



Department of
Environment and Climate Change NSW

**Colo River,
Wollemi and Blue Mountains National Parks
Wild River Assessment 2008**

April 2008

Published by:
Department of Environment, Climate Change and Water NSW
59–61 Goulburn Street
PO Box A290
Sydney South 1232

Report pollution and environmental incidents

Environment Line: 131 555 (NSW only) or info@environment.nsw.gov.au
See also www.environment.nsw.gov.au/pollution

Phone: (02) 9995 5000 (switchboard)
Phone: 131 555 (environment information and publications requests)
Phone: 1300 361 967 (national parks information, climate change and energy efficiency information and publications requests)
Fax: (02) 9995 5999
TTY: (02) 9211 4723

Email: info@environment.nsw.gov.au
Website: www.environment.nsw.gov.au

© Copyright State of NSW and Department of Environment, Climate Change and Water NSW. With the exception of photographs, the Department of Environment, Climate Change and Water and the State of NSW are pleased to allow this material to be reproduced for educational or non-commercial purposes in whole or in part, provided the meaning is unchanged and its source, publisher and authorship are acknowledged.

ISBN 978 1 74293 066 4
DECCW 2010/1039
Released by DECC 2008. Web upload to DECCW website December 2010.

Contents

Executive summary	1
1. Introduction	2
1.1 Wild rivers under the National Parks and Wildlife Act.....	2
1.2 Why declare wild rivers?.....	3
2. Assessment	4
2.1 Assessment methodology.....	4
3. Results	5
3.1 Description of the subcatchment.....	5
3.2 Description of the study area.....	5
3.2.1 Physical features.....	5
3.2.2 Natural values.....	7
3.2.3 Aboriginal cultural heritage.....	9
3.2.4 Recreational values.....	9
3.2.5 Landuse history.....	10
3.2.6 Threatening processes.....	12
3.3 Technical assessment.....	12
3.3.1 Biological assessment.....	12
3.3.2 Geomorphological assessment.....	13
3.3.3 Hydrology.....	14
4. Referrals	15
5. Recommendations	16
6. References	17
7. Appendices	18
7.1 Appendix 1: Data sources – Technical assessment: criteria for wild rivers.....	18
7.2 Appendix 2: Taxa found in the Colo, Wolgan, Capertee and Wollangambe Rivers.....	19

Executive summary

The NSW *National Parks and Wildlife Act 1974* (NPW Act) was recently amended to permit formal recognition and protection of wild rivers. Whereas most rivers in NSW have been greatly changed by modern society, wild rivers remain in a substantially unmodified condition and are of high conservation value.

A river, or part of a river, may be declared a wild river by the Director General (DG) of the Department of Environment and Climate Change (DECC) following a detailed assessment of its conservation value in accordance with DECC's 'Framework for wild river assessment' (DEC 2005). Wild rivers may only be declared on lands reserved under the NPW Act. Wild rivers are managed to maintain and, where possible, restore natural processes associated with river health and to permit the identification, conservation and appropriate management of Aboriginal objects and places. A wild river may also be used as a focal point for protection and rehabilitation works within the catchment.

The Colo River is located within the Hawkesbury–Nepean catchment, its valley is one of the largest sandstone canyon systems in Australia. The catchment is made up of a rugged dissected landscape, dominated by many deep valleys, canyons and cliffs.

The Colo River consists of four subcatchments. These are Colo, Wolgan, Capertee and Wollemi subcatchments. These subcatchments fall largely within the Blue Mountains and Wollemi National Parks, which is overlain by the Wollemi Wilderness. Both these parks, together with Gardens of Stone National Park, Nattai National Park, Kanangra–Boyd National Park, Thirlmere Lakes National Park, Yengo National Park and Jenolan Karst Conservation Reserve are listed as the Greater Blue Mountains World Heritage Area. Newnes State Forest covers the most western edge of the catchment and the eastern side is freehold land.

The Colo, Wolgan, Capertee and Wollemi subcatchments have been and continue to be important to Aboriginal people and contain significant Aboriginal sites. These sites and areas represent a direct link to Aboriginal traditional and spiritual life.

Agriculture, forestry, sand and oil-shale mining all occur on the catchment edges and on the lower reaches of the river. Impacts from mining have occurred in the headwaters of Wollangambe Creek (within the Colo subcatchment) in the past; however, the biological condition of the river is likely to improve rapidly downstream from the colliery with distance and additional flow contributed from the numerous tributaries joining the river.

The Colo, Wolgan, Capertee and Wollemi subcatchments have been assessed for biological, geomorphic and hydrological condition and found to support a high diversity of macroinvertebrate fauna. The biological assessment (AUSRIVAS) has indicated the Colo River's condition has not suffered significantly as a result of disturbances that have taken place in the catchment. A geomorphic assessment of the Colo River and its feeder rivers indicates they are in a high geomorphic condition. The Colo River is a gorge river which is relatively resilient to geomorphic disturbances. Historic flow data, used to detect flow changes over time, is not available for the Colo River or its feeder rivers. Conversely, there is nothing in the catchment's history to indicate that the hydrology of the river or catchment would be substantially disturbed. Overall, the Colo, Capertee, Wolgan Rivers, the Wollemi Creek and their tributaries within the Blue Mountains and Wollemi National Parks are considered to meet the criteria for wild rivers.

1. Introduction

1.1 Wild rivers under the National Parks and Wildlife Act

The wild river provisions under the *National Parks and Wildlife Act 1974* (the NPW Act) present an opportunity to identify some of the most pristine rivers in NSW and to ensure these rivers, including their cultural features, are well managed.

Wild rivers may only be declared on land that is reserved under the NPW Act. To be considered wild, a river must be in a largely natural condition. Consideration is also given to the condition of those parts of the catchment affecting the river.

According to section 61 (4) of the NPW Act:

Wild rivers are those exhibiting substantially natural flow and containing remaining examples in a condition substantially undisturbed since European occupation of:

- (a) the biological, hydrological and geomorphological processes associated with river flow, and
- (b) the biological, hydrological and geomorphological processes in those parts of the catchment with which the river is intrinsically linked.

The purpose of declaring a river as wild is to identify, protect and conserve:

any water course or water course network, or any connected network of water bodies, or any part of those, of natural origin, exhibiting substantially natural flow (whether perennial, intermittent or episodic) (section 61 (4) NPW Act).

