Natural Values

Cultural Values

Economic Values

Social Values

Recreational Values

Part Three

Chapter 18
summary of significance of values

Introduction

When people describe why a place is important to them they usually draw from many attributes and their descriptions are non-specific. To most people, the significance of a place is a combination of many values — natural, cultural and derived values.

However, management needs explicit information about each value and its significance so that important values can be conserved, and management effort can be targeted and prioritised.

The values of Kosciuszko National Park are of two types: the core values of natural and cultural heritage, and the derived values (eg social, recreational, tourism and economic) that depend on these core values.

The primary task of the Independent Scientific Committee (ISC) has been to analyse the specific values of the park and to state why they are important.

Some values are geographically based and can be assigned to a particular area or place (eg the Lower Snowy River) or group of places (eg karst areas) in the park; others are less place-specific, and may refer to a value held by the whole park but not to a specific place within it (eg recreation opportunities, the experience of remoteness).

"The park's importance is the sum of all of the values of the park. All of these values are worthy of being conserved."

There are overlapping or layered values in any part of the Kosciuszko National Park and most places have elements of natural as well as cultural values. Many values are interrelated or interdependent (eg soils and flora), and some are composites of other values (eg ecosystem services). Multiple values may build richness in some places, but they may also create conflict because the existence of one value may degrade another.

Thus, defining the values of such a large area as the park is not simple. Nevertheless, the members of the ISC used consistent methodology as far as possible to define and describe the different types of value. When this approach was not possible, they used methods for description and analysis that were appropriate to their discipline.

A large amount of detailed knowledge was available for some values (eg a recent cultural heritage study formed the basis of the cultural heritage analysis). In other cases, there are still many knowledge gaps, or it was not necessary to provide great detail in order to express the significance of the values.

In the individual topic chapters, the ISC addresses each of the value areas requested by the New South Wales National Parks and Wildlife Service (NSW NPWS), providing detailed information and references. The scope of values and issues that have been addressed is not exhaustive; for example, the ISC identified small-scale issues such as the multiplicity of microclimates in the park, and large-scale issues such as climate change as deserving future review as individual topics. Also, this statement is a contemporary view and may change with time, as knowledge and perception of the park's values changes.

In evaluating the significance of the park's values, the advice from the individual topic authors has been summarised in hierarchical order of significance, and ranked as far as possible, from international at one end of the spectrum to local or park scale at the other. This does not mean that those values of local significance are not important.

Key point
The park's importance is the sum of all of the values of the park. All of these values are worthy of being conserved.

Statement of significance of Kosciuszko National Park's values

The following statement of significance is in six parts:

- international recognition;
- significance of the park in its regional setting;
- significance of the park as a protected area;
- internationally significant values of the par;k
- summary of significance related to the individual values and themes of the park; and
- expanded significance of the individual values and themes of the park.

The chapters on the individual values of the park provide detailed analysis.

International recognition

Two international environmental listings apply to Kosciuszko National Park: the whole park was listed in 1977 as a biosphere reserve under the United Nations Educational, Scientific and Cultural Organization (UNESCO) Man and the Biosphere Program, and part of the park (Blue Lake and its surrounding area) is a wetland of international importance listed under the Ramsar Convention.

The Australian Alps are recognised by the World Conservation Monitoring Centre (WCMC) as one of the 167 world centres of biodiversity; at 11%, endemism in the alps is as high or higher than other mountain areas around the world.

Significance of the park in its regional setting

Kosciuszko National Park forms the central segment of the Australian Alps bioregion that supports all the alpine endemic species found on the Australian mainland. The park forms about half of the area of the Australian Alpine National Parks system and is less fragmented than the dissected landforms of the alpine regions of Victoria. Because Kosciuszko National Park is large and contiguous with other natural areas, full life cycles and gene flow can continue in a regional context.

The park provides ecosystem services that are nationally valuable, including provision of clean water to southeastern Australia through the quality of the park's soils and catchment, and reduction in risk of climate change through large tracts of the park's forest sequestering carbon.

Significance of the park as a protected area

Very few large natural protected areas such as Kosciuszko National Park remain in temperate Australia, where the natural dynamics of ecological processes can still occur without significant human intervention, and where there are active policies to protect naturalness. Such areas are decreasing in number and area over time, and so are becoming more precious. Many of the park's other values depend on maintenance of the naturalness of the park setting; Kosciuszko National Park is a place where there can be prevention of the accumulating harmful effects of new and extended development such as light, air, ater, and noise pollution.

Kosciuszko National Park conserves, in its landforms, a largely intact intrinsic record of past change of soils and vegetation, and has a scientific record that has monitored change over five or more decades. Because of these features, the park can play a major international and national role in monitoring and measuring ecological changes, particularly those associated with climate change. If climate change occurs, the large size of the park, its range of ecosystems, and its links with other natural areas will give species and communities the chance to adapt to this new situation.

Kosciuszko National Park is a place where all people can find solitude and the opportunity for spiritual experience, and a sense of remoteness in the natural setting. In the park, people can maximise the value that they gain from their park experiences without harming the attributes of the park.

The park conserves and demonstrates the setting for the sequence of its past human life and habitation, and the park's cultural heritage significance lies in physical evidence as well as in stories and traditions associated with the park. Many cultural heritage themes have extant evidence in the park.

