

World Heritage Sites

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GREATER BLUE MOUNTAINS AREA AUSTRALIA

The Greater Blue Mountains Area is 1.03 million hectares of deeply dissected sandstone plateaus, cliffs and gorges dominated by temperate eucalypt forest. Its eight protected areas preserve a record of the adaptation and diversification of the eucalypts in post-Gondwanan isolation on the Australian continent. The Area has an exceptionally wide range of habitats which contain ninety-two species of eucalyptus, ten percent of Australia's vascular flora and numbers of rare or threatened, endemic and relict species, such as the Wollemi pine, which have persisted for millennia in highly protected micro-sites.

COUNTRY

Australia

NAME

Greater Blue Mountains Area

NATURAL WORLD HERITAGE SERIAL SITE

2000: Inscribed on the World Heritage List under Natural Criteria ix and x.

STATEMENT OF OUTSTANDING UNIVERSAL VALUE [pending]

The UNESCO World Heritage Committee issued the following statement at the time of inscription:

Statement of Significance

Criteria (ix) and (x): Australia's eucalypt vegetation is worthy of recognition as of outstanding universal value, because of its adaptability and evolution in post-Gondwana isolation. The site contains a wide and balanced representation of eucalypt habitats from wet and dry sclerophyll, mallee heathlands, as well as localised swamps, wetlands, and grassland. 90 eucalypt taxa (13% of the global total) and representation of all four groups of eucalypts occur. There is also a high level of endemism with 114 endemic taxa found in the area as well as 120 nationally rare and threatened plant taxa. The site hosts several evolutionary relic species (Wollemia, Microstrobos, Acrophyllum) which have persisted in highly restricted microsites.

IUCN MANAGEMENT CATEGORY

Blue Mountains National Park	II National Park
Kanangra-Boyd National Park	II National Park
Gardens of Stone National Park	II National Park
Jenolan Caves Karst Reserve	II National Park
Thirlmere Lakes National Park	II National Park
Wollemi National Park	Ib Wilderness Area
Yengo National Park	Ib Wilderness Area
Nattai National Park	Ib Wilderness Area

BIOGEOGRAPHICAL LOCATION

Eastern Sclerophyll (6.6.6)

GEOGRAPHICAL LOCATION

The Greater Blue Mountains Area in New South Wales consists of eight contiguous parks in the mountains which run parallel to the coast behind Sydney. The World Heritage area runs from 160 km north to 65 km south of Sydney and from 55 to 120 km inland of it, between 32° 22' to 34° 23'S and 149° 54' to 151° 07'E. It is divided by a narrow corridor of private land along the Great Western Highway west of Sydney.

DATES AND HISTORY OF ESTABLISHMENT

- 1867: Jenolan Caves opened, the first community managed reserve, later consolidated into public parks;
- 1932: Members of the Mountain Trails Club and the Sydney Bush Walkers leased the Blue Gum Forest in the Grose river valley as a wilderness reserve;
- 1934: A Greater Blue Mountains National Park suggested, similar to the Blue Mountains National Park section of the present Area, following earlier proposals by the conservationist Miles Dunphy;
- 1959: The Blue Mountains National Park designated (62,000 ha); augmented in the 1970s & 1980s;
- 1969: Kanangra-Boyd National Park established;
- 1974: National Parks and Wildlife Act of 1974 passed, the basis of the present system;
- 1979: Wollemi National Park established; Thirlmere Lakes National Park established;
- 1987: Blue Mountains National Park established in its present form;
- 1991: Nattai National Park established;
- 1994: Gardens of Stone National Park established;
- 1998: Yengo National Park established.

LAND TENURE

Crown land permanently reserved under Act. Administered by the New South Wales National Parks and Wildlife Service (NPWS).

AREA

1,032,649 ha in eight areas. Seven adjoining protected areas form a buffer zone of 86,200 ha. Within each park is a protected wilderness. These total 554,822 ha (53.7%) of the nominated area.