Rivers are assessed in accordance with DECC's Framework for wild river assessment (DEC, 2005). If the watercourse meets the NPW Act's requirements, a wild river is declared by the DG of the Department of Environment and Climate Change (DECC) placing a gazettal notice in the *Government Gazette*. Where the declaration may affect functions carried out under the *Water Management Act 2000* or, in the case of State Conservation Areas, the *Mining Act 1992*, the concurrence of the responsible ministers may be required prior to declaration (section 61 (3) NPW Act).

Wild rivers are managed by DECC to maintain and restore (if necessary) their wild river values, and to identify, conserve and protect associated Aboriginal objects and places (section 61 (5) (a) and (b) NPW Act). Wild river declarations can trigger investigations of Aboriginal objects and places, and the development of conservation plans.

A wild river can only be declared if it is consistent with any plan of management in operation for the reserve/s where the water course is located (section 61A NPW Act). The Colo River catchment falls within Blue Mountains and Wollemi National Parks. Plans of management for both parks have identified the Colo River as a potential wild river. A wild river declaration will not alter the current management of the river; therefore, no amendment to the plan of management is required.

1.2 Why declare wild rivers?

Wild River declaration can raise the profile of the most pristine rivers in the state and provide a focus for environmental monitoring and scientific study.

All rivers within the existing reserve system fulfil a role in protecting freshwater and riparian-dependent flora and fauna. Wild rivers, because of their excellent condition, potentially play a wider role in providing a range of environmental services for other parts of their catchment, including a source for recolonisation, water quality improvement, water supply assurance and flood mitigation. They also have a role in protecting cultural and historic heritage.

Wild rivers can provide a focus for land managers who wish to identify and manage streams of high conservation value as part of their activities. Those individuals managing lands outside of the reserve system may wish to complement the wild rivers program with conservation programs in other parts of the catchment.

2. Assessment

2.1 Assessment methodology

Biological, geomorphic and hydrological aspects of the Colo River were assessed to determine whether it was substantially undisturbed and met the definition of a wild river. The assessment was undertaken in accordance with DECC's Framework for wild river assessment (DEC 2005). A range of existing information on the condition of the Colo River and its catchment was reviewed and local knowledge was sought.

The following assessment techniques were used to measure the current biological and geomorphic conditions and these were compared to a reference condition:

- Biological health was assessed using 'AUSRIVAS' (Davies 2000, Turak et al 2004) analysis. This method samples and analyses freshwater invertebrates and uses the presence or absence of groups of invertebrates as a surrogate for biological health.
- Geomorphic condition was assessed using River Styles (Brierley and Fryirs 2005). This method measures a range of physical features of rivers to determine whether there are unnatural rates of change in the river system.

These methods have been used extensively in NSW.

AUSRIVAS uses those rivers in the most pristine condition as benchmarks against which other rivers are compared. These benchmarks, or reference sites, are considered to be rivers which are the least affected by post-European human activities.

Under the River Styles system, each section of a river is classified according to factors such as rainfall, geology and topography of the landscape (e.g. whether the river occurs in a rocky gorge or on a floodplain). Certain features of a river such as extent of bank vegetation or the presence of deep pools, are compared to predicted or reference features for that particular river type. River condition is determined according to how well the river's features meet the reference condition. River condition assessed using this method is indicative of whether the river's geomorphology is changing at an unnatural rate due to human disturbance.

Changes in river hydrology may be determined with some accuracy where flow monitoring stations have been located for some years. However, this information is unavailable for most rivers. Hydrological changes may only be deduced using information on water and land use in the catchment; for example, extent of clearing in the catchment, impediments to river flow, such as dams or weirs, and estimates of water usage from water extraction licences.

Current and historical land-use practices were investigated within the catchment of the Colo River where these had the potential to directly impact on river condition. Current land-use information was also used to highlight any management practices that might impact on the river or catchment in the future. Disturbances that may impact on the biology, hydrology and/or geomorphology of the river include logging, clearing, roads, mining, drainage works, water extraction, frequent or severe fire, intensive recreational activities, grazing, the presence of certain weeds and feral animals. Sources of information used include maps of vegetation structure, aerial photographs, physical evidence and any documents relating to the history, use and management of the area. Local knowledge and input to the study was also obtained. Data sources used and experts consulted for the technical assessment are listed in Appendix 1.

3. Results

3.1 Description of the subcatchment

The Colo River subcatchment is one of the largest sandstone canyon systems in Australia and has been identified as one of a number of wild and scenic rivers in NSW (Helman 1979). Located north of the Colo are the subcatchments of the Wolgan and Capertee Rivers and Wollemi Creek, which feed into the Colo. The upper reaches of the Wolgan and Capertee flow through agricultural land in the west, whereas the Wollemi subcatchment flows from the north and is largely vegetated and within national park boundaries. All the aforementioned subcatchments are considered in this assessment (Figure 1). In 1979, an area of 453,500 hectares, incorporating the catchments of the Colo, Capertee and Wolgan Rivers, Wollemi Creek and the Colo's major tributaries, was gazetted as the Wollemi National Park. Additions since 1979 bring that figure to 488,620 hectares. The Colo subcatchment covers an area of 1468 square kilometres, the Wolgan 531 square kilometres, the Wollemi 1134 square kilometres, and the Capertee 1496 square kilometres (Figure 1). The Wollemi Wilderness, gazetted in 1999, overlays the majority of land in these catchments.

These large and relatively undisturbed catchments in the Blue Mountains and Wollemi National Parks provide an extremely important control mechanism for flood mitigation, water supply and water quality maintenance in the Hawkesbury–Nepean catchment.