Internationally significant values of the park

The park has numerous values of international significance, most related to its natural heritage. They include:

- the suite of karst areas, particularly Cooleman and Yarrangobilly Karst;
- soils that are of outstanding scientific value as examples of some of the great soil groups, both individually (the alpine humus soils) and in association with each other; fossil soils and remnants of fossil soils of high scientific value and practical importance;
- alpine areas that are of international significance as a prime example in the world of mid-latitude alps (eg the vegetation contains at least 21 endemic species and 33 that are rare in a total of some 204 species of flowering plants);
- subalpine ecosystems that provide habitat for a number of rare animal species (eg mountain pygmy-possum in podocarpus heath and corroboree frog in sphagnum bogs);
- probably the most outstanding development of subalpine treeless flats and valleys in the world (internationally significant ecophysiological work has been undertaken on the tree lines);
- populations of thirteen vertebrate taxa that are listed as threatened or near threatened by the World Conservation Union (IUCN), including the endangered mountain pygmy-possum, which has the longest life span of all known small terrestrial mammals;
- natural fire regimes, which are partly a function of climate, that have created subalpine, montane and lowland landscapes of international significance covered with a catena of eucalypts; and
- a cultural heritage theme of science and conservation, with numerous places of outstanding international research value.

Significance related to individual values and themes of the park

Geology

The park's geological significance includes features such as the Ordovician to Lower Devonian rocks that form part of the Lachlan Fold Belt; the dissection resulting from the Tertiary uplift, which has produced spectacular scenery (notably the mile-high drop from the summits of the Main Range to the Geehi Valley); evidence of the great climatic changes in the Pleistocene that produced glacial features (eg cirques, terminal and lateral moraines, lakes, erratics and ice-scratched surfaces and periglacial features) and extensive periglacial evidence; and Holocene features of the park (sediments and peats) that have given valuable information on vegetation changes associated with post-glacial warming.

Soils

The park's significance for soils relates to the great soil groups represented, particularly alpine humus soils, and the ecological services provided by the soils.

Karst

The park's significance for karst relates to values ranging from hydrological and geomorphological, to habitat for endangered species, and to cultural heritage of the past use of these sites.

Aquatic ecosystems

The park's significance for aquatic ecosystems includes four small natural lakes (Albina, Blue, Club and Cootapatamba) that are the only lakes on the Australian mainland that were formed by glacial action. These are also the highest lakes (1890–2070 m) in Australia. There are significant lakes and subterranean water bodies associated with karst. Large rivers above altitudes of 900 m are considered an endangered habitat in the Snowy Mountains region. Undiverted, 'wild' river sections upstream of dams are the Upper Murray River to Murray Gates, Thredbo River down to the village, Goodradigbee River to Brindabellla Station and Yarrangobilly River.

Flora

The park's significance for flora includes the vegetation of the alpine and subalpine zones and the Lower Snowy River area, and the adaptation and dominance of a single genus (Eucalyptus) over the entire elevational range from the coast to the subalpine tree line — the only occurrence of this in the world. The alpine flora is of world interest as it is a mix of species of autothonous (local) species and species of peregrine origins (from other continents). The significance lies in the many commonalities of the floristic groups and the affinities and differences between genera and species, compared with other Australasian alpine areas.

Fauna

The parks significance for fauna includes the extent of its biological diversity. Terrestrial habitats and fauna of the alpine and subalpine zone (15% of area) support populations of 100 native species including endemic or alpine specialists: one mammal, four frogs, four reptiles and a range of invertebrates (eg 10 species of Orthoptera and 10 species of Megascolecid earthworms). The park provides the opportunity to study global declines in amphibians, particularly at high altitude, and restoration of the predator hierarchy in large conservation reserves. The fauna of the alpine environment, and the alpine environment itself, is generally acknowledged as among the most vulnerable in Australia under future climate change caused by the enhanced greenhouse effect.

Landscapes

The landscapes of the park underpin values related to wilderness, ecosystem processes at landscape scale, aesthetic values and cultural heritage.

Wilderness

There are nine wilderness areas recognised under the NSW wilderness legislation, which constitute 346,257 hectares (50.15%) of the park. These wilderness areas are significant at national and international levels as part of the Australian Alps wilderness.

Ecosystem processes

Ecosystem processes that are significant at the landscape scale include the natural fire regime on which many plant communities and species depend; the hydrological regime that is related to macroclimate and microclimate variations; soil formation; and the extreme seasonal variations including processes of snow fall, accumulation and melt, which are particularly critical in maintaining many of the most significant biological and aesthetic values of the park. The park contains the largest contiguous area of snow country in Australia, making it of national significance for this phenomenon.

Aesthetic

Aesthetic values are found in the natural scenery of Kosciusko National Park; both its wildflower displays and its snow-garnished slopes and forests, exhibit aesthetic characteristics highly valued by a large proportion of the population. There is much steep country, sometimes juxtaposed to water, within the Kosciusko National Park, but the natural aesthetic qualities that make it an exceptionally beautiful place for many people lie in the pastel pastiche of eucalypts, cypress pines, scleromorphic shrubs and tussock grasses that clothe gently undulating hills and flat-floored valleys, and the mosaic brightness of flowering daisies on the rounded slopes within the alpine plateau.

Cultural heritage

The cultural heritage of the park is found in many themes: Aboriginal use, pastoral, Kosciusko Huts, mining, water harvesting, conservation, and recreation.

