PROCEEDINGS OF AN INTERNATIONAL YEAR OF MOUNTAINS CONFERENCE

Jindabyne - Australia
November 25-28, 2002

As part of

International Year of Mountains
2002
Acknowledgements

In addition to some presenters who were unable to supply their written paper, there were a number of Aboriginal presenters from different parts of Australia who chose not to submit a written form of their presentation as this is not a traditional method of communication.
Welcome to Country

My name is Rae Solomon Stewart. I was born in Orbost on the banks of the Snowy River. My family come from Dalgety and South Jindabyne areas.

I come to Jindabyne to welcome all the people that are here today to celebrate the Year of the Mountain.

Malarkin gungee yalarguin

In Aboriginal languages one word has more than one meaning.

We are all gathered here peacefully for the Year of the Mountain celebration and we welcome you to our country.

My grandfather, Billy Rutherford used to break in Brumby horses for the police and he used to ride over the snowy mountains and other different places around this area, rounding up the Brumby horses and sometimes searching for people who were lost.

My other grandfather, Ned Solomon used to shear sheep, build fences for the farmers and shoot the wild dogs to stop them killing sheep.

The Snowy Mountains were very important to the people who lived here because of the Bogong Moth. The caves protected the people from the snow, wind and rain in the winter months and provided shade in the summer months.

I trust that your time here in Monaro Ngarigu country will be of great benefit to you all.

Thank you for your time and patience.

Rae Stewart
Monaro Elder
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iv Celebrating Mountains – An International Year of Mountains Conference
Jindabyne, New South Wales, Australia
Day One – Conference Plenary Session
Welcome to the Mountains and Opening of the Conference

Tony Fleming

Director, Southern, NSW National Parks and Wildlife Service

I acknowledge we are in Monaro Country and show my respect to the Indigenous Elders.

Yesterday was a wonderful opportunity to be reminded how rich and spiritually significant indigenous culture is. Thanks to everyone who made yesterday’s celebrations transpire into an event which has touched the hearts of all those who attended. I really hope that the opportunities ahead of us over the next few days will further strengthen the significance and opportunities of indigenous culture.

I would also like to acknowledge that this conference is a product of our hard working park agency staff across the ALPS working with our partners from the CRC for Sustainable Tourism and ICOMOS. Many staff and contractors have worked non-stop for many days and nights to make this event happen. The difficulties, concerns, frustration’s and logistical nightmares have all been overcome due in large part to the strength of the ALPS Program – People from the ALPS Parks together with Environment Australia working in partnership.

International Year of the Mountains is a wonderful opportunity for us to reflect on how important our mountains are:

In Australia, our mountains tend to be:

- Our National Parks
- Our sources of water
- Our higher rainfall areas in what is the worlds driest continent
- Our sources of inspiration
- Destinations for visitors
- Opportunities for challenging ourselves
- Areas presenting enormous challenges for fire managers
- Areas where the containment and management of introduced species present huge challenges
- Areas where natural and cultural conservation merge together.
- Areas of immense social, cultural and economic significance.

We are lucky in Australia in many ways, but most notably is the fact that within our mountains we find peace. Tragically this is not the case today in many mountainous areas throughout the world. In many of the world’s mountainous zones territorial borders run along the mountain tops with resultant political tensions and war.
During the next four days I would encourage you all to take time to reflect on the world situation and to acknowledge the opportunities we have in Australia to better understand and better manage our mountains.

I would also like to acknowledge our sponsors

- CRC for sustainable tourism and Trangrid
- And the support of the Station Resort, Horizons, Perisher Blue and the bus companies
- Thankyou to AUSAID for supporting the attendance of our Nepalese and Bhutanese participants

I would also like to especially acknowledge the interstate and overseas speakers who have travelled so far to join with us and to share their experiences, love and appreciation of their mountains with us.

This conference presents us with a unique opportunity to celebrate the value of our mountains via the three conference themes:

- Mountains for the future
- Mountains for tourism
- Mountains of meaning

On this note I am proud to formally welcome you all here and to declare the conference open.
Global Priority: What Makes Mountains So Special?

Lawrence S. Hamilton

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Free-standing or in a range, mountains, these 3-D earth features should be conspicuous enough to bring out a piqued interest, to an "Oh, wow!" reaction. Often also, added to their impressiveness in the landscape is a metaphysical "presence" that evokes deeper emotions in the inner-being of humans. Mountains are special because they take on deep cultural significance (for example Mount Fuji). To some traditional peoples mountains are held in awe or fear or are sacred sites where religious ceremonies are held. These may be the seats of the gods (Mount Olympus to ancient Greeks), the abode of the ancestors (Mountains in Yunnan to the Dai), cosmic centers (San Francisco Peaks for the Hopi). Mount Kailas, sacred to all Jains, Buddhists and Hindus situated in the high desert of Tibet, is the world’s most sacred mountain (Bernbaum 1990). Difficult to visit, it nevertheless is the site of "the ultimate pilgrimage and circumnabulation" for around a billion people. The sacred, active volcanic peak of Ngauruhoe, part of Tongariro NP was given by the Maori in trust for protection to the people of New Zealand and is now a World Heritage Site. In the United States there are many mountains of sacred significance to Native Americans. Two of these, Mount Shasta and Devil's Tower are currently the scene of much controversy over tourism development and their sacrality. Artists, poets, writers, and alpinists have also developed special metaphysical relationships with mountains. And even the most heavy-breathing hiker or jaded tourist must experience an uplifting of the spirit and a sense of wonder when confronting the majestic valleys and mounts. If the sense of sacredness or wonder does not give them enough protection, we need to give them secular status as national parks, monuments and preserves.

A second important cultural reason why mountains matter, --why they are worthy of special study and care, --is because they are home to at least one-tenth of the world's people, including the most endangered minority ethnic groups. Mountain people, hill-billies, highlanders, marginalized people, whose cultures are being eroded in heedless development by exogenous forces, are too precious a cultural heritage to lose. We are losing one language per week currently (P. Raven 1998, Personal Communication). These cultures add richness to our world fabric, and they are possessors of traditional knowledge and ways of living sustainably in these fragile environments. Most prehistoric hunters and gatherers preferred mountains because of the great plant and animal diversity within short distances, year round water, wood, shelter and conditions favorable for self defense (Rhoades 1985). Moreover, in domesticating the five of the most important food staples in the world (wheat and barley in the Zagros Mountains of the Near East; maize in highland Mexico; potato in the Andes; rice in SE Asia highlands), these early mountain dwellers set the stage for lowland civilization, --which then gradually marginalized the mountain peoples.

Mountains increasingly became areas to be exploited to benefit lowlanders: the transhumant grazier who used the high grasslands only for summer grazing, the lumberjack for wood, the miner for minerals, or the engineer who built dams and roads for the benefit of the lowlands. But through all of these changes,
mountain farmer-herders who chose to live in often remote valleys did evolve a sustainable land use and were able to maintain their cultures partly because of that isolation. We need mountain people, and the world will be culturally impoverished unless we do things differently.

Mountains are the water towers of the world, receiving the bulk of its terrestrial precipitation, largely because of the orographic effect which results in higher rainfall or snowfall than in surrounding lowlands (Linniger et al.). Large amounts of this may be stored as snow and glaciers both of which then nourish the watercourses which are lifeblood of the land. For instance, the Nile and the Indus from their sources in the mountains nourish the life and economies of Egypt and Pakistan. It has been aptly stated that without the nourishing waters from the Karakoram/Hindu Kush ranges there would be no Pakistan. Elsewhere, mossy, lichen-draped **cloud forests** on mountains capture horizontal or occult precipitation which otherwise does not reach the ground, and add it to the water budget (Hamilton et al. 1995). The prime raison d’être for the Forest Preserve in New York State’s Adirondack Mountains was to safeguard the water source of most of the State’s important rivers.

Much of the world’s remaining native biological diversity, especially of species and ecosystems, is in the mountains. For instance, at the Dali fair in Yunnan’s mountains, Dr. Pei Shengji found 550 species of plants and animals brought for trading by six ethnic hill tribes (Pei, 1990 Personal Communication). This species richness is due largely to the extreme heterogeneity of environments (climates and soils), because of the rapid elevational changes (altitudinal vegetation belts), variable directional orientation (aspects), and abundant microhabitats. Moreover a great share of the world’s endemic species are found in mountains (e.g. the Puerto Rican parrot or the mountain gorilla of the Virungas) due to the isolated island nature of mountain massifs. They are often the last bastions of wild nature, --"islands" in a sea of transformed or exploited lowlands.

The aforementioned four reasons why mountains are important alone argue for giving them special attention, but they also have other characteristics which dictate that mountains require a different approach in sustainable development than that which may be applicable elsewhere.

In the first place these three-dimensional structures are **dynamic** earth features, manifesting powerful processes of volcanism, surface erosion, uplift, earthquakes, landslides, torrents and rockfalls due to tectonic and topographic processes. These processes, and the climate which is both variable and extreme, mean disturbance, and also mean a slow recovery from disturbance to the soils, vegetation or fauna. This gives fragility to mountain ecosystems. Lowland development techniques are often totally inappropriate.

Mountains are relatively remote from centers of population, wealth and political power. This compounds their economic and political marginality. Access is poorer, law enforcement is less. These factors often mean a greater distrust of government and more evasion of laws made in distant places over independent mountain people. This often leads to mountains being a sanctuary for refugees from “the system”, or those who wish to escape from the pressures of urban environments and regulations. Poaching game or illegally harvesting plants or timber may be common, --many inhabitants feeling that laws made by a distant government are inapplicable and that livelihoods are more important.

Related somewhat to the above is the situation where the mountains are zones of tension or conflict. One thinks here in part about illegal crops, moonshiners, bandits, and guerrillas that have often characterized these wilder landscapes (e.g. rebel groups in mountains worldwide, cocaine in Colombia, Maui wowie on Haleakala, Hawai`i). Many revolutions have been born in the mountains (e.g. Cuba), and defeated rebels take refuge there. The Afghan mountains are arenas of sanctuary for tribal rebels and have been and are still the scene of armed conflict.

Mountain ranges are also often frontiers between states or nations, and as such have been and are today often the scene of international tension (e.g. Peru/Ecuador) or even warfare (e.g. Virunga Mountains or Kashmir border). On the other hand, they offer singular opportunities for the establishment of abutting border parks, peace parks and transborder cooperation in management which has myriads of ecological, economic and social/cultural benefits (Glacier-Waterton International Peace Park between US and Canada, Alpi Marittime-Mercantour Parks between Italy and France).

As previously mentioned, the highlands are outflow areas, --where physical mountain products (soil, fuelwood, timber, minerals, agricultural products, game, and non-wood forest products, move downslope
to the lowlands. They are also outflow areas for people, wherein young people and skilled persons also move out to the lowlands where opportunities seem better. This leaves a residual population in many mountain regions of older people, and of course women, who have always done much of the land management. There is a special challenge in development scenarios addressing women’s key roles.

The impacts of long-distance transmission of air pollution are felt most in mountains. Acid rain, photochemical smog, and metal deposition from precipitation is seriously affecting fish, soil fauna, forests, and the resulting functioning of ecosystems in the industrialized countries; or downwind from major urban centers even in Third World countries. We experience this in the Northeast USA, with 40% of lovely Adirondack Mountains lakes having dead or affected aquatic life. In Canada’s Banff National Park, toxaphene levels 1000 times greater than in the lowlands has shown up in what were regarded as "pristine" mountain lakes. This is due to the phenomenon of “cold deposition” and occurs with many organochlorides. In Europe it is nowhere more severe than in the Giant Mountains of Czech Republic and Poland, where severe tree mortality and ecosystem damage has occurred. (Flousek, 1997)

Any global warming will have its most severe ecological impacts on the mountain flora and fauna of the altitudinal belts of habitat which will be shifted upwards in elevation to an increasingly smaller area. Mountain "islands" where there is not opportunity for longitudinal migration, will be most severely affected. Long mountain ranges, N-S will, however offer opportunity for species migration in response to temperature changes, and E-W ranges for precipitation change, if we can provide conservation corridors along them such as proposed in the Yellowstone to Yukon Conservation Corridor, or in the Andean Spectacled Bear Ecological Corridor in Venezuela, or the 5-nation Albertine Rift mountains in Eastern Africa.

Mountains, because their summits are the highest things around, are the target of increasingly ubiquitous communication installations. The proliferation of new radio and television stations and cellular phones is creating a skyline graffiti that urgently needs control. There are now over 75 mountain or hilltop transmitting sites in relatively unpopulous Vermont (where I live) and we are told to expect 200 new sites for cellular towers in the next decade; and nationwide there will be 118,000 cellular antenna sites (Vermont Natural Resources Council 1997). I will lift up mine eyes unto the hills, --and I will see telecommunication towers, rather than gaining inspiration. These things are coming to all countries.

Finally mountains do arouse a passion and loyalty in mountain men and women, and in local communities on or near mountains. This is true not only for the superb cloud piercers, but also for relatively low-elevation features. Those who have attempted to relegate the Scottish Highlands to something less than mountain status, or suggested that Australia really doesn't have any true mountains, have experienced some of this passion. This factor can be a real boon in marshalling local support, NGO or individual mountaineer commitment for sustainable mountain development. John Muir's passion for the Sierra Nevada was the basis of his drive to protect nature by establishing The Sierra Club, one of America's most effective conservation NGOs. In Italy, 300 members of the 900-member Parliament have designated themselves “Amici di la Montagna”.

For these and perhaps several other reasons, many mountain men and women feel mountains should achieve a focus for international political and non-governmental action, akin perhaps to tropical rainforests, coral reefs, deserts, and the like. This recognition has come finally in Agenda 21 out of the Earth Summit at Rio de Janeiro, with the global endorsement of Chapter 13. "Managing Fragile Ecosystems: Sustainable Mountain Development". A global Mountain Agenda is now gradually unfolding to implement this chapter. To be successful this process requires that there be broad public support for mountain conservation as a special area of concern. This is being fostered by the organization I represent, IUCN, the World Conservation Union. It is being fostered by a fine journal, Mountain Research and Development. It is being fostered by an electronic Network, The Mountain Forum. And now, 2002, has been declared International Year of Mountains. This has led to a host of conferences, workshops, celebrations, special climbs, and so forth. This Celebrating Mountains in the Australian Alps is another landmark, and it is a most worthy and significant event in the long march to get “Mountains” clear and compelling on the radar screen of the global political community and the laity everywhere. Congratulations!


The Natural Significance Of The Australian Alps

Professor Jamie B Kirkpatrick

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Abstract

The Australian Alps are outlier mountains in many ways. Unlike most mountains of the world, they are tectonically inactive and have been only weakly influenced by Quaternary glaciations. In consequence they sit solidly rounded, soil-mantled rather than constituted of crumbling rock and tearing ice. Their alpine areas are remote from all others in the world except for Tasmania and New Zealand, with which they share small proportions of species, and a few ecosystems. The tall alpine herbfields, heaths and short tussock grasslands characteristic of the Australian Alps have few analogues elsewhere in the world. Even the soils are unusual. Their highlight is the alpine humus soil: acid, organic rich and teeming with earth worms, formed on a mixture of weathered rock and loess. The dominance of the sparse-crowned eucalypts from the climatic treeline to coastal dunes, with their biodiverse understoreys of scleromorphic shrubs, grasses and graminoids, and their even more diverse fauna, rich in marsupials and moths, makes the Australian Alps even more globally unusual.

Introduction

The Australian Alps extend in serried blue undulations, garnished by only the occasional crag, cliff, gorge or crevice, from the Brindabella Mountains in the north to Mount Baw Baw in the south. In the east and south, they run relatively steeply into the sea only in East Gippsland, elsewhere dissipating in plateau or plain. To the west they drop into the great Australian plain, full of wheat, sheep and salt. Native ecosystems prevail throughout their length. In contrast to the western plains, the fragments are the human-modified areas, the ski villages and dams, the clearfell coupes and valley clearings.

It needs to be said at the outset that the descriptor ‘alps’ gives the wrong impression. The Australian Alps, despite a seasonal cover of snow, do not conform to the ‘alps’ image of crumbling crags and tearing ice. Their animals and plants are nonconformists as well. It is the thesis of the present paper that the significance of the Australian Alps lies in this very nonconformity, not in their relatively pathetic approximation of the ‘alp’ archetype.

The Concept Of Natural Significance

The concept of natural significance is now well-regulated, with international treaties, such as the World Heritage Convention, national legislation, such as the Environmental Protection and Biodiversity Conservation Act 1999 (Commonwealth of Australia) and State or Territory legislation, such as the National Parks and Wildlife Act 1974 (New South Wales), detailing or implying criteria for the assessment of the natural worth of areas.
The most important emphasis in these criteria is on the maintenance of particular elements of nature, whether they be biological communities, species, genotypes, land forms, soils or processes. This emphasis on maintaining natural variety arises from a well-founded fear that unregulated human activity might lead to the loss of many elements of nature. A balancing fear, that 'the economy' might be disrupted if all opportunities to destroy nature were regulated out of existence, has led to the development of the comprehensive, adequate and representative (CAR) approach to conserving the variety of nature. This approach, as epitomised in the Regional Forest Agreement process (RFA), seeks reservation and management regimes that ensure the future of all elements of natural variety, then leaves the rest of the landscape to the mercies of economic efficiency (Kirkpatrick 1998).

Using the CAR approach, the assessment of natural significance relates to the distance to, or beyond, adequacy. Thus, an endangered species has greater natural significance than a common species, and the remnant of a once widespread community has greater significance than an equivalent area of a widespread and still intact community. The CAR approach can be applied at a variety of scales: international, national, State, regional or local. Thus, an element of nature that is threatened in a local municipality, but common elsewhere, would have local, but not any other, significance.

The adequacy of reservation and management for the maintenance of particular elements of nature can be determined, to a reasonable degree of certainty, by scientific investigation. This is not the case for another class of natural values recognized in treaties and legislation, those related to social preference. How much wilderness is adequate? How much old growth forest is adequate? Which areas are naturally attractive? Which areas are so naturally attractive that they are worth keeping? Which areas are scientifically or culturally significant? What constitutes a superlative natural phenomenon? How much bush should we leave above the CAR minimum? Of course, the position that the variety of nature is worth keeping is a product of social preference, as much as the proportion of old growth people want to reserve at any time, but once it becomes part of social morality the minimum requirements are determinable. The targets for social preference natural values (SPNV) can only be determined through political processes.

Despite difficulties in determining thresholds, internal variation in the degree of significance of SPNV can be gauged. For example, quantitative techniques have been developed to measure wilderness values (Kirkpatrick and Haney 1980; Lesslie and Maslen 1995) and natural aesthetic values (Mendel and Kirkpatrick 1999). Old growth was considered to be more important for conservation in the RFA if it belonged to a forest community that had little surviving old growth (JANIS 1997). There is considerable scope for applying a CAR approach to SPNV. For example, it can be argued that there should be representation in world heritage areas of different types of natural landscapes that are regarded by different social and national groups as aesthetically outstanding.

A third type of natural values relate to the provision of ecosystem services for people. The production and regulation of water is the most critical of these services in an Australian context. Relative value can be measured in terms of the service provided. For example, even the most casual of computations shows that the cutting of old growth forests in catchment areas is economic lunacy.

The rest of this paper will attempt to identify those of the natural values of the Australian Alps that are significant at a global level. This account is partly based on an earlier analysis of the international significance of the Australian Alps (Kirkpatrick 1994), which, in turn, benefited from several other natural values assessments (Mosley 1988, 1992; Good 1989, 1992; Busby 1990; Boden 1991; Mosley and Costin 1992).

A Globally Unusual Landscape

Most mountain ranges in the world have risen where continental plates collide. The intraplate location of the Great Dividing Range of Australia (Bishop 1988), combined with an extremely narrow continental margin, makes it unique on a global scale. The Australian Alps contain most of the highest points in the Great Dividing Range.

The Australian Alps are one of a set of five temperate southern hemisphere mountain ranges that extend from sea level to at least the alpine zone. These mountains are largely highly disparate in their morphologies. Most New Zealand and Patagonian mountains are the product of plate collisions, and are almost unrelievedly precipitous, and well-carved by active glaciers. The Drakensberg of southern Africa
is sandstone massive, famed for its cliffs and caves, and lacking spectacular glacial scenery. The Tasmanian mountains are strongly influenced in their morphologies by a massive dolerite sill, that intruded on the break up of Gondwana (Leaman 2002), and show substantial, and sometimes spectacular, evidence of Pleistocene glaciation. The Australian Alps are rounded soil mountains, having been subject to minimal glaciation and substantial Holocene donations of topsoil from the plains to the west (Johnston 2001). The closest morphological analogue to the Australian Alps in the northern hemisphere is the Appalachian Mountains. In the southern hemisphere, the Central Otago mountains are also delightfully rounded, and also have relatively deep soils.

The vegetable indumentum of the Australian Alps makes them even more distinct on a global basis. The trees that extend from sea level to the tree line are evergreen, with strangely open crowns, pastel leaves, and a remarkable ability to encourage, and benefit from, fire. They belong to the eucalypts, a diverse collection of species in a few closely-related genera, presently naturally confined to Australia and a few islands to the north (Williams and Woinarski 1997). It is only in parts of eastern Tasmania that eucalypts also run from the sea to the tree line, the Tasmanian alpine areas typically being surrounded by rainforest or sedgeland (Kirkpatrick 1997). Above the tree line, much of the vegetation is naturally dominated by large floriferous herbs or tussock grasses (McDougall 1982; Costin et al. 2000). This makes it distinct from Tasmania, where most alpine vegetation is dominated by shrubs or bolster plants (Kirkpatrick 1997). However, the subantarctic islands and New Zealand have physiognomically comparable vegetation (Wardle 1989).

Elsewhere in the world than New Zealand and Tasmania the alpine mountain vegetation is dramatically and consistently different from that of the Australian Alps. Elsewhere, where forest clothes mountain slopes, altitudinal zones are dominated by taxonomically and physiognomically different species. Elsewhere, in alpine vegetation, large herbs or tussock grasses can occur as dominants, but not both, with the typical northern hemisphere alpine vegetation types being herbaceous mats or sparse fellfield.

**A Landscape Of Unusual Beauty**

There is much steep country, sometimes juxtaposed to water, within the Australian Alps, but the natural aesthetic qualities that make it an exceptionally beautiful place for many people lie in the pastel pastiche of eucalypts, cypress pines, scleromorphic shrubs and tussock grasses that clothe gently undulating hills and flat-floored valleys, and the mosaic brightness of flowering daisies on the rounded slopes within the alpine plateaus; not in cliffs, lakes or torrents, which are in shorter supply and less extreme manifestation here than in most mountainous regions of the world.

Many of the invading Europeans found the typical Australian bush harsh and ugly (Taylor 1992). This is not the current perception of most inhabitants of Australia. The Heidelberg School first captured the beauty of the texture, mood and form of the dry eucalypt forest, an untidy, pastel beauty well divorced from that of the still much-admired emerald green rainforest. Rainforest is rare in the Australian Alps, which are mostly covered by the dry forest and woodland celebrated by the Heidelberg School. Variations in tree species dominance produce subtle changes in canopy colour melded into topography, while variations in the understorey substitute different sets of flowering grasses, herbs and shrubs, depending on moistness, soil type and disturbance history. In recently burned forest, delicate native orchids and lilies flower abundantly among blackened stems.

In the smaller part of the Australian Alps covered by herbfield and grassland there are outstanding wildflower displays in late spring and throughout summer (Costin et al 2000). Even before the peak of flowering there is a wondrous variation in foliage cover in the vegetation mosaics of the alpine country and limestone plains. There are even a few lower altitude valley grasslands where grey kangaroos emerge from the red heads of the dominant kangaroo grass. Such scenes were once common in much of south-eastern Australia, but are now rare (McDougall and Kirkpatrick 1994).

Kirkpatrick (1994) argued that the Australian Alps as a whole had outstanding universal significance for natural aesthetics in that they presented an 'unique combination of gently rounded slopes, highly floriferous alpine vegetation and the pastel untidiness of the eucalypt forest'. The fact that this combination of qualities is not one that conforms with the Eurocentric romantic vision of mountains as places of steep, crumbling, icy grandeur should not detract from its international significance, given that
there is wide intercultural and intracultural variation in aesthetic perception (Dearden 1984). The presence of persistent snow is not a great selling point at the international level.

**An Important Place For The Conservation Of Biodiversity**

Australia is a megabiodiverse country, supporting, for example, almost one tenth of the vascular plant species in the world. Most species and communities that occur naturally in Australia occur nowhere else. Within Australia, the Alps represent a biotic extreme. At the species level, the Australian Alps have some minor biotic affinities with the New Zealand, and greater biotic affinities with the mountains of Tasmania. However, approximately 40% of the vascular plant taxa that occur in alpine vegetation in the Australian Alps do not occur in Tasmanian alpine vegetation (Kirkpatrick 1982), and the equivalent proportions of alpine plant communities (Kirkpatrick and Bridle 1999) and alpine invertebrates (Peter McQuillan, pers. comm.) are even higher.

The biological diversity of the Australian Alps is most outstanding at the community level. At a broad level of classification, over half of the vegetation forms and subforms of Beadle and Costin (1952) are found within their area. One hundred and seventy-seven plant communities are listed for the Australian Alps by Kirkpatrick (1994), most dominated by eucalypts. This compares favourably with the number of communities recorded in other biodiverse areas of Australia, such as western Tasmania (Kirkpatrick 1994). At the species level the Australian Alps probably have about 5% of the invertebrate and vascular plant species of Australia, being less diverse than the tropical and subtropical rainforests, and other areas of eucalypt-dominated communities, such as southwest western Australia, the Blue Mountains and southeastern Queensland. One third of the bird species of Australia occur in the region (Busby 1990).

The Main Range in Kosciuszko National Park has a high concentration of local endemic species (Good 1989; Costin et al. 2000; Kirkpatrick 2002). The Australian Alps as a whole are important for the conservation of threatened species, including two species of Burramys, the only alpine obligate marsupial, and more than 60 vascular plant species, including the white alpine buttercup, Ranunculus anemoneus and a gentian, Gentiana bauerlenii, only known from Namadgi National Park.

**An Important Place For The Conservation Of Geodiversity**

The alpine humus soils of the high plateaus in the Australian Alps are the best manifestation of their type in the world (Costin 1989), supporting enormous earthworm populations (Costin 1989). Unlike elsewhere in the world, where they are largely restricted to carbonate rocks, alpine humus soils form on a variety of rock types in the Australian Alps, perhaps due to the influence of calcium-rich dust, constantly deposited after transportation from more arid areas to the west (Johnston 2001).

A suite of interesting fossil, and active, ‘periglacial’ landforms occur within the alpine and subalpine zones (e.g. Costin et al. 1967; Costin and Wimbush 1973). These have some international interest because they are high mountain features not related to permafrost.

The subalpine and montane limestone plains in the north of the region have some international scientific significance as a result of the work of Jennings, Spate and others (Spate and Household 1989).

