them.

As you pass under the high electricity wires, other smaller tracks go off to the right and left. Keep straight on.

As the track starts to descend, a new kind of eucalypt appears, Sydney Peppermint *Eucalyptus piperita*, and also Sydney Red Gum *Angophora costata* with its red-tan smooth bark. Some of the trees have holes in them, providing nesting sites for crimson rosellas. The scaly-barked tree Red Bloodwood *Corymbia gummifera* continues to grow down the slope. You can also see the popular native garden shrub, Christmas Bush *Ceratopetalum gummiferum*, as well as Flannel Flowers *Actinotus helianthi.*

Outcrops of Hawkesbury Sandstone, the main rock type in the Sydney Basin, signal what is soon to be encountered on a large scale. The narrow leaf shrub Carrot Tops *Platysace linearifolia* makes a delicate display when it is in flower. The diverse array of plants derives its name from the rock: the Hawkesbury Sandstone flora.

When the track forks, keep to the right both times. The track slopes downward again for a while.

Refuge Rock

The arrival at Refuge Rock is understated. The track simply blends into an undistinguished sandstone rock platform featuring isolated pockets of shrubs and moss, usually dark brown but bright green after rain. Clumps of mallee eucalypts and Heath-leaved Banksia grow out on the edge of the platform. The first reaction is: 'Is this all it is?'

Refuge Rock is a series of exposed sandstone surfaces of generally low profile, with variable textures from fairly smooth to pitted. Investigation reveals its extension for hundreds of metres in different directions. It offers numerous good spots to pause for a picnic.

Pat Pike

General Macarthur made his mark as well

Obvervant walkers may be puzzled by numerous markings in the rock surface showing an central pit with teardrop-shaped "engravings" radiating out from the centre. There are more than 60 of these sets of markings, many now overgrown by moss mats and the mallee eucalypts.

Closer examination may reveal fragments of the World War II mortar shells that caused them. Australian Army historians confirm that in the desperate years of the early 1940s, Australian militiamen were trained in the area under the command of General Macarthur following his escape from the Philippines. Invasion was a possibility and Australia was not well prepared. Emergency training took place wherever suitable locations could be found. The site now known as Refuge Rock was used as a target area for troops located nearby in what is now Cherrybrook. Heavier field artillery was also fired northwards into the valley from Thornleigh. Similar hurried training took place at a rifle range then located at Pennant Hills overlooking the Lane Cove River Valley.

George Foster

Mortar shell impacts made during frenzied Australian Militia training during the World War II. Refuge Rock then served as a target area.

Natural arch

At its south-eastern extremity the rock is split by a number of 500 mm wide parallel chasms before a 15 m sharp drop. The main valley separates the rock from Billarga Road, Westleigh, on the distant opposite ridge, where housing can be seen. One of the narrow outer ridges in the rock contains a natural sandstone arch known locally as "London Bridge".

The eastern side of the Refuge Rock platforms drops away in a rough 45° slope meeting the trackless bush. Westleigh seems to be close at this point. A deep narrow section of the main valley lies in between, out of sight below the tree canopy. Also hidden in the bush below is the route of the Great North Walk traversed in Walk 4: *Elouera*, in the vicinity of the high cliff line at the junction of the side track to Elouera Road.

The northern expanse of the rock looks over the location of the Dipping Hole towards Silver Crescent, Westleigh. To the northwest is the Pyes Creek Valley. There are beautiful expansive bush views of Pyes Creek, which is to the northwest, and which joins Berowra Creek, flowing from the right. From this creek junction Berowra Creek continues in a north-easterly direction.

These bushland valleys are home to such threatened species of wildlife as the Powerful Owl *Ninox strenua*. The mallees mentioned above are called Whipstick Ash *Eucalyptus multicaulis*, and they are found along the edge of the rock platform. They are uncommon in the Park, and in the Sydney region generally.

George Foster

A natural stone arch known locally as "London Bridge" is hidden below the eroded section of these unusual block formations on the eastern side of the area. The large parallel-sided features look much like the roofs of railway carraiges waiting in a marshalling yard.

Side-track exploration

Return to the start, being careful to take the right fork after passing under the power lines. As this is a short walk, you can spend time exploring the side tracks, nearly all of which end up at towers for the overhead power lines.

Paul Fredrickson

The eastern side of the formation on the left forms a vertical rock face varying in height from 1m to more than 5m at the site of the arch.

4: Elouera Walk

Thornleigh to Hornsby, one way

Route:
By car: De Saxe Close, Thornleigh, to Rosemead Road, Hornsby

*By train:*Thornleigh Station, then Wells St, cross Lovett St; turn left into Tillock St and right into Morgan St. Turn onto the track at the signpost.

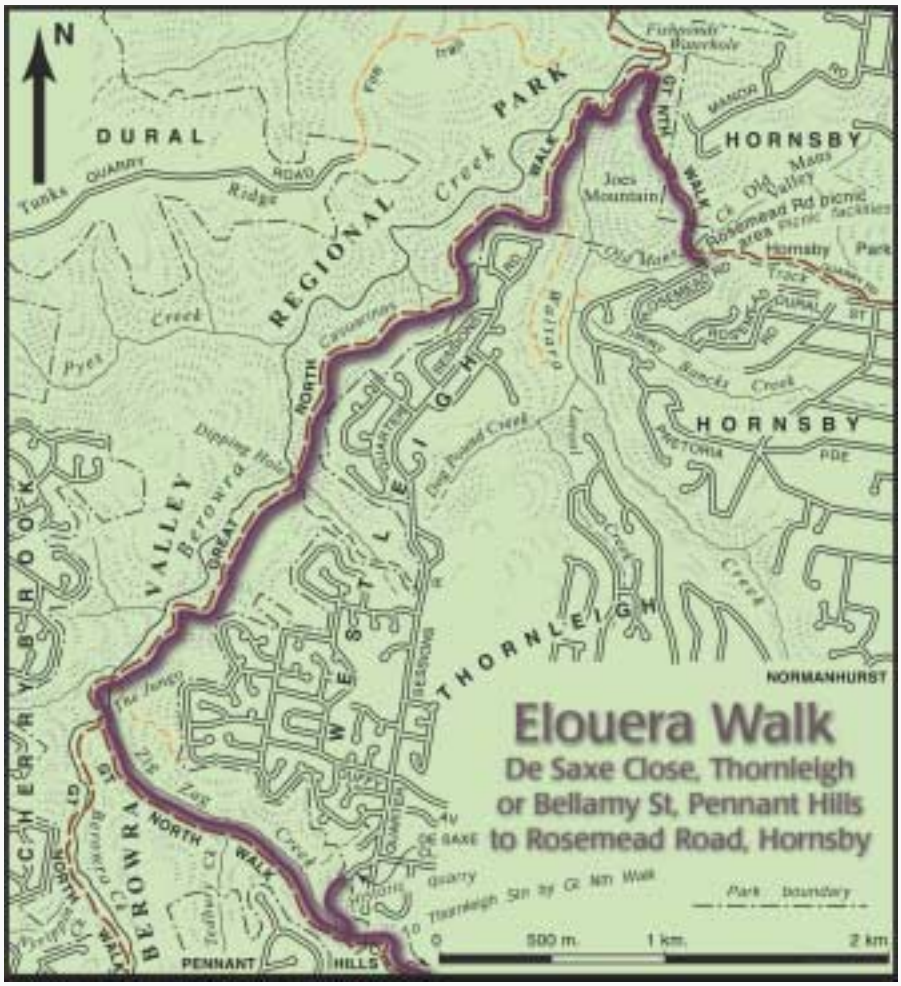
Distance: 9 km

Grade Moderate, with a few short hard sections

Time: 5 hours

Transport: Rail, or two cars, one at each end

Track status: Official track with fire trail sections



Synopsis:

At 9 km, this is one of the longer walks through the Park and most of the attributes of the upper reaches of the valley can be appreciated along the way.

It will take most of the day at a medium pace.

MAIN POINTS OF INTEREST ARE::
—Historic quarry
—Berowra Creek
—Dipping Hole
—Sandstone ridge)
—Waitara Creek
—Fishponds Waterholes
—Old Mans Valley, Hornsby.

ELOUERA WALK GUIDE

De Saxe Close, Thornleigh, to the Historic quarry

Start from the Park entrance off the turning circle at the end of De Saxe Close. The track begins behind the stone wall marking the park entrance and descends by steps beside the stone embankment supporting the turning circle.

As you go down, note the large tree with pinkish, smooth bark. This is one of many Sydney Red Gums *Angophora costata* that you will see on the walk.

A concrete channel leads into the bush from the base of the turning circle, to take run-off from the nearby housing directly into

the creek bed. It is crossed halfway down the log-formed steps. The channel was built as an experiment, by the then Department of Lands at the request of the Elouera Bushland Trust, to inhibit invasion by exotic weeds.

On the steps, just at the concrete channel, are traces of an old road built in about 1890 to carry stone removed from the quarry, now discernible as a bush track.

The concreted roadway at the bottom of the steps was constructed in 2004 as a cycleway. The roadway was constructed on top of a1912 sandstone-cobbled bullock track.. Downhill it heads to the quarry; uphill to the right it passes a sandstone escarpment, then the Wirreanda Guide Hall, Thornleigh, and ends at the Timbarra Road entrance to the Park after about 140 m.

Continue left down the fire trail, along which are a number of well-grown Sydney Peppermints *Eucalyptus piperita* and Sydney Red Gums *Angophora costata*. After 100 m you will reach the historic sandstone quarry on the left. This a semicircular feature about 50 m in diameter, fashioned into the semblance of an amphitheatre complete with log seating and a few barbecue fireplaces. There is a slight echo effect.

Practically opposite the quarry, beside the site of the former hopper, a track descends steeply to Zig Zag Creek and a waterfall, from which the sound of water can be heard in all but the driest conditions.

The quarry was the purpose and end of the old zigzag railway beginning above Thornleigh Station. Sandstone was quarried for the construction of the Main Northern Railway. *[For details see the Historic Quarry section in Chapter 2.]*

George Foster

The concrete cycleway and emergency roadway was built in 2004 on top of the 1912 bullock track. That track, as seen in this 1983 photograph, was surfaced with cobbled sandstone. This provided a heavy duty paving of the day for the bullock teams hauling loads of quarried stone ballast.

Quarry to Zig Zag Creek

Follow the roadway from the quarry down to Zig Zag Creek. A substantial bridge for the cycleway crosses the creek beside a vehicle ford and litter trap. The creek here is typical of the headwaters of creeks rising in sandstone country near Sydney. The bed is rocky with occasional pools and sandy deposits. Most of the sand in the pools downstream results from disturbance and clearing for building in the residential areas at the head of catchment. Cross the creek and turn right at the tall sewer vent.

Hornsby Shire Council

Litter racks installed by the Park managers prevent the worst solid litter from residential areas entering the Park waterways.

Zig Zag Creek to the Jungo

WALK 1: JUNGO AND WALK 4: ELOUERA OVERLAP STARTS

The track leaves the fire trail and becomes a narrow path following Zig Zag Creek. Soon you pass through an extensive patch of *Lomandra longifolia,* herbaceous plants with long straplike leaves.

There are views of a steep sheltered cliff on the right. The sunlight slants down through the canopy of Sydney Peppermints *Eucalyptus piperita*, Sydney Blue Gums *Eucalyptus saligna* and Sydney Red Gums *Angophora costata* to highlight leaves, plants and rocks in the dimness of the gully. Old Man Banksia *Banksia serrata*, as well as Hairpin Banksia *Banksia spinulosa* and Heath-leaved Banksia *Banksia*

John Noble

Spiny-headed Mat-rush Lomandra longifolia

Alternative routes to the tall sewer vent

The following are good alternative routes, but they do not pass by the Historic quarry. The description for all routes is the same from the heading 'Zig Zag Creek to the Jungo'.

From Morgan St

For those arriving in Morgan St on foot from Thornleigh Station, follow the signpost and walk at the rear of properties until the path joins a fire trail. Continue to the tall sewer vent.

From Bellamy St

It is also possible to arrive at the tall sewer vent from Bellamy St. exactly as described at the start of the Jungo Walk

George Foster

Waterfall near the Historic quarry showing the result of a thunderstorm

George Foster

Many overhangs in the Park aquire a veil of water on rainy days.

ericifolia, all grow along here and can be seen flowering from summer to winter. There are also ferns and grass trees.

After about 300 m and just before a walk-marker-post, a side path to the right descends to the sound of running water, opening onto a 10 m-diameter rocky clearing through which the creek passes, trickling down a broad waterfall cascade into a pool of similar size. This is the waterfall below the quarry and hopper site mentioned in the section on the 'Historic quarry and zigzag railway'.

Continue along the main track. Many of the trees have burnt-out trunks where bushfire has reached the central heartwood. When the outer part, the sapwood, survives, so does the tree.

About halfway to the Jungo, just after a pair of 1 m-diameter Sydney Red Gums, you cross a timber bridge over north-flowing Tedbury Creek, which rises beyond Pennant Hills High School in the vicinity of Observatory Park, Pennant Hills Road, Pennant Hills. This bridge and others like it make access easier and prevent disturbance to the plants growing on the banks. Note the soft-leaved fern Common Maidenhair *Adiantum aethiopicum*. Fallen trees and a few large tree stumps along the track remind walkers of the timber-getting era in this area. Eventually the logs decay and add nutrients to the soil, and new trees grow to replace them.

The track rises slightly and you pass through open-forest of Sydney Red Gums and Sydney Peppermints. The valley closes in with the sandstone piling up on both sides, steeper on the right or north-east; this is one of the prettiest sections of the walk.

WALK 1: JUNGO AND WALK 4: ELOUERA OVERLAP ENDS

Jungo to the sandstone ridge

At the Jungo, the walk briefly joins the route of Walk 2: *Callicoma*. Follow the sign pointing to Fishponds, 5.5 km, cross the stream (Berowra Creek), and continue up the steep fire trail, which is concreted as far as the top of the ridge. There, leave the Callicoma Track by taking the right fork Great North Walk track, which descends rapidly over sandstone outcropping to Berowra Creek. The small trees lining the banks, with grey bark and yellow flowers, are Water Gums *Tristaniopsis laurina*.

Cross Berowra Creek and turn left (the route to the right goes to Duneba Drive). The next stretch of several hundred metres along the shady creek bank may be the most exciting for the bird watcher, especially in the early morning.

After swinging away from the main stream, cross a small tributary creek bed by a wooden bridge. The path gently undulates. At the next creek crossing, the rocky ridge that has risen on the right becomes a waterfall site of some 12 m height, flowing on rare occasions.

Further along the track there is a rather stiff climb of about 200 m to the top of the valley side. At the summit you will soon realise it was all worthwhile as this is the beginning of the sandstone ridge stretch. Immediately, to the north, there are good views of Thornleigh Gully from the track as it follows the top of a sheer cliff line on the eastern side of the creek.

Sandstone ridgetop and heathland

The change in environment is matched by a change in vegetation, Broad-leaved Scribbly Gums *Eucalyptus haemastoma* being the dominant trees. These are medium-sized trees with smooth white-grey bark. The surface bark is shed annually, revealing the residual signature 'scribbles' from the activities of insect larvae. The other common large shrub is the Dwarf Apple *Angophora hispida*.

A blue haze that may be detected comes from oils given off by the eucalypts. Because of the small bushland area here, the haze is not as obvious as in the large and deep valleys of the Blue Mountains to the west.

Several successive stretches along the edge of the sandstone ridge, with good examples of ridgetop heathland, follow in this section of the walk. Care should be exercised with younger walkers as the track runs on the exposed rock parallel to the top of the cliff line. The valley drops away precipitously and picturesquely to the left, down to the creek far below. Here on the uplands the terrain is dry, sandy and exposed.

Elouera Road track access

During the second and longer cliff section, and a few minutes after reaching the top of the valley side, there is a turn-off to Elouera Road in Westleigh. This is a popular place to pause for refreshment and enjoy the view. The access from Elouera Road also provides an alternative exit or entry for walkers unable to complete the full walk or wishing to do so at another time. There is parking adjacent to the Sydney Water facility at Elouera Road.

Dipping Hole to Blackfellows Head

After one or two short cliff sections the path drops for a period to a large flat sandstone outcrop with *Banksia*, then falls sharply to an unnamed tributary creek, which you cross first by negotiating the rocks, then one of the early timber bridges installed by Thornleigh Rotary. Here the vegetation, typical of a creekline including Black Wattles *Callicoma serratifolia*, is much denser.

After about 100 m, a rough unofficial track used as a firebreak joins from the right. This is a marker for the next landmark, the Dipping Hole, the turn-off to which is not easy to find. Barely 30 m after the unofficial track, look for 3-4 stone steps down in the path, then a sandstone outcropping surface and finally a 1.8 m high tree stump on the left. Here if you take the track to the left, which may be overgrown, you will, after about 25 m, reach the Dipping Hole.

The Dipping Hole is a broadening of Berowra Creek at a sharp bend, marking the confluence of two creeks. Here you can see Coachwoods *Ceratopetalum apetalum* and Black Wattles *Callicoma serratifolia*. Storm debris may be seen as high as 3m above normal water level.

Continue along the Great North Walk by a timber bridge over the second unnamed tributary creek and a pair of double plank crossings. Follow Berowra Creek through an area dominated by Sydney Red Gums and Sydney Peppermints, many of which have

Look on the ground in this part of the walk for these buds (left) and fruit (right) of Eucalyptus haemastoma

Buds (left) and fruit (right) like these of Angophora hispida should also be present near the trees that shed them.

Paul Fredrickson

Walkers resting after the steep climb up to the top of the ridge line near the access track from Elouera Road Westleigh.

George Foster

The Dipping Hole shows signs of management issues common in urban areas. Weed infestation exists on the banks and aquatic weeds slow and clog the watercourse itself. Siltation provides the shallower habitats the weeds prefer.

Jamie Wright

Grass Trees Xanthorrhoea species carry masses of tiny flowers heavy with nectar sought by birds and insects.

George Foster

Dense and very beautiful concentrations of Grass Trees such as this one create a wonderfully vibrant ambience.

Lyndel Wilson

After fire, Casuarina groves are carpeted only with ash having generally discouraged growth of other species under the mat of "needles". Trees that have lost their canopies do not survive wildfires but the seed cones are activated by fire, restarting the process. During the cycle, other plants occupy the open forest floor, but fail once more as the grove matures.

hollows that are havens for fauna. By-pass a turn-off to the right to Quarter Sessions Road, and pass through numerous large grass trees *Xanthorrhoea arborea* and climb out of the valley, aided by some log-formed steps.

Casuarina country

Descend again. Cross the creek with the sandstone rock-ledge waterfall on the left, below which is a shady valley.

On the other side of the creek the track rises through a glade of Black Sheoak *Allocasuarina littoralis*, which continues for a kilometre or more. Note the characteristic sparse understorey, due to the suppressive effect of the fallen pine needle - like leaves inhibiting the growth of groundcovers, shrubs and other plants. The track rises to higher ground, below Western Crescent, Westleigh, then drops steadily followed by a short rise to another timber bridge over another creek. This bridge is recognised by a Sydney Red Gum *Angophora costata*, which seems to hold it up on the lower side.

One hundred metres later the path crosses yet another tributary, rising fairly steeply through dry, sandy, rocky country, with *Banksia*. This is one of the more difficult parts of the route. Half way up the climb and to the right is a side track to Quarter Sessions Road.

The track wends its way along the slope with good views to the opposite side of the valley. After a while, at a water board inspection cover, housing looms above the track on the right. Fifty metres later a canopy of Black Sheoak *Allocasuarina littoralis* is followed by a tributary crossing where the track bends sharply.

Blackfellows Head to Blue Gum Walk turn-off

The track goes on around Blackfellows Head, the steep-sided end of the long sandstone ridge along which runs Quarter Sessions Road. Prior to urban development, several groups of Aboriginal engravings were present on open rock areas there.

After leaving Blackfellows Head, the track continues along the lower extension of the main ridge where the Flannel flower *Actinotus helianthi* is plentiful. After 100 m or so a rough track joins from the right. A further 70 m, along, Walk 5: *Blue Gum* separates to the right.

Blue Gum turn-off to Rosemead Road

For an alternative description of this section in the reverse direction, see Walk 5: Blue Gum.

From here on the track follows the ridge between two converging valleys of Berowra Creek on the left and Waitara Creek on the right, the ridge narrowing and the path favouring first one valley then the other. The track drops steadily, down sections of hewn, formed rock and pine-log steps, around boulders and through dry vegetation.

Waitara Creek is reached after you descend to pass first under a rock overhang, then through ferns and between a pair of Turpentines on the left and a Sydney Red Gum on the right. Immediately cross Waitara Creek at a natural tumble-wash rock system. This place, one

of the highlights of the walk, is an ideal point at which to pause and enjoy the sight and sound of cascading water.

The area now being entered, known as Joes Mountain, was donated to the Trust by the late Dr Joyce Vickery, a botanist with the NSW Department of Agriculture in the Herbarium at the Botanic Gardens. The area of land was approximately twice the size of the more recent $26,000,000 Hornsby Quarry acquisition by Hornsby Shire Council. (For details see Chapter 1 of the *Guide*.)

Waitara Creek to Fishponds

In the next and interesting stretch to Fishponds, water, rocks, light and sound combine to beautify the setting. The path passes between the creek on the left and Joes Mountain on the right. The confluence of Berowra and Waitara Creeks is easy to miss, occurring below a relatively smooth flat rocky outcrop some 10 m in diameter crossed by the path. Tumbling Waitara Creek makes all the noise as it joins slow-flowing Berowra Creek. Another point of interest is an eroded and colourful rock overhang, with deep honeycombing in the striated sandstone. Water Gums *Tristaniopsis laurina* and Coachwoods *Ceratopetalum apetalum* are common along the banks. After a final 5 m timber bridge and half a dozen log steps you will have reached the picturesque Fishponds Waterhole junction of the tracks.

Fishponds to Rosemead Road

Take the track from Fishponds that leads to Rosemead Road and Hornsby. The branch to the north proceeds to Mt Kuring-gai via Galston Gorge and Crosslands, a walk of around 15 km.

The track to Rosemead Road, Hornsby, joins a fire trail after about 250 m. This continues for nearly a kilometre through sandstone gully forest, among Sydney Red Gums *Angophora costata,* Blackbutts *Eucalyptus pilularis*, Black Wattles *Callicoma serratifolia*, Turpentines *Syncarpia glomulifera* and grass trees. It descends into Old Mans Valley where the vegetation is not only different from the rest of the Park, but also rare in the Sydney basin because of the rich soil developed from the volcanic breccia of the Hornsby diatreme. This vegetation community is known as glen forest. Tall Sydney Blue Gums *Eucalyptus saligna* are common and most of the other scrub is thick and lush. (For details, see Chapter 3: Landscape.)

Rosemead Road to Hornsby Station

When you reach the small park at the end of Rosemead Road, you can continue to Hornsby railway station climbing the old sandstone bush steps that begin in this park. The bush track emerges in Quarry Road. All that remains is several hundred metres by road and footpath to reach Hornsby station.

Jeremy Steele

Eroded section of creekbed reminiscent of old-style laundry tubs.

Marc Thumm

G'day mate! Net-casting spiders like this one will probably have noted you as you pass by, so it is probably best you didn't hear its greeting. Just as well that they're quite small and harmless - at least to monsters like us.

Sandstone steps and 1930s rock graffiti

The steps were built during the depression years of the 1930s, to provide labour for those out of work. The 230 or so steps are the most strenuous part of this walk. Near the top, rock graffiti of a pierced heart (about a square metre in size), a whale, a superman, a kangaroo, a human figure with outstretched arms and a dog — as well as the hammer-picked-out message *'Prosperity around the corner'* are there to be spotted by the truly sharp eyed. It is probable that these were carved around the time the steps were constructed.

5: Blue Gum Walk

Joes Mountain circuit

Route:
Rosemead Road return
Distance: 4.3 km
Grade:
Moderate to hard
Time: 2.5 hrs.
Transport:
Single car, or train and 20-minute walk from Hornsby station following marker posts
Track status:
Official track with fire trail sections

Synopsis
This is a two-hour circuit around Joes Mountain, in three parts. The first part uses the trackhead to the Great North Walk, the second the Great North Walk itself, and the third a former sawyers' track. The walk traverses the major land gift by Dr Joyce Vickery that was instrumental in the creation of the original Park. It takes its name from the what is one of the largest remaining Blue Gum Forests in the Sydney region.

BLUE GUM WALK GUIDE

The Walk officially begins in the small park at the bottom end of Rosemead Road, Hornsby, at a boulder bearing a commemorative plaque stating that the walk was opened by the then Mayor of Hornsby, Councillor Chris Meany, on 31 October 1993. Beside the boulder a National Parks and Wildlife Service signboard marks the Great North Walk, which the Blue Gum Walk partially overlaps, with destinations shown including that to Newcastle, 220 km. Most people arriving by car normally set off from the green fire trail gate at the end of Rosemead Road, a few metres away.

Old Mans Valley has what is reputed to be of the best stands of Sydney Blue Gums *Eucalyptus saligna* in the Sydney metropolitan region. The stand is a glen forest unlike the Blue Gum High Forest on the ridge tops. The origin of the soil is the reason these trees have flourished here. The soil derives from another significant, though less obvious characteristic of the valley as the site of an ancient diatreme. (For an account of volcanic activity here, see Chapter 3: Landscape.) Just out of sight to the north of the park lies the former bluemetal quarry that also exploited this resource.

At the beginning of the fire trail some black rock in the roadway — unless placed there as part of the road bed — tends to confirm the presence of volcanic activity. After about 100 m Old Mans Creek is crossed by means of several concrete stepping stones. Normally a trickle, this creek cannot be safely negotiated after heavy rains.

On the other side the fire trail rises sharply. The Eastern Whipbird *Psophodes olivaceus* usually makes its presence felt. Other plentiful birdlife includes the usual: magpies, currawongs, cockatoos, galahs, rosellas, wrens, willy wagtails, whipbirds and others. Residents report seeing lyrebirds here. All signs of volcanic rock have disappeared well before you reach the creek.

Joes Mountain

Near the top of the hill the fire trail and Blue Gum Track swings to the left. (The side path to the right, or eastwards, leads to the former CSR bluemetal quarry boundary fence.) At the top the track passes between the summits of uninhabited Joes Mountain to the left, and Hornsby Heights, where glimpses of rooftops reveal urbanisation not far away.

At the top of the rise a flat cleared section marks the site of a shack used in the filming of a minor bush–horror drama, *Spook*, a film made by Tesha Media Productions, with the cooperation of the Elouera Bushland Trust, in 1988.

A hundred metres on, to the left, is a small stand of Turpentine trees *Syncarpia glomulifera*, many about 200 mm thick. These are recognisable by their shaggy stringy bark in 25 mm wide strips, and their dark green oval-shaped pointed leaves with lighter backs about 75 mm long. Turpentine was widely used for piles for harbour wharves. Grass trees, too, are evident. Sydney Red Gums *Angophora costata* begin to appear, with a landmark specimen over 1 m in diameter occurring halfway down the slope on the right-hand edge of the fire trail.

So far the fire trail has been broad, almost a country road, with tumbled truck-sized sandstone boulders dotting the slopes to either side. Varieties of wattle proliferate.

When the track divides, leave the fire trail (which swings to the left for a kilometre or so before coming to a dead end not far from the West Hornsby sewage treatment plant) and keep straight on.

After 50 m, ignore the sign on the right marking an alternative route to Galston Gorge, developed in 1995 by the Hornsby Shire Council to avoid the hazard of the rifle range on the other side of Fishponds. Carry straight on as this diversion is not relevant for the present walk.