Aboriginal use

There is new archaeological evidence for Aboriginal use of the alpine country, which, as well as being significant to Aboriginal people, provides important information for non-Aboriginal Australians interested in the story of human adaptation to this ancient landscape. Further work on significance to Aboriginal people is being done, but was not available at the time of this draft. There is evidence of a long history of Aboriginal occupation in the alpine areas of Australia, demonstrating successful adaptation to environments unique to Australia and having potential to provide important new information about the length and nature of Aboriginal occupation.

Pastoral

The pastoral theme, as it is expressed in the alps in general and Kosciuszko National Park in particular, represents montane pastoralism, a unique high country way of life representing a period of economic and social development which is of historic significance at a national level. Currango, built in 1850 and spanning 150 years of European occupation, is of national historic importance, being the largest and most intact example of pastoral settlement above the snowline. The whole Kosciuszko landscape has been affected by the pastoral phase and there is significant evidence of the pastoral era on the landscape. Much of this evidence constitutes damage to the pre-European environment left by the Aborigines, but it also has significant historic value. The pastoral theme as expressed in Kosciusko is also of national aesthetic significance, preserving evidence of vernacular architecture and design. The various bush skills, and traditional crafts and construction methods, which are a response to the unique environment, are important for the continuation of traditional skills and for research into them.

Kosciusko Huts

The Kosciusko Huts in their landscape setting, including the group of pastoral huts, probably comprise the biggest group of different types of huts, designed for the widest range of purposes that exist in a comparative area anywhere in Australia. The complex of huts, ruins and huts sites have national historic and social significance.

Mining

The mining theme of the park relates to the adaptations that were required in Australian mining practise (its living and working conditions) to cope with life in a remote and rugged Australian environment. These adaptations include the Kiandra landscape, a gold rush site of national historic importance; there are additional outstanding sites at Grey Mare and Tin Mine.

Water harvesting

The water harvesting theme is illustrated at the Kiandra goldfield, and is also related to the Snowy Mountains Hydro Electric Scheme, a large part of which is within Kosciuszko National Park. The Snowy scheme is the largest engineering scheme ever undertaken in Australia, with national significance as an engineering feat, a symbol of Australian achievement and a basis for Australia's multicultural society.

Conservation

The conservation theme relates to the effort that created Kosciuszko National Park, which was of historic importance in the development of the conservation movement at a national level. Its subsequent development as a major national park has had an important national influence on the development of park management policies and procedures in Australia.

Recreation

The recreation theme of cultural heritage has a number of aspects of significance, including the Yarrangobilly Caves complex and Caves House and associated developments, which have historic and aesthetic significance as a component of the complex of cave sites developed for tourism as part of an important national social movement. The Kiandra area has significance as the place where downhill skiing was first practised as a recreation in Australia. The ski fields and ski resorts have elements of significance for historic, aesthetic and social reasons, for the important social movement they reflect, and because of elements of the architecture and layout.

Tourism and recreation

The tourism and recreational value of Kosciuszko National Park has been assessed as significant at a national level because of the natural scenic qualities of the park. These include its mountainous landscapes, its size and the presence of snow, and the exceptional variation in diversity of natural settings for recreational opportunities, including education opportunities. The park is especially valuable for its large areas of natural lands, which offer opportunities for solitude and self-reliant recreation.

Kosciuszko National Park and the Victorian Alps are the only two mountain snowfields tourism destinations in mainland Australia. The domestic tourism significance of the park lies not in the total number of visitors who are attracted to it, but in the uniqueness of the tourism experience. It is one of the few areas of Australia where people are able to experience the unique climate, scenery, history and danger of an alpine destination.

Uses and service functions

Significant use values of the park include water supply for irrigation and agriculture, and power generation.

The soils and catchments of Kosciuszko National Park provide vital 'service functions' including water yield and protection of the park's catchments; they supply clean water for domestic use, industrial uses, irrigation, hydro-electric power and a wide range of recreational activities.

The contribution of the waters from the Snowy River to the value of irrigated agriculture in the Murray-Darling Basin is significant. Through Snowy Hydro Ltd, the Snowy River contributes at least 7% ($245 million) to the annual value of irrigated production in the Murray-Darling Basin. The Murray-Darling Basin comprises about 70% of the nation's irrigated land and the value of production from the Basin represents approximately 40% of the national total.

Power generation is a use of the park's resources. The Snowy Mountains Hydro Electric Scheme has a generation capacity of 3756 megawatts, and can provide up to 11% of the total power requirements of the mainland of eastern Australia. It is an important peak load and emergency supplier because of the speed with which it can respond to sudden power demands. From a national perspective it is important as a power generator using a renewable resource.

The recreation use values are significant to the region's economy; it has been estimated that the value of recreation in the NSW part of the Australian Alps is in the order of $5 billion per year.

Expanded significance of Kosciuszko National Park's values

This section provides summaries of the significant aspects of the park's core natural and cultural heritage, and the derived attributes. As far as possible, the words of the authors of the individual values chapters have been used, with minimal editing.

In this section, the values identified by the analyses of the individual values have been ranked in four levels of significance: international values, national values, State or regional values and local or park values.

Values of international significance

Values of international significance were identified for karst, soils, aquatic ecosystems, native fauna, and scientific investigations into biodiversity.

Karst

International significance of Cooleman Plain karst

The geomorphological and hydrological aspects of the Cooleman Plain karst are internationally significant.

International significance of karst in Kosciuszko National Park

The significance of the eight individual karst areas in Kosciuszko National Park ranges from national to local. There are aspects of Cooleman and Yarrangobilly that are assessed to be of international significance. Each of the areas has some level of significance, together contributing to a high value for Kosciuzsko's karst.