**General Discussion**

Kirkpatrick (1994) scored six existing world heritage areas in Australia, and the Australian Alps, using natural criteria relevant to world heritage. The Australian Alps ranked third. If he had assessed the Australian Alps for integrity, they would have been far less successful. Ski villages, cattle grazing, dams and powerlines do not add to a case for natural international significance. Nevertheless, during the process that led to the world heritage listing of the Blue Mountains, IUCN sought a serial listing, based on the story of the eucalypts, in which the Australian Alps would have featured. Such a listing, at a national level, now seems likely under the provisions of the Environmental Protection and Biodiversity Conservation Act (1999) (Commonwealth of Australia).

Irrespective of any legal recognition of significance, the Australian Alps are very much worthy of celebration globally, and even more worth any care we can afford to take in their conservation.
management. Skiing, cattle-grazing and dam-building can take place in an enormous variety of locations on the surface of the globe, but there is only one Australian Alps.

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Rocks are Rocks, Mountains are Mountains - Aboriginal Values of Mountains

Jason Ardler

Director, Cultural Heritage NSW NPWS

Introduction

I would like to acknowledge and pay my respects to the traditional owners of this land and thank the elders for inviting us into their country.

It is particularly appropriate that these celebrations are occurring in the Australian Alps. These mountains have enormous iconic significance for all Australians as the home of the man from snowy river; they have spectacular scenic values, immensely important natural values, are associated with historical events, industries and recreational pursuits and of course are of particular significance to the Aboriginal people whose ancestors shaped and have been a part of this country since time immemorial.

I am very pleased to have been invited to participate in these celebrations and talk about the Aboriginal values of mountains. It provides me with an opportunity to talk about a matter very near to my heart - the associations of Aboriginal people with country – which I would like to do in the context of current approaches to Aboriginal heritage management in NSW.

For 20 years, Aboriginal heritage management in NSW has almost completely been dominated by pre-contact archaeology, in the form of localised impact assessment studies. Apart from ignoring the non-archaeological and historical significance of Aboriginal heritage places, this approach provides few opportunities for decision making by Aboriginal people and is limited in terms of what it can tell us about Aboriginal history on a broader landscape scale.1

Recognising these concerns, much of the work now being done by the NPWS is focused on values other than archaeology. This is not to down play the contribution archaeology has made, and will continue to make, to Aboriginal heritage management, but to put more emphasis on the way Aboriginal people themselves value their heritage.

A New Approach

A new approach to Aboriginal heritage management is being developed, which respects the notion that Aboriginal knowledge and culture is both traditional and contemporary, and that the physical evidence, typically referred to as Aboriginal cultural heritage, requires the stories and traditions of people to give it context in the natural landscape.2

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1 Byrne, Brayshaw and Ireland 2001
2 Visions for the New Millenium Report 1998
It acknowledges the unbreakable ties between Aboriginal cultural heritage and nature, that Aboriginal people are the owners and interpreters of their heritage, and that this culture is inseparable from land and water.

NPWS defines cultural heritage in the following way:

All landscapes have heritage values. Cultural heritage is the value people have given to items through their associations with those items.

Manifestations of cultural heritage values may be non-physical and/or physical and include, but are not limited to, cultural practices, knowledge, songs, stories, art, buildings, paths, and human remains. When natural elements of the landscape acquire meaning for a particular group, they may become cultural heritage. These may include landforms, flora, fauna and minerals.

Consistent with this definition, the management of Aboriginal heritage both within and outside of the reserve system in NSW is guided by the following principles:

Landscapes have been shaped by human use and associations and many people maintain their attachment to, and association with, these lands.

Landscapes have a variety of heritage values, including natural and cultural heritage values, and these values need to be appropriately identified, assessed and managed.

Cultural heritage includes traditional, historical and contemporary associations of people with the landscape and activities related to the natural phenomena it supports as well as with particular items.

Associations or social significance of items is to be considered equally with scientific, historical and aesthetic significance in heritage assessments.

Aboriginal people have culturally specific associations with landscape. These associations may include custodial relationships with particular landscapes.

Communities are active participants in the identification, assessment, interpretation and management of their cultural heritage.

Social benefits flow to communities from participation in the management of their cultural heritage.

Information supplied by communities/individuals, regarding their cultural heritage values and associations, is owned by, and its use controlled by those communities/individuals.

Central to these principle is the notion of cultural identity and integrity.

Increasing attention is being given to the way Aboriginal people have maintained and adapted their cultural identity since European invasion. By working with Aboriginal people, we gain an understanding of the way “links with the land continue to be expressed through story, descent, occupation and use.”

Aboriginal heritage is made up of places, stories and knowledge which have as much value and relevance today as ever before. Continued use of wild resources for foods, medicines and materials, and aspirations for an active role in the management of protected areas, are testament to this.

Ian Brown from the Yarrawarra Aboriginal Corporation on the mid north coast of NSW puts it this way:

“Aboriginal people are part of the land, they don’t own land, the land actually owns them. We call the land our Mother...”

3 NPWS Corporate Plan 2000/2003
4 NPWS Cultural Heritage Strategic Policy 2002
5 NPWS Cultural Heritage Strategic Policy 2002
6 English and Brown 2001
According to Ian, accessing traditional lands

"...is one way of getting back a bit of us, not just our heritage and culture, but we’re getting back to ourselves and with our land our actual mother...our blood actually flows through the land. Every headland, every rocky outcrop, will be mystical or have a story to it."

This view challenges the common assumption that authentic cultural values have been lost in NSW.

**Back to the Future**

In many ways this new approach is like going back to the future.

For over a decade, from 1973, the NPWS and the Australian Institute of Aboriginal Studies undertook a sacred sites survey program in NSW. The survey team was led not by an archaeologist, but by Anthropologist Howard Creamer and Aboriginal Sites Officer, Ray Kelly, now a respected Dhungutti elder.

According to Uncle Ray, many non-Aboriginal people at the time were of the opinion there were no Aboriginal sacred sites in NSW and that any that did exist would not be significant to the Aboriginal people of the day.

The work of the survey team proved these views wrong. Many Aboriginal people, elders particularly, were concerned about the protection of their special places and agreed to share information about these and their associated stories and ceremonies.

This has since been the experience of others, including Scott Cane who notes that many sacred sites are “locations of worship, the abode of ancestors, a place of learning, a source of identity and community coherence. They are the store house of sacred materials and are valued in mythology, territoriality (sic), identity, cultural transmission, security, economy, reciprocity, politics and education. The sites are real, relevant and reinforcing. If these places had significance in the past, their stature has grown in the present.”

**Mountains are Mountains**

The Survey team recorded nearly 600 sites of spiritual or ceremonial significance to Aboriginal people across NSW, including many sites associated with mountains.

The Survey team found that, not only are the coastline and plains dotted with evidence of Aboriginal occupation, but that Aboriginal people moved across the landscape and into mountain areas for ceremonial purposes and to collect wild resources.

It is generally acknowledged that the Aboriginal significance of sites and places can only be determined by Aboriginal people. These values differ from community to community and even within communities, but when it comes to the significance that Aboriginal people place on mountains, there are many commonalities.

The Aboriginal significance of mountains can generally be defined through their:

- Link with traditional stories, belief and practices
- Use in the more recent past or present
- Importance to cultural identity

Mountains have always been the focal point of cultural landscapes. They often dominate a landscape and have importance for more than one cultural group. As such, mountains are often places where people gathered for ceremony.

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7 English and Brown 2001: 14
8 Cane 1990:59
9 Gay 2000
All over NSW mountains contain important and often secret ceremonial sites, to which access is restricted to the uninitiated.

Many older Aboriginal people can recall being told as children about the ceremonies that took place on mountains and how it was forbidden for them to go there without the permission of Elders.

The formation of mountains is usually linked to significant dreaming stories. The Anaiwan people of the NSW Northern Tablelands tell of two brothers who were always fighting over food, women and weapons. The brothers were eventually banished to the far ends of Anaiwan country and turned into mountains. The two brothers now protect their land and people.10

Mountains are often linked by family connections – One of the best known stories is that of the Three Sisters of the Blue Mountains, turned to stone by their witchdoctor father to save them from being harmed by an angry bunyip. However, in his own efforts to escape the bunyip, the witchdoctor lost his power and his daughters now stand silently on their mountain ledge, waiting to be brought back to life.

A further example is that of the 3 Brothers on the mid north coast. This story was told by Gumbaynggir elder Harry Buchanan during the Sacred Site Surveys:

> There were three brothers who had...just gone through initiation and were required to live alone for several months before they could become recognised as fully initiated men in each of their separate stages of initiation. The three brothers had been in the bush for some months when they began to worry about their mother and father. The youngest [brother] volunteered to check on his mother and father... Just when he left their camp he saw an old witch arrive but he didn’t take any notice of her and when he arrived at his mother and father’s camp, he told them that he had seen the old lady near his brother’s camp so his father said to him “you must go quickly or this old lady will kill your two brothers and she will eat them.”

Just before he had left, his father gave him a special boomerang which he had just made, saying “here, this will keep you safe.” So the young boy set off to tell his brothers about the old witch. But when he got near to where his two brothers were camped, he saw the witch had already been there before him. He asked the old woman what she had done with his two brothers and she told him that she had eaten them and then said that she was going to eat him too. Before she had the chance to get him he hit her on the head with his father’s boomerang and split her in two. He then took one half of her body and buried it in the river and the other half he threw in the sea...so that the bad spirits of [the witch] cannot return to the earth again.

After he had done this he went back to his brother’s camp and gathered their bones and took them and buried them on North and Middle Brother mountains. Then he went to the South Brother and committed suicide. Several days later the father came looking for his three sons and when he couldn’t find them he heard a voice which told him they were buried on the Mountains. So he named the mountains after each one of his sons.

Legends such as these are an important means of transmitting intergenerational wisdom. They teach important life skills and provide a tangible link between people and the places they value.11

The telling of these stories is a “creative act.” Each time a story is told it may be varied depending on which lessons the teller wants to emphasise. In this way, stories remain relevant and responsive to people’s need. There at least 2 recorded variations of the Three Brothers’ story.

Many mountains are gender specific. Gulaga (or Mt Dromedary) on the far south coast of NSW is a woman’s mountain and from certain view points resembles the shape of a reclining woman. There is an expression used by Yuin people that when the old woman puts on her possum skin cloak the rain will set in. That is, when the clouds cover the top of Gulaga, the rain will set in.12

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10 Ethel De Silva in Ahoy and Murphy 1996: 30
11 Bird-Rose 1990: 20
12 Bird-Rose 1990: 55
However, some parts of Gulaga are also accessible to men. Often in Aboriginal cultures, the west is associated with women and the east with men. Accordingly, Gulaga is divided into east and west - men’s access is along the eastern ridge, while the western side is the women’s side.

An important aspect of Aboriginal culture is the relationship between individual sites and the landscape within which they lie. That is, it may not only be the mountain that is significant but the sites and places that can be seen from the mountain. Alternatively mountains can provide a link between significant features or places, giving them a collective as well as an individual meaning. Only with an understanding of this wider context is it possible to assess true meaning.

This is true for the Australian Alps. Kosciuszko is the most famous of the peaks in the Alps. And yet, it is only one of many peaks with significance to Aboriginal people, which together form an important complex of initiation sites, trails and sacred places which are all related.

The cultural importance of Kosciuszko is therefore embedded in a much wider range of country than the peak itself.

When it comes to the Aboriginal significance of a mountain, size definitely does not matter. Pigeon House Mountain was so named by Captain Cook because of the way he perceived its distinctive shape and the way it dominates its immediate surroundings.

However, Yuin people view Pigeon House from a different perspective. We call it Bulgaan. The mountain’s significance is associated with its resemblance to a woman’s breast, and also its proximity to a traditional trading route between the coast and tablelands.

Although only rising to a humble 720m above sea level, Bulgaan is one of the most spectacular natural landmarks in NSW and of immense significance to Yuin people.

The use and maintenance of sacred mountains has always ensured the protection and well-being of people and country. However, this has been substantially disrupted since European settlement.

Harry Creamer recorded Dick Donnelly in 1981 saying:

[Traditional knowledge] must be given to you up on a mountain, nobody got a mountain now. They said now well we can’t go anymore, we can’t go up on to that mountain now to school our young people what to do, because the white man won’t have it. That time it was a free country. Got to be a secret place, quiet place up there.

To Yuin people Mumbulla Mountain is Biamanga, a sacred place associated with the initiation of young men.

In Yuin legend, the landscape of the Dreamtime was featureless until superhuman beings formed headlands, lakes, rivers and mountains. These ancestors of current Yuin people had great power and young people had to be shown how to maintain good relations with them.

The arrival of Europeans, to whom the importance of sacred Yuin places was invisible, prevented them being visited. They took gold from Gulaga in the 1890’s and logged Biamanga. However these places continued to be respected and kept alive by the old people.

In 1978 Guboo Ted Thomas led the Wallaga Lake Aboriginal community in a campaign to stop logging on Biamanga and protect the sacred sites associated with it.

It was six months before logging was halted and the claims of the Yuin community investigated. To most people in the non-Aboriginal community there was nothing special about Mumbulla Mountain – as far as they could see “rocks are rocks, mountains are mountains.”
But, according to Guboo Ted Thomas:

“These are sacred matters which must be kept quiet....These are our laws which come to us from the mountain. We only talk about these things when we are forced to do so in order to protect our sacred places.”

Many claimed that this secret sacredness was invented and the then Minister for Conservation was reported as having said there would need to be more evidence than just someone “knocking two sticks together and chanting” to justify the claim.

But, in 1979 a report by Brian Egloff came out in support of the Yuin people’s claims. As a result, 7,508 hectares of forest around Mumbulla Mountain was declared Biamanga Aboriginal place under the National Parks and Wildlife Act 1974.¹³

Later, Biamanga Aboriginal Place became part of Biamanga National Park. In 1996, as part of the Eden Forest Agreement, Biamanga was listed on Schedule 14 of the National Parks and Wildlife Act. Part 4A of the Act provides for lands so listed to be vested in a Local Aboriginal Land Council on behalf of their traditional owners. These lands are then leased back to NPWS and managed by a Board of Management comprising a majority of Aboriginal owners. Unfortunately Uncle Ted is no longer here to see the end of the fight for Biamanga that he started nearly 25 years ago.

It is significant that of the seven protected areas currently listed on Schedule 14 to be returned to their Aboriginal owners, four are associated with culturally significant mountains. These are Biamanga NP, Gulaga NP, Mount Grenfell Historic Site (near Cobar) and Mount Yarrowyck NR (near Armidale).

Places may be declared Aboriginal places under s84 of the NPW Act that are or were of special significance with respect to Aboriginal culture. Aboriginal places may or may not contain physical evidence of Aboriginal occupation. What is important is that significance is determined by Aboriginal people and places that do not contain physical evidence can be afforded the protection of the NPW Act.

Over the past three years, NPWS has been revisiting the work of the Sacred Sites Survey team of the 1970’s, with a view to completing the investigation of places nominated for declaration as Aboriginal places.

Not surprisingly, many of the places nominated were mountains. Also, not surprisingly, given that NPWS now manages over 6.5% of NSW, many of the places nominated have since been incorporated into protected areas.

Despite this fact, many Aboriginal communities have determined that their original nominations should continue to be pursued. As a result Aboriginal places have recently been declared over a number of culturally significant mountains within protected areas.

In these cases, declaration of an Aboriginal place is not so much about protection, but recognition of the cultural significance of a landscape reserved primarily for its nature conservation values.

This is also a call from Aboriginal people for active participation in decision-making with respect to their special places within protected areas.

Elders are traditionally recognised in Aboriginal society as having the right to determine access to sites in their area. They also have the right to speak on and determine questions of use in relation to those sites.

The declaration of an Aboriginal place within the Gibraltar Range National Park has prompted Aboriginal Elders in the Glen Innes area to commence negotiations with the NPWS to prevent access to their sacred site. The Elders have asked that the site not be promoted to park visitors, that signs be removed and a walking track in the vicinity of the site be closed. NPWS has been challenged with finding a solution which respects the Aboriginal significance of the area, while retaining a popular park visitor experience.
Although keen to have their sacred mountains protected and recognised as Aboriginal places, many Aboriginal people do not want their location or the details of their significance generally known.

Many believe that the best protection for significant sites is to keep them secret. As we have seen in the case of Biamanga, it is often only when these sites are in immediate danger that people are prepared to talk about how significant they are.

Others would prefer to let significant sites and information about them be destroyed than compromise their obligations to protect them by giving information to people who shouldn’t have it.14

Of course many mountains have significance beyond their Aboriginal values. Many are regional icons, most have significant natural heritage values and are associated with recreational activities ranging from bushwalking to abseiling and even snow skiing.

Unfortunately, these values sometimes compete with and are detrimental to Aboriginal values. An obvious example of this is Mt Warning, known to local Bundjalung people as Wollumbin – meaning cloud maker.

Mount Warning is the main chamber of a 23 million year old former volcano which dominates the World Heritage listed landscape of the far north coast of NSW. As such, Mount Warning contributes significantly to the sense of place and identity of the people of the far north coast and is an integral part of the natural and cultural fabric of the region.

Mount Warning is also associated with the European “discovery” of Australia, being named by Captain Cook as a visible landmark to warn mariners of the Point Danger reefs near the mouth of the Tweed River.

In the mid-1800’s, forestry in the region provided one of Australia’s earliest export industries and, in the 1890’s, prompted one of the earliest forest preservation campaigns and arguably the beginning of the modern conservation movement. Parts of the current Mount Warning national park were reserved for recreation and conservation purposes in 1928.15

To the Bundjalung people, Wollumbin is a revered warrior who overlooks the entire tweed valley. Wollumbin holds great cultural significance for all Bundjalung people from Yamba in the south to Brisbane in the North.

Mount Warning is of course, also the first place on the Australian mainland to be touched by the morning sun. Largely for this reason, its summit receives 100,000 visits a year.

NPWS previously supported visitation of Mount Warning, maintaining its walking tracks and installing a viewing platform on its summit. By the end of the last century, Mount Warning had become so popular as a destination to view the sunrise on New Year’s Day, that a ballot had to be conducted to restrict visitor numbers.

In 1999, local Bundjalung people sought an injunction to prevent year 2000 New Year celebrations taking place on Wollumbin, claiming that these activities were disrespectful of their cultural beliefs and were having an unacceptable impact on their sacred mountain.

Although their efforts were unsuccessful, a direct consequence of this action has been that the NPWS now more fully understands and recognises the significance of Wollumbin to the Bundjalung people and has committed to cooperative management of the mountain with the Aboriginal community. This has involved the establishment of an Aboriginal management committee for the area.

As I said earlier, Aboriginal heritage values are not restricted to the pre contact era. Mountains are also associated with events of great historical importance to Aboriginal people, not all of which are cause for celebration.

14 Rich 1989
15 NPWS 2002
Massacres of Aboriginal people are known to have occurred on mountains. This is because massacre sites are often associated with the camp sites at which their victims sleep or gather. Camp sites are likewise associated with ceremonial life and in the early days of invasion ceremonial gatherings left Aboriginal people particularly vulnerable to massacre.

In 1835, for instance, Aboriginal men, women and children were trapped on the edge of a large cliff in the Barrington Tops area by white settlers and either left to their death, or were thrown over the cliff edge, depending on which report of the incident you accept. This site is of great significance to Worimi people today and, although protected as part of Mt Mackenzie Nature Reserve, is currently the subject of an Aboriginal place nomination.

In the century following invasion, mountain country was also a refuge for Aboriginal people escaping European violence. In 1842, a letter to the editor of the Sydney Morning Herald recounted the retreat of Baryulgil people of the mid-Clarence area. In part the letter reported that:

“Since the hostile encounters with the blacks which took place upon this river about a year ago… they have rarely shown themselves, but have kept among the mountains, and avoided all intercourse, always making off as fast as possible if accidentally seen…” 16

More recently, at the time of the Darwin bombings, during the second world war, some Biripi people moved on to Middle Brother Mountain in fear of a Japanese invasion.17

Aboriginal people’s knowledge of country and ability on horse-back were critical to the development of pastoralism in NSW. Aboriginal people were very skilful at mustering stock through mountainous terrain, often utilising traditional pathways.18

For Aboriginal people today, mountains are no less significant than they were to their grandparents and great-grandparents. Mountains are still important in defining connections to country and providing a community’s sense of purpose and belonging. Parrots Nest, located just south of Lismore, is one such place for Widjabal Bundjalung people. The protective qualities of the site are said to have been of great support to the Widjabal through their years of struggle against the loss of their lands, enabling them to retain their strength and sense of pride in the fight to retain independence, freedom and dignity.19

Because of their prominence in the landscape, mountains are at the centre of territorial organisation and spirituality for Aboriginal people. They often form a natural border between neighbouring countries and give a distinct identity to people to whom they are important.

An Aboriginal person’s “country” is literally their place of origin, culturally and spiritually. It encompasses all the places, stories and cultural obligations with which people are associated.20

Mountains are integral to country and culture. And for me, their significance is really summed up by Biripi elder Pat Preece speaking of the Three Brothers:

It brings me back to my Aboriginality. Everything my race has stood for. I stand in the shadow of them... Just to think how long they have stood there and my people lived in the shadows of those mountains. They fished, they hunted, they gathered and wherever they looked, wherever they were camping with a campfire of a night, they’d get great comfort from those places. And that’s what sticks in my memory today and its held men in good stead for many years knowing there’s something there like that.”21

Thank you.

16 Riebe 2000
17 Gay 2000
18 Harrison (in prep)
19 NPWS 2000
20 Swain 1993: 2
21 Gay 2000: 40

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The Cultural Significance Of Australian Alpine Areas

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Here where red dust rose
To raddle sheep and men
And the kelpie tongued at noon,
Silence has come again.
The great-boled gumtrees bow
Beneath their load of snow.

The drover and his dray
Have gone; and on this hill
I find myself alone
And time standing still.
Printless the white road lies
Before my quiet skis.

But where my skis trace
Their transient snow furrow,
For generations both
Man and beast will follow.
Now in this winter passage
I cross the deserted stage.

These lines from David Campbell’s poem, “Winter Stock Route”, conjure up images of the falling snow blotting out the evidence of human use and activities in the high country. Is this a metaphor for how we see cultural values in the Alps –recognised, then forgotten, buried or overlain?

The cultural values of our alpine environments are a specialised type and many of these values are of national significance. These values may be seen in items/places, and physical features, but can also be associated with intangible qualities such as people's associations with or feelings for an item or in other items such as cultural practices, knowledge songs and stories.

This paper presents a summary of existing knowledge about cultural values in the Australian Alps, including Tasmania. It outlines historic themes applicable to the cultural heritage of the Alps including World Heritage themes and concludes that the cultural values of the Australian Alps are potentially of international significance by applying the concept of cultural landscapes to them. The mountains of Australia are of cultural significance.
Existing knowledge about cultural values in the Australian Alps and Tasmania

The databases for cultural heritage places in the alpine national parks give some indication of site types, but the collection and analysis is not comparable between agencies. Cultural values derive from types of places/items and these can be organised by themes to allow for comparison. Nevertheless, pastoral sites, mining and pathways/routes predominate. It is well known that many of these pathways were based on prehistoric routes used by Aboriginal people in their seasonal occupation of the alpine country (Grinbergs, 1993; Cubit and Russell, 1999).

Some zones of extensive historical activities, such as gold mining, have been identified. Cultural landscape zones have not been formally delineated even though management guidelines have been prepared for them and some areas are obvious, such as Currango and Kiandra in Kosciuszko National Park, Orroral Valley in Namadgi National Park, the suite of Historic Areas gazetted in Victoria and areas like Cradle valley, Macquarie Harbour and the Upper Mersey valley in Tasmania.

The lack of data about Aboriginal occupation and use of the alpine areas hinders building a picture of continuity and extent of previous use over the last 40,000 years and particularly over the last 200 years, although the 2000 study by Young and Mundy is a step toward addressing this for Kosciuszko.

The following table summarises identified cultural heritage site/place data in 1999 by each agency involved in the alpine national parks, although historical place data has not been included yet for Mt Buffalo, the newest reserve added to the MOU area.

<table>
<thead>
<tr>
<th>Agency</th>
<th>Aboriginal place</th>
<th>Historic place</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victoria</td>
<td>342</td>
<td>150</td>
</tr>
<tr>
<td>NSW</td>
<td>460</td>
<td>1440</td>
</tr>
<tr>
<td>ACT</td>
<td>158</td>
<td>375</td>
</tr>
<tr>
<td>Tasmania - WHA</td>
<td>746</td>
<td>400</td>
</tr>
<tr>
<td>Commonwealth - RNE*</td>
<td>12</td>
<td>109</td>
</tr>
<tr>
<td>Total</td>
<td>1718</td>
<td>2474</td>
</tr>
</tbody>
</table>

* Note –RNE places are also identified in State/Territory listings

Historic themes and assessment of significance

There are several schemes setting out the main historic themes for the Alps as a way of grouping places with similar cultural values. The themes used for the 1991 Jindabyne Symposium on the Cultural Heritage of the Australian Alps (Scougall 1991) were:

- Aboriginal occupation and interaction with the environment prior to European contact
- Exploration and survey
- Pastoralism
- Mining
- Logging and silviculture
- Water harvesting
- Recreation and tourism
- Communication and transport
- Conservation and park management

These have been revised in the recent review of the cultural values of Kosciuszko National Park (Sullivan and Lennon, 2002), and new data and research undertaken since 1991 has been incorporated. The 1991 themes headed Exploration and Survey, and Transport and Communication, have been subsumed into other themes such as Pastoralism, or run right through all the themes, and the Aboriginal theme has been expanded.
In addition, assessments of cultural values have moved to a wider contextual consideration, in which the overarching value of all heritage items is their value to society and other attributes such as aesthetic, scientific or historic value, are seen as subsets of this general social value (Byrne, Brayshaw and Ireland, 2001).

The significance of some items and landscapes arise out of more than one theme. One outstanding example of this relates to the group of Kosciuszko Huts built for pastoral workers use then used by miners, scientists, engineers, tourists, artists and bushwalkers, while another example is the continued association of related communities to the Park, because of their part in its history and their associated customs, knowledge and attachment to the mountains.

For the long awaited new Commonwealth heritage legislation, the Australian Heritage Commission has suggested the following thematic groups to assist in selecting places of national significance:

- An Ancient Country
- An Island of Natural Diversity
- Peopling the Land
- Understanding and Shaping the Land
- Building a Nation
- Living as Australians.

All of these themes apply to items, sites, places in the Australian Alps. The thematic frameworks also assist in allocating levels of significance to places/items.

**Cultural significance of the Australian Alps**

The Alpine region... Constitutes nearly 0.3% of the area of this time-worn continent, only one-fiftieth of whose surface rises above thousand metres. Because of this unique topographic phenomena among the continents, and because both human responses to environmental challenges and the nature of social and technological activities in mountainous terrain are distinctive, it is essential to treasure evidence relating to Australia's alpine cultural heritage. And not only for its scarcity value, or for its representativeness of unique living conditions and achievements, but even for its individuality rather than its typicality (Mulvaney, in Scougall, 1992: 9).

