
**INQUIRY INTO THE – SUPPLEMENTARY SUBMISSION REGARDING THE ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION AMENDMENT (RETAINING FEDERAL APPROVAL POWERS) BILL 2012**

**Senate Standing Committees on Environment and Communications**
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Canberra ACT 2600

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Dear Committee members,

**Re: the Environment Protection and Biodiversity Conservation Amendment (Retaining Federal Approval Powers) Bill 2012**

1/- **Wilderness protection**

The Colong Foundation's initial submission to the Senate Environment and Communications Legislation Committee requested that this Inquiry recommend **that wilderness areas in the National Reserve System be declared matters of national environmental significance, so that proposed development in these "protected" wilderness areas could be deemed controlled actions when appropriate.**

A paper entitled 'Action Toward Wilderness Protection in Australia' (2007) explains how wilderness has not been protected as intended under the 1992 National Forest Policy (see **Attachment 1**). Except for efforts in NSW, the wilderness reserved as a result of Regional Forest Agreements (RFAs) did not result in wilderness protection and management.

Good efforts were made under the Forest Policy to reserve 90 per cent of wilderness in national parks, but the job was only half done. The hard bit, involving forest industry restructuring was done, but then what should have been the easy bit, which involves few, if any, employment or economic impacts, was not done. Wilderness reserved under the Forest Policy in the National Reserve System is not protected and managed as wilderness, except in NSW.

Even in Kakadu National Park, the fifth plan of management in 2007 removed the protection zone from a 475,000 hectare wilderness over Kakadu's 'Stone Country'. This was a wilderness management zone established by the Kakadu Board of Management in 1986.

The Federal Government has a head of power that enables wilderness protection and management. The definition of 'ecosystem and habitats' in the Convention on Biological Diversity (1992) includes wilderness for the purposes of identification and monitoring

(reference: Article 7(a) and Annex I of the convention). Note that the Annex is part of the Convention.

With regard to the precedent of using this Convention provision for the protection of wilderness, I refer Senators to the now repealed Telecommunications (Environmental Impact Information) Regulation 1997 No. 252. This regulation establishes a Federal Statute precedent for including wilderness as a natural heritage value to be protected with the head of power being the Convention on Biological Diversity.

Using the above head of power, wilderness within the National Reserve System should be designated a 'matter of national environmental significance' by amendment of the EPBC Act. Such an amendment would enable actions proposed in a wilderness area to be designated a controlled action by the Environment Minister.

In additionthis Committee should consider advancing the case for wilderness as one of the criteria in the World Heritage Operational Guidelines for the assessment of natural properties nominated for listing under the World Heritage Convention. Such a criterion would reflect the true value and role of wilderness in this increasingly crowded world. Under the current Operational Guidelines, the consideration of important wilderness values is relegated to being either a factor influencing the biophysical integrity of the nominated property or an element of the conservation of scenery criterion. These limited assessment opportunities do not give due recognition to the many enduring values of the last remaining pristine parts of the natural world.

A wilderness World Heritage criterion would help to secure a higher priority for nature-focused management for the reserves listed under that criterion. Such a criterion would assist with protection of the extensive areas wilderness, particularly in Queensland, Western Australia and the Northern Territory through the development of operational procedures under existing bilateral state-federal government agreements that regulate World Heritage nominations.

The Eighth World Wilderness Congress held in Alaska supported wilderness becoming a criterion for World Heritage listing (see **Attachment 2**). Australia should become the lead country in advancing this policy on the world stage and because of the large tracts of wilderness in our National Reserve System and in northern Australia.

2/- **Failure of state regulators to protect matters of national environmental significance**

A/- <u>Emirates Wolgan Valley Resort – a failure of development control</u>

The Emirates 'eco-resort' in the remote Wolgan Valley is a good example of regulatory failure by a state government. Two years of bungled development control ended with the Emirates Wolgan Valley resort being built in a World Heritage listed national park.

In 2005 the Emirates developed an eco-resort proposal for a 1,000 hectare private cattle property in the Wolgan Valley. The property offered many opportunities for resort development.

Ultimately this large resort was established within Wollemi National Park and it is still planned to one-day revoke the affected part of the national park through a yet-to-be-

implemented land swap arrangement. This would then set an Australian precedent of revoking a World Heritage listed national park for a resort.

As stated in our initial submission, the resort relocation from cattle property to national park arose because of a regulatory failure associated with the Part 3A planning process and its associated concept plans.

It was not the Emirates' fault that the proposal submitted to the NSW Government required only a 'concept plan' to be lodged with the development application. The concept plan lacked detail. It did not identify a 1820s homestead that was to be a key feature of the resort, and was too significant a heritage item to be located in the centre of the resort, as the concept plan proposed. The Emirates did the right thing and renovated the homestead and relocated its resort proposal.

The modified concept plan relocated the resort into the national park and there is still a moot point as to whether those drafting the amended concept plan or the Emirates knew that the land in question was a national park.

The removal of so-called green tape recommended by the Tourism and Transport Forum and the Business Council of Australia, has resulted in years of the Emirates time being wasted and caused them great expense. The bungled process could also set an Australian precedent of excising a large resort from a World Heritage listed national park.

Cutting green tape as proposed for the EPBC Act does not speed decision-making or benefit those developers who are committed to protecting the environment. The duplication of environmental assessment that Mr Andrew Bolt has criticised (see **Attachment 3**) arose from cutting green tape. This loss of detailed consideration meant significant cultural heritage went undetected in the midst of the proposed resort. Errors were then compounded by relocation of the resort into a World Heritage Area through a modified concept plan process.

Once this large resort was relocated into the World Heritage Area, the elements of the assessment related to the EPBC Act had to be significantly revised causing unavoidable delays. The delays in the Emirates resort development were not the fault of the EPBC Act but instead an inadequate environmental assessment under the state's planning law.

B/- <u>Destruction of the swamps on Newnes Plateau – a failure to control mine operations</u>

The Temperate Highland Peat Swamps on Sandstone on Newnes Plateau are nationally listed as an Endangered Ecological Community. Intensive underground coal mining has ruined four of the listed swamps on the Plateau. The NSW mine regulatory authorities were well aware of the damage, and yet for over a decade allowed mining under listed swamps to continue.


*East Wolgan Swamp was once dense with Gliechenia fern, Grevillea acanthifolia and Tea-tree* (Photo: c. Jonkers, various dates).


*Two metre deep collapse in East Wolgan Swamp. The dry swamp is now susceptible to bushfire and weed invasion* (Photo: J. Favell , May 2010).

In 2006 Angus Place Colliery developed a Newnes Plateau Shrub Swamp Management Plan (**Swamp Plan**) that failed to acknowledge these "protected" swamps are vulnerable to damage from longwall mining or to consider protection of this nationally endangered habitat from mine subsidence damage. The Plan only proposed to monitor damage and, as a last resort, may require ineffective remediation.


Monitoring under the Swamp Plan did not see management operations adapted to reduce damage. Mining continued for years without reduction in mining intensity or swamp protection.

East Wolgan Swamp is above coal pillars and mine subsidence would be expected to be much less than above the longwall panels (**see opposite**). Yet the surface damage is extreme and the nationally endangered Blue Mountains Water Skink (*Eulamprus leuraensis*) has almost certainly disappeared from the swamp.

After mining and the subsequent cessation of artificial mine effluent discharges through the swamp, the groundwater disappeared from the swamp's soil profile and had not returned by May 2010 when the peat had dried out, collapsed and cracked.

East Wolgan Swamp is now extremely susceptible to fire damage and exotic species invasion.

Centennial's Subsidence Management Status Report for March 2009 incorrectly stated that the cracking *is 'minor and the evidence being gathered in the form of sequential photographs is demonstrating that the cracks are rapidly weathering and filling with silt'*. A further allegation that stream flow will resume through the swamp is not supported by any evidence.

The groundwater has drained through the cracked rock below the peat. It is not possible to rehabilitate this site using the Swamp Plan's remediation strategies (diversions, bunding, etc). These techniques do not deal with the primary cause of damage - the cracking of the underlying aquitards!

The remediation undertaken for the damaged swamps will be at best of small benefit to the area only where the works take place and not to the swamp as a whole. The remediation works fail to address the extensive damage caused by longwall mining to both swamps. Repair of the damaged aquitards under the swamps has not been attempted as this requires much more experimental and unproven techniques.

*Alleged minor [upsidence] cracking claimed to have no effect on East Wolgan Swamp*

*(Photos: C. Jonkers, 2008)*

<u>Role of the EPBC Act in protecting nationally threatened swamps on Newnes Plateau</u>

In 2010 the Federal Government commissioned an independent expert to assess the damage to the swamps on Newnes Plateau. The subsequent EPBC approval condition now prevents mining under high quality swamps; a condition supported by the Expert Scientific Committee on Coal Seam Gas and Coal Mining. In May 2012, the Hon Tony Burke advised the Colong Foundation that he had imposed conditions to prevent mining both directly under Springvale East and Carne Creek West swamps, and within buffer zones. The EPBC approval condition also requires collieries to demonstrate that there is a way of conducting the longwall mining with no adverse impact to the swamps before further such mining can be approved.

The NSW regulators were not be able to protect the Temperate Highland Peat Swamps on Sandstone on Newnes Plateau. Delegation of EPBC approvals to the NSW Government is far more likely to result in these swamps being ruined by intensive coal mining than retaining approval powers with the Federal Environment Minister.

The influence of the NSW Department of Trade, Investment, Resources and Energy is too aligned with the coal industry and too powerful. Other state regulators are unwilling or unable to protect matters of national environmental significance. In these circumstances state regulators accept industry assertions that the damage swamps can be rehabilitated and with small changes to mine plans the swamps can continue to be undermined. These industry assertions have been made in the past on repeated occasions.

Protection of the Temperate Highland Peat Swamps on Sandstone necessitates the continued the involvement of the Approvals and Wildlife Division of the Department of Sustainability, Environment, Water, Population and Communities.

Through on-going independent expert supervision by the Expert Scientific Committee on Coal Seam Gas and Coal Mining and the commissioning of independent reports these nationally endangered swamps can continue to be protected.

C/- Regulatory failure - pollution of the Wollangambe River by Clarence Colliery

The Clarence Colliery lies in the headwaters of the Wollangambe River which flows into the Blue Mountains National Park and from that point it becomes a designated a wild river. Wollangambe River flows through the Wollemi National Park, part of the Greater Blue Mountains World Heritage Area.

The wastewater from the Clarence Colliery is often rich in dissolved metals, even after treatment by aeration, and dousing with lime, potassium permanganate and alum floc at the mine site (Byrnes, 2000). The often clean looking but sometimes still oxygen depleted effluent is mostly groundwater with dissolved iron, manganese, zinc metal ions in a reduced form, and also nickel. A CSIRO study indicates that elevated levels of manganese, cobalt, nickel and zinc are entering the Wollangambe River, the primary receiving water for Clarence effluent (Corkery, 1993). The metals oxidise and precipitate through chemical and biological reactions that remove the dissolved oxygen in surface waters and can cause significant ecological damage. These oxidation processes do not fully occur in the colliery's water treatment plant. It should be remembered, however, that at least this mine has a large capacity treatment plant, while most other collieries do not. On mixing with surface receiving waters the metals continue to be precipitated in the Wollangambe River.

In 1999, a consultant's report for Clarence Colliery stated that 'if the current system is allowed to continue indefinitely, the discharge of such waters into the Wollangambe [River] would be considered a breach of the Clean Waters Act, rendering the mine liable to prosecution. It is therefore evident that this is not an option that is acceptable to Centennial' (Byrnes, 1999). Yet this Wollangambe discharge continues, and is increasing as mining continues.

*Up to 18 ML/day of Clarence Colliery mine effluent can be discharged to the Wollangambe River, a wild river in the largest wilderness in NSW, within a World Heritage listed national park (Photos: K. Muir, 1998; K. McLaughlin, 2010).*

Non-compliances with the Collieries pollution licence total 64 between 2000 and 2011 under the NSW *Protection of the Environment Operations Act, 1997*.

There has been no significant reduction in exceedances by the mine in relation to discharges to the Wollangambe River. These exceedances are despite the Environmental Pollution Licence discharge limit for manganese being doubled to 0.1mg/l on October 30, 2007, and a further lowering of the standard by a factor of five to 0.5mg/l on December 10, 2010.

In view of the regulatory failure that allows Clarence Colliery to legally pollute the Wollangambe River, the Blue Mountains Conservation Society and the Colong Foundation have commissioned an independent survey of this problem. The initial field data shows that the coal mine is clearly causing increased pH and salinity (the latter in contravention of ANZECC guidelines). The salinity data shows that water at the lowest sampling site on the Wollangambe River (approximately 15km downstream) at the World Heritage boundary is about 50% mine effluent. The spatial scale of potentially dangerous concentrations of chemicals (from the mine) is likely to be much longer than this distance.

Before the end of this year sufficient data will be available to make representations to the Federal Government's Expert Scientific Committee on Coal Seam Gas and Coal Mining. At that time, the Colong Foundation anticipates it will be in a position to call for action under the EPBC Act to remedy the significant impact on the World Heritage property. I believe that the failure of the mining company to notify the Federal Government of this significant impact when making referrals may be a serious breach of the Act.

D/- <u>The need for EPBC Act protection of threatened swamps on the Woronora Plateau</u>

Figure 1 on the following page illustrates on-going regulatory failure of underground coal mining in the Southern Coalfield of NSW. A 2001 NSW Commission of Inquiry into the Dendrobium Colliery proposed that various upland swamps to the west of Lake Cordeaux in Sydney's water supply catchment area be protected (see yellow hatching in Area 3C – Figure 1).

The protection established under the initial consent, however, was removed by a subsequent development consent modification in 2008, and four swamps are being subjected to intensive longwall mining impacts (see the first longwall of Area 3B – Figure 1).

Dr Ann Young, the pre-eminent expert on these swamps and sandstone geomorphology, considers that 'allowing Illawarra Coal to proceed in early 2013 with the planned longwall layout will lead to severe, rapid and irreversible damage to 4 large upland swamps'.

Elsewhere in this water catchment area, swamps have been destroyed on streams flowing into Lake Avon and Lake Woronora by intensive underground coal mining. The mining has caused earth movements that lead to loss of these swamps which are essential to maintenance of stream flows in dry weather in Sydney's water catchment.

The regulatory situation regarding the failure to protect the swamps on Woronora Plateau is almost identical to that on Newnes Plateau in the western Blue Mountains. History is repeating itself on the Woronora Plateau where intensive underground coal mining is damaging swamps there.

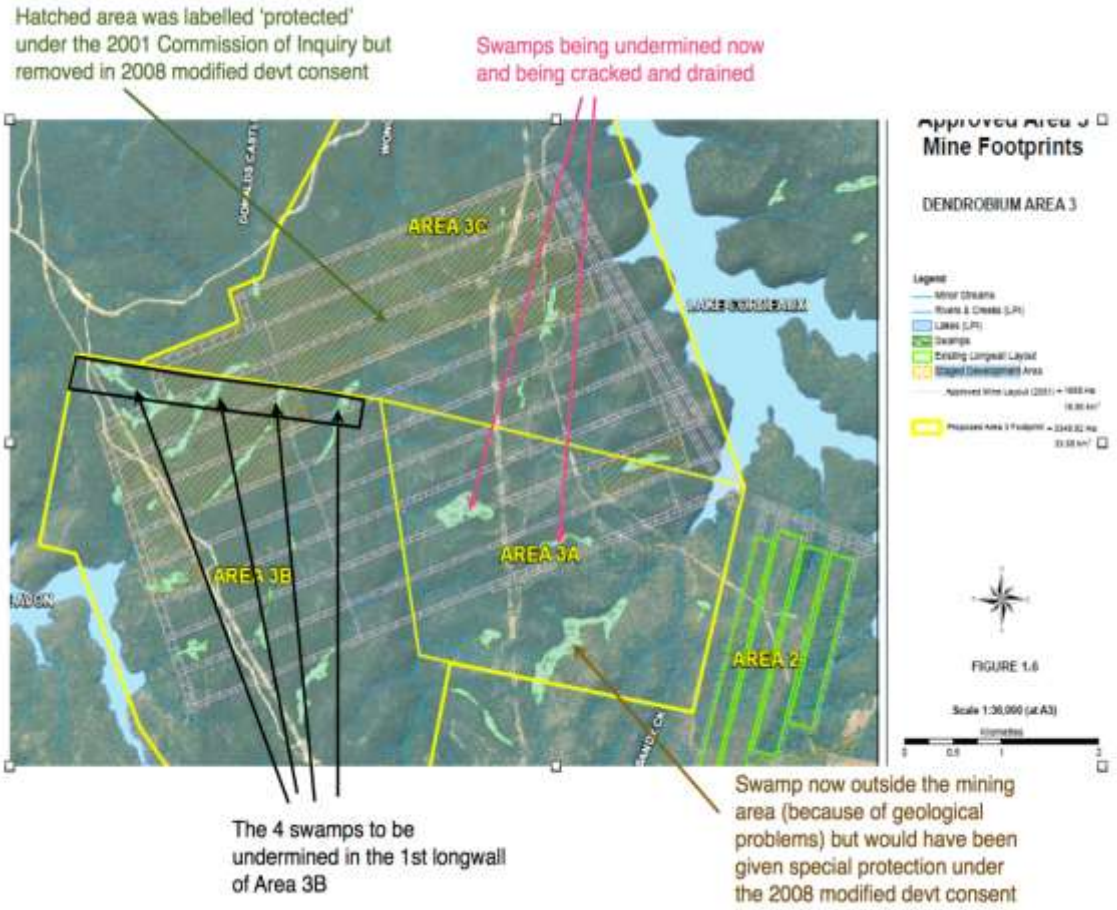



Figure 1 by Dr Young below shows the relationship of these swamps to longwall mining at the Dendrobium colliery.

