Australian Heritage Database

Places for Decision

Class : Natural

Item: 1

Identification

List: **National Heritage List**
Name of Place: Australian Alps National Parks and Reserves
Other Names:
Place ID: 105891
File No: 1/08/284/0028
Primary Nominator: 4107 Minister for the Environment and Heritage
Nomination Date: 30/01/2007
Principal Group: Alpine environments

Status

Legal Status: 30/01/2007 - Nominated place
Admin Status: 03/06/2008 - Assessment by AHC completed

Assessment

Assessor:
Recommendation: Place meets one or more NHL criteria
Assessor's Comments:
Other Assessments: :

Location

Nearest Town: Thredbo Village
Distance from town (km):
Direction from town:
Area (ha): 1608650
Address: The Alpine Wy, Thredbo Village, NSW, 2625
LGA: Yass Valley NSW
Alpine Shire VIC
Towong Shire VIC
East Gippsland Shire VIC
Wellington Shire VIC
Australian Capital Territory ACT
Snowy River Shire NSW
Bombala Shire NSW
Mansfield Shire VIC
Tumbarumba NSW
Tumut NSW
Cooma-Monaro NSW

Location/Boundaries:
About 1,653,180ha, comprising the following national parks and reserves located in the Australian Alps:
Brindabella National Park, about 12050ha, 35km south-south-west of Yass, NSW;
Namadgi National Park, about 105900ha, 35km south-west of Canberra, ACT;
Tidbinbilla Nature Reserve, about 5500ha, 25km south-west of Canberra, ACT;
Bimberi Nature Reserve, about 7100ha, 55km east-south-east of Tumut, NSW;
Scabby Range Nature Reserve, about 3400ha, 25km north of Adaminaby, NSW;
Kosciuszko National Park, about 690000ha, 10km west of Jindabyne, NSW;
Alpine National Park, about 646000ha, 5km south-east of Mount Beauty, VIC;
Snowy River National Park, about 98700ha, 25km north-north-west of Orbost, VIC;
Avon Wilderness Park, about 40000ha, 30km north-north-west of Maffra, VIC.
Mount Buffalo National Park, about 31000ha, Mount Buffalo Road, Mount Buffalo, VIC; and
Baw Baw National Park , about 13530ha, 5km north of Erica, VIC.

Assessor's Summary of Significance:
The Australian Alps National Parks and Reserves (AANP) are part of a unique Australian mountainous bioregion extending over New South Wales, the Australian Capital Territory and Victoria. The AANP displays a mosaic of interactions between its natural and cultural environments.

The natural landscapes of the AANP contain extremely restricted alpine and sub-alpine environments and flora and fauna species, with the alpine zone occupying a very small area (approximately 25,000 hectares). The AANP contains glacial lakes and includes the plateaus and peaks that are prominent and unparalleled in the Australian continent with an average elevation of only 330 metres above sea level. The AANP includes most of continental Australia's peaks over 1,700 metres and

all of those over 1,900 metres and experiences extensive snow coverage on a seasonal basis.

The AANP provides a vital refuge for alpine and sub-alpine flora and fauna species, with a high level of richness and endemism across a wide range of taxa. During the late Quaternary Period and into the present, the high-altitude, cold-climate environment has provided refuge for species in an increasingly arid climate. The distribution of cold-climate species on the mainland retracted to the higher altitudes of the Alps as conditions began to warm up. The high peaks and plateaus of the AANP support a rich and unique assemblage of cold-climate specialist plant and animal species that have evolved unique physiological characteristics, enabling them to survive in an environment subject to extreme climate variation.

The cold-climate, high-altitude history of the AANP is expressed in the assemblage of glacial and periglacial features, unique in low-latitude, low-altitude Australia. These include five alpine lakes, thirteen cirques and associated moraines, ice-grooved and polished pavements and erratic boulders, block streams, permafrost and solifluction deposits. The collection of features contributes uniquely to our understanding of the nature of landscape response to climate during the ice ages of the late Quaternary and into the present.

The Mt Howitt fish fossil site demonstrates remarkable fossil species diversity and preserves fish fossils across a wide range of life stages from larvae to mature fish, over tens of millions of years. The site contributes an important narrative about the evolution of fish across a number of different marine and freshwater environments, and the development of features that enabled vertebrates to leave the water to exploit terrestrial environments for the first time.

Containing the highest parts of the Great Divide, and the only region of mainland Australia with seasonal snow cover, the Australian Alps strongly influence the hydrology of eastern Australia. The Alps contribute significant quantities of snow melt to the river systems of eastern Australia, and the water retention properties of the bog and fen communities in the AANP play an integral role in regulating water flow to river systems.

The AANP provides an outstanding example of the adaptability of a single plant genus, the genus *Eucalyptus*. The eucalypts dominate the AANP vegetation from the lowlands to the alpine heights, where the snow gum (*E. pauciflora)* defines the treeline. Much of the highest land in Australia occurs within the AANP which demonstrates very large topographical variations, which in turn is reflected in the high diversity of eucalypts along the altitudinal and climatic gradient.

The AANP contains the Indigenous history of moth feasting which involved the use of an adult insect – the moth – as the basis for large-scale annual gatherings of different Aboriginal groups for ceremonies sets the gatherings in the AANP apart from other Aboriginal ceremonial gatherings and has captured the Australian imagination, making it exceptional in Australia.

Transhumant grazing commenced in the 1830s and was the practice of using alpine high plains to graze stock during the summer months. It was a significant pastoral activity of the 19th and 20th centuries, continuously practised for over 150 years that made a considerable contribution to Australia's pastoral industry. Transhumant grazing created and sustained a distinctive way of life that is valued as an important part of Australia's pioneering history and culture. Historic features associated with transhumant grazing are evident in the former stockman's huts, the relict former grazing landscapes, stock yards and stock routes.

Scientific research has been undertaken in the AANP since the 1830s. The value is demonstrated by the density and continuity of scientific endeavour. Research sites extending throughout the Alps relate to botanical surveys, soil conservation exclosures, karst research sites, fire ecology plots, arboreta, glacial research sites and space tracking.

Snow-based recreation in the AANP commenced in Kiandra in 1861 with the establishment of the Kiandra Snowshoe Club and expanded from an ad hoc activity by enthusiasts to a multi-million dollar snow sport and tourism industry, today with substantial ski slopes and village resorts. The government hotels established in scenic locations - the Mount Buffalo Chalet, the Yarrangobilly Caves House and Precinct, the Chalet at Charlottes Pass, the Hotel Koscuisko (former) and Mount Franklin Chalet (former) were major features of the expanding activity in the early twentieth century.

Water harvesting in the AANP has contributed to the social and economic development of Australia. Elements of the Snowy Mountains Hydro-electric Scheme and the Kiewa Valley Hydro-electric Scheme occur within the AANP and contribute to the electricity needs of south-eastern Australia, evident in the major pondages along with the numerous tunnels, aqueducts, power stations, huts, roads and former settlements, town and work camp sites. Both schemes were major post-war reconstruction projects with the Snowy Mountains Hydro-electric Scheme employing over 60,000 displaced persons from post war Europe.

The North-East Kosciuszko pastoral landscape demonstrates the use of the mountain resources of summer grasses and herbfields in a remote environment with difficulty of access. As a relict landscape of past grazing leases it conveys the principal characteristics of transhumance and permanent pastoralism being the large areas of open grassy landscapes between timbered ridges and hills, stockman's huts, homestead complexes, stockyards and stock routes.

The AANP is a powerful, spectacular and distinctive landscape and is highly valued by the Australian community for its aesthetic vistas and experiences. Much of the terrain is valued for its remoteness and naturalness, including views to and from the Alps. The mountain vistas, distinctive range-upon-range panoramas, snow covered crests, slopes and valleys, alpine streams and rivers, natural and artificial lakes, snow-clad eucalypts, the high plain grasslands and summer alpine wildflowers all evoke strong aesthetic responses. Recreational pursuits in these landscapes are enhanced by aesthetic appreciation of their wild and natural qualities.

Snow-covered eucalypts, huts in mountain settings and mountain landscapes are distinctive Australian images captured by numerous artists and photographers. The mountain landscapes have inspired poets, writers, musicians and film makers. The AANP has a special association with the Australian community because of its unique landscapes, the experiences of remoteness and naturalness and as the only opportunity for broad-scale snow recreation in Australia. The AANP is widely recognised by Australians as the 'high country'.

Mount Kosciuszko is an iconic feature for all Australians and visited by over 100,000 people each year. The mountain was named by the explorer Paul Edmund Strzelecki after the Polish freedom fighter, General Tadeusz Kosciuszko in appreciation of freedom and a free people, an association that is passionately valued and celebrated by Australia's Polish community.

The pioneering history of the high country is valued as an important part of the construction of the Australian identity featuring in myths, legends and literature. The ballad of *The Man from Snowy River* epitomises horsemanship undertaken in rugged landscapes. The stories, legends, myths and lifestyles of the mountains have been romanticised in books, films, songs, and television series and many, such the *Silver Brumby* novels, are part of Australia's national identity. Through his ballad *The Man from Snowy River,* Andrew Barton 'Banjo' Paterson captured the imagination of the Australian people, stimulating a passion for the high country and the way of life associated with the mountains.

The mountain huts of the AANP constructed for grazing, mining and recreation are valued by communities as a physical expression of the cultural history of the region. They have special associations with many community groups, such as the mountain cattlemen, skiers and bushwalkers but particularly with the Kosciuszko

Huts Association that has been maintaining mountain huts and associated vernacular building skills for over 30 years.

Baron Ferdinand von Mueller is highly recognised nationally and internationally for his contribution to Australian botany, particularly his extensive and thorough botanical collections undertaken in several botanical collecting trips throughout the Alps on horseback. Eugen von Guerard is renowned for his painting *North-east view from the northern top of Mount Kosciusko* that is in Australia's national collection. The writer Elyne Mitchell and poet David Campbell lived near the mountains and their association with the alpine landscape is expressed in their literary works.

Draft Values:

Criterion	***Values***	***Rating***
A Events, Processes	The Australian Alps National Parks and Reserves (AANP) are part of a unique Australian mountainous region. Human interaction with the region has been distinctive in its response to the challenges and opportunities presented by this unique environment. ***Glacial and Periglacial Features*** The assemblage of glacial deposits and features in the AANP includes five alpine lakes, thirteen cirques and associated moraines, ice-grooved and polished pavements and erratic boulders. Periglacial features, both fossil and modern, include block streams, permafrost and solifluction deposits. These features are the material expression of the cold-climate, high-altitude history of the AANP, unique in the low-latitude, low-altitude Australian continent. The glacial and periglacial features contribute uniquely to our understanding of the nature of landscape response to climate during the ice ages of the late Quaternary and into the present and therefore has outstanding heritage value to the nation for its importance in the pattern of Australia's natural history (Percival 1985; Galloway 1989; Yeates 2001a; ISC 2004; AALC 2006). ***Fossils*** The Mt Howitt fish fossil site demonstrates remarkable fossil species diversity and preserves fish fossils across a wide range of life stages from larvae to mature fish, over tens of millions of years. The site contributes an important narrative about the evolution of fish across a number of different marine and freshwater environments, and the development of features that enabled vertebrates to leave the water to exploit terrestrial environments for the first time. Fossils revealed at the site have outstanding heritage value to the nation for their place in vertebrate evolution during the so-called 'Age of Fish' (Vickers-Rich and Rich 1993; Cook ed. 2007). ***Karst*** The Yarrangobilly karst area contains an outstanding collection of surface karst features including gorges, arches, blind valleys, springs and pinnacle fields. It also contains several hundred caves including six show caves with many intricate cave decorations, open for public viewing (ISC 2004). Yarrangobilly has yielded valuable information on the long-term dynamics of landscape formation. The thick flowstone sequences in Jersey Cave span half a million years and provide the longest continuous fire history record from a single site in Australia (DEH 2006b). Yarrangobilly has outstanding value to the nation for its features and karst processes evident in the limestone karst landscape. ***Biological Heritage*** The Alps are one of eleven sites recognised in Australia by the IUCN as a major world centre of plant diversity. During the late Quaternary and into the present, the high-altitude, cold-climate environment has provided refuge for species in an increasingly arid climate. Containing most of the contiguous montane to alpine environments in Australia, the AANP supports a rich and unique assemblage of cold-climate specialist species that have evolved unique physiological characteristics, enabling them to survive in an environment subject to extreme climate variation. Outstandingly rich flora taxa in the AANP include the daisies (Asteraceae), willow-herbs (Onagraceae), starworts and cushion-plants (Caryophyllaceae), southern heaths (*Epacris*), bottlebrushes (*Callistemon*), orchids (*Pterostylis, Prasophyllum* and *Dipodium*) and pimeleas (Thymaelaeaceae). Cold-climate adapted and endemic fauna species include the mountain pygmy-possum (*Burramys parvus*), the alpine she-oak skink (*Cyclodomorphus praealtus*), Snowy Mountains rock skink (*Egernia guthega*), Baw Baw frog (*Philoria frosti*), southern corroboree frog (*Pseudophryne corroboree*), and the northern corroboree frog (*P. pengilleyi*). Species of a great many invertebrate taxa are endemic to the Alps. These include stoneflies, caddisflies, mayflies, grasshoppers, and earthworms. Many display cold-climate adaptations, such as the mountain grasshopper (*Acripeza reticulata*), mountain spotted grasshopper (*Monistria concinna*) and alpine thermocolour grasshopper (*Kosciuscola tristis*). The Bogong moth undertakes regular migration in Australia and an essential part of its lifecycle occurs within the AANP. The AANP is a vital refuge for alpine and sub-alpine flora and fauna species, with a high level of richness and endemism across a wide range of taxa, and therefore has outstanding value to the nation for encompassing a significant and unique component of Australia's biological heritage (Nankin 1983; Costin 1989; Strahan 1995; Good 1995; Boden and Given 1995; WWF and IUCN 1995; Cogger 1996; Crabb 2003 Good 2003; ISC 2004; DSE 2005; AALC 2005; DEC 2006; McDougall & Walsh 2007, ANHAT 2007). ***Moth Feasting*** The use of an adult insect – the Bogong moth – as the basis for past large-scale annual gatherings of different Aboriginal groups for ceremonies sets the gatherings in the AANP apart from other Aboriginal ceremonial gatherings and has captured the Australian imagination, making it exceptional in Australia (White 2006). Therefore the AANP has outstanding heritage value to the nation because of the importance of Aboriginal social gatherings based on moth feasting in the course, or pattern, of Australia's cultural history. ***Transhumant Grazing*** The AANP has outstanding heritage value for its association with historic transhumant grazing that commenced in the 1830s. The practice of using alpine high plains to graze stock during the summer months was a significant pastoral activity of the nineteenth and twentieth centuries and was continuously practised for a period of over 150 years; making a considerable contribution to the early pastoral industry of south-east Australia. Transhumant grazing created and sustained a distinctive way of life that is valued as an important part of Australia's pioneering history and culture. Evidence of transhumant grazing includes huts, the former grazing landscapes, stock yards, and stock routes.	AT

Scientific Research
The AANP has outstanding heritage value for the scientific research that has taken place since the 1830s, demonstrated by the density and continuity of scientific endeavour. Research sites within the AANP include those relating to botanical surveys, soil conservation exclosures, karst research, fauna research, meteorology, fire ecology plots, arboreta and glacial research sites. Space tracking undertaken in the ACT with Honeysuckle Creek Tracking Station having played a significant role in the Apollo 11 moon landing mission.

Water Harvesting
Water harvesting in the AANP has outstanding heritage value to the nation for its contribution to the social and economic development of Australia. Water harvested from headwaters in the AANP contributes to the water needs of Canberra and Melbourne. The Snowy Mountains Hydro-electric Scheme and the Kiewa Valley Hydro-electric Scheme also contributes to the electricity needs of south-eastern Australia. Both schemes were major post-war reconstruction projects, encouraging migration to Australia and employing over 60,000 displaced persons from post war Europe. Evidence of water harvesting in the AANP for power and irrigation includes the major pondages along with the numerous tunnels, aqueducts, power stations, huts, roads and former settlements, town and work camp sites.

Recreation
The AANP has outstanding heritage value for the longevity and diversity of its recreational use. Snow sports commenced in Kiandra in 1861 with the establishment of the Kiandra Snowshoe Club and expanded from an ad hoc activity by enthusiasts to a multi-million dollar snow sport and tourism industry characterised by the groomed ski slopes, ski lift infrastructure and substantial village resorts. The chalets supported by government were major features of the expanding activity and were established in scenic locations in the early twentieth century when mountain retreats were highly regarded for good health. These include the Mount Buffalo Chalet, the Yarrangobilly Caves House Precinct, the Chalet at Charlottes Pass, and the former Hotel Kosciusko and Mount Franklin Chalets.

B Rarity

Landscape and Topography AT
The high altitudes of the plateaus and peaks in the AANP are prominent in a continent with an average elevation of only 330 metres above sea level. The AANP includes most of continental Australia's peaks over 1,700 metres and all of those over 1,900 metres. These high peaks and plateaus contain the vast majority of alpine and sub-alpine environments in Australia. The AANP experiences extensive snow coverage on a seasonal basis, and its glacial lakes are the only wetlands on the Australian mainland covered by ice sheets in winter. The high-altitude landscape of the AANP has outstanding heritage value to the nation for its topographic heights, uncommon alpine and sub-alpine ecosystems and glacial lakes. (AALC 2005; DEC 2006; Geoscience Australia 2007).

Glacial and Periglacial Features
Continental Australia and its southern territorial islands have experienced periods of historic glaciation, with current snow and ice coverage limited to the highest peaks and altitudes. On mainland Australia, the AANP preserves a concentration of glacial and periglacial features without comparison from the ice ages of the late Quaternary Period. The Kosciuszko Plateau is unique in mainland Australia as the only place irrefutably exhibiting landforms shaped by Late Pleistocene glaciers during a series of glacier advances known as the Late Kosciuszko Glaciation. The active and fossil periglacial landforms of the AANP include blockstreams and solifluction features (solifluction is the gradual movement of waterlogged soil down a slope, especially where percolation is prevented by a frozen substrate). They are the most striking and extensive in mainland Australia and demonstrate the widespread effects of cold climate in the Quaternary, mild climate in the Holocene and the absence of intensive Pleistocene ice modification of the elevated landscape of the Victorian and ACT Alps. Therefore the AANP has outstanding heritage value to the nation for containing uncommon glacial and periglacial features (Percival 1985; Yeates 2001; Barrows et al. 2001).

Fossils
The Mt Howitt fish fossil site is globally rare because it preserves a diverse array of fossil fish in uncommon detail at all stages of their lives. It is unique nationally in providing a snapshot of a complete freshwater vertebrate community from the past, and for yielding fossils from all stages of growth of a species, from tiny fish larvae to adult fish, and therefore has outstanding heritage value to the nation because of its preservation of an uncommon aspect of Australia's natural history (Long 2002; Cook ed. 2007).

Alpine and Sub-alpine Ecosystems
The AANP has outstanding heritage significance to the nation for possessing extremely uncommon aspects of Australia's natural history. Alpine and sub-alpine ecosystems are uncommon in the generally arid and warm climate of Australia. The distribution of cold-climate species on the mainland retreated to the higher altitudes of the Alps in the Late Pleistocene as conditions began to warm up. The AANP contains most of the alpine and sub-alpine ecosystems on mainland Australia, supporting flora and fauna species that have evolved to the harsh conditions of the high altitudes. Many of these species are endemic to the Alps and are found nowhere else in Australia. The bog and fen groundwater communities are supported by organic soils and contain exceptional water retention properties. These communities play an integral role in ecosystem function by regulating the slow release of water from saturated peatbeds to the surrounding alpine humus soils, streams and other alpine communities (Good 1995; AALC 2006b).

Eucalypt Flora Community
The AANP provides an outstanding example of the adaptability of a plant genus, the genus *Eucalyptus,* along a steep topographical transect. The eucalypts dominate the AANP vegetation from the lowlands to as high as the alpine region, where the snow gum (*E. pauciflora)* defines the treeline. Much of the highest land in Australia occurs within the AANP, which also demonstrates very large topographical variations, which in turn is reflected in the high diversity of eucalypt species replacing each other along the altitudinal and climatic gradient (Costin 1988; Kirkpatrick 1994; ISC 2004; ANHAT 2007).

D Principal characteristics of a class of places	***North-East Kosciuszko Pastoral Landscape*** The landscape is outstanding for demonstrating the use of mountain resources, namely the summer grasses and herbfields. As a relict landscape of past grazing leases it conveys the principal characteristics of transhumance and permanent pastoralism in a remote environment, these being large areas of open grassy landscapes between timbered ridges and hills, stockman's huts, homestead complexes, stockyards and stock routes. The grasslands with swathes of pioneer shrubs include the Kiandra landscape, Boggy Plain, Nungar Plain, Gulf Plain, Wild Horse Plain, Tantangara Plain, Dairymans Plain, Currango Plain, Long Plain, Cooleman Plain, Kellys Plain, Blanket Plain, Peppercorn and Pockets Saddle (KHA 2008). Homestead buildings include Cooinbil and Old Currango and the modest homestead complexes of Currango and Coolamine with additional features including exotic plantings, sheds, barns, and workers' accommodation. Former stock routes, now fire trails, include the Port Philip Fire and Murrays Gap Fire Trails. Located in the former grazing leases are stockman's huts, Bill Jones Hut, Circuits Hut, Gavels Hut, Hains Hut, Hainsworth Hut, Millers Hut, Oldfields Hut, Pedens Hut, Pockets Hut, Townsends Lodge, Gavels Hut, Long Plain Hut, Gooandra Hut, Schofields Hut, and Witzes Hut (KHA 2008), which in their use and re-use of available materials typify a lifestyle and vernacular bush building technology using hand tools. The array of characteristics relate to over a century of alpine grazing.	AT
E Aesthetic characteristics	The AANP is a powerful, spectacular and distinctive landscape highly valued by the Australian community. The mountain vistas, including distinctive range-upon-range panoramas, snow covered crests, slopes and valleys, alpine streams and rivers, natural and artificial lakes, the snow-clad eucalypts and the high plain grasslands, summer alpine wildflowers, forests and natural sounds evoke strong aesthetic responses. Much of the terrain of the AANP is highly valued for its remoteness, and naturalness, including views to and from the region that capture snow clad ranges and mountain silhouettes against clear skies as well as expansive views of natural landscapes from the high points of the Alps. The upper Snowy River and Snowy Gorge, Mount Buffalo, the Kosciuszko Main Range, Lake Tali Karng, Dandongadale Falls the peaks and ridges between and including Mt Cobbler, Mt Howitt and the Bluff, and other high peaks, ridgelines, granite outcrops and escarpments are examples of dramatic awe-inspiring landscapes. Recreational pursuits in these landscapes are enhanced by aesthetic appreciation of their wild and natural quality. Snow-covered eucalypts, huts in mountain settings and mountain landscapes are distinctive Australian images captured by numerous artists and photographers. The mountain landscapes have inspired poets, painters, writers, musicians and film makers.	AT
G Social value	The Australian Alps have a special association with the Australian community because of their unique landscapes, the possibility of experiencing remoteness and as the only opportunity for broad-scale snow recreation in Australia. The AANP is widely recognised by Australians as the 'high country' and many community groups have a special association with the AANP for social and cultural reasons. Mount Kosciuszko is an iconic feature for all Australians and visited by over 100,000 people each year. It was named by the explorer Paul Edmund Strzelecki after the Polish freedom fighter, General Tadeusz Kosciuszko, in appreciation of freedom and a free people, an association that is highly valued by Australia's Polish community. The pioneering history of the high country is valued as an important part of the construction of the Australian identity featuring in myths, legends and literature. The ballad of *The Man from Snowy River* epitomises horsemanship undertaken historically in the rugged landscape. The stories, legends and myths of the mountains and mountain lifestyles have been romanticised in books, films, songs, and television series and many such as the Elyne Mitchell's *Silver Brumby* novels are part of Australia's national identity. The mountain huts of the AANP constructed for grazing, mining and recreation are valued by communities as a physical expression of the cultural history of the region. They have special associations with many groups, such as mountain cattlemen, skiers and bushwalkers but particularly with huts associations that have been maintaining mountain huts and associated vernacular building skills for over 30 years.	AT
H Significant people	Baron Ferdinand von Mueller is highly recognised nationally and internationally for his contribution to Australian botany, particularly his extensive and thorough botanical collections of the Australian Alps undertaken in several botanical collecting trips on horseback, each of several weeks' or months' duration (Costin et al. 1979). Eugen von Guerard was a significant nineteenth century artist producing a prolific record of Australian landscapes. His 1863 painting the *North-east view from the northern top of Mount Kosciusko* is regarded as one of his finest artistically and is in Australia's national collection. Through his ballad *The Man from Snowy River,* Andrew Barton 'Banjo' Paterson captured the imagination of the Australian people, stimulating a passion for the High Country and the way of life associated with the mountains. His iconic ballad has had a lasting influence on Australians. The writer Elyne Mitchell and poet David Campbell lived near the mountains and their strong association with the place is expressed in much of their nationally important literary works.	AT

Historic Themes:
Group: 01 Tracing the evolution of the Australian environment
Themes: 01.04 Appreciating the natural wonders of Australia
Sub-Themes:

Group: 02 Peopling Australia

Themes: 02.02 Adapting to diverse environments
Sub-Themes:
Group: 03 Developing local, regional and national economies
Themes: 03.03 Surveying the continent
Sub-Themes: 03.03.02 Looking for overland stock routes
Group: 03 Developing local, regional and national economies
Themes: 03.05 Developing primary production
Sub-Themes: 03.05.01 Grazing stock
Group: 03 Developing local, regional and national economies
Themes: 03.11 Altering the environment
Sub-Themes: 03.11.01 Regulating waterways
Group: 07 Governing
Themes: 07.06 Administering Australia
Sub-Themes: 07.06.10 Conserving fragile environments
Group: 08 Developing Australia's cultural life
Themes: 08.01 Organising recreation
Sub-Themes: 08.01.04 Enjoying the natural environment
Group: 08 Developing Australia's cultural life
Themes: 08.11 Making Australian folklore
Sub-Themes: 08.11.01 Celebrating folk heroes

Nominator's Summary of Significance:
Not provided.

Description:
The Australian Alps (the Alps) are identified as a bioregion under the Interim Biogeographic Regionalisation for Australia. The Alps are known in Victoria as the Victorian Alps or the High Country, as the Snowy Mountains in New South Wales and as the Brindabella Range in the Australian Capital Territory. The term 'High Country' is also often understood to mean the entire region of the Alps.