The natural setting and environment of Kosciuszko has influenced its cultural heritage. It has the highest altitude in Australia, a large percentage of land above the snowline, characteristic alpine vegetation and fauna, rugged terrain, bountiful natural resources, and a severe and unpredictable climate.

The climate, remoteness and difficulty of access influenced Aboriginal and European occupation. Specific building and working adaptations, and seasonal use of the high country, characterised European use of the area. Topography had a great influence on movement through the area. The natural resources—Bogong moths and uplands food resources, pasturage, gold and other minerals, timber, water, and indeed snow and scenery have created a series of waves of settlers and transient users who have combined to give the Alps in general and Kosciuszko in particular a rich heritage. These attributes of occupation also apply in part to the Tasmanian high country.

**Aboriginal values:**

Aboriginal occupation in the Tasmanian Wilderness dates from 36,000 years ago currently and 21,000 years in the Alps. The Kosciuszko high country was the traditional gathering place for the Bogong moth festival, one of the most important Aboriginal cultural and social events in south-eastern Australia. Because of the importance of the festival, the ethnographic evidence, the continuing Aboriginal tradition about this event, the sites, routes and physical remains of the activities associated with it are of scientific, historic and social value at a state and possibly a national level.
The new evidence for increased Aboriginal use of the alpine country, as well as being significant to Aboriginal people provides important information for all people interested in the story of human adaptation to this ancient landscape. The traditional European emphasis on scientific (archaeological) research and on the role of men in Aboriginal society has left a legacy of biased recording and analysis of Aboriginal cultural heritage which has yet to be redressed. This has led to misunderstanding and downplaying of some aspects of Aboriginal culture in the Park and an emphasis on places at the expense of landscapes. Aboriginal people and Aboriginal landscapes tend to be invisible to many Australians, and in particular contemporary Aboriginal connections in South Eastern Australia often go unrecognised or in some instances are actively denied. This situation constitutes a threat to the cultural significance of the Aboriginal heritage in alpine areas.

**Pastoral values:**
Pastoralists used prior Aboriginal land use patterns and every explorer and squatter of note in the alpine district was assisted by at least one Aboriginal guide (Lennon, 1992:145). By the early 1850s most of the Australian Alps had been nominally occupied by pastoralists though the severe winters of the high country checked permanent occupation and grazing there (Lennon, 1999: 42).

The pastoral theme, as it is expressed in the Alps represents a unique high country variation of a way of life and a period of economic and social development which is of **historic significance at a national level**. The huts, homesteads, transhumance routes and associated remains constitute physical evidence of pastoral life which is only found at these altitudes. They also represent the way of life of pastoral workers, a theme not well demonstrated elsewhere except for the Upper Mersey valley in Tasmania.

**Currango is of national historic significance** being the largest and most intact example of pastoral settlement above the snowline in Australia with 25 remaining buildings and ruins spanning 150 years of European occupancy (NSW National Parks and Wildlife Service, 1993:6).

The physical setting of the pastoral history has been used for more than a century by famous Australian artists to create works of literature and art which are nationally celebrated and which form part of the national psyche. The pastoral theme as expressed in the Alps is of **national aesthetic significance**.

The pastoral theme as expressed in Australia's highest mountains has strong **social value**, demonstrated in the very active continuation of and celebration of its traditions and the respect for its physical remains including its pastoral landscapes, wild horses, and stock routes. The Man from Snowy River is known in many households around Australia. In this sense **the social value of the theme is of national importance**.

The most celebrated wild horses in the Australian pastoral tradition are those associated with Kosciuszko, which have to some extent become a national icon, along with their riders and musterers, as demonstrated in literature, film and the Man from Snowy River sequence which opened the 2000 Olympic Games in Sydney. On the other hand the damage done, and management problems created by horses in the high country is very considerable and is considered by many people to be in direct conflict with other more significant conservation values. This is an area in which there is a clear potential for a conflict of cultural and natural values which will require careful management.

The darker side of the pastoral theme was also played out in the Alps- pastoralism contributed to the disappearance of the viable and uniquely adapted Aboriginal hunter-gatherer lifestyle in the Alps, the decline in Aboriginal population and the abandonment of many traditional places.

Much of the alpine landscape has been affected by this pastoral phase in our national development and it presents continuing evidence of this era in impressive and appealing cultural landscapes, vegetation change, a changed fire regime, the presence of wild horses and other introduced species and distinctive erosion patterns. Much of this evidence constitutes damage to the pre-European environment left by the Aborigines, but it also has significant historic and scientific value.
Mining values:
Mining rushes of the 1850s and 60’s had a major impact on the Alps, not so much because of the actual area mined, but because of the intensity of the operations. Mining brought large numbers of people into the Alps at a time when they were sparsely settled or unexplored, and provided considerable impetus to regional industries and the development of fledgling towns of the region.

In particular the remains of the Kiandra gold field, being the most extensive and successful Australian gold field at this altitude demonstrate national historic significance which is most readily interpreted in the Kiandra landscape rather than at individual sites. That is, it is outstanding and unparalleled in its combination of a range of mining associated cultural features within an alpine natural environment. It also had one of the largest Chinese camps in the nineteenth century. (LRGM Services, 2002: 53).

Logging and forestry values:
Logging and timber processing is a theme of national importance in developing regional economies and the logging of alpine and mountain ash forests required understanding of the snowy climate and regeneration requirements for sustaining the industry. Timber production was of regional importance in supplying building materials for the miners at the Kiandra gold rush and then for huts and later chalet buildings in the Park.

The Alpine Creek sawmill sites are of State significance as they represent a range of techniques to process mountain ash timber from water wheel through to steam and diesel power. It has been argued that pining in Tasmania—the extraction of Huon Pine from the earliest convict occupation of the south west until the 1950s—was of national significance (Lennon, 2002).

Water harvesting:
Water harvesting is an extremely important historic theme of national historic and social significance in Kosciuszko National Park. The Snowy Mountains Scheme (1949-74), a large part of which is within Kosciuszko National Park, is the largest engineering scheme ever undertaken in Australia. It operated for a quarter of a century and directly recruited 60,000 Europeans; it has national significance as an engineering feat, as a symbol of Australian achievement, and a basis for Australia's postwar multicultural society.

The scheme had a deep and lasting impact on those who worked on it and is appropriately remembered by them and their descendants. Socially, the impact of many foreign male workers had a big effect on the life of the regional towns and their social mores.

Scientific research, conservation and park management values:
The history and achievement of Alpine science is also part of cultural heritage even though the historians of Australia have frequently neglected science in their narratives.

Before 1940, most science in the Alps was incidental, unrepeated and descriptive. It was the science of exploration conducted mostly by individuals. Since 1940, much science in the Alps has been experimental, problem-oriented and sustained over repeated visits. It has often been institutional in derivation (Griffiths and Robin, 1994). The nineteenth century botanical investigations of Von Mueller and Maiden were of international interest as were the geological studies of Edgeworth David, the anthropological work of A.W. Howitt and the meteorological studies of Clement Wragge (Lennon, 1999:54).

Vegetation analysis studies shaped the way the soil conservation agencies of Victoria and New South Wales undertook their work. Costin's work on the Snowy catchment and the Fawcett studies on the Hume and Kiewa catchments also became benchmarks of Australian alpine ecology (Griffiths and Robin, 1994:13). The first attempts at reclamation and revegetation were undertaken in 1959 in the Mt Carruthers to Mt Kosciuszko area and have proved successful. Monitoring sites to measure stone movement on Mt Twynam, karst processes at Coolmna Plain and Yarrangobilly Caves, and treeline dynamics in Thredbo Valley are also sites of outstanding cultural significance associated with scientific research (Lennon, 1999)
As the largest and probably highest profile Park in Australia at the time of its establishment, Kosciuszko has also played an important role in the evolution and development of the profession of Park manager, and of the discipline of Park management generally.

Concentration on nature conservation has had its costs. Certainly the removal of stock from the high country had been well demonstrated to be an ecological necessity, but there was initially insufficient recognition of the loss of way of life, and treasured traditions and a breaking of strong emotional ties, which resulted from the cessation of grazing in the high country (Read, 1996).

In the same way early zeal to restore a "pristine" environment initially ignored the long Aboriginal heritage of the Park, and also led to the destruction or damaging neglect of valuable historic heritage fabric, most notoriously at Kiandra. This in turn has led to protest, lobbying and research by heritage conservationists, and a gradual revision of policies and procedures to protect cultural heritage. The challenge which remains however is the integration of the management on the ground of the natural and cultural values of Kosciuszko.

Recreation values:
Kiandra, at the time of the gold rush was the birthplace of Australian skiing, first noted as a recreational pursuit in 1861, and by 1898 recreation had become an important aspect of the public value in Kosciuszko and in this year, the first complaints of damage to the high country by grazing were made by Helms who complained that it interfered with "the artist and tourist who seek the picturesque " (Gare, in Scougall, 1992: 320).

Mount Kosciuszko itself in its alpine setting as Australia's highest mountain has national significance as a symbol, a source of inspiration, and a recreational attraction for visitors.

The Kosciuszko Huts, now a major recreational asset, represent a diverse history of transient land use in the Park and are important historical markers of different, often overlapping land use but do not necessarily reflect a balance of these phases, since most extant huts date from the 1920s to the 1950s. A characteristic of the huts is their continual adaptation - from grazing, to mining, from Snowy Mountains Scheme construction to grazing, or from any of these to shelter for skiers, walkers and researchers today – and as a group the complex of huts, ruins and huts sites have national historic and social significance.

As we can see from the foregoing, it is knowledge of associations with places which has become an important attribute of cultural values. While many of these cultural values may be of national significance, very few have outstanding universal , the requirement for World Heritage listing.

World Heritage significance of the Australian Alps

In 1994 the World Heritage Committee adopted a Global Strategy which advocated thematic studies as a means of obtaining a more representative World Heritage List. They also recognised that traditional cultures with their depth, complexity and diverse relationships with their environment were hardly represented at all.

The Australian response was developing a methodology and examples of the seven themes for use in identifying "outstanding universal value" in forested areas as part of the studies concerned with Regional Forest Agreements. The following cultural themes have been used in assessments by the Australian and World Heritage division of Environment Australia subsequent to the RFA studies:

iv. Theme: Traditional human settlement and land use
   Sub-theme: Complex persistence of hunting-and-gathering society on a single continent
v. Theme: Artistic expression
   Sub-theme: Rock art
vi. Theme: Religious expression
   Sub-theme: Dreaming sites
vii. Theme: European expansion of the eighteenth and nineteenth centuries
   Sub-theme: Forced migration – a major way in which the expansion took place
   Sub-theme: Land barriers as historical themes
   Sub-theme: Integration of a continent into global economy.
In applying the Australian Thematic Methodology for World Heritage Assessment to cultural values expressed in the Australian Alps, Lennon (1999: 36-63) identified the following new sub-themes given the historical evidence in a universal context and identified places which express these values:

- New sub-theme: Continuity of a seasonal land use pattern
- New sub-theme: Transhumance
- New sub-theme: Utilizing alpine resources
- New sub-theme: Scientific research in alpine areas.

These sub-themes were accepted by the Alps Liaison Committee. They were also used in an update of cultural values in the Tasmanian Wilderness World Heritage Area (Lennon, 2002).

The cultural landscape category was introduced into World Heritage nominations in 1992 as a means of integrating the natural and cultural attributes of places where there was a long history of human interaction with the landscape. Parts of the Alps can be regarded as cultural landscapes under the various categories–designed, relict, evolving and associative. The area is criss-crossed by networks of trails and tracks from various periods of use – by Aboriginal, pastoral, mining, recreation users. There are layers of physical heritage and there is the intangible heritage of stories, songs and music, poetry and art works. The patterns of human occupation, the pathways and nodes of activity and waves of settlement, have left layers of evidence in the landscape. Meanings associated with this evidence, and with the lost or destroyed evidence, is a key ingredient for interpretation in alpine landscapes. However, whether these cultural landscapes have the time depth to illustrate outstanding universal value through a hundred generation long interaction of humans with their landscape is a debatable point. For this continent only those landscapes with a long human interaction can be considered for World Heritage listing, and these will therefore be the associative cultural landscapes of a hunter-gatherer society as with the already inscribed Uluru landscape.

The cultural themes relating to the Alps can also apply in part to other mountains in Australia ranging from Uluru and Purnululu, to the Wet Tropic mountains and the Scenic Rim on the NSW-Queensland border.

At the World Heritage level, sacred mountains have been the subject of recent recognition and study. (See report of UNESCO expert meeting on Asia-Pacific Sacred Mountains, September 2001, Japan). Since the beginning of time, most of the world’s peoples have regarded mountain-tops and forests as places of mystery and spiritual elevation where gods and spirits dwell. Generally speaking, there is little or no material evidence for such places. Thus a sacred site may be purely symbolic with all kinds of remarkable natural features such as stones, cliffs, mountains, forests, waterfalls, lakes and rivers being regarded as of marked religious or spiritual significance. Such places are generally used for religious, meditative, contemplative or even commemorative purposes. Even today mountains are the object of religious and cultural pilgrimages all over the world.

Some cultural values of Australian alpine areas have international value, and in some cases, outstanding universal value as defined in the World Heritage Convention. These values have to be assessed as a regional expression of the World Heritage Committee’s global strategy and as Australia is a continent, we have a case for considering our alpine cultural values in this context. The fact that the Australian Alps are an unusual exemplar of intraplate mountain ranges has resulted in a different character –of rounded ‘soil mountains’, of extensive areas of subalpine treeless vegetation or ‘parks’ unusual on a world scale and prolific in the Australian Alps, of diverse structural types in the alpine eucalypt forests, of international superlative summer wildflower displays Kirkpatrick (1994:58-60). Kirkpatrick also considers the area to be of exceptional natural beauty and similar arguments relevant to the TWWHA were outlined in the RFA Aesthetic Values Study (Young and Lennon, 1996).

There is a case for considering nomination of the Australian alpine park reserves for World Heritage listing and for renomination of existing World Heritage properties such as Tasmanian Wilderness and the Wet Tropics to recognise their outstanding universal cultural values using the following World Heritage criteria:
Criterion 24 (a) (v) – be an outstanding example of a traditional human settlement or land-use which is representative of a culture (or cultures), especially when it has become vulnerable under the impact of irreversible change

The Australian Alps offer an outstanding example of traditional hunter-gatherer use which was representative of that use over 21,000 years and which has become vulnerable under the impact of irreversible change, whereby the direct descendants of these people now live in a modern rural or town society. The current archaeological record of human occupation in the Australian Alps suggests a pattern of links of hunting and gathering societies to the seasonal use of the alpine areas from 21,000 years ago in the cold climate of the Late Pleistocene through the warmer period of the mid-Holocene until the middle of the nineteenth century. The archaeological record illustrates a more intensive seasonal use of the high country from about 4,500 years ago when summer food resources like Bogong moths were available. Therefore it is suggested that in the Australian Alps, above the tree line, the continuity of human seasonal movement is possibly the longest and most ancient practised.

The TWWHA also offers an outstanding example of traditional hunter-gatherer use from 36,000 years. It is most likely the oldest highland occupation of any extreme climate mountain lands in the world by any Aboriginal peoples and this would confirm its significance as having outstanding universal value as a continuous human pattern of seasonal use. The newly recorded archaeological sites of the Holocene occupation of both the southwest coast and the Central Plateau extend the already acknowledged outstanding universal value of the distribution and pattern of Aboriginal occupation in the TWWHA from the Pleistocene occupation caves. And more particularly since rising sea levels separated Tasmania from the mainland about 12,000 years ago, Tasmanian Aboriginal culture has survived one of the longest known periods of geographic and cultural isolation affecting a society. Archaeological surveys since the 1982 nomination have revealed occupation sites along the coastlines, at the mouths of the retreating glaciers in the Central Highlands, along pathways linking plain and mountains.

The seasonal use of resources determining movement by people to and from coasts or high country and the use of fire are cultural practices of exceptionally long duration and from the last Ice Age. They bear witness to cultural continuity as expressed in the archaeological and habitat evidence in the evolving landscape and to the interaction of humans in maintaining the resource base in that landscape over time and through climate change with its consequent adaptations.

Criterion 39 (ii) - ...organically evolved landscape. This results from an initial social, economic, administrative, and/or religious imperative and has developed its present form by association with and in response to its natural environment. Such landscapes reflect that process of evolution in their form and component features. They fall into two categories:

- a relict (or fossil) landscape is one in which an evolutionary process came to an end at some time in the past, either abruptly or over a period. Its significant distinguishing features are, however, still visible in material form.
- a continuing landscape is one which retains an active social role in contemporary society closely associated with the traditional way of life, and in which the evolutionary process is still in progress. At the same time it exhibits significant material evidence of its evolution over time.

Within the TWWHA there are areas that could be categorized as relict cultural landscapes and these relate especially to European land use practices which have now ceased. The uniquely Tasmanian interaction of humans to the natural resource resulted in these distinctive landscapes:

a. The pining landscapes of the Gordon-Macquarie Harbour –Raglan Range which illustrate the range of techniques used in this resource exploitation from the convict era of the early 1800s to the 1940s;

b. The hunting and snaring landscapes of montane grasslands on the Central Plateau, although it could be argued that they also illustrate both transference of European ecological knowledge and European adaptation to Aboriginal seasonal exploitation of native fauna through the re-introduction of traditional Aboriginal burning practices to the north western montane grasslands.

However, these landscapes probably do not have the time depth of the interaction to be considered.
Fire has been the agent maintaining a complex distribution of disclimax vegetation within the TWWHA, especially the button grass plains/sedgeland which comprise 53% of the vegetation in the TWWHA (Jackson, 1999:3). Fire not only produces a successional mosaic but causes extinction of communities and this level of displacement appears to demand a time span of human-induced fire sufficiently long enough to affect soil fertility. The palaeontological record in Tasmania shows a twofold increase in open vegetation relative to closed forest during the Last Glacial cycle. Eucalypt forest increased relative to rainforest, and charcoal increased relative to woody vegetation, and these changes occurred through a variety of climates (Jackson, 1999:1). Human use of fire was the agent. However, the role of fire in maintaining cultural landscapes, especially of the button grass plains, is currently contested.

The most recent studies indicate that the noticeable increase in fire activity about 40,000 years ago when there was no major climate change, is considered to most likely indicate Aboriginal burning. This accelerated existing trends rather than creating a wholesale landscape change but it is difficult to separate the effects of climate and human-induced burning subsequently until the European era (Kershaw et al, 2002:3). The role of fire, albeit at different levels of intensity and distribution, in encouraging the environmental conditions for transhumance—the summer use of high country grasslands for stock grazing—has also led to a continuity of use, of the seasonal fire lighting ritual, in the same places for millennia and now continued from Aboriginal action, through European pastoralists and hunters, to public land and park managers.

As a continuing landscape, the alpine high country is subject to summer seasonal visitation by bush walkers and tourists seeking recreation and spiritual ‘food.’ There is some comparison with the seasonal movement in summer of Aborigines who visited there possibly for 21,000 years and, for at least the last 4500 years, for their Bogong moth festivals and associated rituals. This seasonal movement to the high country is a cultural continuity.

**Criterion 39 (iii)** – associative cultural landscapes. The inclusion of such landscapes on the World Heritage List is justifiable by virtue of the powerful religious, artistic or cultural associations of the natural element rather than material cultural evidence, which may be insignificant or even absent.

Even without documenting the Aboriginal spiritual associations with the alpine high country, there is still abundant evidence on which to further develop the case for associative cultural landscape listing based on the inspirational nature of Australian alpine landscapes due to their superlative natural phenomena and exceptional natural beauty both of which are realized in cultural values. There is a clear case with this criterion for reconsidering cultural values as part of the World Heritage listing.

Wilderness appreciation has now become an associative cultural value for many Australians, yet ironically it implies a disassociation of a minority from their cultural connection to an ancient land and a denial of previous uses which have also left traces of physical evidence in the wilderness. Park management objectives create a wilderness by removing previous evidence and allowing access only to certain places and along designated routes. But the visible signs are only one of the ways in which culture is written on the landscape. Many communities maintain their attachments to areas through photographs and story telling, through festivals and through visits by those who love the bush. They maintain an ‘associative cultural landscape.’

For Aborigines the whole of the land is a cultural landscape and this belief could be sustained in a case for it as an **associative cultural landscape** in accordance with World Heritage criterion 39 (iii) and cultural criterion vi. The beauty of the ‘superlative natural phenomena’ of Australian alpine areas also contributes to this categorization.

It would be interesting to see whether the World Heritage Committee would accept national attachment to the land as an associative cultural value–part of our identity as a people living on this continent down under—or whether it is only interested in relating this value to antiquity as in the 1982 acceptance of the Pleistocene occupation of the caves in SW Tasmania.

**Conclusion**
Despite the extensive identification and assessment of cultural values in Australian mountains and alpine areas and official listing of some cultural values on heritage registers, cultural heritage still has little legitimacy in heritage conservation in the mountains. It is still concerned with ‘dots on the map’ – the recording of mostly archaeological sites, or some restoration of historic fabric. It is time for managers to weave the evidence of long term historical processes into their management planning: to consider climate change, fire histories, and impacts of previous occupation. These provide baseline data from which to measure change and provide frameworks in which to deliberate on the likely impacts of current interventions proposed in the landscape.

Mountains are seen as natural areas – often great green reserves protected through legislation for all times. Yet they too are dynamic and the concept of cultural landscapes is a useful tool to apply in managing the various values, layered in these landscapes and their tangible and intangible expressions. Pathways of meaning await those willing to look at the cultural values in our mountains.

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Co-operative Management of the Australian Alps National Parks: Past, Present and Future

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The past

Human beings create all kinds of boundaries. There are the boundaries between nation states. Within nation states, boundaries exist between different levels of government or jurisdiction, especially within federal nations. Within any one jurisdiction, there are the boundaries between different agencies or areas of administration. In many respects, they are essential in terms of orderly government, but they also create problems. Such agencies usually have narrow and compartmentalised views and mandates that bring both benefits and costs. Another problem is the lack of coincidence between human and natural boundaries. Few of the former bear any relationship to natural resources and ecosystems that span boundaries both within and between jurisdictions. If the natural world is to be managed effectively, new attitudes to these boundaries are required. In the words of the Brundtland report: “The real world of interlocked economic and ecological systems will not change: the policies and institutions concerned must” (WCED 1987: 9).

Parts of the Australian Alps are located in the Australian Capital Territory (ACT), New South Wales (NSW), and Victoria. Within each jurisdiction, there are the boundaries between different areas of government administration; in New South Wales and Victoria, there are local governments. None of these human imposed boundaries coincide with the natural boundaries in the Australian Alps, least of all what demarcates the Alps. The Australian Alps provide a classic illustration of the need to overcome boundaries in the interests of the natural environment (Crabb 2003).

Concern for the natural environment was central to early proposals for reserves in the Alps, some of which were for trans-border parks. In 1938, Myles Dunphy and the NSW National Parks and Primitive Areas Council proposed the Snowy-Indi Primitive Area, covering some 4,000 km² in NSW and Victoria, revising the proposal in 1943. In 1969, the Australian Conservation Foundation (ACF) raised “the desirability of creating a national park in the fullest sense of the word incorporating areas in the Australian Capital Territory, New South Wales and Victoria. This would have the advantage of providing a uniform management policy, and control, and a joint program for matters which affect areas in both States such as the creation of a long distance walking trail, proposed years ago” (ACF 1969, 10). Some years later, in 1973, Gough Whitlam, in his ALP policy speech, stated that a Labor Government would “work in co-operation with the New South Wales and Victoria Governments for a national park in the Australian Alps” (quoted in Mosley 1992).

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1 This paper is a summary of part of a larger analytical history of the co-operative management of the Australian Alps national parks currently being undertaken. The study is supported by the Australian Alps Liaison Committee and the Centre for Resource and Environmental Studies, Australian National University.
By the 1940s, a number of small reserves had been established in the Victorian and NSW High Country as well as the large Kosciusko State Park. Kosciusko was the most significant development in many ways, only some of which can be touched on here. It was along its border with Victoria and in adjacent areas that the early trans-boundary co-operative measures took place. They were small-scale, informal, and ‘on-the-ground’ in every respect. Bushfire prevention management was of a more formal nature, through the Hume-Snowy Bushfire Prevention Scheme established in 1950 and the Border Fire Liaison Committee.

But by the 1970s, far-sighted individuals were looking beyond their immediate concerns and the confines of their agencies. They wanted ‘to do things better’, and knew that they could. Membership of the informal ‘Kosciusko group’ included Alec Costin, Neville Gare, Roger Good and Bruce Leaver. These people, from NSWNPWS, CSIRO and the recently established Australian National Parks and Wildlife Service (ANPWS), were initially concerned with Kosciuszko, but they were united in their concern for the High Country as a whole. South of the border, Ian Weir of the Victorian Parks Service was receptive to their views. There was support beyond government bureaucracies, not least from the ACF. Support was found at the political level, such as from Terry Sheahan and Bob Carr in NSW and Rod Mackenzie and Joan Kirner in Victoria. It was one of those occasions when the right people came together at the right time, with a concern about the one place, the Australian Alps.

The work of these and other people led to the first formal gathering of Australian Alps parks’ staff at Howmans Gap, near Falls Creek, in October, 1985. Funded by the ANPWS (which was trying to find an accepted place for itself in Australian protected area management) and hosted by Victoria (desperately seeking to establish an Alpine National Park), the meeting brought together policy-makers, planners and managers from the four parks services “to discuss strategies and priorities for co-operative planning and management for national parks and other protected areas in the Australian Alps” (Davies 1986, 1). Large numbers of issues were identified in which the parks agencies could co-operate in the management of the Alps. The discussions produced ‘A Framework for Co-operation’ that gained senior bureaucratic and political support. A start had been made.

The MOU is an evolving document and has been revised on three occasions, with a further revision in preparation. The 1989 revision was essentially to accommodate the granting of self-government in the ACT, making the Territory a signatory in its own right, and the creation of Victoria’s Alpine National Park. The document was signed during a Great Alpine Trek from Canberra to Licola, where the Victorian signing coincided with the proclamation of the Alpine National Park. The 1996 revision made a number of administrative changes, strengthened the nature of the requirements for cooperative management and working arrangements, and added the new NSW Brindabella National Park, extending the protected areas covered by the agreement to the northern limits of the Alps. The 1996 revision also dropped the requirement for a more formal legal agreement to replace the MOU, which up until 1992 had been seen as a temporary measure. The 1998 revision, signed at the centenary celebrations of the Australian Alps first park, Mt Buffalo National Park, contained some important changes. There was a new vision statement, Clause 2.5:

“The vision of the Australian Alps co-operative program is of participating Agencies working in partnership to achieve excellence in conservation management and sustainable use through an active program of cross border co-operation”.