Soils

International significance of the soils of Kosciuszko National Park

The soils of Kosciusko National Park are of great scientific interest; they have attracted international attention as outstanding examples of some of the great soil groups, both individually (the alpine humus soils) and in association with each other (eg the alpine sequence of lithosols, snowpatch soils, alpine humus soils, bog and fen peats and silty bog soils); and for the associated studies of the pedogenic factors and process controlling their formation and maintenance. The scientific value is enhanced further by the large degree of 'naturalness' of the soils, being relatively unaffected by the centuries of human occupation and associated uses of most mountains elsewhere in the world. Hence, they are important as natural 'standards' in the same way as above-ground reference areas of vegetation.

International significance as 'soil mountains'

The Australian Alps are significantly different from other alpine areas throughout the world — they are 'soil mountains' in contrast to the rock of Switzerland and New Zealand and the peat and oceanic mountains of Europe.

International significance of the fossil soils of Kosciuszko National Park

Kosciuszko National Park contains fossil soils and remnants of fossil soils of high scientific value and practical importance. Their persistence in parts of the park reflects its relatively subdued terrain compared with many other mountains, and the limited glacial and other types of erosional activity. Thus, some of the older soil materials have been able to persist with present-day soils developed within or over them. Most notable are old topsoil remnants now buried beneath extensive slope mantles, considered to be of solifluction origin, on gentle to moderate slopes on both sides of the mountains. On sites steeper than the angle of repose of unconsolidated materials, slope deposits would also have moved downhill, but could not accumulate. The age of the buried topsoils of about 30,000 years indicates the time at which Ice Age cooling started at Kosciuszko, and contributes to the evidence of general contemporaniety of Ice Age and subsequent climatic changes at Kosciuszko and mountains in other parts of the world.

Natural flora

International significance of vegetation above the tree line

The alpine areas of Kosciusko National Park are of international significance as a prime example in the world of mid-latitude alps, of which there are few. They are also unusual in the development of alpine humus soils on a gently rounded landscape. These physical factors support native vegetation that contains at least 21 endemic species and 33 species that are rare, in a total of some 204 species of flowering plants.

International significance of subalpine ecosystems as habitat for rare fauna

The subalpine ecosystems at Kosciuszko provide habitat for a number of rare animal species (for example podocarpus heath is habitat for the mountain pygmy-possum and sphagnum bogs is habitat for the corroboree frog) and accordingly are of international significance.

International significance of tree line characteristics

The upper slope tree lines are some of the few in the world in which the wooded side is dominated by open-crowned evergreen angiosperms. The same characteristic pertains to the inverted tree lines that are so well developed in the park. It is likely that Kosciuszko National Park has the most outstanding development of subalpine treeless flats and valleys in the world, as a result of relatively deep soils, gentle topography and not particularly frost resistant tree species. Internationally significant ecophysiological work has been undertaken on the tree lines of Kosciuszko National Park for example by Slatyer (1976, 1989).

International significance of the eucalypts in Kosciuszko National Park

These ecosystems occupy both a larger area than those of the snow country and extend through a greater altitudinal range. Furthermore, their contiguity or near-contiguity with other national parks and reserves in NSW, Victoria and the Australian Capital Territory (ACT) extends them geographically from the inland across the Great Dividing Range to the south-east coastline. Superimposed on this broad climatically controlled pattern are the

further variations associated with differences in geology, topography and soils. Such a comprehensive continuum of near-natural environments largely protected as a national park has few parallels elsewhere in the world. The eucalypt communities provide the strongest unifying thread.

The preservation — intact and in continuity — of the ecosytems of the Kosciuszko National Park, hopefully in conjunction with those of associated parks and reserves, is arguably the greatest safeguard to biodiversity in southeastern Australia, also of significance at national and international levels.

Although other regions of the continent may contain a greater number of eucalypt species than the Kosciuszko to Coast Corridor, the latter is ecologically richest, with eucalypts able to exploit every habitat available to trees from climatic tree line to the ocean coastline. No other genus of trees has been able to do this. The wide adaptive capacity of the genus *Eucalyptus* reflects the continuous gene-flow within and between its species, providing suitable genetic combinations able to take advantage of almost any ecological challenge that might arise.

Aquatic ecosystem

International significance of aquatic habitats of streams and rivers

At an international level, all Australian alpine rivers are significant because they form only a very small percentage of running waters nationally and they harbour a number of endemic species of aquatic insect and other invertebrates.

Blue Lake with its surrounding area, including the associated smaller water body of Hedley Tarn, was listed in 1996 as a wetland of international importance under the Ramsar Convention (The Convention on Wetlands) to which Australia is a signatory. Such wetlands are listed as being of significant value not only for the country in which they are located, but for humanity as a whole.

Native fauna

International significance of the park's biodiversity as a component of the Australian Alps

The biodiversity of the Australian Alps as a whole is internationally significant because it includes outstanding examples of significant on-going ecological and biological processes in the evolution and development of communities of fauna. Also, it contains important and significant natural habitats for in-situ conservation of biodiversity, including threatened species that include the mountain pygmy-possum.

International significance for threatened or near-threatened vertebrate taxa

Thirteen vertebrate taxa with populations in the park are listed as threatened or near threatened by the IUCN (International Union for the Conservation of Nature). They include the endangered Mountain Pygmy-possum, which has one of the longest life spans of all small mammals known.