Lyndel Wilson

Typical stand of Blue Gums Eucalyptus saligna showing the signature black "stocking", blue-grey mottled bark and clear understorey.

Jeremy Steele

Grass trees Xanthorrhoea arborea. and Sydney Red Gum Angophora costata are often seen together.

Val Williams

Dense stand of young Turpentines Syncarpia glomulifera

The track, now a path, with single-file walking for most of the rest of the way, soon crosses over rocks with small chiselled steps. The valley drops away to the right, in which a creek, like the track itself, heads towards Fishponds.

Fishponds to Waitara Creek

The Rosemead Trackhead joins the Great North Walk proper at Fishponds Waterhole on Berowra Creek. First-timers will find it worth their while continuing for the 200 m down to the stream, crossing it by stepping stones, to take a close look at the waterhole, once favoured for swimming and still used by local youths for this purpose, perhaps inadvisedly given the questionable degree of purity of the water. (

According to one of the signs at the junction, Newcastle is 210 km away and Galston Gorge 5.8. Old carvings scored into the rocks, perhaps by the makers of the track years ago, give arrows to P.H. (Pennant Hills), G (Galston and H (Hornsby). Take the left (westwards) fork to PH, and follow Berowra Creek.

A Blue Gum Walk sign shows that 2.8 km of the walk remain. After about 20 m a second wooden footbridge crosses the usually dry creek bed that you followed earlier. At the weekend, shots from the nearby rifle range can be heard.

Soon the track narrows, hemmed in with ferns and foliage, and you make your way over and among tumbled rocks and boulders, the creek bubbling away on the right. The most scenic part of the walk begins at a sandstone sculpted eroded defile, where you wend your way below its overhang. Along this stretch dominated by rocks, the creek and the Sydney Red Gums, Berowra and Waitara Creeks diverge below a flat rock expanse. A few hundred metres later, cross Waitara Creek at the natural swirling 'washing tubs' in the rocks and at once climb upwards.

To the Blue Gum turn-off

At the top amidst the taller gums, *Banksia* and Flannel Flowers *Actinotus helianthi* dominate in a sandy, stony flat terrain. The path then rises further, at one point assisted by a flight of 24 stone steps. On the summit of the ridge separating the valleys of Berowra and Waitara Creeks the track is strewn with needles below a stand of casuarinas.

About 1 km from Fishponds, the paths divide at a broad rock outcrop. The Blue Gum Walk heads left, due south, away from the Great North Walk, through a sheoak grove. The back of Joes Mountain looms up across Waitara Creek valley on the left, with the Berowra Creek valley on the right.

Sawyers' route

The Blue Gum Track now follows an old sawyers' route used in the 1800s by the Higgins family to transport timber out of the valley.

Soon the ridge is dominated by tall trees, mainly casuarinas with their rough bark and leaves emulating pine needles, as well as Turpentines *Syncarpia glomulifera* and the occasional Blackbutt *Eucalyptus pilularis* and Sydney Red Gum *Angophora costata*. As the

Old Mans Valley

This valley was logged by the Higgins family for over 100 years for its Sydney Blue Gum *Eucalyptus saligna*, Blackbutt *Eucalyptus pilularis* and possibly Red Cedar *Toona ciliata*. The Sydney Blue Gums in the park at the end of Rosemead Road are regrowth trees. The name of the valley may derive from the large male Eastern Grey Kangaroos *Macropus giganteus* seen by early settlers in the valley or be a reference to 'Old Man Higgins'.

Joes Mountain

Much of the land in this vicinity, including Joes Mountain, was a 100-acre gift from Joyce Vickery in 1967 to the Elouera Trust for inclusion in the then Elouera Bushland Natural Park, to secure access to the Park and to protect the area in perpetuity. Joes Mountain is almost encircled by creeks and is relatively unaffected by development. Fire trails have been constructed around most of the mountain's perimeter as a safety precaution.

Joes Mountain was preserved from fire for over 30 years from 1957, until November 1990 when a bushfire swept over it and down to the fire trail close to Old Mans Creek. As a consequence it has a different vegetation structure from that of surrounding areas.

How did Joes Mountain get its name?

According to the book *Pioneers of the Hornsby Shire*, Thomas Edward Higgins (1800-65) was the first permanent resident in Hornsby Valley, also known as Old Mans Valley. The valley was settled in 1825.

It is not known whom Joes Mountain is named after, but if it were a member of the Higgins family the only likely contender would seem to be Joseph, born about 1890, who worked in timber in Old Mans Valley. He was the son of Edward, Ned (Boomy), Higgins, sixth child of Thomas Higgins III. A photo on p. 202 of *Pioneers* shows Joe Higgins in a saw pit, with father at the saw and mother and brother at its edge. Further information is given in Doris A. Davidson, *A Tree from Old Mans Valley* (private publication, 1977), p. 47.

track begins to descend, large Sydney Blue Gums *Eucalyptus saligna* begin to join the other timbers. High overhead on the right, houses in Westleigh reveal the closeness of suburbia. Below this Westleigh ridge, as the frequency of Sydney Blue Gums increases and with them an increasing density of bracken and ferns, matching rooftops across the valley in Valley Road, Hornsby can be spotted, as further evidence that this semblance of limitless bush is illusory.

Fire trail back to Valley Road

After a considerable distance through this upper shady forest, a flight of timber formed steps down brings you onto a fire trail. At once the route descends steeply.

Leave the wilderness and rejoin suburbia at a tubular gate and metal stile. (After a short distance a diversion to the left of about 50 m leads to the site of a sandstone cottage.) Cross over Waitara Creek by means of the concrete ford and stepping stones, and look out for the ducks. Follow the final few metres of the walk alongside Jimmy Bancks Creek to rejoin the "real world" of Valley Road, at Ginger Meggs Park.

Ginger Meggs Park

Jimmy Bancks (1889-1952), creator of the cartoon character Ginger Meggs, arrived in the Hornsby area in 1892 when his family moved there to live in a railway cottage between the present Main and North Shore rail lines, his father being a railwayman. He was to stay for about twenty years. Bancks' childhood range included Old Mans Valley, and Fishponds on Berowra Creek. Fruit-raiding exploits of the comic strip characters are believed to have been based on the Higgins family orchards in Old Mans Valley. The park was officially named Ginger Meggs Park on 26 July 1997.

Rosemead Road

Ginger Meggs Park is about 400 m from the Rosemead Road starting point, which can be reached by following the road leftwards.

The rifle range

Downstream from Fishponds the Park is intersected by Hornsby rifle range and its safety zone. Although the butts are some 160 m above the creek, walkers are advised to take the clearly marked by-pass route via Manor Road when firing is taking place. [For details, see the information box in Walk 7, *Heritage Bridges*.

Sandstone ruin

Jeremy Steele

George Foster

Remnants of an earlier dwelling.

Jeremy Steele

Ginger Meggs bronze memorial in Hornsby Library

Courtesy Hedley Somerville

Ginge wasn't the only one keen on Fishponds

6: Pogson Trig Walk

Pogson Trig return

Start: End of Quarry Road, Dural
Route: Quarry Road, Dural; Tunks Ridge; Pogson Trig; back to Quarry Road
Distance: 2 km
Grade: Easy
Time: 1 hour
Transport: Single car
Track status: Fire trails

Synopsis

The short Pogson Trig Walk is almost entirely level, and follows broad fire trails. It begins at the gate at the end of Quarry Road and arrives at the Trig. From the Trig, it first samples a stretch along the flat section of Tunks Ridge and returns; then it investigates a section of another firetrail running eastwards towards the sedge swamp and returns.

POGSON TRIG WALK GUIDE

Introduction

Quarry Road

The land in the Quarry Road area was originally owned by the Pogson family, orchardists, woodcutters and graziers. Quarry Road, Dural, is named after a white metal quarry situated just after the Rural Fire Services station. White metal, a metamorphosed sandstone, was used as road surfacing as it is harder than blue metal.

The Quarry Road fire trail at the start of the walk was originally a public road or pony track from Dural to Hornsby, used by Dural farmers. Although evidence suggests that drays and other wheeled vehicles may

have taken this route, after the opening of the bridges in Galston Gorge and the expansion of the goods yard at Pennant Hills Railway Station the track became less popular. It is known locally as Tunks Ridge Track for the reason that it follows the ridge separating Tunks Creek on the left and Berowra Creek on the right.

Locked gate to Pogson Trig

Quarry Road, Dural, is off the Old Northern Road just beyond the junction of New Line Road. The walk begins at a locked gate at the end of Quarry Road, and proceeds northwards following Tunks Ridge for about 2.5 km.

Up to 2000, the left-hand or north-western side of the fire trail had not been burnt since about 1970; the south-eastern or right-hand side was burnt in May 1994.

Along the first section the vegetation is typical sandstone heath and scrub woodland. It contains examples of both coastal and mountain plant species. There are two scribbly gums here, the Narrow-leaved Scribbly Gum *Eucalyptus racemosa* and the Broad-leaved Scribbly Gum *Eucalyptus haemastoma*. Since the introduction of the European honey bee there has been some hybridisation of the two. Nearly all the ridges in this area display this intersection of coastal and mountain vegetation.

The scribbly gum on the right hand side of the gate is covered with trails of the larvae of the scribbly gum moth and of termites. As with many other scribbly gums that you will encounter, this specimen was severely damaged long ago, leaving exposed its heartwood centre.

On the left hand side of the fire trail are examples of Silver Banksia *Banksia marginata*, which has clear yellow flower spikes in autumn-winter. Halfway up the slope, which begins at this point, a Hairpin Banksia *Banksia spinulosa* can be seen on the left, together with Old Man Banksia *Banksia serrata*, familiar from May Gibbs's stories of Australian bush flowers and animals.

Heath-leaved Banksia *Banksia ericifolia* is also present, its red-gold flower spikes standing out in autumn-winter against white-backed, deep green leaves. *Banksia oblongifolia*, a shrub about 1 m high with velvety brown new growth, completes the five species of *Banksia* that occur in this section. This area is one of the best places in the Park to see *Banksia*.

Further along, the Red Spider Flower *Grevillea speciosa* and Sweet Wattle *Acacia suaveolens* grow on either side of the fire trail.

Many of the plants are harsh: touch the leaves and you will find that some may look soft but feel tough and prickly.

Pogson Trig

At a small clearing some 500 m after the locked gate, at the point where a track enters from the east, there is a trig station marker. The steel plate on top indicates north. Do not take the track leading off to the right at this stage. Stay on the fire trail, pausing to see the trunk of another scribbly gum set at odd angles.

In the area around the trig marker, Broad-leaved Scribbly Gum *Eucalyptus haemastoma*, as well as Old Man Banksia *Banksia serrata*

Sandra Kalnins-Cole

Sweet Wattle Acacia suaveolens one of the Park's many colourful wattles

Jeremy Steele

Broad-leaved Scribbly Gum Eucalyptus haemstoma

Jeremy Steele

A fine pair of 'bad banksia men" the fruit of Banksia serrata showing the gaping "mouths" of expelled seeds. Fire is the normal trigger. Banksia cones also behave much like incendiary bombs during wildfires. Violent updrafts lift the fiercely burning cones into the strong winds preceding the fire front, setting more spot fires.

Jeremy Steele

The Pogson Trig station marker

George Foster

Distinctive colouration of a pollinating male casuarina. The leaves of a nearby female tree are difficult to see.

Jeremy Steele

One of the warning signs at the boundary of the Rifle Range Safety Zone

Paul Fredrickson

The carnivorous Sundew Drosera spatulata - a beautiful little insect eater

JGregor Newton

Juncus continuus, one of the rushes that colonise the "hanging swamps" of the Park

and Heath-leaved Banksia *Banksia ericifolia*, Dwarf Apple *Angophora hispida* and Conesticks *Petrophile pulchella*, predominate.

The trees are widely spaced with a medium cover of shrubs underneath. Soon the fire trail passes through bushland where the shrubs become very dense. This may be due to an increase in water availability at this point.

All Australian plants are grey-green - or are they? Notice how many bright green plants there are, and that it is mainly the leaves of the eucalypts, the gum trees, that are grey-green. This colouring is often due to a coating of white wax that can be scraped off to reveal a bright green leaf underneath.

The small tree with fine branchlets and woody, brown, seedbearing cones is Black Sheoak *Allocasuarina littoralis*. It has male and female plants, only the female having cones. When the male plants produce pollen, the plant looks brown all over as if it were dying, but this is just the pollen-producing structures.

The fire trail follows the ridge for some distance, and is fairly flat.

WALK TURN-AROUND

Boundary of Hornsby Rifle Range Safety Zone

When the fire trail reaches the Rifle Range Safety Zone a warning sign identifies the boundary. Turn back now.

The Fire Trail does continue for authorised users only along Tunks Ridge to Galston Gorge. See Chapter 5: Mangement for further information about the dangers of crossing the Safety Zone.

When you arrive back at Pogson Trig, take the track on the left.

Pogson Trig to Sandstone swamp

The final several hundred metres from Pogson Trig are marked not only by *Banksia oblongifolia* but also by small red rosettes close to the ground. These are carnivorous plants that eat insects trapped on the reddish leaves, and which are digested there by secretions from the leaves. Sundew *Drosera spatulata* is the name of the most common of them. If you look closely, you will see the remains of its last meal. As well, at all times of the year you can see the Lesser Flannel Flower *Actinotus minor*, similar to the well-known Flannel Flower but only about 15 mm in diameter.

The sandstone swamp encountered on the left in about 350 metres is made up of sedges, shrubs, grass trees and small plants. The terrain may be soggy after rains, or dry at other times. At its bottom edge you can walk into it from the right-hand side of the track, using side tracks. Once you enter the swamp you can look right across it. Tracks lead to a flat exposed rock expanse.

The section of about 400 m of the Pogson Trig Track between the Trig and the swamp is reputed to have been constructed in the early 1960s or 1970s, to reach a light-aircraft crash site.[1] The fragility of the swamp is apparent with parallel wheel marks originally made by

1. Attempts to confirm this incident for this edition of the *Guide* were unsuccessful.

the heavy loader when removing the light aircraft still visible decades later. The Bush Fire Brigade afterwards extended this access as a walking track to link up with the Benowie Track at Fishponds, to assist in fire control.

The swamp is the only substantive sedgeland in the Park. It has shrunk by at least half the size shown on a map made in 1970 by Macquarie University botanist Dr Frank Burrows, and local people suggest it was once larger still.

Old pictures show that the sedges are being replaced by shrubs such as *Hakea* and *Banksia*. One reason for this may be a lowering of the water table because of increased drainage along the fire trail. Another may be changes to the fire regime: research on other sedgeland indicates that a regular burning regime is needed to stop proliferation of shrubs.

Aboriginal people burnt these swamps almost annually, which cleared them of shrubs; and shrubs lower the water table. Burning also reduced rubbish, so helping to maintain clean water and eliminate mosquitoes, other biting insects, and leeches. There is evidence that Aboriginal people used this swamp as part of a trading route from Prospect and beyond to Palm Beach. Local people speak of their grandparents seeing Aboriginal people passing along this route; this must have been around the middle of the nineteenth century.

Return to Quarry Road gate

Retrace your path to Pogson Trig and then turn left along Tunks Ridge Fire Trail to your original starting point at the Quarry Road gate.

Walkers will note from the map that the fire trail extends beyond the sandstone swamp towards Berowra Creek and Fishponds. However, there is no forrmally constructed track down from the end of the fire trail to Fishponds because the area is a habitat for sensitive and threatened plants. The Park managers also do not encourage regular use of this undefined section because the terrain is steep and has an unstable surface.

Keep an eye out for other interesting residents

Black-faced Cuckoo Shrike *

Native Iris CR

Copper-tailed Skink *

Another of the noisy locals - cicdas like this Black Prince *

Noisy Friarbird *

*Illustrations Courtesy: (*) DEC and (CR) Carol Roach*

Gregor Newton

Juncus usitatus another of the moisture loving rushes seen frequently in the Park

Jeremy Steele

Grinding grooves, evidence of use by indigenous people

Jeremy Steele

Juvenile leaves of Eucalyptus camfieldii a threatened species

Ross Doig

Hakea propinqua has large warty fruit and needle-like leaves.

Rare examples of Australian bridge engineering preserved in the Park

McDonald Timber Truss Bridge

The McDonald Timber Truss Bridges which crossed Berowra and Tunks Creeks were based on a design by the Italian Andrea Palladio (1508-1580). This design was later modified by the NSW Dept. of Public Works (PWD), Chief Engineer William C. Bennett in 1859, to utilise the strengths of local timbers like ironbarks.

Jeremy Steele

This design was known as the "Old PWD Truss'. The design was expensive to maintain and had some structural faults. Only two of these bridges remain in NSW.

In 1884 John Mc Donald, the then PWD Bridge Engineer, produced a new design to overcome these problems and cater for increased loads. McDonald pioneered new technology using composite construction with timber and steel members used to the best structural advantage. His design became known as the McDonald Timber Truss.

Only five of these bridges now survive in NSW and all are of State Heritage significance. Only the bridge over Tunks Creek now survives out of the pair originally built in Galston Gorge in 1891.[1]

Today's bushwalkers have the pleasure of knowing, as they cross the remaining bridge when walking in the Berowra Valley Regional Park, that they are crossing examples of military and engineering history.

1. Based on an article by Don Fraser of the Engineering Hertage Committee, Engineers Australia, Sydney

Steele Military Bridge

The Steele Miltary Bridge across Berowra Creek on the Quarry Rd fire trail replaced an earlier log bridge. It was installed in 1964-65 to provide access from Hornsby to Dural, for fire-fighting vehicles. The replacement bridge came from the Forestry Commission at Coffs Harbour through the auspices of the Outer Sydney Bush Fire Prevention Association which funded the construction by Hornsby Shire Council

The Steele Bridge is a Warren Truss type through bridge design using galvanised mild steel pipe. After using it extensively and successfully in the South West Pacific campaign, the Australian Army sold off its stocks of Steele Bridges In about 1950. It is now rare to find an intact example of the Steele Bridge. The School of Military Engineering History Section believes that only three or four bridges are still in use in NSW today.[1].

George Foster

This bridge was previously known as the Bailey Bridge. It was thought to be a 1910 Sir Donald Bailey design used by the British Army in the Second World War. It is not a Bailey Bridge but an Australian bridge designed and produced in 1942.

As the Australian 6th and 7th Divisions and most of the 1st Corps troops were returning from the Middle East to South East Asia, on the SS Orcades, to face the rapidly advancing Japanese, the Corps' Chief Engineer Brigadier Steele realised Australian forces urgently needed heavy engineering equipment unavailable from Britain.

Brigadier Steele, later Major-General Sir Clive Selwyn Steele KBE DSO MC VD, the first Engineer-in-Chief ever appointed in the Australian Army, served in both World Wars. Between the Wars he built up a successful engineering consulting business.

He instructed Captains G T Colbach and R A Simpson, to design a heavy bridge to be fabricated in Australia. The design was completed in transit. A prototype was made by Hume Steel Limited by April 1942, tested and put into production.

1. This article was based on information provided by the School of Military Engineering History Section and Hornsby Shire Council.

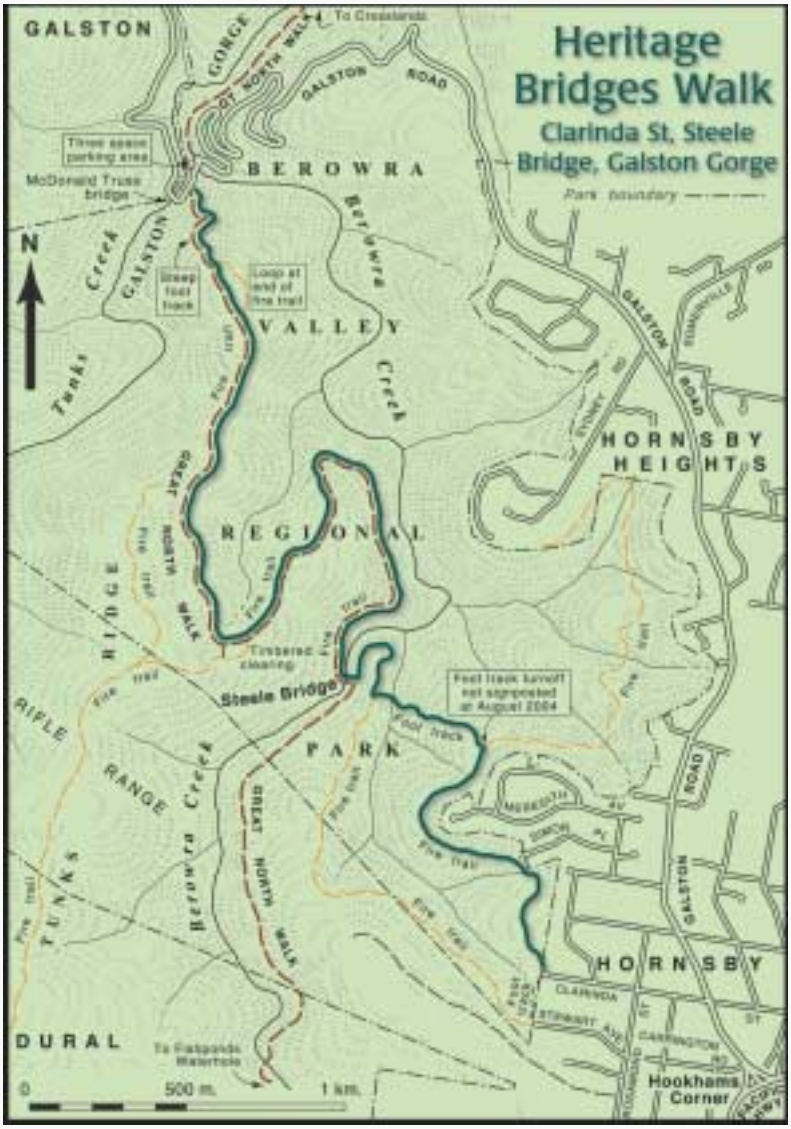
7: Heritage Bridges Walk

Clarinda St. Wetlands, Steele Military Bridge, Tunks Ridge, Galston Gorge and McDonald Truss Bridge

Start:	Clarinda Street Wetlands, Hornsby.
Route	Clarinda Street ,Steele Miltary Bridge, Tunks Ridge Rest Area
Distance:	5.4 km one-way
Grade:	Moderate to hard
Time:	3 - 6 hours
Transport:	Car at each end if walking one way
Trackstatus:	Begins on one fire trail then a steep track to join the next fire trail, includes sections of Great North Walk. The last 500 metres is difficult.

Synopsis

This walk begins at the western end of Clarinda Street, where cars may conveniently be left in the street. Most walkers would probably prefer to walk one way and arrange for a car to be available at Galston Gorge picnic area where there is parking for three cars. There is mobile phone coverage at Tunks Ridge Rest Area.



HERITAGE BRIDGES WALK GUIDE

Introduction

The Clarinda Street Constructed Wetland

This is a example of how Hornsby Council is controlling and treating storm water run-off. The area is now populated by a variety of frogs and birds, including wood ducks. Near the wetland is a population of the rare eucalypt *Eucalyptus camfieldii*. The wetland also contains a variety of sedges and rushes, and open water.

Take the fire trail to the right. Trees along the top of the ridge include Silver-top Ash *Eucalyptus sieberi*, Sydney Peppermint *Eucalyptus piperita*, Grey Gum *Eucalyptus punctata,* Red Gum *Angophora costata* and Black Sheoak *Allocasuarina littoralis*.

Lyndel Wilson

Members of the Clarinda Wetlands Remediation Group assisting Council in the ongoing maintenance of the area

Jeremy Steele

Large Sydney Peppermint Eucalyptus piperita

Jeremy Steele

Downstream view from the Steele bridge shows the dense foliage of the Water Gum, Black Wattle and Coachwood trees along the creek.

Lookout and westerly valley view

About 200 metres on the left a lookout on an interesting split rock shelf gives good westerly views into the valley. Continue downhill, veer left, cross a small creek, then proceed uphill to a junction at a large clearing. Take the left fire trail. Notice a large burl about four metres up the trunk of a Red Gum. The trail crosses a concrete watercourse and sewer line. After a big rock outcrop on the right, houses on Meredith Avenue are visible at the top of the cliff.

At the round sewer manhole, turn left from the fire trail onto a track which leads down the slope to a Casuarina forest on the left. Negotiate your way around fallen trees, then go down the constructed steps to the rocky creek lined by Coachwoods *Ceratopetalum apetalum*. Notice the unusual shape of the Coachwood to the right of the waterfall. Climb up the stone steps on the other side of the gully and turn right onto the fire trail which leads to Steele Miltary Bridge. There is a sign at this point indicating the distance to Galston Gorge (4 km) and Fishponds (4 km).

Gradually as the fire trail drops into the gully, the trees become taller. Sydney Peppermints, characterised by bark hanging in strips from the upper branches, and the large smooth barked Sydney Red Gums become more prevalent.

The sound of the creek can be heard as you advance and the undergrowth becomes more characteristic of rainforest. There are ferns, water gums, and stands of Grey Myrtle *Backhousia myrtifolia*. You may hear a tree creeper, a whipbird or a lyrebird.

Steele Military Bridge

At the foot of the hill the Steele Miltary Bridge[1], now one of only four remaining in service, crosses Berowra Creek.

Here the track joins the Great North Walk. A sign points left to Fishponds (a route that crosses the hazardous Rifle Range Safety Zone). For this walk, take the fire trail to the right, following the Great North Walk. Beside the fern lined trail are tall Coachwoods with patches of pale green lichen on the trunks. Other trees are Black Wattle *Callicoma serratifolia*, White Sally *Acacia floribunda*, Christmas Bush *Ceratopetalum gummiferum*, Blueberry Ash *Elaeocarpus reticulatus*, Water Gum *Tristaniopsis laurina*, and Forest Oak *Allocasuarina torulosa*. The Sydney Red Gums seem to increase in magnificence.

After a steep climb you encounter low open woodland with a scrubby understorey of heath species, dominated by white trunked Scribbly Gums *Eucalyptus haemastoma*. There are also Heath-leaved Banksia *Banksia ericifolia*, Dwarf Apple *Angophora hispida* and a paperbark teatree *Leptospermum trinervium*. A rare plant species, *Melaleuca deanei,* found here is a haven for honey eaters and other birds.

1. For more information see"Rare examples of Australian bridge engineering preserved in the Park", at the commencement of this walk description.

The Tunks Ridge Rest and Camping Area

The Tunks Ridge Rest Area, a large semi-cleared area where camping is permitted, is at the junction of the Great North Walk and another fire trail which leads to Quarry Road, Dural, along Tunks Ridge. Please be aware that the route of this fire trail crosses the Rifle Range Safety Area at an elevation similar to that of the range. If you wish to explore this long trail, do not enter the sign posted restricted area. From the rest area, proceed along the Great North Walk toward Galston Gorge 1.9 km away.

The track passes through shady open forest with a mature shrub layer. Trees include Red Bloodwood *Corymbia gummifera*, Yellow Bloodwood *Corymbia eximia,* Narrow-leaved Scribbly Gum *Eucalyptus racemosa* and Black Sheoak *Allocasuarina littoralis*. Three species of Geebung may be noted: Pine-leaved Geebung *Persoonia pinifolia,* Narrow-leaved Geebung *Persoonia linearis* with dark flaky bark and the Broad-leaved Geebung *Persoonia levis* with smooth pale green leaves and red branches. There are a few Grey Gums *Eucalyptus punctata.* In the understorey you can see Conesticks *Petrophile pulchella*.