The *Australian Alps National Parks and Reserves* (AANP) are a tract of eleven protected areas stretching across the Australian Capital Territory, New South Wales and Victoria, containing the vast majority of alpine and sub-alpine environments in Australia. These reserves have been managed effectively as a single palaeobiogeographic unit for much of the last two decades.

The boundary of the AANP comprises the following national parks and reserves: Brindabella National Park, Tidbinbilla Nature Reserve, Namadgi National Park, Bimberi Nature Reserve, Scabby Range Nature Reserve, Kosciuszko National Park and Alpine National Park, which form the central part of the AANP containing true alpine and sub-alpine environments, Snowy River National Park, the Avon Wilderness, and the outliers of Mount Buffalo and Baw Baw national parks, with Baw Baw representing the southerly extent of the sub-alpine environments on mainland Australia (Parks Victoria, 2005). The boundary of the AANP includes Cabramurra (the highest town in Australia) and the ski resorts of Guthega, Perisher Valley, Smiggin Holes, Blue Cow, Charlotte Pass and Thredbo. In Victoria the six main alpine resorts are outside the boundary of the AANP.

The Alps are within the traditional lands of a number of Aboriginal groups including Ngarigo (Monero-Ngarigo; Ngarego; Ngarrugu); Wiradjuri; Ngunnawal; Wolgol [Walgalu]; Krautungalung; Brabiralung; Braiakaulung; Gunai/Kurnai; Minjambuta; Djilamatang; Djiringanj; Jaimathang - Yaitmathang; Duduora; Biduelli (Maap; Bidawal; Birdawal); Woiworung; Wurundjeri; Taungurung; Thau; and Walbanga (Goulding 2002; Tindale 1974 cited in Kabaila nd). Many Aboriginal people from the Alps now live throughout Victoria, the New South Wales south coast, Canberra, the Snowy Mountains region and beyond. These people continue to have an ongoing connection to the place (Goulding 2002) and some of their recollections of their lives in and around the mountains have been recorded, for example by Wesson (1994), Waters (2004) and Young (2005).

Natural Features

Geomorphology
The Eastern Highlands is an elevated region of eastern Australia, extending for more than 3,000 kilometres roughly parallel to the coast from Cape York Peninsula to central Victoria. The southern part of the highlands is submerged in Bass Strait, before it reappears as the Tasmanian central highlands. The natural landscapes of the highlands vary in age, lithology and topography. In places, plateaus are dissected into rugged hills and their eastern edges, which are generally steeper than the western slopes, form high escarpments. These unite to form the Great Escarpment, which runs from northern Queensland to the Victorian border (Ollier 1988).

The popular name for the highlands, the 'Great Dividing Range', derives from the highlands' function as a drainage divide, which has influenced the hydrology of the entire eastern portion of the mainland by diverting the rivers of the eastern states east to the coast or west inland. For much of its length the divide itself runs across rather low relief country where there is no distinctive 'range'. The highest elevations of the Great Dividing Range occur in the Alps. In eastern Victoria the old plateau has been eroded into separate high plains (such as Snowy Plains and Bogong High Plains), mostly lying south of the divide (Ollier 1988). Australia's highest mountain on the mainland, Mount Kosciuszko, is in the Snowy Mountains.

Topographically, the region is an elevated undulating peneplain, separated in places by valleys and gorges into ridges, escarpments and large flat areas, known as high plains. In New South Wales much of the plateau country is still intact, whereas in Victoria, the ranges show progressively more relief to the south and to the west, where deep valleys and gorges have dissected the topography, leaving the plateaus of the Bogong High Plains and smaller isolated plateaus like Mount Buffalo and Baw Baw prominent in the landscape.

The natural landscape of the Alps was in part shaped by episodes of glaciation. Glaciers are effective agents of erosion, transport and deposition, and glacial features appear distinct in the landscape from features formed by river flow. Glacial lakes often form in depressions carved out by glacial erosion (cirques), but also occur when dams of glacial deposits (moraine) form between a retreating glacier and an earlier end-moraine. In the still water of these lakes, clay and silt settle on the bottom in two thin layers, one light and one dark, called varve. This process is characteristic of glacial lakes, with two layers of sediment representing one year's deposition. These can be read like tree rings to indicate the age of a glacial lake (Plummer and McGeary 2003).

Periglacial processes are also effective agents of erosion, transportation and deposition and occur where the landscape is exposed to extreme conditions of freeze and thaw. Geological features resulting from periglacial processes are usually quite distinct from features formed by glacial processes. The AANP contains a remarkable

concentration of landforms developed under periglacial processes of extreme freeze and thaw action. Such features include the movement of soil particles by the growth of needle ice, and in wet spots below long lasting snowpatches, solifluction and the mass movement downslope of soil and stones. Solifluction most commonly causes terraces or lobes, from the gradual movement of waterlogged soil or other surface material downslope, especially in places where the frozen subsoil prevents the percolation of surface water. Slope deposits and blockstreams are the largest, most widespread and easily recognisable periglacial features in the AANP (Galloway 1989; AALC 2005). On a smaller scale, solifluction terraces range from less than one metre to several metres in size. These include the non-sorted steps above the tree-line at Kosciuszko dating to around 2,500 years ago, which indicate a renewal of cooler conditions at that time (Costin 1989). There are no modern glaciers in Australia, although some snow drifts persist into late summer at higher elevations. Modern periglacial activity is restricted to elevations above the treeline (Barrows et al. 2001).

The Australian continent remained largely untouched by late Pleistocene glaciations even in its highest landscapes. Consequently these landscapes preserve periglacial features, ancient landscapes, deep soil profiles and long biostratigraphic sequences. In Northern Europe and North America, in comparison, advancing and retreating glaciers scoured montane landscapes down to the bedrock, removing many features and deposits shaped by earlier glaciations and periglacial activity. The absence of intensive Pleistocene ice modification of the elevated landscape of the Victorian and Australian Capital Territory Alps is unusual. The lack of glacial activity and the mild climates of the Holocene epoch (the last 12,000 years) have preserved convex slopes and undulating plateaus above the treeline and well-developed deep alpine humus soils, as well as a range of active and fossil periglacial features (Kirkpatrick 1994).

The AANP contains nine limestone karst areas, with Yarrangobilly Caves and Cooleman Plains being the best documented of these. The Yarrangobilly impounded karst area in northern Kosciuszko is characterised by surface karst features such as gorges, arches, springs and pinnacle fields as well as several hundred caves, including six show caves open for public viewing (ISC 2004). The Cooleman Plains karst area is located to the north of Tantangara Reservoir, in the northeast of Kosciuszko National Park. It contains an impressive array of karst features including caves, valleys, active and abandoned springs and stream sinks, and a series of small features known as 'A-tents' (ISC 2004; DEH 2006b).

Flora and Fauna

The flora and fauna of the Alps are a unique assembly of colonists of a young and ephemeral habitat evolved in a cold mountain environment, surrounded by a lower, warmer and more arid landscape (AALC 2005; DEH 2006a). Similar vegetation probably existed during previous interglacial periods and some basic elements of the flora might have persisted for at least the last few hundred thousand years. However, extreme climate fluctuations and changing fire regimes throughout the Quaternary probably resulted in major changes in the distribution and composition of the flora (Kershaw et al. 1986 in Busby 1990; Coyne 2000).

Today, the Alps contain four distinct vegetation zones that are altitudinally and climatically determined. These zones are characterised by changes in height and species of the dominant eucalypt species and in the density, type and growth forms of under-storey and ground cover species (Cameron-Smith 1999; AALC 2005). These zones are the tableland, montane, sub-alpine and alpine zones. The alpine zone occupies a very small area of land above the tree-line (AALC 2006). Over time the extent of the alpine and sub-alpine zones has retreated, with increasing temperatures as a result of a changing climate. The floristic zones are attitudinally defined as follows (AALC 2005):

- Tableland: *VIC* 300-600m, *NSW* 300-800m, *ACT* 700-900m
- Montane: *VIC* 600-1,350m, *NSW* 800-1,500m, *ACT* 900-1,300m
- Sub-alpine: *VIC* 1,350-1,750m, *NSW* 1,500-1,850m, *ACT* 1,300-1,900m
- Alpine: *VIC* 1,750m+, *NSW* 1,850m+

Grassy woodlands and dry open forests occur on lower slopes or tablelands. Precipitation is higher in the montane zone and the forest is generally taller and denser than the sub-alpine zone. The trees are dominated by a mixture of eucalypts which are taller and grow closer together. At the highest elevation of the montane slopes just below the sub-alpine zones there is a band of tall open forest dominated by alpine ash *(Eucalyptus delegatensis*), the tallest eucalypts in the Alps standing at around 20-40 metres (Cameron-Smith 1999; AALC 2005).

Above around 1,500 metres there is an abrupt change in vegetation from tall forest to a low-growing sub-alpine woodland dominated by the snow gum *Eucalyptus pauciflora.* The plants growing here have to endure low temperatures year round and precipitation falls mostly as snow and ice. The trees are stunted and often twisted away from the prevailing wind and as they approach the alpine and valley-bottom treelines, snow gums typically develop an increasingly shrub-like appearance and cluster into 'islands' generally associated with rocky outcrops. They can survive temperatures down to about -18 degrees Celsius, often in deep snow (Cameron-Smith 1999; Coyne 2000; AALC 2005).

The snow gum *(Eucalypus pauciflora)* is an emblematic eucalypt associated with alpine scenery, particularly stunted and twisted growth forms. The species is common on high mountainous and plateau areas of the Alps and Tasmania, but also occurs on other tablelands and mountains, and some near-coastal areas in southern New South Wales, Tasmania, western Victoria and South Australia. It is generally found at an altitude above 1,500 metres to altitudes approaching 2,000 metres but often found down to around 1,000 metres or occasionally 600 metres, with rare occurrences to near sea level in Tasmania (CSIRO nd). The species has several described sub-species, the most cold-tolerant being subsp. *niphophila* (found at the highest altitudes suitable for tree growth in the Australian Capital Territory, New South Wales and Victoria); subsp. *debeuzevillei* (restricted to some isolated peaks in northern Koszciusko National Park, New South Wales and adjacent similar areas of the Australian Capital Territory); subsp. *hedraia* (found only at the upper treeline around Falls Creek in Victoria, with subsp. *niphophila* occurring not far away) and subsp. *acerina* (the treeline form on the Baw Baw Plateau in Victoria). The typical subspecies, i.e. subsp. *Pauciflora,* also occurs where there is a treeline at slightly lower sub-alpine altitudes and is abundant in this sub-alpine habitat on all but the highest parts of New South Wales and Victoria (APC 2007, B Lepschi pers. comm. 25 October 2007). For the purposes of this report the 'snow gum' in the AANP will be referred to as *Eucalyptus pauciflora*.

The alpine zone is subject to the coldest temperatures and the most persistent snow and the most obvious change in the vegetation is the transition at the treeline or upper altitude where trees can survive. The treeline generally coincides with mean mid-summer temperatures of about 10 degrees Celsius. At this level the limited solar energy only provides for day to day survival and renewal of leaves - there is not enough photosynthetic activity for the development of the large root systems, trunks and branches required by trees (AALC 2005, AALC 2006b). The deep organic soils of the alpine zone have been the subject of scientific interest, as they differ from other alpine areas around the world where soil formation is limited (ISC 2004). These soils have remarkable water retention properties and contribute to the slow release of snow melt over the year to the catchment.

In the high plains cold air drainage is associated with an altitudinal inversion of ecosystems. Cold-tolerant communities which are often treeless occur both at the highest and at the lowest levels, often referred to as frost hollows. Forest and woodland communities occur between the altitudinal extremes (Costin 1989; Coyne 2000).

Above the treeline is the true alpine zone the vegetation comprises a diverse mosaic of lower growing vegetation communities including heathlands, grasslands, herbfields and bogs, interspersed by bare protruding rockherbs reaching no more than a metre in height. The alpine zone is subject to the coldest temperatures and

the most persistent snow and is too harsh an environment for trees. The alpine zone supports a diversity of communities including herbfields, heaths, bogs, fens, feldmark and sod-tussock grasslands, and several of these communities have significant hydrological and biological conservation values. Alpine bogs produce significant volumes of high-quality water, which they release slowly into catchments in summer, when rainfall is scarce. Bogs and fens are groundwater communities dominated by hummock-forming mosses (*Sphagnum* spp.) and acidophilous shrubs. These communities develop in sites where partly decomposed organic matter accumulates and is colonised by water-loving species such as sedges (*Carex* spp.) (AALC 2006b). Deep organic soil profiles exist here and are partly responsible for the water retention properties of these high altitude ecosystems.

There is a limited flowering season, and mass flowering takes place in the summer months (ISC 2004). The AANP demonstrates high species richness in a range of plant families and genera including the daisies (Asteraceae, especially *Brachyscome*, *Helichrysum* and *Ozothamnus*), willow-herbs (Onagraceae), starworts and cushion-plants (Caryophyllaceae), southern heaths (*Epacris*), bottlebrushes (*Callistemon*), eucalypts, particularly of the ash type (subgenus *Monocalyptus*), riceflowers (*Pimelea*), lilies (Liliales) and orchids (*Pterostylis, Prasophyllum* and *Dipodium*). One genus of tree, *Eucalyptus*, dominates the alpine landscape. The ubiquitous eucalypts cover upland and valley alike, occupying every available ecological niche except for the frost hollows and the highest mountain tops and ridgelines. Over 30 species of eucalypt replace each other along a number of ecological sequences across Kosciuszko National Park (DEC 2006; ANHAT 2007).

Generally the range of vertebrate species in the region extends beyond the AANP and most are not dependent on alpine conditions. However several alpine vertebrate and invertebrate species have a limited distribution and many are threatened. The family of the smallest of the Australian possums, Burramyidae, includes the mountain pygmy-possum (*Burramys parvus*). Endemic to the Alps, the species is the only marsupial observed to display a physiological adaptation to cold, surviving the winter months in an energy-saving torpor (Mansergh et al. 1989; Mansergh and Broome 1994). Many other animals living in the AANP, particularly reptiles and amphibians, become inactive in colder temperatures and conserve energy by hibernating or becoming torpid. Species such as the mountain pygmy-possum, the native bush rat (*Rattus fuscipes*), the broad-toothed rat (*Mastacomys fuscus*) and Swainson's antechinus (*Antechinus swainsonii*) use the insulating properties of the snow to survive long cold winters by living entirely underneath it (AALC 2005). The ubiquitous short-beaked echidna has adapted to the extreme climate of the region, demonstrating both torpor and hibernation (Grigg et al. 1991).

The alpine she-oak skink (*Cyclodomorphus praealtus*), alpine water skink (*Eulamprus kosciuskoi*) and high plains (or alpine bog) skink (*Pseudemoia cryodroma*) have a substantially alpine distribution. The alpine water skink occurs in sphagnum bogs and alpine she-oak skinks are found at high altitudes in sub-alpine woodland. The mountain dragon (*Tympanocryptus diemensis*) is the only agamid lizard that occurs above the winter snowline in Australia. It is found up to about 1,750 metres in open woodland, open heath and on rocky north- or west-facing slopes of the mainland mountains (Coyne 2000; Cogger 2000; Wilson and Swan 2003; Swan et al. 2004).

The humid climate and generally pollution-free waters and bogs provide ideal habitats for frogs. Several species are largely restricted to the alpine and sub-alpine zones, including the Victorian Baw Baw frog (*Philoria frosti*), the brilliantly marked southern corroboree frog (*Pseudophryne corroboree*) and the northern corroboree frog (*Pseudophryne pengilleyi*) (Cameron-Smith 1999; Coyne 2000; Cogger 2000).

The climbing or broad-finned galaxias (*Galaxias brevipinnis*) is a native fish that used to be found in waterways at all elevations throughout the Alps. It can climb damp rock faces into shallow warm pools of water to regulate its body temperature (Coyne 2000). It is now restricted to the alpine and sub-alpine waterways above waterfalls where introduced migrating trout cannot reach (AALC 2005).

An emblematic alpine insect, the Bogong moth (*Agrotis infusa*) migrates to the high country in early summer from north-western New South Wales and Queensland, where it breeds and feeds. It clusters in large groups in rock crevices and caves and remains dormant over summer to escape the heat of the lowlands. This attribute is called aestivation or summer hibernation (AALC 2005). Caves provide a stable environment for specialised invertebrate fauna in the AANP, much of which is still to be studied (Coyne 2000). Yarrangobilly Caves and Cooleman Plains support distinctive invertebrate species restricted to the karst systems (Coyne 2000).

The AANP contains two identified Ramsar sites: one comprises Blue Lake, Hedley Tarn and the majority of their catchments in Kosciuszko National Park, and the other being the Ginini Flats Wetland Complex in Namadgi (Coyne 2000). Wetlands occur where the water table is close to the surface: in valley bottoms, along stream courses or seepage areas on valley sides. The ecosystems of a few alpine streams have not been influenced by the introduction of trout or by water diversion (Costin 1989). Research on the flora and fauna of alpine aquatic systems indicates major differences between alpine systems and other aquatic systems in Australia (Cullen and Norris 1989). These streams and wetlands are floristically and physiographically complex and vary from wet *Poa* grassland, *Carex*-dominated fens, to peat bogs rich in sphagnum and hydrophytic shrubs and herbs. The presence of an additional sphagnum species, *S. subsecundum,* which is tolerant of submersion, distinguishes bog communities on the Baw Baw plateau and Lake Mountain, outside AANP (Coyne 2000).

Catchments

The Alps receives some of the highest precipitation in Australia and contains the headwaters of a number of major Australian rivers including the Snowy, the Murrumbidgee and Murray rivers. Large quantities of snow melt feed into the alpine rivers during spring and summer and are diverted into the Snowy Mountains scheme (Geoscience Australia 2007). The upper Murray catchment contributes more than 17 percent of the average annual runoff into the Murray-Darling basin, from only 1.4 per cent of the basin's area. The relatively low temperatures result in low evaporation rates and regular and plentiful precipitation. The high water-holding capacity of snow, of deep alpine soils and of vegetation - notably the bog communities, results in slow discharge rates of water and contributes to reliable stream-flow, by Australian standards, throughout the year. Around 2.5 metres of water falls as rain and snow in the region each year, and its slow release by sedgeland peats, fens and sphagnum moss beds maintains flow in streams and rivers, especially during drier summer months (Costin 1989; Good 1992a; Crabb 2003). As a result, the region holds large volumes of water resources and catchments that are highly valued for irrigation and domestic supply.

Indigenous Features

There is physical evidence of Aboriginal use across the region in the form of surface artefact scatters and open campsites, scarred trees, stone quarries, ceremonial grounds, stone arrangements, quarries, rock art and rock shelters with cultural deposit (Flood 1980; Grinbergs 1993a; Goulding et al. 2000; McConnell et al. 2002a, 2002b; Freslov et al. 2004).

Three rock shelters containing evidence of human occupation on the fringes of the AANP during the Late Pleistocene have been excavated: Birrigai – 21,000 ± 220 BP (Tidbinbilla Nature Reserve, Australian Capital Territory), Cloggs Cave – 17,720 + 840 BP (Buchan, Victoria) and New Guinea II - 21,000 ± 900 BP (Snowy River National Park, Victoria). While neither New Guinea II nor Cloggs Cave occurred within the periglacial zone, it is likely that conditions were cold, dry and harsh. Birrigai is immediately adjacent to areas affected by periglacial conditions. Aboriginal rock art occurs at both New Guinea II (finger fluting) and Cloggs Cave.

Aboriginal people have identified many places of value within the AANP, such as dreaming trails, spiritual places, ceremonial places, story places, named places, birthing places, food and medicine collection localities, raw material collection localities, and men's and women's places. A number of specific locations of

importance to individuals have also been named (Goulding et al. 2002; Waters 2004).

Historic Features

Many descriptions of historic features have been summarised from the report *Assessment of the Cultural Heritage Values of the Australian Alps National Parks* (Truscott et al. 2006).

Alpine Pastoralism
The high alpine pastures offered surrounding landholders good grazing during the summer months when feed was scarce on their home stations. Transhumant grazing, the practice of bringing cattle and sheep up to graze on the well watered high country pastures during the summer months, ameliorated the threat of drought in the low lands and allowed home pastures time to recover. This process of moving stock into and out of the high country pastures, resulted in a variety of significant features associated with alpine grazing including stock routes, stockyards, huts and homestead landscapes.

Most of the grazing landscapes of the AANP are now relict but remain obvious by their open character. Maps delineating the former pastoral properties and grazing leases exist illustrating the extent of the activity across most of the 'plain' areas of the AANP. The higher areas remain as grasslands while some of the cold air drainage plains of northern Kosciuszko are now revegetating in shrubs such as hakea.

A large network of stock routes crossed the Alps - some are extant while others have faded into obscurity. The Snowy River Route through the Willis customs station is now the Barry Way (New South Wales) and the Snowy River Road (Victoria). The Tharwa Kiandra Stock Routes and Miners Trails are now the Boboyan Road and Snowy Mountains Highway. Many of the former stock routes became fire trails with some modification to their original form. The Murray Gap Fire Trail in north Kosciuszko is an important historic stock route, the Fainter Cattle Track to the Bogong High Plains became the Fainter Fire Track. Although grazing has ceased in the AANP, the transiting of cattle has been allowed to continue under permit along specified routes through the Alpine National Park.

Permanent pastoral properties were also established in the Alps. These were modest homesteads with many outbuildings for housing stock during the winter months. The huts and homestead complexes demonstrate the vernacular building techniques using hand tools such as an adze and broad axe. Stockyards and in some cases exotic trees also remain in the landscape.

Most of the huts in the AANP are stockmen's huts that were built for alpine pastoral activities are located within or on the edges of open areas, generally near the road or stock route. Shelter huts constructed by stockmen for personal shelter and storage were built to survive the impact of the harsh winter weather. On average they measured three by six metres, with a stone fireplace or detached chimney and with a sleeping platform or bunks. Their fabric reveals the use and re-use of available materials, due to the difficulty of bringing building materials into the high country. Although the number of huts has been depleted, mostly by bushfires, there are around 150 huts remaining in the AANP from the original suite of huts of almost double that number. The Kosciuszko Huts Association (KHA, 2004) and the Victorian High Country Huts Association (VHCHA 2008) list and map the location of the huts in the Alps and a summary of some of the key huts and homesteads follows.

Cascades Hut is located about 50 metres off the fire trail from Dead Horse Gap to Tin Mines. It was built in 1935 as part of a summer pastoral grazing run and was restored in the 1970s. The hut has a strong association with the *Silver Brumby* novels.

Coolamine Homestead was established in the 1880s and is an important example of an alpine pastoral grazing run. The complex today consists of Southwell House and main homesteads, the cheese house, an iron building in front of Southwell House, yards and outhouses.

The Currango Pastoral Landscape shows evidence of former grazing leases of Currango plain and contains 25 buildings constructed between 1851 and 1926, including Old Currango and Currango Homesteads and their outbuildings. The landscape was grazed from the 1830s. Old Currango Homestead, built in 1873 and subsequently modified, is the oldest homestead in Kosciuszko National Park. The Currango homestead complex was built in 1895 and is the largest and most intact homestead complex of the 11 snow belt stations and is the only one that has been almost continuously and seasonally occupied since the 1850s. The homestead is still functioning for tourism.

The Gudgenby Station was used for pastoralism from 1844. It contains the current Gudgenby Homestead, built in 1967 on the site of the original homestead, the Hudson Ready Cut Cottage built in 1927, and ancillary structures. The pastoral landscape is contained within the Gudgenby Valley at the junction of the Gudgenby River and Hospital Creek.

Oldfields Hut was built in 1925 and is located in the east of Kosciuszko National Park almost at the border with Namadgi National Park, on the track that leads up to Murrays Gap and Mount Bimberi. It is a fine example of a hand built slab timber hut with a corrugated iron roof. The place retains remnants of a vegetable garden and fruit trees.

The Orroral Homestead was first used for summer grazing in 1839. The homestead precinct contains remnant fences and stockyards, huts dray tracks, animal pens, sheds, a shearing shed, the 1860s and 1950s buildings, a well, and an orchard and plough-fields.

Wonnangatta Station was established in 1866 and is situated in the Victorian Alps in a remote pastured valley, with the Wonnangatta River running along its length. The Station site consists of the burnt ruins of the main Homestead, a blacksmith shop site and cattlemen's hut, cattle yards and pens, orchard, plantings and cemetery. It is located near the junction of Conglomerate Creek and the Wonnangatta River, 29 kilometres north-west of Crooked River township (DEW 2007a). The main homestead was burnt accidentally in 1957 but the site still contains chimney remains and is surrounded by exotic European tree plantings (Truscott et al. 2006).

Wallaces Hut is also known as Seldom Seen Hut, and is located at Wallace Gap on the Bogong High Plains. This hut is the oldest complete structure in the Alpine National Park built in 1889 by the Wallace brothers, Arthur, William and Stewart, from snow gum slabs and woollybutt shingles. The National Trust classified the hut in 1967, and the Rover Scouts of Victoria have continued to maintain it for some decades (Truscott et al. 2006).

Mining
The gold rushes in the Alps brought miners from all over Australia and the world, including many from Europe, Britain, America and China. From 1851 to the 1920s almost 70 fields were mined in the Alps and adjacent areas in Victoria, including some tin and copper mines, although many mining fields within the region had relatively low yields.

There are 68 mining fields found in the AANP or the adjacent Historic Areas (LRGM 2002). The Kiandra mining field in New South Wales and the Red Robin

Mine landscape in Victoria are regarded as the sites most representative of the low technology style of mining that occurred in the Alps.

The Kiandra mining field shows the particular characteristics of mining in the Alps in the nineteenth century, notably in its extensive alluvial mining remains and use of water races to capitalise on the high water volume but low water velocity. The Kiandra township site and associated diggings include Township Hill, New Chum Hill, Surface Hill, Kiandra cemetery, Pollocks Gully, Commissioners Creek, and sections of Bullock Head and Eucumbene River. The only early extant buildings are the courthouse and Matthew's cottage, both of which have been significantly altered. The diggings are in generally good condition and with all machinery and equipment removed (LRGM 2002).

The Red Robin mine site contains a blend of early and recent elements including huts, camp settlement and housing, mine dam, machinery, mullock heap and tailings dump (Victorian Heritage Register 2006). Of particular interest are the remains of the vertical boiler next to the battery house, used to heat water to facilitate plate amalgamation of gold in sub-zero conditions.

Associated with the sites is an important collection of in-situ mining equipment. Huts such as the suite of Tin Mine huts and the original Grey Mare Hut were constructed for mining. Many of the huts have since become shelter destinations for bushwalkers and skiers.

Water Harvesting
As well as receiving some of the highest precipitation in Australia, the shape of the landforms makes the region particularly amenable for providing ample water resources that are used for power generation. There are two hydro-electric schemes partially within the AANP that tap into this water resource; the Kiewa Hydro-electric Scheme (KHES) and the Snowy Mountains Hydro-electric Scheme (SMHES).