International significance of the park's native fauna

The significance of the fauna of the park is the extent of its biodiversity (numbers of species), the ecological role of fauna in maintenance of the distinctive 'soil mountains', and the differing dominance of classes of fauna in the ecological functioning of the park. As most of the park's fauna is endemic to Australia its uniqueness is significant, demonstrating parallel evolutionary radiation in isolation from other alpine regions.

International significance of vertebrate biodiversity

The total vertebrate biodiversity of Kosciuszko National Park compares very well with other large temperate montane/alpine national parks in North and South America, and is significant for the presence of representatives of all subclasses and infraclasses of mammals (Monotremata, Marsupialia and Eutheria). The high diversity of reptile species, especially above the snowline, is also notable. This value is extended in significance in the context of the Australian Alps as a whole.

International significance for scientific investigations into biodiversity

Kosciuszko National Park is well placed to assist the international investigations into climate change and its effects on biodiversity. Some long-term studies, for example on high altitude frogs, have international scientific importance in monitoring the effects and adaptive strategies for climate change, and assisting the resolution of global scientific questions related to conservation.

Several faunal studies that have been or are planned in the park are of international scientific importance and comparison. They include studies on alpine species such as the mountain pygmy-possum; global declines in amphibians, particularly at high altitude; and restoration of the predator hierarchy in large conservation reserves.

International significance of native fauna's role in ecological processes

Fauna makes a significant contribution to the maintenance and health of Kosciuszko's ecological attributes of international significance, including the 'soil mountains' and the eucalypts from coast to alps.

Natural landscape

International significance of natural fire regimes as an ecosystem process

Natural fire regimes, which are partly a function of climate, have created subalpine, montane and lowland landscapes covered with a catena of eucalypts, interspersed with small patches of less fire-adapted vegetation, such as *Atherosperma moschatum* closed-forest, *Callitris* woodland and *Acacia sylvestris* closed forest. The role of fire regimes, related to the eucalypt theme, is therefore indirectly of potential international significance. The fire regimes of the park could not currently be regarded as natural, but some evidence from nearby mountains suggests that they now more closely approximate the natural regime than that of the time between European occupation and 1970. Thus, the natural fire regime is significant at a landscape scale, in association with the natural communities and species that are dependent on it.

International significance of wilderness in the alps context

The wilderness areas of Kosciusko National Park can be seen as significant at national and international levels as part of the total Australian Alps wilderness, which includes similar types of wilderness country in Victoria and the ACT.

Cultural heritage

International significance of scientific research

The theme of science and conservation in Kosciuszko National Park, as part of its cultural heritage, is of international and national significance.

The 19th century botanical investigations of Von Mueller and Maiden were of international historic and scientific interest as were the geological studies of Edgeworth David, the anthropological work of Howitt and the meteorological studies of Clement Wragge. This century the intense and thorough research work and ecological studies of the Australian Alps are of international significance for historic and scientific reasons.

Places of outstanding universal value associated with this research subtheme include Carruthers and Twynam ridges transects, Dainers Gap and Hotel Kosciusko sites, Main Range glacial sites (Guthrie Saddle, the David Moraine, Perisher Creek exposure), Mt Twynam transect monitored by Jennings and Costin (1963-75), Cooleman Plain karst area and Yarrangobilly Caves monitoring sites, and Slatyer's Thredbo Valley tree line monitoring sites.

Values of national significance

Earth science

National significance of Ordovician to Lower Devonian features

Ordovician to Lower Devonian rocks (approximately 430–370 million years old) form the bedrock of the entire area. The formation of these rocks was followed by a prolonged period of erosion that lasted to the early Tertiary. The Ordovician to Lower Devonian sedimentary rocks are mainly sandstone, siltstone and shale forming greywackes deposited in deep marine environments but including shallow-water limestone found at Cooleman in the northeast, Yarrangobilly in the centre and Indi in the extreme southwest. Some volcanic rocks occur, chiefly in the northern third of the area including the Mt Jagungal basalt, which is the oldest rock in the park. They were extruded mainly under marine conditions but include some subaerial occurrences. Granitic rocks were intruded at depth in Silurian and lower Devonian times and now underlie most of the southern half of the park and the Bogong Peaks wilderness area in the northwest plus scattered occurrences elsewhere. All these rocks have been extensively affected by folding and/or faulting. After the Mid Devonian, the area was subject to prolonged erosion for some 250-300 million years which exposed the granites and reduced the area to a lowland with ridges on more resistant rocks. These rocks form part of the Lachlan Fold Belt and they are of National and State significance.

National significance of Tertiary features

Earth movements in the Tertiary raised the area, especially in the south and west, and enabled stream erosion to cut deep linear valleys along lines of rock weakness, such as the Thredbo River aligned along the Crackenback fault. The dissection resulting from the Tertiary uplift has produced spectacular scenery notably the mile-high drop from the summits of the Main Range to the Geehi Valley. Miocene basalt extruded over the central part of the park covered stream valley deposits of lignite, silt and clay containing alluvial gold and fossils of rainforest trees. Later erosion has reduced the basalt to scattered remnants.

The spectacular scenery of parts of the park, notably the Geehi Valley, is certainly of Australia-wide significance.