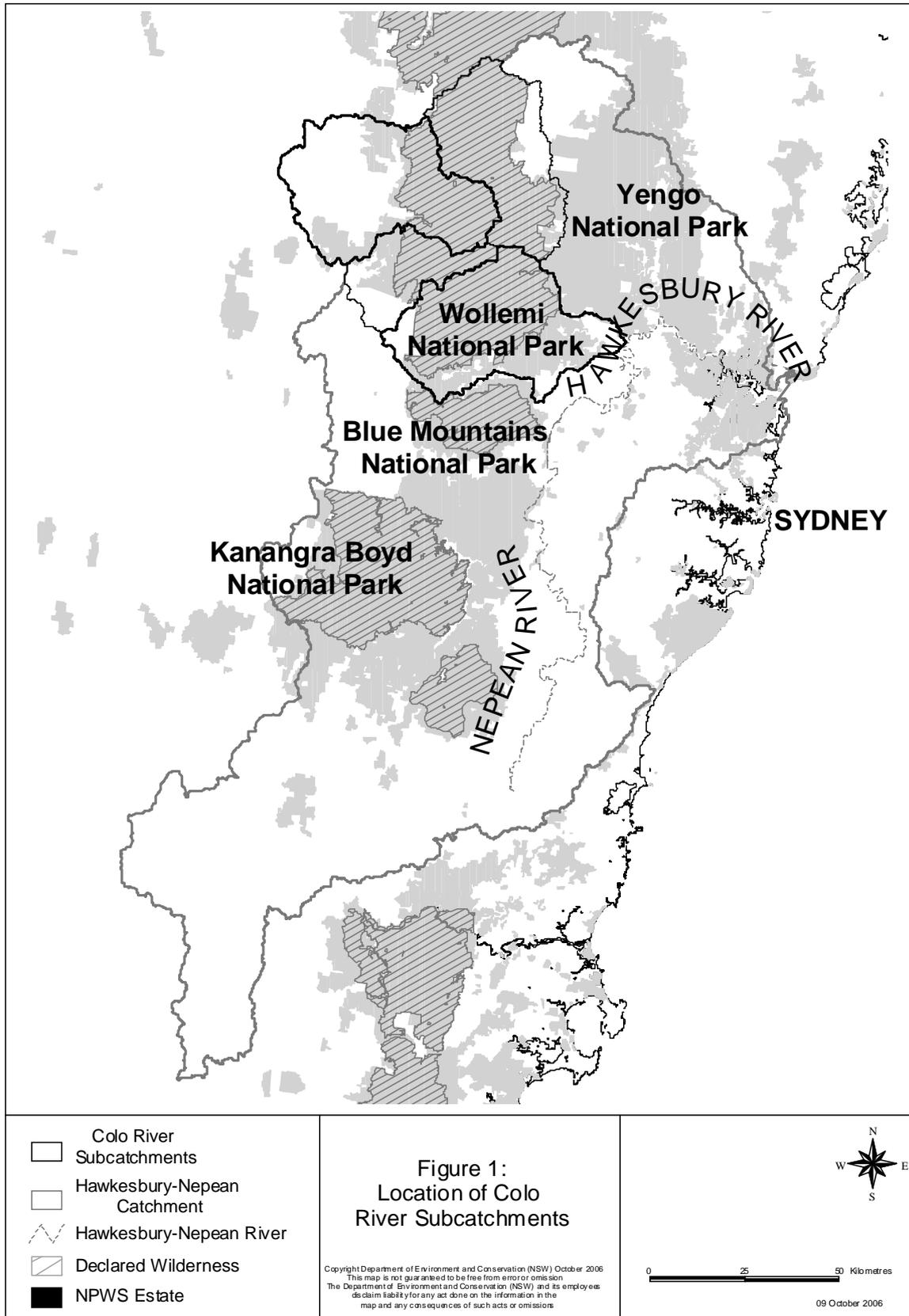
3.2 Description of the study area

3.2.1 Physical features

The geology of the study area is primarily based on four strata of sedimentary rock, namely Permian coal measures overlain by Narrabeen and Hawkesbury sandstones and the Wianamatta shales. Erosion has weathered away the upper strata throughout most of the assessment area, exposing the Narrabeen group. The Narrabeen group consists of sandstones and claystones that have given Wollemi and Blue Mountains National Parks their characteristic dissected landscape, dominated by many deep valleys, canyons, narrow gorges, waterfalls and cliffs. This erosion by major water courses has resulted in towering cliffs of up to 300 metres in the Colo River valley. Underlying the Narrabeen group are the Illawarra and Singleton Permian coal measures, which are visible beneath cliff lines along river valleys such as the Capertee and along the northern escarpment of the park. These strata form steep, vegetated slopes and weather to rich deep-clay loams (NPWS 1997).

The south-eastern quarter of the Blue Mountains National Park, near Colo Heights, contains outcrops of the overlying Hawkesbury sandstone as well as smaller remnants of the Wianamatta shales. Soils formed from the Narrabeen and Hawkesbury sandstones are generally very shallow with little development and low nutrient levels, especially phosphorus. These sandstone-based soils are highly erodible. Residual tertiary basalts occur at places such as Mount Cameron, and extinct volcanic vents have weathered faster than the surrounding sandstone to form holes, such as at Box Tree Clearing. Limited alluvial deposits occur in broader valleys and a large outcrop of Quaternary alluvium occurs in the Mellong Swamp area. The swamps consist of deep sands and clays with rich soils dissected by steep sandstone ridges (NPWS 1997).

Figure 1. Location of the Colo River subcatchments.



3.2.2 Natural values

The most widespread vegetation types (covering approximately 90% of the Wollemi Wilderness) are the eucalypt-dominated open forests on steep, sandstone–shale terrain. More than 100 eucalypt species have been recorded in the Wollemi and Blue Mountains National Parks. The pattern of eucalypt vegetation is largely a mosaic of open forest and woodland with occasional distinctive communities such as rainforest, heath and grassy knolls.

Dry sclerophyll eucalypt forest with an understorey of evergreen and hard-leaved shrubs predominantly of the *Hakea*, *Persoonia*, *Boronia* and *Grevillea* genera is the most common plant community within the Colo subcatchment (The Colong Foundation, 1993). Important dry rainforest suballiances also occur in the catchment, with the *Choricarpia leptopetala* suballiance at Wheeny Creek being at its southern limit of distribution (James 1994).

East of the Colo River, forest cover is largely comprised of Sydney peppermint (*Eucalyptus piperita*), red bloodwood (*E. gummifera*), Sydney red gum (*Angophora costata*) and turpentine (*Syncarpia glomulifera*). In higher areas south-west of the Colo gorge, the forest communities become more like those of the upper Blue Mountains, with common species including silvertop ash (*E. sieberi*), Sydney peppermint, narrow-leaved peppermint (*E. radiata*) and scribbly gum (*E. sclerophylla*).