Even when state regulators are well informed of the damage outcomes, and the consequences of the damage are significant, they are unable to take effective action. For example, the submission from Sydney Catchment Authority stated: 'There is evidence of pools being drained, reduced flows and a reduction in water quality… (and there is) a

potential for cracking beneath swamps to drain a significant amount of water contained in the swamps. This could lead to drying of swamps – adversely affecting their ecological integrity but also reducing water flows downstream. Practical means of remediation are generally not available' (30 July 2001).

The modified 2008 development consent for the Dendrobium colliery places more swamps at risk as the concerns of the Sydney Catchment Authority are generally ignored by the NSW Department of Trade, Investment, Resources and Energy. The preservation of the ecological integrity of Woronora and Metropolitan catchment areas is vital and these threatened swamps must be protected.

The coastal upland swamps on Woronora Plateau have been recommended for inclusion in the definition of the threatened Temperate Highland Peat Swamps on Sandstone community (see **Attachment 4**). It is a minor change in definition and the Colong Foundation believes that the implementation of this review has been too slow given the advanced nature of the draft listing, possibly due to political interference with the scientific listing process.

Delays in Commonwealth listing review are having dire consequences on these swamps that are a crucial element of Sydney's water supply catchment.

**This inquiry should ask the scientific committee what is delaying the adoption of the definition of the Temperate Highland Peat Swamps on Sandstone that would include the coastal upland swamps, given the advanced state of the draft listing advice for these threatened swamp communities.**

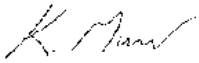
E/- Regulatory failure - logging in a national park

The logging of Murray Valley National Park in NSW and the Barmah National Park in Victoria described as an eco-thinning trial of River Red Gum Parks is a further example of regulatory failure. The appropriate test of significant environmental impact for a national park should be much lower than avoidance of significant threats to endangered species. Threats to endangered species and significant ecological communities within national parks, (i.e. RAMSAR wetlands) should be kept as low as possible. Given that there are alternate sites for the eco-thinning in state forests these trials in national parks should not proceed.

In relation to the RAMSAR wetlands involved, the Federal Government has the ability to refuse the logging proposal (see the Colong Foundation's submission to the referral on this matter – **Attachment 5**). The remaining river red gum forests will need to wait for the designation of the National Reserve System as a matter of national environmental significance. Given recent proposals for continued logging and grazing in the national parks of NSW and Victoria, such a designation cannot come too soon.

Thank you for the opportunity to make a further submission.

Yours faithfully,



Keith Muir
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**References**

Telecommunications (Environmental Impact Information) Regulation 1997 (repealed) http://www.austlii.edu.au/au/legis/cth/num_reg/tiir1997n252678

R. Byrnes, 1999, Clarence Colliery – Proposed Water Management Scheme, unpublished report, International Environmental Consultants, Sydney.

R. Byrnes, 2000, Clarence Colliery – Lease Extension Environmental Impact Statement, International Environmental Consultants, Sydney.

Attachment 1

# Action Toward Wilderness Protection in Australia

**Keith Muir**

**Abstract**—In 1992, a National Forest Policy Statement created a political opportunity to protect wilderness across Australia. The following decade saw over a million hectares of wilderness reserved in the state of New South Wales (NSW) but, until recently, little progress was made elsewhere in Australia. The success in NSW, as opposed to other states, can largely be attributed to the activism of the NSW environment movement and its different relationship with both the political and executive arms of government. This relationship is structured through the NSW Wilderness Act, 1987, which was the first Australian statute to allow the community to formally nominate wilderness areas. Such community-based proposals can advocate the suitability of areas to be managed as wilderness by consideration of particular wilderness values and social and economic factors, as well as provide suggestions for management.

## Introduction

Wilderness, in all its diversity, has evolved over 3.5 billion years. When we experience wilderness, we reconnect with the environment of our seven million year human evolutionary journey, but now the environment that nurtured this development can only continue on its evolutionary journey with our help. This paper is about Australia's efforts to protect wilderness from the all-pervasive influence of modern technological society.

Australia, just like America, is a federation of states and each one is as different as the people within it. Due to the constitutional difficulties of coordinating the nine governments of the federation, any national resources strategy, such as for wilderness protection, generally requires bilateral agreements between each state and the federal government based upon a set of over-arching principles. The 1992 National Forest Policy Statement provided just such a framework (Commonwealth of Australia 1992).

The Statement committed all governments to establishing a comprehensive, adequate and representative reserve system on forested lands and, concurrently, timber resource security. The implementation policies developed under the Statement included a reservation target of 90 percent of all forest wilderness and the development of management plans to protect these wilderness lands (Commonwealth of Australia 1997).

Keith Muir, Director of the Colong Foundation for Wilderness, Sydney, Australia

In: Watson, Alan; Sproull, Janet, Dean, Liese, comps. 2007. Science and stewardship to protect and sustain wilderness values: eighth World Wilderness Congress symposium: September 30–October 6 2005; Anchorage, AK. Proceedings RMRS-P-49. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

By the time governments had signed the Forest Policy, all except for Tasmania, had passed legislation for the protection of wilderness areas (Whitehouse 1993). Yet only the most populous and developed states of Victoria and New South Wales had active wilderness programs, a trend that has continued until recently.

## Northern Territory, Western Australia and Queensland—Three States With a Frontier Mindset

The Northern Territory is Australia's 'frontier' and perhaps has more wilderness than anywhere else in Australia. The Territory has no formally protected wilderness areas, except for an area of Kakadu National Park, a park managed by the Commonwealth Government. The Territory Government, however, has been notably progressive in its attitude toward joint management of national parks with indigenous people. The Gurig National Park became Australia's first jointly managed park in 1981, and in 2004 the government decided that Aboriginal traditional owners would jointly manage all of the Territory's reserves in cooperation with the Parks and Wildlife Commission.

Arnhem Land contains perhaps the most important wilderness in the Territory's Top End and is a stronghold of Aboriginal culture (Mittermier 2002). It is also the latest uranium exploration site for the Canadian-based mining giant Cameco. At this point in time arguments between Indigenous people and non-Indigenous people about the Arnhem Wilderness would be unhelpful. In these circumstances those concerned with environmental justice should close ranks with those who support social justice and use their collective talent to fight for the earth. It isn't a dress rehearsal where we can split hairs over the meaning of wilderness while the bulldozers push exploration roads into remote river catchments. Those concerned with social and environmental justice will learn respect for the different perceptions of wilderness most quickly when joined in a common struggle. As the world's resources run out, these beautiful, precious, undamaged areas will be on the front line for those environment issues climbing to the top of the political agenda: energy and greenhouse policy.

So why has the Territory disregarded its duty toward wilderness preservation? A commonly held opinion is that there is lots of wilderness and few Territorians, so there is no urgency. The National Wilderness Inventory (1995) indicated that more than half the Territory is in a high wilderness condition. This positive assessment of condition needs to be treated with care, however, as the impacts of pest species, particularly cane toads, horses and camels, have caused serious impacts. These impacts have included local extinctions,

loss of native vegetation and massive soil erosion in much of the area identified as wilderness. Unless backed by reliable scientific assessment and data, a regional-scale wilderness assessment, like the National Wilderness Inventory, can produce misleading results that ignore the need for urgent management action for areas vulnerable to environmental degradation, inappropriate use and development.

There is another important reason for concern in relation to the Territory's present wilderness estate. The Territory is working to develop a more comprehensive reserve system without adequate regard to protection of wilderness values. The national parks estate in the Northern Territory has increased from 2 million ha (4,942,108 acres) in 1992 to 5 million ha (12,355,269 acres) today. Nine national parks larger than 100,000 ha (247,105 acres) contain considerable wilderness areas. The management plans for several of these large parks have either a "limited use" or "natural" zone to regulate development and high impact use. There was even a proposal for a Spirit Hills Wilderness Conservation Area (Gregory National Park Draft Plan of Management 2001). But this area, like all wilderness-like zones in the Northern Territory, may be open to mining activities and some national parks are being actively explored. The draft plan of management for Barranyi National Park describes the need to preserve the unique wilderness character of the island, which has only one species of feral animal and few weeds. The draft plan of management unfortunately fails to live up to its stated intentions toward wilderness by leaving the way open for future wilderness lodge development.

An open assessment of the issues and problems of preserving naturalness is essential as Territorians continue to develop their land, on-park as well as off-park. I fear that what I call "wilderness" and indigenous people may call "our country" is all too often available for someone else's plans for wilderness lodges, 4WD vehicle-based recreation, development of roads, mining activities, clearing, grazing, safari hunts and other forms of commercial tourism.

In contrast to the Territory, Western Australia has progressed toward wilderness protection in the last 5 years. A "super-department," the Department of Conservation and Land Management (CALM), manages the state's national parks, state forests and other Crown Land (that is, lands owned by the state government). For decades CALM has been the gatekeeper for the future use of the state's public lands. In such large bureaucracies wilderness protection struggles to have a voice, being represented by a small branch of a division and a long distance from the source of political power. Wilderness protection has been a hard fight in Western Australia and The Wilderness Society has put in a tremendous effort to save wilderness in that state. There are all the usual interests competing for each piece of wilderness land and CALM, with its multiple use mindset, trades off these last remnants, even within national parks.

A 1998 outcome of Australia's National Forest Policy saw 342,000 ha (845,100 acres) of forests reserved in national parks in the southwest of Western Australia by 2003, but the subsequent wilderness assessment of the new reserves initially did not identify any areas for protection. The assessment was redone following an outcry, but only small areas were eventually flagged. The assessment process used criteria to find areas remote from modern technology.

The application of remoteness criteria work most effectively when used to describe threats of proposed development to areas already identified or protected as wilderness. In the case of a proposed development, such as road or logging operations, the potential retreat of wilderness is graphically illustrated by the map-based remoteness criteria (Kirkpatrick 1980). When defining suitable wilderness boundaries, however, the application of remoteness criteria facilitates a reductionist process that often emphasizes the obstacles more than the opportunities for wilderness protection. The remoteness approach also creates the misleading impression that the areas are rarely visited. Despite the political settings for an adequate forest wilderness protection outcome, achieved after much hard work by a broad coalition of environment groups over a decade, the CALM bureaucracy and the wilderness assessment methodology focused the public debate on 4WD roads and made a successful outcome for on-park wilderness protection very difficult.

In the longer established national parks, four have wilderness zones within them, totaling about 225,000 ha (555,987 acres) but these were never afforded statutory protection available under the Conservation and Land Management Act, 1984.

Examination of options for protection of wilderness values is now part of a plan of management review process. The results of this process may prove more fruitful although, so far, CALM has only proposed 21,000 ha (51,892 acres) of wilderness for protection. Placing wilderness protection last in a long chain of land use decision-making creates difficulties as competing activities, such as tourist operations and the pervasive off road vehicle user, become established and then tend to dictate park management. In these circumstances some form of interim protection is necessary, even if this measure is initially only a negotiated moratorium on road making and upgrading, park facilities development and commercial use until the wilderness assessment processes are completed.

Queensland has presented major opportunities for wilderness protection over the last decade but first the major setbacks created by a previous right-wing government, who used national park reservation as a tool to block indigenous land rights, had to be overcome. The Wilderness Society and the Australian Conservation Foundation undertook a strategy of placing land rights on an equal footing with park reservation. They agreed to work with the traditional owners, so when a progressive government was swept into office over a million hectares of land were reserved as national parks or handed back to the region's traditional owners. Queensland now has 7.2 million ha (17,791,588 acres) of protected areas, including 6.7 million ha (16,566,061 acres) of national parks.

The national parks estate can, however, never be big enough to carry all Aboriginal and Islander aspirations forward. A regional land use agreement approach, such as that developed for Cape York in Queensland, provides a cogent solution to ensure an economic base for indigenous people. Providing for claims over lands with a broad range of productive resources can greatly assist with self-determination and economic independence. This alternative is better than remote areas of national parks being developed by the first Australians to provide for economic and social objectives.

The current challenge for the new national parks in Cape York, being taken up by The Wilderness Society, is to obtain adequate funds for the management of feral animals, particularly cattle and horses, and weeds, which are huge problems in the tropics. You cannot separate people from wilderness because wilderness needs management.

There are no wilderness areas formally protected under the Nature Conservation Act, 1992, in Queensland because conservation groups have dropped formal wilderness reservation from their campaign priorities. Wilderness is protected 'de facto' in national parks, such as Mount Barney, Hinchinbrook Island, Currawinya and Carnarvon. In the case of Carnarvon and Hinchinbrook Island, national parks with high wilderness values, their plans of management designate remote-natural zones over most of the park with minimal or no visitor facilities and no motor vehicle access, except for management purposes. For the other parks, the plans of management have tended to make the remote-natural zones much smaller.

In 1999, the South East Queensland Forest Agreement resulted in an immediate addition to the reserve system of 425,000 ha (1,050,198 acres) and a further 215,000 ha (531,277 acres) of new national parks in 2004. A transition program is underway to phase commercial logging out of many areas, including the Wet Tropics. The Shelburne Bay Wilderness was protected from mining in 2003 when existing mining leases over its pure white dunes lapsed on expiry. As I write this paper the progressive Queensland Government is about to introduce a Wild Rivers Bill that would protect 19 of the state's best rivers, following yet another vigorous campaign by The Wilderness Society. The Bill, if passed, will represent the nation's first stand alone and comprehensive legislation to identify and protect wild rivers. The legislation will help to protect the wilderness characteristics of selected catchments of reserved rivers.

Indigenous people own almost half of Australia north of the Tropic of Capricorn and many desert areas. There should be a place for wilderness in the Indigenous landscape, and the management value of wilderness protection should not be compromised by a trend emerging in some quarters to have the definition of wilderness altered to accommodate modern technology, such as 4WD vehicles and permanent settlements.

The political debate regarding national parks must surely turn on what we can do for the land, not what nature and national parks can do for us. Aboriginal and Islander leaders should address the preservation of nature within their land base, particularly within their national parks. Not all areas should be developed, have road networks or permanent settlements within them.

## New South Wales—A Success Story

New South Wales (NSW) has earned a reputation as the center of wilderness protection in Australia. The state has just passed through an enlightened decade of government where wilderness was not just recognized, but received priority. A wilderness logging moratorium began in 1992 and was expanded as National Forest Policy negotiations progressed. In most cases, the areas where logging was deferred in 1995 became declared wilderness by 2003.

This wonderful result came about, at least in part, due to seeds planted 25 years ago by a charismatic environmentalist, Milo Dunphy. He was famous for leading politicians on well-organized trips into the wilderness. He took one future state leader to Mount Cloudmaker, who became inspired by the majesty, awe and wonder of the Kanangra-Boyd, the second largest wilderness in NSW. That leader's name was Bob Carr. In 1987, Carr introduced the first Wilderness Act in Australia. The Act enabled any person to nominate wilderness areas in NSW for assessment and put forward a case for protection. The environment movement has since advanced a series of detailed proposals and these have been carefully assessed by the state's park agency, the National Parks and Wildlife Service (NPWS), which is now part of the Department of Environment and Conservation.

The NPWS uses a wilderness assessment method that examines naturalness of the environment by means other than its surrogate remoteness from development. It is recognized that some of the best wilderness in the state is not remote but within two hour's drive from Sydney, the state's capital city. A naturalness approach that assesses ecosystem disturbance can better provide for opportunities to protect wilderness. The nature-focused assessment reflects the assessment criteria of the Act, which allows for the restoration of land when considering whether an area should be identified as wilderness. Once a wilderness is identified, there can then be an open and transparent, even if politicized, debate over whether it should be protected. Issues associated with unsealed roads then come into play but are considered in the context of the need for protection of the natural environment rather than as the prime factor in defining wilderness boundaries from the outset.

Progress towards wilderness protection under the Wilderness Act began during the era of a conservative government, which declared 650,000 ha (1,606,185 acres) of wilderness between 1991 and 1995. Even in the darkest hours, when two Parliamentary mavericks compromised a major set of wilderness proposals, the future Premier Carr used the opportunity to censure government in Parliament for failing to meet its wilderness promises. He then announced a strong wilderness protection policy and his government secured 1.3 million ha (3,212,370 acres) of threatened forest wilderness over the next 10 years.

A new Premier, Morris Iemma, has recently replaced Bob Carr and a further set of wilderness proposals have been submitted for assessment. Whether wilderness remains on the agenda for the new government depends not only on continuous public education and dialogue between those interested in wilderness protection, key decision makers and everyone else, but also ongoing sympathetic consideration of wilderness proposals by the newly created Department of Environment and Conservation.

NSW has saved more wilderness than any other state but has only one wilderness in Indigenous ownership, within Mutawintji National Park. Very few national parks in NSW are Aboriginally owned but legislation has been established to allow for the transfer of publicly owned parks to traditional owners as freehold land on a term lease arrangement. Conservationists support these moves but are concerned that the lack of unalienable community tenure, and inadequacy of the provisions preventing subdivision, sale and development when the park leaseback term lapses. These weaknesses in

park laws may reduce the security of Aboriginally owned national parks in NSW in the long term.