Disturbed soil could be the scratchings of lyrebirds or echidnas. At a shady clearing at the summit the trees are unexpectedly tall, probably owing to the presence of deeper soil than usually found on ridge tops. The fire trail divides to become a short loop to enable fire fighting vehicles to turn around. Take either branch of the loop. Within the loop is a rock platform heath community where the plants have adapted to the shallow sandstone soil.

Walkers' register and steep final descent to Galston Gorge bridges

At the far end of the loop leave the fire trail to take the narrow rugged track 500 metres down to the creek in Galston Gorge.This picturesque section of the walk is suitable only for the very fit. Not far from the beginning of the track is a clearly marked metal box containing a register in which walkers are encouraged to record their journey and make appropriate comments. The track passes along a level rock ledge for about forty metres then resumes its steep descent, passing rock overhangs and squeezing through crevices. A scramble over rocks is made easier by eight or so metal rungs.

The McDonald Truss Bridge

Towards the end a section with a safety fence affords a good view of Galston Gorge with the bridge crossing Berowra Creek. Finally the picnic area and the road through Galston Gorge is reached. There are two bridges here as this is the confluence of Berowra and Tunks Creeks. The Tunks Creek Bridge[1] is of historical significance as it is now one of only five McDonald Truss Bridges remaining in use. The larger bridge over Berowra was replaced some years ago by a modern concrete bridge.

Jeremy Steele

Part of the steep section down to the Galston Gorge bridges

Jeremy Steele

Walkers must be willing and able to negotiate this steel-rung ladder.

Extended 6.8 km Rocky Fall Rapids Walk to Crosslands

From the Galston Gorge picnic area the walk can be extended along The Great North Walk to Crosslands, some 6.8 km away.

The walk traverses the deep gorge environment, climbs over rocky sparsely vegetated ridges and passes the present head of tidal influence at the location known as Rocky Fall Rapids.

From there the walk continues along the wooded flats beside the widening marine headwaters before reaching Crosslands.

A full walk description is not included in this guide but details are included in the Great North Walk brochure available from NPWS or Hornsby Shire Council.

1. See "Rare examples of Australian bridge engineering preserved in the Park" page 181 of this Guide

8: Lyrebird Gully Walk

Mt Kuring-gai to Berowra, one way

Route:
Glenview Road, Mt Kuring-gai, to Berowra Creek, to Crowley Road, Berowra

Distance: 9 km

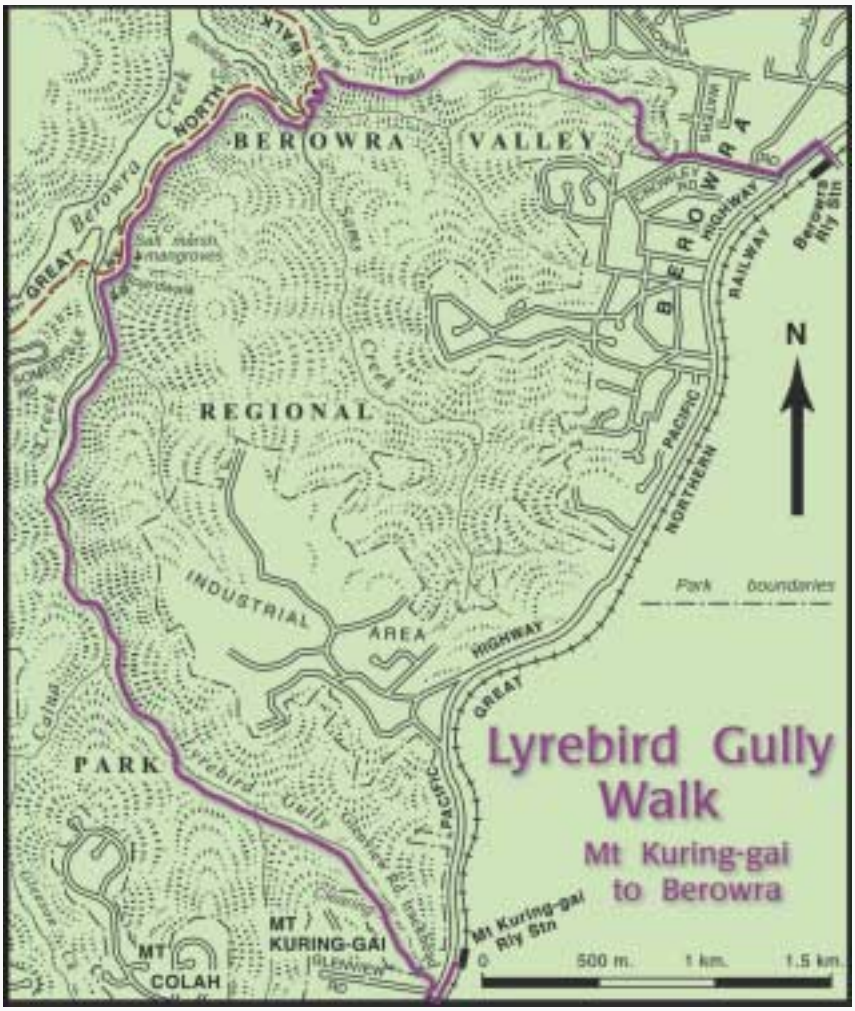
Grade: *Moderate to hard with two steep sections.*

Time: 4 to 6 hours

Track status:
Official marked track

Transport:
Two cars, one at each end; or one, and catch a train at one end; or simply use the train

Starting point:
Trackhead at the traffic-light intersection of Glenview Rd and the Pacific Highway, 100 m south of Mt Kuring-gai station



Synopsis

Some of the best walking in the Park occurs on this walk between two railway stations. First following Lyrebird Gully then joining Calna Creek and then Berowra Creek, the track passes a twin-log bridge and crosses a salt marsh. After shell middens, a big lookout boulder and mangroves, it continues along Sams Creek, leaving the valley up zigzag steps for the final stretch to Berowra. As this walk starts and ends near railway stations it is suitable for walkers without cars. For car users, parking is available at both ends. Alternative end points are Berkeley Close at Berowra Heights and Joalah Crescent, Berowra.

LYREBIRD GULLY WALK GUIDE

Mt Kuring-gai Station to Lyrebird Gully

The first section of the walk, a half-kilometre, steep, downhill, narrow, sealed road, follows the sewerage line. Weeds soon give way to such native plants as smooth-barked Sydney Red Gums *Angophora costata*, Turpentines *Syncarpia glomulifera*, Grey Gums *Eucalyptus punctata* and Sydney Peppermints *Eucalyptus piperita*, which provide shade over the road. Sandstone boulders become prominent.

The track joins Lyrebird Gully, whose waters you can hear flowing on the right. A flat grassy clearing, occasionally used for

camping, was created from spoil excavated during installation of deep sewer mains. The creek passes through large pipes under this clearing. The Pink Waxflower *Eriostemon australasius*, River Rose *Bauera rubioides* and native peas flower here in spring. Sydney Red Gums are the dominant trees.

At the clearing the path divides. Veer left as it becomes a bush track heading in a north-westerly direction. The track soon crosses a square-section concrete drain by a timber plank footbridge. In the sandy and rocky soil there are *Banksia*, scribbly gums and Red Bloodwood *Corymbia gummifera.* The track continues ever downwards. On the surrounding slopes wildflowers abound, which may include, depending on the season, spring-flowering *Boronia ledifolia*, *Leucopogon*, Lesser Flannel Flower *Actinotus minor*, flaky-barked teatrees *Leptospermum trinervium*, Common Fringe-lily *Thyanotus tuberosus* and ground orchids. This has been a picturesque walk so far, requiring modest agility as the route follows along the steep slope with the creek on the right.

Jamie Wright

Common Fringe-lily
Thyanotus tuberosus

Jeremy Steele

Eroded sandstone creek bed

Jeremy Steele

Specification for a hole: a recess, pebbles, plenty of water and heaps and heaps of time

Jeremy Steele

Wonderful range of colours and shapes in eroded overhang

Creek crossing to the waterfall

After about a kilometre, cross to the right of Lyrebird Gully over exposed sandstone flats and rock pool, with a cascade on the lower side. Black Wattles *Callicoma serratifolia* have started to appear along the creek. Below, the terrain begins to resemble a rainforest, with Coachwoods *Ceratopetalum apetalum*, Forest Oak *Allocasuarina torulosa* and Turpentines. Further on, ferns, tree ferns, grass trees, mintbushes, Black Wattles and Water Gums *Tristaniopsis laurina* abound. A notable feature is a sandstone wall about 75 m long and 2 - 5 m high with overhanging rock. About 100 m later there is a large Sydney Red Gum, the base of which appears to flow over the rocks. The track descends to creek level, where it is joined from the right by a creek bed in a shady glade featuring Coachwoods with their characteristic smooth bark marked with whitish blotches, and ferns.

Soon the path joins the creek bed, almost a potholed highway formed out of the natural stone. The track follows this rocky creek bed, along which there may be signs of flooding. The principal landmark at this point is an 8 m-high overhanging waterfall. Here water falls onto rocks to join a pool below. This is a pleasant place to pause for a while.

Calna Creek to the log bridge

Leave the creek bed at the waterfall. The track climbs a little away from the creek, and becomes drier. Near the top of the slope, pass under a series of massive eroded rock overhangs that would provide shelter in the wet. A hundred metres or so further on another valley can be seen entering from the left, with transmission towers and lines. This is Calna Creek, the waterflow from which can be heard as you traverse a drier open woodland slope. Somewhere out of sight below, Lyrebird Gully joins the bigger Calna Creek.

After about half a kilometre descend with an abrupt left turn down rough rock steps to what is now Calna Creek. Follow the creek bed lined with Coachwoods, possibly flooded after rains. Cross to the other side of Calna Creek using jumbled and tossed boulders —

Jeremy Steele

Watch carefully for the track markers that identufy the route.

Jeremy Steele

One of the local Water Monitors who may be watching you

Paul Fredrickson

Salt marsh is found in intertidal areas where the sediments are waterlogged by flooding at the highest tides. Where salt marsh does occur, it is usually—although not always—adjacent to and above stands of mangroves. Today, salt marshes in general have declined in extent in urban areas as a result of human influences.
One of the largest of the pockets of salt marsh in the Park occurs at the junction of Calna Creek and Berowra Creek, crossed by the boardwalk.
The animals and plants that inhabit salt marsh areas are highly specialised and low in diversity. This is because they are specifically adapted to salinity and waterlogged soils. Salt marsh is valuable as it provides a food source for estuarine animals and plants, and because it traps sediments and pollutants, so helping to maintain water quality.

somewhat easier said than done. (Look for direction markers on the rocks and trees.)

Rainforest-like conditions continue: look out for Water Vines *Cissus antarctica*, which may hang over the track. The path, sometimes obscured, proceeds along the creek bed over boulders. After several hundred metres, at an idyllic pool, re-cross the creek to the northern, or right-hand, side. A red arrow on a white diamond sign on a rock at the creek's edge confirms the way.

There follows, along this creek under a canopy of trees, what must be one of the best walking stretches in the Park. Waterholes, trees (Water Gums and Coachwoods), ferns, moss-covered rocks and perhaps sunbaking lizards and lyrebirds - hence the name 'lyrebird gully' - are attractions. Over the next kilometre the creek little by little flattens and broadens.

At the start of an open *Allocasuarina*-grove camping area, cross a watercourse by a 1.5 m timber bridge. Continue through the *Allocasuarina*. Eventually the path leaves the creek, and you cross an unnamed tributary. The area close to the junction of Calna and Berowra Creeks is dominated by mangroves[1], salt marsh and *Allocasuarina* signifying the tidal influence. During king tides the walking track may be knee-deep in water.

Continue through the forest of Black Sheoak *Allocasuarina torulosa,* between mangroves on the left and salt marsh and Swamp Oak *Casuarina glauca* on the right, to the twin-log footbridge. A sign gives the distance and direction of trackheads along the Great North Walk: 4.4 km from Mt Kuring-gai and 6 km to Berowra Waters. This is the halfway point on the Lyrebird Gully walk. Do not cross the bridge, which leads to the Crosslands picnic grounds, but keep to the same side of the creek and follow the arrow to Berowra Waters.

Calna Creek to Sams Creek

This stretch begins with an 80 m board walk across the salt marsh, dominated by grasses, sedges and succulent plants, and surrounded by *Casuarina glauca* on one side and mangroves on the other. Soon the mangroves become dense on the water's edge.

Somewhere out of sight Calna Creek joins the much broader Berowra Creek. Continue northwards, following the east bank of what is now Berowra Creek. Along this stretch are several shell middens. The creek is now 50–100 m or more across, depending on the tide.

Note the tall grass trees along the path. After about a kilometre there are some large boulders, together with a considerable shell midden testifying to the long term use of this lookout rock by the indigenous people over the ages. This site is protected under the *National Parks and Wildlife Service Act 1974*. The boulders remain an excellent vantage point to view the junction of Berowra and Sams Creeks, and the broadening of Berowra Creek both up- and downstream.

1. For details about mangroves see the information box in Walk 8: *Lyrebird Gully*.

Over two hundred years ago, in July 1789, Captain John Hunter surveyed Berowra Creek and arrived at 'The Woolwash' just below Sams Creek.

Sams Creek to zigzag steps

From the great boulder group, continue in an easterly direction away from Berowra Creek until it encounters Sams Creek. First invisible amongst the mangroves, this creek gradually comes into view on the left as the path, which can flood at high tide, follows up Sams Creek valley.

The sides of the gully rise high to left and right. Vegetation includes Rough-barked Apple *Angophora floribunda,* Forest Oak *Allocasuarina torulosa* and the Lilly Pilly *Acmena smithii* as well as a patch of salt marsh. Mangroves along the creek decrease as the water becomes fresher. There are mullet in the creek, and Chestnut Teal, White-throated Treecreepers and Eastern Yellow Robins may also be seen. This 350 m section includes a flat stretch subject to flooding at high tide followed by a creek-edge walk, at the end of which cross Sams Creek with caution, using the rocky and sometimes mossy ford. (Keep a lookout for the signposts here.)

Negotiate the rocky bed of an unnamed watercourse that joins Sams Creek directly opposite for about 50 m, bearing leftwards. The area is thickly vegetated with Water Gums *Tristaniopsis laurina*, Coachwoods *Ceratopetalum apetalum*, Swamp Oaks *Casuarina glauca* and Common Ground Fern *Calochlaena dubia*. The next stage is the zigzag steps. This is a steep ascent.

Zigzag steps to fire trail

Some 260 log and natural formation steps provide the means to climb up another 150 m out of the Sams Creek valley. You leave the rainforest and shaded slopes behind as you climb higher. Smooth-barked Sydney Red Gum *Angophora costata*, Sydney Peppermint *Eucalyptus piperita*, bloodwoods, Christmas Bush *Ceratopetalum gummiferum* and *Banksia* begin to become more common. Shaded rock overhangs support specimens of small ferns and Rock Lily *Dendrobium speciosum*. The steep climb eventually reaches a fire trail. Here it is 3.7 km to Crosslands and 2 km to Berowra station.To go to Berowra Station, turn right as you reach the fire trail.

Detour: Naa Badu Lookout

If you travel left along the fire trail for 300 m you will come to Naa Badu Lookout offering a panoramic view over Berowra Creek, where you have just travelled. This is a worthwhile detour as it offers a view of the previously hidden junction of Calna and Berowra Creeks. The name 'naa badu' in the Sydney Aboriginal language means 'see the water'.

Link to Walk 9 and Berkley Close

If you were to continue along the fire trail in the same direction you would join the route of Walk 9: *Berowra Waters*, reaching either Berkeley Close or Berowra Waters.

George Foster

The protected site at Sams Creek and the substantial area of midden (below) surrounding it, indicate the long-term use of the location by the indigenous people of the area.

George Foster

George Foster

Sams Creek and Merrymans Bay
According to local lore, Sams Creek was named after a fisherman who lived in a cave overlooking Halfmoon Bay. On the opposite, western, shore of Berowra Creek, just north of Sams Creek, is Merrymans Bay, named after lime burners and shingle splitters who used to sing at their work there.

George Foster

Rock Lily Dendrobium speciosum on a ledge high above Sams Creek

Gregor Newton

Pultenaea elliptica

Bob Salt

Macropods like the mound buiding Brush Turkey are becoming more common in the park.

Lyndel Wilson

Ants attending to lerps on the underside of leaves.

Hornsby Shire Council

Berowra
Mary Wall received the first land grant at Berowra in 1879 and by 1895 a tannery was established close to the Crowley Road trackhead. It was 1902 before a road was constructed down to Berowra Waters.

Fire trail to Crowley Road and Berowra Station

In springtime, the numerous wildflowers along this section of the track include Sydney Boronia *Boronia ledifolia*, pea flowers such as *Gompholobium grandiflorum* and *Pultenaea elliptica* and occasional Waratahs *Telopea speciosissima*. The abundance of smooth-barked Sydney Red Gums is emphasised by their pink-tan trunks.

At the Y fork after about a kilometre, keep to the right, following the Great North Walk sign to Berowra Station. (The steep concrete-surfaced left branch of the fire trail leads to Joalah Crescent at the top of the hill, and to residential housing.)

A few hundred metres later, just after crossing a creek underpass, keep straight ahead at the bushwalk marker post, taking the bush track and leaving the fire trail that diverges to the right.

Exit to Crowley Road trackhead

After a small creek is crossed, the track continues east following the southern bank. Re-cross the same creek a little later and head upwards over several broad exposed natural sandstone 'steps'. At the T junction after the 'steps', turn left. Wildflowers in this area include Large-leaf Bush Pea *Pultenaea daphnoides*, River Rose *Bauera rubioides*, Grey Spider Flower *Grevillea buxifolia*, teatree *Leptospermum trinervium*, Lesser Flannel Flower *Actinotus minor* and Sydney Boronia *Boronia ledifolia*.

Several flights of timber and stone steps make the walk easier. A set of eleven metal steps, replacing the original footholds cut into the rock face, announce the near completion of the walk.

A further 450 m later, after a final rise, you arrive at the trackhead in Crowley Road, near the junction with Berowra Waters Road. At the trackhead is an old bush school now used as a community hall.

From the roundabout near the trackhead take Berowra Waters Road east past the sports ground to Berowra station, about 750 m away. Turn left at the junction with the Pacific Highway. The station is at the top of the hill.

The Crowley Road trackhead is on the north west corner of Mary Wall's original sixty acre land grant. Mary is regarded as a pioneer of Berowra: her son Nathaniel was the first white child to be born in the district and the first school in the area was started at her home in 1894. Mary herself was born in County Limerick, Ireland in 1832.

Mary Wall Crescent in the development off Gully Road is named after her.

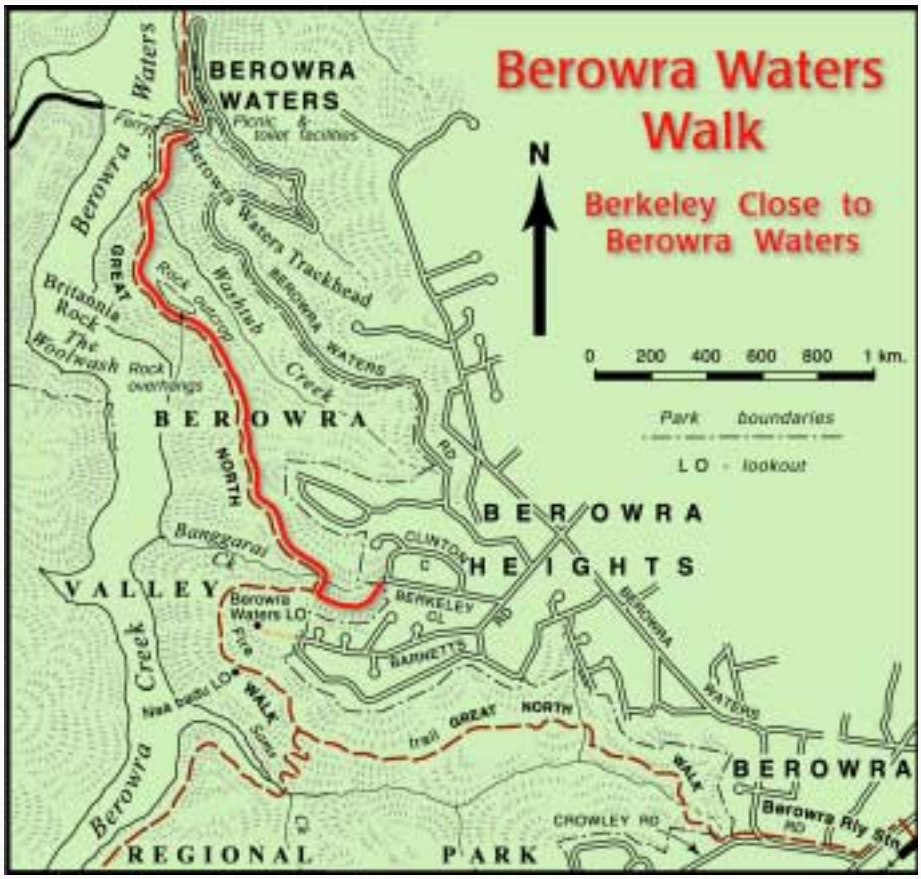
Rickard Road is named after the developer Arthur Rickard to whom Mary's daughter Elizabeth sold the land in 1910 for 1800 pounds. The land was later divided into 150 lots and sold at auction.

Further Reference

Joffe, M. 1992, *Yarns & Photos, Beautiful Old Berowra & Hornsby to the Hawkesbury*, Sandstone Press, Berowra Heights

9: Berowra Waters Walk

Berowra to Berowra Waters, one way



For those taking the train to Berowra Station, this walk may also be started from Crowley Road at the junction with Berowra Waters Road. This section is described at the end of the Lyrebird Gully walk 'Zigzag steps summit to Crowley Road', written for walkers heading towards Berowra.

Route:
Berkeley Close to Berowra Waters

Distance: 3.6 km

Grade: Moderate, with three steep sections

Time: 2–3 hrs

Transport:
Two cars, one at each end

Track status:
Official marked track, part of the Great North Walk

Synopsis

An upland walk offering fine views over Berowra Creek, finishing with a steep descent to the water's edge followed by a short walk to the ferry crossing at Berowra Waters.

BEROWRA WATERS WALK GUIDE

Fire trail to Great North Walk turn-off

This westward walk starts as a fire trail at the bottom of Berkeley Close. The walk follows Banggarai[1] Creek, a tributary of Berowra Creek Catchment. This watercourse is part of the Hawkesbury-Nepean System. The fire trail descends steeply over some 400 m to the Berowra Waters turn-off. The canopy thins overhead, with Black Sheoaks *Allocasuarina littoralis*, Sydney Red Gum *Angophora costata* and such eucalypts as Sydney Peppermint *Eucalyptus piperita*, Grey Gums *Eucalyptus punctata* and Broad-leaved Scribbly Gum *Eucalyptus*

1. *Banggarai* is a Sydney Aboriginal language word meaning Swamp Wallaby.

Jeremy Steele

Christmas Bush Ceratopetalum gummiferum and Sydney Red Gum Angophora costata shedding bark as it adds another growth ring

Jeremy Steele

Steel rung steps at the top of a steep section

Jamie Wright

Waratah Telopea speciosissima bud

haemastoma. Christmas Bush *Ceratopetalum gummiferum* can be seen flowering red at the end of the year. On the ridge on the left an eroded sandstone overhang introduces a length of cliff face.

Great North Walk turn-off to ridge-top

So far the walk has been along a wide fire trail. In order to proceed to Berowra Waters, take the narrow bush track on the right, descending towards Banggarai Creek. (The fire trail continuing onwards is from this point also part of the Great North Walk, leading to Crosslands and beyond.) Although the narrow bush track may seem a minor path, it is in fact part of the Great North Walk: it descends for about fifty log and rock steps to the creek, which is crossed by a timber footbridge.

The track rises out of the moist gully passing through Umbrella Ferns *Sticherus flabellatus* and River Rose *Bauera rubioides*. Here, in spring, Pale-pink Boronia *Boronia floribunda* and orchids are in bloom.

After following the creek's northern flank for about 200 m, the track gently rises and the moist gully is replaced by drier sandy country. The trunk of a 2 m-wide eucalypt, reduced to a shell, is a landmark. After a second creek bed, the track rises strenuously up the sandstone side of the valley assisted by some 60 log steps and a couple of iron U-treads set in the rock. Beside the path, boulders are being forced apart, infinitely slowly, by the roots of a Sydney Red Gum *Angophora costata*.

A pause at the top offers a view across to neighbouring ridges, dotted with occasional housing and open grassland.

Broad-leaved Scribbly Gums *Eucalyptus haemastoma,* recognisable by their white bark, mark the top of the climb, followed shortly after by a signpost marker indicating that the main track proceeds to the left (the track to the right connects to Currawong Road). Thirty metres later a rock outcrop offers a scenic place for a refreshment stop.

Ridge-top to flat-rock lookout

Yellow Bloodwoods *Corymbia eximia,* recognisable by their flaky bark, mark another change in the soil. These trees are characteristic of poor sandstone soils on ridge-tops. The track, after a gentle beginning and a short steep section, at once begins to descend back towards Berowra Creek. Here are *Banksia*, the geebung *Persoonia pinifolia*, Mountain Devil *Lambertia formosa*, native peas, grass trees *Xanthorrhoea* and an occasional Waratah *Telopea speciosissima*, as well as the first glimpses of the expanses of Berowra Creek way below.

More water views soon follow, and more *Allocasuarina* as the track continues its gradual descent. Another valley, known as Washtub Gully, joins on the right, the track running along a ridge between the two. The distant sound of cars on Berowra Waters Road may be heard.

Along this part of the walk, a sandstone cliff-face 6–10 m high rises on the upper side of the track and stretches for over 100 m. Among several interesting formations is a picturesque cavernous scalloped overhang with finely iron oxide-banded sandstone in honey-brown and white.

Soon Christmas Bush *Ceratopetalum gummiferum* begins to reappear, marking a change in the habitat.

Shortly after this the panoramic vistas of the broad expanses of Berowra Creek increase in frequency, eventually to reveal the housing and boats of the Berowra Waters settlement. Close to here, on the shore opposite Britannia Rock, is an area called the Woolwash. Here settlers from Arcadia, Dural and Castle Hill used to bring wool by boat to wash it in the strongly flowing spring water.

Through the trees walkers may spot the car ferry making one of its regular trips.

Lookout to the ferry

Shortly afterwards the tracks drops sharply. Timber and stone steps ease the route. At one point a rocky overhang and seat below offer a rest with a view of Berowra Waters.

Soon the water's edge is reached. Black Sheoaks *Allocasuarina littoralis* and Red Bloodwood *Corymbia Gummifera* and Yellow Bloodwood *Corymbia eximia* are present, and thickets of Common Hop Bush *Dodonaea triquetra* occur.

As the track proceeds downstream to the settlement, an extensive Aboriginal midden of oyster shells recalls the usage of this place by the previous occupants. Shell middens such as this are sites of cultural significance, and are protected under State government legislation.

A trickling waterfall signals the creek of Washtub Gully, which obtained its name from two deep rock holes which, when filled with water, were used by early settlers for their washing.

The vegetation in Washtub Gully includes Water Gums *Tristaniopsis laurina*, Coachwoods *Ceratopetalum apetalum* and Black Wattles *Callicoma serratifolia*.