In the Colo gorge, the talus slopes support Sydney blue gums (*E. saligna*), the occasional Port Jackson fig (*Ficus rubiginosa*), coast Myall (*Acacia binervia*) and a thick understorey including species such as cheese tree (*Glochidion ferdinandi*). Pockets of rainforest are found in the smaller side gorges (The Colong Foundation 1993).

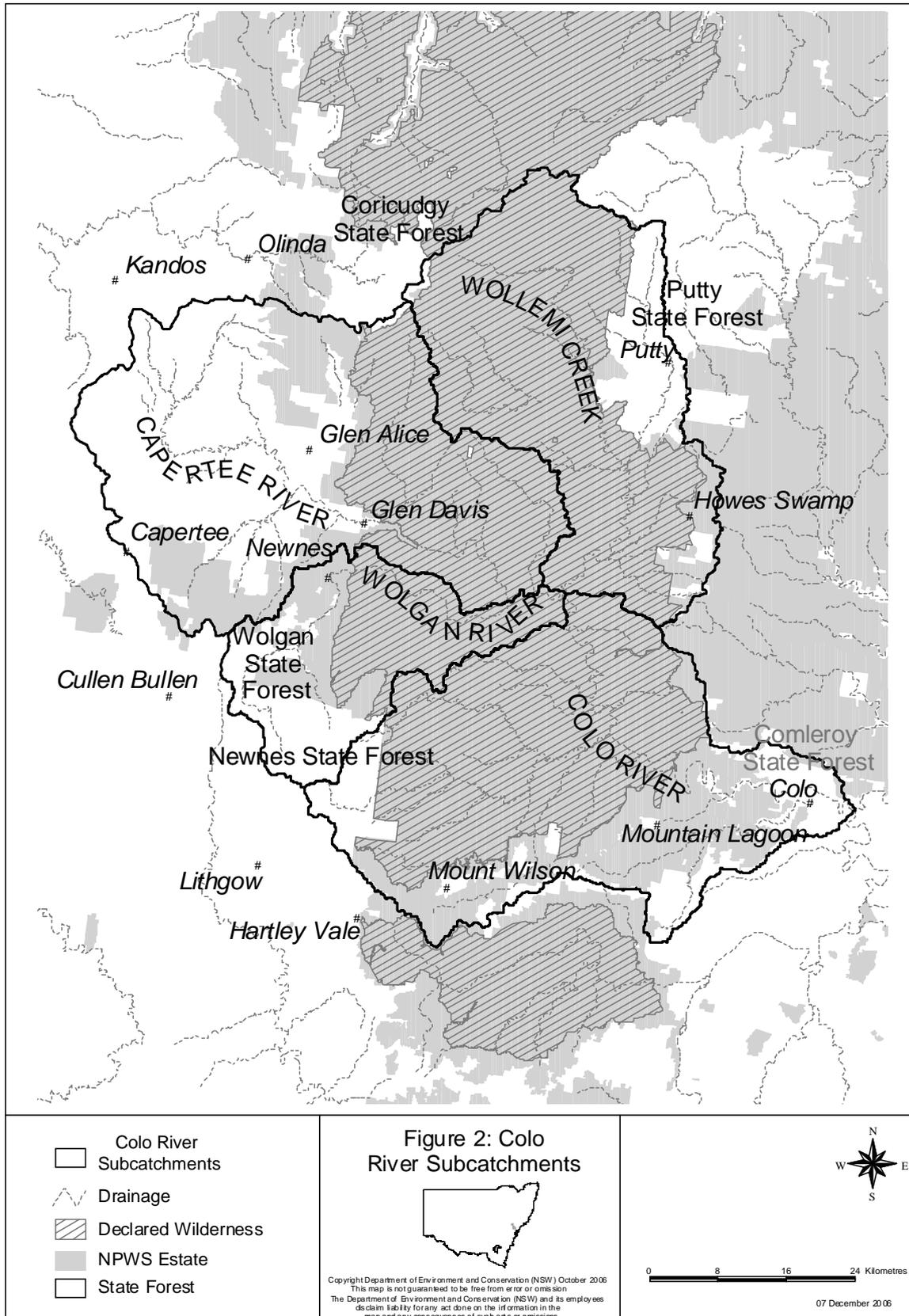
West of the Colo gorge, the forest communities become more like those of the central Blue Mountains, with eucalypts such as red and yellow bloodwood (*E. gummifera* and *E. eximia*) and Sydney red gum (*Angophora costata*) being commonly encountered (The Colong Foundation 1993).

The high-altitude Newnes Plateau has a significant mix of plant communities, including the endangered high-altitude shrub swamps. These swamps are restricted in area and have an important role in flow regulation to the Wollangambe and Bungleboori subcatchments (Tim Hager personal comm.), located in the Colo subcatchment.

Forty-six native mammals have been recorded on the dissected sandstone plateau area of the Blue Mountains. They include the threatened brush-tailed rock-wallaby (*Petrogale penicillata*), which occurs in populations where suitable rock habitats are found. Threatened fauna species include the spotted-tailed quoll (*Dasyurus maculatus*), three micro-bat species, the yellow-bellied glider (*Petaurus australis*) and brush-tailed phascogale (*Phascogale tapoatafa*). Over 235 bird species have been recorded in Wollemi National Park, including the regent honeyeater (*Xanthomyza phrygia*), powerful owl (*Ninox strenua*) and glossy black-cockatoo (*Calyptorhynchus lathamii*), all of which are endangered species (NPWS 1997).

Fifty-eight reptile species have been recorded, including the red-naped snake (*Furina diadema*), Lesueur's velvet gecko (*Oedura leueurii*), the white skink (*Egernia whitii*) and the tree skink (*Egernia striolata*). Amphibians include the red-crowned toadlet (*Pseudophryne australis*), Blue Mountains tree frog (*Litoria citropa*), tusked frog (*Adelotus brevis*), giant burrowing frog (*Heleioporus australiacus*), brown-striped frog (*Limnodynastes peronii*), great barred frog (*Mixophyes fasciolatus*) and Bibron's toadlet (*Pseudophryne bibronii*) (NPWS 1997).

Figure 2. The Colo River subcatchments.



3.2.3 Aboriginal cultural heritage

The Wollemi Wilderness was a relatively inaccessible natural area that separated territories between a number of Aboriginal peoples: the Wiradjuri of the south-western slopes, the Dharuk and Darkinjung of the coast and the mountains to the east, the Wonarua of the Middle Hunter, and the Kamilaroi of the north-western slopes as far south as the Upper Goulburn tributaries (The Colong Foundation 1993).