Wilderness areas are important repositories for Aboriginal culture. A Bega Valley Aboriginal heritage study found that many Aboriginal pathways, migration routes, trade routes, cultural routes, song lines and dreaming or dreamtime tracks pass through the wilderness areas of southeast NSW and these pathways are essentially in an intact condition (Blay 2005). The most significant discovery of Aboriginal rock art in 50 years was found only 2 years ago in the Wollemi Wilderness near Sydney. At the time, Bob Carr described the 4,000-year old drawings as simply "the greatest advertisement for saving wild places in national parks" (Totaro 2003). The art gallery is in near-perfect condition and its exact location, along with the location of the now famous dinosaur tree, the Wollemi Pine also in the Wollemi Wilderness, will be kept secret.

The nation's capital, Canberra, lies within the Australian Capital Territory, which is within New South Wales. While the Territory is self-governing, its small size makes it essentially a glorified local government. The Australian Capital Territory protects its 28,900 ha (71,413 acres) wilderness under the Nature Conservation Act, 1980, and the area also adjoins a similar sized wilderness in NSW in the Kosciuszko National Park, but unfortunately separated from it by a recently established fence to exclude feral horses. While there are no provisions in the legislation to consider community-initiated wilderness proposals, the creation of two community-conservation group initiated roadless areas are proposed within the park under the recently released draft plan of management, but roads for essential fire protection purposes will be allowed (Namadgi National Park Draft Management Plan 2005). The Nature Conservation Act does not define wilderness but its wilderness management principles prevent road construction and are strengthened by other legislation that prevents access by motor vehicles and other mechanized equipment.

## Victoria and the One-Off, State-Wide Wilderness Assessment Strategy

The story of wilderness protection in Victoria is again different. In 1991, the former Land Conservation Council undertook a major study of wilderness. The Council identified many wilderness areas across the state, and subjected these areas to a transparent process of assessment and public review. The Land Conservation Council (LCC) was required to balance competing needs of Victorians. The state-wide processes, while efficient and democratic, relied on the remoteness approach that played into the hands of wilderness opponents. The LCC cut pieces off wilderness here and created easements there, as if every identified wilderness was a pie to be shared out to user groups, like off road vehicle enthusiasts, with nature only receiving a piece of the pie.

The LCC assessment increased the wilderness estate of Victoria to 842,050 ha (2,080,751 acres). The areas that became too small through balancing wilderness and development were placed into a lower category of wilderness protection called remote and natural areas. These less protected wilderness areas total a further 268,900 ha (664,466 acres) within which existing high impact recreation abuses were retained, but with the promise of no additional abuse within these national park areas.

No wilderness outside national parks was considered for protection by the LCC process, which was completed just before the National Forest Policy was signed. Part of the Wongungurra Wilderness, a mere 7,420 ha (18,355 acres), was added to the national park estate in 1999 through the Forest Policy process but it was not reserved as a wilderness or a remote and natural area. No indigenous wilderness areas in Victoria have been created and no wilderness has been protected at all since 1992 when the state-wide process was completed. The downside of a state-wide process is that it creates the impression that the protection program was comprehensive, making the wilderness issue difficult to revisit. A recent decision to rapidly phase out cattle grazing in the state's alpine wilderness over the next 12 months, however, provides an opportunity to revisit wilderness boundaries that were, in some places, established to avoid grazing areas.

## Tasmania and the Case For Wilderness as a Criterion for World Heritage Listing

There is no systematic process for considering wilderness protection in Tasmania within protected areas. In this state, the World Heritage Convention has played a critical part in ensuring wilderness protection. The Tasmanian Wilderness World Heritage Area was inscribed on the World Heritage list of properties in 1982 and was greatly extended in 1989. At the time of its nomination the area was described as one of the last great temperate wilderness areas remaining in Australia. Wilderness was recognized as being of World Heritage value under the scenic beauty criteria for natural areas. As a consequence of the listing, a 1 million ha (2,471,054 acre) wilderness zone was established in the Tasmanian Wilderness World Heritage Area under the plan of management in 1992. The World Heritage Area has now had three areas of Aboriginal land handed back to the community with one of the areas in the wilderness zone and the other two in the self-reliant recreation zone. This wonderful wilderness is more or less intact except for two easements. One easement provides for commercial tourism along the Overland Track and the other provides road access to the Franklin River to enable short rafting trips in the wilderness. As these concessions to development indicate, the wilderness zone is vulnerable to policy changes and subsequent development through alteration of the plan of management.

One of the important threatened Tasmanian wilderness areas is the 390,000 ha (963,711 acres) Tarkine. Half the Tarkine is in a national park and the other half is mainly unreserved public land, including the Wellington Range. The Tasmanian government reluctantly signed the National Forest Policy Statement in April 1995. However, the timber industry in Tasmania obtained resource security legislation in 1991 and only small forest protection gains have been made through the forest negotiations under the National Forest Policy Statement.

Tasmania has a higher density of conservationists than any other state in Australia, and more green politicians as well,

but this weight of support has not secured either wilderness-specific legislation or adequate wilderness protection through park plans for management. Areas like Tasmania benefit from granting World Heritage level recognition to high quality wilderness areas. Such listings help to give these areas the recognition and protection they deserve through the bilateral federal-state government processes that regulate the nomination and management of World Heritage Areas in Australia.

## Wilderness Mining: A South Australian Anomaly

South Australia (SA) passed the Wilderness Protection Act in 1992 and it provides for the creation of wilderness protection areas and wilderness zones. The Act can apply to indigenous and privately owned land as well as Crown Land. The Act has adopted the NSW model that allows any member of the public to propose wilderness areas for protection. In the case of South Australia, however, the mining lobby gained a major concession as mining activities are allowed in wilderness zones, as opposed to wilderness protection areas, a stricter reserve category preventing mining operations. This has greatly weakened the concept of wilderness as applied in SA and opportunities for mining in wilderness create public confusion over appropriate wilderness management.

South Australia's wilderness protection areas and wilderness zones are only reserved after repealing any existing protected area status and then proclaiming the new form of wilderness reserve. This approach to wilderness reservation is necessary because the state's other reserve categories are too weak to support wilderness management.

So far, eight wilderness areas have been protected totaling 184,419 ha (455,709 acres) and most of this area was reserved only last year. In addition, three large informal wilderness zones have been established under plans of management in National Parks and Conservation Parks but these areas lack the security of being reserved under the Wilderness Protection Act and are also open to mineral exploration.

The Wilderness Society has nominated eight terrestrial wilderness areas for assessment under the 1992 Act and a further eight marine wilderness areas. This growing pile of proposals also has a growing political weight that becomes increasingly receptive to a political trigger event. Trigger events can bring about determination of the outstanding proposals and rapidly advance wilderness protection. They include any conservation debacle, as the government will be keen to distract the public attention with important conservation news and placate agitation by the environment lobby.

The Yellabinna Wilderness Protection Area proposal is the most important mallee woodland wilderness proposal in the state and is currently under determination. The government's Wilderness Advisory Committee assessed Yellabinna as having high wilderness value in 1996 and recommended that 1.2 million ha (2,965,265 acres) be protected. The government announced its intention to protect 500,000 ha (1,235,527 acres) in 2004 and gazettal is expected this year. The new park will form the largest strictly protected reserve created in South Australia since 1970. At the same time as making the Yellabinna wilderness protection announcement, the State's Premier signaled that some 14 mining exploration licences will be granted over 2 million ha (4,942,108 acres) in the Yellabinna mallee region. Some of these licences will be in the Yumbarra Conservation Park that had its protection status removed in 1999. Track construction for mining exploration is now fragmenting sensitive arid ecosystems.

## Two Wilderness Dreamings

Wilderness for non-indigenous Australians is seen as a place where the last remnants of the natural world are safe from the spoiling forces of modern technology. Outside wilderness, any economically useful land is generally dedicated to production for our urban-based society (although The Wilderness Society's Wild Country project and new land clearing laws are attempting to change that paradigm). Wilderness offers respite for the increasingly stressed urbanites and their feedlot society, where food and services are brought to them and their wastes are carried away. In wilderness we can connect with life that still evolves by natural processes.

The wilderness of Aboriginal and Islander Australians is a living story based on 40,000 to 60,000 years of belonging to the country—a land of spirits, dreaming paths, myths and ceremony that create a framework of indigenous responsibilities for country. The impacts and influences of indigenous societies in wilderness are recognized, as are the opportunities for indigenous people to retain links with the landscape. While some wilderness critics in Australia claim Aboriginal land use precludes wilderness, the issue of impact from indigenous land use is one of degrees, particularly when compared to recent use of modern technologies.

The harmonization of these two cultural dreamings is imperative to the survival of wilderness in Australia, as much unprotected wilderness is located on Aboriginal land. The belief that Indigenous land use treads more lightly on the land underpins the Malimup communiqué, developed by the former Australian Heritage Commission (Commonwealth of Australia 1998). The communiqué acknowledges and respects the right of indigenous people to maintain and strengthen their spiritual and cultural relationships within wilderness, and has built goodwill in that the preservation of wilderness does not exclude people or indigenous rights. Indigenous wilderness as described by the Malimup communiqué allows for indigenous hunting using firearms, the gathering of bush foods, the use of 4WD vehicles and the establishment of permanent accommodation. The agreement has, in effect, inadvertently defined the distance between these two dreamings.

This distance between the two dreamings will increase as indigenous communities living in a wilderness area use modern technology more intensively and extensively over time. While the occasional use of management roads by indigenous people in 4WD vehicles would perhaps pose a low level of threat, it does set a precedent for further public use of motor vehicles that would be incompatible with wilderness values and possibly damages the integrity of biological diversity. Further, the establishment of permanent settlements clearly contradicts the wilderness management principles currently adopted in most Australian states, and the World Conservation Union (IUCN) defines wilderness as a:

> . . . large area of unmodified or slightly modified land, and/or sea, retaining its natural character and influence, without permanent or significant habitation, which is protected and managed so as to preserve its natural condition.

Intensive use of modern technology and permanent or significant habitation is not consistent with accepted wilderness management practice. Everything that is true and just, desirable and worthwhile is not always compatible or mutually reinforcing (Lines, personal communication, July 2005). There will be times and places when the social justice for indigenous people and environmental justice for wilderness do not coincide. In a mature relationship between conservation groups and Indigenous communities there is space for acceptance of difference.

The efforts made to redefine wilderness, to allow modern technology into wilderness as a special case, can only erode the potential for understanding the management purposes of wilderness. Either the redefined wilderness becomes further fragmented by the expansion of permanent Aboriginal settlements and increased use of 4WD vehicles in these reserves or indigenous communities are alienated and infuriated by conservation groups who supported the granting of indigenous wilderness areas but then successfully oppose any further increase in the use of modern technology or the expansion of settlements into what they believe should be strictly protected reserve areas.

The two wilderness dreamings must be married so as to avoid potential confusion in wilderness reserve management, during public awareness programs about wilderness and, particularly in campaigns to save wilderness areas. This resolution should be achieved through the development of detailed wilderness proposals in consultation with indigenous communities.

The indigenous wilderness concept as found in the Malimup communiqué has not seen wilderness protection extend across northern Australia. Here, non-indigenous wilderness concepts could sit within indigenous wilderness, between the low density of existing roads and settlements. This solution has been developed for Kakadu National Park in a process evolving over the last 20 years and that will go on evolving. Kakadu National Park, a federally managed park within the Northern Territory, contains a wilderness area (designated 'Zone 4' in the plan of management) that covers about 475,300 ha (1,174,492 acre) of the 2 million ha (4,942,108 acre) park (Misso, personal communication, August 2005) However, such an approach contains in it the risk of repeating the lessons learned in the more settled districts where much wilderness has been compromised by development that should have been avoided.

The degree to which the Malimup communiqué creates conflict with wilderness management principles can be moderated through the Wild Country approach developed by The Wilderness Society. Wild Country management can partly accommodate ideological inconsistencies by retaining important bushland links around development areas and linking potential wilderness reserve areas.

Now is the time to preserve wilderness, not when the last options are being played out; when every national park is an outdoor amusement park for tourists on package tours and the 4WD vehicle enthusiast. Now is the time to save wilderness in Cape York in Queensland, Arnhem Land in the Northern Territory and the Kimberly in Western Australia. Aboriginal communities have 4WD vehicles, and should have modern settlements and all the best that modern society can offer. Yet, motor vehicles form a barrier between wilderness and the human soul. You must "walk the land" to fully relate and belong to the land. Surely the most sacred, most biodiverse places should be visited on their own terms.

## Conclusions

What I call protected wilderness is, in administrative reality, a park management system that successfully defends nature from the spoiling forces of modern technology. Wilderness is also a powerful belief that respects the rights of nature and those of indigenous people, and in politics such beliefs become reality. The wilderness idea has done much to protect nature and there is much more to be done.

Indigenous and non-indigenous Australians can effectively act together when the bulldozers, miners, loggers and resort developers arrive to despoil the wilderness. Such defensive campaigns should be closely integrated with positive plans for wilderness protection. The efforts toward wilderness protection will be most effective when detailed wilderness protection proposals are advanced that can then be assessed in an open and transparent manner. Such as assessment of wilderness should be nature-focused, provide opportunities for restoration and be undertaken by a receptive park administration supervised by a sympathetic minister. This requires constant dialogue between wilderness advocates and government.

The Colong Foundation for Wilderness advocates that management of large national parks can provide adequate visitor opportunities for quiet enjoyment and ensure effective conservation of aesthetic, cultural and natural values by adopting the following principles:

- All activities are governed by the plan of management.
- No visitor accommodation on-park.
- The majority of the park should be subject to wilderness-style management with suitable areas on the edges set aside for motorized vehicles.
- Vehicle access should be on formed 2WD roads approved for use by the plan of management.
- Low-key facilities such as picnic tables and basic camping grounds should be located near park boundaries.

Limited high quality road access on the edges of parks and associated low-key facilities are the key to visitor management that can provide ample opportunities for enjoying a national park, while ensuring the integrity of remaining areas. Almost all heavily used park areas are within an hour's walking distance of a vehicle access point. There are some exceptions to the above use versus distance rule, but they are few. These principles have been fundamental to the development of national parks and wilderness areas in NSW and it is time for the other states of Australia to reap the benefits of a greatly expanded wilderness estate.

The World Heritage Committee of UNESCO should consider advancing wilderness as one of the criteria in its World Heritage Operational Guidelines for the assessment of nominated natural properties. Such a criterion would reflect the true value and role of wilderness in this increasingly crowded world. Under the current Operational Guidelines, the consideration of important wilderness values is relegated

to being either a factor influencing the biophysical integrity of the nominated property or an element of the conservation of scenery criterion. These limited assessment opportunities do not give due recognition to the many enduring values of the last remaining pristine parts of the natural world.

The identification and promotion of wilderness that would follow the establishment of such a World Heritage criterion would provide more people with life changing experiences. Appropriate low impact wilderness use is a humbling experience that can provide many visitors with the inspiration to work for a more environmentally sustainable society. A wilderness World Heritage criterion would help to secure a higher priority for nature-focused management for the reserves listed under that criterion. Such a criterion may also assist with protection of the extensive wilderness areas in Queensland, Western Australia and the Northern Territory through the development of operational procedures under existing bilateral state-federal government agreements that regulate the World Heritage nominations.

## References


Blay, John. 2005. Report of the Bega Valley Shire Region Old Path Ways and Trails Mapping Project, public version for the Bega Valley Regional Aboriginal Heritage Study. NSW National Parks and Wildlife Service and Bega Shire Council. [Online]. 40 p. Available: http://www.netspeed.com.au/seforests/Bega%20Eden%20Merrimans%20Path%20Ways%20Public%20Report.pdf. [August 19, 2006].

Commonwealth of Australia. 1992. National Forest Policy Statement, a new focus for Australia's forests. Canberra: Australian Government Printing Service. On file: Central Library—Department of Environment and Heritage, Canberra, Australia.

Commonwealth of Australia. 1997. Nationally agreed criteria for the establishment of a comprehensive, adequate and representative reserve system for forests in Australia. Canberra: Australian Government Printing Service. On file: Central Library–Department of Environment and Heritage, Canberra, Australia.

Commonwealth of Australia. 1998. Malimup communiqué on wilderness management principles. Canberra: Environment Australia. On file: Central Library–Department of Environment and Heritage, Canberra, Australia.

Gregory National Park Draft Plan of Management. 2001. Katherine: Parks and Wildlife Commission of the Northern Territory. [Online]. 119 p. Available: http://www.nt.gov.au/nreta/parks/management/pdf/gregorypom.pdf#search=%22Gregory%20National%20Park%20Draft%20Plan%20of%20Management.%20Parks%20and%20Wildlife%20Commission%20of%20the%20Northern%20Territory%2C%20Katherine.%22. [August 19, 2006].

Kirkpatrick, J. B. 1980. The quantification of developmental wilderness loss—the case of forestry in Tasmania. Search. 11(10): 331–335.

Mittermeier, R. A.; Mittermeier, C. G.; Robles-Gil, P.; Pilgrim, J. D.; Da Fonseca, G. A. B.; Konstant, W. R.; Brooks, T. M., eds. 2002. Wilderness: Earth's last wild places. Mexico City: CEMEX. 576 p.