Out of the ‘Framework’ came the ‘Memorandum of Understanding in Relation to the Co-operative Management of the Australian Alps National Parks’ (MOU), signed by the governments of Victoria, New South Wales, and the Commonwealth (on its own behalf and that of the ACT). Its purpose was ‘To pursue the growth and enhancement of inter-governmental co-operative management to protect the nationally important values of the Australian Alps national parks’. The MOU did not alter any existing management responsibilities, but was essentially a mechanism for the agencies to continue doing what they were doing, but doing them better and in a coordinated way. It set out the objectives and the working arrangements to achieve them.

The full story is much more detailed and only fragments can be mentioned here. Also, research has yet to unearth everything and all of those who were involved.
The concept of ‘alpine’ was extended to include the sub-alpine environments. Perhaps of most importance, the requirement for parks and reserves covered by the agreement to be contiguous was removed and replaced by one of inclusion on a biogeographical basis. This moved the concern of the program from a number of discrete units to the entire Australian Alps. A further revision is in progress. It has been agreed that the ACT’s Tidbinbilla Nature Reserve will be added to the program and there has been discussion about including Victoria’s Baw Baw National Park. The latter would take in the most southerly parts of the Alps, but some areas of significance outside existing protected areas are still not included.

The administrative structure of the Alps program is a simple one (Figure 1). The Ministers meet occasionally and the Heads of Agencies usually once a year. The Australian Alps Liaison Committee (AALC) is the one forum set out in the MOU. Its task is ‘to co-ordinate the development and implementation of co-operative work programs and other arrangements under [the] Memorandum of Understanding’, in essence the cooperative management of the Alps national parks. The Committee, comprising a senior officer from each agency, has responsibility for implementing the projects and outcomes of the cooperative management program within the Australian Alps national parks and for the involvement of staff in the program. Being senior officers, they can make decisions on behalf of their agencies, which is essential for the operation of the Committee and the program. The Committee met for the first time on September 11, 1986, in Wodonga, the members being Neville Gare, Roger Good, Ian Weir and Andy Turner.

![Figure 1 Australian Alps Cooperative Management Structure](image-url)
Meeting about four times a year, membership has changed significantly over those years, yet in spite of the changes and the “often different perspectives on park management priorities, there [has been] a strong degree of agreement and consistency in the decision-making of the AALC” (Byrne 1996).

The early 1990s saw important developments for the operation of the program. Of critical importance was the creation of the position of Program Coordinator, the only person employed by the program on a full-time basis. It is unlikely that the program could function without this position, which is filled by secondment from one of the agencies, generally on a rotational basis. Among the person’s responsibilities are managing the program and budget; advising the AALC and agency staff on the program; drafting policies and procedures; and maximizing communication about the program. There is also a part-time Community Projects Officer who is responsible for media releases, managing the Australian Alps web site, and maintaining the profile of the program in the wider community. The implementation of the program is largely undertaken by the working groups, the number and subject areas having varied over the years. At the present time there are four, concerned with Natural Heritage (NHWG), Cultural Heritage (CHWG), Recreation and Tourism (RTWG), and Community Relations (CRWG).

Their work is undertaken in accord with a three-year Strategic Plan, the first of which was introduced in the early 1990s. The purpose of the Plans is to guide the future work of the program and address the major issues in co-operative management of the Alps national parks. The Plan identifies the main areas of work in terms of Key Result Areas (KRA), together with the outcomes, strategic actions and performance measures for each KRA. Four of the KRAs accord with the working groups, Natural Heritage Conservation, Cultural Heritage Conservation, Recreation and Tourism Management, and Community Awareness. The other two are the Australian Alps Development Program and Management Expertise. For each year, there is an annual works program, with the projects designed to meet the objectives of the Strategic Plan.

The works programs and activities of the AALC, including the Program Coordinator and Community Projects Officer, are paid for from a central fund contributed to by the parties to the agreement. Until the end of the 2000-01 financial year, the contributions were $120,000 each from the Commonwealth, New South Wales and Victoria, and $40,000 from the ACT, making a total of $400,000, a budget described as “extremely modest” by an independent review of the program in 1997 (AACM 1997, 31). In spite of the fact that the budget is so small and yet so critical to the integrity of the program, the Commonwealth announced in 2000 that it would end its financial contribution. It was a poor decision for which no clear reason has been given.

As will be indicated, the program is not without its weaknesses, some significant, but it has produced major positive results, for the national parks and other protected areas and those involved in their management. As an external review concluded, the management of the Australian Alps national parks is better with the program than without it (AACM 1997, iv; see also Mackay 1996). So, what can be said to justify such a conclusion?

Many of the papers in these proceedings are concerned with the activities and achievements of the Alps program in the areas of Natural and Cultural Heritage Conservation, Recreation and Tourism Management, and Community Awareness. There is no need to detail them here. But these areas cover only four of the Strategic Plan’s six KRAs. For the fifth KRA, constantly developing the effectiveness and operations of the program is an on-going activity. The program has done much to raise the level of Management Expertise, the sixth KRA, through such activities as the annual field workshops and specialist courses. One of the most interesting aspects of cooperative management has been the facilitation of cross-border law enforcement. In spite of such very tangible achievements, perhaps of most value have been the intangibles, the day-to-day activities and on-ground work, networking, learning from others, peer support, things that are so hard to value in dollar terms but which are so valuable.

What are some of the weaknesses? The regular comments from interviews with people involved with the Alps program have been the lack of time and resources, the inevitable conflict with the agencies’ tasks, and the lack of commitment to the program and recognition of the work undertaken by the agencies. In many respects, the program operates like a voluntary organization, with all the associated pluses and

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3 Further details can be found in the Annual Reports of the AALC and the newsletter, News from the Alps, which is published three times a year.
There has been a lack of implementation by the parks of work undertaken, both in terms of research outcomes and strategies that have been developed. In part at least, this is often due to a lack of clear connection between projects undertaken and park management requirements. This raises the question, among others, as to what contribution the program has been able to make to the park management reviews currently in progress. From the outset, sound research was seen as the essential basis of the program, but there is clearly a conflict between ‘pure’ research and research that is of value to on-the-ground park management. There are continuing issues in particular parks, such as livestock grazing in Victoria, which have implications for the Alps as a whole. Some major cross-border issues have still to be really tackled, such as wild horses and dogs. Given the significance of such issues, the program should be able to take them beyond the level of individual parks to the national level, where they are perhaps more appropriately addressed. There is a continuing lack of involvement in the program by groups outside the park agencies, such as the Victorian Alpine Resorts Coordinating Council and managers of lands adjacent to the parks. There is continuing lack of community involvement, in spite of the requirements of the MOU. Having made these points, it has to be acknowledged that there are problems of widening involvement and/or membership given the statutory responsibilities of the parks agencies.

The future

The achievements of the MOU are considerable, bringing national and international recognition, the IUCN regarding the Alps program as ‘the most advanced operating border park now in existence’.

What of the future? There have been a number of occasions on which the program has made major steps forward, as in the early 1990s and with the 1998 revision of the MOU. Interviews conducted over recent months suggest that the program may currently be on something of a ‘plateau’ and in need of some re-invigoration. In this context, three issues are relevant, though they can be mentioned only briefly.

Firstly, although the MOU is written only in terms of the ‘national significance’ of the Australian Alps, much effort has been expended in establishing their international significance and endeavouring to achieve international recognition. For example, major reviews covering the international significance of the natural and cultural values of the Alps have been prepared for the AALC (Kirkpatrick 1994; Lennon 1999). Secondly, there is the future role of the Commonwealth, not only because of the withdrawal of its funding, but also in the light of the new Commonwealth heritage legislation and the assuming of Commonwealth involvement in the cooperative program by the heritage section in Environment Australia. Thirdly, there is the Victorian-proposed concept of ‘one park’ or ‘one plan’. Whilst nothing is really impossible, ‘one park’ is unlikely, for a whole range of legal, constitutional and political reasons. ‘One plan’ is much more achievable. At present, significant cooperation is taking place with the reviews of the management plans for Kosciuszko and Namadgi National Parks, to be followed by that for the Alpine National Park. Such cooperation is a significant positive outcome, but it could go much further. The next step from these three revisions could be one plan for all the Australian Alps national parks, with sub-sections for each individual park.

‘One plan’ and/or ‘one park’ will take time, but it is a worthwhile goal, whatever the obstacles. But, going back to the beginning, when the pioneers of cooperative management were told they would get nowhere with their ideas, ‘one park’ may well have been the ultimate objective of ‘trying to do things better’.
References


Day One – Mountains Of Meaning
This paper follows a personal life-long interest in mountains, which materialised in climbs and walks on several mountain ranges but, particularly, in the Andes. It is written in this vein.

Introduction

This brief paper has two parts. The first, analyses the mountain environment of the Inca empire, mostly in the Atacama desert of Argentina. The second, records some early motivations of climbers and explorers for exploring mountains, world-wide from the mid-XIX C to the mid-XX C.

Specifically, it explores the life experiences of climbers and their resulting perceptions, which lead to particular meanings for them. These may be the product of intense emotions, derived from the sheer presence of mountains or from the cultural perspective of the observers, be they mystics, climbers or adventurers. The difference between ‘being’ and ‘doing’ the mountains is telling and the paper analyses motivation as a central theme. Furthermore, the socially-constructed meaning of space (Lefebvre, 1991) will be briefly applied to the case of sixteenth century Inca perceptions and use of space in the high Andes, in the Atacama Desert of Argentina, as well as in other cases.

Significant in this evaluation is the cultural interpretation of mountain spaces and their territorial and temporal continuity - and the impressions made upon climbers and mountain visitors. How are the inherent qualities of mountains best understood and apprehended, by which form of involvement and movement? The ultimate purpose of this analysis is to uphold mountains of meaning, by recognising their intrinsic value as icons and resources and so promoting ethical behaviour in users of mountain environments. Collective recognition, by like-minded mountain spirits, should strengthen progressive geo-political policies for the use of upland resources and cultural visitation - the themes of the other two sections of this Conference.

A Conceptual Framework

An introductory framework may help the analysis of the different motivations for activities in mountain environments. Mountains can be variously seen as alluring magnets, as playgrounds for enterprise or as channels of communication. Religious or spiritual meanings have been attributed to prominent mountains for centuries, notable examples being Mt. Fuji in Japan and Mt. Kailash in Nepal. Such peaks engender on-going pilgrimages whether formal or informal, thereby consolidating meaning and safe-guarding cultural practices associated with the mountain. A different but no less powerful attraction, that of climbing to the summit has engendered a separate meaning, based on singular, topographical prominence, measured by comparative statistics whether on height, latitude or geo-physical configuration. Examples are Everest, Aconcagua and Kosciuszko. However, the outcomes of such popularity have been at times devastating, as portrayed in Simpson’s records of the collective attempts to climb Everest during the 1990s. This affects meaning.
In contemporary times, during the XIX and XX centuries, mountains have been seen by Westerners as the playgrounds of enterprise and competition, with motivations ranging from pioneering exploration to sport and recreation, scientific work and commercial exploitation. These have often combined in multi-purpose pursuits, such as frequent European initiatives to spear-head seemingly heroic ventures to other continents, driven by the combined aims of experimental science, the testing of physical endurance and geopolitics. Amongst local populations, such foreign enterprises have promoted either indifference or strong reaction; at times, adhering to the visitors’ aims, albeit in a less intense form, increasing over time. Examples abound, with competitive sporting aims prevailing in British and German groups attempting the ascent of high Andean peaks during the 1890s-1900s while, in more recent decades, the mountains of Borneo have become the scene of commercial exchange in which mountain resources are denuded and geographic conflicts exacerbated. In many such cases, events may have altered the original meaning of mountains and affected their image.

Finally, over centuries, mountains have been communication channels, acting as trade routes, transportation spines or mere convenient territorial linkages between centres of activity. In this function they resemble other recognised cultural routes, such as the extensive Silk route across Central Asia. Examples of mountain channels are routes over passes in Northern India and on to Tibet or those followed by smugglers across the Andes. Mountains, symbolised as ridges, plateaux or passes, often acquire precise meanings, ranging from routes of convenience, to viewing platforms or mystical journeys.

### A. The Inca Empire’s Mountain Settlements

The Inca Empire, during the XV and XVI centuries, extended over a vast mountainous area, which on today’s geopolitical map extends over the Andes from Colombia to the north to Chile in the south, across some 3000 kms. From its high-altitude capital Cuzco, located at 3,300 mts, a strict socio-political and religious system dominated distant indigenous communities. Communications took place through a road system in which two broadly parallel main paths ran along mountainous valleys and ridges, one along the uplands, one near the coast. Their purpose was the enacting ceremonies and rituals and the engagement in commercial exchanges with regional communities. A system of military posts, religious buildings, housing complexes and cattle enclosures dotted the semi-settled area, extending dominant practices into distant peripheral jurisdictions.

Ian Farrington (1992), scholar of Inca archaeology, analyses the symbology of the Inca settlements, stating: “A state such as the Inca, had the opportunity to impose at a broader scale its own perceptions of a ritual landscape which justify and legitimate its own gods, history, social order and authority. It was empowered to transform that landscape by moving people around within it and, indeed, by moving around the land itself in the form of terraces, river and spring modifications, and rock carvings to create the required benign settings for legends to be told and rituals enacted, that the well-being of the empire might thus be preserved”… He added “validation of Inca rule came about through acceptance and performance of commonly understood myths and ceremony” (in Stehberg, 2002).

The Empire had most expert builders and craftsmen who used stone for their finest structures, while potters and metalworkers excelled in the creation of artworks, regal and domestic objects. The Incas established a sophisticated, hierarchical social system, that worshiped mountains as the embodiment of their gods. Through an advanced service infrastructure, and with llamas as carriers of goods, they developed a support system that enabled priests to reach extraordinary altitudes on the highest peaks of the Andes. People, usually young children or adolescents were sacrificed there and buried in deep graves, which became sacred offerings to the mountain gods. Fine objects were ritually buried in the graves.

#### Inca Sanctuaries In The Atacama Desert

The Puna de Atacama plateau is a vast scree desert, located in the NW Argentine Andes, with a base altitude of some 3,000 mts and peaks rising well above 6,000 mts. During the XVI century it was part of the southern end of the Inca Empire and included the highest peaks of the continental Andes mountain range - Aconcagua, Ojos del Salado and Llullaillaco, with altitudes from 7,000 to 6,700 mts. The region has attracted European expeditions since the last decade of the XIX Century, in which the ascent of peaks and scientific observations were the aims. From 1956 to 1965, the eminent Austrian mountaineer Mathias Rebitsch carried out four expeditions to the Atacama desert, to climb remote peaks and search for remains of Inca settlement at high altitude. I participated in three of these expeditions (Joan Domicelj participated in 1965), during which remains of settlement, wood and pots were found on several summits over 10,000 mts.
We explored the ruins on a pass below the summit of Volcan Llullaillaco, at 6,500 mts, which are the highest ruins and ceremonial platforms in the world.

The existence of many high peaks and the distinct geo-morphological configuration of the region of Atacama increasingly attracted scientists and climbers during the late decades of the XX Century. In 1999, an archaeological expedition was carried out to Llullaillaco by the North-American anthropologist Johan Reinhard, assisted by the Argentine archaeologist Constanza Ceruti. After a thorough search, on the mountain summit at 6,715 mts, the group excavated a sacred burial complex in which three mummified bodies were buried. Besides these graves and the ruins below the summit, remains of walls, a cemetery and enclosures for llamas were found at the base and route towards the volcano. The surveys indicated a network of permanent and temporary settlements, staged and equipped for major movements of people, animals and goods, directed towards the mountain.

Inca And Contemporary Meanings
Following the earlier discovery of several other mummies on prominent mountains of Argentina and Chile, the above findings have confirmed the existence of an extended network of ritual sites and burial grounds, a veritable ‘sacred geography’ (Stehberg, 2002). Rebitsch, Reinhard and Ceruti, together with other Argentine and Chilean climbers and scientists, have pioneered the field of high-altitude archaeology, which has given new evidence on the religious practices of the Incas and of the central role of high mountains as the subject of veneration and the offering of life itself, the ultimate, meaningful ritual. Stehberg (2002), while studying other Inca complexes has noted that “Andean men and women perceived that certain places were more important than others”, due to special morphological characteristics coupled with strategic functional factors. These were apparent in the case of Llullaillaco, in both the upper and lower mountain, in which settlements nestled in mountain cavities but also climaxed in platforms with total summit exposure. Pertinent places in cosmological Inca space, each with a particular significance.

Lefebvre (1996) has observed that the production of space, and its transformation over time, requires (a) purpose, (b) process, (c) outcome and, (d) meaning. The seemingly natural and empty space of the Atacama desert, on the evidence available, follows these steps. Its purpose, of satisfying deep religious needs, has been met; the process of production, in using resources and skilled inputs, appears fulfilled; the outcome, measured by the nature and scale of usage is like-wise complete. Finally, the meaning is clear and powerful, from the recent discoveries but also from extensive prior studies of Inca culture and mountain life. The Atacama space, with its many conical volcanoes rising above the upland desert, many with evidence of human presence, has proved to be a ‘spiritual bowl’. The abstract form of its natural space has in a sense given way to a superimposed cultural reality, replete with meaning.

Religious meanings continue to this day, often mixed with Christian beliefs, yet still expressed in ritual ceremonies performed at high altitudes - although not summits. Intricate paths have become folkways of tradition along Andean uplands, also responding to the exigencies of modern life. As for the mountaineers of the Atacama ranges, Ceruti (2000) has noted that, in spite of having no formal archaeological training, they have proved to be respectful of the findings, through spiritual beliefs and understanding. She emphasises the current development of a ‘mystical archaeology’ on mountains, reflecting, no doubt, the prior Inca belief system in a contemporary fashion. Though in modified form, spiritual interpretation of the meaning of mountains continues to evolve in the former territories of the Incas.

B. A Historical Review Of Motivation Towards Mountains

The Inca beliefs in the sacred nature of mountains need to be canvassed within a referential framework of diverse motivations, including the spiritual and practical factors. The purposes of action and contemplation differ, leading either to precise acts or to a more indefinite, experiential presence in the mountains. Popular accounts exalt the ‘attack’ or ‘assault’ on mountains or, their ‘ascent’, thus ranging from militarism to spirituality. Emphasis may be laid on the ‘mountain’, or just on the ‘peak’, the first comprehensive, the second singular. A recent review of the collection of Himalayan Journals at the India International Centre, in Delhi, gave me the opportunity to study its rare book collection, which covers the history of contemporary mountaineering, starting in the early XIX Century. The 545 items in the collection have an understandable Western bias, not without a dose of British, Alpine Club enterprise. Motivations for accessing mountains have varied widely over time and with changing cultural
Circumstances. The seven selected references provide an insight into their diversity over some 100 years, from 1829 to 1935. The authors are Swiss, British and Austrian and they record climbs and explorations in their own countries, in Argentina and widely across Europe.

**Motivations Mid-1800s: Social Enterprise**

Two publications, from Switzerland and Britain respectively, portray quite different perspectives on how mountain environments were affecting the national identity: inclusive and preoccupied with class considerations - the former (Latrobe, 1829), outward-looking and exploration seeking the latter (Kennedy, 1862). Latrobe, in a telling title of ‘Swiss scenery and manners’ shows concern over the effects travellers have ‘upon the morals of the peasantry’, describes the isolated life of young herdsmen and hunters in the valleys, partly as a backdrop for the mountain journeys of ‘pedestrian travellers’. There is, however, a common feature in the alpenstock, the ‘long-iron spiked pole’, viewed ‘not as an unfitting symbol of the pursuits of travellers’. Swiss mountains thus influence the social configuration of the national society.

Kennedy, considers the configuration of mountains themselves in his book entitled ‘peaks, passes and glaciers’ and reviews excursions by members of the British Alpine Club in various European countries. His keen interest lies in detailed description of routes and of instruments for measuring heights and distances and he encourages the geographical explorations of areas beyond Britain. There was then already a preoccupation with the features of mountainous terrains and the technological means to be deployed in overcoming difficulties. In addition, there was early interest in the variety of mountain environments, from Scandinavia to the Pyrenees, in which mountains appear as the structuring element in the geography of exploration.

**Motivations 1900: Global Enterprise**

Two references at the turn of the XX Century portray the adventurous nature of British mountain enterprises. Two prominent British mountaineers, Fitzgerald and Conway, became keen recorders of their climbing adventures in the central Andes of Argentina, as leaders of two separate expeditions. Fitzgerald (1899), in his book ‘the highest Andes’, records the first ascent of Aconcagua, and his own climb. His aim was scientific and his expedition gathered rocks and fossils. A further account details the visits to the area, decades earlier, of noted scientists Charles Darwin and the German Paul Gussfeldt, the latter also an expert mountaineer. He analyses the effects of the local ‘puna’, or mountain sickness, and the difficulties of the ascent to the summit. Conway’s book (1902) records extended climbing, travel and exploration on Aconcagua and in Tierra del Fuego. He also records the first climb of Aconcagua and his own ascent, in great detail, describing the logistical and physical difficulties.

There are commonalities between the two accounts. Both Fitzgerald and Conway were expert climbers on European terrains, but found the high Andes to be a completely different environment. Higher, more isolated and with support of a different cultural nature, these early climbs of Aconcagua became painful exercises in rarefied air. (Having climbed to the summit of Aconcagua myself in 1952, I felt sympathy for these early explorers, equipped in different terms). Organisationally, the British party had Swiss guides and Italian porters, complemented by local guides who best knew the area. These were grand enterprises to foreign mountains, facing new challenges. Though their aims were comprehensive, to reach the summit of the highest mountain in the Americas was clearly of priority and the competitive spirit was high. It was also an early international test for British mountaineering. In this context, the popular meaning of mountains, as in the case of international Himalayan expeditions over subsequent decades, became both exalted and blurred.

**Motivations 1935: Romance And Mechanisation**

Two further references, during the early decades of the XX C, review both the spiritual depth and the technology of mountaineering and its powerful evolution. Irving’s book (1935) is a magnificent history of its evolution, both in philosophical and operational terms. “The Romance of Mountaineering” is the ‘story of the great heritage of adventure and enjoyment’, open to all climbers. He gives the word romance two interpretations, as the story of adventure and ‘of the relationship of mountain to man’, to be experienced in freedom and without mountain guides, in the world-wide playground. He denounced the ‘obsession with new routes’, the ‘mechanisation’ of mountaineering and the pursuit of ‘danger as a cult’. He also questioned the use of oxygen, which he felt was experiential isolation.

Furthermore, Irving strongly stated that ‘mountaineering is not public entertainment’, and that the ‘responsibility for encouraging the highest climbing is an honourable burden’. While remarking from a
British stance on the inclusiveness of honourable mountain pursuits, he acknowledged the contributions to mountaineering of climbers of other nationalities, such as the Germans and Austrians for their precise development of mountain gear and the Italians for their climbing skills. This perspective also affords multicultural interpretations on how driven, emotional or otherwise cool the various groups of climbers were and what value they gave to particular climbs. Irving discusses the ‘intellectual construct’ of mountains, sustained at the time by leading British academics who were also climbers. He added that ‘mountaineering is a means to an end’, thus emphasising the ethical and moral dimension that leads to the character building and honour that true mountaineers should have. Irving thus made a classic contribution to the responsible interpretation of the value of mountains.

A second exponent in this category is Kugy (1934), an Austrian lawyer from Trieste, who wrote his mountain memoirs under the title of ‘Alpine Pilgrimage’. He loved the Julian Alps, the ‘sovereign Alps with the sea beneath them’. Thinking of the Triglav, highest peak of the range, he stated ‘once I had climbed a peak, its spell enveloped me and I haunted its neighbourhood, as if in search of something lost or forgotten’; he was compelled to ‘learn every side and every feature of the mountain’. He did however on occasions use a guide, the formidable Joseph Croux, his servant but also his master on dangerous climbs. Kugy had a truly romantic feeling for nature, and for mountains and their beauty in particular. It was a matter of unencumbered romanticism: mountains give so much that one loves them in return.

**Motivations 1935 : The Distinguished Travellers**

A final reference focuses upon the needs of travellers when mountaineering had become more popular in Europe and new measuring instruments were being made available. These were aimed, as Reeves (1935) put it, ‘for distinguished travellers’, those imbued with the honourable determination to explore. The publication discusses the requirements of surveys and field astronomy and had the support of professional geographers. It is a comprehensive guide for the practical needs of walkers and campers, the early home preparations, health care, coping with disease and injury. It is also a compendium on meteorology, geology, natural history, anthropology and antiquities. No doubt, a precursor of the plethora of current travel guides, but with a clear bias towards coming to grips with untamed natural country, to apprehend new wild space - a prime need for climbers, with an opportunity to extend their field skills.

**Conclusions**

The Inca experience, with its daring incursions to the summits of the Atacama mountains, offers valuable lessons in how wild nature may become appropriated domain and, ultimately, sacred geography. The routes to the summits were strategically staged through obstacles, boundaries and horizons, and were woven into a progression of constructed spaces leading to summits and other destinations. The strong symbolism of the journey was no doubt coupled with the satisfaction of human needs in the harsh environment. Over thousands of kilometres, the Inca roads maintained their function and symbolism through known sequences of mountain spaces, dotted with stations for human occupation which ‘marked’ the land and, no doubt, the minds of settlers and passers-by. There is evidence to say that the strength of mountain scenery transcends cultures and centuries and can be transferred across different mountain environments to engender empathy and respect.

The above-mentioned framework for analysing motivations towards mountains categorised mountains as magnets, playgrounds and channels of communication. There is evidence that, since the 1970s, an awareness of the significance and attraction of mountains has spread more widely, with culturally-based constituencies developing new meanings, sometimes at last based on respect for indigenous beliefs. This has engendered a broader based usage of mountain spaces, with some benefits but also with the potential risk of disruption and the blurring of meaning. Policy encouragement could well be directed towards those cultural interpretations which acknowledge and respect the integrity and dignity of mountain environments and their custodians, whether residents or visitors (the latter, a much better term than tourists).

Such meanings should be culturally sustained, with implications for the environmental protection of mountains, underpinned by the identification of cultural, ecological and spatial thresholds. Spaces related to mountains are naturally ‘appréhended’ by people and, with the right attitude, may then be ‘appropriated’. This requires a comprehensive approach, a common empathy and co-operation amongst those mountain constituencies, which already share this outlook. Recent studies by the NSW NPWS on the cultural interpretations of open space by Macedonian and Vietnamese communities offers promise for
the development of such an approach. The cultural ‘construction of (mountain) spaces’, following Lefebvre, offers an opportunity and a challenge for mountain environments to be better identified, understood and ultimately respected. Appropriately, this spatial approach also calls for a revival in the interpretation of time-cycles, known to indigenous communities but now all but forgotten.

As Kugy said, you love mountains and they’ll offer more.