National significance of Pleistocene features

In the Pleistocene (approximately the last 2 million years) there were great climatic changes particularly over the period 70–10 thousand years that produced glacial and periglacial features. Glacial features of the park include cirques, terminal and lateral moraines, lakes, erratics and ice-scratched surfaces. There is also extensive periglacial evidence including frost-shattered bedrock (evidence of former permafrost), boulder fields, solifluction deposits, stone streams, stone-banked lobes, non-sorted steps and nivation features.

The glacial features are of very high scientific and educational significance for Australia and the entire southern hemisphere. They are an outstanding example of a glaciation that developed under extremely marginal conditions (Galloway 1989) and are the only occurrences on the Australian mainland. They contribute to understanding the nature of climates during the Pleistocene. The Helms moraine near Blue Lake is a particularly clear example of glacial transport of one kind of rock onto another. The so-called 'Railway Embankment' moraine near Muellers Pass is another interesting example; it is the site of an early estimate for the date of glaciation (David et al 1901) and is consequently significant for the history of geology in Australia. The periglacial phenomena are amongst the most striking in Australia and demonstrate the widespread effects of cold climate in the Quaternary and in the recent past.

National significance of Holocene features

In the Holocene (approximately the last 10,000 years) the climate was roughly similar to that of today.

In the park current surface processes, such as soil wash, frost heaving and nivation, can be observed under the present climate in a great variety of situations. The park can thus serve as a benchmark for processes in more heavily impacted regions elsewhere in southeastern Australia. In particular, it offers comparison with alpine areas in Victoria which are subject to more stock grazing. Pollen in the sediments in Blue Lake and Club Lake and peat in the Twynam cirque have given valuable information on vegetation changes associated with post-glacial warming.

Karst

National significance of Cooleman Plain karst

Work conducted since 1989 has demonstrated the presence of a number of aquatic crustaceans Cooleman Plain of considerable significance in our understanding in the evolution of the fauna of continental Australia. Thus this aspect of the Cooleman Plain karst area is of national significance.

National significance of Yarrangobilly karst

The scientific significance of the Yarrangobilly karst area ranges from local to national. The cultural significance is unquestioned with similar levels of significance. The area has very considerable aesthetic and recreational significance. A very large number of recreational activities are undertaken within the management unit and karst area. The area is recognised nationally as a site of very great recreational value.

National significance of Black Perry Mountain karst and babingtonite

The topography and mineralisation of Black Perry Mountain and the ridge leading to it are of state to national significance. At least one mineral present here (babingtonite) is only known from a few other localities worldwide. The significance of the cave at Black Perry Mountain is of state or national significance.

Soils

National significance of variations of soils in response to major pedogenic factors

In Kosciuszko National Park, understanding of variations of soils in response to major pedogenic factors (climate, geology and physiography) is facilitated by the park's large size and persistence as a relatively undissected uplifted paleoplain, its wide altitudinal and climatic range, and the occurrence of soil parent materials as diverse as basic limestone and basalt, acid granites and metasediments.

National significance of alpine humus soils

In Kosciuszko National Park, alpine humus soils are particularly well developed, and the dominance of the alpine and subalpine climate on soil formation is seen in the development of alpine humus soils on all parent materials, in contrast to the increasingly dominant effect of parent material on soil formation at lower levels. A notable feature of the alpine humus soils in Kosciuszko National Park is the absence of the podzolisation process normally found in cold wet climates on acid rocks with low nutrient vegetation. In fact, the reverse situation occurs, with accumulation of soil colloids and nutrients in the surface soil. Important soil processes include weathering, soil moisture movement, colloid and nutrient cycling, solifluction, aeolian deposition, and soil faunal and mycorrhizal activity.

National significance of soils in catchment and water supply processes

The soils of Kosciuszko National Park have vital 'service functions', including protection of the park's catchments and its water yield; the supply of clean water for domestic and industrial uses, irrigation, hydroelectric power and a wide range of recreational activities. The alpine and subalpine soils of Kosciuszko National Park receive, store, process and supply a larger quantity of high quality water than any other group of soils on the continent. The soils of the surrounding mountain forests in the park also have valuable hydrological functions.

Natural flora

National significance of alpine and subalpine vegetation as water catchments

The alpine area is of importance nationally as that part of the water catchment of the Snowy Mountains. Together with the alpine areas of the park, the subalpine areas are of critical importance in southeast Australia as water catchments and for this reason alone should be protected from disturbance and pollution.

From the major snowfields of the Main Range through alpine and subalpine groundwater areas and woodlands which seem especially designed to trap snow and cloud, to the montane forests which stabilise the steep slopes of the eastern and western escarpments, the park conserves a hydrologic complex that is essential to the well-being of the country.

National significance of subalpine areas and frost hollows

Subalpine woodlands in Australia are unique in that they are dominated exclusively by broad-leaved evergreen species, whereas in most other countries, conifers and deciduous species form the tree line. They occur elsewhere in NSW (for example Barrington Tops) and in the ACT, Victoria and Tasmania, but those at Kosciuszko are of national significance in being by far the largest in area.

Frost hollows, which concentrate and retain cold air, are particularly well developed at Kosciuszko due to the gently sloping terrain over much of the park as contrasted to the usually steep-sided, deeply dissected valleys in alps elsewhere in the world. Moreover, the Kosciuszko National Park examples span virtually the complete spectrum of altitudes, from near tree line, where they are barely distinguishable from alpine in their floristics, to montane examples with very different characteristics. On these counts the Kosciuszko National Park frost hollows have a high degree of national significance.