Namadgi National Park Draft Management Plan. 2005. [Online]. 202 p. Available: http://www.environment.act.gov.au/__data/assets/pdf_file/13426/namadginationalparkmanagementplanpdf.pdf. [August 19, 2006].

National Wilderness Inventory—Australia. 1995. Bulletin No. 3. Australian Heritage Commission, Canberra. Available from the Australian Heritage Commission, Education and Communications Section, Canberra, Australia.

Totaro, Paola. 2003. Rock art find makes Stonehenge seem young. Sydney Morning Herald. July 2, 2003. [Online]. Available: http://www.smh.com.au/articles/2003/07/01/1056825399651.html. [August 19, 2006].

Whitehouse, John F. 1993. Legislative protection for wilderness in Australia. In: Barton, Will, ed. Wilderness—the future. Sydney: Envirobook and Colong Foundation for Wilderness: 94–126.

Attachment 2

8th WORLD WILDERNESS CONGRESS
30 SEPTEMBER - 6 OCTOBER 2005 ANCHORAGE, ALASKA

**RESOLUTION #:** 36

**TITLE:** Wilderness – A Criterion for World Heritage Listing

**WHEREAS:** Under current Operational Guidelines for the consideration of nominated natural area properties, the conservation of important wilderness values of the area nominated for inscription on the list of World Heritage properties is relegated to being either a factor influencing the biophysical integrity or an element of the conservation of the scenery criterion.

**THEREFORE:** A wilderness criterion is necessary under the Operational Guidelines for the implementation of the World Heritage Convention for natural area properties to reflect the true value and role of wilderness in this increasingly crowded world.

Identification, recognition and promotion of wilderness that would follow the establishment of such a World Heritage criterion would provide adequate protection of intrinsic values and more people with life changing experiences and thereby provide the inspiration to work for a more environmentally sustainable society.

A wilderness World Heritage criterion would also help to secure a higher priority for nature-focused management for the reserves listed under that criterion.

**RESOLVED:** That the Eighth World Wilderness Congress requests the World Heritage Committee of UNESCO to include wilderness value as one of the criteria in the World Heritage Operational Guidelines for the assessment of natural areas nominated for World Heritage listing.

THE WILD FOUNDATION
PO Box 1380, Ojai, CA 93024, USA • T: 805-640-0390 / F: 805-640-0230 • www.wild.org

**PROPOSER:** Keith Muir, O.A.M. Director,
Colong Foundation for Wilderness

**SECONDER:** Kevin Kiernan,
Lecturer in Conservation Geomorphology
University of Tasmania

Haydn Washington, Secretary, Blue Mountains
Wilderness Network (Australia)

Attachment 3

Adelaide NOW (The Advertiser – Sunday Mail)

# Bolt: Give me a home among the gum trees

Andrew Bolt
13 June, 2012 11pm

**AUSTRALIA'S latest campaign strikes a balance between our natural and made-made wonders, writes Andrew Bolt.**

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JUST a few seconds into Tourism Australia's marvellous new 90-second ad, you see it - *there,* in the bushes. A luxury hotel! Right inside a Blue Mountains World Heritage Area.

Of course, you might say. Who wants to stand in a hot forest the whole day, looking at trees?

Who wouldn't want to zip back after a couple of hours to grab a cocktail, jump in a pool, lounge on a sun deck or take a massage next to a passing wombat?

But note this. This ad campaign is the first in which Tourism Australia has featured not just our best bits of nature but the luxury resorts right next to them - including spectacular ones at Kangaroo Island and Tasmania's Great Oyster Bay.

Not only that, but this Blue Mountains resort is the one at Wolgan Valley that green groups fought and green tape nearly strangled. A hotel in a national park? Sacrilege!

Which makes Tourism Australia's latest ad campaign, launched in Shanghai, not just a celebration of Australia, but one more sign of the decline of the anti-human green movement.

The Wolgan Valley Resort and Spa, which Test captain Michael Clarke booked out last month for his wedding, is the perfect example.

Emirates announced in 2005 it wanted to build this $125 million extravaganza, yet had to work for two more years just to get its plans through all the green tape, including approvals from the then Howard government, the local shire, the NSW Land and Environment Court and the NSW Labor government.

It's a familiar story for any big developer.

For years now, it's seemed a sin to green preachers to have man's footprint anywhere near nature.

This absurd fear of human contamination has closed a uranium mine in Kakadu, banned oil exploration around the Barrier Reef, halted coal mines in Queensland, delayed housing developments in even the most barren scrub, and now threatens a planned $30 billion gas hub project on James Price Point - an empty scrap of the vast Kimberley.

Even a humble $50 million expansion of the Yaringa Boat Harbour on the Mornington Peninsula was held up for a year by green bureaucrats fretting over an orange bellied parrot no one had actually seen there for a quarter of a century. This anti-human paranoia has also led to attacks on tourism itself. Tourists are told not to climb Uluru; recreational fishing has been severely restricted; horse riding in many national parks is limited or even banned; and where is the five-star resort on the Barrier Reef itself that tourists would cross the world to see?

It's like banning laughter in church. Victoria's magnificent Wilson's Prom is under such prudish management that you can't stay anywhere inside bar a camping site or some Spartan eco-cabin.

The Wolgan Valley resort could have gone the same puritanical way. What an effort and expense Emirates had to go to just to get an official yes to a project that Tourism Australia now touts as one of our biggest tourism magnets.

It had to swap 114ha of bushland it had bought next to the park for 39ha of the park itself, with green groups screaming every inch of the way. It had to plant thousands of trees, modify its designs and agree to all kinds of restrictions.

Even now, just four helicopter trips a week are allowed to ferry in guests to the resort.

Now come the Tourism Australia ads to explode the fallacy and extremism that tends to drive such anti-development campaigns.

No, man is not necessarily a pollution on the landscape.

No, there's not much point in having great scenery if you make it too tough for people to see or enjoy.

These ads no longer trade on our beauty spots being remote and unsullied by human hands. After all, there's not a single national park that isn't improved by a good road on which to go and see it.

So we see the beauty of the Great Oyster Bay through the windows of the Saffire Freycinet luxury lodge.

We look out over Kangaroo Island's beach from the great windows of the Southern Ocean Lodge. Uluru is seen from well-laid dining tables at dusk, and a chopper is parked on top of a waterfall in the El Questro Wilderness Park, because who wants to hike in the heat?

In fact, the sole Victorian entry in the 12 destinations showcased is nothing designed by nature - not the Great Ocean Road or the penguins of Phillip Island - but the Crown Casino.

And Sydney closes the ads with our greatest calling card - the man-made Sydney Opera House, on the edge of the God-made harbour.

It's the perfect balance.

Attachment 4

# Draft listing advice- Peaty swamps on sandstone in the Sydney Basin

## 1. Name of the Community.

**Peaty Swamps on Sandstone in the Sydney Basin**

This ecological community is currently listed under the EPBC Act, as the *Temperate Highland Peat Swamps on Sandstone.* This draft listing advice follows the assessment of information provided from a review of the current listing, recommended by the Threatened Species Scientific Committee (the Committee). Restricting the ecological community to the Sydney Sandstone Basin biogeographical region (as described in IBRA version 6.1) and for elevations greater than 20 metres above sea level (asl), provides a clearly defined geological, ecological and elevation boundary to the ecological community and provides for ready identification of swamps that are included. A number of swamps which are included in the *Temperate Highland Peat Swamps on Sandstone* listing; such as Jackson's Bog (Mila Swamp), and Nalbaugh Plateau (Bega Swamp) that exist on a sandstone substrate in the far south of NSW near Bombala, are outside the Sydney Basin and are excluded from this ecological community.

## 2. Description

The peaty swamps on sandstone in the Sydney Basin of New South Wales (NSW) ecological community (peaty swamps) are either temporary (ephemeral) or permanent swamps. The climate of the Sydney Basin bioregion is described as temperate, and is characterised by warm summers and no dry seasons; average annual rainfall typically exceeds 1000mm. The distribution of the ecological community is strongly related to climate, typically situated in areas with an annual excess of available moisture due to low rates of evapotranspiration (Keith, 1994). The peaty swamps are located in a range of topographic sites in the upland landscape and span an altitudinal range from 20-1100m above sea level (asl) (DEC, 2005). The swamps vary in size, structure, vegetation type and depth of peat development, as a response to their location, elevation, terrain, soil fertility, catchment characteristics and rainfall (total precipitation). While variable, unifying characteristics of the swamps include that they overlie a sandstone substrate and peat is present, which is recognised as unusual, as the sandstone substrate supporting the peat is highly erodible.

***Swamp types***

The peaty swamps overlie a sandstone substrate and are typically dominated by sedge-derived peaty soils; although *Sphagnum* species are often present (Whinam and Chilcott, 2002). They exist as valley and watercourse swamps on slopes usually less than 10 degrees (Young and Young, 1982) and, as hanging swamps. The hanging swamps occur on steep valley sides and on high sandstone cliffs where water continually flows from the interface between sandstone layers or between sandstone and claystone layers. Peat depth varies greatly both between and within individual swamps. As a response to their topographical location hanging swamps generally have a very minimal peat development, while valley swamps generally exhibit a greater peatbed development. The rate of accumulation of the peat is influenced by stream and catchment runoff rates, relatively rapid erosion of the sandstone and subsequent large sediment deposition in the swamps. Rapid seasonal drying in most years also influences the rate of growth of the plant species, particularly *Sphagnum*, that contribute organic matter to the peat development. The dominant water source for the peaty swamps is precipitation and groundwater seepage through joints in the

underlying sandstone, maintaining a persistently high perched water table (Melville and Fitzpatrick, 1983).

The low gradient of the extensive sandstone plateau slopes on which the majority of these swamps occur, results in catchment flows not being great enough to move sandy sediment deposits from any water-pooling areas, allowing for sediment and organic matter accumulations (Young and Young, 1982). As the sediment deposits become saturated, moisture-dependent plants establish, increasing the water-holding capacity of the sediments and the development of peat and peaty soils (Dodd, 1989). The depth of peat development in these swamps is generally in the order of five to 30cm. These types of swamps occur on the Newnes, Kanangra-Boyd, Blue Mountains and Woronora Plateaus.

Swamps also occur in higher gradient valleys or valley side slopes as hanging swamps where run-off and stream flow-rates are such that slow-flowing pools are seldom evident. The high flow-rates of these steeper gradient catchment flowlines generally remove much of the organic matter providing for little peat development except where rock ledges and other barriers occur in the flowlines. The hanging swamps occur mainly as higher elevation swamps of the Blue Mountains and Newnes Plateau, but do occur at lower elevations near Gosford and in the upper Shoalhaven region.

***Hydrology***

The development of peaty swamps has been and is very much controlled by the extent and amount of groundwater seepage from cracks and fissures between the layers of the sandstone substrate in the catchment area of each swamp. There are strong spatial relationships between the distribution of swamps and the perched aquifers that underpin local soil moisture gradients (Young, 1982; Keith and Myerscough, 1993). The extent and rate of groundwater seepage is also influenced by the regular, total precipitation (>850mm/yr) and the occurrence of high intensity rainfall events (75mm/hr) that occur in the upland areas of the sandstone basin. The peaty swamps as such are groundwater dependent with most swamps receiving some surface runoff after heavy or extended rainfall events. These runoff events deposit further sediments in the swamps contributing to the peaty soils of the swamps. Irrespective of soil depth, the function of the swamps, through the moderation of runoff and slow release of water to downstream catchments (Young, 1982; Kodela and Hope, 1992), is consistent across the range of the ecological community. In extreme high-intensity rainfall events, catchment erosion and additional urban runoff can result in high levels of deposition of sandy overburden that is detrimental to the swamps and swamp vegetation – burying the vegetation in the short-term (BMCC, 2007).

With the development of a peatbed or peaty soil layer, the swamps have an important functional role in the larger catchments within which they occur; that of slowing runoff flows and the filtering of sediments, pollutants and nutrients from the waters flowing into and downstream from the swamps. Many peaty swamps also occur within the 19 sub-catchments of the Sydney Catchment Authority (SCA) and as, hydrologically functional systems, they provide ecosystem services in terms of water quality through the filtering of sediments and pollutants, and the regulation of flows through water storage in and through the peats (Young and Young, 1982). An example of a watercourse/valley swamp at the southern margin of the Sydney Sandstone Basin, Wingecarribee Swamp is unique in NSW, being an extensive rushland/sedgeland dominated by *Lepyrodia* species. The swamp is underlain by a sandstone substrate with Tertiary river sediments of sand and gravel, which are overlain in part by basalt sediment from surrounding volcanic soil areas. The swamp is fed by continual groundwater seepage, which enables the swamp to be maintained in an

area where rainfall is insufficient for widespread peat bog formation (Kodela and Hope, 1992; Hope, 1996; Kodela et al, 1996, 2001). Wingecarribee Swamp sits at the headwaters of the Wingecarribee River and plays a significant function in filtering water as part of the Sydney water supply. It is the largest peat swamp on mainland Australia and is the best example of an upland peatland, having an average depth of peat of approximately three metres but up to 10 metres in some parts of the swamp (Hope, 1996).

The swamps as such play a significant role in the control of flow regimes in down-slope streams and rivers. The swamps also contribute to the distribution of water to surrounding and down-slope communities and subsequently the occurrence and distribution of native plants, animals and habitats. The growth of trees around and near swamps, for example, is limited by the high soil moisture regimes that are largely maintained by the swamps.

***Vegetation***

A clear boundary generally delineates the peaty swamps from surrounding vegetation communities, and is typically related to changes in soil fertility and moisture properties (Buchanan, 1980; Keith, 1994). Similarly, the structure of the ecological community varies in relation to gradients in soil type and moisture and nutrient availability (Keith and Benson, 1988; Benson and Keith, 1990; Keith and Myerscough, 1993; Benson and Howell, 1994; Keith, 1994), as well as time since fire (Buchanan 1980; Benson and Howell, 1990; Keith, 2004). The vegetation associated with the peaty swamps is a complex patchwork of vegetation types, and varies from closed sedgelands in the wettest parts of some components, through to open scrubland in the driest parts (Buchanan, 1980; Keith and Benson, 1988; Benson and Keith, 1990; Keith and Myerscough, 1993). Cryptograms and fungi are present in all sites. Variation in community structure between and within swamps is associated with soil type, drainage gradients (NSW Scientific Committee, 2005; Benson and Keith, 1990), and nutrient load (Keith and Myerscough, 1993; LeBrocque and Buckney, 1994). Other factors influencing floristic composition include time since fire, as well as fire intensity (Benson and Keith, 1990), swamp size and recent climatic conditions such as rainfall events (NSW Scientific Committee, 2005).

The peaty swamps have been classified floristically in a number of ways (Benson, 1978; Young, 1982; Keith and Benson, 1988; Benson and Keith, 1990; Keith and Myerscough, 1993; Whinam and Chilcott, 2002; Whinam et al, 2003; Keith, 2004). The number of classification approaches emphasises the difficulty of defining these complex wetland/swamp ecological communities by vegetation type and species occurrences. The dominant species are physically adapted to survive periodically to permanently water-logged soils (Keith, 2004). The defining characteristic of the swamps included in the ecological community is that they exhibit some peat development, predominantly from *Sphagnum* and/or *Baloskian*, *Empodisma*, *Lepyrodium* and *Carex* species. Table 1 provides a list of native plant species which are likely to be found in the peaty swamps, however the list is not exhaustive, and the plants listed will not occur in every swamp component.

**Table 1:** Native plant species indicative of the peaty swamps ecological community. Note that not all swamps will have these species and the absence of these species does not exclude a swamp from the ecological community listing.

| **Vegetation Type** | **Scientific name** | **Common name** |
|---|---|---|
| Mosses | *Sphagnum* spp | sphagnum mosses |
| Ferns | *Blechnum* spp | rough ferns |
| | *Gleichenia microphylla* | coral fern |
| Herbs | *Cryptostylis* spp | tongue orchids |
| | *Microtis* spp | onion orchids |
| | *Prasophyllum uroglossum* | Wingecarribee leek-orchid |
| | *Spiranthes sinensis* | austral ladies Tresses |
| | *Thelymitra pauciflora* | sun orchid |
| | *Viola betonicifolia* | showy purple violet |
| Sedges | *Carex* spp | sedges |
| | *Chorizandra cymbaria* | bristle rush |
| | *Cyperus* spp | umbrella sedges |
| | *Empodisma minus* | spreading rope rush |
| | *Gahnia* spp | saw-sedges |
| | *Gymnoschoenus sphaerocephalus* | button grass |
| | *Isolepis* spp | |
| | *Juncus* spp | rushes |
| | *Lepidosperma limicolum* | razor sedge |
| | *Leptocarpus tenax* | slender twine-rush |
| | *Lepyrodia scariosa* | |
| | *Luzula modesta* | |
| | *Ptilothrix deusta* | fluke bogrush |
| | *Schoenus apogon* | common bogrush |
| Grasses | *Deyeuxia quadriseta* | reed bent grass |
| | *Dichelachne inaequiglumis* | plume grass |
| | *Hemarthia uncinata* | mat grass |
| | *Isachne globosa* | swamp millet |
| | *Poa labillardierei* | tussock grass |
| Shrubs | *Epacris microphylla* | coral heath |
| | *Epacris obtusifolia* | blunt-leaf heath |
| | *Epacris paludosa* | swamp heath |
| | *Baeckea linifolia* | swamp baeckea |
| | *Banksia spinulosa* | hill banksia |
| | *Callistemon citrinus* | crimson bottlebrush |
| | *Dillwynia sericea* | showy parrot-pea |
| | *Grevillea acanthifolia* | spiny grevillea |
| | *Leptospermum* spp | tea-tree |
| | *Pultenaea* spp | bush peas |

## 3. Key diagnostic characteristics and condition thresholds

National listing focuses legal protection on the natural condition, integrity and function of the swamp ecological community. The national ecological community (as described in the Description) is limited to patches that meet the following diagnostic characteristics.