Wollemi National Park	499,879 ha
The Blue Mountains National Park (2 parts)	247,840 ha
Yengo National Park	153,483 ha
Kanangra-Boyd National Park	65,379 ha
Nattai National Park	47,855 ha
Gardens of Stone National Park	15,150 ha
Jenolan Caves Karst Reserve	2,422 ha
Thirlmere Lakes National Park	641 ha

ALTITUDE

20m to 1215m

PHYSICAL FEATURES

The Greater Blue Mountains Area forms the central part of the Great Dividing Range which parallels much of the eastern margin of Australia. It lies distant from the coast between 55 km in the south and 120 km in the north across the Cumberland Plain. It is a well forested deeply incised sandstone upland plateau, much of it still wilderness. The northern parks are a maze of moderately dissected ridges and valleys; the central and southern parks are deeply dissected, with many topographic features. The south also has areas of limestone and in the south-east, the 8,800 hectare Lake Burragarang behind the Worrangamba dam which supplies 70% of Sydney's water.

The rocks which give the Blue Mountains their distinctive character are sandstone plateaus, cliffs and towers, with shales and some granite, basalt, and limestone karst. These originated in a late Cambrian subduction zone which was overlaid by Siluro-Devonian deposits including the carbonate reefs in which the Jenolan caves formed. Subsequent uplift, erosion, marine flooding, deposition and the growth of extensive coal swamps followed. The sandstones and shales, still almost horizontally bedded but now between 500 and 1,000 meters high, were laid down as riverine sediments from the Late Permian to the Mid Triassic. The high escarpment is probably the result of uplift and tectonic movements in the Cretaceous. But in the rim-rock area of the southwest, very ancient underlying basement granites are exposed. Volcanism was an important feature during both the Siluro-Devonian and the Jurassic, periods when a number of volcanic necks were extruded which have now eroded to

form circular amphitheatres. More recently, Miocene lava flows formed basalt caps which protect the summits of several mountains such as Mts Wilson, Banks and Tomah (Mosley, 1989; NPWS, 1998b).

The very hard and relatively impermeable sandstones which are highly resistant to erosion are in many areas underlain by much softer shales which erode more easily. This produces slot canyons like the 30m deep Grand Canyon which is only 3m wide at the top, that become wide valleys in which small underfit rivers flow where the sandstone cap has collapsed. High cliffs are prominent, including the Cliff Wall which runs from the north of Wollemi National Park almost 280km south, reaching nearly 300m high just south of Wentworth Falls. A large number of spectacular waterfalls cascade from these cliffs. Weathering of joints in the limestone and bands of ironstone produce pinnacles and pagoda-like forms. The sandstone-derived soils are dry, infertile, acidic and phosphorous-poor, but they vary within short distances. There are pockets of volcanic soils and several valley floors are alluvial. There has been some erosion by wind and intense fires, and the superb lyrebird while excavating for food or building nest-mounds could have had some impact on erosion over time since they may turnover an average of 63 tonnes of debris per hectare per year (Mosley, 1989; NPWS, 1998b).

CLIMATE

The climate is warm-temperate but temperatures decrease westwards with distance and altitude. The average January (summer) maximum temperatures are 23°C at Mt Victoria (1,050m) but 28°C at Lake Burrigong (150m). The average July (winter) minimum temperatures are 2-3°C at Wentworth Falls (900m). On Mount Victoria there are on average 40 days of frost a year, and 10 days of snow, although this rarely lasts through the day. Rainfall patterns are varied, with a pronounced summer maximum. Mean annual rainfall typically ranges from 1,100 to 1,400mm in the central areas, but there are areas of rain-shadow to the west of the escarpment and in some of the deeper valleys, Little Hartley for instance, receiving an annual average of 748mm. Droughts occur periodically. Winds are typically dry, from the north-west and north and are most pronounced in the winter (Mosley, 1989). The blue haze which hangs over the mountains is partly due to the light-scattering volatile oils of the eucalyptus trees.