Evidence of Aboriginal occupation includes open campsites, occupation deposits in sandstone shelters (some containing art), rock engravings, burials, scarred trees, ceremonial grounds, stone arrangements and axe grinding grooves. These sites are important to the Aboriginal community and provide valuable insights into traditional Aboriginal lifestyles and the interaction of people with their environment by representing a direct link to Aboriginal traditional and spiritual life. The landscape and its significant relationship to sites are expressed in the form of 'dreaming tracks'. They provide a cultural link between the past and present and are preserved as part of the cultural identity of the Aboriginal people in the relationship between place and story (NPWS 1997).

The Windradyne, Wanaruah, Darkinjung and Daruk Local Aboriginal Land Councils and other Aboriginal groups represent the contemporary Aboriginal community involvement in Wollemi National Park (NPWS 2001).

3.2.4 Recreational values

The south-eastern section of the catchment near the Colo River provides an important recreation facility adjacent to north-western Sydney.

The Newnes/Glow Worm Tunnel precinct is a major visitor node in the south-west, with over 10,000 visitors each year. The plethora of tracks invites four-wheel driving and trial-bike riding enthusiasts. Other attractions include the historic oil shale mining relics, the nearby Glow Worm Tunnel walking track and easy access to climbing and canyoning areas. A walk-in camping area is provided in the park at Deep Pass, on the headwaters of Nayook Creek. Small camping areas are located at Galah Mountain Road in Wollemi National Park, which has a low rate of use, and at Bungleboori, in Newnes State Forest, which has a moderate rate of use.

Wheeny Creek camping area is the most popular camping area in the Wollemi National Park section of the Colo catchment and is accessible by vehicle, motorbike, bicycle and horseback as well as on foot. Colo Meroo camping area, on the banks of the Colo River, is accessible on foot as well as by canoe or lilo.

Wollangambe Canyon is probably the most visited canyon in the Blue Mountains area, with up to 150 canyoners on a peak summer day. Impacts are mostly through track erosion on unformed walking tracks, short-term increase in stream turbidity and stream side vegetation damage. Overnight camping is uncommon.

A number of fire trails in the catchment are used by walkers and horse riders, including T3, Tootie Creek, Mailes Ridge, Gaspers Ridge and Cabbage Tree Creek fire trails, located in the mountain lagoon area. Grassy Hill fire trail has four-wheel drive access to a route to Canoe Creek and then on to the Colo River. Culoul Range fire trail provides four-wheel drive access from Putty Road. Walking tracks and routes lead to Hollow Rock and the Colo River. Recreational horse riding is mostly confined to the vehicle access systems; however, a network of informal horse riding trails has developed in the south of Wollemi National Park, around the Colo River, Tootie Creek and Wheeny Creek areas. Impacts include introduction of weeds, soil compaction, erosion, and widening of walking tracks.

3.2.5 Land use history

The rugged terrain, low nutrient soils and dry climate of much of the assessment area have been a constraining factor in European exploration, settlement and industry, and as a result the region has had minimal disturbance. Agriculture, forestry and oil-shale mining were, and continue to be, undertaken in some parts of the assessment area.

Grazing

Pastoralists began to settle in the Capertee Valley and at Dabee in the Wolgan Valley in 1825, at Gaspers Mountain in 1877, and at Mount Cameron soon after. Grazing is centred around freehold land and areas under permissive occupancy. Today, these areas occur on the upper sections of the Capertee and Wolgan subcatchments, outside national park boundaries. Dry land salinity occurs in parts of the Capertee valley (NPWS 1991, 1997).

Localised clearing has also occurred at rural residential locations such as Mount Irvine and Mount Wilson. The Colo subcatchment, however, is largely uncleared. Former freehold grazing lands, such as Mount Cameron, have been added to the national park and are recovering, whereas others, such as Gaspers Mountain, continue to be grazed.

The largest grazing property in the Wolgan subcatchment is likely to be the site of the proposed Emirates six-star resort, and if this development takes place the grazing pressure will be reduced. The proposal includes rehabilitation of eroded areas and a massive tree planting initiative.

Logging

Past harvesting operations in Wollemi National Park were mainly selective logging for saw logs and pit props, and therefore had a relatively low impact on the vegetation (NPWS 1997).

Outside the national park, part of Newnes State Forest occurs on the western edge of the Colo catchment, with the major logging activity being pine forest harvesting. Blue Mountains ash (*E. oreades*) was removed for pit props, cut mainly on the ridges in the southern Newnes area; however, these operations have also been on a minor scale (The Colong Foundation 1993). There is significant roading in Newnes State Forest associated with pine forest operations. Outside the plantations, additional roading was constructed during an intensive coal exploration program in the 1980s. Forestry operations are also associated with use of frequent, low intensity fires and replacement of mature forest with regrowth. Some surface mining facilities remain within Newnes State Forest (NPWS 1997).

Coricudgy State Forest had been logged since the 1920s. A sawmill at Mount Coricudgy was established in 1954 which led to nearby sections in what is now Wollemi National Park, including rainforest stands, being heavily logged. Timber harvesting is also known to have occurred around the Tollagong Range, in the Putty areas, and west of Wollemi and Putty Creeks, possibly dating back to the 1930s. Logging activities also occurred on Grassy and Culoul Ranges and in most of the creek systems east of the Colo River. Currently, there is a sawmill at Colo Heights; however, it sources its timber from outside of the catchment (NPWS 1997).

Mining

Oil-shale mining began in the Wolgan Valley in 1873, with substantial mining from 1903 onwards. In 1905, the Commonwealth Oil Company commenced large-scale operations in Newnes; however, by 1937 it was rationalised and moved to Glen Davis. Some historical ruins such as adits (mine entrances), road works, cleared ground, building footings and old machinery remain at mining sites such as Newnes (The Colong Foundation 1993).

Currently, there are several collieries and areas covered by mineral exploration licences within the assessment area. The coalmines in and near the south-west of the assessment area include Clarence, Angus Place, and Baal Bone, Springvale, Invincible and Western Main mines (NPWS 1997).