### *Key diagnostic characteristics*

The key defining attributes for the ecological community are:

- It occurs above sandstone substrate within the Sydney Basin bioregion (IBRA version 6.1);
- It occurs at elevations between 20m and 1100m above sea level;
- There is a minimum peat or peaty soil development (>10mm) present from *Sphagnum*, *Empodisma*, *Lepyrodium*, *Baloskian*, *Carex* and/or other dominant native swamp species;
- There is a hydrologically functional swamp peat area larger than 0.1ha;
- There is an immediate up-slope catchment (>0.5ha) that provides all surface flows to and through the swamp; and

### *Condition thresholds*

Condition thresholds have not been adopted for this ecological community as condition is difficult to assess for such groundwater dependent ecosystems. The peaty swamps may demonstrate impacts from disturbance, for example through vegetation loss, yet their functionality is not always compromised, and it is therefore often not feasible to adequately assess condition by standard ecological parameters. Furthermore, an intermediate condition does not often occur with swamps as disturbances that affect the functioning of the swamp such as drainage or changes to groundwater aquifers produce catastrophic impacts that lead to the partial or total destruction of the peat. Once peat has been exposed or dried it loses the capacity to hold water and is effectively not recoverable. Therefore it is considered that condition thresholds are not appropriate for this ecological community.

## 3. National Context

### *Distribution*

The ecological community is found only in the Sydney Basin bioregion of NSW. The Sydney Basin is an identifiable and significant geological entity and while occurring only in NSW, is recognised nationally as a discrete area supporting a specialised and nationally significant native flora (particularly the sclerophyll and xerophyll flora) and fauna. The Sydney Basin is a broad structural basin covering approximately 3.6 million hectares or about 4.5% of NSW (Packham, 1969; ANRA, 2011). It encompasses all or a significant part of the catchments of the Hawkesbury Nepean River system, the Hunter and Shoalhaven River system, and the Parramatta, Georges and Hacking rivers. It also encompasses a part of the headwater catchments of the Clyde and Macquarie rivers. The Sydney Basin is also significantly, a single and separate biogeographical region (IBRA) with 14 subregions (Kerrabee, Hunter, Capertree, Wollemi, Yengo, Wyong, Pittwater, Cumberland, Burragorang, Cataract, Moss Vale, Illawarra, Ettrema and Jervis subregions), and this further defines the geographical area of this ecological community.

The Sydney Basin is bounded to the east by the coastline extending from near Bateman's Bay north to Port Stephens. The inland western boundary is an unconformity against folded and faulted lower and middle Palaeozoic rocks extending from Durras Lakes in a wide arc through Ettrema, Tallong, Wingello, Katoomba, Kanangra Walls, Lithgow, Portland, Ulan then eastward to Sandy Hollow, Murrurundi and the Hunter Valley to the coast (Packham, 1969). The sandstones of the Basin are generally referred to as the Narrabeen and Hawkesbury sandstones. The greater part of the Hawkesbury sandstone occurs in the southern part of the Basin. The southern limit of this sandstone type is along the coastal escarpment from Kiama in the east to Fitzroy Falls and Bundanoon in the west. The western boundary of the Hawkesbury sandstone is in the Blue Mountains near Woodford but the cliffs in the Lithgow, Newnes, Glen Davis and Rylstone-Mudgee area, as well as the cliffs and plateau of the Burragorang Valley are part of the more extensive Narrabeen group (Packham, 1969). The latter group covers the major part of the Basin (central and northern areas), with both sandstones groups being underlain by significant Permian coal seams. The greater part of the Sydney Basin is an elevated plateau (above 100m asl) with the exception of the Hunter Valley and the Cumberland Plain.

Studies of past conditions of the peaty swamps (not just the ecological community) indicate that they have been in existence for variable lengths of time from 1 200 (Burralow Creek Swamp) to 45 000 years (Redhead Lagoon, Newcastle) although many at higher altitudes date from the end of the last ice age (Williams et al, 2006; Chalson and Martin, 2009). Analysis of micro-charcoal from several peat cores shows that the fire regimes have varied over the past 10 000 years (Black et al, 2007). There appears to be a strong correlation with ENSO events, with an increase in fires at times of warming (and associated drought) and a decline in cooler periods. Vegetation composition has been relatively stable, suggesting the swamps are resilient to a range of fire regimes. However over the past 2 500 years the vegetation structure at some sites may have been controlled by burning (Black et al, 2008).

### *Equivalent State vegetation units and listings*

Caveat

Ecological communities are complex to classify. Each State/Territory jurisdiction applies its own system to classify ecological communities which can cause challenges when cross-referring amongst systems. They may also vary in accuracy to the on-ground situation, particularly if based on maps and modelling. Any reference to vegetation and mapping units as equivalent to a national ecological community, at the time of listing should be taken as indicative rather than definitive. A unit that is generally equivalent may include elements that do not meet the description. Conversely, areas mapped or described as units other than those referred to may sometimes meet the description. Judgement of whether an EPBC-protected ecological community is present at a particular site should focus on how an area meets the description and condition thresholds of the national ecological community.

New South Wales

The ecological community covers, or has elements of, ecological communities listed under the NSW *Threatened Species Conservation Act 1995*. Peaty Swamps are synonymous with the NSW listed endangered ecological communities: *Newnes Plateau Shrub Swamps in the Sydney Basin Bioregion* and the *Blue Mountains Swamps in the Sydney Basin Bioregion*. At the highest elevations the Newnes plateau shrub swamps floristically grade into the

Blue Mountains sedge swamp communities (Keith and Benson, 1988). The ecological community also shares many floristic and structural characteristics, particularly in the Sydney Basin, with the NSW listed endangered ecological community: *Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps Bioregions*. Another NSW-listed ecological community is partly covered by the peaty swamps: *Coastal Upland Swamp in the Sydney Basin Bioregion*. The peaty swamps include swamp areas of the NSW Coastal Heath Swamps (Madden's Plain and Woronora Plateau) on the escarpment between Waterfall and Wollongong (Keith, 2004). These swamps are the most diverse and extensive heath swamps on mainland Australia (Keith, 2004).

National

There are two ecological communities listed at the national level under the EPBC Act that contain similar elements to the peaty swamps. The *Upland Wetlands of the New England Tablelands (New England Tableland Bioregion) and the Monaro Plateau (South Eastern Highlands Bioregion)* is located in a different bioregion and is found on different substrate (basalt, granite or silicate). This ecological community is generally wetter than the peaty swamps and contains a different suite of species associated with wetter environments. The *Alpine Sphagnum Bogs and Associated Fens* contain *Sphagnum*, as do a number of the peaty swamps. However, the Apline bogs ecological community occurs at higher elevations than the peaty swamps (above 1600m).

***Examples of where the ecological community occurs***

Wingecarribee Swamp at the southern margin of the Sydney Basin has international recognition, as the peats of the swamp date back to about 14 700 years and is a storehouse of Indigenous cultural history over the period of peat development (Hope and Southern, 1981, 1983; National Parks and Wildlife Service, 1997). It is also referenced in a world survey of peatlands (Moore and Bellamy, 1974). The Wingecarribee Swamp, although highly degraded by its partial collapse in 1998, is the most significant single swamp in the SCA drinking water catchment area (DECC, 2008). Near to Wingecarribee swamp is a similar Wilde's Meadow Swamp but much of it has been flooded by the Fitzroy Falls reservoir. Several other significant peat swamps occur near to the southern boundary of the Sydney Sandstone Basin, these being commonly referred to as the Paddy's River wetlands and include Hanging Rock, Stingray, Long and Mundego Swamp.

Wingecarribee Swamp, together with the Blue Mountains sedge swamps, Boyd Plateau bogs, the Budderoo National Park heath swamps, Long Swamp, O'Hares Creek Catchment swamps, and Thirlmere Lakes are listed as important wetlands in the Directory of Important Wetlands in Australia (Environment Australia EA, 2001). Major swamp types of the ecological community are listed in Table 2.

**Table 2:** Swamp areas which are known to be part of the ecological community. (Note that this is not a comprehensive list of composite swamps- other swamp areas that meet the description and key diagnostics are also considered part of the ecological community.)

| **Name** | **Altitude** | **Location** |
|---|---|---|
| Blue Mountains swamps | 800-950m | Katoomba, Blackheath |
| Newnes Plateau swamps | 1000-1100m | Lithgow Wallerawang |
| Paddy's River swamps<br>(Jumping Rock, Hanging Rock, Mundego, Long Swamp, Stingray Swamp) | 600-650m | Penrose, Wingello |
| Woronora Plateau / Madden's Plain swamps | 300-350m | Helensburgh Waterfall |
| Wingecarribee / Wilde's Meadow | 680m | Fitzroy Falls, Robertson |
| Robertson swamps<br>(Butler's, Gallaher's, Stockyard, North-pole, Rock Arch) | 620 – 650m | Northeast of Robertson |
| Gosford Hanging swamps | 250-450m | Gosford |
| Shoalhaven Hanging swamps | 300 – 600m | Ettrema, Budderoo |

The full number, distribution, location and area of the peaty swamps are not known but are estimated to be in the order of 6 000 to 8 000 hectares, which is less than 0.3% of the Sydney Basin area (Australian Natural Resources Atlas, 2011). Some 3 600 to 4 000ha are in the Blue Mountains/ Newnes Plateau region, with some 1 600 to 1 800ha of this being within protected areas (including Blue Mountains, Wollemi, Nattai and Budderoo National Parks) (National Parks and Wildlife Service, 2011; BMCC, 2007; DECC, 2008; DEH, 2005). The majority of the peaty swamps exist in State Forests and Crown lands with the largest, Wingecarribee Swamp, being within a designated Schedule One Special Area managed by the Sydney Catchment Authority. In the Wingecaribee Shire alone, Perry (1996) identified 346 wetlands, ranging in area from 1ha to 320 ha (Wingecarribee Swamp being the largest). One hundred and four of these swamps were identified as peaty swamps in broad, shallow gently sloping catchments on Hawkesbury sandstone.

***Similar ecological communities***

This revised nomination does not include the lowland and coastal sandstone plain swamps within the Sydney Basin below 20m asl. These are included in the NSW listed, *Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions* which includes Coastal Freshwater Lagoons, Coastal Floodplain Wetlands and Coastal Swamp Forests (Keith, 2004). These lowland coastal freshwater swamps are characterised by a different suite of species that are more typical of aquatic environments, such as *Casuarina glauca* (swamp oak) and *Melaleuca ericifolia* (swamp paperbark), with a complex of emergent and amphibious herbs, for example *Villarsia exaltata* (yellow marsh flower), *Alisma plantago-aquatica, Persicaria decipens* (slender knotweed), *Hydrocotyle peduncularis* and *Ranunculus inundates* (buttercup)*;* floating plants such as *Azolla filiculoides* (red azolla), *Marsilea mutica* (nardoo) and submerged plants such as *Triglochin procera* (water ribbon) and *Vallisneria gigantean* (ribbonweed). In sandy lagoons many grasses and grass-like plants occur including *Eleocaris sphacelata*

(giant spike rush), *Baloskian pallens* (cord rush), *Isachne globosa* (swamp millet), *Carex appressa* (tussock sedge), *Paspalum distichum* (water couch) and *Cyperus and Juncus* species (Benson and Howell, 1990; NPWS, 2000; Keith, 2004).

Similarly, the coastal floodplain swamps (wetlands) exhibit a different vegetation complex to that of the peaty swamps, with shrubs such as *Glochidion ferdinandi* (cheese tree), swamp paperbark and herbaceous species including *Alternanthera denticulata* (joyweed), *Dichondra repens* (kidney weed), slender knotweed, *Viola hederacea* (ivy leaved violet), *Baumea juncea* (twig rush), *Carex appressa* (tussock sedge), *Entolasia marginate* (panic), *Juncus usitatus* (common rush), *Zoysia macrantha* (prickly couch), *Imperata cylindrica* (blady grass) and *Gahnia clarkei* (tall saw-sedge) (Keith, 2004).

This nomination also excludes the Montane Freshwater Lakes (deflation hollows) and the Montane Bogs and Fens (Keith, 2004), outside but occurring in sites near to or adjoining the Sydney Basin, several of which were listed in the previous national listing of *Temperate Highland Peat Swamps on Sandstone* ecological community. Many of these swamps are included in the NSW listed *Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South East Highlands and Australian Alps bioregions.* A number of these swamps have floristic elements similar to or in common with the peaty swamps but have been excluded as they have much more in common (geologically, floristically and ecologically) with other swamps that occur on a range of geologies outside the Sydney Basin.

## 4. Relevant Biology and Ecology

### *Vegetation*

Peatlands are a vital component of the carbon cycle, emitting methane and nitrous oxide and storing large amounts of carbon (DPIPWE, 2010). Many native plant species are found in the swamps and in the immediate catchments of the peaty swamps and are listed in Appendix 1. Keith and Myerscough (1993) recorded some 170 vascular species just in the O'Hares Creek catchment and considered that in excess of 200 species would occur in the upland swamps across the Sydney Basin. Cryptograms and fungi are also present in all sites. There is a general continuum of species from one location to another (low to high elevation, low to high precipitation, wet to dry, permanent to temporary) such that the swamps have a complex of vegetation whose occurrence is influenced and determined by rainfall, altitude, aspect and topographic location in the landscape, as well as past and present land-use history. The vegetation of sandstone is richer in species than that of a permanently wet swamp or of more fertile soils (Rice and Westoby, 1983). Tozer et al (2010) note that there is decreasing plant diversity as altitude increases, but local endemism increases to the upper altitudes of the Blue Mountains and Shoalhaven hanging swamps. Swamps having a continuous inflow from groundwater and regular rainfall events (bogs and fens) are dominated by herbs and sedges while swamps with lower or intermittent inflows from groundwater sources tend to be dominated by shrubs (wet heath) species. Table 3 provides a list of threatened flora species known to occur in peaty swamps.

**Table 3:** Threatened species listed under national and state threatened species legislation that are known or likely to occur in the ecological community. R= Rare; V=Vulnerable; E=Endangered (National = EPBC Act; NSW= *Threatened Species Conservation Act 1995*).

| **Scientific name** | **Common name** | **National** | **NSW** |
|---|---|---|---|
| *Boronia deanei* | Deane's boronia | V | V |
| *Callistemon shiressii* | white bottle brush | | R |
| *Carex klaphakei* | swamp grass | | E |
| *Deyeuxia microseta* | | | V |
| *Diuris venosa* | veined doubletail | V | V |
| *Epacris calvertiana* var. *versicolor* | | | V |
| *Epacris microphylla* var. *rhombifolia* | mountain coral heath | | V |
| *Eucalyptus aquatica* | mountain swamp gum | V | V |
| *Gentiana wingecarribiensis* | Wingecarribee gentian | E | |
| *Grevillea acanthifolia* | spiny-leaved grevillea | | V |
| *Grevillea evansiana* | Evan's grevillea | V | V |
| *Hibbertia salicifolia* | guinea flower | | R |
| *Isopogon fletcheri* | Fletcher's drumsticks | V | V |
| *Leptospermum rupicloa* | | | R |
| *Leptospermum thompsonii* | monga tea-tree | V | V |
| *Lysimachia vulgaris* var. *davurica* | yellow loose-strife | | E |
| *Persoonia oxycoccoides* | | | R |
| *Phyllota humifusa* | dwarf phyllota | V | |
| *Prasophyllum fuscum* ssp. *paludosa* | tawny leek-orchid | V | V |
| *Prasophyllum uroglossum* | Wingecarribee leek-orchid | V | E |
| *Pultenaea aristata* | prickly bush-pea | V | V |
| *Pultenaea parrisiae* | bantam bush-pea | V | E |
| *Pultenaea glabra* | smooth bush-pea | V | V |
| *Rulingia prostrata* | dwarf kerrawang | E | E |

***Fauna***

Two nationally threatened amphibian species have been recorded as frequenting the upland peat swamps, these being *Eulamprus leuraensis* (Blue Mountains water skink) and

*Heleioporus australiacus* (giant burrowing frog). The Blue Mountains water skink is a groundwater dependent species and hence threatened by any reduction in groundwater seepage (Dubey and Shine, 2010, a, b). It is restricted to montane areas in the Blue Mountains and Newnes Plateau and is known from less than 40 isolated small swamps (Dubey and Shine 2010, a, b). Therefore the peaty swamps provide critical habitat for this species. Other more common amphibians and reptiles predictably would exist in or near peat swamps.