VEGETATION

The Greater Blue Mountains is one of the three most diverse areas on earth for scleromorphic species, and the only such area outside a Mediterranean climate and dominated by trees. It is also a centre of plant endemism. It contains almost 1500 species, 10% of Australia's vascular plants, and the highest diversity of any of its temperate zones. This is due largely to its exceptional geological stability and intricate topography which has allowed some environments with their biota to persist for millennia as refugia from climatic change. Its inaccessibility has also preserved this heritage. There is a complex mosaic of vegetation types and of unusual groups of species. 114 taxa are found exclusively or predominantly only within the area, and 127 nationally rare and threatened plants, many of them restricted to very specialised habitats such as cliffs, mesa-tops and heathland. The site holds several Gondwanan relict species as well, surviving in restricted microsites, such as the Wollemi pine *Wollemia nobilis* (CR) only discovered in 1994 in an almost inaccessible gorge, the shrub *Acrophyllum australe* and the podocarp *Microstrobus fitzgeraldii*, restricted to wet rocks near waterfalls and only recorded in the Jamieson Valley.

The area also has the largest sclerophyll forest in the world, ranging from grassland, dry mallee heathland scrub and sclerophyll woodland to wet sclerophyll forest, wetlands and swamps. The nutrient-poor soils have discouraged development by man and, over millennia, have conditioned the development of the vegetation. The dominant tree and vegetation type is open dry eucalyptus woodland and forest which is fire-adapted, drought-tolerant and able to grow in a wide range of soils and altitudes, a species being adapted to every situation. Owing to the openness of the canopy and the varying effects of fire, the understorey is diverse and varies with soil type. Ninety-two species of eucalyptus, thirteen percent of the global total, occur in the area, including eight considered rare or threatened and twelve which may be endemic to the Sydney sandstone region. It is described as a natural laboratory for studying eucalypt evolution through periods of global climatic change and because it shows considerable diversity in isolated populations through adaptation of species to complex conditions. An unusual characteristic is seed dispersal by ants.

Characteristic dominant forest associations are, at lower and wetter levels, red bloodwood *E. gummifera* with scribbly gum *E. racemosa* and narrow-leaved apple *Angophora bakeri*; in higher open forest, black ash *E. seiberi*, Sydney peppermint *E. piperita*, *E. racemosa* and smooth-leaved apple *Angophora costata*; on richer soils, blue gum *E. deanii*, turpentine *Syncarpia glomulifera*, and in drier

woodland areas *E. eximia* with grey gum *E. punctata* and scribbly gum *E. sclerophylla*. In mallee and heath *E. stricta* is often dominant. But there are a great number of intermingling associations. The high diversity of scleromorphic taxa is spread over 20 plant families, among them the Fabaceae (149 species), Myrtaceae (150 species), Orchideae (77 species), Poaceae (57 species), Asteraceae (69 species), Proteaceae (77 species), Cyperaceae (43 species), and Acacia (64 species).

Over 70 plant communities have been described and mapped for the Park, their classification being based on dominant species as influenced by geology and climate, more than 40 being recorded from the Blue Mountains National Park alone in which over 1000 species of flowering plant and 346 bryophytes occur (Mosley, 1989). This species richness is exceptional for this climatic type, not only in a single habitat but over changes of taxa with changes in habitat and in changes of taxa in similar habitats but in different geographic areas (*alpha*, *beta* and *gamma* diversity). A number of rainforest communities have been described with affinities to subtropical, dry, warm-temperate and cool-temperate ecosystems. These rainforest patches are restricted to areas of higher rainfall or higher soil moisture, deeper, nutrient-rich soils, unaffected by fires. One of the richest areas of warm temperate rainforest is on the slopes of Mount Wilson. The forests of the east and south give way on the plateau to open woodland. Subalpine species are recorded above 1000m, and heaths, in areas exposed to strong winds such as ridge-tops and cliff edges. At similar altitudes where the drainage is restricted, and in steep-sided basins in headwater valleys hanging swamps have developed, with distinctive sedge, herb and shrub flora, often dominated by button grass *Gymnoschoenus sphaerocephalus*.