The Springvale mine affects the Wolgan catchment, with its pit top at Marrangaroo and lease area extending under Newnes State Forest. Until recently, mine dewatering was adding large volumes of water to the upper Wolgan River. Currently, the drop in river level following the rerouting of mine water elsewhere is very noticeable and the impact of this is unknown (N. Stone pers. comm.).

Clarence Colliery is another major underground coal mine with a pit-top development adjacent to the upper Wollangambe River. The pit-top area has a large coal reject emplacement area, and run-off from the area is conveyed to a series of retention dams designed to hold a 'once every 50 years' storm event. Any overflow from these dams enters a final dam located on a major branch of the Wollangambe River. Runoff from the colliery site during storm events may be a source of contamination of the Wollangambe River. Also, because the lease area for the underground mine covers the upper Wollangambe catchment, there is potential for impacts on groundwater flows, since the mine intercepts fairly large volumes of water (N. Stone pers. comm.).

Complaints from bushwalkers in 1995 led to the investigation by CSIRO of a black 'bio-film' growing on the rocks below the colliery's discharge point. The biofilm was found to be a filamentous algae that trapped ultra-fine coal particles within the biofilm matrix. The Environment Protection Authority (EPA) responded by conducting a full environmental audit of the mine in 1996, resulting in improvements to the mine's water treatment and drainage systems (N. Stone pers. comm.).

There are three sand mining operations on the Newnes Plateau and one at Mellong Swamp that supply Sydney and the Blue Mountains with aggregate. These include open-cut sand quarries near Bungleboori and Bell Creeks. The potential impact from sand mining includes stream pollution, increased sediment load to rivers, and disturbance to surrounding vegetation. A major new sand-kaolin mine was recently approved for an adjacent site. It is unclear what impact this development will have on the integrity of the Wollangambe River in the longer term.

Introduced species

Weed species of concern along the Colo River are prickly pear (*Opuntia stricta*) and tiger pear (*O. aurantiaca*). Recent control efforts have largely eradicated willows from the Colo River within Wollemi National Park (V. Richardson pers. comm.).

Blackberry (*Rubus fruticosus*) occurs along waterways, particularly Wollemi Creek, Blackwater Creek and the Cudgegong, Capertee and Colo Rivers, and tree of heaven (*Ailanthus altissima*) has been recorded at Wheeny and Koondah Creeks and the Wolgan River. Lantana (*Lantana camara*) has been found at Wheeny Creek, and Cape Ivy (*Senecio mikanioides*) occurs in the wilderness area of the Wolgan Valley. The spread of *Coreopsis* species from the Putty Road and Bells Line of Road into the catchment along vehicular access routes is also a concern. DECC's control programs have been considerably successful to date, with the control of tree of heaven at California, blackberry at Putty Creek and Newnes, and lantana at Parsons Creek (NPWS 2001).

Feral species that have been recorded include wild dog, pig, goat, cattle and donkey. Feral cats, rabbits and red foxes also occur in the area. Foxes and cats primarily live on the periphery of the national park, close to human settlement. The basalt caps and diatremes of Gospers Mountain and the valleys near Putty are subject to regular grazing by cattle and feral donkeys. Domestic cattle are known to stray from lands under permissive occupancies into wilderness areas. Apart from the undesirable effects of cattle grazing, this can lead to the establishment of wild cattle populations. Goats are also an issue and have been sighted in the Lower Colo area, along with deer found in the Mellong area since the 1994 bushfires, and in the Putty Road and

Wheeny Creek areas. Feral pig populations have been recorded at Putty, Newnes Plateau, Bilpin, Mount Tootie, Mellong swamps and Kurrajong Heights (NPWS 2001). Impacts caused by pigs include soil erosion, soil compaction and vegetation destruction, although the impacts, which can be quite severe, are localised.

Fire

The dry eucalypt forests and heathlands that dominate the catchment of the Colo River indicate that this landscape and its vegetation have evolved with fire over tens of thousands of years. The various vegetation types that can tolerate and respond to fire with a frequency of every 10 years include heathlands, with blue gum forests tolerating this fire frequency up to about 60 years.

Post-European fire history is poorly documented. Valid fire history information dates back to the early 1950s, with accurate mapping starting in the mid-1970s. Since this time the catchment has had a major fire event roughly every 10 to 15 years.

Parts of Wollemi National Park were extensively burnt during the 1993–94, 1997, 2001–02 and 2002–03 fire seasons. The fires affected large sections of the assessment area. Massive erosion of bare, steep-talus slopes over the few months immediately after the 2003 fire in the Capertee resulted in huge sediment loads being transferred to the lower slopes of the valleys. The last major event in the Colo area occurred in 2001–03, when most of the catchment was burnt over two successive fire seasons (N. Stone pers. comm.).

3.2.6 Threatening processes

Mining has potential for ongoing pollution from existing sources and from proposed mines (Newnes Plateau sand mine, Mount Airly coal mine). The Newnes Plateau is an option for the future supply of materials for the expanding Sydney construction industry. Most of the potential sites on the plateau are within the Wolgan, Wollangambe or Bungleboori catchments. The Clarence, Springvale and Angus Place coalmines will continue to operate for many years.

3.3 Technical assessment

3.3.1 Biological assessment

Biological condition was assessed by sampling aquatic macroinvertebrates of the main tributaries of the Colo River. In May 2005, samples were collected from the upper reaches of the Capertee and Wolgan Rivers, specifically for determining whether the Colo River met the wild river criteria. This recent sampling, together with results collected previously for the National River Health Program (NRHP) for the Colo and Wollangambe Rivers, made up the overall assessment.

AUSRIVAS samples collected in 2005 from edge habitat in the Capertee River, within the national park and just downstream from Freshwater Creek, show this part of the river to be in a condition similar to reference conditions and having high aquatic biodiversity. Although riffle samples suggested a slightly poorer condition than reference condition, this was probably caused by low water levels at the time, resulting from the drought rather than from activities in the catchment upstream. The condition of another site along the Capertee River at Glenn Davis (approximately 2.5 kilometres upstream of the national park boundary) was slightly below reference condition. Aquatic fauna at the site showed slightly impaired condition; however, the condition of the river improved after it enters the national park.

AUSRIVAS samples collected from edge habitats in the Wolgan River within the national park were of a condition similar to reference condition. Although the riffle sample suggested a poorer than reference condition, this was likely to be a consequence of the sample site, which did not provide sufficient riffle habitat to meet AUSRIVAS protocols, and did not necessarily indicate that the river was impaired.