The walk along Berowra Creek features a further change in vegetation to Rough-barked Apple *Angophora floribunda*, Cheese Trees *Glochidion ferdinandi* and Forest Oak *Allocasuarina torulosa*. This area is also one of the few locations where a rare grass known as *Ancistrachne maidenii* is found.

Below the track close to the water is another significant natural feature known as Britannia Rock, named for its resemblance to Britannia's head. Aboriginal carvings in this area show a pilot fish over the top of a shark, matched by similar designs at the mouth of Berowra Creek.

Finally the road at the Berowra Waters Tea House and the punt is reached. Picnic facilities and toilets are nearby.

George Foster

Overview of Berowra Waters ferry

Gregor Newton

Common Hop Bush Dodonaea triquetra

George Foster

Close to the end of the walk is a demonstration of outstanding tree engineering: a root system capable of holding several tonnes of horizontal Angophora for many years, and counting.

Paul fredrickson

The car ferry crosses Berowra Creek to link the extensive parking. picnic, restaurant and boating facilites that are located on both sides.

10: Salt Marsh Walk

Crosslands to Calna and Sams Creeks , return

Route: Crosslands car park to Calna Creek (or extend to Sams Creek) & return

Distance: 1.3 km (one way) with a possible extension to Sams Creek (adding about 1.0 km each way)

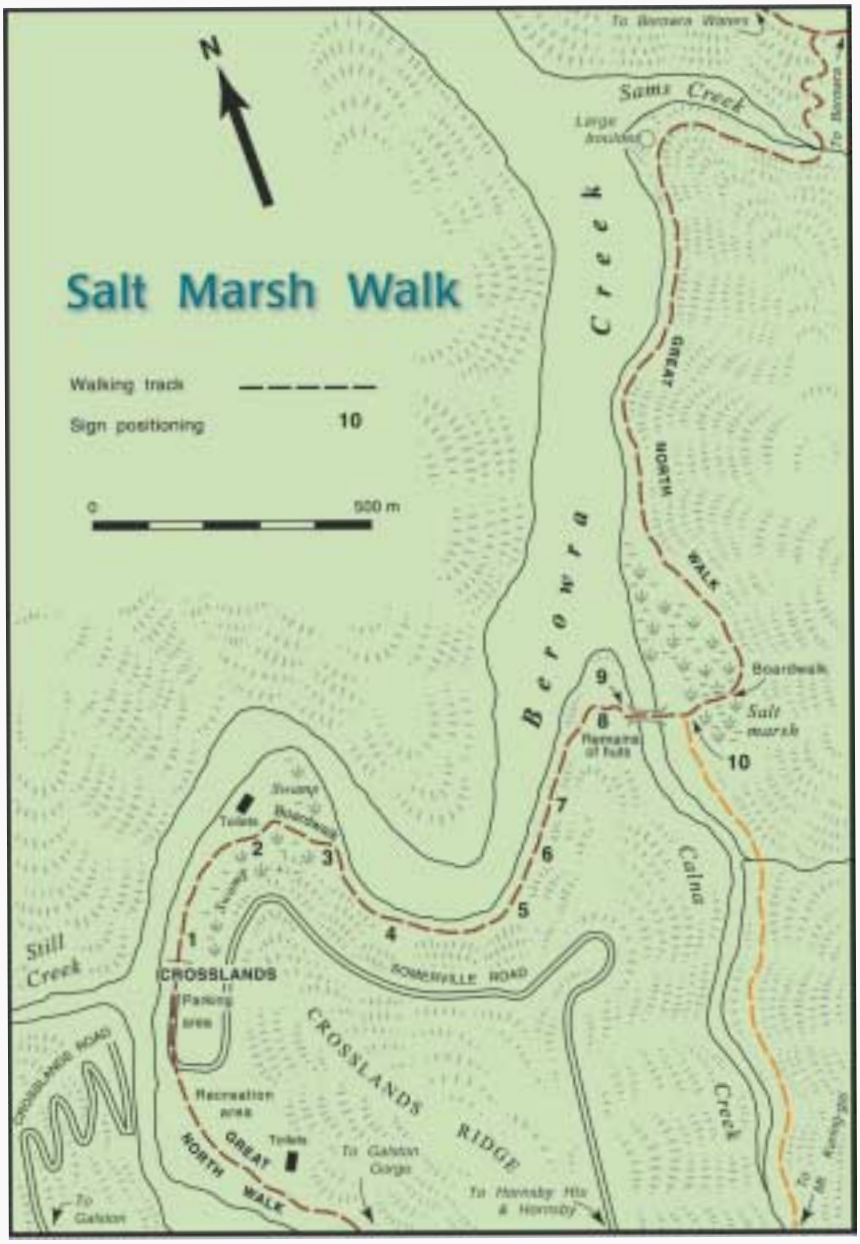
Grade: Moderate; two short steep sections, and some rough steps and rough sections of path

Time: To Calna Creek return: 1–2 hours

To Sams Creek return: 2-4 hours

Transport: Single car to Crosslands via Somerville Road, Hornsby Heights

Track status: Official track with interpretive signs to Calna Creek



SALT MARSH WALK GUIDE

Interpretive Walk

Synopsis

This interpretive walk (an educational section of the Great North Walk) follows the Great North Walk along Berowra Creek through mangroves, salt marshes, forest and woodlands, and past evidence of Aboriginal occupation. There are interpretative signs to Calna Creek.

The signs form part on an educational walk for school projects, years 4 to 8. There are separate school and teacher's kits for junior high and upper primary schools. These are available through Hornsby Shire Council's environmental education officer. A brochure on the interpretive trail is available from the Council and from NPWS.

Car park to Berowra Creek

Sign 1 Crosslands Interpretive Trail

From the north-eastern end of the Crosslands' car park follow the bitumen service track, noting Swamp Oaks Casuarina glauca, the mangroves by the creek, and the remnant trees from the former open-forest (Bloodwoods and Turpentines).

Sign 2 Swamped out the back

To the right of the picnic shelters follow the Great North Walk (Calna Creek 1.3 km) using the boardwalk across the swamp. This boardwalk is suitable for wheelchair use.. This swamp was originally a channel made by Burton Crossland to assist his boat building and construction activities. It has now formed naturally into a backswamp. On quiet days a lyrebird may be heard calling near here. The small plant with bright green angular leaves growing abundantly is New Zealand Spinach *Tetragonia tetragonioide*s, an edible bush food.

At the end of the boardwalk you come to the start of a mangrove section featuring two species: the River Mangrove *Aegiceras corniculatum* and the Grey Mangrove *Avicennia marina* var. *australisca*.[1] Patches of Sea Rush *Juncus kraussii* can be seen growing in the shallow water.

The track continues behind the mangroves, more or less following the high-tide line to a cleared area and large rock. Here a viewing platform takes advantage of views of the creek and to enable marine organisms to be inspected at low tide.

Sign 3 Original inhabitants

From this point on there is frequent evidence in shell middens of the original Kuring-gai Aboriginal people. While this track gives the appearance of an amenity provided by government authorities for the benefit of modern-day bushwalkers, it has probably been in use by humans since sea levels rose following the end of the last ice age thousands of years ago.

For an authoritative account of the indigenous people see section 2.2 'Aboriginal people of Berowra Valley'.

Berowra Creek to Calna Creek

As the track continues, the bushland on the right — mainly open-forest with Swamp Oak *Casuarina Glauca* and the occasional Grey Gum *Eucalyptus punctata* dominating — rises steeply towards Somerville Road.

Sign 4 All Creatures great and small

After the sign giving information on the animal species in the area there are a number of minor detours to avoid the high-tide line. Here and there large boulders have tumbled down from the slopes above.

1. For details about mangroves see the information box in Walk 8: *Lyrebird Gully.*

Jenifer Lewis

Mangroves at high tide when the intertidal area is a haven for small fish.

Hornsby Shire Council

Boardwalk viewing platform gives access to intertidal zone marine life.

George Foster

The track reveals an almost continuous layer of shells, all evidence of concentrated use by indigenous people of seafood resouces along the creek.

Buds and fruit of the Grey Gum Eucalyptus punctata should be present on the ground in this section of the walk.

Interpretive signs throughot the walk add greatly to understanding of the Salt Marsh environment.

Boys will be boys

As far back as we can remember, this tree between Calna and Sams Creeks has sprouted ropes on a regular basis. Modern management requirements include minimisation of risk for users of the Park under the threat of substantial public liability risks. It seems that the sheer pleasure of a swing and plunge still has the same attraction for kids today as it did for their grandfathers.

Val Williams

Xanrhorrhoea arborea in company with wildflowers.

Paul Fredrickson

Star fungi - one of many, often pungent fungi to be seen in the Park.

Sign 5 Catch the threats

At a major and particularly scenic bend in the stream the currents have so deepened the creek bed as to form a swimming hole and fishing place. The sign at this point gives information about the catchment.

Sign 6 The Rock Club

After the sign dealing with the rocky places as habitats for plants and animals the track crosses several more shell middens.

Lorraine Muscio

Sign 7 Bush supermarket

At the next sign grass trees *Xanthorrhoea arborea* are abundant. The sign explains the uses that the indigenous people and early settlers made of this plant.

Next, just after some stone steps — five down and three up — an old 1.5 m by 2 m concrete slab can be seen at the water's edge. This was once a landing stage serving the occupants of some fishing shacks formerly on the ridge above.

The track rises quite steeply, through open-forest thinning to woodland on the ridge. Near the top are the remnants of a sandstone wall embankment, built perhaps to support a track between the landing stage and the shacks.

Sign 8 Stop! Look! Listen! And smell!

At the ridge-top is another shell midden. As locations selected by the indigenous people for the consumption of shellfish would have had some particular advantage, the presence of a shell midden at this location, now hemmed in by trees, suggests that it might once have afforded a panoramic view of the two creeks, Berowra Creek below to the east and Calna Creek to the west.

An indistinct path crosses the main track at the interpretive sign, heading uphill to the right and following the ridge towards the hairpin bend on Somerville Road. About 40 m along it on the left are

galvanised iron and wooden frame remains of one of the fishing shacks. Back on the main route, the steep descent is made easier by log-formed steps.

Sign 9 Rock 'n roll

Just before the last descent there is a seat and a sign explaining the geological and natural history of the Hornsby plateau, and of the earth. Calna Creek is just below, and the steep cliffs of Gundah Ridge rise on the other side of it.

The twin logs bridging Calna Creek were dropped into place by an Australian Army helicopter when the Benowie walking track was formed in the 1980s.[1] The 700 mm wide boardwalk is most springy at the halfway point.

Calna Creek to Sams Creek

Calna Creek is fringed with mangroves at the log bridge. There is a walking track sign on the far side: the route to the right leads to Mt Kuring-gai (via Lyrebird Gully), that to the left continues the Great North Walk towards Berowra. Go left for this walk.

Sign 10 Fragile marsh

Almost at once a salt marsh is reached, crossed by a boardwalk. Calna Creek salt marsh, once threatened by sand-mining proposals in Berowra Creek, is one of the few salt marshes in the Sydney region not to have been filled in for sports fields, housing or industrial uses. It looks like an open paddock, yet it floods twice a day with each high tide; and at the spring and autumnal equinoxes it does so to a considerable depth. Sea Rush *Juncus kraussii*, Bare Twig-rush *Baumea juncea* and Austral Seablite *Suaeda australis* dominate. The marsh is fringed by stands of Swamp Oak *Casuarina glauca* and River Mangroves. In time, if sea levels do not rise rapidly and siltation continues, this area might be colonised by shrubs and trees and could become a river flat forest. Already *Casuarina glauca* has established small islands in the marsh.

For a slightly longer walk, a 1 km extension beyond the interpretive signs at the salt marsh is recommended. This rocky and undulating segment is described in Walk 8, Lyrebird Gully under the heading 'Calna Creek to Sams Creek'. It is as attractive as the first section, and the big rock at Sams Creek is the highlight at the end.

Return

The return to Crosslands 1.3 km from the salt marsh or 2.3 km from Sams Creek is likely to be much quicker than the outward walk. There are barbecue facilities at Crosslands.

George Foster

View of the northern end of Crosslands from the access road

Ken Turnidge

Ideal rendezvous for group canoeing

George Foster

Sandbar at the entrance to Calna Creek from the twin-log bridge

Jeremy Steele

The salt marsh may often appear dry and hard but is always waterlogged and subject to tidal inundation.

1. For a description of this operation see Story of the Park.

Paul Fredrickson

Superb views from Barnetts Lookout and track head facilites

Paul Fredrickson

Shaded open picnic space at Bellamy Street trackhead

Picnic places

Paul Fredrickson

Hornsby is promoted as the 'Bushland Shire' and as such offers innumerable places for informal picnics on bushwalking tracks as well as in suburban parks. Within the Park, Council and National Parks and Wildlife Services have formally equipped a number of places with picnic facilities, which are described below. Open fires are discouraged at most times owing to bushfire risk, so visitors should carry lightweight walkers' gas barbecue equipment. Camping facilities are restricted, for park management purposes, to the Council owned section of the riverside flats at Crossslands.

1 Bellamy Street, Pennant Hills

Conveniently situated at one of the original trackheads of the Benowie section of the Great North Walk (see Walk 1: *Jungo*) for picnics at the start or end of the walk, this grassy area is surrounded by bushland and has easy access from the nearby car park at the northern end of Bellamy Street. It is sunny at midday and is provided with a garbage bin and tap water. However, it is within sight of nearby houses.

Location and facilities of Picnic Places

	Location	Disab. access	Tables	Tap water	BBQ	Bins	WC	Camp	Other attraction	Access	Rating
1	Bellamy Street, Pennant Hills	Y	N	Y	N	Y	N	N		C, Ft	★
2	Historic Quarry, Thornleigh	N	N	N	N	N	N	N	History	Ft	★★
3	The Jungo on Berowra Creek	N	N	N	N	N	N	N		Ft	★
4	Lakes Reserve, Cherrybrook	Y	Y	Y	Y	Y	N	N	Playground, shops	C, Ft	★★
5	Rosemead Road, Hornsby	Y	Y	Y	E	Y	N	N		C, Ft	★★★
6	Top of Galston Gorge	Y	Y	N	N	N	N	N	Views	C	★★
7	Tunks Ridge	N	N	N	N	N	N	Y	Solitude	Ft	★★
8	Crosslands Reserve	Y	Y	Y	E	Y	Y	Y	Sports, space	C, Ft	★★★★
9	Barnetts Reserve, Berowra	Y	Y	Y	N	Y	N	N	Views,Playground	C	★★★
10	Berowra Waters	Y	Y	Y	E	Y	Y	N	Tourist, shops	C, Ft	★★★

C = car, E =electric barbecue, Ft = on foot along tracks, N = no, Y = yes.

2. Historic Quarry, Thornleigh

This is an atmospheric, shady picnic area surrounded by tall gum trees, set within the high rock walls of an old sandstone quarry. See Walks 1: *The Jungo* and 4: *Elouera* for access, which is on foot along rocky fire trails (about 250 m) from Timbarra Road or De Saxe Close in Thornleigh or (about 500 m) from the Bellamy Street trackhead described above. Logs for seating are the only facilities.

The Historic Quarry is popular with local youth groups for evening barbecues. See Chapter 2.3 for a description of the historic quarry and the zigzag railway.

3. The Jungo on Berowra Creek

The Jungo is a sunny clearing with bush all round and with no evidence of houses on the ridge-tops. It is approached on foot, along bushwalking tracks from Bellamy Street or Boundary Road trackheads, or on rocky fire trails from Schofield Parade in Pennant Hills or part of the Callicoma walk from Cherrybrook as discussed in Walks 1, 2 or 4.

Nearby, hidden in thick bush, is the junction of Berowra and Zig Zag Creeks. This spot, now filled with sediment, was once known as the 'junction swimming hole', one explanation of the 'jungo' name of the area.

4. Lakes Reserve, Cherrybrook

The suburban park Lakes Reserve, Cherrybrook, lies outside the Park, at the start of Walk 2: Callicoma. It is a convenient place to start walks into the Park. It has good picnic facilities and is close to shops and a garage. Ample parking is available nearby.

5. Rosemead Road, Hornsby

This pretty park in a tall blue gum setting is the starting point for the trackhead to Fishponds and the Great North Walk (see Walk 5: *Blue Gum: Joes Mountain circuit*). It is readily accessible by car at the northern end of Rosemead Road or can be approached on foot, down 230 bush steps from Quarry Road and Hornsby station. There is tap water, as well as an electric barbecue and roofed picnic tables.

George Foster

Open-air community theatre and picnic use was made of the quarry in the late 1980s after landscaping carried out by local Rotary Clubs.

Jamie Wright

Waratahs may be seen on most walks in the Park in the spring.

Paul Fredrickson

Pleasant picnic location at Lakes of Cherrybrook

Jeremy Steele

Tall Blue Gums at Rosemead Road Park

Gregor Newton

Galston Gorge lookout and picnic area

Jeremy Steele

Rest and camping area on Tunks Ridge suitable for serious walkers - but no drinking water.

Paul Fredrickson

Crosslands is a popular site for learning the basics of camping and responsible care of the environment.

Paul Fredrickson

Facilities match the variety and quality of the environment at Crosslands.

6. Top of Galston Gorge

This small paved picnic area, easily reached from an adjacent parking area for three cars, has picnic tables. It catches the afternoon sun and has excellent views over the bush-lined Berowra Creek valley in Galston Gorge. It is situated next to Galston Road, near the first of the hairpin bends, about 700 m west of Montview Road in Hornsby Heights.

7. Tunks Ridge

This bush camp ground is situated on the Great North Walk on top of Tunks Ridge in a pleasant woodland setting. The area has small clearings for three or four small tents, and wooden seats. Drinking water is not available. The site is approached only on foot along fire trails about 5 km from Dural or Hornsby, as shown in Walk 7: *Heritage Bridges*, or up the very steep bush track about 700 m from the car park near the Galston Gorge bridge over Berowra Creek. The only evidence of civilisation at night is the faint noise of cars negotiating the hairpin bends in Galston Gorge.

8. Crosslands Reserve

Crosslands Reserve is a major recreation reserve and the best-equipped of the picnic places within the Park. The extensive open grassed areas, surrounded by tall gums, are popular with families for picnics and games on fine weekends throughout the year. The area is well maintained by Council, which provides children's playground equipment, tap water, barbecues, picnic tables, bins, toilets and parking for many cars. It is a recognised camping ground on the Great North Walk. Group camping is possible but requires prior booking with Hornsby Council.

Access is by car down a partially sealed road, starting at a gate (locked at night) at the northern end of Somerville Road at Hornsby Heights. Alternatively, access is on foot along the Great North Walk, from Galston Gorge (6 km to the south) or from Berowra or Mt Kuring-gai Railway Stations (see Walk 8: *Lyrebird Gully*) about 6 km to the north and west.

Berowra Creek is broad and tidal at Crosslands. It is popular for fishing and provides excellent canoeing at high tide for many kilometres upstream to Rocky Fall

Rapids and downstream over the sandflats to Berowra Waters. Visitors do swim at Crosslands, but should be aware of potential risk from algae or stormwater pollution at certain times. Council rangers display signs when significant risks occur. Across the Creek are a private Field Studies Centre and a Scout Camp.

9. Barnetts Reserve, Berowra

This site is high over Berowra Creek Valley and has superb views downstream to Berowra Waters and upstream to Crosslands. It is accessible from the western end of Barnetts Road in Berowra Heights. A short walk of about 150 m from the carpark through a quiet and pretty woodland reserve leads to the panoramic views. Wooden tables and water are provided for picnickers. plus disabled access pathway.

10. Berowra Waters

Picnic tables, electric barbecues, tap water, bins and toilets are available near the boat-launching ramp on the western side of Berowra Waters. Access is by car along Galston Road from Galston or across the car ferry from the Hornsby side of Berowra Creek. Access on foot to the eastern side of the car ferry is along the Great North Walk. Restaurants, take-away food shops, scenic river cruises and boat hire are available here. This is a popular area, especially on summer weekends, when it can sometimes be difficult to find a car parking spot, and when the ferry queues may be long.

Jenifer Lewis

Adjoining the northern extremities of the Park is the popular haven of Berowra Waters, also favoured as an exclusive water-access-only hideaway and residential location. Berowra ferry links the steep hairpin curves of the original and narrow Berowra Road with the less demanding route to Arcadia and Dural. Restaurants, boat hire and maintenance complement the launching, parking, playground and picnic facilites. For boating enthusiasts, Berowra Waters provides access to whole Hawkesbury system.

The natural environment displays extraordinarily fine detail for those who choose to seek it out. Running water created the Berowra Valley and is the fundamental element that drives the wonderful biodiversity of the Park.
PHOTOGRAPH BY LORRAINE BECKETT AN ENTRANT IN HORNSBY SHIRE COUNCIL'S 2004 PHOTO COMPETITION

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Arthropod Groups

List of Arthropod Groups

Useful contacts

Park information

Berowra Valley Regional Park Trust

The Trust held its last meeting in June 2004.The Minister is currently considering alternative arrangements.

National Parks and Wildlife Service Ranger

Berowra Valley Regional Park
Lower Hawkesbury Area
National Parks and Wildlife Service
P.O. Box 3056, Asquith, NSW 2077
Phone: (02) 9472 9321
Fax: (02) 9457 9054
Email: lower.hawkesbury@npws.nsw.gov.au

Hornsby Shire Council

The General Manager
Hornsby Shire Council
P.O. Box 37, Hornsby, NSW 1630
Phone: (02) 9847 6832
Fax: (02) 9847 6598
E-mail: hsc@hornsby.nsw.gov.au

Local emergencies

Police - Fire - Ambulance 000
Bushfire restrictions (02) 9898 1356
Poisons information 131 126

Services

Police

Pennant Hills (02) 9484 3010
Hornsby (02) 9476 9799

Water Police (02) 9692 5411
Hospital: Hornsby (02) 9477 9123
Chemists (after hours) (02) 9477 1049

Weather information: 1900 937 107

Public transport

Transport infoline: 131 500

State Rail Authority:

Hornsby Station: (02) 9847 8507
Pennant Hills Station: (02) 9847 8523
Shorelink Bus Service: (02) 9457 8888

Other bodies

Great North Walk

Department of Lands
GNW Coordinator
437 Hunter Street
Newcastle 2300
Phone: (02) 4960 5155
Internet: http://www.dlwc.nsw.gov.au

Guided walks

- Council's Guided Bushwalks Program
  Bushland and Biodiversity Management Team
  (02) 9847 6832
- Chase Alive

Kalkari Visitor Centre
Ku-ring-gai Chase National Park
Ku-ring-gai Chase Road
Mount Colah 2079
Phone: (02) 9457 9853

Friends of Berowra Valley Regional Park
c/- Hornsby Shire Council
P.O. Box 37, Hornsby, NSW 1630

Registered bushcare groups
For information on becoming a volunteer in Hornsby Shire Council's bushcare program, contact Community Nursery and Earthwise Cottage, Phone: (02) 9484 9572.

Rifle Range
(President, North Shore District Rifle Association)
Phone: (02) 9675 3157
Operating hours
Open every day of the week, including Saturday and Sunday 9 a.m to 5 p.m., and Tuesday and Friday night, 7.30 to 9.30 p.m.
Closed on Good Friday and Christmas Day.

Controlling organisation: Department of Lands, licensed to the North Shore District Rifle Association

Species Lists

Mosses and liverworts

Alison Downing and Ron Oldfield

The species lists of Berowra Valley mosses and liverworts were assembled from the records of the Macquarie University Herbarium. It is probable that a detailed survey of the valley would add significantly to the species list presented here.

The allocation of species to a particular habitat should be used as a guide only.

Key to symbols

** = introduced*
c = cosmopolitan
D = Disturbed site
E = Epiphyte

TABLE 1.
Mosses in Berowra Valley Regional Park

Mosses	Ridge tops *Open-forest or Woodland*	Hill sides *Open-forest or Woodland*	Gullies *Closed-forest - Rainforest*
Campylopus clavatus	+	+	
Campylopus introflexus	+	+	+
Eccremidium pulchellum	+	+	
Barbula calycina	+D	+D	
[c]Bryum argenteum	+D	+D	
[c]Ceratodon purpureus	+D	+D	
Ditrichum difficile	+D	+D	
Philonotis tenuis	+D	+D	
**Trichostomum brachydontium*	+D		
[c]Weissia controversa	+D	+D	
Campylopus bicolor		+	
Campylopus pyriformis		+	
Dawsonia polytrichoides		+	+
Leucobryum candidum		+	+
Pogonatum subulatum		+	+
[c]Polytrichum juniperinum		+	+
Ptychomitrium australe		+	+
Rosulabryum billardierei		+	+
Sclerodontium pallidum		+	+
Thuidium sparsum		+	+
**Barbula unguiculata*		+D	
Bryum dichotomum		+D	+D
Bryum pachytheca		+D	
Bryum pseudotriquetrum		+D	
Bryum sullivanii		+D	
Dicranella dietrichiae		+D	+D
Fissidens humilis		+D	+D
Fissidens pallidus		+D	+D
Fissidens pungens		+D	+D
[c]Funaria hygrometrica		+D	+D
**Pseudosclero podium purum*		+D	
Achrophyllum dentatum			+
Dicranoloma billardieri			+
Dicranoloma menziesii			+
Distichophyllum crispulum			+
Fabronia australis			+E
Hypnodendron vitiense			+
Macrocoma tenue			+E
Macromitrium involutifolium			+E
Mittenia plumula			+
Pyrrhobryum mnioides			+
Pyrrhobryum parramattense			+
Racopilum cuspidigerum			+
Rhaphidorrhyn chium amoenum			+E
Wijkia extenuata			+E

TABLE 2.. Liverworts and hornworts in Berowra Valley Bushland Park

Leafy liverworts	Ridge tops Open-forest or Woodland	Hill sides *Open-forest or Woodland*	Gullies Closed-forest (Rainforest)
Lophocolea semiteres	+	+	+
Bazzania involuta		+	+
Cephaloziella exilifiora		+	+
Goebelobryum unguiculatum		+	+
Lethocolea squamata		+	+
Telaranea centipes		+	+
Acromastigum colensoanum			+
Balantiopsis diplophylla			+
Cheilolejeunea mimosa			+E
Chiloscyphyus fissistipus			+
Frullania monocera			+E
Frullania rostrata			+E
Frullania squarrosula			+E
Kurzia hippuroides			+
Lejeunea drummondii			+E
Lepidozia laevifolia			+
Telaranea dispar			+

Leafy liverworts	Ridge tops Open-forest or Woodland	Hill sides *Open-forest or Woodland*	Gullies Closed-forest (Rainforest)
Telaranea cf. herzogii			+
Zoopsis leitgebiana			+
Zoopsis setulosa			+
Thallose Liverworts and Hornworts			
Fossombronia sp.		+	+
[c]*Lunularia cruciata*		+D	+D
[c]*Phaeoceros laevis (hornwort)*		+D	+
Aneura alterniloba			+
Asterella drummondii			+
Metzgeria decipiens			+E
Pallavicinia lyellii			+
Podomitrium phyllanthus			+
Riccardia aequicellularis			+
Riccardia colensoi			+
Symphiogyna podophylla			+

Birds of Berowra Valley Regional Park

and adjacent areas of Berowra Creek Valley

David Martin

The bird list for the Berowra Valley Regional Park was first drawn up by Peter Roberts in 1968. The list draws on the work of Dick Cooper in 1975, Bradstock and Fitzharding in 1979, Mollie Crawford of the Hornsby Conservation Society as at December 1982, T. J. Fatchen and Associates in 1987, Peter and Judy Smith in 1990, and David Martin in 1997.