FAUNA

The exceptional floristic and structural diversity of the region's habitats explains the richness of the fauna. There are 400 vertebrate taxa including 52 native mammals plus 13 introductions, 265 birds, 63 reptiles, more than 30 frogs, and unusual species such as the platypus *Ornithorhynchus anatinus* and short-beaked echidna *Tachyglossus aculeatus aculeatus*. Endemic, relict, rare, threatened and restricted-range species include 12 mammals, 28 other vertebrates, 15 birds and 12 invertebrates. The mammals include a number of well-known animals such as the eastern grey kangaroo *Macropus giganteus*, the red-necked wallaby *M. rufogriseus*, common wallaroo *M. robustus*, koala *Phascolarctos cinereus* and wombat *Vombatus ursinus*, the greater glider *Petauroides volans*, the squirrel glider *Petaurus norfolcensis*, mountain brushtailed possum *Trichosurus caninus*; also the rarer spotted-tailed quoll *Dasyurus maculatus*, long-nosed potoroo *Potorous tridactylus* (VU), yellow-bellied glider *Petaurus australis* and brush-tailed rock wallaby *Petrogale penicillata* (VU).

The avifauna is diverse, with some 265 native species, a third of the Australian total, and 10 introduced species. The diversity of honeyeaters is high: 25 species have been recorded from the nominated area. The white-eared honeyeater *Lichenostomus leucotis* and New Holland honeyeater *Phylidonyris novaehollandiae* are found in the drier forests, Lewin's honeyeater *Meliphaga lewinii* frequents the rainforests and wet sclerophyll forest. Other species include the well-known gang-gang cockatoo *Callocephalon fimbriatum*, glossy black cockatoo *Calyptorhynchus lathami*, superb lyrebird *Menura novaehollandiae*, crimson rosella *Platycercus elegans*, kookaburra *Dacelo gigas*, and satin bowerbird *Ptilonorhynchus violaceus*. Raptors recorded from the area include the wedge-tailed eagle *Aquila audax* and a number of owls.

In all, over 60 species of reptiles have been recorded, including two tortoises, one being the endemic Nepean River tortoise *Emydura* sp.nov. The endemic broad-headed snake *Hoplocephalus bungaroides* (VU) is largely restricted to the Hawkesbury sandstone; the Blue Mountain water skink *Eulamprus leuraensis* (EN) is a rare endemic. Over 30 species of frog have been recorded from the Greater Blue Mountains Area including the giant barred frog *Mixophyes iteratus* (EN), booroolong frog *Litoria booroolongensis* (CR) and green and golden bell frog *Litoria aurea* (VU) plus the red-crowned toadlet *Pseudophryne australis* (VU) The invertebrate fauna is poorly known, but there are 120 species of butterflies and an estimated 4000 species of moth. The rainforest areas are particularly rich and the Jenolan Caves have 67 species of invertebrates. The primitive phylum *Onychophora* (between worm and insect) is particularly important, with at least five species out of a global total of only 200. Glowworms are also of interest, particularly the primitive members of the genus *Arachnocampa*.

CONSERVATION VALUE

The area is a pristine highland of wide views, rugged tablelands, dramatic cliffs, deep inaccessible valleys and high altitude swamps. Its unique and diverse wildlife of threatened and endemic species preserves a record of Australia's evolution, especially that of the eucalypts and plants associated with

them. Its topography, altitudinal range and climate have enabled the development and survival of a broad and important range of different plant communities, some being relicts of Gondwanan times. The mountains are part of a designated WWF/IUCN Centre of Plant Diversity. There is an exceptionally wide range of habitats which contain ninety-two species of eucalyptus, ten percent of Australia's vascular flora and numbers of rare or threatened, endemic and relict species, such as the Wollemi pine, which have persisted for millennia in highly protected micro-sites. The Park also lies within a WWF Global 200 Freshwater Eco-region and in one of the world's Endemic Bird Areas.