The KHES was constructed over more than 20 years from the late 1930s. The scheme diverts and harnesses branches of the Kiewa River, with its source in the Bogong High Plains and near Mount Hotham (AGL 2008). The topography of the Victorian Alps with its low valleys extending deep into the high country means that several parts of the KHES are not within the AANP. However, the relevant catchments and many individual features lie within the AANP. Facilities associated with the scheme include water storages, aqueducts, pipelines, roads, power stations and gauging stations.

The SMHES was constructed between 1949 and 1974 and is located partly in the north-western Kosciuszko National Park (McHugh 1999; Pearson and Marshall 2000). The source of the Snowy River is on the Main Range. The scheme harnesses branches of the Snowy River and diverts water flow to the west, producing electric power and providing water to major irrigation systems along the Murrumbidgee and Murray Rivers.

Recreation and Tourism
The network of tracks and roads throughout the Alps, many of which were originally established to allow access for early infrastructure for industries such as logging, mining and pastoralism, have more recently been used for the development of the tourism industry and for park management. These routes range in condition from walking trails and fire management trails through to serviced roads and highways. This evolving network of routes has made the Alps accessible to recreational users.

Trails within the AANP are used by horse riders, bushwalkers, hikers and mountain bike riders. The Australian Alps Walking Track spans some 650 kilometres from Walhalla in Victoria to Tharwa in the Australian Capital Territory. The Bicentennial National Trail, launched in 1988, extends from Healesville through the Alps to Cooktown in Queensland. Other walking trails of note include McMillans Walking Track and the Hume and Hovell Walking Track. Service roads and highways include the Alpine Way; the Kosciuszko Road and the Great Alpine Road. These are examples of works undertaken by state governments to encourage and underpin tourism in the region throughout the twentieth century.

As a result of the Alps becoming more accessible, tourism began to prosper from the early 1900s. Many features of early tourism enterprise are still extant in the landscape, others have been lost through bushfire and development, and others have been upgraded. These historic recreation features include resorts and associated tourism infrastructure, hotels, lodges and chalets. Many of the huts originally constructed for mining and pastoralism have become shelter destinations for bushwalkers and skiers.

The main resorts within the AANP include Thredbo, Perisher, Guthega, Smiggin Holes, Blue Cow and Charlotte Pass in New South Wales and Mt Buffalo in Victoria. The Victorian resort villages of Mt Hotham, Falls Creek and Dinner Plain are not within the AANP boundary. Mt Buffalo resort is on a granite massif plateau, and touring groups began visiting the Mount Buffalo plateau from 1856. By the 1890s there was a hospice and a hotel on the plateau offering accommodation to visitors. Thredbo, on the other hand, is a compact village in a narrow valley, and the central Kosciuszko resorts have a particular landscape character in the way the buildings integrate with the environment, in particular: their clustering, spacing and scale; as well as their conformity to the land slopes, creeks and access bridges (Freeman 1998). The resort style architecture shows the adaption of a number of styles to Australian conditions, and ranges from accommodation built in simple vernacular style, to buildings that adapt the style of chalets built in European alpine regions. The buildings in the resorts are a mix of private and commercial lodges, hotels, apartment blocks and staff accommodation lodges, and many show innovative design concepts.

The Yarrangobilly Caves House was built in 1901. The majority of buildings from this period are still present and in near original condition (DEW 2007d). The original Hotel Kosciusko was built in 1909 and was destroyed by fire in 1952. The Hotel Kosciusko was a large European style building that had a grand slam ski run, the first commercial ski slope in the Snowy Mountains area. The existing building is adapted from the staff quarters of the original complex and is known as Sponar's Chalet.

The Mount Buffalo Chalet was designed as a temporary building and was completed in 1910. The Chalet is reminiscent in style to northern European Chalet architecture (Heritage Register Victoria 2007). The Chalet at Charlotte Pass was originally opened in 1930 to encourage tourists to visit the Snowy Mountains. It was rebuilt in 1939 has undergone some modifications and upgrades to meet visitor demand and expectations over the years and still continues to operate as a tourism destination.

The Franklin Chalet south west of Canberra was built in 1937-38 and was destroyed in the 2003 bushfires. The Chalet site, associated huts, a stone gateway, ski runs, and the remains of a vehicle powered tow are extant and associated with Australian skiing in the period 1936-1963 (KHA, 2007). Illawong Lodge at Guthega was built in 1957 as a simple one storey structure which was added to the former Pound's Hut and still functions as a ski lodge (DEW 2007c). Cope Hut on the Bogong High Plains was constructed for the safety of skiers in 1929 (KHA 2001).

The Ski tube is Australia's highest rack railway system and is an 8.5 km journey through the longest railway tunnel (a total of 6.3 km) in the country. Bullocks Flat terminal is 1,120 metres above sea level and the terminal at Mount Blue Cow is at 1875 metres - a total climb of 755 metres.

Scientific Research
The alpine environment, unique on mainland Australia, early attracted scientific interest. Scientific research in the AANP encompasses three key stages, the first of which commenced in the early 1800s with exploratory research undertaken by several pioneering individuals, who significantly contributed to the documentation of the region's geography, geology and botany. The second stage, during the period from the end of the 1800s to the early 1900s, developed scientific endeavour into more specific disciplines such as meteorology, geomorphology, ecology and astronomy. During the final stage, research built on previous efforts, with an increasing focus on conservation sciences from the1970s.

The AANP contains features associated with this developing scientific research. Routes and shelter-huts, for example, are often associated with historic scientific research along with other activities in the AANP. Scientific routes often followed previous tracks made by pastoralists and gold-prospecting surveyors, but also explored 'new' ground, opening new paths to Europeans. An example of historic scientific surveys following previous routes is the botanical surveys undertaken by Baron Ferdinand von Mueller between 1853 and 1861, which have since been mapped (Truscott et al. 2006; Costin et al. 1979).

Other features of historic scientific research include vegetation monitoring and fire ecology plots, glaciation research sites, karst research sites and hydrological monitoring sites.

The Yarrangobilly Caves karst area is the best-known and largest karst area of the AANP and is located in northern Kosciuszko. Historic research at the site has involved studies into karst processes and karst flora and fauna. The Cooleman Plain karst area has been used as a glaciation research and hydrological monitoring site.

The AANP has been extensively researched in terms of vegetation community dynamics. Vegetation monitoring and fire ecology research include sites such as the Piccadilly Fire Ecology Plots. Other long term research includes studies into vegetation trends in the sub-alpine and alpine zones between 1957 and 1978, as documented by Wimbush and Costin (1979). The Pretty Valley and Rocky Valley grazing exclosures were long-term vegetation monitoring plots located on the Bogong High Plains and were first started in 1941 by Maisie Fawcett (Carr). These plots formed part of scientific research resulting from a concern for clean water supply and have been carefully maintained and the vegetation remeasured regularly.

The Orroral Valley and Honeysuckle Creek Space Tracking Stations were established in 1965 and 1967 and closed in 1985. The foundations of the antennae, the administration buildings and their infrastructure remain today as evidence in the landscape. The 26 metre antenna from Honeysuckle Creek was relocated to Tidbinbilla Tracking and renamed Deep Space Station 46 where it is used for communicating with spacecraft positioned close to the Earth.

Hundreds of stream gauging stations installed by water and power authorities provide important data related to surface and snow run-off; impacts from erosion; fire predictors and post-fire recovery; changing condition of catchments; and impacts as a result of infrastructure, such as the hydrological research by Costin and Wimbush (Griffiths and Robin 1994; Macdonald and Haiblen 2001a).

There is a range of research currently underway on climate change and its impacts on the high altitude ecosystems of the AANP. This includes the monitoring of snowpatches as a useful single index of climate change; monitoring of the extent of vegetation retreat or change; participation in the Global Observation Research Initiative in Alpine Environments (GLORIA) - an international effort studying sites on an altitudinal transect with vegetation plots and temperature loggers; studies of invertebrates on snow-melt gradients; studies of alpine lakes involving coring of lake ice-depth, establishing the ice break-up date and snow algae and associated diatoms; studies of treelines which are already moving into the sub-alpine treeless valleys in both Victoria and New South Wales; and studies looking at the phenology of flowering in the alpine zone (K Green pers. comm. 5 April 2008). Other research includes studies into post fire recover after the 2003 bushfires includes the assessment of fire impact on *Sphagnum* bogs in Namadgi National Park, assessment of the recovery of the broad-toothed rat in Brindabella National Park and the effect of bushfires on orchid reproductive (ACTEC, 2004).

Analysis:
Claims

This assessment covers the eleven parks and reserves of the 'Australian Alps national parks' and also addresses two nominations which were limited to Kosciuszko National Park and a further three in relation to Alpine National Park. The place is referred to as the Australian Alps national parks and reserves (AANP). The parks and reserves include: Brindabella National Park, Namadgi National Park, Tidbinbilla Nature Reserve, Bimberi Nature Reserve, Scabby Range Nature Reserve, Kosciuszko National Park, Alpine National Park, Snowy River National Park, Avon Wilderness Park, Baw Baw National Park and Mount Buffalo National Park. The two latter parks, although not contiguous with the others, are an integral part of the AANP as a biogeographic unit. Their separation is a function of regional geological/geomorphological evolution as the uplifted plateau of the Eastern Highlands became increasingly dissected to the south over time.

In June 2005, the then Minister for the Environment and Heritage considered the Alpine National Park for inclusion in National Heritage List under the emergency listing provisions of the *Environment Protection and Biodiversity Conservation Act 1999*. Based on the advice of the Australian Heritage Council (AHC) the Minister requested that the AHC conduct a full assessment of the parks and reserves that are the subject of this report.

Exclusions

The SMHES has potential National Heritage values in its own right. A separate NHL assessment is pending for the SMHES for its historical engineering and social importance. Aspects of the scheme are considered in this assessment as part of the theme of 'water harvesting'.

Method

The methods used in the following analysis include available literature and expert opinion and the following additional resources:

Historic Values*:* Desk top study *Assessment of the Cultural Heritage Values of the Alps National Parks* by Truscott et al. (2006) that reviewed relevant source documents and synthesised the themes of human activity to a small number that encapsulated the distinctive aspects of the human experience of the Alps.

Indigenous Values: The available published literature for this assessment was peer reviewed in an unpublished report: White, J P (2006). *Potential National Heritage Indigenous values of the Alps, A review of assessment.* Unpublished report, Department of the Environment and Heritage, Canberra.

Natural Values*:* The natural biological values of the AANP are addressed in a national context through analyses using the Australian Natural Heritage Assessment Tool (ANHAT).

CRITERION (a) – ***The place has outstanding heritage value because of the place's importance in the course, or pattern of Australia's natural or cultural history.***

One nominator claimed that Kosciuszko National Park is internationally significant for the evidence it provides of geomorphological processes in the alpine and treeless sub-alpine zones and for its character as a globally unusual intraplate mountain range. These claims are addressed against criteria (a), (b), (c) and (d) and considered in the context of the wider AANP.

Glacial and Periglacial Features
The AANP preserves features diagnostic of glacial and periglacial activity during the most recent glacial advances of the Quaternary Period (the last 2.6 million years). Mainland Australia was rarely affected directly by ice action during these glacial advances, even in its highest landscapes. This resulted in outstanding preservation of periglacial features, ancient landscapes, deep soil profiles and long biostratigraphic sequences in its alpine regions. In contrast, in Northern Europe, North Asia, North America, New Zealand and even Tasmania, advancing and retreating glaciers scoured landscapes down to the bedrock. This destroyed much of the evidence for periglacial activity in near-glacier montane environments.

Whereas the high altitude regions of other continents and the higher-latitude Tasmania experienced permanent snow cover during the glacial advances of the last hundred thousand years, mainland Australia experienced very little. This unusual type of cold-climate activity for a low-altitude, low-latitude land mass is reflected in the glacial features of Kosciuszko National Park, and the periglacial features of the wider AANP (Galloway 1989; Yeates 2001). The alpine assemblage of fossil glacial and periglacial deposits and features contributes uniquely to our understanding of the nature of landscape response to climate during the Quaternary.

There is a variety of well-preserved glacial features in the vicinity of Mount Kosciuszko. These are unique on the mainland, often better preserved than their Tasmanian counterparts, and are nationally significant in defining the nature and greatest extent of the last glacial stages (Percival 1985; ISC 2004; AALC 2006a). They include:
- five alpine lakes (Albina, Blue, Club, Cootapatamba and Hedley Tarn);
- thirteen cirques and associated moraines;
- ice-grooved and polished pavements; and
- erratic boulders.

Periglacial features including solifluction features and blockstreams, dating mostly from the last glacial interval, are widespread across the Alps and extend beyond the boundaries of the AANP on the Australian mainland, however their wider distribution is poorly known and they are best described from the AANP (Galloway 1989). The glacial and periglacial features of the AANP complement those of the Tasmanian highlands in their important contribution to our understanding of past and present cold climates (Galloway 1989, 2002; Kirkpatrick 1994; Kiernan 1996).

The AANP has outstanding heritage value to the nation under criterion (a) for its glacial and periglacial features.

Fossils
During the Middle Devonian, fish species diversified and radiated. Lobe-finned fish appear in the fossil record, ancestral to the earliest tetrapods, the first vertebrates to walk on the land. The Mount Howitt fish fossil site on the Howqua River has one of the most important records of freshwater vertebrate fauna from the Middle Devonian (approximately 380 million years ago) in the world (Vickers-Rich and Rich 1993; Cook ed. 2007). There is excellent potential for reconstructing the palaeoenvironment because the many fish species represented are accompanied by plentiful plant remains, thus demonstrating the nature of early forests on the shores of a still, freshwater environment. The modern site is the same kind of intramontane setting as that in which the Devonian fish lived and died (Cook ed. 2007).

With only three other significant Devonian fish fossil sites in Australia, Mount Howitt contributes an important narrative about the evolution of fish across a number of different marine and freshwater environments, and the development of features that enabled vertebrates to exploit terrestrial environments:
- the marine and freshwater site at Wee Jasper in New South Wales records details of lungfish brain cases and other beautifully preserved Early Devonian specimens;
- the Gogo assemblage in the Western Australia's Kimberley region shows marine fossil fish associated with an ancient and vast barrier reef system around the time of the Late Devonian Frasnian-Famennian mass extinction event; and
- Canowindra in New South Wales records a rich Late Devonian fish fauna, including several species of sarcopterygian, the group that includes the air-breathing lobe-finned fish ancestral to terrestrial vertebrates, in a single mass kill event in a freshwater environment.

The Mount Howitt fish fossil site is the only one of these four extraordinary Devonian fish localities preserving both outstanding species diversity and fossils across a wide range of life stages from larvae to mature fish (Cook ed. 2007).

The fossils revealed at the Mount Howitt fish fossil site have outstanding heritage value to the nation under criterion (a) for their place in vertebrate evolution during the 'Age of Fish'.

Karst
In 2006, DEH held a workshop focussing on karst environments, with participation from prominent karst experts in Australia. This workshop identified karst systems across Australia and identified sites with potentially outstanding heritage value to the nation (DEH 2006b).

Yarrangobilly Caves and Cooleman Plains karst areas were included in the short-list of 15 sites across the country that were identified at the workshop as having significant karst values, as compiled by the karst experts. Yarrangobilly Caves and Cooleman Plains areas are both located within the AANP (DEH 2006b). These two sites are the best documented of the karst areas within the AANP.

The Yarrangobilly karst area contains an outstanding collection of surface karst features including gorges, arches, blind valleys, springs and pinnacle fields. It also contains several hundred caves including six show caves with many intricate cave decorations, open for public viewing (ISC 2004). Yarrangobilly has yielded valuable information on the long-term dynamics of landscape formation, and Houshold (pers. comm. and Houshold et. al. 1986) suggests that Yarrangobilly presents the best site (of the Eastern Highland impounded karsts) for studies of karst landscape development and evolution. Yarrangobilly Caves also contain evidence of past climatic processes. The thick flowstone sequences in Jersey Cave span half a million years and provide the longest continuous fire history record from a single site in Australia (DEH 2006b).

The AANP was the only region in mainland Australia to have been affected by glaciation, around 20,000 to 30,000 years ago. Many of the caves contain rockfall

sections that are thought to be related to ice wedging, along with periglacial features that developed at the margins of glaciers (DEH 2006b).

The Cooleman Plains are a high-altitude grassy plain about 1200 metres above sea level, dissected by deep gorges. The karst area contains a comprehensive range of karst features including 110 known caves, dolines, blind and semi-blind valleys, dry valleys, gorges, active and abandoned springs and stream sinks, and a series of small features known as 'A-tents' that are very uncommon in other Australian limestones (Spate 2002; DEH 2006b).

While both the Yarrangobilly and the Cooleman Plains karst areas are highly significant karst environments, Yarrangobilly is more comprehensively documented and is outstanding for its features and processes evident in the limestone landscape, and provides an outstanding insight into the evolution of a karst landscape (DEH 2006b).

The Yarrangobilly karst area has outstanding heritage value to the nation under criterion (a) as an exceptional example of limestone karst landscapes.

Tectonics
Claims that Kosciuszko National Park as part of the wider region is nationally and internationally significant for its character as a globally unusual intraplate mountain range cannot be substantiated. The entire Australian lithosphere has undergone complex evolution over the past 4.6 billion years, which continues today (Betts et al. 2002). There is no evidence to suggest that the events which shaped the Eastern Highlands are more or less important than any other, or that they can be considered outside a wider context of global tectonism. Furthermore, geodynamic models of plate tectonic activity since the 1970s accept that lithospheric thickening is not uncommon at passive continental margins, as in eastern Australia during the opening of the Tasman Sea from about 95 million years ago, which was accompanied by uplift of the Eastern Highlands (Duff 1974; Kohn et al. 2002; Bishop 2007). Therefore, **the AANP does not have outstanding heritage value to the nation under criterion (a) for its tectonics.**

Biological Heritage
The diversity of plant life underpins most of our terrestrial ecosystems and provides important ecosystem services such as the protection of watersheds, stabilisation of slopes, maintenance and improvement of soils, moderation of climate and provision of habitat (WWF and IUCN 1995). Major centres of plant diversity are recognised by the World Conservation Union (IUCN) as sites considered globally significant for the richness of species, the number of endemic species, gene pools, range of habitat types and species adapted to special edaphic conditions. The Alps is one of eleven sites recognised on mainland Australia by the IUCN as a major world centre of plant diversity (Boden and Given 1995; WWF and IUCN 1995).

In contrast to arid zone expansion in much of continental Pleistocene Australia, the Alps provided important biological refugia during the arid phases of the late Pleistocene as their glaciers and melting snow sheets bestowed spring and summer run-off to parched lowlands. During the late Quaternary the high-altitude, cold-climate environment of the Alps provided refuge for species at a time when aridity expanded elsewhere in the continent. Today the AANP supports a rich and unique assemblage of cold-climate specialist species that have evolved unique physiological characteristics, enabling them to survive in an environment subject to extreme climate variation (Good 1995), reflecting the interaction of flora and fauna with climate, altitude, topography and lithology over time.

In a continent of generally low relief and arid climate, the extent of alpine and sub-alpine environments is largely confined to two locations, the Alps on mainland Australia and the high altitudes of Tasmania. There are notable differences between the alpine ecosystems of Tasmania and the mainland. The Tasmanian alpine flora more closely reflects Gondwanan elements with the bulk of Tasmanian endemic species being Gondwanan in origin, whereas the alpine flora of the AANP exists as small islands surrounded by an older continental landscape. This flora is an unusual assembly of colonists from surrounding, lower woodlands, many of which have opportunistically colonised the young and ephemeral alpine habitat as conditions became drier. Species from across nearly all Australian plant families grow in the region (AALC 2005). That this infiltration by lowland taxa occurs to a greater extent in AANP than in alpine regions elsewhere may reflect the long history of environmental response to increasing aridity (Good 1992; 1995). Physiological adaptation to dryness also appears to provide tolerance to frosts and alpine climates (Good 1992; Kirkpatrick 1994; Good 1995).

Another significant difference from the Tasmanian assemblage is the climatically determined treeline. In the AANP the snow gum *Eucalyptus pauciflora* dominates the sub-alpine zone and forms the treeline as the only tree species able to survive at this altitude (AALC 2005, APC 2007). *Eucalyptus coccifera* and *Nothofagus* species (southern beech) survive at the higher altitudes in Tasmania, the latter species dominating the sub-alpine communities of New Zealand and South America, reflecting their affinities with Gondwana (Busby 1990; Coyne 2000).

Plant endemism in mountain regions around the world is high, at around five per cent. It is estimated that the proportion of endemic species in the Alps as a whole easily exceeds this figure, at approximately 11 per cent (Good 1995; Good 2003; DEC 2006). For example, of the 212 species of native ferns and flowering plants known from Kosciuszko National Park, at least 21 species are endemic (Costin et al. 2000). The treeless vegetation shows particularly high levels of endemism, with around 30 per cent of taxa restricted to the Alps and a further 14 per cent or so are restricted to mountain areas but also occurring outside the Australian mainland, such as in Tasmania and New Zealand (McDougall and Walsh, 2007).

Many of the endemic fauna species in the AANP are associated with very restricted habitats or freshwater environments, such as *Sphagnum* bogs, wetlands and lakes. One of the Kosciuszko National Park nominations claimed that Blue Lake was important as a Ramsar-listed wetland. Claimed values include its importance as one of only a few cirque lakes on the mainland of Australia. The Ramsar listing also describes the importance of the surrounding habitat, along with the occurrence of restricted invertebrate species. Blue Lake was also included in the Ramsar list for the purity of its water as well as being, together with the other alpine lakes, the only natural wetlands on the Australian mainland with an ice sheet over the lake surface during the winter months (DEW 2007e).

The AANP was analysed at a continental scale for biological heritage values relating to species richness and endemism using ANHAT. There are 24 mapsheets (at a scale of 1:100,000) that correlate with the boundary of the AANP, however only eighteen of these were analysed as the remaining included only a small portion of the AANP within them. A high threshold was set to determine the mapsheets in Australia ranking in the top two per cent for richness and endemism values. Of the 18 mapsheets analysed, outstanding levels of richness or endemism were found for a range of flora and fauna taxa, with some individual mapsheets returning between 11 and 26 values in the top two per cent of the country.

The ANHAT analysis verified that AANP is one of the most important areas in Australia for species richness in a range of plant families and genera, including the daisies (Asteraceae, especially *Brachyscome, Helichrysum* and *Ozothamnus*), willow-herbs (Onagraceae), starworts and cushion-plants (Caryophyllaceae) southern heaths (*Epacris*), bottlebrushes (*Callistemon*), riceflowers (*Pimelea*), lilies (Liliales) and orchids (*Pterostylis, Prasophyllum* and *Dipodium*). The high diversity of the Asteraceae family is of particular significance, as the daisies are one of the largest plant families in Australia, constituting more than six per cent of the total vascular flora.

The ANHAT analysis verified that the AANP is significant for a number of endemic plant groups with several ranking the highest of anywhere in the country, including the daisies and the pimeleas (Thymaelaeaceae). Other groups showing exceptional levels of endemism include the pin cushions (Caryophyllaceae) and the

leak orchids *(Prasophyllum*). The AANP is one of the most important areas in southern Australia for species richness in a range of fauna species including birds such as tree-creepers (Climacteridae), cockatoos and parrots, (Psittaciformes), robins (Petroicidae), and two out of the three pygmy possum species. Several invertebrate groups returned exceptionally high scores in ANHAT for richness such as water beetles, termites and microscopic freshwater invertebrates (rotifers).

Two families of marsupials returned high scores in ANHAT for endemism; the potoroidae (potoroos) and burramyidae (pygmy-possums) (Nankin 1983; Strahan 1995). The long-footed potoroo (*Potorous longipes*) occurs in a small area of around 1,600 square kilometres in east Gippsland and a small area in New South Wales (Strahan 1995). ANHAT revealed that the long-footed potoroo is present in Alpine and Snowy River National Parks. The mountain pygmy possum has a highly restricted range, and is the only Australian mammal whose distribution is contained to the alpine and sub-alpine regions, where it can survive under a continuous period of snow, regularly for up to six months, conserving energy by lowering its metabolism in a state of torpor (Strahan 1995).

There is a marked degree of reptile endemism in the AANP for some genera, including *Cyclodomorphus* and *Egernia.* For example, the alpine she-oak skink (*Cyclodomorphus praealtus*) is confined to alpine woodlands and heath above 1,500m, the Snowy Mountains or Guthega rock skink (*Egernia guthega*) is confined to the Alps where it lives in rocky areas in woodlands, grasslands and heaths above 1,600m, and the tan-backed or montane rock skink (*E. montana*) lives in areas of granite associated with tall open forest and heath within the Alps (Cogger 2000; Wilson and Swan 2003; Swan et al. 2004).

The AANP contains several endemic amphibians from the myobatrachidae (southern frogs) family. The Baw Baw frog (*Philoria frosti*) is known almost entirely from the higher parts of the Baw Baw plateau (Cogger 2000). The southern corroboree frog (*Pseudophryne corroboree*) is the most distinctive and easily recognised of Australian frog species with bright yellow or greenish yellow above with shiny black stripes and is known only from the Alps, including the high alpine zone around Mount Kosciuszko. It is found above the treeline or near creeks, and breeds in the alpine sphagnum bogs. The northern corroboree frog (*P. pengilleyi*) is similar to the southern form and is associated with the high country of the Brindabella Range (DEC 2006). The alpine tree frog (*Litoria verrauxii alpina*) is recognised as a subspecies and is confined to the southern parts of the Alps (Cogger 2000).

Many invertebrate species also have outstanding levels of endemism including stoneflies, caddisflies, mayflies, grasshoppers, and earthworms. For example, 32 invertebrate species are found only in Kosciuszko National Park (DEC 2006), including several grasshopper species. Other alpine insects display cold-climate adaptations. The mountain grasshopper (*Acripeza reticulata*) has shorter wings than its lowland relatives. The mountain spotted grasshopper (*Monistria concinna*) manufactures a chemical akin to antifreeze which prevents tissues freezing and associated mechanical damage. The alpine thermocolour grasshopper (*Kosciuscola tristis*) changes colour to a dark blue-green to improve heat intake, and reverts to a lighter green when conditions warm up. Many other species are restricted to the alpine and sub-alpine zones, however the invertebrate fauna generally remain poorly known (Cameron-Smith 1999; Coyne 2000).