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Introduction

“Ridges in horizontal view become peaks in vertical view,
And heights differentiate seen afar and at close quarters.
You are not capable to realize the true beauty of Lushan,
Only because you yourself are in this Mountain”

(Su Shi, Yuan Dynasty in The People’s Republic of China, 1995: 110)

For many centuries, mountains all over the World have been the focus of religious veneration and artistic production and are, what could be called, Mountains of Meaning. These are mountains that have special meanings or spiritual values attributed to them, or places that inspire creative works or thoughts.

The purpose of this conference is to celebrate mountains. There can, perhaps, be no greater accolade than for a mountain to be included on the UNESCO’s World Heritage List.

“sacred mountains are the World Heritage sites that enshrine the highest physical and spiritual values”

(Bernbaum, 1997:34)

There are four major aims of this paper. Firstly, to review the mechanisms that are in place to accommodate the inclusion of Mountains of Meaning on the World Heritage List (List). This will involve an examination of the criteria for World Heritage inscription that allows for the inclusion of non-material, intangible heritage values on the List. Secondly this paper is to look at Mountains of Meaning that have been included on the List and to consider their outstanding, intangible heritage values. Thirdly, this paper will look at World Heritage mountains that have intangible cultural heritage values ascribed to them but which are not inscribed on the List for such values.

Fourthly, this paper will consider the types of Mountains of Meaning that might be included on the list in the future and in particular those that might be included for their ‘inspirational’ qualities rather than their spiritual associations. This last section of the paper will consider some theory associated with the selection of such places and posit some questions for further reflection.
Review of World Heritage Inscription

The World Heritage Convention- properly entitled The Convention Concerning the Protection of the World Cultural and Natural Heritage, (the Convention) was first adopted by UNESCO in 1972. It is an international treaty that endeavours to identify and protect the natural and cultural heritage of ‘mankind as a whole’ that is of ‘outstanding universal value’.

The Convention identifies two types of heritage that can be included on the World Heritage List (List) natural and cultural.

Article 1 of the Convention identifies the types of cultural heritage to be included: monuments, groups of buildings and sites, ‘sites’ are:

“works of man or the combined works of nature and man, and areas including archaeological sites which are of outstanding universal value from the historical, aesthetic, ethnological or anthropological point of view” (UNESCO, 1972).

Article 2 of the Convention identifies the types of natural heritage to be included: ‘natural features’, ‘geological and physiographical formations’ and ‘natural sites’. Natural Sites are:

“natural sites or precisely delineated natural areas of outstanding universal value from the point of view of science, conservation or natural beauty” (UNESCO, 1972).

It is these two types of sites that are relevant to the inscription of Mountains of Meaning on the World Heritage List.

In order for a property to be inscribed on the World Heritage List it is nominated under one, or more, of four natural or six cultural criteria or a combination of them both. These criteria are the benchmark for the inclusion of properties on the List.

Cultural criterion (vi) is the World Heritage cultural criterion that is used to identify non-material, associative, intangible heritage values of places/’sites’. Intangible heritage value is an ascribed value that is related to an association with a place. It is the “special connections that exist between people and a place”1 and the meanings that people attribute to a place; often this is related to a spiritual association.

(vi) be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance (the Committee considers that this criterion should justify inclusion in the List only in exceptional circumstances and in conjunction with other criteria cultural or natural) (UNESCO, 2000)

Natural criterion (iii), like cultural criterion (vi), can be interpreted as a criterion that identifies ‘intangible’ heritage values of a place:

N (iii) “Contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance” (UNESCO, 1994).

Natural criterion (iii) is included in the Operational Guidelines for the Implementation of the World Heritage Convention (Operational Guidelines) (UNESCO, 2000) under the criteria for the inclusion of natural properties on the List. The assessment of ‘exceptional natural beauty’ is, however, a cultural construction, or social preference and it must therefore be considered as an intangible cultural heritage value, not a natural one.

Mountains of Meaning can be included on the List as cultural ‘sites’. This includes individual places and also the sub category of cultural landscapes developed by the World Heritage Committee in 1992.

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1 The Australian ICOMOS Burra Charter, 1999, para 1.15
There are three types of cultural landscape categories defined by the Operational Guidelines but it is the ‘associative’ cultural landscape that is of interest in relation to *Mountains of Meaning*:

“The inclusion of such landscapes on the World Heritage List is justifiable by virtue of the powerful religious, artistic, or cultural associations of the natural element rather than material cultural evidence, which may be insignificant or even absent” (UNESCO, 2000)

The category of associative cultural landscapes encapsulates two types of landscape that have come to be known, within World Heritage circles, as ‘spiritual’ ie those with religious associations and ‘inspirational’ ie those with artistic or cultural associations. It is these types of landscapes, in addition to individual ‘site’ based nominations, that might be used to identify *Mountains of Meaning* for inclusion on the List.

Of places already considered as, World Heritage, associative cultural landscapes, only Tongariro National Park, New Zealand, Uluru – Kata Tjuta National Park, Australia and the Lake District National Park, UK are associated with *Mountains of Meaning*.

Tongariro National Park in 1993 and Uluru-Kata Tjuta in 1994, were inscribed on the List as ‘spiritual’ landscapes because of their significance to their indigenous communities and their associated belief systems and were the first to be recognised as associative cultural landscapes.

The Lake District National Park, is being proposed to the List as an ‘inspirational’ cultural landscape because of its associations with Wordsworth and the Lake Poets. This will be the first landscape to be evaluated for these types of ‘inspirational’ values and will set a precedent in World Heritage practice.

It is the ‘associations’ in these landscapes that represent the ‘non-material’, or ‘intangible’ heritage values of ‘associative’ cultural landscapes and which facilitate the inclusion of mountain landscapes on the List.

**Mountains of Meaning – Listed Intangible Heritage Values**

In addition to the mountains included in the associative cultural landscape inscriptions of Tongariro, and Uluru - Kata Tjuta, seven *Mountains of Meaning* have been included on the List for their intangible cultural heritage associations. All these mountains have been inscribed using cultural criterion (vi) and some have been inscribed using natural criterion (iii) for their ‘exceptional natural beauty’.

The use of cultural criterion (vi) and natural criterion (iii) together, which reflect the intangible heritage values of a place, illustrates how closely natural places and cultural values are related.


Mount Taishan:
Mount Taishan is in the Province of Shandong, China. It has played an important part in the cultural and religious history of China since the 17th century B.C. and is the most sacred of the five sacred mountains in traditional China. The mountain is most importantly associated with the Confucianism. Taoists and Buddhists also consider the mountain to be sacred (IUCN, 1987). It is also associated with artistic/literary works and is the place where a new form of Chinese calligraphy occurred in 219BC (ICOMOS, 1987).

Mount Taishan was inscribed on the list for its natural values under natural criterion (iii) as:

“Superlative natural and cultural beauty. Mt Taishan is a majestic site, its dense forests and ancient temples complementing each other”

(IUCN, 1987)

Thus, in this inscription the inspirational link of man and nature is recognised.
Mount Lushan:
Mount Lushan is an area in the Jiangxi Province and was the first of the Chinese sacred mountains to be the inspiration for artistic works. Lushan was the home and inspiration to great Chinese poets, painters and calligraphers. The pioneer of the Chinese sect of Buddhism also worked at Lushan (ICOMOS, 1996). Mount Lushan is inscribed under cultural criterion (vi) for these inspirational and spiritual associations. It is not, however, inscribed for its natural values which are not considered to be of "outstanding universal value".

Mount Emei:
Mount Emei is another of the five sacred Chinese Mountains it is in Sichuan Province and it was inscribed for both its cultural and natural values (but not for its natural beauty). It was described by ICOMOS as:

"an area of exceptional cultural significance, since it is the place where Buddhism first became established on Chinese territory and from where it spread widely throughout the east. It is also an area of natural beauty into which the human element has been integrated with skill and subtlety, to produce a cultural landscape of outstanding quality”.

(ICOMOS, 1996)

There are more than 30 temples on Mount Emei some of them very ancient and they reflect the sacredness of the mountain and of the relationship between the man made and natural elements.

Mount Wuyi:
The justification for the inscription of Mount Wuyi under cultural criterion (vi) was:

"Mount Wuyi was the cradle of Neo-Confucianism, a doctrine that played a dominant role in the countries of Eastern and South-Eastern Asia for many centuries and influenced philosophy and government over much of the world.

(WHC-99/CONF.209/22)

and under natural criterion (iii) for

"The riverine landscape of Nine-Bend Stream (lower gorge) is also of exceptional scenic quality in its juxtaposition of smooth rock cliffs with clear, deep water.”

(WHC-99/CONF.209/22).

It is interesting to note that cultural criterion (vi) and natural criterion (iii) are used together to capture the natural beauty and the sacred values of this Chinese Mountain of Meaning as it was with Mount Taishan.

Mount Qincheng:
Mount Qincheng, Sichuan Province, was the place that (in 142 CE) Zhan Ling founded the doctrine of Taoism, which has been a long standing religion of East Asia. Later temples were built on Qincheng and it became the centre of Taoist teachings. (ICOMOS, 2000). Qincheng is not inscribed for any natural World Heritage values.

A brief analysis of the Mountains of Meaning in China show that they are closely related to some of the major religions of the world, Buddhism, Hinduism and Taoism. Their natural beauty and elevation attracted the holy men of these religions and in turn these attracted pilgrims, artists and writers to capture the sacredness of the place in artistic forms.

These then are truly Mountains of Meaning and have been included on the World Heritage List, not as cultural landscapes, although some of them combine “the highest physical and spiritual values” (Bernbaum, 1997:34), but as individual ‘sites’ as defined by the Convention.
In Europe there are two mountains that have been inscribed for their spiritual values and associations, Mount Athos, Greece and Mount Sinai, Egypt (St Catherine Area)

Mount Athos:
Mount Athos was inscribed under cultural criterion (vi) because of its spiritual association which have existed since 1054 AD and because of its influence on the Orthodox art. (UNESCO, 2002)

It was also inscribed under natural criterion (iii) by the Committee because:

“The Committee accepted the ICOMOS proposal to add natural criterion (iii) - outstanding universal value from the point of view of natural beauty - to cultural criteria, since this site involves a humanized landscape the characteristics of which are due to persistence of farming practices and traditional arts and crafts linked to the stringent observance of monastic rules” (SC-88/CONF.001/13)

Mount Sinai:
Mount Sinai was inscribed on the World Heritage list in 2002 under cultural criterion (vi) because of its associations with Christianity, Islam and Judaism.

“The St Catherine’s area, centred on the holy mountain of Mount Sinai (Jebel Musa, Mount Horeb), like the Old City of Jerusalem, is sacred to three world religions: Christianity, Islam, and Judaism.” (WHC-02/CONF.202/25).

Mountains of Meaning – Unlisted Intangible Heritage Values

There are many mountains inscribed on the World Heritage List, which although imbued with sacred or spiritual values are inscribed only for their natural values. Mount Everest also known as Sagarmatha in Nepali, “whose head touches the sky” (Nepal, 1979) in Sagarmatha National Park, India, the highest place in the world, is one such mountain. It was inscribed in 1979 not for its sacred values but for its natural values under natural criterion (iii) including its exceptional natural beauty.

In spite of the fact that Mount Sagarmatha was inscribed for its natural values alone, to the local Sherpa people who call it Chomolangma, “Goddess Mother of the World” (Nepal, 1979) it holds spiritual values. Thus, Sagarmatha National Park could also have been inscribed using cultural criterion (vi) to reflect the intangible, spiritual value of these mountains and the interaction of man and nature.

Another such mountain on the World Heritage List, inscribed in 1988 for its natural values alone, is Nanda Devi in Nanda Devi National Park. Nanda Devi is in the Indian part of the Himalaya and these mountain landscapes are referred to in ancient Hindu scriptures as “Dev Bhumi” the land of the Gods (Ramakrishnan, 2000).

by this I mean national governments signatory to the World Heritage Convention.

It contains unique, rare or superlative natural phenomena, formations or features of areas of exceptional natural beauty. There can be no doubt that their unsurpassed elevation qualifies Sagarmatha and the Great Himalayan Range as unique. In addition, the park includes a mountain complex of superlative grandeur, beauty and challenge complemented by cultural elements of great interest” (Nepal; 39, 1979)

it is a sacred mountain. Sherpa culture has developed in close association with the mountains in the area and it is reflected in their folklore and belief systems. (Sherpa, 2001).
With these two examples alone, it can be seen that *Mountains of Meaning* exist within the World Heritage List beyond those explicitly inscribed for such meanings. Other mountains inscribed on the World Heritage List for natural values alone, but which have recorded spiritual values, are: Mount Kinabalu, Malaysia, Mount Kenya, Kenya and Yakushima, Japan and there are undoubtedly others. There is a need for States Parties to the Convention to consider an extension of the World Heritage values of some of these mountains. These should include consideration of intangible heritage values, of outstanding universal value, under cultural criterion (vi) in order that a true reflection of their cultural significance is provided.

**Inspirational Mountains of the Future**

The final part of this paper will briefly consider the inclusion of ‘inspirational’ mountains, or mountain landscapes, on the World Heritage List. It will highlight issues that might arise when attempting to inscribe such mountains on the List because of their intangible heritage values associated with artistic or literary works.

The Lake District National Park, UK, is being proposed for inscription partially on the grounds of its inspirational qualities (Department of Culture Media and Sport, 1998, 2002). Mountains that could be given the same consideration, and have been mooted in World Heritage circles for inscription are, Montagne Saint Victoire, France, the mountain Cezanne painted many times, and Mount Fuji, Japan, which has been the focus of much art work, as well as a focus of spiritual values.

One of the major issues concerning ‘inspirational’ landscapes and places such as mountains, is the theoretical and methodological process to be used in their identification. It will be recalled that no ‘inspirational’ landscapes or mountains have yet been explicitly inscribed on the World Heritage List.5 These landscapes are identified because “of the powerful...artistic or cultural associations of the natural element” and inscribed using criterion (vi) “be directly or tangibly associated with...artistic and literary works of outstanding universal significance”

Dr Henry Cleere, former World Heritage Convenor of the International Council on Monuments and Sites (ICOMOS), which evaluates cultural properties and makes recommendations to the World Heritage Committee for inscription, said the following of the assessment and inclusion of ‘inspirational’ landscapes:

> “The evaluation of landscapes with artistic or cultural associations remains to be considered by ICOMOS. The basic criterion must surely be that of the ‘outstanding universal value’ of the artist concerned. The success of a hypothetical nomination of the Montagne Sainte Victoire would depend upon the evaluation of the universal significance of Cezanne who painted it so often...This is an aspect of the concept of associative cultural landscapes that requires long and deep consideration, and by an organization other than ICOMOS, which is not equipped to pronounce upon matters of non-material culture of this kind”

(Cleere, 1995:56).

The idea of the artist being of ‘outstanding universal value’ highlights some crucial issues in the consideration of ‘inspirational’ landscapes and mountains for inclusion on the List. Using the theories of the French sociologist, and theorist, Pierre Bourdieu (Bourdieu, 1993) these issues can be looked at in a more dispassionate way.

Cleere (1995) has suggested that, through the mechanisms of World Heritage inscription, the ‘consecration’ of the artist (ie being of outstanding universal value) confers ‘sacredness’ on a landscape or place depicted by such an artist (ie its inclusion on the World Heritage List under cultural criterion (vi)) Bourdieu would argue that the merit of the artistic creation lay in the representation, not in the thing represented. This also raises the issues of cultural production and the acceptance of the art-work as a

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5 Mount Lushan, China was inscribed in 1996 and was recognised by ICOMOS as a cultural landscape of outstanding aesthetic value and ‘powerful associations with Chinese spiritual and cultural life’ but this has not been formally recognised by the World Heritage Committee (WHC-96/CONF.201/21).
fetish, ie art is only considered to be art, if the artist is known (Bourdieu, 1993). Thus, inspirational qualities of landscapes and places are only valid if they inspire great artists to produce art.

The identification of artists of ‘outstanding universal value’, in World Heritage evaluation, plays to the ‘charismatic ideology’ as Bourdieu calls it, that of the artist as the genius (Bourdieu, 1993). With this follows the World Heritage Committee’s approach that if the artist is not of ‘outstanding universal value’ then the subject of his/her cultural production will be unworthy of consideration.

A question to be asked is, is the World Heritage Committee including mountains, landscapes and places on the List that are admired, on purely aesthetic grounds, and is it using the connection with a ‘consecrated’ artist to construct some form of ‘bar’ or ‘cultural bench mark’ in order to justify their identification and evaluation for inclusion on the List? Conversely, would the World Heritage Committee inscribe a landscape used as a subject by a ‘consecrated’ artist in his/her ‘cultural production’ if the Committee did not admire it on aesthetic grounds? A linked but very important question is ‘what is the methodology of choosing one ‘consecrated’ artist and their field and subject of cultural production over another?’

These theories of Bourdieu are ones that I present to you as food for thought in relation to inspirational qualities of mountains, landscapes and places for inclusion on the World Heritage List and ones that need further detailed consideration by the World Heritage Committee and its Advisory Bodies, including ICOMOS.

It may perhaps be more constructive to think of the art works themselves as ‘indicators’ of the intangible values associated with a mountain or landscape rather than the artist who made them as holding the ‘outstanding universal value’. If this approach is adopted, what it is that makes a place special and therefore justify its inscription on the World Heritage List, must still identified.

Conclusion

The World Heritage Convention has, through its inscription process, identified Mountains of Meaning for inclusion on the World Heritage List. The protection of the values for which a World Heritage property is inscribed is a key issue in the management of a World Heritage area.

The protection of intangible heritage values is no less of an issue, but poses more of a problem, than for example, the protection of material fabric or wildlife habitat. To protect the meanings and associations of a Mountain of Meaning requires, not only the protection of the natural landscape from inappropriate development, or natural erosion, but also the protection of the culture that ascribes meanings and associations to that location. In the case of all the Mountains of Meaning discussed in this paper, this would require the continuity of religious/spiritual practice and observance at these mountains. This is, of course, without the power of any State Party or International body and highlights the mutable quality of intangible heritage values and how they may change over time as different groups ascribe different values. The suggestion here, therefore, is that it is not possible to protect the intangible heritage values of a place through the World Heritage List but only record their currency. This posits a wider question as to whether the World Heritage List should be reviewed on a cyclical basis to ensure the authenticity of its inscriptions. Unfortunately this is not something that I can explore this afternoon and must be the subject of another paper.
Table 1: Mountains Discussed in Text Illustrating Criteria for Inscription and Identified Values

<table>
<thead>
<tr>
<th>Property</th>
<th>Cultural Criterion</th>
<th>Living Traditions</th>
<th>Ideas</th>
<th>Beliefs</th>
<th>Artistic/Literary Works</th>
<th>Natural Criterion</th>
<th>Beauty</th>
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<tr>
<td>Mount Tai Shan China #437, 1987</td>
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<td>x</td>
<td>(iii)</td>
<td>(iv)(v)</td>
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<td>(v)</td>
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<td>(iii)(vi)</td>
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<td>(iii)</td>
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References


UNESCO World Heritage Committee Documentation

SC-88/CONF.001/13


WHC-02/CONF.202/25

Decisions Adopted By The 26th Session Of The World Heritage Committee Budapest, Hungary, 24 - 29 June 2002.

WHC-99/CONF.209/22

I’m here to talk about celebrating mountain heritage – its Facts and Fantasies – its Myths and Legends – its associations and meanings – or rather one legend in particular and its expression today. In doing so I shall touch briefly on such expressions elsewhere and possible tensions or conflicts that may arise in the management of such associations and meanings.

This ballad, *The Man from Snowy River* was written by Andrew Barton Paterson – ‘Banjo’ Paterson - in 1895. The publication sold out within a week and the poem forms part of Australia’s myth and national cultural identity (as mentioned by Jane Lennon in her paper). It is worth noting that a legend is a non-historical or unverifiable story handed down by tradition from earlier times and popularly accepted as historical.

I will return to the poem later, for the focus of my paper is Craig’s Hut. Found in the Alpine NP above Mansfield in Victoria just beyond the Mt Buller ski resort, Craig’s Hut sits high on a ridge in a spectacular alpine setting with fine views of Victoria’s high country and of Mount Cobbler. The hut itself is said to be a replica of a pioneer’s hut.

Craig’s Hut was built in 1982 as a replica of a pioneer hut for the Australian film *The Man from Snowy River*, then in a sequel film and television series. The hut was later rebuilt in 1995 as a tourist attraction. In Mansfield pictures of Craig's Hut are displayed prominently, featuring in posters in shop windows, post cards, and on the front of tourism information materials.

However, the hut is not a replica, neither its form nor its location replicate the construction of a pioneer or mountain hut and its siting on a mountain ridge exposed to the weather is not where any self-respecting pioneer and Mountain Cattleman would locate any such structure. Also, the graves around the hut are fake.

Craig’s Hut was found to have social value in the Regional Forest Agreement process that included consultation with communities about their heritage values (Context 1997). Both the Mansfield community and others, in fact the High Country community generally clearly found it the most important
of all the Mountain Huts; the statement of significance drafted for the Australian Heritage Commission Register of the National Estate outlines its heritage values:

Craig's Hut is of aesthetic significance because of its aesthetic appeal, spectacular setting and evocative association with a major Australian film. The Hut is constructed in a bush vernacular style in a dramatic mountaintop location with extensive panoramic views. It is a replica of a pioneer's hut built for the film 'Man from Snowy River' in 1982 and later rebuilt as major tourist attraction. The hut is frequently visited by the local community and others because of its values, and is depicted in tourism publications. (Criterion E1)

The legend of The Man from Snowy River is an interesting example of myth-making and its role in forming cultural identity, even in nation-building. The poem itself was at a time of intense discussion at the end of the 19th century regarding the Australian character. Paterson and Henry Lawson, both writing for The Bulletin at the time, were debating the urban character and the Bush Myth with Paterson fostering the notion of the Bush Man - the larrikin - the anti-authoritarian, egalitarian Australian we so treasure as part of our identity today. It was only 20 years later that the ANZAC story took place to add to this legendary aspect of the Australian personality.

Even the horse in the poem reflects this character:

He was hard and tough and wiry – just the sort that won’t say die –
There was courage in his quick impatient tread;
And he bore the badge of gameness in his bright and fiery eye,
And the proud and lofty carriage of his head.

The poem The Man from Snowy River very clearly expresses this aspect of the Australian character. It must be noted that even at the time of writing it was as a symbol, not as an account of any true event. Nonetheless its very iconic nature has meant that its meaning is repeatedly revisited and used, such as the films in the 1980s, taking place at a time when we celebrated our Bicentennial. The 1980s was also the height of the conflict in Victoria regarding ongoing cattle-grazing in national parks, something that had ended in New South Wales in the late 1960s.

It is still revisited, such as recently in other Mountain celebrations, for example in the adoption of The Man from Snowy River as its own in Corryong in North East Victoria, which has an annual Man from Snowy River Bush Festival, as well as a Man from Snowy River Museum. The town also claims one of its own, Jack Riley, as the original Man from Snowy River. This claim is hotly debated, with many other individuals also identified as the original ‘Man’.

I do not wish to debate whether such appropriations of the Man are genuine celebrations or cynical commercial uses to tempt cultural tourism. But it is clear that the Man from Snowy River is now a cultural icon expressed not only in poem, film but in spectacular events, such as seen in the 2000 Olympics in Sydney and since at the Sydney Royal Easter Show in 2001 and 2002 as well as in a recent musical. Even the names at the venue of this conference, The Station Resort, reflect the remance of the High Country Cattleman. And its expression in a place such as Craig’s Hut.

There are other examples of building new places to express symbols and cultural icons that have influenced cultural identity and how a nation sees itself:

A famous one is the Romantic neo-medieval castles built by mad Ludwig II of Bavaria, such as Neuschwanstein built in the foothills of the European Alps. Built in 1869, Neuschwanstein is a fantasy castle decorated in images that draw on Nordic sagas that supposedly took place many hundreds of miles from Bavaria along the Romantic Rhine. Ludwig's obsession influenced Wagner as seen in his Nibelungen Lied operas. Such symbols of the past came at the time of the unification of Germany under Bismarck for the first time ever in 1871. Again later such symbols were taken up and favoured by Nazi Germany.
Such romantic notions of nation were also used elsewhere such as in Hungary and the Czech republic later in the 19th C to stake a claim of cultural identity separate from the domination of the Austrian Empire. Churches, palaces and public buildings were nationalistically decorated with heroes from medieval mythic sagas staking claims to the land and a past based on ethnicity and autonomy.

Such reference to and use of past myths is also seen in the appropriation of an extant place for rituals and celebrations without historical fact. A well known example of this is found at Stonehenge with the Druid festivals at the summer solstice that started in the 19th century. Today Stonehenge is as well known for its New Age symbolism including the ongoing Druid ceremonies as for its historic and archaeological importance.

Much of this myth has thus now become fact, even protected as heritage, telling historical stories of past social value. For example, Neuschwanstein has a huge annual visitation with most people totally unaware of or ignoring the nearby real castle ruin dating from the Middle Ages on the nearby hillside.

Similarly in South Africa in Zululand, the ‘fake’ village of King Shaka, Shakaland, attracts more visitors than the many villages with impoverished Zulu in the surrounding landscape (p. comm A Hall, Nov 2002).

Does such mythologising matter? Lowenthal confirms in his article “Fabricating Heritage” (no date) that:

> “Heritage should not be confused with history. History seeks to convince by truth, and succumbs to falsehood. Heritage exaggerates and omits, candidly invents and frankly forgets, and thrives on ignorance and error. Time and hindsight alter history, too. ... Heritage uses historical traces and tells historical tales. But these tales and traces are stitched into fables closed to critical scrutiny.”

I am not sure that this is how heritage significance is viewed in Australia but Lowenthal reminds us of Renan's statement to his fellow French:

> Getting its history wrong is crucial for the creation of a nation and that Australians are said to spend more of their spiritual energy in quests for enshrined symbols of identity than in any other pursuit; worship of the past in Australia is one of the great secular religions.

Certainly this is manifest at Craig's Hut, which has probably a higher visitation that the approximately 200 'real' mountain huts in the Australian Alps and mountains; some of them, a few, pre-dating Paterson’s poem of 1895, such as Wallaces Hut also in the Alpine National Park dating from 1889, or Bluff Hut that was built much later but is still a working Mountain Cattlemen’s Hut, or other genuine remnants of Mountain Cattlemen’s way of life such as Wonnangatta Station.

Such mythologising or fabrication of the past may matter when it comes to the allocation of resources and community energy, for example, Craig’s Hut has an active 4WD club that maintains it regularly. Some historical huts have similar Friends Groups co-ordinated by Parks Victoria, but very few of them, and they all urgently need maintenance and active care.