CULTURAL HERITAGE

The area has cultural associations with both indigenous cultures and western colonisation. The local Aborigines' relation to the land dates back at least 14,000, perhaps 22,000, years. It intensified about 7,500 and even more about 3,500 years ago when a tradition of tool use began there. The evidence is seen in rock shelters, stone implements, tool-making sites, axe grinding grooves and about 700 sites with art work (Mosley, 1989). The three main language groups were Gundungurra, Daruk and Darkinjung, each subdivided by bands and each maintaining traditions and stories associated with creation and the landscape which were noted down for the Gundungurra. The art is largely in the Simple Figurative styles which are widespread across Australia. It includes a wide range of motifs from figures, hands, feet, terrestrial and marine animals, birds and human tracks and animals. They include petroglyphs and pigment art both found in rock shelter sites, while petroglyphs only are found on open sandstone platforms.

At first the mountains were seen by the early European settlers only as a physical barrier. A number of ventures penetrated far into the mountains, including that of George Caley, botanist and plant collector for Joseph Banks who reached the base of Mount Banks in 1804. Caley noted that the mountains were "impassable" but in 1813 explorers eventually crossed the region, between the Cox and Grose Rivers and began to settle the region. By 1915 their route was a rough ridge-top road, now the basis of the Great Western Highway. This, and a smaller route through the Bell Range, remain the only roads which cross the 320 kilometer length of the mountains. As Sydney became a city the mountains came to be valued for recreation and their proximity encouraged the modern appreciation of conservation and wilderness. A number of reserves were developed, particularly along the railway, for example at Katoomba Falls, gazetted in 1883 for the "health, morale and intellectual advancement" of the residents of Sydney. For many years the Colong Foundation for Wilderness with other informal organisations have fought to preserve the area from development.

LOCAL HUMAN POPULATION

There is no resident population within the Park boundaries but there are several urban centres close to the boundaries, particularly along the line of the Great Western Highway in the Blue Mountains National Park section of the nominated area which for 100 kilometers divides the area along a ridge top of residential, tourist and small farm strip development collectively known as the City of the Blue Mountains, with an expanding population of some 80,000.

VISITORS AND VISITOR FACILITIES

A number of trails were built as far back as the 1830s, and hiking increased dramatically with the completion of the railway in 1867-8. The earliest gazetted public recreation reserves were the Fish River Caves (now the Jenolan Caves Karst Conservation Centre) in 1866 and the Grand Canyon in 1872. Visiting the mountains accelerated in the 1960s and by 1997 visitors to all the parks totalled 2,364,000, nearly two million (85%) of whom went to the Blue Mountains Park, especially to Echo Point and Govett's Leap, and quarter of a million (11%) to the Jenolan Caves (NPWS; 1998b). Tourist centres are all outside the Park except at Jenolan Caves, particularly along the Great Western Highway. There is a wide range of recreational activities with bushwalking (hiking) and camping being widespread. There are at least 140 kilometers of trails, with use ranging from several thousand to some 300,000 walkers per year. Picnicking and camping, riding, cycling and some vehicle touring are also common: there are 175 kilometers of roads and a further 275 kilometers of vehicle trails in the park. Parts of the area are heavily used for climbing, abseiling and canyoning, a combination of walking, canoeing and roped climbing in the canyons. There are NPWS visitor information centres at Glenbrook in the east, Blackheath to the west, and at Echo Point and Wentworth Falls in the highway corridor (NPWS; 1998a, b).

SCIENTIFIC RESEARCH AND FACILITIES

The area is a classic site for the examination of geological movements and change. Much research has been undertaken by tertiary research and educational establishments in Sydney and elsewhere

but there are no research stations within the Park boundaries. The NPWS is undertaking a number of research programmes on conservation issues and have set priorities for future research (NPWS, 1998a). The rare Wollemi pine, invasive species and biodiversity in the Blue Mountains and the use of Jenolan Caves are all regularly monitored.