Names given follow that of the RAOU Checklist (Christidis and Boles 1994) and *A Field Guide to Australian Birds* (Slater *et al.* 2001).

The arrangement introduced in the present edition is, for the convenience of the non-specialist, alphabetically by common name, not in taxonomic order.

The symbol ~ indicates a repetition of the bird name in the listing.

Columns in the table

Column 1: Common name

Column 2: Scientific name

Column 3: Indicates movement of the bird for this area, broadly categorised as follows:

- R = sedentary (always present)
- M = movement to and from overseas
- N = internal nomadic movement
- D = seasonally dispersive (local migrant over short distances—e.g. high to lower altitudes)
- S = summer
- W = winter
- T = trans-Bassian migrant (breeds in Tasmania and migrates into south-eastern Australia)

Column 4: Frequency indicator scale for this area:

- 1 = very commonly seen or heard at any time;
- 2 = commonly seen or heard;
- 3 = may be seen or heard on occasions;
- 4 = seen or heard on occasions, perhaps at particular times of the year;
- 5 = very infrequently seen or heard; rare.

TABLE 3. Birds of the Park and Valley

Common name	Scientific name	Mvt	Fq
Bowerbird			
Satin Bowerbird	*Ptilonorhynchus violaceus*	R	3
Bronzewing			
Common Bronzewing	*Phaps chalcoptera*	R–N	3
Brush turkey			
Australian Brush-turkey	*ectura lathami*	R–D	5
Butcherbird			
Grey Butcherbird	*Cracticus torquatus*	R	1
Cicadabird			
Cicadabird	*Coracina tenuirostris*	S–N	4
Cockatoo			
Galah	*Cacatua roseicapilla*	R	1
Gang-gang ~	*Callocephalon fimbriatum*	R–N	5
Glossy Black ~	*Calyptorhynchus lathami*	R	5
Little Corella	*Cacatua sanguinea*	R	3
Sulphur-crested ~	*Cacatua galerita*	R	1
Yellow-tailed Black ~	*Calyptorhynchus funereus*	R–S–N	4
Corella	*[See Cockatoo]*		
Cormorant			
Black (or Great) ~	*Phalacrocorax carbo*	R–N	3
Little Black ~	*Phalacrocorax sulcirostris*	R–N	3
Little Pied ~	*Phalacrocorax melanoleucos*	R–N	2
Crake			
Spotless ~	*Porzana tabuensis*	R–N	4
Baillons ~	*Porzana pusilla*	R-N	5
Cuckoo			
Brush ~	*Cacomantis variolosus*	S–N	4
Channel-billed ~	*Scythrops novaehollandiae*	S–M	3
Common Koel	*Eudynamys scolopacea*	S–M	2
Fan-tailed ~	*Cacomantis flabelliformis*	R–S–N	3

Common name	Scientific name	Mvt	Fq
Horsfield's Bronze ~	*Chrysococcyx basalis*	S–M	4
Pallid ~	*Cuculus pallidus*	S–N	4
Pheasant Coucal	*Centropus phasianinus*	R	5
Shining Bronze ~	*Chrysococcyx lucidus*	S–N	4
Cuckoo-shrike			
Black-faced ~	*Coracina novaehollandiae*	R–N	2
Currawong			
Pied Currawong	*Strepera graculina*	R–N	1
Darter			
Darter	*Anhinga melanogaster*	R	3
Dollarbird			
Dollarbird	*Eurystomus orientalis*	S–M	3
Dotterel			
Black-fronted ~	*Elseyornis melanops*	R–N	4
Dove			
Peaceful ~	*Geopelia striata*	R	4
Bar-shouldered ~	*Geopelia humeralis*	R	3
Drongo			
Spangled Drongo	*Dicrurus bracteatus*	W–N	4
Duck			
Hardhead (or White-eyed) ~	*Aythya australis*	N	3
Pacific Black ~	*Anas superciliosa*	R–N	2
Australian Wood (Maned) ~	*Chenonetta jubata*	R	2
Chestnut Teal	*Anas castanea*	R	1
Grey Teal	*Anas gracilis*	N	3
Eagle			
Wedge-tailed Eagle	*Aquila audax*	R	3
Sea Eagle, White-bellied	*[See Sea-eagle]*		

Common name	Scientific name	Mvt	Fq
Egret			
Cattle ~	*Ardea ibis*	R–N	1
Great ~	*Ardea alba*	R–N	2
Fairy-wren			
Superb ~	*Malurus cyaneus*	R	2
Variegated ~	*Malurus lamberti*	R	1
Falcon			
Brown ~	*Falco berigora*	N	3
Australian Hobby (Little ~)	*Falco longipennis*	R–D	3
Peregrine ~	*Falco peregrinus*	R	3
Fantail			
Grey ~	*Rhipidura fuliginosa*	R–N	2
Rufous ~	*Rhipidura rufifrons*	S–D	3
Finch			
Chestnut-breasted Mannikin	*Lonchura castaneothorax*	R–N	5
Double-bar ~	*Taeniopygia bichenovii*	R–N	4
Red-browed ~	*Neochmia temporalis*	R	3
Flycatcher			
Black-faced Monarch	*Monarcha melanopsis*	S–N	3
Jacky Winter (Brown ~)	*Microeca fascinans*	R–N	5
Leaden ~	*Myiagra rubecula*	S–N	2
Satin ~	*Myiagra cyanoleuca*	S-N	4
Restless ~	*Myiagra inquieta*	R–N	3
Friarbird			
Little ~	*Philemon citreogularis*	S–N	3
Noisy ~	*Philemon corniculatus*	S–N	2
Frogmouth			
Tawny Frogmouth	*Podargus strigoides*	R	4
Galah	*[See Cockatoo]*		

Common name	Scientific name	Mvt	Fq
Goshawk			
Brown ~	*Accipiter fasciatus*	R–N	3
Grey ~	*Accipiter novaehollandiae*	R–N	4
Grassbird			
Little Grassbird	*Megalurus gramineus*	R–N	3
Grebe			
Australasian Grebe (Little ~)	*Tachybaptus novaehollandiae*	R–N	3
Gull			
Silver Gull	*Larus novaehollandiae*	R	1
Hawk			
Pacific Baza (Crested ~)	*Aviceda subcristata*	R	5
Heathwren			
Chestnut-rumped Heathwren	*Hylacola pyrrhopygia*	R	4
Heron			
Nankeen Night ~	*Nycticorax caledonicus*	N	5
Striated ~ (Mangrove ~)	*Butorides striatus*	R	3
White-faced ~	*Egretta novaehollandiae*	R–N	2
White-necked ~ (Pacific ~)	*Ardea pacifica*	N	3
Honeyeater			
Brown-headed ~	*Melithreptus brevirostris*	R–N	3
Eastern Spinebill	*Acanthorhynchus tenuirostris*	R	2
Lewin's ~	*Meliphaga lewinii*	R	2
New Holland ~	*Phylidonyris novaehollandiae*	R	2
Bell Miner	*Manorina melanophrys*	R	3
Noisy Miner	*Manorina melanocephala*	R	1
Scarlet ~	*Myzomela sanguinolenta*	S–N	3
Wattlebird, Little	*Anthochaera chrysoptera*	R–N	2

Common name	Scientific name	Mvt	Fq
Wattlebird, Red	*Anthochaera carunculata*	R–N	1
White-cheeked ~	*Phylidonyris nigra*	R	2
White-eared ~	*Lichenostomus leucotis*	R–S–D	2
White-naped ~	*Melithreptus lunatus*	S–N	3
Yellow-faced ~	*Lichenostomus chrysops*	S–N	2
Yellow-tufted ~	*Lichenostomus melanops*	S–N	3
Ibis			
Sacred ~ (Australian White ~)	*Threskiornis molucca*	R–D	2
Straw-necked ~	*Threskiornis spinicollis*	N–R–D	2
Kestrel			
Nankeen ~ (Australian ~)	*Falco cenchroides*	R–D	3
Kingfisher			
Azure ~	*Alcedo azurea*	R	3
Sacred ~	*Todiramphus sanctus*	S–N	2
Laughing Kookaburra	*Dacelo novaeguineae*	R	1
Kite			
Black-shouldered ~	*Elanus axillaris*	R–N	4
Whistling ~	*Haliastur sphenurus*	R–N	3
Koel	*[See Cuckoo]*		
Kookaburra	*[See Kingfisher]*		
Lapwing			
Masked Lapwing	*Vanellus miles*	R	1
Lorikeet			
Rainbow ~	*Trichoglossus haematodus*	R	1
Scaly-breasted ~	*Trichoglossus chlorolepidotus*	R–N	3
Little ~	*Glossopsitta pusilla*	N	3
Musk ~	*Glossopsitta concinna*	N	3

Common name	Scientific name	Mvt	Fq
Lyrebird			
Superb Lyrebird	*Menura novaehollandiae*	R	3
Magpie			
Australian Magpie	*Gymnorhina tibicen*	R	1
Magpie-lark			
Australian Magpie-lark	*Grallina cyanoleuca*	R	2
Martin			
Tree Martin	*Hirundo nigricans*	S–N	4
Miner	*[See Honeyeater]*		
Mistletoebird			
Mistletoebird	*Dicaeum hirundinaceum*	N	3
Moorhen			
Dusky Moorhen	*Gallinula tenebrosa*	R	2
Mound builder	*[See Brush Turkey]*		
Nightjar			
Australian Owlet ~	*Aegotheles cristatus*	R	4
White-throated ~	*Eurostopodus mystacalis*	S–N	5
Oriole			
Olive-backed Oriole	*Oriolus sagittatus*	S–N	3
Osprey			
Osprey	*Pandion haliaetus*	N	5
Owl			
Barn ~	*Tyto alba*	N	3
Boobook (Southern Boobook)	*Ninox novaeseelandiae*	R	3
Masked ~	*Tyto novaehollandiae*	R–N	5

Common name	Scientific name	Mvt	Fq
Powerful ~	*Ninox strenua*	R	4
Pardalote			
Spotted ~	*Pardalotus punctatus*	R	1
Striated ~	*Pardalotus striatus*	R–N	3
Parrot			
Australian King ~	*Alisterus scapularis*	R	2
Swift ~	*Lathamus discolor*	W–T	5
Pigeon			
Brown Cuckoo-Dove (Brown ~)	*Macropygia amboinensis*	R–N	3
Crested ~	*Ocyphaps lophotes*	R	1
Emerald Dove (Green-winged ~)	*Chalcophaps indica*	N	5
Superb Fruit-Dove	*Ptilinopus superbus*	N	5
White-headed ~	*Columba leucomela*	N	4
Wonga ~	*Leucosarcia melanoleuca*	R	3
Pipit			
Richard's Pipit	*Anthus novaeseelandiae*	R	4
Plover	*[See Lapwing]*		
Quail			
Brown ~	*Coturnix ypsilophora*	R–N	3
Painted Button-~	*Turnix varia*	R–N	4
Stubble ~	*Coturnix pectoralis*	R–N	4
Quail-thrush			
Spotted Quail-thrush	*Cinclosoma punctatum*	R	4
Rail			
Buff-banded ~	*Gallirallus philippensis*	R–D	5
Lewin's ~	*Rallus pectoralis*	D	5
Raven			
Australian Raven	*Corvus coronoides*	R–N	1

Common name	Scientific name	Mvt	Fq
Reed-warbler			
Clamorous Reedwarbler	*Acrocephalus stentoreus*	S–N	3
Robin			
Flame ~	*Petroica phoenicea*	W–D	4
Rose ~	*Petroica rosea*	W–D	3
Scarlet ~	*Petroica multicolor*	W–D	4
Yellow ~	*Eopsaltria australis*	R	2
Rosella			
Crimson ~	*Platycercus elegans*	R	1
Eastern ~	*Platycercus eximius*	R	1
Scrubwren			
Large-billed ~	*Sericornis magnirostris*	R	4
White-browed ~	*Sericornis frontalis*	R	1
Sea-eagle			
White-bellied Sea Eagle	*Haliaeetus leucogaster*	R	3
Shrike-tit			
Crested Shrike-tit	*Falcunculus frontatus*	R–N	4
Silvereye			
Silvereye	*Zosterops lateralis*	R–N	1
Sittella			
Varied Sittella	*Daphoenositta chrysoptera*	R–N	3
Snipe			
Latham's Snipe	*Gallinago hardwickii*	S–M	4
Spinebill	*[See Honeyeater]*		
Spoonbill			
Royal Spoonbill	*Platalea regia*	N	3

Common name	Scientific name	Mvt	Fq
Swallow			
Welcome Swallow	*Hirundo neoxena*	R	1
Swamphen			
Purple Swamphen	*Porphyrio porphyrio*	R	2
Swan			
Black Swan	*Cygnus atratus*	R–N	3
Swift			
White-throated Needletail (Spine-tailed ~)	*Hirundapus caudacutus*	S–M	4
Teal	*[See Duck]*		
Thornbill			
Brown ~	*Acanthiza pusilla*	R	1
Buff-rumped ~	*Acanthiza reguloides*	R	3
Striated ~	*Acanthiza lineata*	R	2
Yellow ~	*Acanthiza nana*	R	2
Yellow-rumped ~	*Acanthiza chrysorrhoa*	R	3
Thrush			
Grey Shrike-~	*Colluricincla harmonica*	R	2
Bassian ~ (Australian Ground ~, Scaly ~, White's ~)	*Zoothera lunulata*	R–N	5
Treecreeper			
White-throated Treecreeper	*Cormobates leucophaeus*	R	1
Triller			
White-winged Triller	*Lalage sueurii*	S–N	5
Wagtail (Fantail)			
Willie Wagtail	*Rhipidura leucophrys*	R	2
Warbler			

Common name	Scientific name	Mvt	Fq
Brown Gerygone	*Gerygone mouki*	R	2
Rock Warbler	*Origma solitaria*	R	3
White-throated Gerygone (Warbler)	*Gerygone olivacea*	S–N	3
Wattlebird	*[See Honeyeater]*		
Whipbird			
Eastern Whipbird	*Psophodes olivaceus*	R	1
Whistler			
Golden ~	*Pachycephala pectoralis*	R	2
Rufous ~	*Pachycephala rufiventris*	S–N	2
Woodswallow			
Dusky ~	*Artamus cyanopterus*	S–N	3
White-browed ~	*Artamus superciliosus*	S–N	4
White-breasted ~	*Artamus leucorhynchus*	S–N	5
INTRODUCED SPECIES			
Blackbird			
Common Blackbird	*Turdus merula*	R	3
Bulbul			
Red-whiskered Bulbul	*Pycnonotus jocosus*	R	1
Finch			
Nutmeg Mannikin (Spice Finch)	Lonchura punctulata	N	5
Myna			
Common Myna (Indian ~)	*Acridotheres tristis*	R	1
Pigeon			
Rock Dove (Feral Pigeon)	*Columba livia*	R	1
Turtle-Dove			
Spotted Turtle-Dove	*Streptopelia chinensis*	R	1
Sparrow			
House Sparrow	*Passer domesticus*	R	2
Starling			
Common Starling	*Sturnus vulgaris*	R	1

References

Christidis, L. & Boles, W.E. 1994, *The Taxonomy and Species of Birds of Australia and its Territories*, Royal Australasian Ornithologists Union, Hawthorn East, Vic.

Slater, Peter, Slater, Pat & Slater, Raoul 2001, *The Slater Field Guide to Australian Birds*, Rigby Publishers, Adelaide.

Plants of the Berowra Valley

Botanical names in the following lists follow Harden (1990-93). However, where these botanical names have subsequently changed, the synonym used in Harden is shown in brackets as ('syn.'–)

Authorities for new plant names published since Harden are included under 'References' (e.g. Michael 1995).

These vegetation species lists were compiled from earlier lists to which the following and others contributed in a range of capacities. In chronological order:

- Robert Coveny, first as a student, and later as a botanist with the Royal Botanic Gardens, Sydney;
- Horrie Hornshaw, Hornsby Conservation Society;
- Dr Joyce Vickery, botanist, Royal Botanic Gardens, Sydney;
- Dr Frank Burrows and Alison Edgecombe, School of Biological Sciences, Macquarie University;
- Peter and Judy Smith, Ecological Consultants;
- Val Williams, past-President, Australian Plants Society;
- Patricia Pike, Hornsby Conservation Society;
- Ross Doig, Australian Plants Society.

Native plant species

subsp. = subspecies, var. = variety, syn. = synonymous

TABLE 4. Native plants of the Berowra Valley

Genus and species	Common name
Acacia binervia	Coast Myall
Acacia brownii	
Acacia buxifolia subsp. *buxifolia*	Box-leaved Wattle
Acacia bynoeana	
Acacia decurrens	Black Wattle
Acacia echinula	Prickly Moses
Acacia elata	Mountain Cedar Wattle
Acacia elongata var. *dilatata*	Swamp Wattle
Acacia elongata var. *elongata*	Swamp Wattle
Acacia falcata	Sickle Wattle
Acacia filicifolia	Fern-leaved Wattle
Acacia floribunda	White Sally
Acacia hispidula	
Acacia implexa	Hickory Wattle
Acacia irrorata subsp. *irrorata*	Green Wattle
Acacia juncifolia subsp. *juncifolia*	Rush Leaf Wattle
Acacia linifolia	Flax-leaved Wattle
Acacia longifolia	Sydney Golden Wattle
Acacia longissima	
Acacia myrtifolia	Red-stemmed Wattle
Acacia oxycedrus	Spike Wattle
Acacia parramattensis	Parramatta Green Wattle
Acacia parvipinnula	Silver-stemmed Wattle
Acacia schinoides	
Acacia stricta	Straight Wattle
Acacia suaveolens	Sweet Wattle
Acacia terminalis	Sunshine Wattle
Acacia ulicifolia	Prickly Moses
Acianthus caudatus	Mayfly Orchid
Acianthus exsertus	Mosquito Orchid
Acianthus fornicatus	Pixie Caps
Acmena smithii	Lilly Pilly
Acrotriche divaricata	Ground Berry
Actinotus helianthi	Flannel Flower
Actinotus minor	Lesser Flannel Flower
Adiantum aethiopicum	Common Maidenhair
Adiantum formosum	Giant Maidenhair
Adiantum hispidulum	Rough Maidenhair
Aegiceras corniculatum	River Mangrove
Agrostis avenacea var. *avenacea* [See *Lachnagrostis filiformis*]	Blown Grass

Genus and species	Common name
Allocasuarina distyla	Scrub Sheoak
Allocasuarina littoralis	Black Sheoak
Allocasuarina nana	Dwarf Sheoak
Allocasuarina torulosa	Forest Oak
Almaleea paludosa	
Alphitonia excelsa	Red Ash
Alternanthera denticulata	Lesser Joyweed
Amperea xiphoclada var. *papillata*	Broom Spurge
Amperea xiphoclada var. *xiphoclada*	Broom Spurge
Ancistrachne maidenii	
Angophora bakeri	Narrow-leaved Apple
Angophora costata	Sydney Red Gum
Angophora floribunda	Rough-barked Apple
Angophora hispida	Dwarf Apple
Anisopogon avenaceus	Oat Speargrass
Aotus ericoides	Aotus
Apium prostratum subsp. *filiforme*	Sea Celery
Apium prostratum subsp. *prostratum*	Sea Celery
Aristida benthamii var. *spinulifera*	
Aristida calycina var. *calycina*	Dark Wiregrass
Aristida ramosa	
Aristida vagans	Threeawn Speargrass
Asplenium australasicum	Bird's Nest Fern
Asplenium flabellifolium	Necklace Fern
Asterolasia correifolia	Starbush
Astroloma humifusum	Native Cranberry
Astroloma pinifolium	Pine Heath
Astrotricha floccosa	Flannel Leaf
Astrotricha latifolia	Broad-leaf Star-hair
Astrotricha longifolia	Long-leaf Star-hair
Atriplex semibaccata	Creeping Saltbush
Austrodanthonia fulva (syn. *Danthonia linkii* var. *fulva*	
Austrodanthonia linkii (syn. *Danthonia linkii* var. *linkii*)	Wallaby Grass
Austrodanthonia tenuior (syn. *Danthonia tenuior*)	

Genus and species	Common name
Austromyrtus tenuifolia	Narrow-leaf Myrtle
Austrostipa pubescens	Tall Speargrass
Austrostipa ramosissima	Stout Bamboo Grass
Avicennia marina subsp. *australasica*	Grey Mangrove
Babingtonia pluriflora (syn. *Baeckea virgata*)	Twiggy Heath-myrtle
Backhousia myrtifolia	Grey Myrtle
Baeckea brevifolia	Short-leaved Heath-myrtle
Baeckea diosmifolia	Heath Myrtle
Baeckea imbricata	
Baeckea linifolia	Swamp Heath-myrtle
Baeckea virgata [See Babingtonia pluriflora]	
Banksia ericifolia subsp. *ericifolia*	Heath-leaved Banksia
Banksia integrifolia subsp. *integrifolia*	Coast Banksia
Banksia marginata	Silver Banksia
Banksia oblongifolia	
Banksia robur	Swamp Banksia
Banksia serrata	Old Man Banksia
Banksia spinulosa var. *collina*	Hairpin Banksia
Banksia spinulosa var. *spinulosa*	Hairpin Banksia
Bauera rubioides	River Rose
Baumea juncea	Bare Twig-rush
Baumea nuda	
Baumea rubiginosa	Soft Twig-rush
Bertya brownii	
Billardiera scandens	Appleberry
Blandfordia grandiflora	Northern Christmas Bell
Blandfordia nobilis	Christmas Bells
Blechnum ambiguum	
Blechnum cartilagineum	Gristle Fern
Blechnum nudum	Fishbone Water Fern
Boronia floribunda	Pale-pink Boronia
Boronia fraseri	Fraser's Boronia
Boronia ledifolia	Sydney Boronia
Boronia mollis	Soft Boronia
Boronia parviflora	Swamp Boronia
Boronia pinnata	Pinnate Boronia

Genus and species	Common name
Boronia rigens	Stiff Boronia
Boronia serrulata	Native Rose
Bossiaea ensata	Small Leafless Bossiaea
Bossiaea heterophylla	Variable Bossiaea
Bossiaea obcordata	Spiny Bossiaea
Bossiaea prostrata	
Bossiaea rhombifolia subsp. *rhombifolia*	
Bossiaea scolopendria	
Brachyloma daphnoides	Daphne Heath
Breynia oblongifolia	Coffee Bush
Brunoniella pumilio	Dwarf Blue Trumpet
Bulbine bulbosa	Bulbine Lily
Bulbophyllum exiguum	Autumn Bulbophyllum
Burchardia umbellata	Milkmaids
Bursaria spinosa	Blackthorn
Caesia parviflora	Pale Grass-lily
Caladenia carnea var. *carnea*	Pink Fairy
Caladenia catenata	White Caladenia
Caladenia testacea	Honey Caladenia
Calandrinia pickeringii	Pink Purslane
Caleana major	Large Duck Orchid
Callicoma serratifolia	Black Wattle
Callistemon citrinus	Crimson Bottlebrush
Callistemon linearis	Narrow-leaved Bottlebrush
Callitriche muelleri	
Callitris muelleri	Mueller's Cypress
Callitris rhomboidea	Port Jackson Pine
Calochilus campestris	Copper Beard Orchid
Calochilus gracillimus	Slender Beard Orchid
Calochilus robertsonii	Purplish Beard Orchid
Calochlaena dubia	Common Ground Fern
Calotis lappulacea	Yellow Burr-daisy
Calytrix tetragona	Fringe Myrtle
Cardamine paucijuga	
Carex appressa	Tall Sedge
Carex inversa	Knob Sedge
Carex fascicularis	Tassel Sedge
Cassinia aculeata	Dolly Bush
Cassinia aureonitens	Golden Cassinia
Cassinia compacta	Long-leaved Cassinia
Cassinia denticulata	Stiff Cassinia

Genus and species	Common name
Cassinia longifolia	Long-leaved Cassinia
Cassinia uncata	Sticky Cassinia
Cassytha glabella	Slender Devil's Twine
Cassytha pubescens	Common Devil's Twine
Casuarina cunninghamiana subsp. *cunninghamiana*	River Oak
Casuarina glauca	Swamp Oak
Caustis flexuosa	Curly Wig
Caustis pentandra	
Cayratia clematidea	Slender Grape
Centella asiatica	Pennywort
Centipeda cunninghamii	Common Sneeze Weed
Centipeda minima var. *minima*	Spreading Sneeze Weed
Centrolepis strigosa subsp. *strigosa*	Hairy Centrolepis
Ceratopetalum apetalum	Coachwood
Ceratopetalum gummiferum	Christmas Bush
Chamaesyce drummondii	Caustic Weed
Cheilanthes austrotenuifolia	Rock Fern
Cheilanthes distans	Bristly Cloak Fern
Cheilanthes sieberi subsp. *sieberi*	Mulga Fern
Chenopodium glaucum	
Chiloglottis seminuda	Ant Orchid
Chloanthes stoechadis	Ice Plant
Christella dentata	
Chrysocephalum apiculatum	Common Everlasting
Cissus antarctica	Water Vine
Cissus hypoglauca	Giant Water Vine
Citriobatus pauciflorus [See *Pittosporum multiflorum*]	Orange Thorn
Clematis aristata	Old Man's Beard
Clematis glycinoides var. *glycinoides*	Headache Vine
Clerodendrum tomentosum	Hairy Clerodendron
Comesperma ericinum	Matchheads
Comesperma volubile	Love Creeper
Commelina cyanea	Scurvy Weed
Conospermum ericifolium	Cone-seed
Conospermum longifolium subsp. *longifolium*	Cone-seed
Conospermum taxifolium	Smoke Bush
Conospermum tenuifolium	Grass-leaved Conospermum

Genus and species	Common name
Coprosma quadrifida	Prickly Currant Bush
Correa reflexa var. *reflexa*	Common Correa
Corybas aconitiflorus	Spurred Helmet Orchid
Corybas pruinosus	Toothed Helmet Orchid
Corymbia eximia (syn. *Eucalyptus eximia*)	Yellow Bloodwood
Corymbia gummifera (syn. *Eucalyptus gummifera*)	Red Bloodwood
Cotula australis	Common Cotula
Crassula sieberiana	Australian Stonecrop
Crowea saligna	
Cryptandra amara var. *amara*	
Cryptostylis erecta	Tartan Tongue Orchid
Cryptostylis subulata	Large Tongue Orchid
Cuscuta australis	Australian Dodder
Cyathea australis	Rough Treefern
Cyathochaeta diandra	
Cymbidium suave	Snake Orchid
Cymbopogon refractus	Barbed Wire Grass
Cynodon dactylon	Couch
Cyperus laevis	
Cyperus mirus	
Cyperus polystachyos	
Cyperus sanguinolentis	
Dampiera purpurea	
Dampiera stricta	
Danthonia [See *Austrodanthonia*]	
Darwinia biflora	
Darwinia fascicularis subsp. *fascicularis*	
Darwinia pedundularis	
Darwinia procera	
Davallia solida var. pyxidata (syn. *Davallia pyxidata*)	Hare's Foot Fern
Daviesia acicularis	
Daviesia alata	
Daviesia corymbosa	
Daviesia ulicifolia	Gorse Bitter Pea
Dendrobium linguiforme	Tongue Orchid
Dendrobium speciosum	Rock Lily