Alpine environments are an essential part of the lifecycle of other invertebrates not endemic to the Alps, such as the Bogong moth (Crabb, 2003). Bogong moths comprise the most outstanding and best known regular terrestrial invertebrate migration in Australia. Bogong moths migrate annually from north-western New South Wales and Queensland to spend the warmer months sheltering in the cooler caves and rock shelters of the Alps, spending an integral component of their life cycle congregating and mating, before leaving to lay their eggs. Random mass dispersal of invertebrates occurs in a range of species, however this behaviour is typically unpredictable. When it occurs it is associated with unusually favourable conditions allowing populations to flourish to plague proportions as with the Australian plague locust (*Chortoicetes terminfera*), or where juveniles disperse into new territory, as in the 'ballooning' behaviour of some spider species. Regular or seasonal mass invertebrate migrations are otherwise only known among marine and estuarine species, notably the seasonal mass spawning of the giant Australian cuttlefish (*Sepia apama*) in South Australia's Spencer Gulf (Steer and Hall 2005). The regular movement of Bogong moths to aestivate in the cool rocky sheltered habitat within the Alps is outstanding as the only known Australian example of seasonal invertebrate migration, and the Alps represent the culmination of the migration for this species.
Covering an area of over 1.6 million hectares, the AANP a major component of the largest contiguous natural areas remaining in temperate Australia, where ecological processes can still occur without significant human intervention. By virtue of the limited extent of alpine and sub-alpine environments in Australia, its diversity of landscapes and elevations and the teleconnections between them, the AANP acts as a vitally important refuge for alpine, sub-alpine and montane flora and fauna species (Costin 1989; AALC 2005).

The AANP has outstanding heritage value to the nation under criterion (a) for encompassing a significant component of Australia's biological heritage, with a high level of richness and endemism across a wide range of flora and fauna taxa, including a number of alpine specialists.

Dingos
One of the nominators made claims relating to the significance of the dingos in Kosciuszko National Park under several NHL criteria, primarily as a story of a native, threatened, pure 'alpine-type' and keystone species. The significance of the dingo population in the Alps will only be addressed under criterion (a).

The dingo *(Canis lupus dingo)* was not a part of the ancestral fauna of Australia. The dingo is a primitive dog and is now considered to be a subspecies of the wolf. It became widespread throughout the Australian mainland after its introduction at least 3,500 years ago, possibly by Asian seafarers. Its range today is much diminished (Strahan 1995; Queensland Museum 2000; DNRW 2006).

There has been much interbreeding between the domestic dog (*Canis familiaris*) and the dingo, particularly in the more settled coastal areas of Australia and increasingly inland, which is impacting on the pure dingo gene-pool. In the south-eastern highlands, around one third of the dingos are considered as cross-breeds (Strahan 1995). In contrast, the dingo population on Fraser Island is regarded as largely genetically pure, confirmed by the research of canine genetics researcher Dr Alan Wilton (ABC 2005). This genetic evidence is supported by skull morphology and coat colour patterns, together suggesting that the Fraser Island dingo population is one of the closest to ancestral populations that can be found in Australia (L Corbett pers comm. 29 October 2007).

Despite the genetic significance of the Fraser Island population, the dingo is not considered a threatened or vulnerable species under Commonwealth or Queensland legislation. Glen and Dickman (2005) state the dingo is only a potential 'keystone' species. Furthermore, the presence of single species; keystone, iconic, threatened or otherwise, is unlikely in itself to be sufficient justification for National Heritage listing. Therefore, **the presence of dingos in the AANP as an alpine or keystone species is not considered to be of outstanding heritage significance to the nation under criterion (a)**.

Indigenous Values

Indigenous values have been analysed for Pleistocene occupation and Holocene occupation at a national scale, and for the practice of moth-feasting.

Pleistocene Occupation
Evidence from three sites on the fringes of the AANP demonstrates Aboriginal occupation and use of alpine and sub-alpine areas began in the Late Pleistocene, coinciding with the last glacial maximum (21,000 – 15,000 BP) (Lourandos 2,000). Two sites: Birrigai in Tidbinbilla Nature Reserve, Australian Capital Territory (Flood et al. 1987) and New Guinea II in the Snowy River National Park, Victoria (Ossa et al. 1995) are situated within the AANP, the third, Cloggs Cave in

Buchan, Victoria (Flood 1980) is situated approximately 40 kilometres from the Snowy River National Park. While Victorian sites are located outside the periglacial zone, it is likely that conditions were cold, dry and harsh. Birrigai occurs at an elevation of 730 metres above sea level and is immediately adjacent to areas affected by peri-glacial conditions during the last glacial maximum.

While there are no published data on the number of artefacts associated with the basal dates at New Guinea II, two artefacts were associated with the basal date at Cloggs Cave, and one artefact with the date at Birrigai. All sites show consistently small numbers of stone artefacts and artefact discard rates during the Late Pleistocene, suggesting limited use of the sites during this period (Ossa et al. 1995). This pattern continued at New Guinea II, while at Cloggs Cave only two artefacts occurred in deposits after 8,700BP. In contrast, there was a major increase in artefact discard rates and sedimentation rates after 3,000BP at Birrigai, suggestive of more intense use of the shelter from this time. While low overall artefact numbers limited the scope for detailed technological analysis, in general lower levels in these sites contained cores/pebble tools with few formal tool types. A few geometric microliths were located in the upper levels of New Guinea II, while a microlithic industry characterised the upper Holocene levels of Cloggs Cave (with no clear technological continuity between the older and younger industries) (Flood 1980).

Bone implements were identified at New Guinea II throughout the stratigraphy, and a single bone point and burnishing points were found in stratigraphic levels dating to between 17,720 - 13,690 BP at Cloggs Cave (burnishing stones also occurred in recent deposits). While large quantities of faunal remains were present at both sites, most of this was considered to originate from avian carnivores, such as owls (Ossa et al. 1995).

These sites suggest a similar pattern of low intensity Aboriginal occupation of rock shelters on the fringes of the AANP during the last glacial maximum, characterised by a generalised stone tool assemblage and some evidence of skin working. This evidence can be compared with Pleistocene sites in southwest Tasmania.

Pleistocene sites in southwest Tasmania provide comparable evidence of Aboriginal adaptation to alpine and sub-alpine environments in Australia, demonstrating clear archaeological and taphonomic patterns that are repeated in many of the excavated cave sites (Cosgrove 1995).

Six Pleistocene sites in southwest Tasmania have been found to contain evidence of human occupation in sub-alpine environments spanning the last glacial maximum Cosgrove 1984; Cosgrove et al. 1990; Allen 1989; Kiernan et al. 1983; McNiven et al. 1993). These sites are located in river valleys below 400m, and all occur in areas affected by peri-glacial conditions in the last glacial maximum (Mulvaney et al. 1999).

Two sites approximately 100km to the north - Mackintosh 90/1 (dated ca. 17,000 – 15,000 BP) (Stern & Marshall 1993) and Parmerpar Meethaner, just below Cradle Mountain in the central north (dated ca. 33,800 – 780 BP), are also considered to represent part of the southwest archaeological system, although some important differences have been observed (Cosgrove 1995).

Broadly, the evidence of Aboriginal occupation from the southwest Tasmanian sites consists of high densities of stone artefacts, with faunal remains dominated by one or two human prey animals: Bennett's wallaby, accounting for over 90 per cent of identifiable remains, and the Common Wombat. A range of other species also occurs (McNiven et al. 1993). There is clear evidence of butchering and bone processing (extraction of bone marrow), suggesting specialised hunting strategies and processing activities. Evidence of seasonal use at least during late winter or early spring is found at Nunamira Cave in the form of emu eggshell fragments (Mulvaney et al. 1999). The stone tool assemblages show some evidence of raw material and technological change over time (McNiven et al. 1999). Sharp-tipped bone points have also been identified.

Some sites were used more intensively for a few years spanning the last glacial maximum; others were not (Cosgrove 1995; Kiernan et al. 1983). The evidence suggests an intensification of occupation following the glacial maximum at about 17,000 years ago, with changes in settlement, technology, and use of raw materials. All of these sites (with the exception of Parmerpar Meethaner) were abandoned by ca. 12,000 BP, perhaps due to engulfment of the landscape by closed forests (Lourandos 1997).

On the basis of the evidence, Cosgrove et al. (1990) has argued that the periglacial uplands of southwest Tasmania had a distinct and long lasting pattern of occupation, with concentrated human activity centred on wallaby hunting. While Cosgrove's model has been questioned by others (eg: Lourandos 1997), these sites nonetheless demonstrate a clear pattern of intensive and dynamic human settlement in alpine and sub-alpine conditions during the late Pleistocene that is markedly different from the evidence surrounding the AANP.

The material evidence for Pleistocene Aboriginal occupation in the AANP is primarily stone artefacts which are on the whole poorly dated and as such are unable to contribute to a broader picture of settlement patterns in the montane region of south-eastern Australia. The faunal record is likewise poorly represented in the AANP. In contrast the southwest Tasmanian sites contain a much wider range of data and there is better chronological control. As such the southwest Tasmanian sites provide a better example of human adaptation to sub-alpine and alpine environments during the Pleistocene as demonstrated in the archaeological record (White 2006). **There is insufficient evidence to show that the human adaptation in the AANP during the Pleistocene has outstanding heritage value to the nation because of the place's importance in the course, or pattern, of Australia's cultural history.**

Holocene Occupation

Archaeological evidence suggests more intensive use of alpine, sub-alpine and montane environments during the late Holocene throughout the AANP, dating from at least 5,800 BP. Dated sites occur at a range of elevations, and there is evidence of Aboriginal occupation across the AANP.

Different models have been proposed for Aboriginal occupation of this region (eg Flood 1973; Bowdler 1981). Flood (1973) has argued for a model of seasonal transhumance, with summer occupation of the high country based on the 'hunting' of Bogong moths. This view is based on archaeological evidence and a reading of ethno-historical evidence relating to Bogong moth festivals in the AANP.

Flood's transhumance model has been questioned by subsequent research in the Jindabyne area, the Snowy Mountains and Victorian Alps (Chapman 1977; Grinbergs 1993b; Freslov et al. 2004), which has found evidence of human occupation in high altitude areas which do not readily fit with the predictions made from Flood's model. Both Chapman (1977) and Grinbergs (1993b) argue that there is no archaeological or ethnohistorical evidence to support the hypothesis that the high country was only occupied in summer.

Grinbergs (1993b) proposes a different model for Aboriginal use of the high country with a major Aboriginal exploitation zone situated between 700 and 1,100 metres, characterised by base camps situated in open montane forests. This area was used all year round with periodic forays into high altitude areas in summer and periodic moves to lower altitude areas in winter. Recent survey results from Victoria broadly support this model. Freslov et al. (2004) have suggested that the configuration of the landscape meant that people could have safely used some sub-alpine areas well into early autumn and early winter, with the Bogong Plains and Mount Hotham area offering a dense concentration of resources and safe exits out of the mountains (Freslov, 2004). At least one group of people were thought to be

living throughout the year in the high country in the Omeo area (Freslov 2004).

The evidence for year round occupation of the upper areas corresponds with the evidence from Tasmania which suggests that high altitude areas could be used by Aboriginal people all year round (Cosgrove 1984; Ryan 1996; Jones 1974). Archaeological evidence indicates that Aboriginal sites in the Central Plateau tend to concentrate around the many lakes and at the interface between woodland and heath, with some of these sites containing large numbers of surface artefacts (Cosgrove 1984).

An analysis of the ethno-historical records shows that the traditional lands of one of the bands of the Big River Tribe, the Luggermairrernerpairrer, was centred on Great Lake and the High Country. There is evidence that this group visited both the east and the west coast of Tasmania during the summer months (Ryan 1996; Jones 1974), but Jones also points out that, 'During times of stress… they were capable of living throughout the year in the plateau country' (Jones 1974, 342). He adds, 'We may look at the Big River economy as one of the prime examples in Australia of a montane ecological adaptation'.

The evidence suggests similar adaptations by Aboriginal people living in the high country of the Alps and Tasmania during the Holocene. While the evidence for this type of human adaptation may be of outstanding heritage value to the nation, the available evidence does not demonstrate that one place is more important than the other. **The evidence for human adaptation in the AANP during the Holocene, therefore, is insufficient to show that the place has outstanding heritage value to the nation because of the place's importance in the course, or pattern, of Australia's cultural history.**

Moth Feasting

While there is little evidence for a consistent pattern of Aboriginal transhumance within Australia's alpine or sub-alpine environments, there is some historical evidence and oral history accounts of Aboriginal people moving along defined routes to the high country in summer for the seasonal collection of Bogong moths and associated ceremonies (Flood 1980; Waters 2004; Goulding 2002). The historical accounts suggest that Aboriginal people from different mountain tribal groups often travelled long distances to attend the gatherings that occurred as part of the Bogong moth collection (Freslov et al. 2004b, 18 citing Robinson's journal, 15/6/1844; Flood 1980; Payten 1949; Dawson n.d.).

The Bogong moth migrates annually to the Alps during early October from the inland north-western New South Wales and southern Queensland to escape the hot and dry unpalatable grasses to aestivate in the cool crevices of the Alps (Flood 1980). During this migration, Aboriginal people met at the foot of the main range/s for ceremonies before moving into the mountains to collect moths, and to utilise other seasonally abundant resources. These gatherings appear to have had an important social function, mediating and maintaining social and political links between tribal groups as people came together for ceremonies, corroborees and inter-tribal battles (Young et al. 2000; Flood 1980).

There is evidence for large inter-tribal gatherings associated with ceremonies and specific resource use elsewhere in Australia. Peterson (1986) suggests that such gatherings were usually based on the abundance of one or two highly localised, seasonally available 'special' resource foods; and can be distinguished from seasonal resources resulting from annual variation in climate which might have led to an aggregation or dispersal of people (Peterson 1986). Clearly, large ceremonial gatherings required an abundance of food resources to support participants; in some cases, people travelled to these resources, in others, these resources were available more locally and brought back to the community (eg: cycads in Eastern Arnhem Land (Beaton 1977). Ceremonial gatherings coincided with the abundance of one or two 'special' resources, and the timing of these gatherings depended on the timing and availability of these resources. In contrast, seasonal abundance as a result of climatic conditions resulted in annual gatherings or dispersals which were mainly an economic strategy.

Most Aboriginal ceremonial gatherings were based on abundant plant or aquatic resources. Examples of ceremonies based on abundant plant resources include: the Bunya nut festival in Queensland's Bunya and Blackall Mountains (Flood 1980; Morwood 1987; Petrie 1904; Curr 1886; Sullivan 1977); the seasonal ceremonial gatherings in eastern Cape York, Queensland, based on harvesting the abundant fruit of *Manilkara kauki* (Wongai plum) (Peterson 1986); and, ceremonial gatherings between late September and early November in Arnhem Land, Northern Territory, when *Aponogeton elongatus* (an aquatic herb) could be harvested in great quantities (Peterson 1986). An example of seasonal ceremonial gatherings based on aquatic resources are the corroborees, initiation ceremonies, trade, and barter that occurred during the autumn or winter fishing season at the Aboriginal fish traps at Brewarrina in New South Wales (Mathews 1901). In some cases, for example, the Bunya Nut Festival, Aboriginal groups used defined pathways when travelling to the seasonally abundant resources (Sullivan 1977).

While information about the exact size and nature of these ceremonial gatherings is variable, there are clear parallels with the moth feasts in the AANP. However, the unusual nature of the abundant resource, aestivating moths, sets the gatherings in the AANP apart from other Aboriginal ceremonial gatherings. The recognition of moth feasting in the Australian Bicentennial History, through sculptures outside the Australian Institute of Aboriginal and Torres Strait Islander Studies, in public interpretations in National Parks and in current tertiary and secondary textbooks shows that moth feasting has captured the Australian imagination (White 2006).

The Aboriginal social gatherings based on moth feasting in the AANP have outstanding heritage value to the nation under criterion (a).

Historic Values

One of the nominators claimed that the alpine grazing leases of the Victorian Alps have been and still are the basis of the activities of the mountain cattlemen, which are of cultural, historic and heritage significance to all Australians. This claim is covered in the assessment against criterion (a). Aspects of the claim are also covered in the assessment against criterion (d).

Another nominator claimed that the place is significant under criterion (a) for its demonstration of a richness of features that are a tangible part of Australia's cultural history relating to: the story of the Man from Snowy River and summer seasonal horse riding and brumby running; mountain grazing and associated cultural practices; seasonal living in handcrafted bush huts; the story of the developing understanding of the land and its resource use.

The AANP has a rich post-settlement history with the early explorer-settlers in the 1820s, the establishment of pastoralism through the 1830s, and the gold rush at Kiandra in 1859-60. Throughout the twentieth century across the Alps has been the development of extensive irrigation and hydro-electric schemes, built predominantly by post war migrants, and the reservation of the Alps as national parks and their use for recreation.

Transhumant Grazing

The Alps hold a significant place in Australia's pastoral history. In response to the drought of 1837-1844, many pastoralists in south-eastern Australia began to open up routes to move their stock to the high country where food and water were abundant. This began a pattern of annual migration of stock, known as transhumance which continued for over 150 years. In the later years of the nineteenth century governments introduced controls to the practice by a system of leased blocks and annual licences. The leases for the Bogong High Plains were issued in the 1860s and alpine grazing leases in New South Wales in the 1880s. According to King (1959, 129), the highlands of Tasmanian and south-eastern New South Wales were the only places in Australia that played a role in relief grazing.

The transhumance practice lead to the establishment of well defined stock routes and stock mustering points such as the town of Jindabyne (King 1959, 131). Important stock routes of transhumance in Kosciuszko were a complex of tracks and routes that provided access from all directions. They are noted and schematically plotted by King (1959, 136-7). Transhumance can be compared to other significant pastoral activities such droving and stock movement. Other epic journeys of overlanders along routes like the Marrnji Track, the Birdsville Track and the Canning Stock Route are an important part of Australia's cultural history. While transhumance in the AANP differs in terms of nature and scale of these journeys, the continuity of practice makes it a significant pastoral activity at a national scale and it led to a distinctive high country way of life.

The AANP has outstanding heritage value to the nation under criterion (a) for historic values relating to transhumant grazing.

Mining

Mining for gold brought thousands of people into the Alps, encouraged farming settlements and strengthened communication routes to and through the alpine areas. However many important relict mining landscapes are beyond the boundaries of the AANP for example the Glen Wills Historic Area, Howqua Hills Historic Area, Pioneer Mine and Water Races, Grant Historic Areas and the Oriental Claims area. Rob Kaufman's study 'Australian Alps Mining Heritage Conservation & Preservation Strategy' (LRGM Service 2002, xii) identified 68 substantial mine diggings across the Alps, predominantly for gold having remnant features and noted that there were various other small mines diggings and prospects.

The Kiandra mining landscape was a major New South Wales gold field and contains a wide ranging collection of mining sites around the area (regarded as the greatest concentration of historic features in Kosciuszko National Park) reflects a variety of mining methods and, together with the remains of the town, shows how men and women lived and worked. The Red Robin Gold Mine is a palimpsest of small mine workings, operational and redundant mining equipment and huts. It has had continual use since 1940 essentially with 'traditional-type' mining technology and techniques.

Mining has been undertaken extensively throughout Australia with large mining complexes and numerous associated towns and cities. Castlemaine Diggings is the only mining site on the National Heritage List. It is highly valued as a mid-nineteenth century gold rush relict cultural landscape. The gold rush of 1851-1860 fundamentally changed the pattern and course of Australia's history. Other mining sites with potential National Heritage value include Broken Hill and Kalgoorlie.

When compared with these places in scale, economic and social impact, the Kiandra Mining Field and the Red Robin mine are not considered to be nationally significant in the course and pattern of Australia's history. Therefore, **the AANP does not have outstanding heritage value to the nation under criterion (a) for values relating to mining history.**

Scientific Research

The Alps are one of the most researched environments in Australia. Scientific research has encompassed the early scientific explorations of Dr John Lhotsky, Baron Dr Ferdinand von Mueller, Paul Edmund de Strzelecki and includes the later research of the meteorologist Clement Wragge, geologists Reverend W B Clark and Alfred Howitt and ecologists such as Maisie (Fawcett) Carr, Alex Costin, M Gray, C Totterdill and D Wimbush.

Environmental research in the alpine environment includes the Cooleman Plain Karst area, other glaciation research sites of David Moraine, Guthrie Saddles, Perisher Creek exposure, and the Railway Embankment. Scientific research has been undertaken for over 100 years, with Clement Wragge's meteorological station on Mount Kosciuszko in 1897, Australian Capital Territory Arboreta (remaining post 2003 fires) Piccadilly Fire Ecology Plots, Pretty Valley and Rocky Valley Grazing Exclosures (Truscott et al. 2006) and the Yarrangobilly Caves Karst Area (Macdonald and Haiblen 2001).

MacDonald and Haiblen (2001) noted the importance of the Alps in the development of theories of science in relation to and human interaction in the natural environment. Some of the specific research undertaken as at the Victorian pastoral exclusion plots and the Coolamine Plain Karst landscape has been for significant periods of time. Other geographic areas that might have had similar scientific research intensity are the T G B Osborn Vegetation Reserve at Koonamore, South Australia – an arid area of ecology monitoring sites in South Australia with 63 years of records (DEW 2007f), and Australia's Antarctic Bases – Macquarie and Heard Islands, and Mawson, Davis and Casey Bases. The report *Australia's Antarctic Science Program Science Strategy 2004/05 2008/09* (AAD 2007) notes over 120 projects being undertaken in the Antarctic and sub-Antarctic regions to protect the environment, understand global climate change and other practical economic and scientific work.

The AANP demonstrates both a longevity of scientific geological research that commenced in the nineteenth century, and an outstanding scope of scientific research covering the ecological impacts of grazing, impacts of fire, rehabilitation, geology and geomorphology, hydrology, meteorology, paleoecology, native flora, native fauna, arboreta and impact of exotic species (MacDonald and Haiblen 2001).

The AANP has outstanding heritage value to the nation under criterion (a) for historic values relating to scientific research.

Water Harvesting

The use of the Alps for irrigation and domestic water supply has been a major part of the cultural history of the AANP. Providing an estimated 25 per cent of the flow for the Murray River system, the Alps is a vitally important source of water for New South Wales, Victoria, the Australian Capital Territory and South Australia. The importance to eastern Australia of water harvesting in the Alps, and the need to ensure good quality water supply for farmland and population centres in the surrounding lowlands, led to the protection of much of the alpine and sub-alpine area which today forms the AANP.

The boundaries of the Australian Capital Territory specifically included the mountainous catchments of the Cotter River (now part of Namadgi National Park) for the purpose of providing the federal capital with domestic water. The decision to declare the Kosciusko State Park was based on water catchment and recreation requirements. Increased land use restrictions in the Alps from the 1930s until the 1970s was driven primarily by catchment concerns. Soil conservation measures in Victoria and New South Wales in alpine areas were driven by the need to protect the catchment flowing into the Hume Reservoir and later to protect the pondages and flow systems for the Kiewa Hydro Electric Scheme (KHES) and the Snowy Mountains Hydro-electric Scheme.

The KHES began in 1938 to capture the headwaters of the Kiewa River and some of the tributaries of the Mitta Mitta River on the Bogong High Plains. The SMHES diverted water westwards for irrigation and harnessed the falling waters in the diversion to produce hydro-electric power. The SMHES generates 10 per cent of the total energy consumption of New South Wales and 82.5 per cent of the renewable energy supplied to the southeast Australian grid (Good 1999). The SMHES was a major post-war government reconstructive initiative and a defining event in Australia's history as it employed very large numbers of non-English speaking people displaced by the effects of World War II. The SMHES has been proposed as a separate NHL nomination in its own right, therefore details of the scheme are not emphasised in this assessment.

Water harvesting is conducted in numerous locations across the Australian continent to supply urban water, water for irrigation and water for hydro electricity. Water harvesting schemes for irrigation include massive pondages such as the Ord River Irrigation Scheme and Lake Argyle. Lake Argyle claims to be the largest

fresh water storage lake in Australia holding 10,760 million cubic metres of water. The scheme generates 30 megawatts of electricity. While large in scale, those two schemes have not had the major economic and social impact that water harvesting in the Alps has had. Water diverted from the Alps irrigates 70 per cent of Australia's irrigated crops and pastures, meets part of the water needs of Canberra and supplies ten per cent of current electricity in New South Wales.

Water harvesting is an activity of significant historic, economic and social importance to Australia, and has a strong association with the AANP. Many of the reserves contained within the AANP owed their original reservation and declaration to the recognition of their water resources. The use of alpine water for power generation, irrigation and domestic water supply is demonstrated in arrays of features within the Kiewa Hydro Scheme (KHES) landscape, the SMHES area, and the Upper Cotter Catchment area. Features include dam wall structures, pondages or reservoirs, power stations, pipe lines, tunnels, aqueducts, huts, roads, switching stations, and work camp sites (some of which are within the AANP and some adjacent. Numerous long term stream monitoring sites are also associated with this activity and include many small scale monitoring sites.

The AANP has outstanding heritage value to the nation under criterion (a) for historic values relating to water harvesting.

Recreation
Snow based recreation in Australia commenced in the 1860s in Kiandra and has become a major tourism activity. Recreation in the mountains commenced in earnest in the 1920s with a growing appreciation of a wild landscape and the healthy body movements that encouraged the increase mountain hiking and the formation of various recreational clubs. This was also a contributing factor to the declaration of reserves along with the requirement to protect natural resources and available clean water.

Over three million people visit Kosciuszko National Park each year (AALC 2005). Mount Buffalo has between 150-200,000 visitor days per year (DNRE 1996, 18). Given that not all the alpine parks keep statistics, an estimate of visitor numbers to the Alps to pursue recreation activities is around six million per year. The Alps are a venue for a diversity of recreation activities that include bushwalking, canoeing, paragliding, horse riding and cycling. However it is the snow based recreation of skiing that is the longest and the most intensive of the recreation activities of the region.

The AANP has outstanding heritage value to the nation under criterion (a) for values relating to recreation.

Conservation
The story of conservation in the Alps commence in the late nineteenth century with the concern to secure sources of clean water and protect areas of scenic beauty such as Mount Buffalo. The declaration of national parks/ reserves was not the earliest and took over 90 years for the bio-region to be fully reserved. The 1986 Memorandum of Understanding (MOU) between the Federal, Australian Capital Territory, New South Wales and Victorian Governments for a cooperative management program to protect the landscape, water catchments, plants, animals and cultural heritage of the Australian Alps as a whole ecosystem while providing opportunities for public appreciation and sustainable enjoyment is an administrative achievement. It does not demonstrate outstanding value to the nation with regard to conservation. **The AANP does not have outstanding heritage value to the nation under criterion (a) for values relating to conservation.**

CRITERION (b) – ***The place has outstanding heritage value to the nation because of the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history.***

Landscape and Topography
One nominator claimed that Kosciuszko National Park is nationally significant under criterion (b) for Mount Kosciuszko and because it contains the largest contiguous area of snow county in Australia. These claims are considered in the context of the wider region of the AANP.