The endangered *Petalura gigantea* (giant dragonfly) survives in Wingecarribee Swamp and several swamps in the Blue Mountains (SCA, 2007; BMCC, 2007; Baird pers. comm., 2011). It is particularly threatened in Wingecarribee swamp due to changes in water regimes since the collapse of the swamp in 1998 (SCA, 2001). It is also threatened in the Blue Mountains swamps due to disturbance, peat destruction, changed water regimes and mining operations. The giant dragonfly has a very limited occurrence in the Blue Mountains swamps and is considered to be in decline in those swamps (Baird pers. comm., 2008). The peaty swamps are also likely to provide habitat for other invertebrate species including molluscs.

*Rattus lutreolus* (swamp rat) and *Hydromys chrysogaster* (water rat) have been recorded in or near many sandstone swamps (BMCC, 2006), while other small mammals such as *Petaurus norfolcensis* (squirrel glider) and *Antechinus stuartii* (brown antechinus) have been recorded in the near catchments of many swamps (SCA, 2001; BMCC, 2006). *Ornithorhynchus anatinus* (platypus) was a common inhabitant of the upper Wingecarribee Swamp before its collapse in 1998 (SCA, 2001) but no documented sightings have been made since that time, although they are known from the Wingecarribee River and Fitzroy Falls Reservoir (NPWS Wildlife Atlas, 2011).

Avifauna species are transient visitors to swamps although no birds are solely dependent upon the ecological community for their existence and survival. These species inhabit the surrounding heaths, woodlands and associated plant communities in the catchments of the swamps, utilising the swamps as a water source. Birds such as *Pachycephala olivacea* (olive whistler), *Phylidonyris novaehollandiae* (New Holland honyeater) and *Rhipidura albiscapa* (grey fan-tail) have been observed in habitats around and near swamps (NSW Wildlife Atlas, 2011).

The upland swamps provide habitat for an unknown number of insect, crustacean, amphibian and reptile species due to the limited extent of specific fauna surveys conducted. Table 4 provides a list of threatened fauna listed under state and/or national legislation that are know to occur within the ecological community or utilise its resources.

**Table 4:** Threatened species listed under national and state threatened species legislation that are known or likely to occur in the ecological community. R= Rare; V=Vulnerable; E=Endangered (National = EPBC Act; NSW= *Threatened Species Conservation Act 1995*).

| **Scientific name** | **Common name** | **National** | **NSW** |
|---|---|---|---|
| *Botaurus poicilptilus* | Australasian bittern | E | E |
| *Eulamprus leuraensis* | Blue Mountains water skink | E | E |
| *Heleioporus australiacus* | giant burrowing frog | V | V |
| *Litoria aurea* | green and golden bell frog | V | E |
| *Ninox strenua* | powerful owl | | V |

| | | | |
|---|---|---|---|
| *Pachycephala olivacea* | olive whistler | | V |
| *Petalura gigantea* | giant dragonfly | | E |
| *Petaurus norfolcensis* | squirrel glider | | V |
| *Pseudophryne australis* | red-crowned toadlet | | V |

## 5. Description of Threats

Almost all known swamp areas have been impacted to some degree by human activities and urban development from clearing, stock grazing and the introduction of exotic animals. The disturbances imposed by these activities and the spread of feral animals has impacted upon the catchment characteristics, flow regimes into the swamps and extensive degradation of the swamp vegetation and species populations. In many cases the impacts on the swamps and the degradation of the ecosystem are irreversible even though the knowledge of swamp restoration ecology is well advanced (Good et al, 2007; Good and Wright, 2010; Good et al, 2010; Whinam et al, 2010). Swamps are particularly sensitive to changes in hydrology (Whinam et al, 2003) while *Sphagnum* species are particularly sensitive to drying and exposure to ultraviolet light (UV-B) (White, 2007; Good and Wright, 2010).

The most immediate and significant threats to the integrity and maintenance of the hydrological function and condition of the swamps that need to be addressed as a priority are the changing fire regimes and mining impacts. In particular, that of increased frequency of fire in the landscape imposed by prescribed burning and increasing arsonist fires near to urban areas, and long-wall coal extraction that is contributing to subsidence of swamps.

### *Altered fire regimes*

Keith (2010) has provided a set of fire management thresholds for threatened ecological communities in the Blue Mountains City Local Government Area. For the *Blue Mountains Swamps in the Sydney Basin Bioregion* and the *Newnes Plateau Shrub Swamps in the Sydney Basin*, Keith recommended that the minimum fire frequency be at least eleven years. As prescribed burning is undertaken regularly in the Blue Mountains local government area for life and property protection, the frequency of fire in the landscape is often greater (every 4 to 5 years) than that recommended by Keith. Keith's 11-year minimum interval may not be appropriate for parts of the peaty swamps ecological community, as fire in peat bogs is naturally a very rare event, so the implementation of regular short interval prescribed burning where needed, should only be in the plant communities surrounding the peat swamps.

The development of bushfire mitigation infrastructure including bushfire access tracks, fuel breaks, helicopter pads etc together with increased prescribed burning for life and property protection has had, and continues to have, an impact upon the peaty swamps, particularly in the Blue Mountains, Newnes Plateau and Woronora Plateau (BMCC, 2007).

### *Mining*

An increasing threat to many swamps in the Blue Mountains, Newnes Plateau and Woronora areas is that of peat mining and underground long-wall coal mining. Peaty swamps maintain a high water table due to the poorly permeable underlying sandstone. When the bedrock is cracked by subsidence, water is no longer held up in sediment, but drains rapidly into the shattered sandstone below. Once the swamp has drained, sediments dry out and become erodible. Minewater discharge is also an issue as it contains

contaminants and oxidants. Ongoing flow of discharge water across the surface of swamp creates rilling and erosion and vegetation can be killed from being submerged. Discharge can also open up bare areas which are then prone to invasion to exotics.

Subsidence from long-wall mining is already evident on the Newnes Plateau (Carey, 2007; Hensen and Mahoney, 2010) and Woronora Plateau. Swamp subsidence and drainage has required restoration works, which have been implemented in several swamps over recent years, including Dendrobium Swamps (Good, Hope and Blunden, 2007). Long-wall coal mining activities on the Newnes Plateau have caused a loss of ecosystem function evidenced by a loss of peat, erosion, vegetation dieback and weed invasion in three swamps- Narrow, East Wolgan and Junction (DSEWPaC 2011).

Peat mining can cause catchment instability, erosion and upstream gullying (Kodela and Hope, 1992). Long Swamp, which extends for approximately 5km along the length of Long Swamp Creek, has been mined for peat for over 10 years (HNCMA, 2008). Peat mining in the Wingecarribee Swamp occurred for around 30 years. Peat was mined down to approximately three metres using the wet extraction method (SCA, 2004). Impoundment of the lower portion for creation of the Wingecarribee Reservoir, combined with a flood event, may have contributed to the collapse of the peat in the remainder of the swamp in 1998. The edges of the swamp have been disturbed and there is deep fracturing and fissuring due to the swamp collapse (SCA, 2004). The area of the swamp has been reduced to approximately 25% of its original extent. The swamp is now a fragmented and highly-incised system with water being channelled between the peat sections, rather than flowing in a broad front through the peat. This has resulted in a lower water table, which negatively impacts the remaining sections.

***Weeds***

The presence of weeds in the peaty swamps is a threat as they decrease the overall diversity and abundance of many native species. This may impact on the functioning of the ecological community through changes in the amount of peat-forming vegetation. Significant weeds include Yorkshire Fog (*Holcus lanatus*), birds foot trefoil (*Lotus uliginosis*), reed sweet grass (*Glyceria maxima*), willow (*Salix cinerea*), sweet vernal grass (*Anthoxanthum odoratum*) and blackberry (*Rubus anglocandicans*). Peaty swamps are generally too wet to be significantly invaded by pine (*Pinus radiata*) wildlings from surrounding plantations, and in terms of direct impacts pines are mainly an issue for surrounding vegetation (Douglas and Robyn, 2010). However, as peaty swamps become drier due to local hydrological changes as well as forecast drying due to climate change, pine invasion becomes a much larger threat (Douglas and Robyn, 2010). Shading of narrow swamps by close planting of pines may also have an impact as many plants in peaty swamps require a large amount of light.

Run-off from urban areas, contribute pollution and sediments to the swamps and the detrimental impacts of these is evident in many swamp areas. Weeds and other exotic plants have established in many swamps, for example willows in Wingecarribee Swamp (SCA, 2007), and exotic herbaceous weed species in many Blue Mountains / Newnes Plateau swamps (BMCC, 2007; Good and Hope, 2007).

***Feral animals***

Australian soils and vegetation are very susceptible to the impacts of hard-hooved vertebrates. Cattle enter the waters of the swamps to feed and drink, especially in dry weather, and in swamps that have not been impounded, domestic stock are frequently let loose to graze on swamp vegetation. Feral pigs can cause damage by wallowing, causing

extensive damage to vegetation. In particular, *Sphagnum* is easily crushed and broken up by trampling and wallowing, both of which are inevitable around any water course where animals are liable to congregate on a regular basis. Once *Sphagnum* cover is lost, peat environments are very susceptible to desiccation, incision and soil erosion (Good, 1992). Trampling is damaging to the vegetation and underling peat as it can destroy the sub-surface portions of the vegetation, thereby reducing regeneration of the affected plants. Most of the peaty swamps have been affected by physical disturbance caused by introduced animals. Introduced animals also disperse weeds throughout the ecological community by consuming then excreting seeds. The introduced animals identified from the ecological community include cattle (*Bos taurus*), deer (*Cervus* spp.), horses (*Equus cabbalus*), rabbits (*Oryctolagus cuniculus*), foxes (*Vulpes vulpes*), pigs (*Sus scrofa*), cats (*Felis catus*) and dogs (*Canis lupus*).

***Urban development***

Urban development in the Blue Mountains and in and around other major urban centres within the Sydney Basin has and will continue to impact many swamp areas through sediment and pollutant loaded runoff from roads and other hard-faced surfaces. Associated with these runoff sediments is an increasing exotic and weed species seed population that can readily establish in the sediment deposits in the swamps. This situation is very evident in many swamps surrounding the urban areas in the Blue Mountains. In Wingecarribee Swamp weed invasion (willows) has been the dominant vegetation 'recovery' after its partial collapse in 1998.

Even though some swamps are protected within the Blue Mountains National Park, the sensitivity of the ecological community to disturbance leaves all peaty swamps at risk from changes in the environment upstream. For example, the creation of roads and tracks (including walking tracks) upstream increases the inorganic sediment load in the swamps. If the rate of sedimentation is sufficiently high, or sustained over a prolonged period, it will smother the vegetation in the swamp, raise the surface above the watertable, and ultimately result in a different ecological community.

***Recreation activities***

Recreational activities both passive and active such as bushwalking, off-road four wheel vehicle driving, trail bike riding, horse riding etc have had a significant impact on the swamps through track entrenchment, drainage, vegetation destruction and the fragmentation of swamp catchment vegetation communities (SCA, 2001, 2007; Good and Hope, 2007; BMCC, 2007; OEH, 2011a). In particular four-wheel vehicle driving and trail biking in swamp areas and their catchments that are readily accessed from urban areas, fire trails or forestry roads, have had and are having a significant damaging impact on many swamps. Peaty swamps have been incised by wheel tracks that have resulted in drainage and drying of the peats.

***Climate change***

Predicted climate change over the next 20 to 30 years will further exacerbate the impacts of fire and enhance the increase in feral animal populations that will utilise the swamps as habitat particularly during predicted extended dry seasons. The drying of swamps will also assist and contribute to the spread of weed species that will colonise the swamps. Key issues for ecological health of freshwater systems under a changing climate scenario will be water quantity and temperature changes (DPIPWE, 2010). Reduced precipitation may potentially impact peaty swamps through oxidisation and/or reduction in the rate of peat accumulation (DPIPWE, 2010).

## 6. Draft conservation assessment

***Criterion 1. – Decline in geographic distribution***

The majority of the swamps in the ecological community have experienced some change in area, structural elements, function, vegetation and geographical distribution. In all of the major swamp areas (for example, Wingecarribee Swamp and Blue Mountains Swamps) there has been a decline in the size of individual swamps due to human activities, changed fire regimes, recreational pursuits, drainage, and from subsidence induced by mining under the swamps (BMCC, 2007). Many swamp areas have been impacted by human activities to the extent that they have dried out through changes in flow regimes and drainage (for example, Newnes Plateau (Baird pers. comm. 2006) and Woronora Plateau Swamps (Good et al, 2007) and hence there has been a small but significant decline in geographical distribution of all swamp types within the nomination.

Wingecarribee swamp, the largest peat swamp in the Sydney sandstone basin, collapsed in 1998 as a response to peat mining with the irretrievable loss of some five million cubic metres of peat (SCA, 2001). The swamp has also been reduced from its original 690ha to 310ha, being permanently flooded by Wingecarribee Dam. Many smaller swamps have been drained, converted to farm storage dams or ploughed over for agricultural activities. A number of small to medium sized swamps have been heavily impacted or destroyed by past forestry operations (Stingray and Hanging Rock Swamp) and several by past peat extraction activities (Long Swamp) (Southern Highlands Community Action Group, 1995).

The actual extent and total area of the upland peat swamps is not known and the figure given is only an estimate. An amalgamated estimate of the total area of peat swamp decline suggests a decline from approximately 6 000ha to some 4 500ha. (Young 1982, 1986a; NPWS, 2000; Tozer et al, 2010; OEH, 2011a,b,c).

There is not adequate data to provide a reliable estimate of the extent of decline in the ecological community and therefore it is **not eligible** for listing under this criterion.

***Criterion 2. - Small geographical distribution coupled with demonstrable threat.***

The peaty swamps cover only about 0.3% (OEH, 2011a,b,c) of the Sydney Basin biogeographical area and an even smaller area in terms of swamp areas in NSW and on a national basis. They are restricted to specific topographic and groundwater sites (Young, 1982, 1986; Young and Young, 1982) and are closely aligned with climatic gradients. Individual swamp areas range from less than 1ha to 310ha with the majority being in the 3 to 15 ha range (NPWS, 1997, 2011; SCA, 2007; OEH, 2011a,b,c)**.** The few larger swamps (>15ha) account for about 50% of the total estimated area of the ecological community (Keith, 2004; Perry, 2007). Therefore the ecological community would be considered to have a restricted distribution as patch size is generally less than 100ha. Less than half of the swamps fall within national parks and protected areas, where it is estimated that some 1 500ha occur (NPWS 2003; NSW Scientific Committee 2005, 2007).

The threats to the peaty swamps have been outlined previously. As the swamps occur in and as a response to specific landscape attributes and are dependent on groundwater, they are susceptible and sensitive to changes in groundwater levels (water table changes) and seepage rates (Young, 1982, 1986b). They are also sensitive to precipitation changes and

are predictably threatened by climate change **(**Good, 2004; Good and Wright, 2010; OEH, 2011a,b,c; Baird pers. comm., 2011). Changes in fire regimes (dehydration of peat and destruction of swamp vegetation (Whinam et al, 2010) and long-wall mining (Krogh, 2004, 2007; BMCC, 2007; Good et al, 2007)**,** leading to subsidence and drainage of the swamps, also threaten the ecological community. Many areas of peaty swamp have been impacted by domestic grazing activities over past decades, while the increasing populations of feral animals (deer, pigs, goats, rabbits, cats) are impacting on both the functional role of the swamps and the native biota that utilise the swamps.

The peaty swamps is an ecological community that has a restricted natural occurrence and distribution as they are very site specific in terms of topography and geology. As previously discussed, the threats and their intensities are increasingly degrading vegetation communities and swamp ecosystem functions.

The peaty swamps ecological community is therefore **eligible** for listing as **endangered** under this criterion.

***Criterion 3 – Loss or decline of functionally important species.***

The peaty swamps are a significant hydrologically functional community supporting several important water-dependent plants (Whinam and Chilcott, 2002). No species are individually significant but several species are an essential part of the peat swamp ecosystem and are crucial to the functioning of the ecological community. *Sphagnum*, *Baloskian, Carex, Lepyrodia* and *Empodisma* species contribute to the continuing accumulation of organic matter and peat / peaty soil development in the swamps. The peatbeds filter pollutants from seepage and catchment runoff waters (Wimbush, 1970; Grover et al, 2005.) They provide a significant benefit to the potable water supplies of Sydney, Newcastle, Wollongong and other major regional towns in the Basin. Many species but particularly *Sphagnum*, are extremely sensitive to dehydration, (Whinam and Chilcott, 2002; Whinam et al, 2003) high intensity fires, and changes in climatic regime and increasing levels of ultraviolet light (UVB) (Good and Wright, 2010). *Sphagnum* has declined in total area across the swamps and is now extinct in several swamp areas (BMCC, 2007; Whinam and Chilcott, 2002; Young pers. comm., 2011).

Any degradation or loss of one or more of the peat-forming species impacts on the functional role of the swamps. No data covering all swamps in terms of percentage decline of swamp area, functionality and/or significant species is available but the degradation of Wingecarribee Swamp, several Woronora swamps (Dendrobium) and Newnes Plateau swamps as a result of surface and subsurface mining has reduced the estimated total area of swamp by about 20 percent (BMCC, 2007; Baird pers. comm.; Good et al, 2007; SCA, 2007).

There is not adequate data to provide a reliable estimate of the loss or decline of functionally important species and therefore it is **not eligible** for listing under this criterion.