Samples collected at two sites on the Wolgan River, one at Newnes just outside the national park, and one at Wolgan Gap, about 20 kilometres upstream, gave mixed results. Some results showed sections of rivers to be slightly below reference condition and others slightly above. However, on the whole, these results suggested that this section of river had high aquatic biodiversity and was in good condition, and that the river's condition improved as it entered the national park.

The Wollangambe River immediately downstream of Clarence Colliery was sampled in autumn and spring, 1999, for the NRHP. This site was found to be in much poorer condition than the reference condition, suggesting that the aquatic biota was severely impaired by discharges from the coal mine. The site was situated at the head waters of the Wollangambe River, where aquatic habitat was poor. The Wollangambe River enters the Blue Mountains National Park approximately 1.6 kilometres downstream from the colliery, where the river is in good condition. The biological condition of the river is likely to rapidly improve with distance downstream from the colliery and additional flow contributed from the numerous tributaries joining the river.

Data from one site in the lower part of the Colo River, outside the national park boundary, was assessed as being much poorer than the reference condition, possibly reflecting impacts from current land uses and past disturbances in this section of the river.

Appendix 2 lists those taxa found in samples taken from the Colo catchment.

In conclusion, various activities in the upper sections of the three main tributaries of the Colo River constitute a mild threat to the aquatic biodiversity of the Colo River, but the slight impairment of the biota in these sections does not appear to persist inside the national park, with the possible exception of the Wollangambe River, for which no data were available. The results from the lower Colo outside the national park suggest the river is in very poor condition; however, this is most likely to be a consequence of intensive land uses in that part of the valley. On the whole, sections of the Colo River currently within national park boundaries appear to have high biodiversity and are in good ecological condition.

3.3.2 Geomorphological assessment

The river system is one of confined sand bed reaches due to the sandstone geology. There are 'sand slugs' in the upper parts of the Wolgan, Capertee and Wollemi subcatchments. Sand slugs are large deposits of sediment that move slowly downstream and are created episodically. Sand slugs potentially alter the natural composition of freshwater fauna (Downes et al 2006).

Although sand slugs can form naturally after certain events, the sediments noted in the Colo system are thought to be due to unnatural processes. Sedimentation is likely to have occurred when Europeans brought in livestock then cleared land for grazing and cropping, and may take hundreds of years to flush from the river system.

The Colo River is devoid of any obvious sand slugs throughout the national park down to the Mount Townsend bend; however, sand slugs occur again downstream of this point. There is an abrupt change in gradient at the Mount Townsend bend, which may be why sediments have collected at this point.

The Capertee River has a low surface flow in the upper reaches. It is thought that water flows through and/or under the sand in this section and that this is due to human-related disturbances in the catchment.

There is some accelerated stream bank erosion on the upper parts of the Wolgan River. It is therefore recommended that the wilderness boundary at the junction with the Wolgan River be used as the upper limit of the wild river gazettal and that the Mount Townsend bend on the Colo River be used as the lower limit.

3.3.3 Hydrology

Only very minor water extraction takes place from the Colo River system. Water extraction here is for stock and domestic use only, and there is no irrigation or other high demand requirements. It is estimated (P. Simpson pers. comm.) that much less than 2% of the total water flow is extracted, which is a negligible amount compared to total water flow. This estimate is based on land use, number of licences and the volume of water in the river.

There may be some reduction in groundwater flows due to the Clarence Colliery and associated retention dams, however the catchment area affected by the mine is a very small percentage of the catchment, therefore the volumes of water affected are also likely to be very small compared to total water flow.

Overall, it is considered that the Colo River and its tributaries have a substantially natural flow and that it meets the hydrological criteria for listing as wild rivers.

The Colo catchment will fall under the Metropolitan Water Sharing Plan currently in preparation by the Department of Natural Resources. It is not expected that any substantial changes to the Colo catchment's hydrology, including substantial increase in water allocations will occur as a result of this plan.

4. Referrals

Where a wild river declaration may affect functions carried out under the *Water Management Act 2000*, the concurrence of the Minister for Water may be required prior to declaration. The *Water Management Act 2000* does not currently cover the Colo River (it is still covered by the *Water Act 1912*); however, in anticipation of the implementation of the Sydney Metropolitan Water Sharing Plan (due mid-2008), concurrence is being sought by the Minister for Water, as declaration of the Colo as a wild river may impact on functions being carried out by this plan.

Similarly, in the case of State Conservation Areas, where a wild river declaration may affect functions carried out under the *Mining Act 1992*, the concurrence of the Minister for Primary Industries may be required prior to declaration. No State Conservation Areas occur within the catchment of that part of the river to be declared and thus declaration does not require concurrence with the minister responsible for the *Mining Act 1992* (note that Parr SCA occurs downstream of the area proposed for declaration).

DECC invited comment on the declaration of the Colo River as a wild river from the following agencies: Sydney Water, Cabinet Office, Natural Resources Commission, Department of Natural Resources, Department of Primary Industries, State Water Corporation and Sydney Catchment Authority, on 25 October 2006. Replies were received from Sydney Catchment Authority and the Department of Primary Industries, which expressed no concerns over the declaration.

5. Recommendations

The Colo River and its tributaries as described below are considered to meet the criteria for wild rivers as listed in the NPW Act and are recommended to be declared as wild rivers.

Within the Capertee subcatchment:

Capertee River, from the junction of (and including) Dingo Creek, to the Colo River and their tributaries. This should provide adequate distance for the river to recover from mining disturbances upstream.

Within the Wollemi subcatchment:

All of the Colo River and Wollemi Creek along with their tributaries that are bounded by the Wollemi Wilderness.

Within the Wollangambe subcatchment:

The Wollangambe River to its intersection with (and including) Bungleboori Creek, and all their tributaries, except those parts of Bowens Creek which lie beyond the wilderness area. This will exclude parts of the river that are potentially affected by contamination sources upstream.

Within the Wolgan subcatchment:

The Wolgan River to its intersection with (and including) Rocky Creek and their tributaries. This should provide adequate distance for the Wolgan River to recover from any disturbances upstream.

6. References

Brierley GJ and Fryirs K 2005, *Geomorphology and river management: application of the River Styles Framework*, Blackwell Publications, Sydney.