Australia is the lowest continent in the world in altitude. The highest points on the other continents are all more than twice as high as Mount Kosciuszko, which is mainland Australia's highest mountain at 2,228 metres. At 8,848 metres, Mount Everest is almost four times as high. However, the altitudes of the plateaus and peaks in the AANP are prominent in a continent with an average elevation of only 330 metres above sea level.

Heard Island (Mawson Peak 2,750 metres) and the Australian Antarctic Territory contain peaks and ice plateaus higher than the AANP, but the AANP includes the highest land on continental Australia, including Tasmania. The AANP includes most of Australia's peaks over 1,700 metres; almost all of those over 1,800 metres (the exceptions being Mount Hotham, Mount McKay, Mount Higginbotham and Mount Buller - all in alpine resorts in Victoria); and all of those over 1,900 metres. There are three peaks over 1,900 metres in the Victorian Alpine National Park (Mount Bogong, West Peak - generally considered part of Mount Bogong - and Mount Feathertop) and one (Bimberi Peak) in Namadgi National Park in the Australian Capital Territory, with the remainder in Kosciuszko National Park. All of the peaks over 2,000 metres are in Kosciuszko National Park, mostly on the Main Range with some between Jagungal and the Main Range.

The glacial lakes of the AANP are an integral part of the alpine landscapes and ecologies. As with the rest of the suite of glacial and periglacial features in the Alps, they are distinguished by the region's extraordinary altitude, geological history and climate, which determine their shape, function and biota. Club Lake and Blue Lake lie in cirques whereas Lakes Albina, Cootapatamba and Hedley Tarn were dammed by moraine deposits. The highest and freshest lakes in Australia, they are the only wetlands on the mainland covered by an ice sheet during winter (DEW 2007e). Blue Lake appears to be the only dimictic lake in mainland Australia, where the thermal layers are mixed completely twice each year. The glacial lakes of the AANP are significant as they are low in salt and nutrients and provide key habitat for species of invertebrate fauna not found elsewhere (AALC 2005; DEC 2006).

These high peaks and plateaus contain the vast majority of alpine and sub-alpine environments in Australia. The seasonal presence of snow sets the Alps apart from most other places on the mainland (DEC 2006). Above an average height of 1,600 metres above sea level, snow features prominently between July and November on the mainland, compared with around 750 metres and above in Tasmania.

The AANP has outstanding heritage value to the nation under criterion (b) for its uncommon landscape and topographic features including the seasonal presence of snow, glacial lakes and high peaks and plateaus that are unusual in a continent of low relief.

Glacial and Periglacial Features
The AANP preserves a concentration of glacial and periglacial features without comparison in mainland Australia. Although evidence of widespread glaciation is very well-preserved in various forms across the continent, most of these features are the result of much more ancient icehouse events, several orders of magnitude older than the events of the Quaternary, and which have little direct bearing on the shape of modern Australian landscapes. The Kosciuszko plateau is unique in mainland Australia as the only place irrefutably exhibiting landforms shaped by Late Pleistocene glaciers during a series of glacier advances known as the Late Kosciuszko Glaciation (Percival 1985; Yeates 2001; Barrows et al. 2001).

There are no modern glaciers in Australia or Tasmania, although some snow drifts persist into late summer at higher elevations. Periglacial processes continue today

in the AANP but fossil features show that such activity was more widespread during the glacial advances of the latest Pleistocene (Barrows et al. 2001). During the advances of the Late Kosciuszko Glaciation, glaciers probably formed in a small area of 30-40 square kilometres around Mount Kosciuszko and much more extensively in the Tasmanian highlands (Barrows et al. 2002; Galloway 1989; Kiernan 1996; DEC 2006). The Tasmanian glaciers formed at much higher latitudes, so their lowest elevations were about 600 metres lower than in the AANP. The Kosciuszko glacial features are better-preserved and their low-altitude, low-latitude setting is unusual.

Outstanding examples of the glacial landforms include cirques, moraines, lakes, erratic boulders and ice-grooved and polished pavements, which together represent the only Australian examples of glaciation that formed at a comparably lower altitude to other glaciated areas across the world, and at low latitude. Modern periglacial landforms include frost-fractured stones, and earth hummocks and terraces formed by frost penetrating the soil (Galloway 1989; AALC 2006a; DEC 2006). Fossil periglacial features including blockstreams, scree slopes and snow-moved rocks occur in the Snowy Mountains, the Victorian High Plains and the Upper Cotter region in Namadgi National Park (DEC 2006; Rosengren and Peterson 1989; Environment ACT 2003). The Cobberas –Wombargo area in Alpine NP contains the most extensive blockstreams on the Australian mainland (McRae-Williams et al. 1981).

The absence of intensive Pleistocene ice modification of the elevated landscape of the Alps in Victoria and the Australian Capital Territory is rare in Australia. Mild climate during the Holocene and the lack of scouring by glaciers have preserved a range of active and fossil periglacial features of great scientific interest and rarity (Kirkpatrick 1994). The periglacial features of the AANP are the most striking an extensive in Australia and demonstrate the widespread effects of cold climate during the Quaternary and under modern conditions (Barrows et al. 2001; Barrows et al. 2002; Galloway 1989; ISC 2004; Kiernan 1996; DEC 2006).

The AANP has outstanding heritage value to the nation under criterion (b) for its rare and uncommon glacial and periglacial features.

Fossils

The Mount Howitt fish fossil site is globally rare because of the detailed preservation of Middle Devonian fossil fish, especially of delicate features such as placoderm tails. The site also preserves rare, complete acanthodian fossils. It is unique nationally in providing a snapshot of a complete freshwater vertebrate community from the past. Such diversity is only otherwise seen in one other Middle Devonian site in the southern hemisphere, Antarctica's Aztec Siltstone. The only comparable site in Australia is the Canowindra fish fossil site in New South Wales, which preserves a single mass-kill event, such as a waterhole drying up during a drought, and as a result has large numbers of mature fossil fish at a particular stage in their life cycles rather than the cross-section of a community through time as represented at Mount Howitt (Cook ed. 2007).

The Canowindra site is outstanding for its preservation of large tristichopterids, a huge number of fish carcasses, and is the earliest occurrence of a complete rhizodont, *Gooloogongia*. But a greater number of species is represented at Mount Howitt, which preserves a very different assemblage of freshwater Devonian fish fossils (Cook ed. 2007):

- 14 named species, and another undescribed;
- many generic taxa which are so far found nowhere else;
- monotypic new families represented nowhere else (eg *Howittacanthidae*, *Culmacanthidae*);
- fish in all stages of growth.

The early Devonian Taemas limestone of Wee Jasper contains exquisitely detailed bony fish fossils, but these are preserved in much older sediments, and are marine facies, not freshwater as at Mount Howitt and Canowindra. The Mount Howitt fish fossil site preserves a diverse array of Middle Devonian freshwater fish in uncommon detail at all stages of their lives.

The AANP has outstanding heritage value to the nation under criterion (b) as a rare fossil vertebrate assemblage which preserves a diverse array of Middle Devonian freshwater fish in uncommon detail at all stages of their lives.

Alpine and Sub-alpine Ecosystems

Alpine and sub-alpine ecosystems are driven by a range of environmental variables, predominantly temperature, precipitation and altitude. Alpine and sub-alpine ecosystems are extremely uncommon in the generally warm and arid climate of Australia. Their distribution is confined across the dry Australian continent to the cool temperate regions of the Alps in south eastern Australia and the highlands of Tasmania.

The AANP contains the vast majority of the alpine and sub-alpine ecosystems on mainland Australia, including a highly diverse mosaic of alpine and sub-alpine bogs and fens, alpine feldmark and tall and short herbfields and frost hollows. These diverse vegetation communities are supported by deep alpine soils that contain water retention properties, leading to a rich organic surface and sub-surface soil profile. Vegetation communities such as the sod tussock grasslands in the alpine and sub-alpine valleys give rise to high soil moisture levels. Raised bogs and valley bog communities, underlain by deep peat beds feed large quantities of snow melt into the alpine rivers during spring and summer, sustaining riverine ecosystems by contributing regular freshwater to both the Alps and the naturally drier lowland habitat.

There are significant differences between the alpine and sub-alpine ecosystems of Tasmania and the Australian mainland. In Tasmania there is no distinct treeline, with *Eucalyptus cocciferra* growing wherever it can find shelter close to mountain tops, or forming open woodlands on the best-drained parts of alpine plateaus of altitudes up to 1,300m (PWS 2007). The altitudinal and floristic zonation in the mainland Alps is more pronounced, with 4 distinct zones; the lower elevations or tablelands, montane, sub-alpine and alpine zones (AALC 2005). Above around 1,500 metres there is an abrupt change in the Alps from tall forest to a low-growing sub-alpine woodland dominated by the snow gum *Eucalyptus pauciflora.* The treeline in Victoria and New South Wales is much more defined than in Tasmania and occurs at a much higher altitude, lying above 1,750 metres.

By virtue of its geographical limits in Australia and its topographic, lithographic and altitudinal range, the AANP provides important refuge for flora and fauna species (Costin 1989; DSE 2005). The young and ephemeral alpine and sub-alpine environments of the mainland have provided refugia for flora and fauna species as the climate became increasingly arid. As Australia warmed up, the distribution of cold-climate species retreated to the higher altitudes. Over time species have evolved to the harsh conditions of the high altitudes, such as seasonal snow cover, extreme frost, low temperature, strong winds and ultraviolet radiation -which is more noticeable at the higher elevations due to the thinner atmosphere, and increases in summer (AALC 2005).

In comparison, Tasmania, with its cool and very temperate maritime climate (BoM 2007), experiences much less climatic variability, which helps to sustain environments that contain ancient species with affinities with Gondwana, such as *Nothofagus*. Today, *Nothofagus* in Tasmania is a dominant species in cool temperate rainforests, and also occurs as an understorey species in wet forests and as a shrub in alpine and sub-alpine vegetation (DPWI, nd). On the mainland, it has a much reduced distribution in southern Victoria (eg. Central Highlands, Baw Baw Plateau, Otway Ranges and the Strzelecki Ranges). *Nothofagus* is an ancient genus, which was present in Gondwana and can be found today in South America, New Zealand, New Guinea, New Caledonia as well as in Australia. Fossil records of *Nothofagus* have also been found in Antarctica (ASGAP 2006).

Tasmania's alpine region is also more rugged than that of the mainland, more closely reflecting alpine regions of other southern hemisphere landmasses such as New Zealand and the subantarctic islands (Kirkpatrick 1988; Mummery and Hardy 1994; Crabb 2003). The Alps display the most outstanding development of open treeless sub-alpine valleys in the world, an attribute related to their generally gentle topography and relatively deep soils. The significance of the present alpine flora lies in the many commonalities of the floristic groups, and the affinities and differences between genera and species, compared with those of alpine Tasmania and with the other Southern Hemisphere continents and subantarctic islands (Good 1992a; Kirkpatrick 1994; Coyne 2000).

The AANP has outstanding heritage value to the nation under criterion (b) for containing uncommon alpine and sub-alpine environments.

Eucalypt Flora Community

The sclerophylls, in particular the genus *Eucalyptus*, dominate the sub-alpine, montane and tableland vegetation of the Alps (Kirkpatrick 1994; ISC 2004). The AANP demonstrates the remarkable adaptability of this plant genera over a broad altitudinal and climatic gradient, from the lowlands to the alpine heights. The genus here adapted to extreme environmental conditions including seasonal snow cover, water stress, extreme temperatures, nutrient deficiencies, widely differing soil conditions, wind, mechanical damage and fire, all of which are well expressed in the AANP.

Within Australia, major centres of eucalypt diversity are the Hawkesbury Sandstone region of south-eastern New South Wales in the Blue Mountains, the eastern wheatbelt and goldfields of Western Australia, the far north coast of New South Wales, with other less significant centres of diversity for sub-genera located in eastern Queensland, Arnhem Land and the Alps. Elsewhere in Australia, only Tasmania provides a comparable example of variation in *Eucalyptus* species reflected over a broad topographical range from lowlands to alpine heights.

Tasmania's alpine and sub-alpine environments occupy a small proportion of its land surface, with most areas located in the west of the state (PWS 2007). Tasmania has a cool and very temperate maritime climate due to its latitude and the stabilising effect of surrounding oceans whose temperatures change by six or seven degrees throughout the year (BoM 2007). The island experiences mild summers and strong and persistent winds in winter and early spring, causing a distinct maximum rainfall of up to 3,200 millimetres in the west and northwest, from sea level to mountain height (up to 1,617 metres at Mount Ossa) (BoM 2007; Geoscience Australia 2007). Tasmania is less susceptible than the AANP to seasonal and topographic climate variations, largely as a function of its more southerly latitude and maritime location. The altitudinal gradient in the Alps, however, displays a much greater topographical and climatic range as well as diversity in Eucalypt species when compared to Tasmania.

An ANHAT analysis compared the richness of *Eucalyptus* between the Alps and western Tasmania. There are between 3 and 16 species in western Tasmania. The AANP demonstrates greater richness, containing 17 to 40 species for a similar area. The greater diversity along an altitudinal gradient in the AANP is a result of the topographical and climatic variation, where the eucalypts have colonised environments ranging from semi-arid in the Snowy River valley to the cool temperate and alpine conditions of the elevated areas. Growth forms range from tall forest trees to mallee in the higher altitudes, where the snow gum *Eucalyptus pauciflora* survives at the highest altitudes to the treeline (ISC 2004).

The high diversity of Eucalypt species replacing each other along an altitudinal transect reflects both the adaptability of the genera and the large topographical and climatic variation within the AANP. This demonstrates the close relationship between climate, relief and biology, which defines the Alps as a bioregion (Costin 1989; Mummery and Hardy 1994; Kirkpatrick 1994; ISC 2004).

The AANP has outstanding heritage value to the nation under criterion (b) because of the representation of a highly adaptive plant genus, the eucalypts, across a very wide topographical range from lowlands to alpine heights.

Uncommon Alpine Soils

Soils are complex systems involving physical, chemical and biological interactions. In the alpine zone the deep organic soils play an integral role in the function of the alpine ecosystem. The deep organic soils of the alpine zone differ from other alpine areas around the world where soil formation is limited. The soils of Kosciuszko National Park have attracted international scientific attention as outstanding examples of some of the ‘great soil groups’; both individually as alpine humus soils and in association with each other; the alpine sequence of lithosols, snowpatch soils, alpine humus soils, bog and fen peats and silty bog soils (ISC 2004).

The Great Soil Group classification system was developed in the late 1960’s by Stace et al (1968) and was a tremendous advancement in the understanding and classification of Australian soil types. The system was based on the description of soil properties such as colour, texture, structure, drainage, lime, iron, organic matter and salt accumulation, as well as on theories of soil formation. The system is limited in that central concepts are inadequately defined which makes confident identification of some soils difficult, and this system is no longer in regular use in Australia, however some of the terms are still frequently used to describe soils (DPI 2007). The Australian Soil Classification System (Isbell 1996) has since replaced 1968 the Great Soil Group classification system and the some 20-30 previously classified ‘great soil groups’ have been consolidated and generally correlated against 13 soil groups (NSW DNR 2005).

Despite the acknowledgement of the alpine soils as outstanding examples of some of the previously classified ‘great soil groups’, there are many other soil groups across the Australian continent. The outstanding examples of each of the full suite of Australian soils cannot each be represented or recognised on the National Heritage List simply for being outstanding examples of a particular soil group, and there is no evidence to suggest that any soil group surpasses another. Notwithstanding the integral role of alpine soils in the function of alpine ecosystems and their water retention properties (addressed above under alpine and sub-alpine ecosystems); and despite the international attention on the uncommon alpine soils of Kosciuszko, international attention of an environmental variable does not automatically translate into a National Heritage value. It is therefore concluded that **there is insufficient evidence to suggest that the alpine soils of the AANP have outstanding heritage value to the nation under criterion (b).**

Rare Species and Communities

Many alpine species are highly restricted and threatened, while alpine and sub-alpine habitats have a very limited extent in Australia. These communities occur only within the south east of the mainland in the Alps and in Tasmania. Populations of thirteen vertebrate taxa that are listed as threatened or near-threatened by the World Conservation Union, including the endangered mountain pygmy possum, occur within Kosciuszko National Park (DEC 2006). Kosciuszko National Park has one nationally endangered and ten nationally vulnerable plant species; six endangered and six vulnerable animal species (DEC 2006).

Although alpine habitats support a number of rare or threatened plant and animal species, this number is smaller than for areas of similar size elsewhere in Australia. For example ANHAT analyses of large regions such as Cape York Peninsula, regions around Sydney, south-western Australia, the coast of northern New South Wales and southern Queensland verifies that these regions support significantly more rare and threatened species than the AANP. Although the AANP contributes to the conservation of the rare or endangered EPBC listed species, the conservation of these species is itself a separate matter of national environmental significance under the EPBC Act and does not in itself constitute recognition as a National Heritage value. Therefore, **the AANP does not have outstanding heritage value to**

the nation under criterion (b) for containing threatened species.

Rare Historic Values
One nominator claimed values under criteria (b) but provided no supporting information while another claimed that the place possessed uncommon, rare or endangered aspects of Australia's cultural history based on the diminishing access of horse-riders to Snowy River and Kosciuszko National Parks caused by park management decisions.

The claim that horse riding in the Alps is a rare or endangered aspect of Australia's cultural history is not supported given that access by horse riders, although restricted, still exists and the practice of remote horse riding continues in other parts of Australia such as on the Bicentennial Trail. Current horse-riding is considered to be a contemporary recreational activity and is not of outstanding cultural heritage value as an uncommon, rare or endangered aspect of Australia's cultural history (DEH 2005).

Cultural activities in the Alps such as historic transhumance and pastoralism, water harvesting for power generation and snow based recreation are also undertaken in Tasmania, albeit to a much lesser degree. Although there are cattlemen's huts in Tasmania, the suite of huts in the AANP are exceptional as a collection and are included in the assessment against criterion (g). **Based on this evidence the AANP does not have outstanding value to the nation against criterion (b) for rare historic values**

CRITERION (c) – ***The place has outstanding heritage value to the nation because of the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history.***

Ecological Research
One nominator claimed that Kosciuszko National Park is nationally significant under criterion (c) for the level, range and importance of scientific research conducted there and for themes of science and conservation. These claims are considered in the context of the AANP.

Scientific research work in the AANP has been undertaken across a range of disciplines and encompasses important research in anthropology, botany, ecology, geology, geomorphology, hydrology and meteorology (DEC 2006) as discussed earlier under criterion (a).

Groundbreaking ecological studies throughout the AANP has been undertaken by renowned scientists, in particular work on the Bogong High Plains by botanists from the University of Melbourne, began by Maisie Carr (née Fawcett) in 1947, and pioneering work at Mount Kosciuszko by Alec Costin and colleagues at CSIRO Plant Industry.

Systematic scientific research into the ecology of the Bogong High Plains began in 1947, when Maisie Carr, a pioneering botanist at the University of Melbourne, fenced cattle out of two small areas to investigate the direct impacts of grazing on Australian alpine and sub-alpine vegetation (Gillbank 2006). Maisie Carr's original plots are still systematically monitored, and represent the longest continuous series of ecological data of any single site in Australia. It is one of the longest-running ecological experiments in the world and has attracted international attention. While Costin's work remains very influential and forms a potential baseline for future study, his plots and transects have not been actively studied since the 1970s (Williams n.d.; Macdonald and Haiblen 2001).

Although of fundamental significance to current questions of fire and land management in the Alps (Williams n.d.), the research tradition exemplified by Carr and Costin and their colleagues needs to be situated in the context of a rich history of longitudinal ecological research in Australia over the last 50 years, much of which focuses on the effects of fire, grazing and rehabilitation. For example, although not site-specific, important research currently focuses on fire ecology and land management in central Australia, in south-western Australia and in Arnhem Land (Russell-Smith et al. 2002; Yibarbuk et al. 2001; Krull et al. 2007). While Carr's and Costin's sites are of undoubted historical significance, their ongoing potential to yield information of outstanding heritage value to the nation cannot be demonstrated. New techniques such as isotope analysis permit regional studies of land-use change through time (for example, Krull et al. 2007). Ecologists no longer need to rely on intensive, long-term, local studies such as those pioneered by Carr in the 1940s.

There are long-term studies undertaken by scientists from other disciplines and regions that are of comparable importance to Australia when compared to the work of the alpine ecologists. For example, at CSIRO in the 1940s Frank Fenner and Francis Ratcliffe, among others, investigated biological control of rabbits which led to the release of myxomatosis. The introduction of rabbit haemorrhagic disease virus RHDV (also known as rabbit calicivirus) in 1995 again reduced rabbit numbers to very low levels, with greatest impact in arid zones (CSIRO 2005). The work of Gurdip Singh and his Australian National University colleagues at Lake George in the 1970s (Bowler et al. 1976; Singh and Geissler 1979; Singh et al. 1981) and Peter Kershaw's ongoing palynological investigation focusing on Lynch's Crater in Queensland (Kershaw 1974; Kershaw 1986; Turney et al. 2001) provide a deeper time perspective on fire history, climate and ecological change in eastern Australia. They are recognised as two of Australia's most important sites for palaeoenvironmental reconstruction (Cook ed. 2007; Stevenson and Hope 2005).

Despite its longevity and its international contribution to understanding vegetation dynamics, successional theory and the impact of grazing (Costin 1989; Coyne 2000), **there is insufficient evidence to suggest that long-term research into vegetation change in the Bogong High Plains and Kosciuszko Plateau has outstanding heritage value to the nation under criterion (c).**

Research into Climate Change
The question of climate change research as a potential National Heritage value in the AANP is considered under criterion (c) as it relates to the potential of the AANP to yield information about and contribute to our understanding of the future impacts climate change.

The Intergovernmental Panel on Climate Change released its fourth assessment report in 2007, concluding that warming of the earth's climate system is unequivocal and that humans are likely to have been the cause of most warming experienced since 1950 (CSIRO & BoM 2007). Impacts from climate change are expected to be widespread and numerous across the Australian continent.

Research into climate change crosses numerous scientific disciplines and involves monitoring and modelling of a range of environmental variables such as temperature, precipitation, humidity, solar radiation, evapotranspiration, wind speed, sea surface temperature and sea levels. Projections indicate that droughts are likely to become more frequent with soil moisture declining over much of southern Australia; evaporation rates are likely to increase, particularly in the north and east; high-fire-danger weather is likely to increase in the south-east; tropical cyclones and other extreme weather events are likely to become more intense; and sea levels will continue to rise (CSIRO & BoM 2007).

Early impacts of climate change can be firstly observed in ecosystems that are sensitive to small changes in precipitation, temperature and sea levels. Such sensitive environments include coral reef systems in shallow water, high altitude alpine environments whose ecosystem functions are primarily controlled by high precipitation and low temperature conditions, low-lying coastal environments such as mudflats and mangroves and climatic transitional zones such as temperate to

semi-arid and semi-arid to arid. Monitoring changes in these sensitive ecosystems will provide important contributions to understanding the dynamics of ecological responses and adaptations to a changing climate. Climate change research, in particular research relating to sensitive or marginal terrestrial and marine ecosystems that provide useful indicators of climate change, collectively contributes to the national intellect of potential climate change in Australia.

As a high altitude alpine environment, the main impacts predicted for the AANP relate to ecosystem functional change as a result of changes in precipitation rates, extent snow cover and snow melt, as well as changes to temperature gradients. A transitioning of vegetation ecosystems is anticipated, with decreased ranges for some species while expansion in range for others, both native and feral (Pickering et al 2004). Many of the cold-climate adapted species will be vulnerable to changes to snow coverage, such as the mountain pygmy-possum that relies on the insulating blanket of snow cover, protecting it from weather extremes and predators.

Climate change research in the AANP is scientifically significant for making a contribution to the study of the effects of climate change on a steep topographical environment. However, climate change occurrence and its associated monitoring and modelling is not unique to the AANP. Despite the scientific validity of climate change research in the AANP and its importance in understanding impacts in an alpine setting, there is no information to demonstrate that the response of alpine ecosystems to climate change is more outstanding than the response of reef ecosystems to increased water temperatures and levels and occurrence of nutritional load as a result of increased runoff from rainfall in the north, or the increasing aridity of inland Australia. Furthermore, research into an environmental threat such as climate change does not necessarily translate into an outstanding heritage value. There is no evidence to demonstrate that research relating to climate change in the AANP surpasses any other research into climate change on the Australian continent. Therefore, it is concluded that **there is insufficient evidence to demonstrate that the AANP has outstanding heritage value to the nation under criterion (c) for climate change research.**

Research into Indigenous Values
Recent post-fire survey work across the AANP, together with past research has expanded an understanding of the nature and extent of Aboriginal use and occupation of the region. In particular, Parks Victoria identified further sites and prioritised Indigenous heritage and produced the audio-visual *Dancing and the Devil: uncovering the hidden histories of the Alps.* Detailed excavations are currently underway in Victoria, revealing further evidence of Aboriginal occupation in alpine areas. It is considered that additional archaeological research, in particular archaeological excavation, could yield further information about the nature of human adaptations to alpine and sub-alpine environments in Australia. These issues could also be investigated within Tasmania.

Based on available evidence, however, the information that further archaeological work might yield is limited owing to the lack of rock shelters or other sites with good faunal or floral preservation that could contribute to an understanding of prehistoric human organisation in this region (White 2006). As a result **the AANP does not have outstanding heritage value to the nation under criterion (c) for its potential to yield information that will contribute to an understanding of Australia's cultural Indigenous history.**

Research into Historic Values
A nominator claimed values under criterion (c) relating to historic values but provided no supporting information. **The AANP does not have outstanding value to the nation against criterion (c) for the claims relating to for historic values**.

CRITERION (d) – ***The place has outstanding heritage value to the nation because of the place's importance in demonstrating the principal characteristics of:***
(i) a class of Australia's natural or cultural places; or
(ii) a class of Australia's natural or cultural environments.

The MCA and the SMHRA claimed this value but provided no supporting information. The AANP is considered against criterion (d) for demonstrating the principal characteristics of classes of natural and cultural environments.

Cultural Environments

Alpine cultural environments are representative of cultural systems specific to the Alps, some of which are now relict cultural landscapes (the cultural systems which they represent no longer have an active role in contemporary society). These landscapes commonly demonstrate the use of particular mountain resources and adaptation to the extreme climate conditions and remoteness to achieve social and economic advantages. The AANP identified cultural environments aligned to each of four 'alps' themes: alpine pastoral landscapes, alpine mining landscapes, snow-based recreation landscapes and water harvesting landscapes for hydroelectricity.