***Criterion 4 – Reduction in community integrity.***

The integrity of the swamps is in decline to various degrees and this decline will be enhanced by predicted climate change impacts (DEH, 2005; NSW Scientific Committee,

2007). An accurate assessment of the total extent of reduction in community integrity across the peaty swamps is extremely difficult but sufficient circumstantial evidence exists to recognise that considerable and significant reduction in community integrity across the various swamp types has occurred, particularly over the past 15 to 20 years.

There is a growing body of information on the reduction in area, function and integrity of the peaty swamps due to drainage, subsidence, loss of peatbeds from changed fire regimes and seasonal drying (climate change impacts). The decline in the integrity of the biggest and most significant swamp, Wingecarribee Swamp (SCA, 2001) and several other swamp areas (Newnes Plateau, Blue Mountains and Woronora Plateau) has been well documented (NSW Scientific Committee, 2005, 2007, 2011; BMCC, 2007; OEH, 2011a,b). The latter swamp areas have suffered from clearing, high frequency fires, grazing, forestry operation impacts, recreational impacts and more recently mining induced subsidence and subsequent drying of a number of swamps (Keith, 2004; Baird pers comm., 2007, 2011; BMCC, 2007; Blunden pers comm., 2007; Good et al, 2007; OEH, 2011a,b). The majority of other swamps have declined in status and their integrity compromised by past landuse, current human induced detrimental activities and the spread of weeds and feral animals (Costin et al, 1959; Whinan and Chilcott, 2002; SCA, 2007; BMCC 2007; A Carey pers comm., 2007;).

Once the ecological integrity of peaty swamps has been degraded, restoration to a fully functional state takes many years of restoration works. The first attempts at restoration of highly degraded peat swamps was made in the mid 1960s and these swamps have been monitored to the present time (Good, 2004, 2009; Good et al, 2010). This monitoring has indicated that even with the application of restoration techniques and materials, recovery of peat swamps from flowline incision and peat drying, takes at least 30 to 40 years, with the recovery of organic matter accumulations taking an even longer time, predicted to be longer than 100 years. Therefore the ecological community is unlikely to be able to be restored in the near future.

The peaty swamps ecological community is **eligible** for listing as **endangered** under this criterion.

***Criterion 5 – Rate of continuing detrimental change.***

Detrimental changes across many swamp areas of the Sydney Sandstone Basin are recognised as having occurred as a result of past grazing, changed fire frequency, peat extraction, urban development, pollution and sediment build-ups, recreational activities in swamp areas, denudation of catchments and the more recent increases in both the rates of mineral and gas exploration and subsurface mining, with subsequent subsidence and drainage of swamps. It is recognised that these impacts are increasing (Keith, 2004; BMCC, 2007; Whinam et al, 2010) and that the rate of impact will be enhanced by climate changes (NSW Scientific Committee, 2005, 2007, 2011; Good and Wright, 2010; OEH, 2011a,b) and subsequent impacts induced by climate change, for example increasing number of high intensity fires, increasing temperatures and reduced precipitation leading to loss of *Sphagnum* and other swamp moisture / water dependent plants.

Sufficient circumstantial evidence, for example the Wingecarribee collapse, subsidence of Newnes and Woronora Plateau swamps, is available to identify that major episodes of decline have occurred and that there is an insidious and consistent rate of decline of

swamps that amount to some 25 to 30 percent decline in functional peat swamps due to the many threats operative in all the major swamp areas. However, there is not sufficient reliable data to determine the rate of decline over the entire ecological community.

The peaty swamps ecological community is therefore **not eligible** for listing under this criterion.

***Criterion 6 – Quantitative analysis showing probability of extinction.***

Many threatened species occur in the swamps or in the immediate catchments of the swamps and several of these face extinction if existing threats to the swamps continue but there is little data or evidence that suggests the swamps as an ecological community, will become extinct in the near future. If the predictions for climate change occur in the near future (2020 to 2050), decline and loss of peaty swamps can similarly be predicted; hence the swamp ecological community could or will be under threat of extinction in about 2050.

Insufficient documented data is available at this time to identify the actual degree of probability of extinction of the ecological community; therefore the peaty swamps ecological community is **not eligible** for listing under this criterion.

## 6. Publications used to assess the ecological community


ANCA **(**1996). A Directory of Important Wetlands in Australia 2nd Edition. Australian Nature Conservation Agency. Canberra. pp.964.

ANRA (2011). Biodiversity and Vegetation – Sydney Basin. Australian Natural Resources Atlas.

Benson DH (1978). *Native Vegetation of the Newnes Plateau*. Report to the NSW Department of Agriculture.

Benson DH and Howell J (1990). The natural vegetation of the Howes Valley 1:100 000 map sheet, Unpublished report. Royal Botanic Gardens. Sydney.

Benson DH and Howell J (1994). The natural vegetation of the Sydney 1:100 000 map sheet. Cunninghamia 3(4):677-787.

Benson, D.H. and Keith, D.A. (1990). The natural vegetation of the Wallerawang 1:100000 map sheet. *Cunninghamia* 2. pp.305-335

Black D (1976). An exploratory survey of the vegetation of the Boyd Plateau. MSc. Thesis. University of Sydney.

Black MP, Mooney SD and Attenbrow V (2008). Implications of a 14200 year contiguous fire record for understanding human-climate relationships at Gooches Swamp, New South Wales, Australia. The Holocene 18: 437-447.

Black MP, Mooney SD and Haberle SG (2007). The fire, humans and climate nexus in the Sydney Basin, Australia The Holocene 17: 469-480.

Black MP, Mooney SD and Martin HA (2006). A 43000 year vegetation and fire history from Lake Baraba, New South Wales, Australia. Quaternary Science Reviews 25: 3003–3016

Blue Mountains City Council BMCC (2007). Notes from Blue Mountains Swamp rehabilitation staff training course.

Buchanan RA (1980). The Lambert Peninsula, Ku-ring-gai Chase National Park. Physiography and distribution of podzols, shrublands and swamps with details of swamp vegetation and sediments. Proceedings of the Linnean Society of New South Wales 104: 73-94.

Carey A (2007). Protecting swamp communities in the Blue Mountains. Australasian Plant Conservation 16: 2. 14-16.

Chalson JM and Martin HA (2009). A Holocene history of the vegetation of the Blue Mountains, New South Wales. Proc. Linnean Society of NSW 130: 77-109.

Costin AB (1954). A study of the ecosystems of the Monaro Region of NSW with special reference to soil erosion. NSW Government Printer. Sydney.

Costin AB, Wimbush DJ, Kerr D and Gay LW (1959). Studies in catchmewnt hydrology in the Australian Alps 1. Trends in soils and vegetation. CSIRO Plant Industry. Canberra.

DECC (2008). Wingecarribee Swamp. Department of Environment and Climate Change. http:/www.heritage.nsw.gov.au/07 subnav 02 2.cfm?itemid=5001277

DEH (2005). Nationally threatened Species and Ecological Communities: Temperate Highland Peat Swamps on Sandstone. Department of Environment and Heritage. Canberra.

DPIPWE (2010). Vulnerability of Tasmania's Natural Environment to Climate Change: An Overview. Unpublished Report. Department of Primary Industries, Parks, Water and Environment, Hobart.

DSEWPaC (2011). Mining company to pay for environmental damage. Media Release- 21 October 2011. Department of Sustainability, Environment, Water, Population and Communities. www.environment.gov.au/about/media/dept-mr/dept-mr20111021.html

Dodd GP (1989). Environmental Degradation of Upland Dells (swamps) on the Woronora Plateau NSW. Hons. Thesis. Dept of Geography University of Wollongong.

Douglas S and Robyn S (2010). Weeds and other threats to Stingray Swamp Flora Reserve and environs, Penrose. Prepared for Wingecarribee Shire Council on behalf of Woodlands Environmental Management, Wingello.

Dubey S and Shine R (2010a). Plio-Pleistocene diversification and genetic population structure of an endangered lizard (the Blue Mountains Water Skink, Lampreys leuraensis) in south-eastern Australia. Journal of Biogeography 37: 902-914.

Dubey S and Shine R (2010b). Restricted dispersal and genetic diversity in populations of an endangered montane lizard (*Elamprus leuraensis*, Scinidae). Molecular Ecology 10: 886-897.

Environment Australia (2001). A Directory of Important Wetlands 3rd edition. Environment Australia. Canberra.

Fallding HB and Benson JS (1985). Natural vegetation and settlement at Macquarie Pass, Illawarra Region New South Wales. Cunninghamia 1: 285-311.

Fairley A (2004). Seldom Seen. Rare Plants of Greater Sydney. Holland Publishers. Sydney. pp. 208.

Gibbons L (2007). A geophysical investigation of two upland swamps, Woronora Plateau, NSW Australia. Honours Thesis, Macquarie University.

Good RB (1999). Rehabilitation and revegetation of the Kosciuszko summit area following the removal of grazing- An historic review. In: Promotion, Practice and Partnerships. Proceedings 4th biannual conference of the Australian Network for Plant Conservation. Canberra.

Good RB (2004). Rehabilitating fire-damaged wetlands in the Snowy Mountains Australasian Plant Conservation 12:2-4 Australian Network for Plant Conservation, Canberra.

Good RB (2009). Restoration of mires (bogs and fens) in the Australian Alps following domestic stock grazing and the impacts of the 2003 wildfires. Ecological Restoration and Management Society and the Global Restoration Network. Posted on :

http://www.globalrestorationnetwork.org/countries/australianew-zealand/

Good RB, Hope G and Blunden B (2007). Dendrobium Area 3 Swamp 15a Contingency Plan. Illawarra Coal, Wollongong.

Good RB, Wright G, Whinam J and Hope G (2010). Restoration of mires of the Australian Alps following the 2003 bushfires. 353-362 In: S.Haberle, J.Stevenson and M.Prebble. *Altered Ecologies. Fire, climate and human influence on terrestrial landscapes.* Terra australis 32. ANU Press. Canberra.

Good RB and Wright G (2010). Predicted responses of alpine plant communities to increases in solar ultraviolet light in the Alps National Parks. In: K.McCue and S.Lenz (eds). *National Parks can they take the heat* . Proceedings of the National Parks Association ACT Symposium. National Parks Association. Canberra.

Grover SPP, McKenzie BM, Baldock JA and Papst WA (2005). Chemical characteristics of bog peat and dried peat of the Australian Alps Australian Journal of Soil Research 43:1-9 CSIRO .

Harden GJ (2003). Flora of New South Wales Vol 1-4. University of NSW Press. Sydney.

HNCMA (2008). WetlandCare Australia's Paddy River Draft Wetland Management Plan. Hawkesbury Nepean Catchment Management Authority. Goulburn.

Hensen M and Mahoney E (2010). Reversing drivers of degradation in the Blue Mountains and Newnes Plateau Shrub Swamp endangered ecological communities. *Australasian Plant Conservation* 18:4. Australian Network for Plant Conservation. Canberra.

Hope GS (1996). Assessment of Wingecarribee Swamp, New South Wales for listing on the Register of the National Estate. Report to the Australian Heritage Commission.

Hope GS and Southern W (1981). Organic deposits of the Southern Tablelands region, New South Wales. NSW National Parks and Wildlife Service. Sydney.

Hope GS and Southern W (1983). Peatlands of the Southern Tablelands of New South Wales. Report to NSW National Parks and Wildlife Service.

Keith DA( 2004). *Ocean Shores to Desert Dunes: the native vegetation of New South Wales and the ACT*. Department of Environment and Conservation. Sydney.

Keith DA (1994). Floristics, structure and diversity of natural vegetation in the O'Hares Creek catchment, south of Sydney. Cunninghamia 3: 543 – 595.

Keith D (2010). Fire management thresholds for Threatened Ecological Communities in the Blue Mountains City Local Government Area. NSW Department of Environment, Climate Change and Water. Sydney.

Keith DA and Benson DH (1988). The natural vegetation of the Katoomba 1:100000 map sheet. Cunninghamia 2: 107-143.

Keith DA and Myerscough PJ (1993). Floristics and soil relations of upland swamp vegetation near Sydney. Australian Journal of Ecology 8: 325-344.

Klaphake V (1995). Plant survey of Hanging Rock Swamp and surrounding area, Penrose, Central Tablelands NSW. Southern Highlands Community Action. Moss Vale.

Kodela PG (1997). Environmental change in the Robertson area, NSW. Unpublished PhD thesis. University of New South Wales. Sydney.

Kodela PG and Dodson JR (1988). A Late Holocene vegetation and fire record from Kuring- gai Chase National Park, New South Wales, Proceedings of the Linnean Society of New South Wales 110: 317-26.

Kodela PG and Hope GS (1992). Wingecarribee Swamp: statement of significance National Trust of Australia (NSW). Sydney.

Kodela PG, James TA and Hinds PD (1996). Vegetation and flora of the swamps on the Boyd Plateau, Central Tablelands, New South Wales. Cunninghamia 4: 525-530.

Kodela PG, Sainty GR, Bravo FJ and James TA (2001). Wingecarribee Swamp flora survey and related management issues. Sydney Catchment Authority NSW. Sydney.

Krogh M (2004). Assessment of potential causes underlying the collapse of Flatrock Swamp. Internal report Sydney Catchment Authority. Sydney.

Krogh M (2007). Management of longwall coal mining impacts in Sydney's southern drinking water catchments. Australasian Journal of Environmental Management 14: 155-165.

Le Brocque AF and Buckney RT (1994). Vegetation and environmental patterns on soils derived from Hawkesbury Sandstone and Narrabeen substrata in Ku-ring-gai Chase National Park, New South Wales. Australian Journal of Ecology 19:229-238.

Lucas C, Hennessy K, Mills K and Bathols J (2007). Bushfire weather in southeastern Australia: recent trends and projected climate change impacts. CSIRO. Melbourne.

Melville MD and Fitzpatrick EA (1983). Some hydrological characteristics of the sandstone plateau areas near Barren Grounds N.S.W. In 'Aspects of Australian Sandstone Landscapes' (eds RW Young. and GC Nanson). Australia. and New Zealand Geomorphology Group, Special Publication No.1.

Mooney SD, Webb M and Attenbrow V (2007). A comparison of charcoal and archaeological information to address the influences on Holocene fire activity in the Sydney Basin. Australian Geographer 38: 177-194.

Moore PD and Bellamy P (1974). Peatlands of the World. Cambridge University Press, Cambridge UK.

Murray M and Winning G (1993). Review of Literature on High Country Wetlands of New South Wales and Victoria. An addition to the Directory of Important Wetlands in Australia. Report to The Australian Nature Conservation Agency. Canberra.

National Parks and Wildlife Service (NSW) (1997). Submission to Chief Mining Warden's Inquiry into the Renewal of mining leases over Wingecarribee Swamp.

National Parks and Wildlife Service (NSW) (2011). Data from the NPWS Geographical Information System.

NSW Scientific Committee (2004). Montane peatlands and swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South East Highlands and Australian Alps bioregions – endangered ecological community listing – final determination. NSW Department of Environment and Climate Change. Sydney.

NSW Scientific Committee (2005). Newnes Plateau Shrub Swamp in the Sydney Basin Bioregion – endangered ecological community listing – final determination. NSW Department of Environment and Climate Change.

NSW Scientific Committee (2007). Blue Mountains Swamps in the Sydney Basin Bioregion – vulnerable ecological community listing – final determination. NSW Department of Environment and Climate Change.

NPWS (2000) Vegetation Survey, Classification and Mapping: Lower Hunter and Central Coast Region. V 1.2. National Parks and Wildlife. Sydney.

NPWS (2003). The native vegetation of the Woronora, O'Hares and Metropolitan catchments. Unpublished report. National Parks and Wildlife. Sydney.

NSW Scientific Committee (2011). Coastal Upland Swamp in the Sydney Basin bioregion – proposed endangered ecological community listing. Office of Environment and Heritage. Sydney.

OEH (2011). Blue Mountains Swamps in the Sydney Basin Bioregion – vulnerable ecological community listing. Office of Environment and Heritage. Sydney.

OEH (2011). Newnes Plateau Shrub Swamp in the Sydney Basin Bioregion – endangered ecological community. Office of Environment and Heritage. Sydney.

OEH (2011). Montane Peatlands and Swamps of the New England Tableland, South Eastern Highlands and Australian Alps bioregions – Determination to make minor amendment to Part 3 of Schedule 1 of the Threatened Species Conservation Act. Office of Environment and Heritage. Sydney.

OEH (2011). State Environmental Planning Policy (SEPP). Office of Environment and Heritage. Sydney.

Packham GH (ed) (1969). The Geology of New South Wales. Geological Society of Australia Incorporated. Sydney. pp654.

Perry S (1996). Inventory of Wetlands within Wingecarribee Shire. Honours Thesis. Department of Environmental Science. Faculty of Science, University of Wollongong.

Stricker J and Stroinovsky N (1995). Wingecarribee Swamp. A natural and cultural history. Sydney Water Corporation.

Rice B and Westoby M (1983). Species richness in vascular vegetation of the West Head, New South Wales. Australian Journal of Ecology 8:163-168.

Robbie A and Martin HA (2007). The history of vegetation from the last glacial maximum at Mountain Lagoon, Blue Mountains, New South Wales. Proc. Linnean Society NSW 128: 57-80.

SCA (2004). Hydrological and geophysical investigations of Wingecarribee Swamp-Stage 1 Robertson New South Wales. Sydney Catchment Management Authority, Penrith.