National significance of the Lower Snowy Valley

The juxtaposition of elevated cold moist watershed and the lower dry and warm valley produces ecosystems and groups and sequences of ecosystems not found elsewhere in the park or as well developed elsewhere in Australia. The box-pine community is considered by some ecologists to be a relict of earlier more widespread climatic conditions, still preserved within the refugium of the Snowy Valley. The aquatic environment of the Lower Snowy River, although now much modified by upstream dams and diversions above Jindabyne, is also unusual within Kosciuszko National Park. Several short, fast-flowing, cold-water subalpine rivers (Jacobs, Pinch and Ingegoodbee) discharge directly into the warmer waters of the Lower Snowy itself.

Despite partly irreversible changes in the terrestrial and aquatic ecosystems, the Lower Snowy Valley contains some of the most outstanding natural and cultural resources of the park, certainly of local and national and arguably of international importance.

Native fauna

The analysis of the native fauna values amalgamated the national (continental), state and bioregional significance because of the overlap the significance for these levels. The general criterion used was the degree of uniqueness on continental Australia and significance to adjacent environments. The significance at this level of individual species and communities was considered in terms of endemism; rarity and conservation status (this may have legal significance; cultural importance, icon species, aboriginal use (bogong moths); and scientific studies and long-term monitoring studies providing insight to conservation science questions, some of which may also be of international significance.

National or state significance of terrestrial habitats and fauna of the alpine and subalpine zone

Terrestrial habitats and fauna of the alpine and subalpine zone (15% of the park's area) support populations of 100 native fauna species, including endemic/alpine specialists: (including one mammal, four frogs and four reptiles, a range of invertebrates (including 10 species of Orthoptera and 10 species of Megascolecid earthworms) and a variety of karst-based endemic invertebrates such as undescribed members of Syncarida.

National or state significance of Kosciuszko's fauna biodiversity in context of Australian Alps

The unique features of the Australian Alps bioregion and the high percentage of its area managed for biodiversity conservation indicates that its actual and potential value will increase into the future at the continental scale.

National or state significance of fauna habitats over altitudinal gradients

The fauna of the alpine environment, and the alpine environment itself, is generally acknowledged as among the most vulnerable in Australia under future climate change caused by the enhanced greenhouse effect. Most literature supports the proposition that montane areas will become critical refugia for fauna under enhanced climate change scenarios. The altitudinal range and the diversity of habitats is therefore an important feature of the park at the continental scale.

The altitudinal gradients of the forest and woodland habitats surrounding the alpine environment supports a wide range of taxa. Habitats in these areas support numerous populations of threatened fauna species and provide critical elements of habitat depleted elsewhere (for example mature seral stages). From an ecological viewpoint the fauna contributes to the health of the vegetation and the provision of ecosystem services.

National or state significance of alpine environments and their dependent biota in context of climate change

Implications of the effects of enhanced greenhouse climate change suggest that the alpine environments and their dependent biota are amongst the most vulnerable environments in Australia and their protection and that of the adjacent eucalypt montane forests and woodlands are vital for biodiversity conservation at the national scale.

Natural landscape

National significance of fire, air and water as physical ecosystem processes

The significance of physical ecosystem processes in Kosciuszko National Park lies largely in their importance in maintaining and creating other values. These, of course, include much of the water supply of Adelaide, most of the irrigation industry of the Murray-Darling basin, and the ski industry of NSW. More importantly, in the context of the present discourse, they are necessary for the perpetuation of almost all of the other natural values of Kosciuszko National Park.

The processes of snow fall, accumulation and melt are particularly critical in maintaining many of the most significant biological and aesthetic values of the park. The park contains the largest contiguous area of snow country in NSW and Australia, making it of both state and national significance for this phenomenon.

National significance of natural aesthetics

The natural scenery of Kosciusko National Park, both its wildflower displays and its snow garnished slopes and forests, exhibit aesthetic characteristics highly valued by a large proportion of the population, as is evidenced by the high frequency of their depiction in popular publications, and the popularity of the park for tourists.

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

The Australian Alps as a whole have significance for natural aesthetics and present a unique combination of gently rounded slopes, highly floriferous alpine vegetation and eucalypt forest. The Kosciuszko National Park has 604,935 hectares (87.62% of its area) of forest and woodland dominated by eucalypts or cypress pines. Of this, 466,302 hectares (67.54% of the park) is the dry forest and woodland celebrated by the Heidelberg School. Variations in tree species dominance produce subtle changes in canopy colour melded into topography, while variations in the understorey substitute different sets of flowering grasses, herbs and shrubs, depending on moistness, soil type and disturbance history. In recently burned forest, delicate native orchids and lilies flower abundantly among blackened stems.

Most of the 80,415 hecatres (12%) of the park covered by herbfield and grassland produces outstanding wildflower displays in late spring and throughout summer. Even before the peak of flowering there is a wondrous variation in foliage cover in the vegetation mosaics of the alpine country and limestone plains. There are even a few lower altitude valley grasslands where grey kangaroos emerge from the red heads of the dominant kangaroo grass. Such scenes were once common in much of southeastern Australia, but are now rare.

Cultural heritage

National significance of historic, social and aesthetic aspects of pastoralism

The pastoral theme, as it is expressed in the alps in general and Kosciusko in particular, represents a unique high country variation of a way of life and a period of economic and social development which is of historic significance at a national level. Pastoralism played a key role in the development of Australia. Montane pastoralism, and seasonal transhumance with its wide regional connections and economic implications is more strongly represented in the alps than anywhere else in Australia, and some aspects of this history, being related to the highest land and vegetation complexes in Australia, are unique.