The representative landscapes were tested against the threshold of outstanding value to the nation using indicators developed from Lennon and Matthews (1996), Truscott et al (2006), and Fowler (2003). Those landscapes above threshold demonstrate:

- integrity with a completeness of features that typify a thematic expression and a coherent cultural pattern (both relict and continuing) of an economic or social process based on features, spatial organization, response to the natural environment and an ability to illustrate changes to the landscape character;
- authenticity of features in form, design, traditions and legibility of the features in the landscape;
- a balanced relationship of human created features from relict and continuing activities with the topography, ecological and biotic systems, and their continuity;
- a balance of historic to modern features that can convey the story of a continuing process over time;
- the absence of discordant elements that would interfere in the interpretation of the cultural landscape along with a coherent and authentic contextual landscape setting.

Alpine Pastoral Landscapes
Alpine pastoral landscapes are considered within the broad class of Australian pastoral landscapes. Within this broad class, are distinctive groups strongly influenced by climate and landform that can be considered as having representative examples with national heritage value. The groups include:
· Arid pastoral landscapes - extend across the arid areas of Queensland, Western Australia, the Northern Territory, northern areas of South Australia and north-west New South Wales. They are often large holdings that demonstrate particular adaptation to cope with remoteness, and hot and dry conditions.
· Range-land pastoral landscapes - located in the less extreme areas of climate and topography covering both grand and modest properties that demonstrate a range of grazing activities. The properties are generally in temperate areas of New South Wales, Victoria, south-west Western Australia, and Tasmania.
· Alpine or 'high country' pastoral landscapes - located in comparatively high elevations and subject to regular winter snow cover. They demonstrate adaptations to the constraints and opportunities of the mountain landscapes, difficulties of access, the cold climate and the presence of snow.

(i) Eight major pastoral cultural landscapes areas with representative characteristics have been identified. Each of these areas encompasses numerous individual leases. The landscapes retain a typical open character partly from past grazing and burning. Some are regenerating with pioneer shrubs such as hakea.

(ii) The physical form and fabric of alpine huts typify the vernacular bush architecture of other parts of Australia. However, they also show adaptations to the

climate such as steep pitches on roofs and detached chimneys. The difficulty of transporting building resulted in a continuity of use and recycling of early materials along with survival of vernacular building techniques using hand tools such as an adze and broad axe (Truscott et al 2006).

(iii) Demonstrating the many functions of self sufficiency required in remote regions, the homestead assemblages of Orroral and Gudgenby, Currango, Coolamine and Wonnangatta are representative of the small sample of extant permanent pastoral runs established after 1836. Like the huts many of the buildings demonstrate vernacular construction styles. Other homestead buildings have lost many ancillary features.

(iv) Stock routes providing access to pastoral sites are within and adjacent to the Australian Alps national parks (King 1959). Former major stock routes now roads are the Snowy River Stock Route, the Tharwa-Kiandra Stock Route, and a portion of the Great Alpine Road. Many major stock routes have been modified for fire trails.

(v) Shelter huts and homesteads are usually on slightly elevated areas to afford views across the grazing plains and at the edge of the open areas close to stands of woodlands, for protection. Permanent properties have outbuildings close to the homesteads and exotic plantings, including fruit trees, for food or protection from prevailing winds. Stock yards, some of 'chock-n-log' construction, are present in the lease areas but often at a distance from the huts.

Transhumance continues in sub-alpine forest areas beyond the AANP but the area is only a fraction of the extent of the higher alpine areas. Runs like Tom Groggin, Benambra, Black Mountain near Omeo, and Ingebyra on the southern Monaro (all outside the AANP and predominantly montane) are also typical of high alpine pastoral activity and some continue to be farmed and grazed. The pastoral practice in Tasmania commenced by the late 1830s, progressed until well into the twentieth century but declined before World War II (Cubit and Russell 1999). Tasmania has around 70 huts in its mountain national parks, including examples constructed from hand split timbers and logs. The huts were constructed for shelter for trappers and snarers, stockmen and fishermen and recreationists. With the exception of the Highlands of Tasmania, the Alps are the only part of Australia with an array of alpine pastoral landscapes.

Some of the AANP pastoral landscapes such as the Kosciuszko Range have lost integrity due to the development of ski-recreation. At Wonnangatta Station landscape the integrity has been compromised through fire losses. The Lower Snowy, Hotham /Cobungra and Bogong Pastoral landscape although significant as transhumant landscapes, do not have pastoral property assemblages. The Orroral Valley/Gudgenby landscape is a fine montane pastoral landscape but is at a lower elevation to the alpine and sub-alpine places and therefore does not demonstrate comparable living extremes. However, North-East Kosciuszko pastoral landscape is a comparatively intact heritage landscape.

The North-East Kosciuszko pastoral landscape (NEKL) is the outstanding representation of alpine pastoral landscapes, comprising undulating and plain landforms located within Coolamine Mountain to the north, Bimberi Range, the AANP boundary, the Snowy Mountains Highway and the Fiery Range:

(i) extensive visible grazing modified landscapes manifest as predominantly open grasslands, or shrub regrowth areas that include the Kiandra area, Boggy Plain, Nungar Plain, Gulf Plain, Wild Horse Plain, Tantangara Plain, Dairymans Plain, Currango Plain, Long Plain, Cooleman Plain, Kellys Plain, Blanket Plain and Pocket Saddle.

(ii) an exceptional array of huts including Bill Jones Hut, Circuits Hut, Gavels Hut, Hains Hut, Hainsworth Hut, Millers Hut, Oldfields Hut, Pedens Hut, Pockets Hut, Townsends Lodge, Gavels Hut, Goandra Hut, Schofields Hut, and Witzes Hut, show a range of vernacular styles including split log and sheet metal construction.

(iii) exceptional examples of permanent pastoral properties include Coolamine historic homestead assemblage, Currango Homestead assemblage, and the former homesteads of Cooinbil and Old Currango. The permanent pastoral complexes are modest vernacular low-technology expressions with features typical of alpine living. Sullivan and Lennon (in ISC 2004) noted Currango has potential national heritage significance as the largest and most intact example of pastoral settlement above the snowline in Australia with 25 remaining buildings and ruins.

(iv) former stock routes cross the landscape and many are now used as fire trails or access roads, including Port Philip Fire Trail and Murray Gap Fire Trail.
(v) the typical spatial arrangements of pastoral landscapes of both the transhumance and permanent properties with the locations of huts and buildings in protected locations.

NEKL has authentic features of transhumant huts and permanent property buildings. Collectively the rich array of building styles demonstrating vernacular design and traditions presents a typical alpine pastoral landscape, revealing over a century of pastoral activity (KHA 2008). The landscape demonstrates a balanced relationship of cultural and natural features. The variable changes to the ecological and biotic systems is in evidence as clearings in the woodlands or swathes of pioneer shrub growth in the open regenerating landscapes but does not diminish the landscape recognition. The settings for the huts and the homesteads are authentic and representative of alpine adaptation.

Despite Tantangara Dam in the centre of the landscape, there is an absence of discordant elements in the setting landscapes. Although there is a gradual loss of extant features and visibility of the grazed-modified (now relict) landscapes continues to diminish (Godden Mackay Logan 2005) this does not compromise the pastoral landscape expression.

The North East Kosciuszko landscape has outstanding value to the nation against criterion (d) for demonstrating the principal characteristics of an alpine pastoral landscape.

Mining Landscapes
The AANP contains 68 mining sites from the mid-nineteenth century gold rush. Principal features are the use of slopes for water races, climate adaptations, settlement features, mining equipment and diggings (including shafts and mullock dumps).

The Kiandra Mining Landscape expresses alpine mining above the snowline and the characteristic features of water races adapted to low velocity streamflow. The townsite consists primarily of archaeological fabric, along with the extant buildings of the courthouse and Matthew's cottage, both of which have been altered. Diggings are generally in good condition despite removal of equipment (LRGM 2002). Extant mining features include surface diggings, ground and hydraulic sluices, shafts, mullock dumps, water races and dams, equipment and tailings (LRGM 2002).

Although the Kiandra mining landscape exemplifies alpine mining, other alpine mining fields at Hotham Heights, Brandy Creek, Boiler Plain, Mount Wills and the Dargo High Plains show similar features. The extant buildings at Kiandra have lost integrity. High altitude low technology mines are found throughout the mountains of Tasmania. Castlemaine Diggings in Victoria is in the National Heritage List and contains an outstanding array of mid-nineteenth century features that surpass those at Kiandra.

The Red Robin Gold Mine is a collection of mine workings at high elevation with operational and redundant mining equipment and huts. The mine has been used continuously since 1940 essentially with 'traditional-type' mine techniques and retains existing elements from original to current use. It is a working quartz mine using antiquated processes, with a variety of extant machinery and huts. The evolution of mining operations on the site is apparent (LRGM 2002). Its significance is based on its intactness, alpine adaptation, and continuity of use. However, areas around Queenstown in Tasmania have ongoing high-altitude mining. As a low technology twentieth-century operation with some adaptations to high-altitude industry, Red Robin has significance but not of outstanding value to the nation. **The alpine adaptation of the mining landscapes of Kiandra and Red Robin in the AANP do not demonstrate outstanding value to the nation against criterion (d).**

Snow-based Recreation Landscapes

Snow-based recreation landscapes are a distinctive class of cultural environment. The AANP has several snow-based recreation landscapes mostly developed over the former grazing lease areas with intact arrays of representative features in sound condition that characterise the evolution and continuity of the activity for over 100 years.

The principal features are: (i) use of the steep, snow-clad topography predominantly cleared of trees; (ii) scenic landscape locations; (iii) groomed slopes; (iv) ski lift infrastructure; (v) stylised accommodation structures in landscape settings and associated access routes.

Routes like the Kiandra to Kosciuszko ski route, the road from Jindabyne to Perisher, Charlotte Pass, the Great Alpine Road, and the Alpine Way, undertaken by state governments to encourage alpine tourism are closely associated with snow-based recreation landscapes. Australia's highest railway, the Ski-tube, is a contemporary example of visitor access to the Alps. Running from Bullocks Flat in the Thredbo River valley to Blue Cow it is the only functioning example of an electric powered cog/rack driven railway system in Australia.

The ski resorts developed after the 1950s are evolving landscapes that retain an active social role in contemporary society, and typify alpine land-use. Although there are traces of early relict ski slopes in places like Mt Franklin, most of the ski-resort landscapes continuously upgrade structures.

The central Kosciuszko ski-resort landscape of Guthega, Blue Cow, Smiggin Holes, Perisher, and Charlotte Pass contains intense snow based recreation infrastructure, and well demonstrates the principal characteristics of a snow-based recreation landscape, from early twentieth-century lodges to the consolidation of villages and transport links from the 1970s. There is a sound representation of the ski-resort architecture categorised by Freeman (1998) as vernacular, alpine, European alpine, State Park alpine and innovative.

However, unlike alpine mining, there been no comprehensive study of ski resort recreation landscapes. Freeman (1998) covers only part of the alps resort areas (alpine resort villages of the central Kosciuszko area). The heritage significance of the AANP resorts needs to be compared with the Victorian alpine resorts, Jindabyne (New South Wales) and Ben Lomond (Tasmania) to enable thorough analysis. **There is insufficient information available to determine outstanding heritage value to the nation of ski resort landscapes under criterion (d).**

In the early twentieth century, medical professionals considered mountain retreats essential for good health. Numerous sanatoria and guest houses, some government-funded, took advantage of the bracing fresh air and mountain scenery. The four historic guest houses established with government assistance and their associated landscapes, the Kosciuszko Hotel, the Chalet at Charlottes Pass, Yarrangobilly Chalet and Mt Buffalo Chalet, are representative of a distinctive class of cultural heritage places. While the two former have been significantly altered, Mount Buffalo Chalet, constructed in 1910 in a scenic park landscape setting of granite tors, and the Yarrangobilly Chalet and Caves Precinct of decorative karst, exemplify the class of places associated with the early high country tourism enterprises. Both exhibit stylised architecture reminiscent of European chalets in a bungalow style, with steeply sloping roofs in high altitude landscapes with high scenic interest, and typically small private rooms and large public spaces.

Outside the AANP, the Jenolan Caves House in the Blue Mountains is an extant example of a government-funded guest house, set like Yarrangobilly Chalet in a picturesque karst landscape. Jenolan Caves House is a larger complex located in an equally outstanding karst landscape. Therefore Yarrangobilly Chalet and Caves precinct does not have outstanding heritage to the nation as a representative example of a mountain retreat.

Despite the effects of the 2003 bushfires, the Mt Buffalo Chalet is a distinctive and representative feature of the Mt Buffalo recreation precinct. There is an absence of discordant elements that would interfere in interpretation of the snow-based recreation landscape. The intact, government-funded historic guest house is central to landscape integrity. Set among highly scenic granite tors and the Eurobin Falls, the chalet has a strong association with snow-based recreation. The precinct also contains arguably the first ski tow in Australia. The landscape meets integrity and authenticity thresholds and other indicators of alpine heritage value, including altitude, climate and scenic values, representing almost 100 years of Australian snow-based recreation. However, lack of adequate comparative information on alpine and montane resorts, as well as a national analysis of the heritage values of other recreation landscapes, prevents thorough analysis of the National Heritage values of the place as containing the principal characteristics of a snow-based recreation landscape in Australia. **There is insufficient information available to determine outstanding heritage value to the nation of the Mt Buffalo recreation precinct under criterion (d).**

Water Harvesting and Hydro Electricity Generating Landscapes

Water harvesting has been conducted in the AANP area since the mid-nineteenth century (mining) and twentieth century (irrigation and hydroelectricity). The Dartmouth Dam supplies the Murray River and the Cotter catchment supplies Canberra. Both schemes contain large pondages, dam walls, pumping stations. There are numerous catchment schemes throughout Australia such as the Nepean Scheme in New South Wales, Lake Eildon (Victoria), Warragamba (New South Wales) and the Great Lakes (Tasmania). All have representative features, but some are older and have more historic systems while some have more highly engineered dam walls. The Dartmouth Dam and Cotter water harvesting landscapes do not have representative features that could be considered outstanding to the nation.

The Kiewa (KHES) and Snowy Mountains Hydro Electric Schemes (SMHES) are continuing cultural systems that typify the use of the landscape to capture water from snow and divert it to existing rivers, illustrating continuing demand for water and power since the mid twentieth century. While features of human settlement have disappeared, the main structural features of the landscapes are sophisticated and highly structured. The massive scale of the pondages has transformed the alpine landscape. The features are authentic and highly legible. Stockmen's huts were recycled for workers and some pastoral/recreational routes redeveloped following the superimposition of catchment activity on grazing and recreation landscapes. Associated with catchment landscapes are stream gauging and weather stations, huts, soil conservation and revegetation work, accommodation sites, and power stations (although most of the power stations are outside the AANP).

With three power stations and five pondages, the KHES (1938-61) is the second largest construction project of its kind in Australia and when it first came into operation (1944), it was the largest in Australia and remains the largest scheme in Victoria. However, some of the power stations and pondages are not included within the AANP boundary. Furthermore, the structures of the SHMES surpass it, therefore it is unlikely to have outstanding heritage value to the nation under criterion (d).

The cultural environment of the SMHES (1949-1975) combines the water harvesting of the alps landscape and the industrial structures and landscape works of the hydroelectric system, superimposed over alpine grazing and recreation landscapes. It is the largest engineering scheme in Australia, containing 16 major dams, numerous smaller diversion structures, 150 kilometres of tunnels, 80 kilometres of aqueducts, a major pumping station, several hydroelectric power stations and accommodation sites including 71 tent camp sites, 31 snow hut camp sites, 31 barracks camp sites, 18 cottage camp sites, 26 hut sites and 10 extant huts. A large component of the scheme landscape and approximately 70 per cent of the accommodation sites are within the Alps area. There are over 80 work camp sites from the SMHES in the Alps parks area.

The KHES and SMHES landscapes have their greatest similarity with schemes in Tasmania. However the scale of the Tasmanian hydroelectric scheme landscapes and the array of features are less extensive than the SMHES landscapes. The SMHES is a design achievement of the highest order (DECC 2006) and is by far the largest engineering project ever undertaken in Australia. It is also one of the largest and most complex hydroelectric schemes in the world, containing both typical features of contemporary engineering and exceptional engineering accomplishments. Other comparative information is noted against criterion (a).

The SMHES is likely to have National Heritage value. However, **the AANP does not demonstrate outstanding value to the nation against criterion (d) for the principal characteristics of water harvesting and hydroelectricity generation, as the AANP captures only part of the SMHES.**

CRITERION (e) – ***The place has outstanding heritage value to the nation because of the place's importance in exhibiting particular aesthetic characteristics valued by a community or cultural group.***

A nominator claimed that the AANP has values under (e) but provided no supporting information. The assessment method developed in the study of Inspirational Landscapes (2003) by Context is used to assist in the analysis of aesthetic values. The indicators of significance developed in that study - powerful landscape, stories, uncommon landscapes, defining images and creative expressions have been applied in the following analysis.

Powerful Landscapes
The attributes of long-distant vistas and alpine plateaus are well researched for their effect in triggering aesthetic responses. The Main Range of the Snowy Mountains; high mountain peaks and plateaus of the AANP (such as the Baw Baw Plateau, Mount Bogong, Mount Buffalo) and the Victorian 'high plains' (such as the Bogong High Plains and Howitt High Plains) are shown to be visually important to communities in winter when covered in snow and in summer when adorned with wildflowers. River valleys and gorges, notably the Snowy River, the lower Snowy (New South Wales) and the upper Snowy and Snowy Gorge in Victoria are highly valued as dramatic landscapes and as wild recreational areas. The alpine peaks are prominent in the landscape and the vista can be viewed up to 200 kilometres away.

Crocker and Davies (2005) identified features within the Victorian Alps including the Bryces and Moroka gorges, the secluded Lake Tali Karng, the Avon wilderness, waterfalls on the Wabonga Plateau, Paradise Falls and Dandongadale Falls, Mount Feathertop and the Razorback. Many other aesthetic aspects of the Alps symbolise the alpine region, such as the distinctive form and colours of snow-gums or summer wildflowers or a single mountain hut in its high country setting. These are frequently pictured without specific location, but define the AANP experience of remoteness and natural beauty.

Spate in his Cooleman Plains assessment report noted 'Cooleman Plains especially its gorges, cave and large springs – has long been highly regarded as a scenic attraction (DEH 2006b). The plains themselves, surrounded by the steep volcanic terrain, form an attractive sight. Gale (1875), Leigh and Etheridge (1894) and other visitors to the Alps in the nineteenth century commented on the scenic values and the area remains extremely popular with visitors today'.

The characteristics that demonstrate the powerful inspirational aesthetic value of the landscape have been recorded over time. In 1899 the geologist WH Ferguson described the Alps in the following terms:

The scenery is wild and rough and grand in the extreme. In no place else in Victoria are there such dizzy precipices, such sheer bluffs, or gorges with such vertical sides. In places the river is hemmed in between rocks which leave but a 30ft waterway (quoted in Seddon 1998).

In 1933, keen pioneer skier CJM Cole made the following comment on the view from Mount Bogong:

I stopped and looked in delight at the wonderful panorama which stretched out before me. As far as the horizon there were mountains. All the big peaks were visible... Further away were the Barry Mountains and Mts. Buller and Howitt... To the north-east the most majestic view was seen; the Kosciuszko plateau, heavily laden with snow and the only portion of the panorama bathed in sunlight and looking particularly bright by contrast (AALC 2005, 1).

Uncommon Landscape
The AANP is valued as an uncommon landscape. It is one of the few places in Australia where people can experience the expansive snow covered mountain vistas, falling snow, the snow clad eucalypts, and the ephemeral qualities of wildlife in the snow and their movement across the snow-clad landscape, freshly fallen snow to snow melt and snow fed rivers and streams.

Images of the wild, remote Alpine landscapes have also been popular in Australia ranging from the picturesque paintings of the artists (von Guerard and Chevalier) to the Charles Kerry photographs, and more recently those of Klaus Hueneke and David Tatnall. George Seddon believes that the popularity of such images may be because of their relative paucity in the overall Australian landscape. 'It would seem that many Australians have a strong emotional investment in the High Country, more so than in any other single landscape' (Crocker 2005, 34).

The botanist, Dr Jamie Kirkpatrick notes the aesthetic quality of the natural landscape of Kosciuszko (Kirkpatrick 2001). Kirkpatrick (1994) quotes Costin (1979, 37) describing the wildflower displays in the alpine zone as 'a massed flowering in summer which is surpassed in few other parts of the world'. Kirkpatrick (1994) further notes that the Alps are:
'aesthetically unique with its combination of gently rounded slopes, highly floriferous alpine vegetation and the pastel untidiness of the eucalypt forest that form a highly natural and ineffable beauty' (p 30).

Defining Images
The mountain peaks of the AANP repeatedly feature in art. Mount Kosciuszko has become a cultural icon not only because it is Australia's highest mountain, but because it is repeatedly painted and photographed. Responses to its visual purity date from its European discovery (Strzelecki in 1845 and the geologist Clarke in 1860), and this was soon represented by von Guérard (1860s) for others to see. Later artistic images for travel and tourism, commemoration, and artistic purposes are seen nationally each year. Some 30,000 people walk or ski to the summit of Mount Kosciuszko every year.

The Victorian alpine mountain peaks are regarded as 'inspirational landscapes' eliciting aesthetic responses by artists, photographers, writers such as von Guérard's

North-east view from the northern top of Mount Kosciuszko 1863, *Mount Kosciuszko seen from the Victorian border (Mount Hope Ranges) 1866*, Chevalier's *The Buffalo Ranges, Victoria* 1864, Streeton painted the Bogong Plains and Mount Feathertop (Crocker and Davies 2005b). Nicholas Caire's photos of Mount Bogong, taken in 1877, are well known. Frank Hurley (1885-1962) produced a number of images of the Alpine NP, including photos of Mount Bogong, held by the National Library of Australia. Harry Nankin's books contain images of Alpine landscapes and other well known photographers have also published photos taken in the park, eg David Tatnall and Steve Parish (Crocker and Davies 2005b, 36). John Bowman's *Mount Kosciusko* drawing of 1873 later became and engraving. Piguenit painted the Kosciuszko massif *Mount Kosciusko and the Valley of the Upper Murray in 1883* and *Kosciusko* in 1903 (Andrews 1991). Imant Tillers painting of *Mount Analogue* (1985) is an interpretation of von Guérard's Mount Kosciuszko painting.

Alpine features included in paintings and photographs are: Mount Speculation, Mount Bogong (Victoria's highest peak), Mount Buffalo, Mount Cobberas, Mount Cobbler, Mount Cope, Mount Feathertop, Mount Howitt, Mount Pinnibar, Mount Warwick, Mount Wombargo, The Bluff, The Pinnacles, Mount Kosciuszko, Mount Townsend and general views of Great Dividing Range.

A number of films have been shot in the Alps area including The Man from Snowy River (1982), The Plains of Heaven (1982), Snow: the Movie (1982), Cool Change (1986), The Far Country (1987), The Man from Snowy River II (1988), and The Silver Brumby (1993). The works of Banjo Paterson-*The Man from Snowy River* and Elyne Mitchell - *The Silver Brumby* have been inspirational to Australians of all ages, encouraging romantic appreciation of the alps landscape. Poets and writers such as Banjo Paterson, Marie Pitt, Albert Bartlett, Sidney Jephcott, Henry Kingsley, Rolf Boldrewood, Edward Harrington, Barcroft Boake, Henry Kendall, David Campbell, Betty Casey Litchfield and Sidney Porteus have referred to the mountain landscapes. A number of films use the landscape as settings such as The Plains of Heaven (1982), The Far Country (1987), The Man from Snowy River (1982), Snow: the Movie (1982), Cool Change (1986) as well as, The Man from Snowy River II (1988), and The Silver Brumby (1993) (Crocker 2005). The mountains and mountain way of life have inspired music and the Numeralla and Nariel folk festivals feature folk music associated with the mountains.

The Alps have featured in numerous posters, books, guides, tourism and bushwalking publications, calendars, and large format books for over 30 years. Crocker and Davies (2005 b, 36) referred to some examples being, *Alps at the Crossroads,* Dick Johnson, Victorian National Parks Association 1974; *Australia A Timeless Grandeur,* Reg Morrrison and Helen Grasswill, 1981; *Discover Australia's National Parks and Naturelands,* Michael and Irene Morcombe, 1983; *Wild Australia,* Readers Digest, 1984; *Australia's Wilderness Heritage, Vol 1,* Geoff Mosley et al, 1988 Weldon Publishing with the ACF, New South Wales; *Victoria's National Parks Explorers Guide* 1999; *Inspired by Nature*, Steve Parish 2004; *Australia's National Parks - A Journey of Discovery*, Steve Parish, 2004.

Alpine scenery such as snow clad eucalypts is a distinctly Australian image has been captured by photographers and appears in books, calendars, travel and tourist information celebrating Australia's beauty.

Community Associations
The community's attachment to the Alps is demonstrated in the depth and breadth of community responses and the popularity of artistic alpine imagery. The landscape has been painted, photographed and filmed to become part of our national identity. Photographs of snow gums, alpine wild flowers, high country animals, snow scenes and mountain huts, often location free, are instinctively recognised as the Alps. Community action has contributed to the declaration of the Alps as national parks.

Several community groups' workshops held for the Regional Forest Agreement (RFA) studies (1999 and 2000) identified the Alps and its features as significant for aesthetic value. This shows that the AANP is well-known and valued by the regional and the wider community for their aesthetic values.

The AANP is the largest contiguous snow clad landscape in Australia. Other mountain ranges in Australia having National Heritage aesthetic value include the Blue Mountains, the Grampians, Glass House Mountains and the Warrumbungles. The Blue Mountains and the Grampians are significant for their dramatic landscape, the aesthetic responses experienced from scenic drives and lookout points, as a defining image painted by artists and with the Grampians for its concentrations of rock art. The Warrumbungles display distinctive and spectacular volcanic landscape of spires, domes, plugs and dykes that is uncommon in Australia and have scenic vistas important to the community. The Glass House Mountains are noted for embodying significant landmark qualities for the community and evoke strong emotional responses. They are a dominant and instantly identifiable landform from a number of distant observation points and their summit lookouts offer strong aesthetic experiences including broad panoramas. The Glass House Mountains have inspired a number of works by significant Australian artists.

The AANP compares strongly with all these inspirational mountain landscapes. As the only alpine area in Australia it has provided defining images which have inspired art, literature and film. Its dramatic and uncommon landscape contains features of beauty and inspiration. Today the region has become appreciated for their difference from the 'typical' Australian landscape. Their distinctiveness continues to inspire artistic and emotional reactions that emphasise the aesthetic value the AANP holds for Australians.