Genus and species	Common name
Dendrobium striolatum	Streaked Rock Orchid
Dendrobium striolatum	Streaked Rock Orchid
Dendrophthoe vitellina	Mistletoe
Deparia petersenii subsp. *congrua (syn. Lunathyrium petersenii)*	Japanese Lady Fern
Desmodium rhytidophyllum	Rusty Tic-trefoil
Desmodium varians	Slender Tic-trefoil
Deyeuxia quadriseta	Reed Bent
Dianella caerulea var. *caerulea*	Blue Flax Lily
Dianella caerulea var. *producta*	Paroo Lily
Dianella longifolia var. *longifolia*	
Dianella prunina	
Dianella revoluta var. *revoluta*	Mauve Flax Lily
Dichelachne crinita	Longhair Plumegrass
Dichelachne micrantha	Shorthair Plumegrass
Dichelachne rara	
Dichondra repens	Kidney Weed
Dicranopteris linearis	
Dictymia brownii	
Digitaria brownii	Cotton Panic Grass
Digitaria diffusa	
Digitaria parviflora	Small-flowered Finger Grass
Digitaria ramularis	
Dillwynia acicularis	
*Dillwynia floribunda [*syn. *Dillwynia floribunda* var. *floribunda]*	
*Dillwynia elegans [*syn. *Dillwynia floribunda* var. *teretifolia]*	
Dillwynia retorta species complex	Heathy Parrot Pea
Dillwynia sericea	
Diospyros australis	Black Plum
Dipodium punctatum	Hyacinth Orchid
Dipodium variegatum	Blotched Hyacinth Orchid
Dodonaea pinnata	
Dodonaea triquetra	Common Hop Bush

Genus and species	Common name
Dodonaea viscosa subsp. *spatulata*	
Doodia aspera	Rasp Fern
Doodia caudata (syn. *Doodia caudata* var. *caudata*)	Small Rasp Fern
Doryphora sassafras	Sassafras
Dracophyllum secundum	
Drosera auriculata	Sundew
Drosera binata	Forked Sundew
Drosera peltata	Sundew
Drosera pygmaea	Pygmy Sundew
Drosera spatulata	Sundew
Dysphania glomulifera subsp. *glomulifera*	
Echinopogon caespitosus var. *caespitosus*	Tufted Hedgehog Grass
Echinopogon ovatus	Forest Hedgehog Grass
Einadia hastata	Berry Saltbush
Einadia polygonoides	
Einadia trigonos subsp. *trigonos*	Fishweed
Elaeocarpus reticulatus	Blueberry Ash
Elaeocharis gracilis	Slender Spike-rush
Empodisma minus	Spreading Rope-rush
Entolasia marginata	Bordered Panic
Entolasia stricta	Wiry Panic
Entolasia whiteana	
Epacris crassifolia	
Epacris longiflora	Fuchsia Heath
Epacris microphylla var. microphylla	Coral Heath
Epacris obtusifolia	Blunt-leaf Heath
Epacris pulchella	NSW Coral Heath
Epacris purpurascens var. *purpurascens*	
Epaltes australis	Spreading Nut-heads
Epilobium billardierianum subsp. *billardiereanum*	Willowherb
Eragrostis benthamii	Lovegrass
Eragrostis brownii	Brown's Lovegrass
Eragrostis leptostachya	Paddock Lovegrass
Eragrostis parviflora	Weeping Lovegrass

Genus and species	Common name
Eriostemon australasius subsp. *australasius*	Pink Waxflower
Eucalyptus agglomerata	
Eucalyptus botryoides	Bangalay
Eucalyptus camfieldii	Heart-leaved Stringybark
Eucalyptus capitellata	Brown Stringybark
*Eucalyptus eximia [*See *Corymbia]*	
Eucalyptus globoidea	White Stringybark
*Eucalyptus gummifera [*See *Corymbia]*	
Eucalyptus haemastoma	Broad-leaved Scribbly Gum
Eucalyptus luehmanniana	Yellow-top Ash
Eucalyptus multicaulis	Whipstick Ash
Eucalyptus oblonga	Common Sandstone Stringybark
Eucalyptus paniculata	Grey Ironbark
Eucalyptus pilularis	Blackbutt
Eucalyptus piperita	Sydney Peppermint
Eucalyptus punctata	Grey Gum
Eucalyptus racemosa	Narrow-leaved Scribbly Gum
Eucalyptus resinifera	Red Mahogany
Eucalyptus saligna	Sydney Blue Gum
Eucalyptus sieberi	Silvertop Ash
Eucalyptus sparsifolia	Narrow-leaved Stringbark
Eucalyptus squamosa	Scaly Bark
Eucalyptus umbra	Bastard White Mahogany
Euchiton involucratus (syn. *Gnaphalium involucratum*)	
Euchiton sphaericum (syn. *Gnaphalium sphaericum*)	Common Cudweed
Eustrephus latifolius	Wombat Berry
Exocarpos cupressiformis	Cherry Ballart
Exocarpos strictus	Dwarf Cherry
Ficus coronata	Creek Sandpaper Fig
Ficus rubiginosa	Port Jackson Fig
Fimbristylis dichotoma	
Gahnia clarkei	Tall Saw-sedge
Gahnia erythrocarpa	
Gahnia melanocarpa	Black-fruit Saw-sedge
Gahnia microstachya	Slender Saw-sedge
Gahnia sieberiana	Red-fruited Saw-sedge

Genus and species	Common name
Galium binifolium	
Gastrodia sesamoides	Cinnamon Bells
Geitonoplesium cymosum	Scrambling Lily
Genoplesium fimbriatum	Fringed Midge Orchid
Geranium homeanum	Northern Cranesbill
Geranium solanderi var. *solanderi*	Native Geranium
Gleichenia dicarpa	Pouched Coral Fern
Gleichenia microphylla	Coral Fern
Gleichenia rupestris	Coral Fern
Glochidion ferdinandi var. *ferdinandi*	Cheese Tree
Glochidion ferdinandi var. *pubens*	Hairy Cheese Tree
Glossodia major	Waxlip Orchid
Glossodia minor	Small Waxlip Orchid
Glycine clandestina species complex	Love Creeper
Glycine microphylla	
Glycine tabacina species complex	Love Creeper
*Gnaphalium involucratum [*See *Euchiton involucratus]*	Cudweed
Gompholobium glabratum	Dainty Wedge Pea
Gompholobium grandiflorum	Large Wedge Pea
Gompholobium latifolium	Golden Glory Pea
Gompholobium minus	Dwarf Wedge Pea
Gompholobium pinnatum	Pinnate Wedge Pea
Gonocarpus micranthus	Creeping Raspwort
Gonocarpus salsoloides	Nodding Raspwort
Gonocarpus tetragynus	Poverty Raspwort
Gonocarpus teucrioides	Germander Raspwort
Goodenia bellidifolia subsp. *bellidifolia*	Daisy-leaved Goodenia
Goodenia hederacea subsp. *hederacea*	Violet-leaved Goodenia
Goodenia heterophylla	Variable-leaved Goodenia
Goodenia ovata	Hop Goodenia
Grammitis billardieri	Finger Fern
Gratiola pedunculata	Brooklime
Grevillea buxifolia subsp. *buxifolia*	Grey Spider Flower
Grevillea linearifolia	White Spider Flower

Genus and species	Common name
Grevillea mucronulata	Green Spider Flower
Grevillea sericea	Pink Spider Flower
Grevillea speciosa	Red Spider Flower
Gymnostachys anceps	Settler's Flax
Haemodorum corymbosum	Bloodroot
Haemodorum planifolium	Bloodroot
Hakea bakeriana	
Hakea dactyloides	Finger Hakea
Hakea gibbosa	
Hakea propinqua	
Hakea salicifolia	Willow-leaved Hakea
Hakea sericea	Needle Bush
Hakea teretifolia	Dagger Hakea
Hardenbergia violacea	False Sarsaparilla
Helichrysum elatum	White Paper Daisy
Hemarthria uncinata var. *uncinata*	Mat Grass
Hemigenia cuneifolia	Broad-leaved Hemigenia
Hemigenia purpurea	Narrow-leaved Hemigenia
Hibbertia aspera	Rough Guinea Flower
Hibbertia bracteata	Blue Mountains Guinea Flower
Hibbertia cistiflora	
Hibbertia dentata	Twining Guinea Flower
Hibbertia empetrifolia	Trailing Guinea Flower
Hibbertia fasciculata	
Hibbertia linearis	Showy Guinea Flower
Hibbertia monogyna	Leafy Guinea Flower
Hibbertia obtusifolia	Grey Guinea Flower
Hibbertia riparia	Erect Guinea Flower
Hibbertia rufa	
Hibbertia scandens	Climbing Guinea Flower
Histiopteris incisa	Bat's Wing Fern
Homalanthus populifolius (syn. *Omolanthus populifolius)*	Bleeding Heart
Hovea linearis	Narrow-leaf Hovea
Hovea longifolia	Long-leaf Hovea
Hybanthus monopetalus	Slender Violet-bush
Hybanthus vernonii subsp. *vernonii*	
Hydrocotyle laxiflora	Stinking Pennywort
Hydrocotyle peduncularis	
Hydrocotyle tripartita	Pennywort

Genus and species	Common name
Hydrocotyle verticillata	Shield Pennywort
Hymenanthera dentata	Tree Violet
Hymenophyllum cupressiforme	Common Filmy Fern
Hypericum gramineum	Small St. John's Wort
Hypericum japonicum	Matted St John's Wort
Hypolaena fastigiata	Tassel Rope-rush
Hypolepis muelleri	Harsh Ground Fern
Imperata cylindrica var. *major*	Blady Grass
Indigofera australis	Native Indigo
Isolepis inundata	Swamp Club-rush
Isolepis nodosa	Knobby Club-rush
Isopogon anemonifolius	Drumsticks
Isopogon anethifolius	Narrow-leaved Drumsticks
Jacksonia scoparia	Dogwood
Juncus continuus	
Juncus kraussii subsp. *australiensis*	Sea Rush
Juncus planifolius	Broad-leaf Rush
Juncus prismatocarpus	Branching Rush
Juncus subsecundus	Finger Rush
Juncus usitatus	Common Rush
Kennedia rubicunda	Red Kennedy Pea
Kunzea ambigua	
Kunzea capitata	Heath Kunzea
Lachnagrostis filiformis (syn. *Agrostis avenacea* var. *avenacea*)	Blown Grass
Lagenifera stipitata	Blue Bottle-daisy
Lambertia formosa	Mountain Devil
Lasiopetalum ferrugineum var. *ferrugineum*	Rusty Petals
Lasiopetalum joyceae	Joyce's Rusty Petals
Lasiopetalum parviflorum	Small Rusty Petals
Lasiopetalum rufum	Red Rusty Petals
Lastreopsis microsora	Creeping Shield Fern
Laxmannia compacta	Wire Lily
Laxmannia gracilis	Slender Wire Lily
Leionema dentatum (syn. *Phebalium dentatum*)	
Leionema diosmeum (syn. *Phebalium diosmeum*)	
Lepidosperma laterale	Variable Sword-sedge

Genus and species	Common name
Lepidosperma neesii	Stiff Rapier-sedge
Lepidosperma viscidum	
Leptocarpus tenax	Slender Twine-rush
Leptomeria acida	Sour Currant Bush
Leptospermum arachnoides	Spidery Teatree
Leptospermum grandifolium	Woolly Teatree
Leptospermum juniperinum	Prickly Teatree
Leptospermum laevigatum	Coast Teatree
Leptospermum polygalifolium subsp. *polygalifolium*	Lemon-scented Teatree
Leptospermum squarrosum	Peach-flowered Teatree
Leptospermum trinervium	Paperbark Teatree
Lepyrodia scariosa	Scale-rush
Leucopogon amplexicaulis	
Leucopogon appressus	
Leucopogon ericoides	Bearded Heath
Leucopogon esquamatus	
Leucopogon juniperinus	Bearded Heath
Leucopogon lanceolatus var. *lanceolatus*	Lance Bearded Heath
Leucopogon microphyllus var. *microphyllus*	
Leucopogon muticus	Blunt Beard Heath
Leucopogon setiger	
Lindsaea linearis	Screw Fern
Lindsaea microphylla	Lacy Wedge Fern
Liparis reflexa	Yellow Rock Orchid
Lissanthe strigosa	Peach Heath
Lobelia alata	Angled Lobella
Lobelia dentata	
Lobelia gibbosa	Tall Lobelia
Logania albiflora	
Lomandra brevis	
Lomandra confertifolia subsp. *rubiginosa*	
Lomandra cylindrica	
Lomandra filiformis subsp. *filiformis*	Wattle Mat-rush
Lomandra fluviatilis	
Lomandra glauca	Pale Mat-rush
Lomandra gracilis	

Genus and species	Common name
Lomandra longifolia	Spiny-headed Mat-rush
Lomandra micrantha subsp. *tuberculata*	Small-flowered Mat-rush
Lomandra multiflora subsp. *multiflora*	Many-flowered Mat-rush
Lomandra obliqua	Fish Bones
Lomatia myricoides	River Lomatia
Lomatia silaifolia	Crinkle Bush
Lunathyrium [See *Deparia*]	
Lycopodiella cernua (syn. *Lycopodum cernuum*)	Scrambling Clubmoss
Lycopodiella lateralis (syn. *Lycopodium laterale*)	Bushy Clubmoss
Lythrum hyssopifolia	Lesser Loosestrife
Marsdenia rostrata	Common Milk Vine
Marsdenia suaveolens	Scented Marsdenia
Maytenus silvestris	Narrow-leaved Orangebark
Melaleuca deanei	Dean's Honeymyrtle
Melaleuca linariifolia	Snow-in-summer
Melia azedarach	White Cedar
Micrantheum ericoides	
Microlaena stipoides var. *stipoides*	Weeping Meadow Rice Grass
Micromyrtus ciliata	Fringed Heath-myrtle
Microtis unifolia	Common Onion Orchid
Mirbelia rubiifolia	
Mitrasacme polymorpha	Mitre Weed
Monotoca elliptica	Tree Broom-heath
Monotoca scoparia	Prickly Broom-heath
Morinda jasminoides	Jasmin Morinda
Muehlenbeckia gracillima	Slender Lignum
Muellerina eucalyptoides	
Myoporum acuminatum	Mangrove Boobialla
Notelaea longifolia	Large Mock-olive
Notelaea ovata	Mock-olive
Olax stricta	
Olearia microphylla	Small-leaved Daisy-bush
Olearia tomentosa	
*Omalanthus populifolius [*See *Homolanthus populifolius]*	Bleeding Heart
Opercularia aspera	Coarse Stinkweed
Opercularia varia	Variable Stinkweed
Oplismenus aemulus	
Oplismenus imbecillis	Australian Basket Grass
Orthoceras strictum	Horned Orchid
Oxalis perennans	
Oxylobium [See *Podolobium*]	
Ozothamnus diosmifolius	White Dogwood
Palmeria scandens	Anchor Vine
Pandorea pandorana	Wonga Wonga Vine
Panicum obseptum	White Water Panic
Panicum simile	Two Colour Panic
Parsonsia brownii	Mountain Silkpod
Parsonsia straminea	Common Silkpod
Paspalidium distans	
Passiflora cinnabarina	Red Passionflower
Passiflora herbertiana	Yellow Passionflower
Patersonia fragilis	Short Purple Flag
Patersonia glabrata	Leafy Purple Flag
Patersonia longifolia	Dwarf Purple Flag
Patersonia sericea	Silky Purple Flag
Pellaea falcata	Sickle Fern
Persicaria decipiens	Slender Knotweed
Persicaria hydropiper	Water Pepper
Persicaria lapathifolia	Pale Knotweed
Persicaria praetermissa	
Persoonia lanceolata	Lance-leaf Geebung
Persoonia laurina subsp. *laurina*	Golden Geebung
Persoonia levis	Broad-leaved Geebung
Persoonia linearis	Narrow-leaved Geebung
Persoonia mollis subsp. *mollis*	Soft Geebung
Persoonia mollis subsp. *maxima*	
Persoonia pinifolia	Pine-leaved Geebung
Petrophile pulchella	Conesticks
*Phebalium dentatum [*See *Leionema dentatum]*	Toothed Phebalium
*Phebalium diosmeum [*See *Leionema diosmeum]*	
Phebalium squameum	Satinwood
Phebalium squamulosum	Scaly Phebalium
Philotheca buxifolia subsp. *buxifolia* (syn. *Eriostemon buxifolius*)	Wax Flower

Genus and species	Common name
Philotheca hispidula (syn. *Eriostemon hispidulus*)	Rough Wax Flower
Philotheca salsolifolia	
Philydrum lanuginosum	Frogsmouth
Phragmites australis	Common Reed
Phyllanthus hirtellus	
Phyllota grandiflora	
Phyllota phylicoides	Heath Phyllota
Pimelea curviflora var. *gracilis*	Rice Flower
Pimelea linifolia subsp. *linifolia*	Slender Rice Flower
Pittosporum multiflorum (syn. *Citriobatus pauciflorus*)	Orange Thorn
Pittosporum revolutum	Hairy Pittosporum
Pittosporum undulatum	Pittosporum
Plantago debilis	Slender Plantain
Platycerium bifurcatum	Elkhorn
Platylobium formosum subsp. *parviflorum*	Handsome Flat Pea
Platysace ericoides	Heathy Platysace
Platysace lanceolata	Native Parsnip
Platysace linearifolia	Carrot Tops
Plectranthus parviflorus	Cockspur
Plectorrhiza tridentata	Tangle Orchid
Plinthanthesis paradoxa	
Poa affinis	Tussock Poa
Poa labillardierei	Tussock
Podocarpus elatus	Plum Pine
Podocarpus spinulosus	
Podolobium ilicifolium (syn. *Oxylobium ilicifolium*)	Prickly Shaggy Pea
Podolobium scandens var. *scandens* (syn. *Oxylobium scandens* var. *scandens*)	Netted Shaggy Pea
Polymeria calycina	Swamp Bindweed
Polyscias sambucifolia	Elderberry Panax
Polystichum australiense	Mother Shield Fern
Pomaderris aspera	Hazel Pomaderris
Pomaderris discolor	
Pomaderris elliptica	Smooth Pomaderris
Pomaderris ferruginea	Rusty Pomaderris
Pomaderris intermedia	

Genus and species	Common name
Pomaderris lanigera	Woolly Pomaderris
Pomax umbellata	Pomax
Poranthera corymbosa	Clustered Poranthera
Poranthera ericifolia	Heath-leaved Poranthera
Poranthera microphylla	Small Poranthera
Portulaca oleracea	Pigweed; Purslane
Potamogeton tricarinatus	Floating Pondweed
Prasophyllum elatum	Tall Leek Orchid
Prasophyllum patens	Broad-lipped Leek orchid
Prasophyllum striatum	Streaked Leek Orchid
Pratia purpurascens	Whiteroot
Prostanthera incana	Velvet Mintbush
Prostanthera linearis	Narrow-leaved Mintbush
Prostanthera ovalifolia	Oval-leaf Mintbush
Pseuderanthemum variabile	Pastel Flower
Pseudognaphalium luteoalbum	Jersey Cudweed
Psilotum nudum	Skeleton Fork Fern
Pteridium esculentum	Bracken
Pteris tremula	Tender Brake
Pteris vittata	Chinese Brake
Pterostylis acuminata	Pointed Greenhood
Pterostylis longifolia	Tall Greenhood
Pterostylis nutans	Nodding Greenhead
Ptilothrix deusta	
Pultenaea daphnoides	Large-leaf Bush Pea
Pultenaea elliptica	
Pultenaea ferruginea	
Pultenaea flexilis	Graceful Bush-pea
Pultenaea hispidula	
Pultenaea linophylla	
Pultenaea paleacea	
Pultenaea paludosa [See *Almaleea]*	
Pultenaea polifolia	
Pultenaea retusa	
Pultenaea rosmarinifolia	
Pultenaea scabra	Rough Bush-pea
Pultenaea stipularis	Fine-leaf Bush-pea
Pultenaea villosa	
Pultenaea viscosa	
Pyrrosia rupestris	Rock Felt Fern

Genus and species	Common name
Ranunculus plebius	Hairy Buttercup
Rapanea howittiana	Brush Muttonwood
Rapanea variabilis	Muttonwood
Restio fastigiatus [See *Saropsis fastigiata*]	Tassel Rush
Rhytidosporum procumbens	White Marianthus
Ricinocarpos pinifolius	Wedding Bush
Rorippa laciniata	Marsh Cress
Rubus hillii	Molucca Bramble
Rubus parvifolius	Native Raspberry
Rumex brownii	Swamp Dock
Sambucus gaudichaudiana	White Elderberry
Samolus repens	Creeping Brookweed
Sarcochilus australis	Butterfly Orchid
Sarcocornia quinqueflora subsp. *quinqueflora*	Samphire
Sarcopetalum harveyanum	Pearl Vine
Saropsis fastigiata (syn. *Restio fastigiatus*)	Tassel Rush
Scaevola albida var. *albida*	Small-fruit Fan-flower
Scaevola ramosissima	Hairy Fan-flower
Schelhammera undulata	Lilac Lily
Schizaea bifida	Forked Comb Fern
Schizaea dichotoma	Branched Comb Fern
Schizaea rupestris	
Schizomeria ovata	Crabapple
Schoenoplectus mucronatus	
Schoenus apogon	Fluke Bogrush
Schoenus brevifolius	Zig-zag Bog-rush
Schoenus ericetorum	Heath Bog-rush
Schoenus imberbis	Beardless Bog-rush
Schoenus lepidosperma subsp. *pachylepis*	
Schoenus maschalinus	Dwarf Bog-rush
Schoenus melanostachys	Black Bog-rush
Schoenus moorei	
Schoenus paludosus	
Schoenus turbinatus	
Schoenus villosus	Hairy Bog-rush
Selaginella uliginosa	
Senecio bipinnatisectus	

Genus and species	Common name
Senecio diaschides	
Senecio glomeratus	
Senecio hispidulus	Hill Fireweed
Senecio lautus subsp. *dissectifolius*	Variable Groundsel
Senecio linearifolius	Fireweed Groundsel
Senecio minimus	
Senecio quadridentatus	Cotton Fireweed
Sigesbeckia orientalis subsp. *orientalis*	Indian Weed
Smilax australis	Sarsaparilla
Smilax glyciphylla	Sweet Sarsaparilla
Solanum americanum	Glossy Nightshade
Solanum campanulatum	
Solanum opacum	Green-berry Nightshade
Solanum prinophyllum	Forest Nightshade
Solenogyne bellioides	
Sphaerolobium vimineum	
Spiranthes sinensis subsp. *australis*	Ladies' Tresses
Spirodela punctata	
Sporobolus virginicus var. *virginicus*	Sand Couch
Sprengelia incarnata	Pink Swamp Heath
Stackhousia viminea	Slender Stackhousia
Stellaria flaccida	Forest Starwort
Stenocarpus salignus	Scrub Beefwood
Stephania japonica var. *discolor*	Snake Vine
Sticherus flabellatus	Umbrella Fern
Stipa [See Austrostipa]	
Stylidium graminifolium	Grass Triggerplant
Stylidium lineare	Narrow-leaved Triggerplant
Stylidium productum	Triggerplant
Styphelia longifolia	Long-leaf Styphelia
Styphelia triflora	
Styphelia tubiflora	Red Five-corners
Styphelia viridis subsp. *viridis*	Green Five-corners
Suaeda australis	Austral Seablite
Swainsonia galegifolia	Smooth Darling Pea
Syncarpia glomulifera	Turpentine

Genus and species	Common name
Synoum glandulosum	Scentless Rosewood
Telopea speciosissima	Waratah
Tetragonia tetragonioides	New Zealand Spinach
Tetrarrhena juncea	Wiry Ricegrass
Tetratheca ericifolia	Black-eyed Susan
Tetratheca glandulosa	
Tetratheca thymifolia	Black-eyed Susan
Thelymitra carnea	Tiny Sun Orchid
Thelymitra ixioides var. *ixioides*	Dotted Sun Orchid
Thelymitra nuda	Plain Sun Orchid
Themeda australis	Kangaroo Grass
Thysanotus tuberosus	Common Fringe-lily
Todea barbara	King Fern
Toona ciliata	Red Cedar
Trachymene incisa	Cut-leaf Trachymene
Trema tomentosa var. *viridis* (syn. *Trema aspera)*	Native Peach
Tricoryne simplex	Yellow Rush-lily
Tricostularia pauciflora	Needle Bogrush
Triglochin striatum	Streaked Arrowgrass
Triptilodiscus pygmaeus	
Tristania neriifolia	Water Gum
Tristaniopsis collina	Mountain Water Gum
Tristaniopsis laurina (syn. *Tristania laurina)*	Water Gum
Trochocarpa laurina	Tree Heath
Tylophora barbata	Bearded Tylophora
Typha orientalis	Broad-leaved Cumbungi
Urtica incisa	Stinging Nettle
Utricularia dichotoma	Fairy Aprons
Utricularia laterifolia	Small Bladderwort
Velleia lyrata	
Vernonia cinerea var. *cinerea*	

Genus and species	Common name
Veronica calycina	Hairy Speedwell
Veronica plebeia	Trailing Speedwell
Viminaria juncea	Native Broom
Viola hederacea	Ivy-leaved Violet
Wahlenbergia communis	Tufted Bluebell
Wahlenbergia gracilis	Sprawling or Australian Bluebell
Wahlenbergia littoricola	
Wahlenbergia multicaulis	Tadgell's Bluebell
Wahlenbergia stricta subsp. *stricta*	Tall Bluebell
Woollsia pungens	Snow Wreath
Xanthorrhoea arborea	Grass Tree
Xanthorrhoea media	Forest Grass-tree
Xanthorrhoea resinosa	
Xanthosia pilosa	Woolly Xanthosia
Xanthosia tridentata	Rock Xanthosia
Xylomelum pyriforme	Woody Pear
Xyris complanata	Feathered Yellow-eye
Xyris gracilis	Slender Yellow-eye
Xyris bracteata (syn. *Xyris gracilis* subsp. *laxa)*	
Zieria laevigata	
Zieria pilosa	Hairy Zieria
Zieria smithii subsp. A	Sandfly Zieria

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Introduced plant species

Not all the following plants are present in the Park, but they have been recorded in the broader valley. This list is included to encourage residents to recognise introduced plant species as weeds, and to consider whether they might wish to eliminate them, and plants likely to become weeds, from their gardens. It is also included to encourage people to seek Council advice about removing such plants from nearby areas. Such action would help prevent the spreading of introduced plant species into the Park.

Noxious weed categories

The *Noxious Weeds Act 1993* (NSW) divides noxious weeds into the categories in the following table. These determine the level of control required.

W1	The presence of the weed on land must be notified to the local control authority and the weed must be fully and continuously suppressed and destroyed.
W2	Weed must be fully and continuously suppressed and destroyed.
W3	Weed must be prevented from spreading and its numbers and distribution reduced.
W4a	Weed must not be sold, propagated or knowingly distributed and any part of the weed must be prevented from growing within 3 metres of the boundary of a property.
W4b	Weed must not be sold, propagated or knowingly distributed, and any existing weed must be prevented from flowering and fruiting.
W4c	Weed must not be sold, propagated or knowingly distributed and the weed must be prevented from spreading to an adjoining property.
W4d	The weed must not be sold, propagated or knowingly distributed and the weed must continuously suppressed and destroyed if it is: • 3 metres in height or less, or • within half a kilometre of remnant urban bushland, as defined by SEPP 19, and is not deemed by a council as having historical or heritage significance. • Or if it is more than 3 metres in height and not included in a management plan approved by council.
W4e	The weed must be fully and continuously suppressed and destroyed. All reasonable precautions must be taken to ensure produce, soil, livestock, equipment and vehicles are free of the weed before sale or movement from an infested area of the property.
W4f	The weed must not be sold, propagated or knowingly distributed. Any biological control or other control program directed by a local control authority must be implemented.
W4g	The weed must not be sold, propagated or knowingly distributed.