This situation potentially creates conflict and tension between the real and the recreated – the fact and the fantasy – and is a problem to heritage managers in deciding how do deal with it. As such, whilst I find the associations and meanings of Craig’s Hut living evidence of our cultural icons, I am also aware the Paterson’s ballad is itself NOT history, but is part of a fabricated heritage that was created in the name of national identity. I trust therefore that Craig’s Hut and its like serve a purpose as a symbol, but not hopefully at the expense of those places with authentic fabric.
Postscript

A postcard seen at Jindabyne during the conference show Craig's Hut as one of a series of photographs titled "Kosciuszko National Park" a fine example of how the myth of the Man from Snowy River is now transcending even its location as a physical symbol in Victoria!!

References

I acknowledge the comments and ideas for this paper from Kristal Buckley, Meg Goulding, Tracey Ireland, Julie Ramsay and Andrew Hall of South Africa.


Lowenthal, D (no date) "Fabricating Heritage" History and Memory Volume 10, Number 1.
Day One – Mountains For The Future
The Mountain Mires Of Southern New South Wales And The Australian Capital Territory: Their History And Future

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Abstract

The southern tablelands and alps of New South Wales support the most varied and extensive peatlands and mires of mainland Australia even though conditions today are marginal for mire growth. Mires huddle in valley bottoms particularly where there is run on and deep soil mantles to bring them water. Peat has accumulated with average depths of 1-3m although greater depths of up to 8m of sedge peat occur in a few cases. The mires are sensitive to trampling and drainage but are important for moderating runoff and maintaining summer flows in streams.

The peat-bearing mires are unusual in generally eroding mountain landscapes because they preserve their own history in the organic matter that accumulates in them. Many bogs formed as a result of post-glacial climate change about 12-8000 years ago when increasing rainfall offset the drying caused by rising temperatures. Drier conditions in the last 5000 years has seen some bogs cease to grow while for others there have been a major growth phase over the last 2-3000 years. Charcoal in the peat shows that the catchments have always experienced fire but an analysis of the last 9000 years in most sites shows that the largest change occurs with the arrival of European settlers, their grazing animals and weeds.

Bibliographic Note

Geoffrey Hope is Professor of Natural History in the Department of Archaeology and Natural History, Research School of Pacific and Asian Studies, Canberra. He studies peatlands in Australia, Southeast Asia and the Pacific as sources of records of environmental change and the history of human impact. In addition to his work in southeastern Australian mountains he has worked extensively in the above treeline communities of Papua and Papua New Guinea and visited mountain mires in several parts of the world.

Peatlands in Southeastern Australia

Australia is a temperate to tropical continent of high evaporation, unreliable rainfall and relatively subdued relief. Except in the coolest and wettest areas organic matter produced by vegetation will decay. The accumulation of peat or humus requires permanent inflows of water to maintain waterlogged conditions. Accordingly, almost all peat forming mires in Australia occupy low places in the landscape, and are termed topogenous mires (caused by topography). Other than estuarine infills, it is in wet, cool montane areas that low gradient valleys develop mires and peats may form. Near the alpine treeline these valley sites may extend onto gentle slopes to form ombrogenous (formed by cloud) blanket bog. There are almost no large raised bogs in Australia, in contrast to the cold wet areas of northern Europe, North
America, southern Chile and southern New Zealand where sedge or moss bogs may be many thousands of hectares in extent, and often over 8m in depth. The average topogenous montane mire in southern New South Wales preserves 1-3 m of peat, emphasising the very marginal conditions for peat growth in Australia.

New South Wales is thus poor in peatlands, and the variety of types is not as great as in other countries. Nevertheless there is a rich mire flora and a wide range of vegetation communities, many growing in isolation from the nearest similar vegetation. The peatlands of Australia have been only briefly described (eg Campbell 1983, Kershaw et al 1993, Whinam et al 1989, in press) and merit further study. Although the total area covered by peatland is only small (<2% in the subalpine), the ecosystem is distinguished by preserving a record of the development of the site and surrounding vegetation in the organic remains. Peatlands are thus archives whose records are only beginning to be read.

Raw peat consists of up to 90% water, and peatlands are very efficient at trapping rainwater or surface flow. Dr A. Costin (pers. comm.) regards peat deposits as important in New South Wales and Australian Capital Territory catchments because they moderate runoff and, being thermally insulating, retain warmer groundwater than would otherwise be the case. For example Snowy Flat Bog is yielding 2.1 megalitres per day after 6 months of drought (A. Wade pers comm.). Water moves through peatlands as groundwater, in narrow deep channels or across the surface in wide shallow channels floored by depressions (Siegel 1992). The surface vegetation filters out mineral sediment and releases clear water, although it also uses up water in transpiration. The fibrous surface vegetation and top sediment layer are tough and resistant to erosion, which is often not very active on the flats and gentle slopes (Wimbush and Costin 1983).

Many terms exist to describe peaty wetlands, for example, bog, fen, mire, moor, marsh, swamp, morass. Of these, only bog, fen and moor have specialist definitions (Birks and Birks 1980, Bridle 1993):

**Bog:** characterised by complex vegetation with little free water surface: stagnant water; usually acidic and of low nutrition

**Fen:** simple vegetation with some open water: groundwater is moving and mineral matter often present, giving better nutrition.

**Moor:** simple sedge or open sedge-shrubland on slopes with shallow muck or fibrous peats: forming an organic soil.

In the absence of data on nutritional status, the terms are best used in relation to the structure of the major vegetation community on the site. Bogs may have cushion plants, including mosses, and often low shrubs or even trees. Fens have graminoid (grass-like) plants, especially sedges (Cyperaceae) or rushes (Juncaceae, Typhaceae, Restionaceae). However, grass or sedge bogs are known, for example *Gymnoschoenus* (button grass) bog, in which densely packed graminoid hummocks provide a complex structure.

Definitions of organic deposits are complex and highly variable internationally (Bridle 1992), because they can be viewed as sediments, soils and biological systems. Classifications of peatlands may include the physical peat typology, floristics, topographic setting, water inputs and chemistry (Moore 1984). Peat is one of several types of organic sediment which form from the dead remains of plants, both large and microscopic, almost always accumulating in permanently waterlogged conditions in which breakdown is hindered. The presence of a high proportion of organic material creates reducing conditions which prevent microbial action, and the porous, relatively light matrix retains water readily. This moisture allows continued accumulation of organic matter. Peat is not just dead sediment but is also a component of a living ecosystem, the net production of which forms the substrate on which the living part depends. The surfaces of organic deposits provide specialised habitats for plants and animals tolerant of aquatic, or wet, reducing conditions. An organic deposit preserves some of the remains of plants and animals that have lived there through the period (or periods) over which the deposit forms. In this paper the term “peat” will be used for all organic sediments containing >40% dry weight of organic material. Moore and Bellamy (1974), define peat types more precisely. A peatland is an area in which at least 40 cm of peat has accumulated.
The vegetation forming the organic material varies according to availability and nutritional status of the water (Table 1). At one extreme, bogs dominated by slow growing mosses occur in very wet, cool climates in sites where groundwater is minimal, so that growth depends on nutrients brought in with rain water. Peat formed in these bogs is termed "terrestrial". If increased nutrition, for example from groundwater, is available, shrubs and sedges will invade and co-exist with the moss, or exclude it. If the watertable occurs at the surface for a substantial time, many shrubs will not survive, and shallow rooted sedges, grasses, twig rushes etc. will form an open cover. Peat forming at the watertable is termed "telmatic". Finally, in deeper water, aquatic species such as cumbungi (bulrushes), reeds, sedges, water lilies, strap rushes and pond weeds will dominate, and the organic material will contain plant debris and organic muds (limnic or lake sediment).

Table 1: Characteristics of organic deposits in southern Australia.

<table>
<thead>
<tr>
<th>Surface vegetation</th>
<th>Moss cushions</th>
<th>Heath</th>
<th>Sedge fen</th>
<th>Open water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface sediment</td>
<td>Fibrous moss</td>
<td>Wood peat</td>
<td>Fibrous sedge peat</td>
<td>Organic mud</td>
</tr>
<tr>
<td>Deep sediment</td>
<td>Humic peat</td>
<td>Humic peat</td>
<td>Humic peat (amorphic)</td>
<td>Organic mud (gley typa)</td>
</tr>
<tr>
<td>Water Table</td>
<td>Raised</td>
<td>Near surface</td>
<td>At surface</td>
<td>Above surface</td>
</tr>
<tr>
<td>Surface peat type</td>
<td>Terrestrial</td>
<td>Terrestrial</td>
<td>Telmatic</td>
<td>Limnic</td>
</tr>
<tr>
<td>Site type</td>
<td>Ombrogenous</td>
<td>Topogenous</td>
<td>Topogenous</td>
<td>Topogenous</td>
</tr>
<tr>
<td>Example</td>
<td>Blanket Bog</td>
<td>Valley Bog</td>
<td>Lake Edge</td>
<td>Tam</td>
</tr>
<tr>
<td>Mineral Nutrition</td>
<td>Poor (Oligotrophic)</td>
<td>Medium (Mesotrophic)</td>
<td>Medium-good (Eutrophic)</td>
<td>Various</td>
</tr>
<tr>
<td>Source of minerals</td>
<td>Rainwater</td>
<td>Groundwater</td>
<td>Ground water and streams</td>
<td>Streams into lake</td>
</tr>
</tbody>
</table>

**Growth of peat deposits**

A mire will build up organic horizons if plant material build up exceeds losses due to decay and removal. Most Australian peat deposits represent a very slight positive balance, giving rise to long-term accumulation rates in the order of 0.01-1.0 mm per year (commonly expressed as 0.1-10 cm/century). Production is increased by high temperatures, abundant water, light and nutrients and an absence of herbivores. However, the decay rate rises even more quickly with temperature and a good supply of mineral nutrients. This explains why peat deposits are rare in the subtropics. In cool, humid climates the rate of production is reduced, but a relative absence of decay by soil bacteria and fungi allows accumulation. Such peat bogs may be very slow to regenerate, once stripped of vegetation. Parts of a bog may collect litter at a fast rate, but this does not represent rapid growth of the peat because organic matter at the surface is uncompacted and less decayed than that at greater depth.

Clark (1983) has reviewed growth rates for *Sphagnum* bogs and made observations on Ginini Bog (ACT) over several seasons. She found that while the moss surface might increase by 30 cm in a good growing season, all this height can be lost in a single winter due to compression by snow or animal trampling, and that the current net growth in the bog is almost nil or perhaps negative. The long-term growth rates for moss bogs in good conditions rarely exceed 5 cm century; for Ginini Bog the long-term growth rate is 3.5 cm century. Sedge fens in extremely good conditions may reach 10 cm/century. For example the upper 25 cm of peat at Nursery Swamp, (ACT) has accumulated in less than 250 years. Again decay and compression result in a long-term accumulation rate of less than 4.0 cm/century of fibrous sedge peat. Major hindrances to growth are caused by erosion, gullying or fire. Increases in the rate of loss or of decay may prevent further growth by drying out the entire surface, which may then become hydrophobic. Some peat bog taxa are intolerant of too much or too little nutrition, so that pollution or changes in water supply may affect accumulation rates. Growth may not be continuous because the establishment of a species may lead to change in hydrology, for example moss hummocks may block the drainage.
Continued accumulation at any spot leads to a hummocky microtopography. The vegetation tends to be a mosaic which is not static but changes with the microhabitats of the site. The most detailed study of this process in Australia has been carried out in a subalpine bog in Victoria by Ashton and Hargreaves (1983). They found that moss hummocks several times replaced shrublands over 4,000 years. Fire was important in causing changes to surface topography. Also zinc was shown to be a limiting micronutrient and fires resulted in net losses of stored nutrients which probably impeded shrub re-invasion. Drainage-impeding growth gradually raises the local watertable and maintains wet conditions and further growth. In this sense peatlands represent a renewable resource, but the growth is too slow to allow Australian peat to be "harvested" on any commercial timescale.

Stability

Peat bogs in Australia are delicately balanced, and relatively minor changes may have large responses. Change can take place in the following ways (Table 2).

<table>
<thead>
<tr>
<th>Change</th>
<th>Possible Cause</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased production</td>
<td>Cool moist conditions</td>
<td>Growth on drainage lines, local flooding and fen development</td>
</tr>
<tr>
<td>Decreased production</td>
<td>Hot dry conditions, increasing drainage</td>
<td>Growth ceases, dry-land plants invade</td>
</tr>
<tr>
<td>Increased nutrition</td>
<td>Catchment erosion spreading on to the peatland; animal manuring</td>
<td>Death of oligotrophic taxa, e.g. Sphagnum, weed growth</td>
</tr>
<tr>
<td>Increased drainage</td>
<td>Gullying or drains; growth of trees</td>
<td>Growth ceases, top layers dry out, become water repellent, liable to fire</td>
</tr>
<tr>
<td>Clearance in catchment</td>
<td>Agriculture or forestry</td>
<td>Higher peak discharges, incision by streams increases drainage. Mineral matter covers swamp.</td>
</tr>
<tr>
<td>Stream incision</td>
<td>Clearance, compaction</td>
<td>Bank collapse by groundwater undermining. Peat bursts</td>
</tr>
<tr>
<td>Surface compaction</td>
<td>Grazing or traffic</td>
<td>Infiltration reduced, increased surface runoff and erosion, elimination of taxa</td>
</tr>
<tr>
<td>Loss of surface peats</td>
<td>(1) Fire following lowered watertable</td>
<td>Peat fires slow but hot, totally kill all surface plants, erosion follows</td>
</tr>
<tr>
<td></td>
<td>(2) Oxidation</td>
<td>Peat decays to ash, and becomes compact by loss of moisture. Erosion follows</td>
</tr>
<tr>
<td>Collapse and slumping</td>
<td>Heavy runon, reduced strength due to ditching and mining</td>
<td>Bogs may catastrophically slump, the fibrous layers shearing above weaker layers.</td>
</tr>
<tr>
<td>Flooding, water diversion</td>
<td>Water supply dams, catchment clearance</td>
<td>Death of plant cover, erosion</td>
</tr>
</tbody>
</table>

Fires can totally remove peat deposits and are very difficult to stop once established. Several peatlands in Australia have been destroyed by fire, for example blanket bog in the Central Plateau of Tasmania smouldered for five months in 1961 and over 20,000 ha were reduced to mineral soil. This quickly eroded into creeks and rivers, and plant regrowth in the area has been extremely slow (Jackson 1973). At Wyrie Swamp, a peat mine in South Australia, attempts by bulldozing and pumping water failed to control a fire. It was only extinguished by totally flooding the site by blocking the outfall drains (Dodson 1977). The extent of peatlands destroyed by fire following drainage in Australia is unknown, but is probably very great.

The reason for the persistance of under surface fires in peat derives from the changes in properties in peats once they dry out. The infiltration capacity may become low, and the large void space allows combustion to proceed slowly. Hosing down the area will not extinguish the fire because peat is an excellent insulator and this protects the fire from chilling as well as smothering. Water reaching these fires will react with the burning peat to produce carbon monoxide and hydrogen which can eventually
burn. From time to time the surface peat will collapse into the firehole and a normal fire can result, with a risk of spreading fire into adjacent vegetation. Raised bogs are at greater risk from fire than valley bogs.

Increased drainage also allows peat to oxidise and become compressed or decay to organic loams. However fibrous peat is quite resistant to streamflow erosion. Ditches cut in Mulloon Swamp still retain the scoop marks after 12 years, although the ditches have precipitated headward erosion at the downstream end. Catastrophic peat losses are known to occur when undercutting of the trenches by upwelling water is followed by slumping. Once disturbed, breakdown and erosion may be rapid and complete. Topogenous mires such as valley bogs with substantial catchments are particularly at risk. Remnant stacks of peat occur for 3 km down stream of Jackson's Bog, N.S.W., and indicate that up to 20 ha of peat have been eroded completely by a stream now flowing on bedrock (Kershaw et al. 1993). The cause of incision by the stream is unknown, but stock damage to watercourses and possibly fire may have been important. The largest montane mire in southeastern Australia, Wingeecarribee Swamp, lost about 1,600,000 cu m of peat on 9 August 1998 after very heavy rains (Whinam et al in press). Rain swelled the peat, possibly allowing hydrostatic pressure in the underlying gravels to lift the upper layers of the mire, which then slumped into the cut mine ponds starting a catastrophic failure that reached to the head of the bog. A stream now flows through the former peatland. Dewatering of the peat reduced it from 6m to ca 2m blocks.

**Peatland in the Australian mountains**

A national survey of wetlands has been completed (Australian Nature Conservation Agency 1996). The ANCA report lists two Interim Biogeographic Regions for the montane area, Australian Alps and South Eastern Highlands of NSW. These are equivalent to montane (>500m) and subalpine (>1400m) zones. The ANCA report extracted data from an earlier survey of montane peatlands (Hope and Southern 1983), and further research on mires has taken place since then, with about 165 sites being investigated, the majority of which do not retain peat forming mires at present.

<table>
<thead>
<tr>
<th>Area (Bioregion)</th>
<th>This Report</th>
<th>ANCA 1996</th>
<th>RAMSAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACT Alps (AA)</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>ACT highlands (SEH)</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>NSW Alps (AA)</td>
<td>5</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>NSW Southern Highlands (SEH)</td>
<td>15</td>
<td>8</td>
<td>?1</td>
</tr>
</tbody>
</table>

Peatlands in montane southern New South Wales show a striking distribution pattern. Most obvious is the lack of peatbearing deposits in the central plains between the ranges presumably because this area is within a general rainshadow. Most sites occur on the western, eastern and southern ranges of the region, notably at altitudes of about 1000 m above sea level.

There are 12 large peatlands (with greater than 1,000,000 cubic metres of peat) and a further 45 minor peatlands. (Figure 1).
One or two clusters of sites do emerge, specifically in the southeast (Jackson's Bog, Craigie Bog, Killarney, Badgery's and Bega Swamps) and the western ranges (Tomney's Plain, Spencers Bog, Tarcutta, Micalong, Couragago, Tumorrama and Yaouk Swamps). According to Costin's (1954) map of soils for the Monaro Tablelands there is also a dense cluster of small peat deposits around the Badja Swamps, including Pepper's Swamp to the west.

Fens (those where the watertable is at the surface for much of the year) in southern montane New South Wales are largely dominated by sedges (Cyperaceae), especially *Carex gaudichaudiana*. Costin (1954) distinguishes rich and poor fen peat with *Carex* dominating the formation of both. The difference between these peats lies within the acidity of the sediments: rich fen peat being slightly acid to alkaline and poor fen peat being moderately to strongly acid. Costin also notes an altitudinal separation of these peats with the latter mainly in the alpine and subalpine areas. Average pH values for fen peat are 5.6 - 5.8. Good examples of deep fen peat were found at Wingecarribee, Killarney and Nursery Swamps, Jacksons Bog, Micalong, Tarcutta and Yaouk Swamps. Restionaceae (*Anarthria, Baliskion, Empodisma*) may contribute to some swamps.

The best development of such sites is seen in areas with granite as basement parent material, as these produce coarse sands that underly the peat and act as aquifers. The major exception to this rule is Wingecarribee Swamp which has developed to a remarkable degree upon a sandstone and shale base. A gently sloping landscape helps to explain its presence but the singularity of this site in terms of size, volume and distance from other major peatlands suggests a geological explanation connected with aquifer discharge into gravels from beneath the basalt flows on the eastern margin. Long Swamp, west of Moss Vale, is also unusual, being a *Carex gaudichaudiana* fen peatland infilling a sandstone cliffed valley.

The development of shrub-*Sphagnum* bogs is best in small catchments with only minor streams since it thrives in conditions of deprived nutrient intake while having sufficient moisture to maintain growth.
Below altitudes of about 1100 m the development of such peats is relatively uncommon (Whinam and Chilcott in press) although Sphagnum is found almost to sea level. Shading and local groundwater may limit the lower altitude bogs to the base of valley slopes where it is shaded. Sphagnum grows only where sheltered by valley sides and forest at Nursery Swamp and Tom Gregory Bog. Small Sphagnum bogs occur along subalpine creek lines with increasing frequency above 1100 m altitude. A rough estimate is that collectively these bogs may make up about 1% of the area above 1300 m. Shrub richness increases with altitude, lower altitude bogs having Leptospermum and Epacris species. Above 1400m Richea continentis is often dominant with Baeckia gunniana. Peat depth is not so great as for fens, being generally 1-2m and they are more acid, pH < 4.5. Sphagnum moss often develops into hummocks which can attain heights of up to a metre as at Snowy Flat. The moisture balance within the hummocks is maintained by the capillary action of Sphagnum. During summer the surface of the hummocks may show severe drying but the subsurface moss is moist and green. Destruction of the living Sphagnum quickly results in the decomposition of underlying peats since the mechanism which maintains the moisture level in the hummocks is lost. Once exposed to the dry aerobic conditions the peats rapidly decompose and lose their characteristic structure.

The alpine region above the treeline has extensions of shrub bogs and Carex fens which resemble those of the montane southern group, though usually these communities are shorter, and lacking several subalpine species such as Hakea microcarpa. Carex gaudichaudiana fens are widespread, but shrub bog tends to be riparian. Unlike the montane area, wet habitats extend out onto slopes and below long lasting snow patches. The plants blocked streams and the wet conditions created of anaerobic conditions and peat accumulation followed. These are highly related to topography but the low evaporation and high precipitation give rise to areas of poorly developed blanket bog, dominated by Empodisma minus, tussock grasses and snow daisies.

**Mire Histories**

**Peatland initiation**

Current research based on carbon dating, fossil pollen and spores, and microscopic charcoal suggests that the majority of peatlands in the region post-date the last period of glaciation which occurred from 26-16,000 years ago (Barrows et al 2001) and owe their origin to the post-glacial amelioration of climatic conditions. At the end of the Pleistocene most montane streams lay above the treeline and their channels were choked infilled by sands and gravels. Increasing temperature and precipitation allowed grasslands to stabilise the catchments permitting the establishment of many swamp plants on the river flats. The plants blocked streams and the wet conditions created of anaerobic conditions and peat accumulation followed.

Some valley wetlands may formerly have held peat bogs which were lost through erosion, fire or drying. Wood in black clays below sands at Wingecarribee Swamp provides an age of 37,000 BP for a probable early swamp building phase. One remarkable Victorian site, Caledonia Fen has preserved a deep deposit with repeated phases of bog formation (M. MacKenzie personal communication).

There is no clear correlation between the onset of peat formation and mire altitude. Early sites at 14-15000 BP occur at all altitudes and must reflect topographically favourable locations (Table 4). By 10,000 BP peat formation was extremely widespread; thus we can conclude that slopes had become increasingly stabilised between 15,000 and 10,000 years ago. The pollen analyses at montane sites (eg Delegate River Crystal Bog Jacksons Bog Rennex Gap) show that forest vegetation developed in the region after 11,000 BP while in alpine sites (Blue Lake, Mt Twynham, Raine 1974), original fjeldmark was replaced by alpine herbfields or heaths by about 9000 BP.

There is thus good reason for presuming that climatic conditions and well developed vegetation generally resembled present day environments by 9000-10,000 BP. This broad conclusion needs a great deal of further research on a geographical range of sites to obtain detail on the processes of environmental change. The reasons for the variation in ages for the initiation of peat are not yet understood. Possibly the early sites are those in the most humid regions and increasing rainfall probably played a part.
### Peat Formation in Montane Sites

#### Table 4. Dates for the Initiation of Peat Formation in Montane Sites

<table>
<thead>
<tr>
<th>Site Name</th>
<th>Locality</th>
<th>Altitude</th>
<th>Date (years BP)</th>
<th>Lab Number</th>
<th>Peat (cm)</th>
<th>Material</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bega Swamp</td>
<td>30 km E of Nimmitabel</td>
<td>1080</td>
<td>13,400±280</td>
<td>ANU-1216</td>
<td>268</td>
<td>Humic peat</td>
<td>Polach and Singh (1980)</td>
</tr>
<tr>
<td>Big Badja Swamp</td>
<td>35 km E of Cooma</td>
<td>1030</td>
<td>9,760±170</td>
<td>GRN-3523</td>
<td>218</td>
<td>Humic peat</td>
<td>Martin, unpubl.</td>
</tr>
<tr>
<td>Black Swamp</td>
<td>Barrington Tops</td>
<td>1550</td>
<td>8,865±120</td>
<td>SUA-1414</td>
<td>180</td>
<td>Humic peat</td>
<td>Dodson, (1987)</td>
</tr>
<tr>
<td>Bogong Swamp</td>
<td>Mt. Kosciuszkos</td>
<td>1590</td>
<td>2,750±970</td>
<td>SUA-1623</td>
<td>220</td>
<td>Core peat</td>
<td>Martin, unpubl.</td>
</tr>
<tr>
<td>Brooks Ridge Fen</td>
<td>Happy Jacks Plain</td>
<td>1450</td>
<td>3730±300</td>
<td>β-81387</td>
<td>47</td>
<td>Fibrous peat</td>
<td>Mooney et al 1997</td>
</tr>
<tr>
<td>Bunyip Bog</td>
<td>Mt Buffalo, Vic</td>
<td>1330</td>
<td>10,250±220</td>
<td>GX-3981</td>
<td>300</td>
<td>Sphagnum peat</td>
<td>Binder (1978)</td>
</tr>
<tr>
<td>Caledonia Fen</td>
<td>Mt Buller, Vic</td>
<td>1280</td>
<td>&gt;80,000</td>
<td>OSL</td>
<td>1900</td>
<td>Organic clay</td>
<td>MacKenzie unpubl.</td>
</tr>
<tr>
<td>Club Lake</td>
<td>Mt Kosciuszkos</td>
<td>1955</td>
<td>9,770±140</td>
<td>SUA-1259</td>
<td>265</td>
<td>Peaty silts</td>
<td>Martin 1986</td>
</tr>
<tr>
<td>Cotter Source A</td>
<td>Mt Scabby, ACT</td>
<td>1720</td>
<td>9,040±80</td>
<td>ANU 10194</td>
<td>115</td>
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<td>1350</td>
<td>14,190±170</td>
<td>GX-5234</td>
<td>285</td>
<td>Organic clay</td>
<td>Williams (1980)</td>
</tr>
<tr>
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<td>1000</td>
<td>12,160±310</td>
<td>GaK-5846</td>
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<tr>
<td>Diggers Creek</td>
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<td>1755</td>
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<td>GaK-3929</td>
<td>132</td>
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<td>Martin (1999)</td>
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<td>13 km E Lake Mt Vic</td>
<td>1370</td>
<td>5,380±160</td>
<td>GaK</td>
<td>160</td>
<td>Sphagnum peat</td>
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<td>SUA-1415A</td>
<td>150</td>
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<tr>
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<td>ca50</td>
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<td>14,900±1200</td>
<td>ANU-1257</td>
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<td>Scabby nature reserve</td>
<td>1100</td>
<td>925 ± 40</td>
<td>ANU 11439H</td>
<td>195</td>
<td>Peaty clay</td>
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Holocene histories

Some subalpine mires, for example Ginini Flats and Rotten Swamp, have not preserved their earlier Holocene fill. Both peatlands rest on gravelly slope deposits of probable late Pleistocene age. A lower altitude Carex fen, Nursery Swamp, preserves humic clays from the early Holocene period, but the bulk of the sediment there is fibrous peats formed within the last 3000 years. Wingecarribee has old organic clays, but the upper 6m of the peatland also seems to have formed within the last 3000 years (Kodela 1997). At about this time there is a probable development or expansion of Sphagnum moss bogs. Bunyip and Crystal Bogs have an expansion event dated at 2050 and 2650 years ago respectively (Binder 1978; Williams 1980). At Jackson's Bog the presence of Sphagnum is first detected 2800 years ago (Southern 1982). Costin (1972) gives a basal date of 3280 years BP for the Sphagnum peats at Ginini Bog. Similarly the Lake Mountain bog commenced growth about 3500 BP. There is a possibility that these changes represent inherent instability or fire events. The preliminary data hints that peat growth was a regional event and hence probably related directly or indirectly to climate (Macphail and Hope 1985).