The AANP has outstanding heritage value to the nation under criterion (e) for aesthetic values.

CRITERION (f) – ***The place has outstanding heritage value to the nation because of the place's importance in demonstrating a high degree of creative or technical achievement at a particular period.***

National Heritage values relating to the technical achievements of the Snowy Mountain Hydro Electric Scheme have been deferred for a separate NHL nomination.

CRITERION (g) – ***The place has outstanding heritage value to the nation because of the place's strong or special association with a particular community or cultural group for social, cultural or spiritual reasons.***

Association with Aboriginal People
Aboriginal people have an association with the AANP that spans thousands of years, and for many is timeless. Despite the effects of colonisation, which severely disrupted and sometimes severed connections to this country, many Aboriginal people maintain strong and lasting connections to the Alps (Goulding 2002). Goulding (2002) found that the way people related to land in the region was considerably influenced by their experience of disruption. Some people assert their inherited traditional rights to areas of the country within the AANP, including cultural knowledge, language, places of cultural importance and respect for elders. Others know they belong to that country, but have minimal direct knowledge of cultural connections. Others still have no traditional links but have historical ties.

The past use of the area for annual ceremonies which brought different tribal groups together from many areas is seen by some Aboriginal people today as an important part of their heritage (Wesson 1994; Waters 2004; Young 2005). In more recent history, many Aboriginal people have lived and worked in and around the mountains, as black trackers, stockmen, station hands, house servants, brumby runners and working on the Snowy Mountains Scheme (Waters 2004). The mountains

have also been used for hunting, collecting food and medicines, and as a place of spirituality, for reconnecting with ancestors and country. As one community person has said, the mountains 'mean a lot to me. 'Cause that's where my people come from up there … Yeah, up in the mountains … that's where my people roamed up there … that was their home. That's why I like going up that way … So the mountains mean a lot to me' (Goulding 2002, 87).

While Aboriginal people express their strong relationship or connection with the AANP, this is similar to the relationships that all Aboriginal people hold to their traditional country, the place where they come from and to which they are connected through birth, spirit and their ancestors. In this regard**, there is insufficient evidence to show that the AANP is more outstanding than any other place under criterion (g) because of its strong or special association with Aboriginal people.**

Association with Community Groups
A nominator claimed that the alpine grazing leases of the Victorian Alps have been, and still are, the basis of the activities of the mountain cattlemen, which is of immense cultural, historic and heritage significance to all Australians. Another nominator claimed that Kosciuszko National Park possesses values relating to criterion (g), primarily the recognition of horse riders with the Kosciuszko National Park. These claims are considered and discussed in the following analysis.

The AANP has a special association with the Australian community because of its unique landscape, experience of remoteness and as the pre-eminent place for snow recreation. The AANP, and particularly the Snowy Mountains, have gained pre-eminence in the national psyche as the 'high country'. Seddon states that 'Many Australians have a strong emotional investment in the High Country, more than in any other landscape' (Seddon 1986). The pioneering history is valued as an important part of Australia's myths and legends,

Mount Kosciuszko is highly important to Australians and particularly the Polish people many of whom were refugee migrants. In 1997 following 200 public submissions, the spelling of Mount Kosciuszko was corrected to the Polish spelling. Each year thousands of people walk to the summit - an experience that is both recreational and becoming a cultural ritual. Various events have been held by religious groups and musicians on Mount Kosciuszko and by the Polish community (Lang 2008). The Polish explorer Count Paul Edmund de Strzelecki is known nationally for his defining event of naming Mount Kosciuszko and for his mapping of south-eastern Victoria. Named after the Polish General Tadeusz (Thaddeus) Kosciuszko, Strzelecki wrote 'amongst a free people, who appreciate freedom and its votaries, I could not refrain from giving it the name of Mount Kosciuszko' (Andrews 1991, 24).

The social value of the AANP is expressed through the tangible elements of the landscape and the intangible cultural associations with that landscape. The mountain cattlemen of the high country have national recognition. The 'community', in this case, consists of those men and women who share the interest of the traditional practice of alpine grazing; with around 150 years of traditional practice of grazing on the summer pastures of the alpine region. These people have a strong attachment to the place. The community of mountain cattlemen is sizeable although dispersed across the region. The community of mountain cattlemen and its association with the place and traditional practice has recognition beyond the region and the state. Representatives from the Mountain Cattlemen Association of Victoria (MCV) attended regional community workshops to identify places of social value for the Regional Forest Assessment process. The community holds events such as 'get togethers' which commenced in 1983, parades at shows and rallies as listed in the nomination to the National Heritage List. The national recognition of the community is evident through literature, and public media such as the books by Holth and Barnaby (1980), Holth and Barnaby (1990, 225-35), and Holth (1991, 155-63).

The practice was handed down from one generation of the community to the next, adapting and modifying to changing circumstances over its long history. Most of the practice and rituals undertaken by the associated community are now undertaken outside Alpine National Park. Although transhumant alpine grazing in the AANP was gradually reduced over time until it ceased in 2005, the imagery of the cattlemen/stockmen/horsemen generally retains iconic popularity with many Australians.

The mountain cattlemen community have been associated with the place since the 1830s through the traditional practice of grazing in the high country. Transhumant grazing was also practiced in the high country of Tasmania, specifically on the Central Plateau, the sub-alpine areas around Cradle Valley, Middlesex Plains, Vale of Belvoir and the Surry Hills area. The practice in Tasmania commenced by the late1830s, progressing until well into the twentieth century but declining before the Second World War (Cubit and Russell:1999, p.40).

Although the association between cattlemen and the high country still exists in Tasmania, the community association is stronger in the Alps because of its extent and its longevity. The national significance is based on how the place is treasured by the community, the longevity of the community association, the direct association of the nationally important story, as described under criterion (a), and how the story is continuing as an iconic story that has recognition in the nation.

The mythology created by Banjo Patterson's the Man from Snowy River, arguably Australia's best known ballad, maintains the sense of the AANP as a distinctive part of Australia's cultural heritage and has contributed to our national identity. The iconic association is demonstrated in the depiction of the Man from Snowy River on the Australian $10 note and the representation in the opening ceremony of the 2000 Sydney Olympic Games (Truscott et al. 2006). Elaine Mitchell's Silver Brumby novels further enhance the association of the Australian community with the AANP. The AANP has heritage value to Australians for the iconic mythology of the Man from Snowy River and the horsemanship undertaken in a very rugged landscape, known as the 'high country'.

Although the Snowy River Horse Riders conduct horse riding excursions into Kosciuszko National Park and have an association with the park, this is not considered of greater importance than the associations of other recreationists.

There are well over 157 groups with associated use and caring activities that cover recreation users, historical societies, ski club groups, conservation groups and friends groups. The mountain huts of the AANP constructed for grazing, mining and recreation are valued by communities as a physical expression of the cultural history of the region. They have special associations with community groups and associations that undertake caretaking activities, such as the Victorian High Country and the Kosciuszko and huts associations. Major conservation groups such as the Victorian and New South Wales parks associations along with other conservation groups have campaigned to create the parks. The campaigns have culminated in an initial Memorandum of Understanding (MoU) in 1986 between Commonwealth and three State agencies to manage the one bioregion – the Australian Alps national parks (AALC 2007). The MoU is an administrative arrangement by the government agencies and does not demonstrate a strong or special association with a particular community or cultural group for social, cultural or spiritual reasons.

The AANP has outstanding value to the nation under criterion (g) for its association with the broad Australian community because of its landscape, the myth of the *Man from Snowy River* and the legends of horsemanship undertaken in the rugged landscape. The iconic Mount Kosciuszko has a special association with the broad Australian community. Many community groups have a special association with the AANP for social and cultural reasons.

CRITERION (h) – ***The place has outstanding heritage value to the nation because of the place's special association with the life or works of a person, or group***

of persons, of importance in Australia's natural or cultural history.

Two nominators claimed that the AANP possesses values relating to criterion (h), due to the association of horse riders, mountain cattlemen, A B (Banjo) Paterson, Elyne Mitchell, Miles Franklin and Betty Casey Litchfield.

In response to the claim it is noted that the Snowy River Horse Rider's Association and the Mountain Cattleman's Associations may have local and regional recognition, however there is not sufficient evidence to prove that the association of the place to either group is of outstanding value to Australia's cultural history. The writer Miles Franklin is of national importance, was born at Talbingo and lived close the Alps for her first decade. Her book *Childhood at Brindabella* reflects on that association. However her association with the greater Alps area is not a long and meaningful association. The poet, Betty Casey Litchfield lived on the Monaro and has a strong association with the AANP. However, she is not regarded as a nationally significant literary figure.

Both Banjo Paterson and Elyne Mitchell have produced works that have forged a link between their audience and the Australian high country. These people had an association with the AANP, which is the setting of their well-known popular work. Elyne Mitchell lived near the Alps and wrote about the place for most of her life. Her involvement is significant. She produced 21 stories relating to the Alps, many of which have been translated and are popular internationally. The contribution of their work to the inspirational appreciation of and myth-making about the mountains is noted against criteria (e) and (g). However her books are not as popular as Norman Lindsay's 1917 children's book *The Magic Pudding* and Ethel Turner's *Seven Little Australians* (1894).

The AANP is where a number of nationally recognised persons or groups have made major national achievements in endeavours central to the Alps experience. The individual sites where such research has taken place are scattered across the region.

In 1839 Count Paul Edmund de Strzelecki undertook field-work for a geological map that took him in zigzags across New South Wales and to the AANP, where alone he ascended what he considered the highest peak, calling it after the Polish democratic leader, Tadeusz Kosciuszko (Heney 1967) (refer analysis criterion (g)).

Scientists of the nineteenth century are widely recognised and associated with their exploration and early study of the AANP. Ferdinand von Mueller undertook a series of botanical surveys throughout the Victorian Alps and to the Snowy Mountains in the New South Wales Alps, identifying almost all the sub-alpine and alpine flora species. Von Mueller is regarded by botanists (Costin et al. 1979) as the greatest Australian botanist having undertaken the most extensive, complete and thorough botanical collections of the Alps and its high peaks having conducted three extensive surveys that lasted months at a time. He is also known nationally for his development of the botanical gardens in Melbourne from 1857-73 and regional Victoria, and was honoured internationally for his donation of Australian flora, including eucalyptus, from Australia. Many of his plant collections were sent to Kew Herbarium and formed the basis for the publication by George Bentham *Flora Australiensis.* His contribution to the knowledge of the alpine flora was of major importance (Costin et al, 1979). Mulvaney (1992, 13) noted that during his five journeys between 1853 and 1861, he collected 235 plant species, 78 of them previously undescribed and that the association between flora and the outstanding pioneer botanist remains significant in cultural history.

Alfred William Howitt was an able and competent individual and highly acclaimed after his successful journey to Coopers Creek and rescue of the explorer King the only survivor of the disastrous Burke and Wills expedition. He became a public official when he was appointed police magistrate and warden of the Omeo goldfields in 1863. He reported that he had ridden between 400 and 1000 kilometres each month (Mulvaney 1992, 13). He studied and documented the geology and botany of the landscape. After becoming interested in anthropology wrote numerous papers on Aboriginal societies, and ethnographic descriptions particularly communities associated in south-east Australia associated with the Alps. In 1904, he published his research *The Native Tribes of South-East Australia* (1904) (Stanner 1972 432-435). The intensity of his association with the Alps is probably when he was magistrate at Omeo. His Aboriginal society research is well known to anthropologists, but this association is with the whole area of south-east Australia. The association of Howitt with the Australian Alps is not considered of outstanding value to the nation.

Although a distinguished Australian journalist, war correspondent, war veteran, ballad-writer, horseman, bushman, and artist, the association of AB (Banjo) Patterson with the AANP is immortalised by his epic poem *The Man from Snowy River*, arguably Australia's best known ballad since it was first published in 1890. The ballad created a mythical character with extraordinary horse riding prowess that has become distinctive part of Australia's cultural heritage and has contributed to our national identity as demonstrated in the depiction of the *Man from Snowy River* on the Australian $10 note and the representation in the opening ceremony of the 2000 Sydney Olympic Games (Truscott et al. 2006) (Semler 1988).

The Alps is the location of work by persons well-known for their important contributions to the development of the newly established capital of Canberra at the beginning of the twentieth century. Dr J H L Cumpston's decision in 1913 as head of the Commonwealth Quarantine Service to exclude grazing from the Upper Cotter for the water catchment of Canberra, pre-dated these studies in Victoria, and was based on the idea of clean drinking water. He later became head of the Commonwealth Department of Health.

The SMHES reflects conservation responses being closely associated with the work of the Snowy Mountains Authority's official title not colloquial title, Sir William Hudson, who not only achieved the realisation of the Scheme, but consciously funded rehabilitation, soil conservation and restoration of the Main Range between Mounts Twynam and Carruthers, and strongly supported the establishment of the Kosciuszko National Park in 1969 (Truscott et al. 2006).

Count Paul Edmund de Strzelecki's naming of Kosciuszko is known nationally for his defining event of naming Mount Kosciuszko and for his mapping of south-eastern Victoria. However, the significance of the naming of a place as an outstanding association of the whole of the Alps area with the life and works of Strzelecki is not demonstrated as outstanding to the nation.

Sir William Hudson's strong association with the place may be more appropriately included in the proposed Snowy Mountains Scheme NHL assessment.

The association of Baron Ferdinand von Mueller with the AANP demonstrates a considerable life time achievement in Australia's flora identification over an extensive area of the AANP that is recognised nationally and internationally. Albert Barton Paterson (Banjo) captured the Australian people’s imagination and stimulated a passion for the mountain country and the way of life associated with the mountains through his work, *The Man from Snowy River*. The poem was published first in 1894 in a collection of his ballads that became instantly popular with the Australian public and has retained that popularity into modern times. It has inspired two films, a TV series and a bush festival.

Eugen von Guerard was a significant nineteenth century artist producing a prolific record of Australian landscapes. His 1863 painting the *North-east view from the northern top of Mount Kosciusko* is regarded as one of his finest artistically and is in Australia's national collection.

Elyne Mitchell's writings and David Campbell's poems evoke the alpine environment and helped people appreciate their beauty. Mitchell's *Silver Brumby* books

have a large following in Australia and overseas.

The AANP has outstanding heritage value to the nation under criterion (h) for special association with the life and works Baron Ferdinand von Mueller, Eugen von Guerard and Albert Barton Paterson (Banjo) Elyne Mitchell and David Campbell.

CRITERION (i) – ***The place has outstanding heritage value to the nation because of the place's importance as part of Aboriginal tradition.***

There is limited documented information about Aboriginal traditions associated with the AANP. Both Freslov et al. (2004) and Waters (2004) have noted that traditional owners have been extremely reluctant to record oral histories or document traditional knowledge associated with the mountains, due in large part to current native title processes that are underway.

Many Aboriginal people see the AANP as a living landscape inscribed with travelling routes and pathways, dreaming trails, burials, physical sites, spiritual, ceremonial and story places, camps and meeting places, named places, massacre sites, food, medicine and raw material collection localities, men's and women's sites, recreational places, places where people lived and worked, missions, stories of movement between the mountains and the sea, views of the mountains and ancestors country (Goulding 2002). Specific localities in the AANP also have particular importance to individuals. However, this is similar to the relationships that all Aboriginal people hold to their traditional country, the place where they come from and to which they are connected through birth, spirit and their ancestors. In this regard, **there is insufficient evidence to show that the AANP is of outstanding heritage value to the nation because of its importance as part of Aboriginal tradition.**

History:

Landform History

Between 132 and 95 million years ago, pyroclastic volcanism may have been related to the onset of continental extension in eastern Australia. Uplift of the Eastern Highlands themselves is associated with the separation from Australia of the Lord Howe Rise and the opening of the Tasman Sea, beginning about 95 million years ago in the Late Mesozoic Era. Sea floor spreading terminated in the Tasman Sea at about 54 million years ago during the early Cenozoic Era, but continued in the Southern Ocean as Australia continued to drift northward relative to Antarctica. Episodes of upwelling of the mantle intruded granite into the crust. This metamorphosed the marine and alluvial sedimentary rocks of the High Plains into schist and gneiss. Uplift and erosion eventually produced granite massifs like Kosciuszko, Baw Baw and Mount Buffalo.

Uplift along the eastern and south-eastern margin of Australia continued into the Cenozoic. Volcanism between 70 million and about 5,000 years ago formed chains of volcanoes and volcaniclastic sediment along the length of the highlands. In much of south-eastern Australia, regional tilting and the development of disconformities within the Bass Strait basins, fault reactivation and localised uplift in the Strzelecki Ranges, Mount Lofty Ranges and Flinders Ranges, as well as the later 'Kosciuszko Uplift' of the reactivated Eastern Highlands, continues to the present day (Betts et al. 2002; McGowran et al. 2004).

During the Quaternary Period (the last 2.6 million years), global environments were subject to up to twenty severe glacial episodes. The highest parts of the AANP experienced two glacial periods during the latest Quaternary (in the last 100,000 years). The earlier sequence, before about 60,000 years ago, is known as the Snowy River Advance or the Early Kosciuszko Glaciation. The glacier sequence of the later Headley Tarn Advance, between 35,000 and 15,000 years ago, became progressively less extensive and is termed the Late Kosciuszko Glaciation (Barrows et al. 2001; Barrows et al. 2002). During the Late Kosciuszko Glaciation, glaciers probably formed in a small area of 30-40 square kilometres around Mount Kosciuszko and more extensively in the Tasmanian highlands (Galloway 1989; Kiernan 1996; DEC 2006). These advances correlate with glacier advances in South America and New Zealand and are recorded in landscapes, sediments and features of the Kosciuszko Plateau.

Early Indigenous Occupation

The more recent biophysical character of the Alps has been determined by its long geological and climatic histories. Geological uplift, volcanism and glacial and fluvial erosion of the region have led to an open peneplain landscape in the north and central regions, glacial features in the higher altitudes, with an increasingly rugged and dissected environment to the south. The shape, orientation and altitude of the natural landscape of the Alps have strongly influenced the movement of people across the region.

The migrations of modern people around the world witnessed and moved with the glacial and interglacial cycles of the Quaternary, as sea levels, treelines and water tables rose and fell. During these climate cycles, Australian landscapes were increasingly subject to cold aridity or 'dust ages' rather than ice ages, as Australia drifted northward into drier climates (Bowler 1978; Bowler 1982). The Alps, in contrast to arid zone expansion in much of continental Pleistocene Australia (1,800,000 to 12,000 years ago), provided important biological refugia during the arid phases of the late Pleistocene, as their glaciers and melting snow sheets provided spring and summer run-off to parched lowlands (Bowler 1978; Bowler 1982).

During the latest Quaternary at the height of the Last Glacial Maximum (LGM), approximately 20,000 years ago, small areas within the Snowy Mountains were glaciated, and periglacial conditions extended down to at least 1,000 metres above sea level along the Great Dividing Range. Evidence from the New Guinea II rock shelter in the Snowy River National Park shows the earliest scientific evidence for Aboriginal occupation on the fringes of the AANP during this time.

Excavations of three rock shelters - New Guinea II (Snowy River) and Cloggs Cave (Buchan River) in Victoria, and at Birrigai rock shelter (Tidbinbilla Nature Reserve) in the Australian Capital Territory – show a consistent pattern of small numbers of stone artefacts in occupation levels dated to the late Pleistocene and early Holocene, approximately 15,000 years ago (Ossa et al. 1995). Beginning around 12,000 years ago the present alpine plant communities most likely colonised the higher altitudes in response to increasing temperature and precipitation following the LGM.

About 5,000 years ago an increase in human occupation and use of the Alps began (Rosenfeld and Winston-Gregson 1983; Flood 1987; Kamminga et al. 1989; ISC 2004; Freslov et al. 2004; Freslov et al. 2004; J Tunn pers. comm. October 2005). This was a period of cultural change in Australia, marked by new technologies such as the small tool tradition. The archaeological evidence shows that at this time Aboriginal people moved throughout the region, from lower plains and valleys through to the alpine highlands.

Larger open occupation sites are generally located at lower altitudes within sub-alpine or montane environments, in sheltered areas associated with more diverse resources. In Victoria major open sites containing 4,000 artefacts and 18,000 artefacts have been located at Horsehair Plains (1,570m - 1,300 metres) (Freslov 2004) and at Dinner Plain (1,250 metres) at least two artefact scatters estimated to contain more than 100,000 artefacts have been identified (Freslov 2004). A high density of discrete sites has been recorded at Little Thredbo Valley in New South Wales (1,100-1,200 metres), which Kamminga et al. (1989) interpreted as representing repeated visits by small groups of people over a long time period.

Open sites in higher altitude areas such as the Mount Buffalo plateau, Bogong High Plains and Perisher Gap (1830 metres) are generally sparse of artefacts, consisting of small isolated finds or low density artefact scatters, as well as some edge ground axes (Freslov 2004; Flood 1987). Sites in these alpine and sub-alpine areas generally occur on summit ridges, broad highland plains or spur ridges, often associated with gneiss outcrops, snow gums and water. In some cases multiple small sites have been found clustered around rocky outcrops which might have supported Bogong moth populations (Freslov 2004).

The most intense occupation appears to be associated with major lines of movement through the highlands, for example along major river valleys and ridge lines, with large, denser sites occurring along relatively easy routes through the mountains; and small, sparse sites located on harder, less used routes (Freslov et al. 2004; ISC 2004). It is likely that resource exploitation and settlement patterns were complex and wide ranging in response to a risky, less predictable environment (Freslov et al. 2004).

Ethnohistorical records describe the annual movement of Aboriginal people into the high country prior to or during the summer months for large inter-tribal gatherings associated with the collection of Bogong moths (Flood 1980; Waters 2004; Goulding 2002). Historical references specifically refer to moth collecting in the high country of Kosciuszko National Park, in particular Bogong Mountain and the Townsend-Abbott Range; in the Brindabella Range; and the Victorian high plains, with specific reference to a mountain at Omeo (Bennett 1834; Scott 1869; Helms 1895; Jardine 1901; Eyre 1859; Gale 1927; Freslov et al. 2004; Flood 1980). The different locations mentioned in the various ethnohistorical records suggest that the moths would probably have been exploited wherever they aestivated in the Alps (Flood 1980).

Local groups such as the Jaimathang of Omeo, Djilamatang of the Upper Murray, and the Minjambuta of Mount Buffalo were joined by clans travelling long distances to attend these gatherings, which appear to have been highly organised (Freslov et al. 2004 citing Robinson's journal, 15/6/1844; Flood 1980). Coastal tribes might also have travelled into the mountains to join these gatherings (Payten 1949; Dawson nd). People met at the foot of the Alps in early summer for ceremonies before moving into the mountains to collect Bogong moths and use other seasonally abundant resources. The daisy yam, for example, was an important resource in alpine and sub-alpine zones, and Aboriginal people with yam digging sticks were frequently observed in the uplands in the nineteenth century (Freslov et al. 2004) maintaining social and political links between tribal groups as people came together for ceremonies, corroborees and intertribal battles (Young et al. 2000; Flood 1980).

Alpine plants were an important resource to Aboriginal people for food, medicine, tools, clothing, decoration, and ceremonial use (DECC 2006). The grass-tree (*Xanthorrhoea australis*) was used for kindling for fires and fire-stick farming. Vegetable food was a staple especially the tuber and daisy yam because of the availability throughout all seasons. Other important vegetables include: bulrush roots; orchid tubers, the starchy pith of tree-fern trunks, young shoots of grass-trees, and varieties of seeds and fruits. Seeds and seasonal fruits and berries were collected during the summer and autumn months while the honey from native flowers such as the bottlebrush and other native flowers provided sweet nectar (Flood 1996).

Pastoralism and Mining

In the early 1820s early explorers and settlers moved into the Snowy Mountains well before the colonial administration took steps to promote the spread of the colony (Higgins 1992; Hayes 1999). Explorers such as Hume and Hovell (1824) and John Lhotsky (from 1834) made early observations of Aboriginal people's presence in the Alps: the smoke of Aboriginal camp fires seen at a distance, scarred trees, river dams and the people themselves (Young 2005; Freslov et al. 2004). Many accounts of Aboriginal people, their cultural practices, movements and daily lives in the Alps were recorded during the 1800s, and surveyors working in the district recorded many Aboriginal place names (Young 2005; Boot 2004; Freslov, 2004; Wesson 2000).

Some traditional routes and pathways through the high country were used by Aboriginal people guiding early settlers and explorers into the high country (Gardner 1991; Wesson 1994). For example, it is believed that the cattlemen Brown and Wells found the Bogong high plains and the route up the ridge north of the Bundarah River with the assistance of local Aborigines (Gardner 1991). The pathways of human movement through the Alps, namely the tracks, roads and routes used by the early explorers and cattlemen were influenced by the existing Aboriginal pathways, the climate, access to water and the topography of the Great Dividing Range itself. These pathways helped navigate the scientists, gold prospectors and recreation seekers through the Alps as well.

The arrival of Europeans in the broader region led to many changes in Aboriginal people's lives, restricting access to resources and movement across the landscape, and disturbing traditional social and cultural practices. Clashes occurred between Aborigines and settlers with deaths on both sides, for example at Bungil and Thologolong on the Murray, and on the northern side of the Murray River at Dora Dora (to the east of Albury) (Freslov 2004 citing Philipp 1987). Regionally, the 'Faithfull Massacre' occurred in 1838 near present-day Benalla, where a number of Aboriginal people attacked and killed seven Europeans and their stock in a party of overlanders led by George Faithfull. A large number of Aboriginal people were killed in retaliation (Freslov 2004).

Most early settlers that came to Australia were from the United Kingdom and this applies to the first pastoralists into the Alps. The rapid uptake of land in the 1830s meant settlers and stockmen in eastern Australia were expanding into the Snowy Mountains looking for grazing country. Pastoral settlement of the Victorian high country started with the early journeys of exploration by George MacKillop who travelled along the Snowy River and through to Omeo in 1835. Stock from permanent pastoral establishments such as Currango was moved from the high country for the winter months keeping only a small number of breeding-stock. In recent years four-wheel drive vehicles have taken the role of the pack horse but for many years horses carried horse feed, tucker, saddles, shoeing gear, tools, camp ovens, dog food, dogs and candles. Stock yards, often portable post structures, were used in the musters.

Drought at the end of the 1830s created significant interest in the well-watered mountain environment with the high pastures offering landholders good grazing during the summer months when feed was scarce on their home stations. This led to transhumant grazing, a practice unique in mainland Australia – that of bringing cattle and sheep up to graze on the high country pastures during the summer months ameliorating the ever present threat of drought in the low lands and allowing home pastures time to recover (Hayes 1999).