TABLE 5. Introduced plants of the Valley

Botanical name	Noxious weed classifi-cation	Common names
* *Acacia baileyana*		Cootamundra Wattle
* *Acacia dealbata*		Silver Wattle
* *Acacia fimbriata*		Fringed Wattle
* *Acacia mearnsii*		Black Wattle
* *Acacia podalyriifolia*		Queensland Wattle
* *Acacia extensa*		Wiry Wattle
* *Acacia pubescens* (v, V)		
* *Acacia pycnantha*		Golden Wattle
* *Acacia saligna*		Golden Wreath Wattle
* *Acer negundo*		Box Elder
* *Acetosa sagittata*	W4b	Turkey Rhubarb
* *Acetosella vulgaris*		Sorrel
* *Ageratina adenophora*		Crofton Weed
* *Ageratina riparia*		Mist Flower
* *Ageratum houstonianum*		Blue Billygoat Weed
* *Agrostis capillaris*		Browntop Bent
* *Ailanthus altissima*		Tree-of-heaven
* Aira cupaniana		Silvery Hair Grass
* *Alstroemeria pulchella*		New Zealand Christmas Bells
* *Alternanthera philoxeroides*		Alligator Weed
* *Alternanthera pungens*		Khaki Weed
* *Amaranthus deflexus*		Spreading Amaranth
* *Amaranthus viridis*		Green Amaranth
* *Anagallis arvensis*		Scarlet Pimpernel
* *Andropogon virginicus*		Whisky Grass
* *Anredera cordifolia*	W4c	Madeira Vine
* *Apium graveolens*		Celery
* *Araujia sericiflora* (syn. *Araujia hortorum*)		Moth Vine
* *Arctotheca calendula*		Capeweed
* *Ardisia crenulata*		Red Coral Berry
* *Arrhenatherum elatius var. bulbosum*		Bulbous Oatgrass
* *Artemisia verlotiorum*		Chinese Wormwood
* *Arundo donax*	W4a	Giant Reed
* *Asclepias curassavica*		Blood Flower
* *Asparagus officinalis*		Asparagus

Botanical name	Noxious weed classification	Common names
* *Aster subulatus*		Bushy Starwort
* *Atriplex patula*		
* *Atriplex prostrata*		Hastate Orache
* *Avena fatua*		Wild Oats
* *Axonopus affinis*		Narrow-leaved Carpet Grass
* *Bambusa spp.*		Bamboo
* *Bidens pilosa*		Cobbler's Pegs
* *Borago officinalis*		Borage
* *Brachychiton acerifolius*		Illawarra Flame Tree
* *Brassica fruticulosa*		Twiggy Turnip
* *Brassica juncea*		Indian Mustard
* *Brassica rapa* subsp. *silvestris*		Turnip
* *Briza maxima*		Blowfly Grass
* *Briza minor*		Shivery Grass
* *Briza subaristata*		
* *Bromus catharticus* (syn. *Bromus unioloides*)		Prairie Grass
* *Bromus diandrus*		Great Brome
* *Bryophyllum pinnatum*		Live Plant
* *Bryopyllum delagoense*		Mother-of-millions
* *Buddleja madagascariensis*		Butterfly Bush
* *Callitriche stagnalis*		Common Starwort
* *Canna indica*		Canna Lily
* *Capsella bursa-pastoris*		Shepherd's Purse
* *Cardamine hirsuta*		Common Bittercress
* *Cardiospermum grandiflorum*	W4c	Balloon Vine
* *Celtis sinensis*		Chinese Celtis
* *Centaurium erythraea*		Common Centaury
* *Centaurium tenuiflorum*		
* *Cerastium glomeratum*		Mouse-ear Chickweed
* *Cestrum parqui*	W2	Green Cestrum
* *Cestrum aurantiacum*		Orange Cestrum
* *Chamaecytisus palmensis*		Tree Lucerne
* *Chenopodium album*		Fat Hen
* *Chenopodium ambrosioides*		Mexican Tea
* *Chenopodium murale*		Nettle-leaf Goosefoot
* *Chloris gayana*		Rhodes Grass

Botanical name	Noxious weed classification	Common names
* *Chlorophytum comosum*		Spider Plant
* *Chlorophytum comosum* cv. *Variegatum*		Spider Plant
* *Chrysanthemoides monilifera* subsp. *monilifera*	W2	Boneseed
* *Cichorium intybus*		Chicory
* *Ciclospermum leptophyllum*		Slender Celery
* *Cinnamomum camphora*	W4d	Camphor Laurel
* *Cirsium vulgare*		Spear Thistle
* *Citrullus lanatus*		Wild Melon
* *Cobaea scandens*		Cup and Saucer Vine
* *Colocasia esculenta*		Taro; Elephant's Ear
* *Conium maculatum*		Hemlock
* *Conyza albida*		Tall Fleabane
* *Conyza bilbaoana*		Canadian Fleabane
* *Conyza bonariensis*		Flaxleaf Fleabane
* *Conyza canadensis var. canadensis*		Canadian Fleabane
* *Conyza parva*		Small Fleabane
* *Coprosma repens*		Looking-glass Bush
* *Coreopsis lanceolata*		Coreopsis
* *Coronopus didymus*		Lesser Swinecress
* *Cortaderia selloana*	W2	Pampas Grass
* *Corymbia citriodora*		Lemon-scented Gum
* *Cosmos bipinnatus*		Cosmos
* *Cotoneaster glaucophyllus*		Cotoneaster
* *Cotula coronopifolia*		Water Buttons
* *Crassocephalum crepidioides*		Thickhead
* *Crassula crepidoides*		Pride of London
* *Crataegus monogyna*		Hawthorn
* *Crocosmia X crocosmiiflora*		Crocosmia; Montbretia
* *Crotalaria semperflorens*		
* *Cyathea cooperi*		Straw Treefern
* *Cymbalaria muralis*		Ivy-leaved Toadflax
* *Cyperus brevifolius*		Mullumbimby Couch
* *Cyperus congestus*		
* *Cyperus eragrostis*		Umbrella Sedge
* *Cyperus rotundus*		Nutgrass
* *Cyrtomium falcatum*		Holly Fern

Botanical name	Noxious weed classification	Common names
* *Daucus carota*		Wild Carrot
* *Delairea odorata*	W4d	Cape Ivy
* *Dietes* sp.		
* *Digitaria ciliaris*		Summer Grass
* *Digitaria didactyla*		Queensland Blue Couch
* *Digitaria sanguinalis*		Summer Grass
* *Dipogon lignosus*		Dolichos Pea
* *Duchesnea indica*		Wild Strawberry
* *Echinocholoa crus-galli*		Barnyard Grass
* *Echium plantagineum*		Paterson's Curse
* *Ehrharta calycina*		Perennial Veltgrass
* *Ehrharta erecta*		Panic Veltgrass
* *Ehrharta longiflora*		Annual Veltgrass
* *Eichhornia crassipes*	W1	Water Hyacinth
* *Eleusine indica*		Crowsfoot Grass
* *Elodea canadensis*		Canadian Pond Weed
* *Epilobium ciliatum*		Glandular Willow Herb
* *Eragrostis curvula*		African Lovegrass
* *Erigeron karvinskianus*		Bony-tip Fleabane
* *Eriobotrya japonica*		Loquat
* *Erythrina x sykesii*		Indian Coral Tree
* *Erythrina crista-galli*		Cockspur Coral Tree
* *Euphorbia cyathophora*		Painted Spurge
* *Euphorbia peplus*		Petty Spurge
* *Facelis retusa*		
* *Ficus elastica*		India Rubber Tree
* *Ficus pumila*		Creeping Fig
* *Foeniculum vulgare*		Fennel
* *Freesia* hybrids		Freesia
* *Fumaria muralis* subsp. *muralis*		Wall Fumitory
* *Fumaria bastardii*		Bastards Fumitory
* *Galinsoga parviflora*		Potato Weed
* *Gamochaeta americana* (syn. *Gnaphalium americanum*)		
* *Gamochaeta pennsylvatica* (syn. *Gnaphalium pennsylvanicum*)		Cudweed
* *Genista monspessulana*	W4b	Montpellier Broom
* *Genista stenopetala*		Madeira Broom

Botanical name	Noxious weed classification	Common names
* *Gibasis geniculata*		Tahitian Bridal Veil
* *Gleditsia triacanthos*		Honey Locust
* *Gnaphalium coarctatum*		Purple Cudweed
* *Gomphocarpus fruticosus*		Narrow-leaved Cotton Bush
* *Gomphocarpus physocarpus*		Balloon Cotton Bush
* *Grevillea robusta*		Silky Oak
* *Harpephyllum caffrum*		Kaffir Plum
* *Hedera helix*		English Ivy
* *Hedychium gardnerianum*		Yellow Ginger Lily
* *Holcus lanatus*		Yorkshire Fog
* *Howea forsteriana*		Lord Howe Island Palm
* *Hydrangea macrophylla*		Hydrangea
* *Hydrocotyle bonariensis*		Pennywort
* *Hypericum perforatum*	W2	St Johns Wort
* *Hypochaeris glabra*		Smooth Catsear
* *Hypochaeris radicata*		Catsear
* *Impatiens walleriana*		Impatiens
* *Ipomoea indica*	W4c	Blue Morning Glory
* *Ipomoea purpurea*		Morning Glory
* *Jacaranda mimosifolia*		Jacaranda
* *Jasminum mesneyi*		Yellow Jasmine
* *Jasminum polyanthum*		
* *Juncus bufonius*		Toad Rush
* *Juncus cognatus*		
* *Juncus microcephalus*		
* *Lactuca saligna*		Willow-leaved Lettuce
* *Lactuca serriola*		Prickly Lettuce
* *Lagerostroemia indica*		Crepe Myrtle
* *Lagurus ovatus*		Hare's Tail Grass
* *Lamium amplexicaule*		Dead Nettle
* *Lantana camara*	W2	Lantana
* *Lepidium africanum*		Common Peppercress
* *Lepidium bonariense*		Argentine Peppercress
* *Leptospermum petersonii*		Lemon-scented Teatree
* *Ligustrum lucidum*	W4b	Large-leaf Privet
* *Ligustrum sinense*	W4b	Small-leaf Privet
* *Lilium formosanum*		Formosan Lily
* *Liquidambar styraciflua*		Sweetgum

Botanical name	Noxious weed classification	Common names
* *Lolium* hybrids		Ryegrass
* *Lomandra hystrix*		
* *Lonicera japonica*		Honeysuckle
* *Lophostemon confertus*		Brush Box
* *Lycopersicon esculentum*		Tomato
* *Macfadyena unguis-cati*	W4c	Cat's Claw Creeper
* *Magnolia grandiflora*		Magnolia
* *Malva parviflora*		Small-flowered Mallow
* *Medicago arabica*		Spotted Burr Medic
* *Medicago lupulina*		Black Medic
* *Medicago polymorpha*		Burr Medic
* *Medicago sativa*		Lucerne; Alfalfa
* *Melaleuca armillaris*		Giant Honey Myrtle
* *Melaleuca hypericifolia*		Red Honey Myrtle
* *Melilotus indicus*		Hexham Scent
* *Melinis repens* (syn. *Rhynchelytrum repens*)		Red Natal Grass
* *Mentha x rotundifolia*		Apple Mint
* *Mentha x spicata*		Spearmint
* *Michelia figo*		Port Wine Magnolia
* *Modiola caroliniana*		Red-flowered Mallow
* *Morus alba*		White Mulberry
* *Murraya paniculata*		Sweet Orange Jessamine
* *Myriophyllum aquaticum*		Parrot's Feather; Brazilian Water Milfoil
* *Myrsiphyllum asparagoides*	W4c	Bridal Creeper (Florist's Smilax)
* *Myrsiphyllum scandens*		Climbing Asparagus
* *Nandina domestica*		Heavenly Bamboo
* *Nephrolepis cordifolia*		Fishbone Fern
* *Nerium oleander*		Oleander
* *Nothoscordum borbonicum*		Onion Weed
* *Ochna serrulata*	W4b	Ochna
* *Oenothera stricta* subsp. *stricta*		Common Evening Primrose
* *Oenothera indecora* subsp. *bonariensis*		Smallflower Evening Primrose
* *Olea europaea* var. *africana*		Common Olive
* *Onopordum acanthium* subsp. *acanthium*		Scotch Thistle

Botanical name	Noxious weed classification	Common names
* *Opuntia stricta* var. *stricta*	W4f	Common Prickly Pear
* *Osteospermum ecklonis*		Star of the Velt
* *Oxalis corniculata* var. *corniculata*		Creeping Oxalis
* *Oxalis incarnata*		Climbing Oxalis
* *Oxalis latifolia*		Pink Shamrock
* *Oxalis pes-caprae*		Soursob
* *Papaver somniferum* subsp. *setigerum*	W2	Smallflower Opium Poppy
* *Paraserianthes lophantha* subsp. *lophantha* (syn. *Albizia lophantha*)		Crested Wattle
* *Parietaria judaica*	W3	Pellitory; Asthma Weed
* *Paronychia brasiliana*		Chilean Whitlow Wort
* *Paspalum dilatatum*		Paspalum
* *Paspalum urvillei*		Vasey Grass
* *Paspalum quadrifarium*		Tussock Paspalum
* *Passiflora edulis*		Common Passionfruit
* *Passiflora subpeltata*		White Passionflower
* *Passiflora suberosa*		Cork Passionflower
* *Pavonia hastata*		
* *Pellaea viridis*		
* *Pennisetum clandestinum*		Kikuyu Grass
* *Pennisetum macrourum*		African Feather Grass
* *Pennisetum purpureum*		Elephant Grass
* *Pennisetum setaceum*		Fountain Grass
* *Persicaria capitata*		Japanese Knotweed
* *Petrorhagia nanteuilii*		Proliferous Pink
* *Petrorhagia velutina*		Velvet or Hairy Pink
* *Phalaris aquatica*		Phalaris
* *Phalaris arundinacea*		Reed Canary-grass
* *Phalaris canariensis*		Canary Grass
* *Phalaris paradoxa*		Paradoxa Grass
* *Phoenix canariensis*		Canary Island Palm
* *Phyllostachys aurea*	W4a	Fishpole Bamboo
* *Physalis peruviana*		Cape Gooseberry
* *Phytolacca octandra*		Ink Weed
* *Pinus radiata*		Radiata Pine; Monterey Pine
* *Pistacia chinensis*		
* *Pistacia vera*		Pistachio Nut

Botanical name	Noxious weed classifi-cation	Common names
* *Plantago lanceolata*		Common Plantain
* *Plantago major*		Large Plantain
* *Poa annua*		Winter Grass
* *Polycarpon tetraphyllum*		Four Leaf Allseed
* *Polygala myrtifolia*		Sweet Pea Shrub
* *Polygonum aviculare*		Wireweed
* *Poly*pogon littoralis		Perennial Beardgrass
* *Poly*pogon monspeliensis		Annual Beardgrass
* *Protasparagus aethiopicus*	W4c	Asparagus Fern
* *Protasparagus plumosus*	W4c	Climbing Asparagus Fern
* *Prunella vulgaris*		Self-heal
* *Prunus cerasus*		Sour Cherry
* *Prunus persica*		Peach
* *Psoralea pinnata*		African Scurf-pea
* *Pyracantha angustifolia*		Orange Thorn
* *Pyracantha fortuneana*		Firethorn
* *Quercus robur*		English Oak
* *Ranunculus repens*		Creeping Buttercup
* *Ranunculus sceleratus*		Celery Buttercup
* *Rhaphiolepis indica*		Indian Hawthorn
* *Richardia brasiliensis*		White Eye
* *Richardia stellaris*		Field Madder
* *Ricinus communis*	W2	Castor Oil Plant
* *Robinia pseudoacacia*		Black Locust
* *Roldana petasitis* (syn. *Senecio petasitis*)		Californian Geranium
* *Romulea rosea* var. *australis*		Onion Grass
* *Rorippa nasturtium-aquaticum*		Watercress
* *Rubus fruticosus* species aggregate	W2	Blackberry
* *Rumex conglomerata*		Clustered Dock
* *Rumex crispus*		Curled Dock
* *Sagina apetala*		Annual Pearlwort
* *Sagina procumbens*		Procumbent Pearlwort
* *Salix alba*	W4g	White Willow
* *Salix babylonica*		Weeping Willow
* *Salix cinerea*		Pussy Willow
* *Salix fragilis*	W4g	Crack Willow

Botanical name	Noxious weed classifi-cation	Common names
* *Sambucus nigra*		Common Elder; Elderberry
* *Salvinia molesta*	W1	Salvinia
* *Sapium sebiferum*		Chinese Tallow Tree
* *Saponaria officinalis*		Soapwort
* *Selaginella kraussiana*		Creeping Club Moss
* *Senecio madagascariensis*		Fireweed
* *Senecio vulgaris*		Groundsel
* *Senna floribunda*		Smooth Cassia; Arsenic Bush
* *Senna pendula var. glabrata*		Colladon; Cassia; Winter Senna
* *Setaria geniculata* (syn. *Setaria gracilis* var. *pauciseta*)		Slender Pigeon Grass
* *Setaria palmifolia*		Palm Grass
* *Setaria verticillata*		Whorled Pigeon Grass
* *Sida rhombifolia*		Paddy's Lucerne
* *Silene nocturna*		
* *Silene vulgaris*		Bladder Campion
* *Silene gallica* var. *gallica*		French Catchfly
* *Sisymbrium officinale*		Hedge Mustard
* *Solanum jasminoides*		Potato Climber
* *Solanum mauritianum*		Wild Tobacco Bush; Bug Tree
* *Solanum nigrum*		Blackberry Nightshade
* *Solanum pseudocapsicum*		Madeira Winter Cherry
* *Solanum seaforthianum*		Brazilian Nightshade
* *Soleirolia soleirolii*		Corsican Carpet; Baby's Tears
* *Soliva anthemifolia*		Dwarf Jo-jo; Button Burweed
* *Soliva sessilis*		Jo-jo; Bindyi
* *Sonchus oleraceus*		Common Sowthistle
* *Sorghum halepense*		Johnson Grass
* *Spergula arvensis*		Corn Spurry
* *Spergularia marina*		
* *Spergularia rubra*		Sandspurry
* *Sporobolus africanus* (syn. *Sporobolus indicus* var. *capensis*)		Parramatta Grass

Botanical name	Noxious weed classification	Common names
* *Sporobolus indicus* var. *major*		Giant Parramatta Grass
* *Stachys arvensis*		Stagger Weed
* *Stellaria media*		Chickweed
* *Stenotaphrum secundatum*		Buffalo Grass
* *Syagrus romanzoffianum*		Queen Palm; 'Cocos Palm' (Hort.)
* *Tagetes minuta*		Stinking Roger
* *Tanacetum vulgare*		Tansy
* *Taraxacum officinale*		Dandelion
* *Tecoma capensis*		Cape Honeysuckle
* *Thunbergia alata*		Black-eyed Susan
* *Tolpis umbellata*		Yellow Hawkweed
* *Toxicodendron succedaneum*	W2	Rhus Tree; Wax Tree; Poison Tree
* *Tradescantia fluminensis* (syn. *Tradescantia albiflora*)	W4c	Trad; Wandering Jew
* *Tradescantia minima*		Bridal Veil
* *Tradescantia zebrina*		Giant Trad
* *Trifolium arvense*		Haresfoot Clover
* *Trifolium campestre*		Hop Clover
* *Trifolium dubium*		Yellow Suckling Clover
* *Trifolium pratense*		Red Clover
* *Trifolium repens*		White Clover
* *Trifolium subterraneum*		Subterranean Clover
* *Tropaeolum majus*		Nasturtium; Indian Cress
* *Urtica dioica*		Stinging Nettle; Giant Nettle
* *Urtica urens*		Small Nettle

Botanical name	Noxious weed classification	Common names
* *Verbascum thaspsus*		Blanket Weed; Aaron's Rod;
* *Verbascum virgatum*		Twiggy Mullein; Green Mullein
* *Verbena bonariensis*		Purple Top; Square Weed
* *Verbena incompta*		Purple Top; Square Weed
* *Verbena officinalis*		Common Vervain
* *Veronica anagallis-aquatica*		Blue Water Speedwell
* *Veronica hederifolia*		Ivy-leaved Speedwell
* *Veronica persica*		Creeping Speedwell
* *Veronica arvensis*		Wall Speedwell
* *Vicia hirsuta*		Hairy Vetch
* *Vicia sativa* subsp. *sativa*		Common Vetch; Tares
* *Vicia sativa* subsp. *nigra*		Narrow-leaved Vetch
* *Vicia tetrasperma*		Slender Vetch
* *Vinca major*		Blue Periwinkle
* *Viola arvensis*		Field Pansy
* *Viola odorata*		Violet; Sweet Violet
* *Vitis vinifera*		Grape
* *Vulpia bromoides*		Squirrel Tail Fescue
* *Vulpia myuros*		Rat's Tail Fescue
* *Watsonia meriana* cv. *Bulbillifera*		Wild Watsonia; Bugle Lily
* *Wistaria sinensis*		Wisteria
* *Xanthium occidentale*		Noogoora Burr; Cockle Burr
* *Xanthium spinosum*		Bathurst Burr

Local Aboriginal names for some common plants around Sydney.

Jim Kohen

Note: * Kuring-gai language. Unmarked words are from one of the two dialects of Dharuk.
? The question marks in the 'Taxa' column indicate that the original descriptions did not positively identify the particular species.

TABLE 6. Aboriginal names of plants

Taxa	Common name	Aboriginal name	Re-spelt
Acacia spp.	wattle	wattungulle	wadangala
Acacia decurrens	Black Wattle	melonba *	malunaba
Allocasuarina spp.	sheoak	kulgargru (coastal)	gulgargaru
Angophora spp.	apples	bunda	bunda
Avicenna spp.	mangrove	maroubai *	marubai
Banksia spp.	*Banksia*	weereagan	wirayagan
Blechnum spp.	fern	gurgy	gurgi
Brachychiton spp.	kurrajong	kurrajong	garadyång
Casuarina cunninghamiana	River Oak	goomun (inland)	guman
Ceratopetalum apetalum	Coachwood	dirrebing *	dirabing
Cissus spp.	native grape	waiung, wyong *	wayung
Commersonia fraseri	Brush Kurrajong	goodimba *	gudimba
Dianella caerulea	lily	wirra wirra *	wirawira
Doryanthes excelsa	Gymea Lily	knurro *	ngaru
Dioscorea transversa	yam	midin, darug	midiny, dharuk
Eucalyptus spp.	eucalypts	yarra	yara
Eucalyptus spp.	stringybark	buran	buran
Eucalyptus crebra	Narrowleaf Ironbark	muggargru	magargaru
Eucalyptus pilularis	Blackbutt	terrumbine *	darumbayin
Eucalyptus saligna	Sydney Blue Gum	terra-ulong *	dirayulång
Eucalyptus robusta ?	Swamp Mahogany	booroomamurry	buruma mari
Eucalyptus haemastoma ?	Broad-leaved Scribbly Gum	da-ran-e	darani
Eucalyptus fibrosa	Broadleaf Ironbark	dirrabari	dirabari
Eupomatia laurina	Bolwarra	bolwarra	bulwara
Exocarpos cupressiformis	Cherry Ballart	kwigan	gwigan
Ficus rubiginosa	Port Jackson Fig	tammun	damun
Ficus coronata ?	Creek Sandpaper Fig	cooroowal	guruwal
Livistona australis	Cabbage Tree Palm	tarangera	darangara
Macrozamia communis	Burrawang	burrowan (fruit)	baruwan

Taxa	Common name	Aboriginal name	Re-spelt
Melaleuca spp.	teatree, paperbark	budjor	budyur
Patersonia spp.	native flag	poculbee	bugulabi
Persoonia spp.	geebung	geebung	dyibung
Pittosporum undulatum	*Pittosporum*	dougun *	dugun
Pteridium esculentum	Bracken	nourgai *	nurgai
Pultenaea spp.	*Pultenaea*	dalgalba *	dalgalba
Rubus spp.	native raspberry	kauen *	gawan
Sambucus australasica	Native Elder	bambara *	bambara
Smilax spp.	native sasparilla	warraburra	warabara
Styphelia spp.	*Styphelia*	wongrouba *	wångaruba
Telopea speciosissima	Waratah	waratah	warada
Toona ciliata	Red Cedar	noullai *	nulai
Typha	bullrushes	wollogollin, baraba	wulugulin, baraba
Xanthorrhoea spp.	grass tree	boungai *	bungai
Xylomelum pyriforme	Woody Pear	merrydugare	mari dugara

Molluscs of Berowra Valley Regional Park

Michael Shea

Key to symbols

+ = Berowra Waters shell midden fauna.
* = Exotic species.
z = Australian Museum record only (may no longer occur in Berowra Valley).
Note: there are almost certainly more species in Berowra Valley. A specimen of the marine bivalve *Laternula marilina* had a drill hole of a Naticid gastropod—none of which were found on the survey.

Identification advice

All material referred to in this appendix is 'vouchered' (i.e. has a catalogue number) in the Australian Museum collection.