MANAGEMENT

The nominated area has a complicated border, defined partly by adjoining privately owned lands which, in the Blue Mountains Park section, also divides it into northern and southern sections along the corridor of the Great Western Highway. The heart of each Park is reserved as wilderness which totals 54% of the nominated area. All eight component Parks, have or will soon have separate management plans. A comprehensive draft plan of management for the Blue Mountains National Park was prepared in 1998 by the NSW National Parks & Wildlife Service. This details a broad range of activities and policy priorities including development and maintenance of trails and roads; pest and alien species management; fire management; restoration of degraded land, protection of Aboriginal heritage; research, development of recreational, educational and interpretation facilities. These plans include liaison with the external agencies responsible for adjacent developments, among them several other parks and recreation areas. The NPWS has primary responsibility for the management of the Park, though most of the watershed areas of Lake Burragarang are jointly managed with Sydney Water Corporation. A zone within 3km of the lake is subject to special regulations as this area, the Warragamba catchment, is a Schedule One water protection zone. Private inholdings within the property are excluded from the nominated area but the continuing policy is to buy and incorporate these enclaves to preclude their exploitation as tourist resorts.

MANAGEMENT CONSTRAINTS

The urban development along the Great Western Highway has a growing population. Much of its polluting drainage runs directly into the Park where several rivers are now unfit to drink. This area is also subject to the impacts of tourism. Such pressures increase the threat of fires, accidental or deliberate which can be quite frequent, invasion by pest species both plant and animal, urban run-off, sedimentation and nutrient enrichment from cultivation. Efforts are being made to control sewage and further urban development and funds have been made available to purchase private land. Alien species are a major focus for management programs. There are at least 39 noxious plants within the park, most of them in disturbed sites close to settlements and their runoff. Volunteer groups working with NPWS authorities have had some success in their control and removal, but problems remain. There are also some 13 introduced animals, including fox and feral cat and feral populations of cattle, horses and pigs.

Fire is an integral part of this ecosystem, and its management is an important part of the overall Park management, for safe recreational use, and for the natural systems themselves. Too frequent fires alter vegetation regimes, erosion patterns and water quality. Too infrequent fires lead to loss of early successional species and an increase in large intensive fires which threaten the natural vegetation and neighbouring urban and farm lands. Mining is prohibited within the Parks but coal seams occur in several places and there are groups of coal mines to the northeast, southeast and west of the nominated area. A mine adjacent to Wollemi National Park is polluting streams; some mines have caused landslips, another mine is proposed for in the southwest catchment area and exploration for gas is proposed in Nattai National Park. Limestone and sand mining, clear-felling, off-road driving, highways, power stations, dams, tourist pollution, aircraft noise and urban sprawl are all potential threats from groups in the vicinity, especially in the timber and coal industries, who are opposed to what is seen as uneconomic use of the area.

STAFF

There is little information on the Greater Blue Mountains Area as a whole. For the Blue Mountains National Park there are 33 professional staff, which include managers, rangers, tour guides and fire management officers. There are a further 38 technical staff, including pest species officers, administrative officers, and visitor centre staff; there are also some 35 maintenance staff (NPWS; 1998b).

BUDGET

The government grants an annual budget for managing the National Parks within the nominated area. In 1997 this was \$A4.3million (\$US3,096,000) with revenues covering only about 5% of their costs. Annual maintenance of Jenolan Caves costs \$A3.1 million (\$US2,232,000), 90% of it coming from revenues.

LOCAL ADDRESSES

The Regional Manager, Central Region, NSW National Parks and Wildlife Service, P.O.Box 95, Paramatta, New South Wales 2124, Australia.

The Regional Manager, Metropolitan Region, NSW National Parks and Wildlife Service, P.O.Box 1967, Hurstville, New South Wales 2220, Australia.

REFERENCES

The principal source for the above information was the original nomination for World Heritage status.

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----- (2000b). *The Greater Blue Mountains Area World Heritage Nomination, Supplementary Documentation*. Provided in support of the nomination.

----- (2000c). *New Information provided by Australia Regarding the Nomination of The Greater Blue Mountains Area for Inscription on the World Heritage List*.

DATE

December 1998. Updated 2-2005, May 2011.