Yaouk Swamp, and possibly Snowy Flat, have peaty sediments that are early Holocene. A suggestion is that since wet sclerophyll forest expanded in the mid-Holocene to altitudes beyond present limits, wetter conditions than present may have occurred from 9000 to about 4000 years BP. This may have been a time of consistent peat formation and the late Holocene growth phase did not occur at these sites. A few swamps, such as Bega Swamp, Rennex Gap Bog and possibly Cotter Source Bog provide full records of the Holocene.

European land management

The impact of European pastoralism can be discerned in virtually every record that has been examined, and that impact is the greatest alteration to the environment that can be seen in the Holocene. Several records have been completed at high resolution, including Bega Swamp (Hope unpublished), Cotter Source Bog (Hope unpublished), Brooks Ridge Fen (Mooney et al 1997) and Club Lake (Dodson et al 1994). Pine pollen forms a useful marker as it occurs in all sites within the last 100 years. Usually introduced daisies such as Hypochoeris increase before the appearance of pine, and in some sites (but not Brooks Ridge) charcoal reaches a peak soon after this. Sites in reserves, such as Rennex Gap and Cotter Source Bog, show a decline in charcoal to low levels after pine is well established, probably around 1935. This indicates that Europeans were responsible for a considerable shift in fire regimes throughout the mountains and elsewhere (Dodson and Mooney 2002). Figure 2 shows a pine and charcoal curve from Top Flat, just below Cotter Source Bog in the ACT, which has these features. There is a rise in charcoal near the top of the section which may be a result of the 1983 fire that burnt across the bog. Post fire stream incision started to dry out the shrub bog so planks were placed across the channels to block the drainage. This was partially successful and bog regeneration has occurred in some sections.
Management considerations

Southern montane New South Wales has the largest biologically distinctive montane peatlands on the mainland. This relative richness compared to the rest of inland Australia creates a good case for optimising the catchment conservation and scientific values of the peatlands as a whole. The agricultural use of these bogs is not compatible with high conservation values and extractive mining demonstrably is a considerable risk to them. Although considerably altered from pre-disturbance state, regeneration is possible, as the communities are adapted to change and colonisation. Causes of disturbance must first be removed, by fencing the perimeter if necessary. The main aim is to return the watertable and flow regime can be returned to pre-drainage conditions. Above the nick points on artificial drains or incising channels this can be achieved by blocking the drains at intervals determined by the natural fall of the bog. The effect of these barriers would be to direct flow out onto the bog surface where it would disperse amongst the vegetation. Carex and other sedges would thrive and the peats will expand as water re-enters the dry sediment. Barriers should be extended above the present upstream limit of peat formation so that sediment load can be caught before it enters the mire.

Below the nickpoints the aim is to raise the watertable and reduce the hydraulic gradient which is causing wall slumping. In some cases an earth wall with a down stream dissipative slope would create a pond. Alternatively grading an even slope from the bog to the downstream channel would allow the generalised flow to wet the entire area, propagating the bog downstream. Shrubs such as Leptospermum lanigerum might be used there to create a stable vegetation tolerant of intermittent flooding. Re-wetting the bog will solve most weed problems.
Acknowledgements

This work rests on several unpublished analyses of mountain peatlands. In particular I acknowledge help from Debbie Argue, Robin Clark, Alec Costin, Dominique O'Dea, Ben Keaney, Justine Kemp, Phillip Kodela, Michael Macphail, Tony Martin, Ian Raine, John Rogers, the late Gurdup Singh and Dave Wheeler. I am grateful to Roger Good, Ian Pulsford and Rob Hunt of the NSW National Parks and Wildlife Service and Trish MacDonald, Brett MacNamara and Virginia Logan of Namadgi National Park, ACT for their active encouragement and help.

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Frog declines in the Snowy Mountains: what do we know after fifteen years?

Will Osborne and David Hunter

Abstract

Alpine regions of Australia support a number of fascinating and unique species of frogs. They include such renowned species as the Southern Corroboree Frog (Pseudophryne corroboree), Alpine Tree Frog (Litoria verreauxii alpina) and the Baw Baw Frog (Philoria frosti). The rapidly growing list of frogs, which have suffered from population declines, and extinctions has raised considerable international concern. Whilst the decline of some species have been attributed directly to the activities of humans (e.g. draining wetlands, habitat destruction, competition with introduced species), many disappearances of amphibians have occurred in apparently undisturbed habitats, particularly at high altitudes. In 1985 we commenced research and annual monitoring of populations of Australian alpine frogs, particularly in the Snowy Mountains. Over this period we have witnessed the decline and virtual disappearance of the Southern Corroboree Frog and several other alpine species. This observation has led us to document the extent of population declines in alpine frogs and to discover the cause of the decline. Failure to identify the cause of these declines has lead to much speculation as to whether they are the result of long-term natural cycles, population fluctuations or are a sign of some form of human impact on amphibians. The lack of consensus on this debate has been compounded by our lack of knowledge of the biology of most species. We have focussed our research on three species that are in serious decline in high altitude regions of the Snowy Mountains and adjacent mountain ranges (Fiery Range, Bimberi Range, Brindabella Range). We have attempted address the question of whether each species really has declined to a critical level and then, through a combination of observation and experimental work, have attempted to establish the factors that might be leading to the population declines. Finally we have initiated a joint program with the NSW National Parks and Wildlife Service to attempt to experimentally increase the size of remnant populations of the Southern Corroboree Frog. This is being done by a combination of captive husbandry and in situ manipulation of pond water levels to prevent egg and tadpole mortality.

Introduction

The growing list of Australian frogs reported to have suffered from severe declines in their populations, or even extinctions, has raised considerable international concern (Campbell 1999). While the decline of some species has been attributed directly to the activities of humans (e.g. draining wetlands, habitat destruction, competition with introduced species), many disappearances of amphibians have occurred in apparently undisturbed habitats, particularly at high altitudes. Unexplained declines and disappearances of amphibians at high elevations have occurred in many mountainous regions along the eastern coast of Australia, from the Wet Tropics to the southern Australian Alps (Campbell 1999). Failure to identify the cause of these declines has lead to much speculation as to whether they are the result of long-term natural

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cycles, population fluctuations or are a sign of some form of human impact on amphibians. The lack of consensus on this debate has been compounded by our lack of knowledge of the biology of most species.

Some of the most restricted and unusual species of frogs in Australia occur in alpine and subalpine environments where they have a particular association with the sphagnum-dominated wetlands characteristic of these upland regions. In the Snowy Mountains of NSW these frogs include two species of Corroboree Frog (Pseudophryne corroboree and P. pengilleyi) and the Alpine Tree Frog (Litoria verreauxii alpina). Each of the species has been carefully monitored at representative sites since 1986, with reliable records for some sites dating back to 1966 (Osborne et al. 1999). Unfortunately these frogs have suffered extensive and prolonged declines and concern is now held for their survival in the wild. One species, the Spotted Tree Frog (Litoria spenceri), is now quite possibly extinct in New South Wales, having disappeared precipitously from the one site it was abundant at in Kosciuszko National Park (Gillespie and Hines 1999). The declines have not been confined to subalpine and alpine areas; at tableland elevations in the Canberra and Monaro region three other taxa (Litoria aurea, L. reniformis and L. castanea) disappeared - all were members of the Green and Golden Bell Frog complex (Osborne et al. 1996).

A global trend for declines in frog populations has become apparent in recent years (e.g., Wyman, 1990; Blaustein et al., 1994; Ferraro and Burgin, 1994; Laurance, 1995; Stebbins and Cohen, 1995). Several potential causal factors have been suggested, including long-term population fluctuations, habitat destruction, climate change, ozone depletion, increased levels of ultra-violet radiation, and disease (Ferraro and Burgin, 1994). Changes in climatic conditions, such as extreme drought, have been implicated in the decline of some species (e.g., Osborne, 1989; Pounds and Crump, 1994; Stewart, 1995; Osborne et al., 1996; Osborne and Davis, 1997). In contrast, other authors have rejected climatic change as a causal factor in the declines of some frog species (e.g., Laurance, 1996).

A feature of amphibian declines is that they appear to be most severe at high altitudes in mountainous regions, often in comparably pristine environments. Speculation about the reasons for this apparent trend has included consideration of unusual weather patterns (Corn and Fogleman 1984; Pounds and Crump 1994), acid precipitation (Dunson et al. 1992), increased UV-B radiation resulting from ozone depletion (Blaustein et al. 1994), deposition of pesticides (Colborn and Clement 1992) and virulent disease (Laurance 1996; Berger et al 1999).

There is no evidence to date that acid precipitation is a problem in the Australian Alps - mainly due to the distant proximity of industrial areas and other sources of pollution, however, there is no information available on the levels of possible contaminants in precipitation and dust in this region. There is now some evidence to suggest that several species of frogs found in the Snowy Mountains have been infected by the chytrid fungus (Dr R. Speare James Cook University pers. comm.). However, the apparently slow, but progressive, decline rate in the alpine species in Australia (Osborne et al. 1999) is not typical of that observed in declines that are attributed to chytridiomycosis in North Queensland. Nevertheless it is highly likely that the decline in alpine frogs has been exacerbated by the chytrid fungus acting in concert with some other factor, such as changed weather patterns or increased UV-B radiation.

In this paper we report briefly on research and proactive experimental management aimed at understanding the reasons for declines in alpine frogs and in stemming further declines in field populations. As a last resort action, we acknowledge the considerable role that captive husbandry will now play in the conservation of these species as they move closer to extinction in the wild.

Frog declines in the Snowy Mountains region

Declines of frog populations in the Southern Highlands of New South Wales were first observed in the early 1980’s (Osborne 1986, 1989, 1990). The species involved included several pool-breeding species found at subalpine and alpine elevations: the Alpine Tree Frog (Litoria verreauxii alpina), the Southern Corroboree Frog (Pseudophryne corroboree), and the Northern Corroboree Frog (Pseudophryne pengilleyi).

The Alpine Tree Frog, a distinctive subalpine and alpine subspecies, has now disappeared entirely from the alpine zone in the Snowy Mountains where it was once abundant (Hunter et al. 1997; Osborne et al. 1999). It now persists at a few isolated sites associated with relatively deep, well-vegetated artificial
water bodies at lower elevations. In Victoria the subspecies has disappeared from the Bogong High Plains, but is still common on the slightly lower elevation Dargo High Plains and near Dinner Plain and Horsehair Plain east of Mount Hotham (Osborne et al. 1999).

The Southern Corroboree Frog has suffered an extensive decline throughout its range. Most remaining breeding populations are reduced to a few individuals and the species is in imminent danger of extinction (Osborne et al. 1999; Hunter 2000). The Northern Corroboree Frog has declined extensively at subalpine sites on the Bimberi Range, but persists in reasonable numbers at many montane sites (below about 1200m) in the Fiery Range (Osborne et al. 1999).

Understanding of population dynamics essential for informed management

One part of our research is directed at obtaining information on the population dynamics of declining alpine frog species. Prior to this research it was believed that the Southern Corroboree Frog only lived for three years (two years as a sub-adult and one year as a breeding adult), however through the use of skeletochronology (a technique for determining age by counting growth rings in bone cross-sections obtained from Museum specimens) we now believe this species may live for up to seven years. This data, and similar data obtained on the Northern Corroboree Frog and Alpine Tree Frog, is important for interpreting the results of the long term monitoring program for these species.

Information has also been obtained indicating that high levels of mortality during the egg and tadpole stages may be contributing to the continued decline in the Southern Corroboree Frog and that this level of mortality is probably being exacerbated by the small size of remnant populations. Reduced autumn and winter precipitation may be one explanation for the high over winter mortality of the eggs and tadpoles.

**Is ultraviolet radiation responsible for declines in alpine frogs?**

This research relates to our knowledge that there has been considerable depletion of stratospheric ozone over the past two decades, and that this has resulted in increased levels of ultraviolet-B radiation (UV-B). Ozone depletion appears to be most severe in the Southern Hemisphere and UV-B radiation may therefore be of particular concern for Australian amphibian declines. This is particularly likely to be the case at high altitudes where UV-B levels are significantly higher than in adjacent lowlands.

In research recently completed by Broomhall et al. (2000) experiments were conducted in artificial water bodies established at three altitudes (1360 m, 1600 m, and 1930 m) near Thredbo in the Snowy Mountains. Broomhall et al. (2000) compared the survival of eggs and embryonic tadpoles that were shielded from UV-B (by means of clear plastic UV-B filter) with the survival of other replicates not provided with filters and with controls which had a filter that actually let UV-B through. The results were quite dramatic. At all altitudes the blocking of ultraviolet-B significantly enhanced the survival of the declining species, the Alpine Tree Frog. Without protection from UV-B tadpoles of the Alpine Tree Frog invariably died. By contrast, a non-declining species, the Common Eastern Froglet (*Crinia signifera*) survived in much higher numbers under all treatments, although there was also a significant effect of UV-B, particularly at the higher altitude sites. The results strongly supported the hypothesis that ultraviolet radiation is a factor in the disappearance of the Alpine Tree Frog at high altitudes - it still persists at a few low altitude sites, usually in association with deep artificial ponds with somewhat murky water. This last observation is important because we know that murky water high in dissolved organic carbon provides a very effective shield against ultraviolet radiation.

More recently we (Hunter, Osborne and Green in prep.) completed similar field trials in enclosures in natural pools that allowed the hatched embryos access to the bottom of the pools. In this set of experiments there appeared to be little difference in the survival rate enclosures protected from UV-B radiation and those directly exposed to sunlight. Due to a lack of financial support we have been unable to continue these trials and further work is required to substantiate our preliminary findings.
Why climate change might lead to losses in frog populations at high elevations

Frogs are very likely candidate species that may be sensitive to climate change. They are dependent on moist environments for both physiological maintenance and reproduction (Duellman and Trueb 1994). Several long-term studies have correlated population fluctuations in amphibians with climatic variables, particularly with annual variation in precipitation patterns (Stewart 1995; Pechmann et al. 1991). The direct effect of climate on amphibians may include desiccation of both the larval and adult phases, while indirect effects include prevention of breeding activity and the lowering of the immune system making the frog more susceptible to pathogens (Pounds and Crump 1994).

The effects of global warming on our environment have continued to be an area of concern (Zhang, 1996). The surface temperature of the Earth is affected by the presence of minor trace gases (or greenhouse gases) such as carbon dioxide, methane, nitrous oxide, and chlorofluorocarbons (Scientific Aspects of Major Environmental Topics: Climate Change, 1992). As the levels of many greenhouse gases continue to increase in our atmosphere, some global warming is expected (Pearman, 1991; Brereton et al., 1995; State of the Environment Advisory Council, 1996; Zhang, 1996; Whetton 1998). Global warming resulting from increasing greenhouse gases will produce other environmental changes including alterations to rainfall and snowfall patterns (Brereton et al., 1995). It has been estimated that global warming of 1.5 - 4.5 °C is probable over the next 30-50 years, which will lead to regional changes in the hydrological cycle (Pearman, 1991; Salinger and Pittock 1991).

Whetton (1998) predicted the likely occurrence of decreasing natural snow-cover over the next eighty years; using a version of the snow-cover model presented by Galloway (1988) and current CSIRO climate change scenarios. However, using data to 1996, Osborne and Davis (1997) noted that an annual increase in maximum temperatures in south-eastern Australia of less than 0.1 °C has been recorded since 1951. Also, Ruddell et al. (1990) did not find any significant trends in temperature or precipitation in the Snowy Mountains region. Furthermore, Ruddell et al. (1990) found no trends in snow-cover in south-eastern Australia, as did Duus (1992) at Spencer’s Creek, New South Wales (between 1910 and 1991). These conclusions are, however, based on the data from very few weather stations and clearly an update and more sophisticated analysis is required.

Although there is no direct evidence yet for a general warming in the Alps (Snowy Mountains and Bogong High Plains) it does not necessarily imply that there has been no effect on alpine and subalpine areas. There is clear evidence of a recent warming trend at lower elevations in the region. Ruddell et al. (1990) note that at two low elevation stations, Mt Beauty and Rubicon, that are adjacent to alpine areas in Victoria, there are reliable long-term records clearly suggestive of warming trends. They observed that there has been an overall increase in temperature of between 0.2 and 0.4 °C every ten years since the mid-1940’s. More recently, Davis (1998) compared winter temperature trends (May to October) from Cabramurra with trends in upper air temperatures at Wagga Wagga. Davis found that there was a slight indication of warming at both locations, particularly evident in the Wagga Wagga record. It is feasible that even slight warming would be enough to increase evaporation from shallow seepages and directly from the ground surface near breeding sites. The high levels of insolation and lower air pressure in alpine areas would enhance the effect (Mani 1968).

Climatic changes of the magnitude predicted by climatologists may dramatically alter alpine ecosystems. Using BIOCLIM to model species occurrence and distribution, Brereton et al. (1995) found that the distribution of many of our species might be drastically altered, possibly to extinction, by global warming. Busby (1998) argued that increasing temperatures due to the greenhouse effect might result in the mass extinction of alpine species throughout south-eastern Australia. Species which are poor dispersers, have narrow habitat requirements, and/or inhabit montane and alpine habitats are possibly vulnerable to environmental changes such as global warming (Brereton et al., 1995). Montane and alpine frog species, due to their dependency on water, poor dispersal abilities and specific habitat requirements (Duellman and Trueb 1994) may succumb to changing climates more quickly than other species. The decline of up to seven species of frog in the higher altitude areas of south-eastern Australia (Gillespie et al., 1995) is suggestive of a regional influence (Osborne and Davis, 1997).
Monitoring of populations of the Southern Corroboree Frog over the last 12 years indicates that there has been a substantial decline in the population with a gradual contraction of the geographic range of the species to the wetter more easterly part of its former range. It is possible that long-term changes in weather patterns may be in some way involved in the decline of this species. Annual fluctuations and longer-term oscillations (related to the El Nino southern oscillation) characterise the precipitation record in the Australian Alps during all of the 20th century. Osborne and Davis (1997) found that found that the onset of the declines in alpine frogs coincided with particularly severe droughts during a long period of below average precipitation (1979-1987). What is surprising, though, is that there has been no sign of recovery in the frog populations despite a return to more favourable weather conditions during the 1990’s (excluding the recent drought which once again had a severe effect on both species of Corroboree Frog).

The need for predictive modelling at a landscape scale

Whilst temperature increases are difficult to detect at alpine elevations, perhaps due to the lack of sampling sites in this region, a clear trend of increasing temperature is reported for nearby lower elevation regions (ACT State of Environment Report) and the slight changes likely to have been experienced at higher elevations may still have had some impact. It is possible that combination of changed annual weather patterns - for example decreased winter precipitation - combined with slightly increased temperatures may cause pools to dry at this stage when tadpoles are present in the pools. It is also possible that subtle and localised differences in climate and weather patterns may act in concert with other causal agents (such as the pathogen chytridiomycosis (Berger et al. 1999) which has recently been detected in both species of corroboree frog) in the decline of alpine frogs.

Approaches to examining this possibility would include examining shifts in seasonality of precipitation, the distribution and magnitude of precipitation events and the intervals between precipitation events. On the ground, a landscape scale analysis is required to determine whether there is a link between local weather patterns and the pattern of declines.

Attempts to increase the size of small remnant populations of the Southern Corroboree Frog

In an attempt to ameliorate the continued decline and extinction of small remnant populations of the Southern Corroboree Frog, two additional projects commenced in 1997 - a population augmentation experiment (combination of field and ex situ actions) and captive breeding program in collaboration with the Amphibian Research Centre in Melbourne (a private centre run by Gerry Marantelli that is focussed on the captive husbandry and conservation of Australian frogs) (Hunter et al. 1999).

The aim of the population augmentation project is to increase the size of several small populations of this species through increasing the level of survivorship from egg to metamorphosis. This is being done by a combination of captive husbandry and in-situ manipulation of pond water levels to prevent egg and tadpole mortality. To confirm whether our captive rearing procedure is in fact reducing mortality during these early life-history stages, a comparison of survivorship between captive-reared and natural field-reared tadpoles was undertaken. The results demonstrated our ability to significantly increase survivorship via captive rearing, with the greatest level of field mortality occurring during the over-wintering stage – field mortality has been very high, with many clutches failing completely.

It appears that with reduced autumn rainfall the eggs are not hatching, and that the encapsulated tadpoles are then dying due to freezing of the oviposition site in early winter. By removing eggs and raising them in the lab, or by placing well-advanced eggs directly into the pools before winter, we have greatly increased survivorship through to metamorphosis the following summer. As the Southern Corroboree Frog takes from three to four years to reach sexual maturity, we will not be able to test the results of our efforts until the summer of this year (2002/2003); at this time we expect to see a significant increase in the number of adults at our experimental sites when compared to control sites where no manipulation is being undertaken.
Conclusion

Our research has focussed on three species (Southern Corroboree Frog, Northern Corroboree Frog and Alpine Tree Frog) that are in serious decline in high altitude regions of the Snowy Mountains and adjacent mountain ranges (Fiery Range, Bimberi Range, and Brindabella Range). We have attempted address the question of whether each species really has declined to a critical level and then, through a combination of observation and experimental work, we are in the process of attempting to establish the factors that might be leading to the population declines.

Research to date has addressed climate change and the influence of increased levels of ultraviolet radiation. For four years a joint effort has been conducted involving the University of Canberra (Applied Ecology Research Group), the NSW National Parks and Wildlife Service and the Amphibian Research Centre (in Melbourne) in an attempt to experimentally increase the size of remnant populations of the Southern Corroboree Frog. This is being done by a combination of captive husbandry and in situ manipulation of pond water levels to prevent egg and tadpole mortality. A similar program is now planned for some populations of the Northern Corroboree Frog. The recent discovery of the amphibian chytrid fungal pathogen in specimens of both species of corroboree frog highlights the need for urgent further action and support for ex situ conservation efforts.

Acknowledgements

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References


Rehabilitation of the Jounama Pine Plantation, Kosciuszko National Park

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Abstract

The 602 hectare Jounama Pine Plantation was progressively established between 1923 and 1935 in the then Jounama State Forest. In 1944 it became part of firstly, the Kosciusko State Park (in 1944) and, ultimately, Kosciuszko National Park. The Plantation lies at an altitude of about 1000-1200 metres. It is surrounded by a variety of forest communities and, nearby, the broad, open sod-tussock grasslands. There are a large number of coniferous species, chiefly Pinus laricio, P. ponderosa, P. contorta and P. lambertiana and other Pinus spp., within the Plantation.

During the 1970s, it was becoming increasingly apparent that the Plantation was having an impact on the native vegetation with the spread of Pinus wildings more than 20 kilometres across the Park. In the 1980s there was some belief that the Plantation was having some impact on karst values in the wider Yarrangobilly Management Unit.

Following the gazettal of the 1982 Plan of Management for the Park which specifically identified the need to address the Pinus problems, and the production of an Environmental Impact Statement, logging commenced in 1985 with active rehabilitation starting about a year later.

This paper describes the Plantation history and setting, outlines the problems presented by the Pinus wildings and describes the rehabilitation process.

Introduction

The 602 hectare Jounama Pine Plantation lies in the northern end of Kosciuszko National Park surrounded by a large variety of vegetation types including tall, moist forests, moist to dry sclerophyll subalpine forests and woodlands and tussock grasslands. Importantly, the Plantation is within the catchment of the nationally significant Yarrangobilly karst area (Map 1). Indeed, some 12-15% directly overlies the limestone karst which includes both caves and integrated karst drainage systems.

Three Pinus species predominate in the Plantation together with a large number of other coniferous species either planted in compartments or in an arboretum. The dominant species are Pinus ponderosa (354 ha), P. laricio (218 ha) and P. contorta (30 ha). There is a 1.4 ha coupe of P. lambertiana. Some

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1 The NSW Geographical Names Board has changed the spelling of 'Kosciusko' to Kosciuszko'. The latter spelling is used in this paper except where publications are cited or formal names are used.
planted coupes failed soon after planting and the pines, chiefly *P. jeffreyi*, have been replaced by fine stands of self-sown eucalypts such as *Eucalyptus viminalis*. There is no *P. radiata* among the 12 species of *Pinus* within the Plantation.

By the early 1970s it became apparent that the Plantation was providing a source for the spread of *Pinus* wildings across the northern part of the Park. The main species involved are *P. contorta*, *P. ponderosa* and *P. laricio*. Wilding pines that could only have come from Jounama were establishing in many ecological communities to the east of the Plantation. There were also concerns about the Plantation’s possible impacts on the karst systems both under the Plantation and further downstream.

Following growing concerns and some public submissions in the late 1970s the issue of the Plantation was directly addressed in the 1982 Plan of Management for Kosciusko National Park (Anon 1982). This led to the production of an Environmental Impact Statement (EIS) for the harvesting and rehabilitation of the Jounama Pine Plantation, which was prepared, jointly by the National Parks and Wildlife Service and the Forestry Commission (Anon 1983). Harvesting was to be carried out under the auspices of the Forestry Commission (now State Forests) with revenue being split with the National Parks and Wildlife Service (NPWS). The NPWS’s share of the revenue was earmarked for rehabilitation, which was aimed at returning the Plantation area into self-sustaining vegetation communities such as existed on the site before European settlement, and for the control of pine wildings.

Harvesting commenced in 1985 and rehabilitation in 1987. This paper describes the Plantation, its history and the harvesting and rehabilitation project. The Environmental Impact Statement (Anon 1983) remains the best source of information on the Plantation, its history, setting and environment as well as describing the philosophy and direction of the harvesting and rehabilitation project.

**Jounama Pine Plantation And Its Environment**

The desirability of pine plantations for the Tumut region, including in the Yarrangobilly area, was mooted as long ago as 1904. In spite of its almost total inaccessibility plantings began in 1923 and continued until 1935. A very small additional coupe was planted in 1954. Plantation planning included the definition of paddocks for the horse teams to be used in harvesting! Very little silvicultural work was carried out through the plantation’s lifetime although there was some minor logging, chiefly of *P. ponderosa*, for short-term projects or during highway reconstruction.

In 1944 the area was transferred to the then Kosciusko State Park (which became Kosciusko National Park in 1967) but management of the Plantation remained in the hands of the Forestry Commission.