The colonial administration instituted a system of grazing licences in 1836 to control grazing, and licenses were issued on an annual basis for a fee of £10. Whilst they afforded no title in land they could be renewed and there was no limit to area or stocking rate. By 1855 taking cattle up to the high pastures of the Alps had become an established practice from both sides of the Great Divide, giving rise to some varied forms of land tenure in areas that became set aside for national parks, and became the source of major conflict in land and resource use (King 1959).

Most of the stock routes across region are associated with transhumant grazing. An important stock route was the Monaro route through to East Gippsland following the Snowy River. Large numbers of cattle, sometimes numbering in the thousands, were taken along this route when the ports of Gippsland handled large livestock export volumes (Grinbergs 1993a). After the parks became established many stock routes were renamed and in some cases modified and developed as fire trails but still used for moving stock.

By the mid 1800s, Aboriginal people had become an important part of the region’s pastoral industry, working as stockmen, station hands, house servants, and 'black trackers'. Many oral histories recollect stories of mustering brumbies from the Alps to be transported to the south coast then shipped to be used as cavalry horses;

sometimes Aboriginal people would also trade horses for food (Wesson 1994).

The early explorers, pastoralists, scientists and artists, who experienced the landscape for its agricultural uses, scientific information and scenic topography, were predominantly immigrants from Europe, who brought with them their traditional use practices, scientific and mountain landscape experience and appreciation. Many early explorers, scientists, and artists associated with the Alps came from other countries in Europe: Lhotsky and Strzelecki from Poland, Mueller, Guérard, and Neumayer from Germany, and Lendenfeld from Austria. In 1840 Mount Kosciuszko was scaled by Paul Edmond de Strzelecki and named by him after his Polish countryman, Tadeusz Kosciuszko. An insightful account of Strzelecki's ascent is provided by Clews (1973).

The two significant waves of European migration into Australia that impacted on the cultural diversity and the cultural life in the Alps were the Gold Rush of the mid-nineteenth to early-twentieth century and after World War II during the development of the two major hydro-electric schemes: the KHES in Victoria and the SMHES in New South Wales.

From about the mid 1850s, gold miners entered the region and followed the established tracks set by earlier travellers to explore the valleys, foothills and rivers surrounding the Alps. From 1851 to the 1920s almost 70 fields, including some tin and copper mines, were mined in the Alps and adjacent Historic Areas in Victoria (LRGM 2002).

The gold rushes in the Alps brought miners from all over Australia and the world, including many European countries, Britain, America and China. The influx of hopeful miners from around the world changed the demography of the region and many miners stayed. Resentment and inter-racial hostility plagued the goldfields and the first real violence took place at the Buckland field in 1857, known as the 'Buckland Riots'.

Many mining fields within the region had relatively low yields and the main interest centred on Kiandra, which experienced a brief gold rush commencing in 1859 after the Pollock brothers, who were graziers, discovered gold. By 1860 there were 10,000 people on the goldfield but the rush was short-lived, ending in 1861 (LRGM 2002). By the 1920s mining had mostly ceased in the region and the population soon declined, reflecting the broader economic situation impacted by a shortage of labour and materials after World War I. There was sporadic activity later when the gold price rose, and in 1941 there was a rush at the Red Robin mine near Mount Hotham in Victoria, which is still being mined (LRGM 2002).

Mountain ash and alpine ash were harvested for use in the mining, hydro electricity and recreation industries. Most mills were small family businesses located in the sub-alpine regions with harvesting sourcing timber from the sub-alpine and montane zones. Kiandra had a waterwheel driven mill in 1885. With the establishment of forest commissions, forest management measures were introduced along with arboreta and plantations. The timber harvesting industry in the current AANP area was small compared to that undertaken at lower elevations. *Eucalyptus* oil distilling was also undertaken in the montane zone (RFA 1999; Sullivan and Lennon 2004).

In the latter half of the nineteenth century, the Victorian Board for the Protection of Aborigines and the New South Wales Aborigines Protection Board gradually moved many Aboriginal people from the Alps onto missions and reserves outside the AANP, such as Lake Tyers and Coranderrk in Victoria from 1861, and Delegate and Brungle in New South Wales from the 1880s. Despite this, some Aboriginal people maintained connections with the mountains as a place for work, hunting, collecting food and medicines, and as a place of spirituality for reconnecting with ancestors and country.

Recreation and Water Harvesting

The earliest tourism activity developed in the mid-1850s, with touring groups visiting the Mount Buffalo plateau from 1856. By the 1890s there was a hospice and a hotel on the plateau offering accommodation to visitors. In New South Wales snow sports were also gaining popularity, with the earliest recorded 'snow-shoe and skiing sports' reported at the goldfields town of Kiandra in 1861.

Governments began to recognise the tourism potential for the Alps and funded improved access and infrastructure such as roads and rail networks, as well as the development of the Yarrangobilly Caves House in 1909, the Kosciusko Hotel in 1909, the Mount Buffalo Chalet in 1910, and the Chalet at Charlottes Pass in 1920. After World War I, many recreational activities were fostered as part of the healthy body movement, including bushwalking, skiing, horse riding, cycling, tennis, golf and ice skating on the Kosciusko Hotel's artificial lake (Gare 1992).

The emergence of skiing as a significant recreational activity started in the 1920s in the Alps. The Ski Club of Australia was formed in 1920, followed by the Ski Club of Victoria in 1924 and many other ski clubs shortly after. By the 1930s facilities for winter sports were well established at Mount Buffalo and the slopes of Mount Hotham, attracting more adventurous skiers. In New South Wales, the Kosciusko State Park Trust began investment into resort development, including an appropriate architectural idiom up until 1967 (Freeman 1998).

The demand for clean water to supply Australia's growing urban and regional centres was the key driving force behind the protection of many of the catchments in the Alps. The Upper Cotter catchment near Canberra (now within the Namadgi National Park) was reserved in 1909 to ensure domestic water supply for the capital. Protection of mountainous country in both Victoria and New South Wales came about as a result of concerns about the catchment of the Hume Reservoir in the 1930s, while some began to express concern at the potential damage to the environment by sheep and cattle grazing practices as well as burning, which was thought to be causing large-scale erosion. In 1938, the New South Wales Government declared the Upper Snowy River and its tributaries an area of erosion hazard.

During the early twentieth century attention was also increasingly focussed on the opportunity to harvest water sourced from the Alps for power generation. The Victorian State Electricity Commission proposed a major hydro-electric scheme for the Kiewa River and construction commenced in the late 1930s.

The idea for a hydro-electric scheme in the Snowy Mountains formed part of post-war reconstruction planning during World War II. The Federal government saw the development of the scheme as part of a major tool for post-war employment. The SMHES began construction in 1949 and employed migrants and about 60,000 European Displaced Persons from World War II. Migrants formed 70 per cent of all workers from 30 countries, especially from eastern and southern Europe. Similarly the KHES employed around 3,500 workers in 1951, many of whom were migrants. Both schemes took longer to complete than anticipated: the KHES was finished in 1961 and the SMHES in1974.

These large projects in sparsely settled areas required their own infrastructure and, as a result, new towns were built to service the schemes and their employees: Mount Beauty in Victoria for the KHES; and Khancoban, Talbingo and Cabramurra in New South Wales for the SMHES. However, the construction of water storages for both schemes in low-lying areas, such as at the town of Old Adaminaby in New South Wales, displaced the local populations from their homes and land with much grief (McHugh 1999).

The construction SMHES was pivotal in opening up the Kosciusko State Park through construction of road and villages. Commercial enterprises began in the post war years at the resorts in the development and operation of the ski tows. The early phase of resort development re-used former SMHES workers' accommodation as

ski lodges (Freeman 1998). Migrant workers on the hydro-electric schemes from continental Europe often stayed on in the region and participated in winter recreation.

The alpine resort villages commenced development in the 1950s and by 1957 there were a number of ski clubs operating. Tony Sponar, a Czechoslovakian hydrographer who worked for the SMHES, along with Charles Anton, Eric Nicholls and Geoffrey Hughes, promoted the development of Thredbo as a ski resort. Thredbo resort developed from its original concept and lease in 1955 into the most developed alpine resort in Australia. From 1959 large operators took over the commercial enterprises and expanded them (Freeman 1998). Resort villages also developed within the parks; Perisher, Smiggen Holes, Guthega, Selwyn and Mount Franklin. Larger resorts and resort towns beyond the AANP boundary developed to service ski recreation. The development of infrastructure to support snow skiing in the Australian ski fields saw Australia producing skiing champions such the paralympian Michael Milton, and Kirstie Marshall, Australia's first world champion skier. Zali Stegall, winning the Bronze medal for Alpine Skiing in 1998 at the Winter Olympics held in Nagano (AIS 2007).

Scientific Research

Scientific research in the AANP encompasses three key stages (Macdonald and Haiblen 2001a) each of which reflects the wider scientific interests of the relevant period. The first stage commenced in the early 1800s and comprises early exploratory research undertaken by several pioneering individuals, who significantly contributed to the documentation of the region's geography, geology and botany. The second stage from the end of the 1800s and early 1900s shows a general branching out of scientific endeavour into more specific disciplines such as meteorology, geomorphology, ecology and astronomy. The final stage of research builds on previous efforts, with an increasing focus on conservation sciences from the1970s.

Scientific research in the AANP from the early 1800s was typical of the era with increasing interest in the natural sciences. Vast collections were made around the world and housed in national museums. Key researchers during this period include geologists Dr John Lhotsky in 1834 and Paul Edmund de Strzelecki who undertook investigation and mapping in the Alps in 1840, and Thomas Townsend, the New South Wales Government Surveyor, who determined the source of the Murray River in 1846-47, delineating the eventual border between the colonies of New South Wales and Victoria when Victoria became self-governing in 1851.

Between 1853 and 1861, Baron Ferdinand von Mueller, Victorian government botanist for Victoria, greatly advanced botanical research in the Alps region. He undertook four botanical surveys following tracks made by pastoralists and gold-prospecting surveyors, but also explored country new to Europeans, finally climbing Mount Baw Baw in 1861. He made extensive collections of plants which were sent to Kew Herbarium in London and formed major part of George Bentham's, *Flora Australiensis* (a seven-volume flora of Australia published between 1863-1878) (Costin et al. 1979). Mueller discovered many new species of sub-alpine and alpine flora for western science (Costin et al. 1979; Truscott et al 2006).

In 1863 Alfred William Howitt, explorer, ethnographer and natural scientist, was appointed police magistrate and warden of the Omeo goldfields. During this period he traveled long distances on horseback throughout Victoria, studying and documenting the geology and botany of the landscape. He wrote numerous papers on Aboriginal societies and ethnographic descriptions, including studies of communities in south-east Australia associated with the Alps (ADB 2006).

From the 1870s to the 1880s James Stirling, the Victorian district surveyor at Omeo recorded the geography, geology, botany and meteorology of the Alps. From the 1890s Joseph Maiden, New South Wales government botanist, undertook botanical research in the Kosciuszko region, while in 1897, Richard Helms, government geologist, undertook mining surveys. They documented the degraded catchments from grazing and regular burning (Good 1992).

The second phase of research is typified by sustained research into many scientific disciplines that contributed to a growing understanding of the area. Towards the end of the nineteenth century, researchers began to pursue more specific inquiries. The English-born meteorologist Clement Wragge established a weather station in 1897 on Mount Kosciuszko to compare temperature and air pressure at sea level and at altitude, reflecting earlier work he had conducted on Scotland's Ben Nevis. During this period there was a growing international interest among natural scientists about the possible glaciation of alpine Australia which led to conflicting theories held until the 1960s after which it became increasingly convincing that glaciation had occurred. Glaciation research sites, including the Cooleman Plain karst area, are closely associated with the Sydney-based geologist Tannatt William Edgeworth David (Macdonald and Haiblen 2001a). In 1901, when absolute dating was not scientifically possible, Edgeworth David, Richard Helms and Edward Pitman estimated the dates of glacial features at Railway Embankment, New South Wales, now seen as 'one of the finest attempts at an absolute age anywhere in the world' (Griffiths and Robin 1994, 40).

The 21 arboreta in the Brindabella Range in the Australian Capital Territory were established in the late 1920s at differing altitudes and aspects for tree conservation, taxonomic research and to monitor the ecology of flora. The Australian Capital Territory 's oldest and largest arboretum was located on at Blundell's Flat in Uriarra Forest with the first plantings began in 1929 (TAMS 2006). The Bendora Arboretum is the only remaining example of the original 21 arboreta that were destroyed by the 2003 bushfires.

Key scientific figures drove the need for a clean water supply and soil conservation across the Alps. In the 1940s Maisie Fawcett (Carr), when with the newly established Soil Conservation Board of Victoria, and later with John Turner of Melbourne University, established and regularly monitored a series of grazing exclusion plots at Rocky Valley and Pretty Valley near Falls Creek in Victoria. These grazing exclosures were established as long-term vegetation monitoring plots and have been carefully maintained in the following decades and the vegetation remeasured regularly. The plots provided important information on the impacts of grazing on the long-term regeneration of alpine grasslands. Fauna studies also became more targeted from the 1940s, with, for example, research into invertebrates describing 40 different insect families found above 1,700 metres in the Snowy Mountains.

Since the 1950s Alec Costin has undertaken extensive research into alpine vegetation community dynamics and soil science. Costin documented the destruction of alpine and sub-alpine moss beds (*Sphagnum*) and other alpine plant communities in Victoria and New South Wales from grazing, and undertook detailed research into alpine soil. Hydrological research undertaken by Costin and Dane Wimbush in the early 1960s focused on hundreds of stream gauging stations that were installed by water and power authorities, providing data related on surface and snow run-off, and impacts from erosion and fire, fire predictors and post-fire recovery, and infrastructure impacts (Costin and Wimbush 1961).

Other research of note undertaken in the 1960s and 1970s related to geomorphological processes, with key research sites located in the Kosciuszko National Park and in Victoria at the Buffalo Plateau and Mount Howitt. The Cooleman Plain Karst area was first visited in 1860 by the geologist, Reverend William Branwhite Clarke. Dr Joseph (Joe) Jennings, a renowned geomorphologist, commenced his research at the karst sites in the 1960s. Research at Cooleman and Yarrangobilly karst sites have illustrated a facet of the complex interrelationship of karst and cold climate geomorphology, defined periglacial dates for the region and improved knowledge of the climate and vegetation variation of this alpine area, (Griffiths and Robin 1994; ISC 2004; Macdonald and Haiblen 2001a).

A joint agreement between Australia and the United States of America in 1960 resulted in three space tracking stations being built in the Australian Capital Territory as part of a wider international network with National Aeronautical and Space Administration (NASA). Honeysuckle Creek provided essential support to the Apollo 11 mission in August 1969, relaying Neil Armstrong's first words upon stepping on the moon '*That's one small step for a man, and one giant leap for mankind*' (Fabricius 1995, 13-4).

Results from grazing exclosures after several decades of vegetation monitoring confirmed the need to return environments to their pre-grazing state. Tighter controls over grazing occurred over the following decades from the 1940s in all alpine and sub-alpine areas to manage soil erosion and flora damage in all the alpine areas, eventually leading to the exclusion of grazing by 1961 in Namadgi and by 1972 in Kosciuszko. Grazing was removed from additional areas in Victoria in the 1990s (Macdonald and Haiblen 2001) and more recently from the Alpine National Park from 2005.

The Piccadilly Fire Ecology Plots in the Australian Capital Territory were established in 1973 by Phil Cheney of the Commonwealth Scientific and Industrial Research Organisation (CSIRO), to investigate effects of fire on sub-alpine vegetation. Together with a sister study in the Top End of the Northern Territory the plots are the longest running fire ecology experiments in Australia, and possibly the world (Macdonald and Haiblen 2001a). Results from such fire plots and experiments indicate the possibility that fire was rare before European settlement, suggesting that fire was essentially absent from alpine and sub-alpine wetlands for 10,000 years. In 2000 further research at the Piccadilly Fire Ecology Plots and elsewhere in the Brindabella Range showed that the vast majority of low intensity fires leave fire scars on snow gums, concluding there is no evidence of Aboriginal burning in that area (Macdonald and Haiblen 2001a, 41-3).

Bird banding commenced in the Brindabella Range in the 1960s, making it the longest continuous bird banding site in Australia. The area has yielded much information on avian migration patterns. Comprehensive research into alpine flora and fauna in the latter part of the twentieth century has yielded information about ecological processes as a result of changing climates. Research of note has includes population studies on the endemic mountain pygmy possum and the corroboree frog, which continue today.

Many of the early explorers, surveyors and scientists have their names remembered in features in the alpine landscape: Mount Townsend, Mount Clarke, Mueller's Peak, Mount Howitt, Mount Stirling, Wragges Creek, Helm's Moraine, David Moraine, Spencers Creek, and Hedley Tarn below Blue Lake.

Conservation

Myles Dunphy was an intrepid bushwalker and important figure in the early conservation movement, with close association with the Blue Mountains surrounding Sydney. In 1933 Dunphy called for volunteers to establish a National Parks and Primitive Areas Council in New South Wales, and in 1935 one of the areas identified was the Snowy-Indi Primitive Area. The proposed reserve of 400,000 hectares included land on both sides of the New South Wales/Victorian border.

In the 1970s there was heightened public consciousness about the impacts of human activity on the natural environment. This concern contributed to the declaration of a number of national parks across the AANP. These reserves were declared after much historical research and conservation efforts; many were set aside to conserve water catchments. The declaration dates of these national parks and reserves span almost a century. Mount Buffalo National Park was declared in 1898 and the National Chase Snowy Mountains was declared in 1906 and later extended to 10,518 hectares in 1908, before the area was formally gazetted as Kosciusko State Park in 1944 covering 528,646 hectares (Mosley 1991). Tidbinbilla Nature Reserve was established in 1962, Snowy River National Park and Baw Baw National Park in 1979, Scabby Range in 1982, Namadgi National Park in 1984, Bimberi Nature Reserve in 1985, Avon Wilderness Park in 1987 and in 1989 the Cobberas, Tingaringy, Wonanngatta-Moroka and Bogong national parks were extended and combined to create the Alpine National Park (Cameron-Smith 1999).

In 1986 the Federal, Australian Capital Territory, New South Wales and Victorian governments agreed to a cooperative management program for the AANP. A Memorandum of Understanding (MOU) was signed to protect the landscape, water catchments, plants, animals and cultural heritage of the Australian Alps as a whole ecosystem while providing opportunities for public appreciation and sustainable enjoyment. This MoU spans more than 20 years and is acknowledged internationally as an example of best practice cross-jurisdictional and trans-border protected area management.

Aesthetic Appreciation

The first written works on the scenic beauty of the Alps were written by many of the explorers and early settlers in the early nineteenth century. Hume and Hovell wrote about their aesthetic appreciation of the region in 1824 as did Strzelecki in 1845, Alfred Howitt in 1866, Joseph Maiden in 1898, and the W B Clarke in 1860 (Gare 1992). It is possible that popular verse, as well as the writings of the explorers, allowed these 'invented landscapes' to be possessed (Lennon 1992, 151), at least regarded as 'icons' whether known and experienced or not (Context 2003, 10).

The painters Eugene von Guérard and Nicholas Chevalier accompanied Howitt to the Alps in 1858. Guérard's paintings View of the snowy bluff on the Wonnangatta River 1864, *North East View from the Northern Top of Mount Kosciuszko*, 1864 and *Mount Kosciuszko seen from the Victorian border (Mount Hope Ranges)* are regarded as classic Australian masterpieces. Chevalier's 1864 painting *The Buffalo Ranges, Victoria* won the Trustees prize that year on the opening of the National Gallery of Victoria (Truscott et al. 2006). These paintings were reproduced in Australian art history from the 1960s and since in post-card reproductions. More recent critical analysis of art recognises again these influences of European ideas of travel, nature and art on the Australian landscape (Bonyhady 1985; Horne 2005). Later era artists continued to paint the Alps landscape such as the post-modern artist Imant Tillers who painted *Mount Analogue* painted in 1985.

A popular and potent image of the Alps is evoked by *The Man from Snowy River*, which has entered Australian consciousness as an image of national identity reinforcing the notion of the larrikin bushman. The ballad by Andrew Barton 'Banjo' Paterson, written in 1895, is now central to Australian folklore, resulting in two films, a television series, a replica 'mountain hut' that is more widely known than many genuine huts, and festivals based on the myth of 'the Man', included in the opening ceremony of the 2000 Sydney Olympics, and 'the Man's' appearance on the Australian $10 note (Truscott 2003; Truscott et al. 2006).

Noted poets and writers such as Paterson, Marie Pitt, Albert Bartlett, Sidney Jephcott, Henry Kingsley, Rolf Boldrewood, Edward Harrington, Barcroft Boake, Henry Kendall, David Campbell and Sidney Porteus have referred to the mountain landscapes. Campbell's poems on the alps are included in the *Speak with the Sun* collection*, Winter Stock Route*, *The Miracle of Mullion Hill*, *The End of Exploring, Windy gap, Snow-Gums, Ariel, The High Plains, The Monaro.* A number of films use the landscape as settings such as *The Plains of Heaven* (1982), *The Far Country* (1987), *The Man from Snowy River* (1982), *Snow: the Movie* (1982), *Cool Change* (1986) as well as, *The Man from Snowy River II* (1988), and *The Silver Brumby* (1993) (Crocker 2005). The mountains and mountain way of life have inspired folk music and the Numeralla and Narial folk festivals are associated with the Alps.

Nicholas Caire photographed in the high country from the 1870s and photographs of the Alps were increasingly seen in magazines. These magazines brought remote Australia into everyday homes and were more widely accessible than paintings in galleries. After World War I, poster images of the Alps became prevalent. Mountain destinations and alpine recreation, notably skiing, walking, fishing and horse-riding were shown along with scenic mountain vistas, as well as flora and fauna in the *Take a Kodak* campaign. The Mount Buffalo Chalet was advertised in a huge banner across the front of Melbourne's Flinders Street Station circa 1920, and in posters such as *Visit the Victorian Alps* showing skiers at Mount Buffalo, or *Summer is always Spring at Mt Buffalo National Park Victoria* (Truscott et al. 2006).

Many books were written recounting adventurous experiences in the Alps, such as Robert Croll's *The Open Road in Victoria* (1928) and Elyne Mitchell's *Australia's Alps* (1942). Alpine themes were further popularised from 1958 in Mitchell's *Silver Brumby* series of books. Romantic images of alpine scenery are perpetuated today by photographers such as Harry Nankin and David Tatnall. In comparing the Alps to Australia's World Heritage places, Kirkpatrick (1994, 37) asserts that ‘the

aesthetic aspect of the Australian Alps that stands out…is the outstanding wildflower display in the alpine environment'.

Community Associations
It is the social importance of a place or landscape that is valued by the community. Social values are expressed and conserved through tangible and intangible elements of a place or landscape. Community heritage studies considering the social values of the Alps were conducted as part of the comprehensive regional assessments for the Regional Forest Agreements in North East Victoria, Gippsland, East Gippsland and the Central Highlands (Johnston and Lewis 1993a; Johnston and Lewis 1993b). The results show a high degree of correlation between social and aesthetic values, and between social and historic values

Aboriginal and other groups express an important attachment to the Alps giving the region significant social value. This is recognised in the plans of management for the various national parks within the AANP, particularly the Alpine National Park, Mount Buffalo National Park. The Kosciuszko National Park Plan of Management explicitly acknowledges the cultural heritage of Aboriginal and non-Aboriginal people and the cultural heritage management partnerships with communities and families.

Many Aboriginal people from the Alps now live throughout most of Victoria, the New South Wales south coast, Canberra and the Snowy Mountains region and beyond. The spiritual attachments, surviving traditional knowledge, and family stories and memories demonstrate the ongoing cultural connection that these people have with the Alps. Places associated with the pastoral and mining history are of historic and social significance to local Aboriginal people because of their involvement within these industries (DECC 2006).

The Australian polish community (the Cultural Foundation of Puls Polonii) have a strong association with Mount Kosciuszko, named after the polish hero General Tadeuz Kosciuszko (Lang 2008). Strzelecki wrote 'amongst a free people, who appreciate freedom and its votaries, I could not refrain from giving it the name of Mount Kosciuszko' (Andrews 1991, 24). The association is celebrated by an annual festival in Cooma and Jindabyne that includes poetry and singing about Kosciuszko, as well as a community pilgrimage to the summit along with traditional dancing and music on the summit (Lang 2008).

Other communities holding associations with the Alps include groups based on historical economic activity (such as the Mountain Cattlemen Association Victoria) to caretaker and friends' groups for individual huts, homesteads and mining fields. Two major hut caretaker groups are the Kosciuszko Huts Association formed in 1970 and the Victorian High Country Huts Association formed in 2003. The heritage significance of huts has been the subject of several detailed studies in New South Wales, Victoria and the Australian Capital Territory (GBA 1996; 2005). In Namadgi National Park, a number of huts and homesteads have been included in the Australian Capital Territory Heritage Register. A comprehensive cultural heritage assessment of all huts in Kosciuszko National Park was commissioned by the NPWS following the 2003 fires (GML 2005). The social values assessment was conducted to a considerable extent according to the method established for the RFA processes.

Others groups such as field naturalist clubs focus on caring for the natural environment. Recreational user groups and clubs such as bushwalking, skiing, horse riding, fishing, hunting, 4-wheel driving and mountain biking, are permitted to enjoy these activities in the Alps according to zoning and permit arrangements.

Each of the major parks comprising the Australian Alps has a history of community esteem, and often community-based campaigns to protect these areas from perceived threats or changes in land use. The actions of the National Parks Association of New South Wales, the Victorian National Parks Association, the National Parks Association of the Australian Capital Territory and the Colong Foundation for Wilderness have driven the formation of the parks themselves, and the progressive withdrawal of grazing.

The associated community debate about the loss of important traditions provides a strong indicator of social values and connections to the AANP, as demonstrated by the intense sense of loss following the 1939 and 2003 bushfires.

Condition:
The AANP has been subject to a range of land uses and environmental conditions throughout history, all of which have had a degree of impact on its natural and cultural values. Subsequently, the AANP constitutes a mosaic of natural and cultural environments that span the full condition spectrum, from localities that have been degraded and are in poor condition through to localities that exhibit integrity and intactness. The bushfires in 2003 damaged and burnt an extensive proportion of the natural and cultural assets of the AANP, such as bogs and fens as well as many historic huts.

Today, the condition of natural and cultural National Heritage values is influenced by a range of land uses within the boundary, such as recreation activities in summer and winter seasons, feral species and extreme weather such as bushfires and floods, as well as by the broader incidence of global climate change (DEC 2006; AALC 2006b).

Condition statement as at May 2008.

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