Davies P 2000, Development of the National River Bioassessment System (AUSRIVAS) in Australia, pp 113–24 in Wright JF, Sutcliffe DW and Furse MT (eds), *Assessing the biological quality of freshwaters: RIVPACS and other techniques*, Freshwater Biological Association, Cumbria, United Kingdom.

Department of Environment and Conservation 2005, 'Framework for wild river assessment', unpublished report.

Downes BJ, Lake PS, Glaister A and Bond NR 2006, 'Effects of sand sedimentation on the macroinvertebrate fauna of lowland streams: are the effects consistent?', in *Freshwater Biology* 51, pp 144–60.

James T (ed) 1994, 'An assessment of the World Heritage values of the Blue Mountains and surrounding plateaus', draft final report, Royal Botanic Gardens.

The Colong Foundation 1993, *NSW wilderness red index*, The Colong Foundation for Wilderness Ltd, Sydney.

NSW National Parks and Wildlife Service 2001, *Wollemi National Park Plan of Management*, Department of Environment and Conservation.

Turak E, Waddell N and Johnstone G 2004, *New South Wales AUSRIVAS sampling and processing manual*, Department of Environment and Conservation NSW and Department of Environment and Heritage, Commonwealth of Australia, Canberra and Sydney.

7. Appendices

7.1 Appendix 1: Data sources

Technical assessment: criteria for wild rivers

	Biological condition	Geomorphological condition	Hydrological condition
Data sources	Department of the Environment and Heritage, 2003; <i>Australian River Assessment System (AUSRIVAS) National River Health Database</i> ; Australian Government, Canberra, ANZCW0501009864.	ID&A Pty Ltd. <i>Geomorphic Categorisation of Streams in the Hawkesbury–Nepean Catchment</i> , Report for Department of Land and Water Conservation, and Bega Valley Shire Far South Coast Catchment Management Committee.	DNR water extraction licence data.
Technical advice	Eren Turak, Research Scientist, Policy and Science, Department of Environment and Climate Change. Joanne Ling, Research Scientist, Policy and Science, Department of Environment and Climate Change.	David Outhet, Research Scientist, Department of Natural Resources.	Paul Simpson, Senior Natural Resource Officer, Water Management Division, Department of Natural Resources.

Additional expert-panel members

Agency	Name	Division/branch	Title/position
DECC	Neil Stone	PWD	Acting Area Manager Upper Mountains
DECC	Vanessa Richardson	PWD	Ranger Upper Mountains
DECC	Tim Hagar	EPRD	Conservation Assessment Officer
DECC	Anita Zubovic	PWD	Acting Wilderness Conservation Officer

Consultation

Paul Bennett, Hawkesbury–Nepean Catchment Management Authority

7.2 Appendix 2: Taxa found in the Colo, Wolgan, Capertee and Wollangambe Rivers

<i>Acarina</i>	<i>Hebrus axillaris</i>
<i>Anisops</i>	<i>Hemigomphus gouldii/heteroclytus</i>
<i>Aquarius antigone</i>	<i>Heteroceridae</i>
<i>Araneae</i>	<i>Hydaticus</i>
<i>Archichauliodes</i>	<i>Hydraena</i>
<i>Asmicridea</i> sp. AV1	<i>Hydrophilidae</i>
<i>Atalophlebia</i>	<i>Hyphydrus</i>
<i>Atriplectides dubius</i>	<i>Illiesoperla</i>
<i>Aulonogyrus strigosus</i>	<i>Lectrides varians</i>
<i>Austroaeschna</i>	<i>Leptoceridae</i>
<i>Austroaeschna pulchra</i>	<i>Leptoperla</i>
<i>Austroaeschna unicornis unicornis</i>	<i>Leptophlebiidae</i>
<i>Austrogomphus</i>	<i>Megaporus</i>
<i>Austrogomphus cornutus</i>	<i>Micronecta</i>
<i>Austrogomphus guerini</i>	<i>Microvelia</i>
<i>Austrogomphus ochraceus</i>	<i>Nannophlebia risi</i>
<i>Austrosimulium</i>	<i>Necterosoma</i>
<i>Austrosimulium bancrofti</i>	<i>Nerthra</i> EPA sp. 1
<i>Austrosimulium furiosum</i>	<i>Notalina</i>
<i>Austrosimulium torrentium</i>	<i>Notalina bifaria</i>
<i>Baetidae</i>	<i>Notalina fulva</i>
<i>Baetidae</i> genus 5	<i>Notalina</i> sp. AV22
<i>Berosus</i>	<i>Notoaeschna sagittata</i>
<i>Caenidae</i>	<i>Notonectidae</i>
<i>Carabhydrus</i>	<i>Oecetis</i>
<i>Carabidae</i>	<i>Oligochaeta</i>
<i>Ceratopogoninae</i>	<i>Orthoclaadiinae</i>
<i>Cheumatopsyche</i>	<i>Oxyethira</i>
<i>Chironomidae</i>	<i>Physidae</i>
<i>Chironominae</i>	<i>Rhadinosticta simplex</i>
<i>Chostonectes</i>	<i>Rheumatometra</i>

<i>Coloburiscoides</i>	<i>Rheumatometra dimorpha</i>
<i>Corixidae</i>	<i>Scatopsidae</i>
<i>Dinotoperla</i>	<i>Scirtidae</i>
<i>Dytiscidae</i>	<i>Simuliidae</i>
<i>Elmidae</i>	<i>Staphylinidae</i>
<i>Epididae</i> SRV sp. 7	<i>Sternopriscus</i>
<i>Enithares woodwardi</i>	<i>Synlestes weyersii</i>
<i>Forcipomyiinae</i>	<i>Synthemistidae</i>
<i>Glossiphoniidae</i>	<i>Tanypodinae</i>
<i>Gomphidae</i>	<i>Taschorema complex</i>
<i>Gordiidae</i>	<i>Tasmanocoenis</i>
<i>Gripopterygidae</i>	<i>Tasmanophlebia</i>
<i>Gyrinus convexiusculus</i>	<i>Tenagogerris euphrosyne</i>
<i>Tipulidae</i>	<i>Ulmerophlebia</i>
<i>Triplectides</i>	<i>Veliidae</i>
<i>Triplectides similis</i>	