SCA (2007). Wingecarribee Swamp and Special Area Plan of Management 2001. Sydney Catchment Authority. Sydney pp.40

Thackway R and Cresswell ID (1995). An interim biogeographical regionalisation for Australia: a framework for setting priorities in the National Reserve System Cooperative Program. ANCA Canberra.

Threatened Species Scientific Committee (TSSC) (2005) Commonwealth Listing Advice on Temperate Highland Peat Swamps on Sandstone.

Tompkins KM and Humphreys GS (2006). Upland swamp development and erosion on the Woronora Plateau during the Holocene. Unpublished technical report to Sydney Water.

Tozer MG, Turner K, Keith DA, Tindall, D, Pennay C, Simpson C, Mackenzie, B and Beukers P (2010). Native vegetation of southeast NSW: a revised classification and map for the coast and eastern Tablelands. Cunninghamia 11: 359 - 406.

Whinam J and Chilcott N (2002). Floristic description and environmental relationships of Sphagnum communities in NSW and the ACT and their conservation management. Cunninghamia 7: 463-500.

Whinam J, Hope GS, Clarkson BR, Alpasch PA and Adam P (2003). Sphagnum in Peatlands of Australasia: Their distribution, utilisation and management. Wetlands Ecology and Management 11: 37- 49.

Whinam J, Hope GS, Good R and Wright G (2010). Post-fire experimental trials of vegetation restoration techniques in the peatlands of Namadgi (ACT) and Kosciuszko National Park (NSW) Australia. 363–379. In: S.Haberle, J.Stevenson and M.Prebble. *Altered Ecologies. Fire, climate and human influence on terrestrial landscapes.* Terra australis 32. ANU Press, Canberra.

White A (2007). The impact of climate change on the distribution, function and condition of alpine mossbeds on the Bogong High Plains, Victoria. Unpublished report. La Trobe University

Williams NJ, Harle KJ, Gale SJ and Heijnis H. (2006). The vegetation history of the last glacial–interglacial cycle in eastern New South Wales, Australia. J. Quaternary Science 21: 735–750.

Wimbush DJ (1970). Hydrological studies on Sphagnum bogs in the Snowy Mountains. MSc Thesis University of Sydney.

Young ARM (1982). Upland Swamps (Dells) on the Woronora Plateau, NSW. PhD Thesis, Department of Geography, University of Wollongong

Young ARM (1986). Quaternary sedimentation on the Woronora Plateau and its implications for climate change, Australian Geographer 17: 1-5.

Young ARM (1986). The geomorphic development of dells (Upland Swamps) on the Woronora Plateau, N.S.W., Australia. Zeitschrift fur Geomorphologie 30: 317-327.

Young RW and Young ARM (1982). Altogether Barren, Peculiarly Romantic: The Sandstone Lands Around Sydney. Australian Geographer 19: .9-25.

## Appendix

**Native Plant Species recorded in or around Upland Peat Swamps.** Species list compiled from Keith (2004), NSW OEH (2011), Benson and Keith (1990), Keith and Benson (1988), Keith and Myerscough (1993), Young (1982), Black (1976), Van Klaphake (1995), NSW Scientific Committee (2004, 2005, 2007, 2011), NPWS (2003), OEH website.

| Species name | Common name | Species name | Common name |
|---|---|---|---|
| *Actinotus minor* | miniature flannel flower | *Hydrocotyle laxiflora* | stinking pennywort |
| *Adenochilus nortonii* | | *Hydrocotyle pedunculatus* | |
| *Almaleea paludosa* | marsh bush-pea | *Hydrocotyle tripartita* | pennywort |
| *Asperula sp.aff. gunnii* | mountain woodruff | *Isachne globosa* | swamp millet |
| *Asterolasia ateriscophora* | lemon star-bush | *Isolepis spp* | club rushes |
| *Baeckea linifolia* | weeping baekea | *Juncus spp* | rushes |
| *Baeckea imbricata* | heath myrtle | *Lepidosperma limicola* | razor sword-segde |
| *Baloskion australe* | mountain cord-rush | *Lepidosperma neesii* | stiff rapier-sedge |
| *Banksia ericifolia* | heath-leaved banksia | *Leptocarpus tenax* | slender twine-rush |
| *Banksia spinulosa* | hairpin banksia | *Leptospermum continentale* | prickly tea-tree |
| *Bauera microphylla* | river rose | *Leptospermum grandifolium* | woolly tea-tree |
| *Bauera rubioides* | dog rose | *Leptospermum juniperinum* | prickly tea-tree |
| *Baumea acuta* | pale twig-rush | *Leptospermum myrtifolium* | myrtle tea-tree |
| *Baumea teretifolia* | twig-rush | *Leptospermum obovatum* | blunt-leaf tea-tree |
| *Blechnum spp* | water-ferns | *Leptospermum polygalifolium* | tantoon |
| *Blandfordia nobilis* | Christmas bells | *Leptospermum squarrosum* | pink tea-tree |
| *Boronia parviflora* | swamp boronia | *Lepyrodia anarthria* | scale rush |
| *Burchardia* | milkmaids | *Lepyrodia scariosa* | chaffy scale-rush |

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|---|---|---|---|
| *umbellata* | | | |
| *Callistemon citrinus* | crimson bottlebrush | *Lindsaea linearis* | screw fern |
| *Callistemon linearis* | narrow-leaved bottlebrush | *Lomandra longifolia* | spiny-headed mat-rush |
| *Carex appressa* | tall sedge | *Luzula modesta* | Southern woodrush |
| *Carex echinata* | star sedge | *Luzula ovata* | clustered woodrush |
| *Carex fascicularis* | tassel segde | *Melaleuca squarrosa* | scented paperbark |
| *Carex gaudichaudiana* | tufted sedge | *Microtis spp* | onion orchids |
| *Carex inversa* | knob sedge | *Mirbelia rubiifolia* | heathy mirbelia |
| *Cassytha glabella* | slender dodder-laurel | *Mitrasacme polymorpha* | mitre weed |
| *Celmisia spp* | mountain daisies | *Notochloe microdon* | |
| *Centella asiatica* | Asiatic pennywort | *Olearia glandulosa* | swamp daisy bush |
| *Chorizandra cymbaria* | heron bristle-rush | *Olearia quercifolia* | oak-leaved olearia |
| *Chorizandra sphaerocephala* | round-head bristle-sedge | *Opercularia varia* | variable stinkweed |
| *Cryptandra ericoides* | heathy cryptandra | *Patersonia fragilis* | swamp iris |
| *Cryptostylis spp* | tongue-orchids | *Petrophile pulchella* | conesticks |
| *Cyperus spp* | flatsedges | *Phyllota humifusa* | dwarf phyllota |
| *Dampiera stricta* | blue dampiera | *Plinthanthesis paradoxa* | wiry wallaby-grass |
| *Daviesia latifolia* | hop bitter-pea | *Poa labillardieri* | common tussock-grass |
| *Deyeuxia gunniana* | | *Pomaderris sp.aff. phylicifolia* | narrowleaf dogwood |
| *Deyeuxia quadriseta* | reed bent-grass | *Prostanthera rugosa* | mint-bush |
| *Deyeuxia microseta* | bent-grass | *Ptilothrix deusta* | fluke bogrush |
| *Dichelachne inaequiglumis* | loose plume-grass | *Pultenaea aristata* | bearded bush-pea |
| *Dillwynia floribunda* | parrot pea | *Pultenaea divaricata* | elusive bush-pea |
| *Dillwynia sericea* | showy parrot-pea | *Restio tetraphyllus* | tassel cord-rush |
| *Dillwynia stipulifera* | | *Schoenus apogon* | common bog-rush |
| *Drosera binata* | forked sundew | *Schoenus brevifolius* | zig-zag bog-rush |

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|---|---|---|---|
| *Empodisma minus* | spreading rope rush | *Schoenus lepidosperma* subsp. *pachylepis* | slender bog-sedge |
| *Entolasia stricta* | wiry panic | *Schoenus paludosus* | bog rush |
| *Epacris microphylla* | coral heath | *Selaginella uliginosa* | swamp selaginella |
| *Epacris obtusifolia* | blunt-leaf heath | *Sowerbaea juncea* | rush lily |
| *Epacris paludosa* | swamp heath | *Sphaerolobium vimineum* | leafless globe-pea |
| *Epilobium billardierianum* | variable willow-herb | *Sphagnum spp* | sphagnum moss |
| *Euchiton involucratus* | star cudweed | *Spiranthes sinensis* | Austral ladies tresses |
| *Eurychorda complanata* | flat cord rush | *Sporodanthus gracilis* | |
| *Gahnia sieberiana* | red-fruit saw-sedge | *Sprengelia incarnata* | pink swamp heath |
| *Geranium neglectum* | crane's bill | *Stackhousia nuda* | wiry stackhouse |
| *Geranium solanderi* | native geranium | *Stylidium graminifolium* | grass trigger-plant |
| *Geum urbanum* | avens | *Stylidium lineare* | narrow-leaved triggerplant |
| *Gleichenia dicarpa* | pouched coral fern | *Symphionema montanum* | |
| *Gleichenia microphylla* | scrambling coral fern | *Symphionema paludosum* | |
| *Gonocarpus micrantha* | creeping raspwort | *Tetraria capillaris* | hair sedge |
| *Gonocarpus salsoloides* | | *Tetrarrhena turfosa* | smooth rice grass |
| *Gonocarpus tetragynus* | common raspwort | *Thelymitra pauciflora* | slender sun orchid |
| *Goodenia bellidifolia* | daisy-leaved goodenia | *Thysonotus juncifolius* | |
| *Goodenia dimorpha* | | *Utricularia dichotoma* | fairy aprons |
| *Gratiola peruviana* | Australian brooklime | *Velleia montana* | mountain velleia |
| *Grevillia* | | *Viminaria juncea* | golden spray |

| | | | |
|---|---|---|---|
| *acanthifolia* | | | |
| *Grevillea oleoides* | red spider flower | *Viola betonicifolia* | native violet |
| *Gymnoschoenus sphaerocephalus* | button grass | *Viola sieberiana* | |
| *Haemodorum corymbosum* | bloodroot | *Xanthorrhoea resinosa* | Grass tree |
| *Haloragis heterophylla* | rough raspwort | *Xanthosia dissecta* | cut-leaved xanthosia |
| *Hakea teretifolia* | needlebush | *Xyris gracilis* subsp. *laxa* | |
| *Helichrysum calverttianum* | | *Xyris juncea* | dwarf yellow-eye |
| *Hemarthria uncinata* | matgrass | *Xyris operculata* | tall yellow-eye |
| *Hibbertia riparia* | erect guinea-flower | *Xanthosia tridentata* | rock xanthosia |
| *Hibbertia rufa* | brown guinea flower | *Xyris ustulata* | yellow flag |
| *Hibbertia serpyllifolia* | hairy guinea flower | | |

Attachment 5

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Tuesday, 15th January, 2013

Referral Business Entry Point
EIA Policy Section (EPBC Act)
Approvals and Wildlife Division
Department of the Environment, Water, Heritage and the Arts
GPO Box 787
Canberra ACT 2601

Dear Sir/Madam,

epbc.referrals@environment.gov.au

**Re: EPBC Reference #: 2013/6713, received: 08 Jan 2013**

**DSE Vic & NSW Environment & Heritage/Natural resources management/ Murray Valley NP NSW & Barmah NP Victoria/VIC & NSW/Eco thinning trial in NSW & Victorian River Red Gum Parks**

The debate over natural resource conservation has a long history. It goes back to a debate between Gifford Pinchot, a forester, and John Muir, a wilderness advocate, regarding the fate of natural resources. In regard to forests, this debate usually has been resolved through the allocation of public lands set to national parks and state forests.

It does not take too much imagination to realise that sooner or later some bright spark would attempt to apply Glifford's wise use philosophies to a national park, disguising such management as a necessity for the good of the area's natural resources.

As the Approvals and Wildlife Division would be aware, the NSW and Victorian governments have advertised for commercial logging contractors to undertake the proposed thinning operations.

Further, NSW Environment Minister Robyn Parker said: "It is estimated that about 3000 tonnes of residue will be created, which can be made available to local Riverina residents as part of the existing river red gum domestic firewood program" (the Age, 4/12/12). So this trial in National Parks is to keep the home fires burning

and logging contractors employed. This referral could mark a step change in the management of protected areas in this country.

The 'ecological thinning' proposed in this referral proposes is either 'trojan horse' or a 'stepping stone' to commercial logging within River Red Gum National Parks. The concept of 'adaptive management' outlined is also being distorted forwards political ends.

Logging as an 'adaptive management' tool has the potential to severely threaten and undermine the integrity of the National Parks estate because there are motivations involved well beyond the protection of natural resources or the quiet enjoyment of those resources. While matters of national environmental significance are affected by the proposal, it is really the need to uphold the primary nature conservation purpose of national parks which should make this activity a controlled action. Using bad science from this trial to justify on-going logging in River Red Gum national parks is a highly likely outcome arising from this referral.

Prejudice

The proposed trial is prejudiced, as it assumes that 'thinning' is the preferred management approach. Other management options, including fire and flooding, more significantly influence tree health and hollow formation.

As you would know, the Commonwealth funded provision of existing environmental water entitlements deliver much stronger and more widespread environmental outcomes than those that can be expected from thinning. The referral documents are deficient as they propose no trials to consider fire or flooding (as more cost-effective and arguably less invasive means) to improve the ecological health of River Red Gum forests.

The hoped for outcomes from thinning are based on optimistic and slanted readings of the scientific research. The referral document's presentation of evidence for thinning improvement of rates hollow formation in River Red Gum by Horner et al 2009 compares extremely dense (4,000 trees per hectare) un-thinned stands, with stands thinned to below 1,000 trees per hectare. Of course there is greater mortality of saplings in the un-thinned stands. It is misleading to conclude that thinning 'improves' tree health. Increased mortality in un-thinned stands is through natural processes of self-thinning and only to be expected.

The use of machinery to replace natural self-thinning processes is not an improvement but an expensive subsidy for logging contractors. River Red Gum forests have been regenerating naturally for untold generations prior to the arrival of European foresters in this landscape.

Further, the control sites are likely to have poorer measured tree health and greater mortality, because natural self-thinning is a process that causes trees to decline and die, compared with the trial sites where trees would also have self-thinned naturally if

they are not cut down instead. The proposed trials are then a foregone conclusion and the results will be slanted towards on-going thinning (read logging).

Recent research provides no evidence of environmental benefits from commercial thinning to River Red Gum forests or woodlands. Regenerating River Red Gum forests naturally self-thin over time, as they have done for millennia.

A 2010 paper on 'ecological thinning' in River Red Gums by Cunningham et. al. from the Australian Centre for Biodiversity, School of Biological Sciences at Monash University concludes that there is no benefit to the health of retained trees from thinning. Cunningham et al also found that stands as dense as those tested by Horner et al were rare on the Victorian Murray floodplain.

Increased water availability through flooding is necessary to reduce dieback in River Red Gums. Thinning of River Red Gum forests is less likely to reduce forest dieback, when compared to flooding.

Alternatives

The referral incorrectly states that there are no alternatives for this proposed thinning trial. There is ample scope to conduct the proposed thinning trials to determine ecological benefits in the nearby state forests. More than 12,000 hectares of River Red Gum state forest are suitable for such trials in Victoria and over 20,000 ha in NSW, plus more suitable forests on private lands.

The River Red Gum National Parks are also not needed for firewood harvesting. The NSW Red Gum IFOA provides for logging of 17,533 tonnes of residue per annum and an additional 20,000 tonnes of early thinnings in 2012-2013. There is also an extensive Red Gum industry on private land also providing firewood.

The "ecological thinning" in NSW will use heavy machinery in 24 national park 'logging coupes'. Each 'coupe' will be 9 ha in size. The total area to be logged in NSW totals 216 ha. An area of similar size is proposed to be designated in Victoria, giving a total national park area of 396ha to be 'treated'.

The conditions that the trials were designed to test do not exist. In other words, few suitable forests are badly stressed from exceptionally dry conditions. Much of the River Red Gum national parks have been flooded over the past 18 months. In fact, the referral makes mention of the need to defer thinning on some trial sites until the forest has dried out enough to permit machinery access.

The use of forestry-based prescriptions to develop the trial design is yet another cause of concern.

MNES should be fully protected in national parks

The RAMSAR wetlands now located in National Parks should not be subjected to ecological thinning as a matter of principle. Other areas distant from MNES and

national parks are available for the proposed referral activity, on land within state forests. The logging is an unnecessary impact as other more effective management techniques are available, if needed, to help restore ecosystem health.

The Colong Foundation believes that the test of no significant threat to any listed threatened species known to occur within these forests is also inappropriate test to apply in a national park. The appropriate test for a national park should be to ensure the threats to endangered species are as low as possible. Given that alternative sites in state forests exist, this is not the case.

I trust that the officers of the Approvals and Wildlife Division who are more competent in considering the finer points of the relevant matters of national environmental significance will find a path to enable your Minister to deem this referral a controlled action.

The proposed application of 'ecological thinning' could not be economic or appropriate to apply in a broad acre form across the River Red Gum national parks. The high cost of thinning would lead towards the NSW and Victorian Governments approving highly inappropriate forms of commercial logging in these national parks. As logging contractors are already involved, such a decision would be only a matter of time.

Thank you for the opportunity to comment.

Yours sincerely,

Keith Muir
Director
The Colong Foundation for Wilderness Ltd