The redevelopment of the Snowy Mountains Highway in the early 1970s provided a realistic logistic opportunity for harvesting the Plantation.

The Plantation lies at an altitude of between 1020 and 1190 metres. It is largely within the catchment of the Yarrangobilly River although it spills over into the headwaters of Jounama Creek. The drainage to Jounama Creek lies through the enigmatic and probably karst-related Jounama Ponds.

The Yarrangobilly Limestone underlies some 12-15% of the Plantation area with most of the remainder being shales and similar rocks of the Ravine Beds. There has been some contact and hydrothermal metamorphism, chiefly of the limestone, associated with the emplacement of the Bogong Granites to the north of the Plantation. There are very small areas of granites and volcanics. Slopes range from zero to 26° with most being well below 18°.

The Soil Conservation Service, as part of the EIS process, mapped the soils and identified six groups reflecting the geology. The most abundant were described as ‘Red Mudstone Soils’ and ‘Reddish Limestone Soils’. During the rehabilitation phase considerable variation in soil type, and plant response became apparent. None of the soils appears highly erodible but some are very shallow and poor in nutrients.

Although records are scant, it would appear that parts of the Plantation were both natural and artificial sod tussock grassland prior to planting. In other areas, eucalypt forest was deliberately felled and burnt for establishment. There may have been some prior clearing of subalpine woodlands and similar communities.
reaching back as far as the 1840s as the scant records do mention the establishment of pines in regrowth areas.

As mentioned above, the 1982 Plan of Management for the Park required the production of an Environmental Impact Statement for the harvesting and rehabilitation project. This followed canvassing of the issue in the draft plan exhibition period. There was public support for the project in all submissions to the exhibited plan as well as some local criticism - largely in the Tumut press.

Harvesting was to be carried out under the control of the Forestry Commission utilising the Tumut Forestry District’s Code of Logging Practices for Conifer Plantations with some additional proscriptions dealing with wet-weather and winter season operations.

The EIS spelt out a philosophy and directions for the rehabilitation works but, as such a project was unique in an Australian context, only general guidelines could be provided.

It is probably wise to examine the potential impacts that the Jounama Pine Plantation might have in its geographic context within Kosciuszko National Park. Firstly, there is an undoubtedly aesthetic impact of a major, non-natural and highly distinctive vegetation block dominating the scenic Yarrangobilly Village, visible from the high peaks of the Bogong Wilderness (although small compared to many other Pinus plantations visible from these peaks) and very much part of the viewscape from the Snowy Mountains Highway.

Secondly, the Plantation is the source for the spread of Pinus wildings across much of northern Kosciuszko. Surveys carried out as part of the development of the EIS suggested very high densities of various pine species around the Plantation. Subsequent objective surveys reinforced these estimates – indeed they proved that the earlier surveys considerably underestimated the problem. P. contorta has spread as much as 22 km from the Plantation. There have been a number of sightings of cockatoos carrying pinecones in their claws well away from the Plantation!

Earlier suggestions that the Plantation may have been having a substantial impact on the Yarrangobilly karst outside the planted area would seem unfounded. Inside the Plantation there are clear impacts on the karst including on surface karst features, on cave microclimates and on cave biota (Anon 1983, Spate unpublished).

Anecdotal, but well-substantiated, evidence from Naracoorte Caves and other areas in southeastern South Australia, and to a lesser extent from New Zealand, has demonstrated considerable impacts on caves from overlying Pinus species. These impacts have largely been on the hydrological regimes but also, significantly, on the vertical fluxes of water into caves. The pines have certainly had a direct impact on the caves underlying the Plantation. These impacts include changes in water and carbon dioxide regimes within the caves (Anon 1983, Spate unpublished) and on invertebrate cave faunas (Anon 1983). Interestingly once the pines have been harvesting some spalling of limestone outcrops takes place leading to similar impacts to that of fire on limestone (Holland 1994). The mechanism for this low temperature spalling is unknown.

Following the EIS process, and indeed well after the commencement of harvesting and rehabilitation activities, the Southern Branch (New South Wales) of the Institute of Foresters of Australia nominated about 50 ha of the Plantation for inclusion on the Register of the National Estate (Bratby 1995). The nomination proceeded to fruition and the area is now listed. From the current authors’ perspective this action, should the 50 ha of Plantation remain, means that the wilding source would remain within the Park and that the very considerable cost of rehabilitation had been squandered? Harvesting occurred in the nominated area in 2001/2002. But, prior to any harvesting, the area was photographed (for record purposes) and extensive seed collection was carried out. Seed from the nominated area is now being archived by State Forests of NSW as a biological record of the species planted.
Harvesting

Harvesting of the Plantation presented a number of problems over and above those normally encountered in a pine logging operation. These included various social interactions (for example, the logging season is the time of the busiest use of the Snowy Mountains Highway) and the fact that only one of the species (P. ponderosa) to be harvested was utilised in local sawlog and veneer mills. Different species have different mechanical and chemical characteristics and thus machines need to be reset, chemicals changed and so on during the utilisation process.

When the project was first mooted there was very considerable interest from mills at Tumut and Wagga Wagga for product from the Plantation. Through the life of the harvesting project the market has waxed and waned and in some years no market could be found and thus no logging took place. Much less of the timber resource has been utilised than was originally envisaged. The search for markets has resulted in some unusual destinations for timber from the Plantation with the recent supply of pit props to the South Korean mining industry being perhaps the most surprising.

Although there was some handfelling in the early years of harvesting it has been largely machine-based with product mainly going to Tumut processors for sawlogs, veneer and pulp although these latter have been harder to sell. In recent years markets within Canberra have been sourced for the larger material (although this market has now waned) and some hope rests with the construction of the new Visy paper mill at Tumut in utilising the pulp-sized wood.

Other than marketing problems there have been few problems with the logging operations with perhaps the most dramatic being one not foreseen in the EIS process. This was a substantial increase in kangaroo roadkill numbers along the Blowering foreshores sections of the Snowy Mountains Highway. In later years, rather more logging slash remains on site following harvesting than expected and this has lead to a greater use of fire in clearing the site.

Rehabilitation

The philosophy behind the rehabilitation project was to replace the pines with native species to provide opportunities to allow ecological processes to take the environment back to some sort of ecological equilibrium. This may seem like playing God (in Kosciuszko rather than Yellowstone, Chase 1986). The full rehabilitation would obviously require many decades, considerable dollar inputs and a dedication to see it through.

In the mid-1980s there was little experience in Australia, certainly not at the subalpine/montane boundary, in broad-acre landscape rehabilitation outside of the mining industry, which has had many innovative approaches to rehabilitation – usually backed by considerable financial backing. Mine site rehabilitation presents quite different problems to that of replacing an aggressive, virtual monoculture such as a pine plantation, with native communities.

Thus the approach had to be experimental. As modern parlance has it – “thinking outside the square” – was very definitely needed. The rehabilitation process also had to be cheap and effective, and to be ecologically appropriate providing a durable cover using propagules of local provenance.

Experiments included sowing time trials, species trials, seed processing and storage methodologies, the cutting and spreading of ‘hay’ from the local grasslands and the planting of advanced stock into riplines and along drainage depressions. These limited plantings of advanced stock are far outweighed by broadacre establishment from sowing of untreated seed onto bare ground. In the early stages of the rehabilitation process, the seed was broadcast onto areas scraped clear of slash using rakehoes. In later years bobcats were used to produce the slash-free patches for seed broadcast. Trials demonstrated that seed is best broadcast in the late-autumn, early-winter period.

Before the project started there was some research into the presence and viability or otherwise of seed stored in the soil. This work indicated that regeneration from the soil seed store was unlikely to be a factor in the rehabilitation process. There has been a very large amount of self-sown species establishment particularly of shrubs such as Pimelea pauciflora and of various grasses. In most areas
native species establishment has been adequate. In other areas it has not been as effective. This is presumably due to subtle soil and temperature factors.

As logging slash amounts to perhaps 150 tonnes per hectare, removal using fire has been increasingly utilised to assist in the rehabilitation process. This also provides a measure of weed control and allows better access for both sowing and other weed suppression activities.

Wildings provide a particular problem. There are wildings of varying degrees of maturity from immediately adjacent to the Plantation to as far as 25+ km away. It is not a simple gradient of maturity from Plantation to ‘natural’. The dispersal agents (such as Sulphur-crested Cockatoos) do not operate in a negative exponential relationship. When the project was first envisaged it was felt that low-intensity fire would control wildings in the communities adjacent to the Plantation. Experience since then has demonstrated that we cannot rely on low-intensity burns even for control of small-diameter wildings.

The Service, the Tumut/Brungle Aboriginal Land Council, contractors and volunteers have conducted many wilding control programs inside and outside the Plantation. The problem is huge – and short of a major, extreme bushfire-event may not be capable of solution.

Take, for example, the Yarrangobilly karst. *Pinus* wildings are widespread across the karst in a variety of topographic situations. Some are inaccessible because of the presence of cliffs. We know that much of the limestone area has not burnt since 1909 (Jack Bridle, Talbingo, and Clarrie Dunn, Talbingo, personal communications, November 2002). The riparian zone is unlikely to ever burn. Physical methods are therefore difficult or impossible in some areas and the use of fire is contraindicated or may not be possible. Thus wilding control has to be active and hands-on and likely to have to continue for many years.

**The Future**

The future of the harvesting and rehabilitation process depends very much on available markets for the remaining pine to reduce the source for the spread of *Pinus* wildings across the Park. Wildings outside the Plantation and regeneration of pines within the harvested areas will be an ongoing problem, as will other weeds, mainly blackberries. The National Parks and Wildlife Service will have Jounama Pine Plantation and its legacy facing it for many years to come.

Establishment of native species has been successful but full development of a pre-Plantation ecosystem will take many decades – perhaps centuries. In general, monitoring of the harvesting and rehabilitation operations has shown that environmental impacts of these have been minimal and not unexpected.

**Acknowledgements**

The authors would like to acknowledge the efforts of very many people in the harvesting and rehabilitation of the Jounama Pine Plantation. They are simply too many to mention individually but include the many members of the various ‘J-teams’, the various Forestry Commission/State Forest project officers, the many people associated with the Tumut/Brungle Aboriginal Land Council who have carried out much wilding control, and various NPWS teams who have battled the flames – real and allegorical. At the risk of offending many by omission, we would particularly like to thank Roger Dawson, Keith Bousfield, Geoff Winnett and the Canberra Speleological Society. Jackie Taylor reviewed the manuscript.
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From the Mountains to the Sea, Recovering a Lost River

Graeme Enders

Abstract

In 1967 the Snowy Scheme's Jindabyne Dam was completed, and the final door came down on the wild flow of the Snowy River. Its' high country snow-melt headwaters, the Eucumbene, the Thredbo, and the Snowy had been diverted west for the generation of electricity, for drought security in the Murray and Murrumbidgee Rivers, and for development of inland irrigation schemes. Not everyone agreed with the development of the Snowy Scheme, or with its effect on rivers. In fact, communities along the Snowy felt they had been short-changed by the political processes leading up to its total diversion. It was not until the Corporatisation process for the SMHEA provided opportunity that a long community campaign resulted in a decision of governments to restore environmental flows to the Snowy River, sourced from water savings made in irrigation areas. The governments of NSW and Victoria are now cooperating to source water savings for the Snowy, to rehabilitate the degraded river channel, and to involve communities in its recovery. This paper looks at a framework for river recovery, and discusses current recovery activities.

The views expressed in this paper are those of the Author and do not reflect the position or opinion of the NSW Government or its Agencies.

Introduction

I grew up exploring mountain rivers in the north east of Victoria; the Rose, Dandongadale, King, Buckland, and so on. I spent time in my teenage years canoeing the Ovens & Murray Rivers, and even in that short time I saw significant changes to catchment hydrology, infestation of willows and other riparian weeds, changes in fish such as native 'greasies' (blackfish) to redfin, and the movement of European carp into the upper Murray system. I later worked along the Murray River when its problems were becoming very apparent. So it is a privilege for me to come back to rivers, and be able to work with NSW Premier’s, DLWC and Snowy River people on the recovery of the Snowy River.

The title of this paper, is a trifle ambitious, given that the Snowy flows over 350 kilometres from Jindabyne to Marlo, and every km of the river is different, through a number of strikingly different sub-catchments. The river falls 2228 metres from Mt Kosciuszko to sea level (through alpine, sub-alpine, montane, tableland, coastal and estuarine ecosystems and their local variations) and nearly 1000m of that from Jindabyne. To do this justice in a short paper is not possible, so readers will have to discover the geography of the Snowy River for themselves. Recently I toured the Snowy with a group of people in buses, and after three long days we had only just scratched the surface of who or what the Snowy is, so when you go looking give yourself plenty of time.

So for a river where Chaos theory of infinitely unfolding inner margins holds true, I can only present a small view of this river, and perhaps a view of partial recovery.
The Snowy River

When we think of reduced scale, we are brought to George Seddon’s now famous simile for the modern Snowy – “a cot-sized trickle in king-sized bed”. More on the trickle later, but why “king-sized” - would not just “big bed” or even “double bed” do? Not for the Snowy, where “the river runs those giant hills between” (Banjo Paterson).

The huge landscapes created by the Snowy have provided for people ...ever since they formed the living spaces of the Gnunnawal, Ngarigo, Manero, Bidawaal and Gunnai ancestors, and the many others whose songlines brought them to the mountains...

...ever since they threw up the most significant barriers to European, explorers, pioneers and prospectors beyond the encircling bluffs of the Blue Mountains...

...and ever since Australians laboured to convert the power of the River’s flow into a consumable currency (the Snowy Mountains Scheme). One way or another the Snowy is etched into our country, and into us. It is indeed “king-sized”.

This is a river that once flowed 1200GL of water in an average year, a lot of water. At average peak spring discharge, it probably flowed at near to 10,000 swimming pools, or 10 GL, per day at Jindabyne. During peak floods, there was more.

So the river captured our hearts, but also our imaginations, and in 1947 the Snowy Scheme was begun. 20 years later, in 1967, Jindabyne Dam was closed, and 2000 generations of connection to the snow-melt moods of the river were severed. Australians had to make do with their memories and the echoes of the Spirit of the Snowy.

But not permanently.

By 1997, 30 years on, people called loudly for the Snowy flows to be restored. “The River is our blood” the Koori people said. “The River is our life”. The people who commissioned a benchmarking study into the condition of the Snowy River agreed that the water was the life of the river, and those who formed the Snowy River Alliance, to lobby governments for return of Snowy water, agreed that the river was the life of its people.

By 2000, the NSW and Victorian Governments had agreed to restore up to 28% of the Snowy’s flows, sourced from water savings in irrigation areas – everyone wins.

By 2002, the first instalment of environmental flows (6%) was delivered (on 28th August).

By 2012, Snowy River people expect to have 22% of their river flowing again, nearly one quarter, or in units of Seddon, about a child’s single bed. With corporate investment, this could be lifted to 28%.

This paper is about what we can do to capitalise on environmental flows (with $300m of NSW and Victorian money being invested), what we do to ‘sing up the river’ and to bring it back into the lives of the people who felt wronged when the river was taken from them, and who struggled to be heard for 3 decades. The Snowy never was just a river of water running wasted to the sea, it is a river of life for people living with, or connected to, it. Friendly at times, relentless in its ferocity, a barrier, a pathway, a source of income, it is always their inspiration.

McKeller's Crossing on the Snowy River, Deddick, circa 1900. Photo kindly provided by Heather Livingstone.
**Snowy River Recovery**

The program I work with seeks to integrate community and economic outcomes with the environmental. After some time working with various themes, I think our river recovery model is well-covered by just four:

- Focus of Governments
- Rehabilitation of the River
- Economic opportunities, and
- Strong Snowy River communities.

Each is discussed in turn below, and some of the activities that are going on in relation to each, to demonstrate how river recovery might be achieved.

**Focus of Governments**

The scale of the Snowy River and the way in which it has influenced the lives of Australians, requires that Governments remain focussed on the challenges of its recovery in a way that reflects the priority that they have given to it in recent years.

**Government coordination.** Working together across governments, particularly NSW and Victoria across a state border, to improve the Snowy River, and to manage it as a complete entity. Within NSW there are four key natural resource and environment agencies in NSW with a role to play in river recovery. What do we need to do together and with communities to achieve better outcomes for the Snowy River?

**Snowy Corporatisation agreements** – implementing the outcomes of this lengthy government process which produced contracts between SHL and 3-4 governments (Acts of parliament, regulations, legal agreements), a need to establish commercial viability, to implement environmental debt recovery projects, and deliver environmental flows. A lot of the territory is new to institutions that have been in a fixed pattern in NSW since the last Hydro Agreements Act in 1957, so there is learning, innovation and change.

**Linkage with other processes of Government** – What else is happening in Snowy River country that presents opportunities (or barriers) to river recovery – e.g. Park POM reviews, Local Government plan review, catchment -management blueprints and strategies, Ski resort planning with an increased emphasis on water use, and broader demographic and economic changes?

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Rafting the Lower Snowy - November 2001. Photo G Enders

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Celebrating Mountains – An International Year of Mountains Conference
Jindabyne, New South Wales, Australia
Rehabilitation of the River

Environmental Flows is perhaps the simplest factor in river rehabilitation, “just add water” – however can be quite complex in its implementation, particularly to reconstruct a smaller river in the large, old Snowy river bed.

- **Principles**: Habitat Utilisation flows, Flushing Flows, Channel Maintenance Flows, Connectivity, river signature

- **The mosaic River**: dynamic flow inputs to Snowy, each can overwhelm the other, base signature to the Snowy was the huge Spring thaw flows out of the snowmelt headwaters, Eucumbene, Thredbo then Snowy came down Sept – December. Mowamba River is now the functional headwater of the river (although connectivity is still an issue). The Delegate and Bombala come together at the Quidong with water from the northern side of the Errinundra, then a series of mountain river catchments including the Jacobs, Pinch, Deddick and Buchan Rivers, among others. Down in the Snowy estuary, the Brodribb River comes in from the southern (wet) side of the Errinundra. Each can run flows that eclipse the main river flow, e.g. the 1971 February flood flows that reached the deck of McKillops Bridge, 30m above the river.

- **Implementing Flow Agreements**: Snowy Recovery here is about recovering the snowmelt river signature, albeit at a much smaller scale, and fixing up the river channel. To do this water has first to be ‘saved’ in the western irrigation areas as through more efficient infrastructure, and then delivered from Snowy Scheme structures on the eastern side. The target Snowy environmental flows are 22% by 2012, or 28% with industry partnership, Mowamba flows are now 6%, a new outlet on Jindabyne Dam will be available in 3 years time.

A 500ML/day Environmental Flow in the Snowy River at Dalgety, September 2002 Photo T Fletcher.

River Channel Rehabilitation – precedes flows, but to unclog the blocked arteries of the Snowy in preparation for flows, there is a lot to be done.

- Renovation of riparian vegetation - Key elements are:
  - Willow removal,
  - Riparian weed removal, principally blackberry,
  - selective revegetation with pliant riparian species, stabilisation of the river channel and banks.

- Channel configuration
  - In quieter reaches of the river, use flows to scour out a deeper channel, through accumulations of sand – results in a smaller channel within the old bed,
  - Stabilise with vegetation. Controls the amount of sand moving downstream – more likely to move laterally.
Recovery of fish habitat and populations – Begins with reaching an understanding of fish populations from survey and anecdotal information – we now have a picture of a renowned Snowy River Bass fishery now depleted, similar for trout, River Blackfish populations extinct in Snowy, but remnant in some tributaries. Eels and goldfish abundant. Tupong (Congoli) still migratory to foot of Jindabyne Dam. Survey and collation of anecdotal information.

We are learning about the importance of fish in the river, such as the ecological importance of e.g. Tupong, Galaxids, and Smelt; the cultural importance of e.g. River Blackfish, the economic importance of e.g. Snowy River Bass, and Trout, and Problem Fish, such as Goldfish and redfin perch (there are no European Carp yet).

Reintroduction/re-wilding of fish populations is a desirable outcome for such a significant investment in the ecological recovery of a river. We can reach a greater understanding about what fish are there, barriers to fish movement (less drowning out with lower flows), we can improve in-stream and riparian habitat, introduce woody debris, and frame opportunities to reinforce or rebuild fish populations, perhaps from nursery populations.

River Blackfish (Gadopsis marmoratus). Photo R.H. Kuiter.

Benchmarking the ecological condition of the river

With river recovery it is very important to be able to describe the ecological results achieved, and give some measure of return to investment in environmental recovery. Rapid Expert Panel benchmarking of the Snowy was carried out in 1996, when the condition of the river was found to be very poor.

Since 1997, the baseline ecological condition of the Snowy River has been recorded in detail by the NSW Department of Land & Water Conservation (and before flows were released). Parameters that are periodically sampled include Geomorphology, Water quality and hydrology, Vegetation, Algae, Macroinvertebrates and Fish.

In brief, the benchmark findings are of reduced channel size, pools infilled with sand, loss of habitat diversity, increased algae, decreased native fish, a river typical of silty slow-flowing conditions, poorer than unregulated nearby rivers, and not what could be expected for a cold swift-flowing mountain river.

This program is now in a phase of flow response monitoring to find out and measure the changes expected from environmental flows in the river.
Economic Opportunities

There has been lots of speculation about economic benefits likely to arise from environmental flows in the Snowy. Although more quantitative work can always be carried out, the streams of economic activity that have existing kernels of activity include:

**River based recreation**: including *Recreational angling* – there is established demand for Snowy River Bass (‘perch’) angling in the lower river, trout angling in the headwaters, and the possibility of boutique native species catch-and-release conservation fisheries, and cultural fish conservation programs, and

**Wilderness recreation** – canoeing, river-rafting, horse riding, trekking, and inspirational activities abound. A number of operators are established (even with high insurance premiums), catering largely to educational and backpacker markets.

**Regional/river-corridor tourism** – exploring a diversity of landscapes and localities along the Snowy. May local operators are already offering a range of products. An interstate, community-based dialogue on tourism infrastructure and marketing are probably the next steps that need to be taken.

**Cultural interpretation** – Koori people of the Snowy River are looking at the feasibility of cultural activities with economic potential, including back-country cultural camps and cultural learning tours in Snowy River country.

**Heritage, Education and Knowledge activities** – Education group users are established, and the experience of recovering the first of Australia’s great rivers will build a unique set of data and knowledge. There is an existing market for the products of such knowledge, both domestically and internationally.

**River rehabilitation activities** – Natural Resource management agencies are currently investing in the Snowy River amounts of several hundred thousand dollars per year. Much of this investment is generating local employment, contracting and business opportunities.
Strong Communities

The investment of governments in ecological recovery of a River would be a diminished outcome without making some efforts to ensure that it was consistent with and linked to the perceptions, expectations and opportunities for people in river communities, and others with strong links to the river. Three examples are provided to illustrate how this area of river recovery is being addressed for the Snowy.

How do communities feel about their River? – in 2002 Jeanne Adeland surveyed three river towns and found that social capital and community motivation were very strong and that the Snowy River was very important to these communities, in differing ways. For example, in answer to the question "Is the Snowy River important to you for personal, leisure/recreation or business reasons?" a majority of persons expressed a response of personal or leisure, rather than business (see figure). It will be interesting to note if this response changes in the future as potential for business opportunities along the river is realised (or not).


What do people share along the river? – As a Year of mountains lead-up event, the Snowy River Journey took a group of community people and others with an interest in the future of the Snowy River on
a three day tour of the river, linking up with community events along the way. The event demonstrated that community spirit is very strong, there is cohesive social capital, and the Snowy River is important to these small communities. It also illustrated that Snowy River communities were generally accessing government services/decision making very effectively (via lobby, consultation, dialogue, local action), but that more could be done to facilitate community-government interactions. Outcomes of the ‘Journey’ included a celebration of community achievement, a “Spirit of the Snowy” booklet, increased cross-border collaboration, network building between river communities, demonstration of potential for future events and festivals, exploration of tourism potential, and the collection of a bottle of symbolic Snowy River Water. This water was presented to the Jindabyne Conference from the Snowy River Journey travellers to symbolise the importance of water from mountains to all people.

How can community linkage to the Snowy be strengthened? The Snowy River Care Pilot Program provides an example of how government agencies and communities can enter cooperative partnerships to develop stronger links.

A meeting in Jindabyne in October 2001 brought Aboriginal people together from Sydney, the South Coast, and East Gippsland for talks about the Snowy River environmental flows. That meeting called for practical economic outcomes, and for inclusion in rehabilitation of the Snowy River. The meeting called for acknowledgment of the cultural loss to Aboriginal people caused by losing the waters of the Snowy River to hydro scheme diversion. NSW Premier’s Department, Department of Land and Water Conservation and NSW Department of Technical and Further Education are now working in a partnership with the Bega - Eden - Merrimans Federation of Elders to develop a Snowy River Care training and contract package.

A NSW Department of Education and Training Elsa Dixon Program grant facilitates the partnership by covering the costs of community involvement. DLWC as host partner is providing practical training and contract opportunities in River Care. TAFE as training provider is supporting a Certificate II in Bushland Regeneration for participants. The program aims to develop skills and capacity within communities for the care, rehabilitation and management of rivers.

Outcomes for the participants will include a TAFE Level II Certificate (Bush Regeneration), including First Aid, Chemical Safety and Chainsaw operation, entry level to continuing TAFE learning, practical skills in a range of river rehabilitation techniques, an improved capacity to compete for employment and contract work in river rehabilitation, and an opportunity to enter small business in land and river rehabilitation.

The lessons of this partnership have been to have a flexible approach, to enter all discussions with goodwill and overall to "Work Together - Work Strong".
Conclusion

The Snowy demonstrates that River Recovery cannot be undertaken as a scientific ecological rehabilitation alone, although science must be there. Recovery must be a partnership between the relevant governments and the people who hold connection to the river.

Enough has already been achieved to show that river rehabilitation is about community agreement on outcomes, about hard work, and about focus on the job for considerable periods of time. The Snowy below Jindabyne slowly choked for 30 years, it might take several decades to get a healthy river back, but the trend-lines have been cast.

Once flows are provided, the Snowy is a relatively simple Australian river to rehabilitate, compared with say the Murray River. Much of the river's length flows through National Parks and rocky gorges, its communities are passionate about it, it has only localised water-dependent industries, and it does not yet have European Carp.

Successful rehabilitation of the Snowy will give us a useful gauge on the costs of settling environmental debts, and will undoubtedly become a benchmark for improvement of the health of other rivers both here and overseas.

And for the future - perhaps a Snowy River Biosphere Reserve, managed to protect its landscapes and provide for its people? A great corridor, with National Parks at its core, and sustainably managed land surrounding, that brings you down from the Alps to the East Gippsland coastline, and in doing so generates an economy driven by knowledge, heritage, recreation, tourism, innovative agriculture and great wild and peaceful spaces.

The Snowy River belongs to its people. We are all its people. What becomes of the Snowy is up to us.