TABLE 7. Molluscs of the Park

ESTUARINE SPECIES	HABITAT	DISTRIBUTION/NOTES
GASTROPODA		
LOTTIIDAE • *Patelloida mimula* (Iredale, 1924) +	Associated with oysters, intertidal	Locally extinct. Aboriginal shell middens only
BATILLARIIDAE • *Pyrazus ebeninus* (Bruguiere, 1792)	Muddy sand flats, intertidal	Known from an operculum only, Crosslands Creek. (May have floated upstream on tide.)
• *Batillaria australis* (Quoy & Gaimard, 1834) +	Intertidal rocks and sand flats	Locally extinct, Aboriginal shell middens only.
LITTORINIDAE • *Bembicium auratum* (Quoy & Gaimard, 1872) +	Intertidal rocks, in crevices.	Uncommon at Berowra Waters, also occurs in Aboriginal shell middens.
HYDROBIIDAE • *Aschoris tasmanica* (Martens, 1858)	On sand, rocks and weed, upper tidal areas.	Upper tidal section of Crosslands Creek and probably in other similar locations.
• *Tatea rufilabris* (Adams, 1862)	In large aggregations under upper tidal rocks and logs in mangroves, salt marsh and on rocky shoreline.	Very common throughout estuarine section of Berowra Creek e.g. Crosslands, Berowra Waters etc.
• *Tatea huonensis* (Tenison-Woods, 1876)	Probably occurs in similar situations to above species.	Known from a dead shell from lower Crosslands Creek.
ASSIMINEIDAE • *Assiminea* sp.1	On submerged debris in swampy Casuarina forest (Brackish swamp)	Calna Creek camping area and probably other areas.
• *Assiminea buccinoides* Quoy & Gaimard, 1835	Under leaf litter, rocks, logs and on open mud surface in Mangroves, salt marsh and on rocky shoreline, in upper intertidal zone.	Common throughout its distribution in Berowra Creek in estuarine areas e.g. Crosslands and Berowra Waters.
TRIPHORIDAE • c.f. *Tetraphora granifera* (Brazier, 1894) +	Possibly associated with subtidal mussel beds and sponges.	Possibly locally extinct, Aboriginal Shell middens.
MURICIDAE • *Bedeva hanleyi* (Angas, 1867) +	Associated with oysters.	Locally extinct, Aboriginal shell middens.
BUCCINIDAE • *Nassarius (Plicularia) jonasii* (Dunker, 1846)	Muddy sand flats, subtidal mussel beds and under subtidal rocks.	Berowra Waters area.
• *Nassarius (Plicularia) burchardi* (Dunker, 1849)	Muddy sand flat at low tide.	Berowra Waters area.
DENDRODORIDIDAE • *Dendrodoris nigra* (Stimpson, 1855)	Under subtidal rocks and mussel beds.	Berowra Waters area. Egg masses are distinct yellow spiral ribbons under rocks.
ELLOBIIDAE • *Ophicardelus ornatus* (Ferrusac, 1821)	Both *Ophicardelus* species occur in upper intertidal and	Both Ophicardelus species occur throughout estuarine

ESTUARINE SPECIES	HABITAT	DISTRIBUTION/NOTES
• *Ophicardelus quoyi* (H & A. Adams, 1855)	supralittoral areas in mangroves, salt marsh and on rocky shorelines.	environments in Berowra Creek.
AMPHIBOLIDAE • *Salinator solida* (von Martens, 1878)	Upper intertidal and supralittoral areas in mangroves, salt marshes and less commonly on rocky shorelines.	Occurs throughout estuarine environments in Berowra Creek.
ONCHIDIIDAE • *Onchidium* sp.	Under and inside rotting logs in Mangrove/salt marsh areas in upper intertidal zone.	3 individuals seen in mangrove/ salt marsh, northern end of Crosslands camping area.
BIVALVIA		
ARCIDAE • *Anadara trapezia* (Deshayes, 1840)+	From low tide to shallow subtidal areas, buried in muddy sand.	Locally extinct, Aboriginal shell middens.
MYTILIDAE • *Xenostrobus securis* (Lamarck, 1819)	In large aggregations in crevices of intertidal and subtidal rocks, mangroves and wharf piles.	Throughout estuarine section of Berowra Creek.
• *Trichomya hirsuta* (Lamarck, 1819) +	Probably in dense aggregations in subtidal environments.	Locally extinct, Aboriginal shell middens.
OSTREIDAE • *Saccostrea glomerata* Gould, 1850 +	Formerly in large aggregations on intertidal rocks and mangroves.	Locally extinct, Aboriginal shell middens.
GALEOMMATIDAE • *Montacuta* sp.1	Subtidally in sand.	Crosslands and Crosslands Creek at Berowra Waters.
• *Arthritica helmsi* (Hedley, 1915)	Subtidally in sand, extending into upper tidal reaches of creeks.	Crosslands and Crosslands Creek at Berowra Waters
CHAMIDAE • *Chama fibula* Reeve, 1846 +	Subtidally on hard surfaces.	Locally extinct, Aboriginal shell middens.
MACTRIDAE • *Spisula (Notospisula) trigonella* (Lamarck, 1819)	Subtidally in muddy sand.	Berowra Waters area.
• *Mactra* sp.	Probably subtidally in sand.	Crosslands Creek at Berowra Waters.
TELLINIDAE • *Tellina (Macomona) deltoidalis* Lamarck, 1818	Subtidally in muddy sand.	Berowra Waters area.
PSAMMOBIIDAE • *Soletellina alba* (Lamarck, 1818)	Subtidally in muddy-sand extending into upper tidal reaches of creeks.	Throughout estuarine section of Berowra Creek. Conspicuous on muddy sand banks at low tide e.g. Crosslands, Berowra Waters.
VENERIDAE • *Venerupis* c.f. *galactities* (Lamarck, 1818) +	Probably subtidal in muddy sand.	Locally extinct, Aboriginal Shell middens.
• *Irus (Irus) crenatus* (Lamarck, 1818) +	Probably in clumps of *Saccostrea* and Trichomya at low tide and subtidally.	Locally extinct, Aboriginal Shell middens.
TEREDINIDAE • spp.	Inside wood intertidally and subtidally, particularly in mangroves and wharf piles.	Throughout estuarine areas of Berowra Creek.
LATERNULIDAE • *Laternula marilina* (Reeve, 1860)	In muddy-sand subtidally, well buried.	Berowra Waters area.

	HABITAT	DISTRIBUTION/NOTES
FRESHWATER SPECIES		
GASTROPODA		
HYDROBIIDAE • *Potamopyrgus antipodarum* (Gray, 1843) *	On submerged debris, sand and rocks.	In every creek in Berowra Valley catchment. [New Zealand native].
LYMNAEIDAE • *Austropeplea viridis* (Quoy & Gaimard, 1833) *	On submerged debris and on damp mud just above waterline.	Upper Berowra Valley catchment. [East Asia native].
• *Austropeplea brazeri* (Smith, 1882)	On submerged debris and on damp mud just above waterline.	Lower freshwater reaches of Berowra Creek between Rockyfall Rapids and Galston Road crossing.
• *Austropeplea lessoni* (Deshayes, 1830) z	On submerged debris, often floats under water surface.	"Fish Ponds Creek, Hornsby" [Australian Museum Record - undated]
• *Pseudosuccinea columella* (Say, 1817) *	On submerged debris.	Throughout Berowra Valley catchment. [North American Native].
ANCYLIDAE • *Ferrissia (Pettancylus) tasmanicus* (Tenison-Woods, 1876)	On submerged leaves and wood.	Most creeks in Berowra Valley catchment.
• *Ferrissia (Pettancylus) petterdi* (Johnston, 1879)	On submerged leaves and wood.	Berowra Creek, Lyrebird Gully and Washtub Gully.
PLANORBIDAE • *Helicorbis australiensis* (Smith, 1882)	On submerged wood.	Berowra Creek at Galston Road crossing (low numbers).
• *Glyptophysa (Glyptophysa) gibbosa* (Gould, 1846) z	Probably on submerged debris.	"Fish Ponds Creek, Hornsby" [Australian Museum Record—undated].
PHYSIDAE • *Physella acuta* (Draparnaud, 1805) *	On submerged debris.	Throughout Berowra Valley catchment [Native to Europe, Middle East, North Africa].
BIVALVIA		
HYRIIDAE • *Hyridella depressa* (Lamarck. 1819) z	Probably buried in sand in pools and riffle areas.	"Fish Ponds Creek, Hornsby" and "Berowra Creek, Hornsby" [Australian Museum records, both undated].
CORBICULIDAE • *Corbicula (Corbicula) australis* (Deshayes, 1830)	In sand in areas with water flow.	Berowra Creek at Galston Road crossing (low numbers).
SPHAERIIDAE • *Musculum tasmanicum* (Tenison-Woods, 1876)	In sand or mud in areas with water flow.	In Berowra Creek and in creek draining the Lakes Reserve at Cherrybrook.
• *Pisidium etheridgii* (Smith, 1882)	In sand or mud in areas with water flow.	Berowra Creek.
• *Pisidium* sp. 1	In sand.	Berowra Creek at Galston Gorge and Fishponds waterholes.

	HABITAT	DISTRIBUTION/NOTES
TERRESTRIAL SPECIES		
GASTROPODA		
ACHATINELLIDAE • *Tornatellinops jacksonensis* (Cox, 1864)	On grass and on creepers in vine thickets, overgrown gardens and shell middens.	Berowra Waters area.
PUPILLIDAE • *Pupilla australis* (Angas, 1864)	Shell midden debris (lives in grass).	Washtub Gully, Berowra Waters.
• *Gastrocopta strangeana* (Iredale, 1937)	Shell midden debris (lives in grass).	Berowra Waters area.
• *Gastrocopta pediculus* (Shuttleworth, 1852) *	Shell midden debris (lives in grass).	Berowra Waters area.
• *Pupisoma circumlitum* Hedley, 1897	Shell midden debris and in vine thickets and overgrown gardens (lives on vines).	Berowra Waters area.
• *Pupisoma* sp. 1	Shell midden debris (lives on vines and branches).	Washtub Gully, Berowra Waters.
• *Pupisoma* sp. 2	Shell midden debris (lives on vines and branches).	Washtub Gully, Berowra Waters.
SUBULINIDAE • *Lamellaxis clavulinus* (Potiez & Michaud, 1838) *	Under leaf litter and debris accumulated below overgrown waterfront gardens.	Western side of Berowra Waters Ferry landing next to road. [Native to East Africa.]
RHYTIDIDAE • *Saladelos dulcis* (Iredale, 1943)	Vine thickets, forest and shell midden debris.	Throughout Berowra Valley bushland.
• *Austrorhytida capillacea* (Ferussac, 1832)	Under rocks, logs and leaf litter in forest, vine thickets and gardens.	Generally distributed through Berowra Valley bushland.
PUNCTIDAE • *Paralaoma caputspinulae* (Reeve, 1854)	Shell midden debris and in gardens.	Berowra Waters area and probably widely distributed through Berowra Valley.
• *Iotula microcosmos* (Cox, 1864)	Shell midden debris, vine thickets and gardens.	Berowra Waters area and probably widely distributed through Berowra Valley.
CHAROPIDAE • *Gyrocochlea c.f. impressa* (Hedley, 1924)	Vine thicket on underside of logs.	Calna Creek, Crosslands.
• *'Roblinella' belli* (Cox, 1864)	Vine thicket, under logs and in shell midden debris.	Berowra Waters area, Crosslands, Old Mans Valley Hornsby.
• *Dentherona saturni* (Cox, 1864)	Eucalypt forest under logs and in shell midden debris.	Quarry at Thornleigh and in Berowra Waters middens.
• *Egilomen lirata* (Cox, 1864)	In shell midden debris.	Berowra Waters shell middens.
• *Discocharopa* sp. 1	In shell midden debris.	Berowra Waters shell middens.
• *Elsothera sericatula* (Pfeiffer, 1850)	Eucalypt woodland/forest and in midden debris.	Distributed throughout Berowra Valley Bushland.
• *Coenocharopa c.f. multiradiata* Stanisic, 1990	Vine thicket on underside of logs.	Berowra Waters (eastern side).
ATHORACOPHORIDAE • *Triboniophorus* sp. 1	Forest, woodland and sandstone outcrops.	Hornsby Park, Old Man's Valley, Mt Kuring-gai, Berowra and Berowra Waters.
HELICARIONIDAE • *Euconulus fulvus* (Müller, 1774) *	Shell middens and waterfront gardens.	Washtub Gully, Berowra Waters [European native].
• *Melocystis jacksonensis* (Gray, 1834)	Vine thickets and tall forest, under litter.	Sporadic distribution between Hornsby and Berowra Waters.

ESTUARINE SPECIES	HABITAT	DISTRIBUTION/NOTES
• *Fastosarion freycineti* (Ferussac, 1821)	Tall forest to woodland, under logs.	Along Berowra Creek between Galston Gorge and Crosslands/Calna creek and probably elsewhere.
• *Helicarion* c.f. *leopardina* (Iredale, 1941)	Vine thickets, under logs.	Calna Creek.
LIMACIDAE • *Limax maximus* Linnaeus, 1758 *	Gardens at edge of bushland and where weeds occur.	Asquith West and probably elsewhere [European native].
• *Lehmannia marginata* (O.F. Müller, 1774) *	Under rocks and rubbish in open grassy area next to bushland.	Old Man's Valley, Hornsby and probably elsewhere [European native].
AGRIOLIMACIDAE • *Deroceras (Agriolimax)* c.f. *agreste* (Linnaeus, 1758) *	Under a rock in a concrete drain next to bushland and farmland.	Charlton Creek road at Arcadia [European native].
• *Deroceras laeve* (Müller, 1774) *	Wherever weeds occur.	Calna Creek [European native].
CAMAENIDAE • *Austrochloritis* sp. 1	Under logs in forest, woodland and vine thickets.	Distributed throughout Berowra Valley bushland.
• *Meridolum duralensis* (Cox, 1868)	Under rocks, logs and accumulated fallen bark in forest, woodland and vine thicket.	Throughout western side of Berowra Valley.
• *Meridolum middenense* McLauchlan, 1954	Under rocks, logs and accumulated fallen bark in forest, woodland and vine thickets.	Throughout eastern side of Berowra Valley.
BRADYBAENIDAE • *Bradybaena similaris* (Ferussac, 1831) *	Gardens at edge of bushland, wherever weeds occur and at some disturbed shell middens near human habitation.	Sporadic distribution through Berowra Valley. Empty shells are conspicuous at Washtub Gully midden at Berowra Waters. [East Asian native]
HELICIDAE • Helix (*Cryptomphalus) aspersus* (Müller, 1774) *	Gardens at edge of bushland.	Generally distributed around edge of Berowra Valley. [European native]

M
P

Rare and threatened species

Jamie Slaven

The following flora and fauna profile lists of threatened species in the Park are restricted to those species for which reliable and relatively current records are available. In addition, a separate 'potential' list has been compiled of threatened species that might be believed to be present, on the basis of suitability of habitat and 'proximate records'—i.e. records of observations of these species made near the Park boundaries.

Species names in the following tables are consistent with the NSW Scientific Committee listing in the *Threatened Species Conservation Act 1995* (NSW)

Key to Status

e = Endangered (Schedule 1 of the Threatened Species Conservation Act).
v = Vulnerable (Schedule 2 of the Threatened Species Conservation Act).
E, V The symbols E and V denote 'Endangered' and 'Vulnerable' nationally listed threatened species categories under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth).

TABLE 8. Rare and threatened species

Species name	Status
Recorded in the Park	
Amperea xiphoclada var. *papillata*	(3KC-)
Bertya brownii	(2RC-)
Boronia fraseri	(2RCa)
Darwinia procera	(2RCa)
Eucalyptus luehmanniana	(2RCa)
Gonocarpus salsoloides	(3RCa)
Hibbertia nitida	(2RC-)
Lomandra brevis	(2RC-)
Lomandra fluviatilis	(3RCa)
Platysace clelandii	(2RCa)
Potentially occurring in the Park	
Genoplesium baueri	(3RC-)

TABLE 9. Threatened flora species profiles

Species	Status	Description	Habitat
Ancistrachne maidenii	*v*	A scrambling perennial grass to 50 cm tall. The outer surface of the spikelets is covered with microscopic curved hairs.	Usually found on mid to lower slopes, associated with soils derived from the Narrabeen Group, often near the ephemeral creeks draining into the Hawkesbury River. Populations are known from Berowra Waters, Brooklyn and Lower Hawkesbury near Wisemans Ferry.
Darwinia biflora	v, V	A small understorey shrub to 80 cm tall (mostly below 50 cm tall). Paired small green flowers with red bracteoles.	Occurs in woodland, open-forest or scrub-heath on the edge of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone.
Darwinia peduncularis	v	Spreading shrub to 1.5 m tall, with red young stems and blue-green leaves.	Grows in heath and woodland, usually on or near rocky outcrops. Found on or near sandstone ridgetops or more rarely near larger creeks.
Epacris purpurascens var. *purpurascens*	v	Erect stiff shrub 50–150 cm high. White to pink flowers along much of the branchlet.	Found on both clay-capped ridges and near creeks in sandstone terrain. Likes damp places. Strongly associated with the endangered Sydney Turpentine Ironbark Forest and Shale/Sandstone Transition Forest.
Eucalyptus camfieldii	v, V	A mallee or small tree to 2–8 m tall. Juvenile leaves are heart-shaped or circular and adult leaves are broad and lance-shaped.	Grows in shrubby heath and woodland on poorly drained soils on sandstone ridgetops and plateaus. Strongly associated with ridgetop laterites.
Lasiopetalum joyceae	v, V	An erect and open shrub up to 2 m tall. Leaves are linear and densely covered underneath with rusty coloured star-hairs.	Found on ridgetops and upper slopes on or near the shale/sandstone transition in heath, open-scrub, woodland and open-forest.
Leptospermum deanei	v, V	A slender leaf shrub, up to 5 m tall with bark peeling in long strips.	Occurs in open-forest on footslopes close to or within creek-line vegetation.
Melaleuca deanei	v, V	Medium shrub 1–3 m tall with rough papery bark when old. Flowers are creamy yellow.	Grows in wet heath, hanging swamps, open heath and woodland on ridgetops or upper slopes. Sites often have poorly drained soils and are usually on or near the shale/ sandstone transition.
Persoonia mollis subsp. *maxima*	e, E	A medium to tall and spreading shrub, 2–6 m high, with hairy young branchlets, buds and young leaves. Flowers are yellow and covered in copper-coloured hairs.	A very rare species that occurs mainly in sandstone vegetation communities. It is usually restricted to the deeply dissected and sheltered gullies on the Hornsby Plateau mainly within Hornsby Shire.
Tetratheca glandulosa	v, V	A low spreading shrub 10–50 cm tall with multiple sprawling stems, with stiff hairs on the leaves (toothed margins) and the flower sepals and stalk. Flowers are pink and have four petals.	Grows in heath, scrub, woodlands and open-forest on ridgetops and upper slopes, in or near the shale/sandstone transition.

TABLE 10. Threatened fauna species profiles

Species	Status	Description	Habitat
Barking Owl *Ninox connivens*	v	A medium-sized owl similar to a Boobook, but more robust. Dark streaks appear on the breast and large white spots on the wings.	Open-forest and woodlands; territorial range greater than 100 hectares. Roosts in dense foliage along creek lines. Preys on arboreal mammals and birds.
Giant Burrowing Frog *Heleioporus australiacus*	v, V	A large plump and warty ground frog reaching up to 100 mm in total length. These frogs are coloured steely blue-grey to black. Tadpoles are large; up to 50 mm in length.	Small headwater ephemeral and permanent drainage lines, with water quality unaffected by urban run-off. Prefers sandstone ridgetop woodland, open-forests and heath, and may be associated with hanging swamps.
Glossy Black Cockatoo *Calyptorhynchus lathami*	v	Small brown-black cockatoo with two bright red markings under the tail. Female differs from male in having yellow patches on head and neck and orange-red tail markings.	Forest and woodlands containing sheoaks for feeding including Black Sheoak *Allocasuarina littoralis*, and Forest Oak *Allocasuarina torulosa*. Requires large tree hollows for nesting.
Rosenberg's Goanna/ Heath Monitor *Varanus rosenbergi*	v	Dark grey above, finely spotted in yellow or white and with blackish cross-bands from the neck to the end of the tail and with a pale-edged facial stripe. Average length 900 mm.	Heath and woodland in areas where rocky outcrops are present for shelter.
Koala *Phascolarctos cinereus*	v	An arboreal marsupial with grey to brown fur with white underparts or patches. Large furry ears and large bare nose.	Now rare in the Park. Likely to occur in open-forest and woodland where an abundance of Scribbly Gum *Eucalyptus haemastoma/racemosa* and Grey Gum *Eucalyptus punctata* exists.
Large Bent-wing Bat *Miniopterus schreibersii*	v	An insectivorous bat with blackish to red-brown fur and a high-crowned head.	Broad range of habitats such as rainforest, wet gully forest, open-forest, and open woodland. Roosts primarily in caves, or in artificial habitats such as stormwater drains.
Masked Owl *Tyto novaehollandiae*	v	Large white or creamy-breasted owl with brown above and prominent facial disk.	Open-forest and woodlands. Prefers deep gullies for nesting in large tree hollows or caves. Preys on terrestrial mammals, especially rodents. Foraging range similar to the Powerful Owl.
Powerful Owl *Ninox strenua*	v	Large Boobook-like owl, grey to brown, with distinctive broad V-shaped markings on a pale breast.	Open-forest and woodlands; foraging range of 600-1000 hectares. Roosts in dense foliage along creek lines. Preys on arboreal mammals, including possums, as well as on birds and flying-foxes.
Red-crowned Toadlet *Pseudophryne australis*	v	Small ground-dwelling frog to 20–25 mm in length. Dark brown to black with prominent red markings on crown and lower back.	Mid to upper slopes in open-forest, woodland, scrub and heath communities. Prefers permanently moist soaks or areas of dense ground vegetation or litter along or near the upper reaches of ephemeral streams.
Spotted-tailed Quoll *Dasyurus maculatus*	v, V	A cat-sized carnivorous marsupial with rufous brown to dark brown fur above covered by white spots of various sizes. The fur underneath is a pale brown to cream.	Variety of habitats. Core habitat is open to tall forest in deep gullies. Suitable den sites are hollow logs, tree hollows, rock outcrops or caves.

TABLE 11. Other threatened flora and fauna species that may occur within the Park based on proximate records and suitable habitat.

Name	*Status*
Flora	
Acacia bynoeana	e, E
Acacia gordonii	e, E
Caladenia tessellata	v, V
Callistemon linearifolius	v
Eucalyptus sp. *'Cattai'*	e
Grevillea parviflora subsp. *supplicans*	e
Haloragodendron lucasii	e, E
Persoonia hirsuta	e, E
Pimelea curviflora var. *curviflora*	v, V
Fauna	
Broad-headed Snake *Hoplocephalus bungaroides*	e, E
Eastern Cave Bat *Vespadelus troughtoni*	v
Eastern False Pipistrelle *Falsistrellus tasmaniensis*	v
Eastern Little Mastiff-Bat *Mormopterus norfolcensis*	v
Eastern Pygmy-possum *Cercartetus nanus*	e
Greater Broad-nosed Bat *Scoteanax ruepelli*	v
Grey-headed Flying Fox *Pteropus poliocephalus*	v, V
Large-eared Pied Bat *Chalinolobus dwyeri*	v
Large-footed Myotis/Fishing Bat *Myotis macropus* formerly *adversus*	v
Osprey *Pandion haliaetus*	v
Southern Brown Bandicoot *Isoodon obesulus*	e, E
Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*	v
Superb Fruit-dove *Ptilinopus superbus*	v
Swift Parrot *Lathamus discolor*	e, E
Turquoise Parrot *Neophema pulchella*	v

TABLE 12. Rare or threatened Australian plants (ROTAP)

The Berowra Valley Regional Park is also home to nationally rare flora species that are not currently listed as threatened. The codes below are based on the publication *Rare or Threatened Australian Plants* (ROTAP), by J.D. Briggs and J.H. Leigh, CSIRO, revised edition 1995. Note that the codes assigned to these species are based on out-dated information,,and the system of assessing species' conservation status has now been replaced by the *Threatened Species Conservation Act 1995* (NSW) and the *Environmental Protection and Biodiversity Conservation Act 1999* (Cwlth). Some of the ROTAP species listed below may be far more threatened than these codes indicate, whilst others may not be threatened at all and are just naturally rare.

1	Known by one collection only.
2	Species with a geographic range of less than 100 km.
3	Species with a geographic range of over 100 km.
X	Presumed extinct: species not collected or otherwise verified over the past fifty years despite thorough searching, or of which all known wild populations have been destroyed more recently.
E	Endangered: species at serious risk of disappearing from the wild within one or two decades if present land use and other threats continue to operate.
V	Vulnerable: species not presently endangered but at risk of disappearing from the wild over a longer period (20–50 years), or which occurs on land whose future use is likely to change and threaten its survival.
R	Rare: species that are rare in Australia but which are not currently considered threatened, i.e. endangered or vulnerable.
K	Poorly known: species suspected, but not definitely known, to be endangered, vulnerable or rare.
C	Species known to be represented (at least one population) within a national park or similar conservation reserve.
a	1000 or more plants known to occur within a conservation reserve or reserves.
i	Fewer than 1000 plants known to occur within a conservation reserve or reserves.
-	Reserved population size is unknown.

References

Information in the tables was compiled from the following sources:

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Estuarine fishes of Berowra Creek - sampling survey

David J. Booth:

Table 13: Fishes sampled in Berowra and Cowan Creek using a small hand-held seine net (15 mm stretch mesh), 1995–97
• Denotes juveniles of commercial species (Booth and Schultz 1997

Species		Berowra Creek	Cowan Creek
Common name	Scientific name	Total	Total
Smooth toadfish	*Tetractenos glaber*	1516	18
• Mullet	*Myxus elongatus*	643	30
Glassfish	*Ambassis* sp.	374	6
• Yellowfin Bream	*Acanthopagrus australis*	110	22
Goby (various species)	Family: *Gobiidae*	65	8
• Whiting	Family: *Sillaginidae*	55	45
Silver biddies	*Gerres subfasciatus*	49	28
Hardy Head	*Atherinomorus ogilbyi*	32	224
• Trumpeter whiting	*Sillago maculata*	27	2
• Flounder-left eyed	Family: *Bothidae*	24	1
• Leather jacket-general	Family: *Monacanthidae*	23	40
• Tarwhine	*Rhabdosargus sarba*	23	10
Yellow tail scad	*Trachurus novaezelandiae*	16	0
• Eastern striped trumpeter	*Pelates sexlineatus*	14	20
• Bridled Leather jacket	*Acanthaluteres spilomelanurus*	12	0
Half Bridled goby	*Arenigobius frenatus*	11	0
• Tailor	*Pomatomus saltatrix*	11	0
• Flounder-large tooth	*Pseudorhombus arsius*	10	6
• Soles	Family: *Soleidae*	7	0
Blue eye (false mullet)	*Pseudomugil signifer*	6	5
• Dusky flathead	*Platycephalus fuscus*	5	1
Fortesque	*Centropogon australis*	4	3
• Six-spine Leather jacket	*Meushenia freycineti*	4	0
Weeping toad	*Torquigener pleurogramma*	4	0
• Yellow fin Leather jacket	*Meushenia trachylepis*	3	0
Dragonet stinkfish	*Repomucenus* sp.	2	0
Sandy Sprat	*Hyperlophus vittatus*	2	0
Starry Pufferfish	*Arothron stellatus*	2	5
• Trevally	Family: *Caragidae*	2	0
• Dusky Leather jacket	*Paramoncanthus otisensis*	1	0
Eastern Blue Groper	*Achoerodus viridis*	1	0
Painted Lizardfish	*Trachinocephalus myops*	1	3
• Sand flathead	*Platycephalus bassensis*	1	1
• Whiting, King George	*Sillaginodes punctatus*	1	0
Bearded Rock cod	*Pseudophycis barbata*	0	1
• Black fish	*Girella tricuspidata*	0	1
Blue Striped Goatfish	*Upenichthys vlamingii*	0	1
• Garfish	Family: *Hemiramphidae*	0	3
Longfin pike	*Dinolestes lewini*	0	0
Numbfish (ray)	Family: *Torpedinidae*	0	1
Painted Stinkfish	*Synchropus papilio*	0	1
Rabbit fish	*Siganus nebulosus*	0	1
Ramsay's Glass fish	*Ambassis marianus*	0	1
• Snapper	*Pagrus auratus*	0	2
Stink fish	*Foetorepus calauropomus*	0	1
	Total catch	3061	491

TABLE 14: The five most abundant species of fish caught at Berowra Creek, as percentages of total catch
(Booth and Schultz 1997)

#	Berowra	Species	
	%		
1	49.5	*Tetractenos glaber*	Toadfish
2	21	*Myxus elongatus*	Mullet
3	12.2	*Ambassis* sp.	Glassfish
4	3.6	*Acanthopagrus australis*	Bream
5	2.1	*Gobiidae* sp.	Gobies

Reference

Booth, D.J. & Schultz, D.L. 1997, *Fish assemblages as indicators of estuarine health in Berowra Creek and Cowan Creek*, Report to Berowra Creek Estuary Management Committee.

Arthropod Groups

Identified at Old Mans Valley, April 2002

Mites	Class *Acarina*
Amphipods	Order *Amphipoda*
Spiders	Order *Araneae*
Cockroaches	Order *Blattodea*
Beetles	Order *Coleoptera*
Springtails	Class *Collembola*
Flies	Order *Diplura*
	Order *Diptera*
Ants	Family *Formicidae*
Centipedes	
Millipedes	
Bugs	Order *Hemiptera*
Bees and Wasps	Order *Hymenoptera* excluding ants
Woodlice -	Order *Isopoda*

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