Within the park, very few original squatting stations survive, though many of the surrounding properties have important remains of early pastoralism and an active and continuing tradition. Coolamine was taken up in 1838 and the current homestead built in 1892 and Currango in 1850. Currango is of national historic importance being the largest and most intact example of pastoral settlement above the snowline in Australia with 25 remaining buildings and ruins spanning 150 years of European occupation.

The variety, geographic spread, and representativeness of the pastoral huts of Kosciusko, and their association with traditional pastoral routes and summer grazing settings make them a unique manifestation of a particular type of grazing. They also represent the way of life of pastoral workers, a theme not well demonstrated elsewhere. The group of huts associated with pastoralism in Kosciuszko, is of national historic and social importance as part of the complex in the alps generally.

The physical remains, especially the huts and homesteads, and their exotic domestic plantings in a unique and beautiful mountain setting have a very strong appeal to visitors and to locals imbued with the pastoral traditions. The pastoral history, stories and myths and the landscape and remains left behind have been used for more than a century by famous Australian artists to create works of literature and art which are nationally celebrated and which form part of the national psyche. The pastoral theme as expressed in Kosciusko is of national aesthetic significance.

Many of the pastoral complexes have a high degree of authenticity. They preserve evidence of vernacular architecture and design which is a response to the unique environment, various bush skills, and traditional crafts and construction methods and are important for the continuation of traditional skills and for research into them.

The pastoral theme as expressed in Australia's highest mountains has strong social value, to descendants, to modern bushmen and to many other Australians. This is demonstrated in the very active continuation of and celebration of its traditions and the respect for its physical remains including its pastoral landscapes, wild horses, and stock routes. The high country's traditions are known, celebrated and passed on locally, and regionally and have an important place in the historic consciousness of Australians especially in regional Australia, albeit in a somewhat romantic way. *The Man from Snowy River* is known in many households around Australia — urban and rural. In this sense, the social value of the theme is of national importance.

National significance of mining — adaptation to severe environment

A key element of the significance of the mining in Kosciusko relates to the adaptations that were required in Australian mining practise to cope with an environment that was unique in Australia in terms of altitude and severe winters, with abundant snow and lack of access. This complex of sites forms an interesting contrast with the adaptations necessary to allow mining in the arid zone where lack of water, timber and the extreme heat created a need for other unique adaptations.

In particular, the remains of the Kiandra gold field, being the most extensive and successful Australian gold field at this altitude, demonstrates national historic importance — it is the best example of a gold field operating in a context and environment that is unique to Australia. This national significance is most readily interpreted in the Kiandra landscape rather than at individual sites. That is, it is outstanding and unparalleled in its combination of a range of mining associated cultural features within a montane natural environment.

National significance of water harvesting

This national significance is most readily interpreted in the Kiandra landscape rather than at individual sites. Water harvesting is an extremely important historic theme of national historic and social significance in Kosciuszko National Park. The Snowy Mountains Hydro Electric Scheme, a large part of which is within Kosciuszko National Park, is the largest engineering scheme ever undertaken in Australia. It has national significance as an engineering feat, as a symbol of Australian achievement, and a basis for Australia's multicultural society.

The following elements together give the scheme as it is now manifested in Kosciuszko National Park national historic, social, and scientific significance:

- it represents an outstanding engineering success and achievement and is the largest and most complex example of such a scheme in Australia;
- the scale and nature of many of its engineering and design components are rare, and it exhibits technical and design achievement of the highest order;
- many of the components have the potential to provide more information about the experience and achievement of the scheme's workers, designers and contactors;
- it adds to the complex layers of human occupation of an important and significant area, juxtaposing major engineering objects on a distinctive mountain landscape and exerting a profound aesthetic and environmental effect on this landscape;
- the scheme is closely associated with a number of prominent Australians;
- it is significant in the history of post World War 2 migration and can be considered as the basis for Australia's multicultural society;

- it revolutionised post -war working conditions and industrial relations and introduced modern concepts of management and large-scale project development in Australia;
- it continues the already established alps tradition of work by men in unusual and harsh conditions, and caused the evolution of work attitudes and management systems to cope with this;
- it is strongly symbolic for a large part of the Australian community and is held in high regard by them; it is very publicly and continually associated with Kosciuszko National Park and attracts many visitors in its own right;
- the large community of former Snowy workers and their families hold it in special regard; at a local and regional level the scheme evokes sorrowful and powerful cultural memories of loss and mourning among some of the community whose lives were disrupted by it;
- the scheme was influential in phasing out alpine and subalpine grazing and led to a program of soil erosion control, but also caused very considerable environmental damage within the park; and
- the development of the area, the existence of the scheme and the improvement in number and quality of access roads led to an increase in recreation opportunities and development.

National significance of scientific research

Vegetation analysis studies shaped the way the soil conservation agencies of Victoria and NSW undertook their work. The first attempts at reclamation and revegetation were undertaken in 1959 in the Mt Carruthers to Mt Kosciusko area and have proved successful. Costin's work on the Snowy catchment and the Fawcett studies on the Hume and Kiewa catchments also became benchmarks of Australian alpine ecology. There is a controversial scientific debate about the extent of glaciation, illustrated by geological features on the Main Range sites associated with the dating of Australian glacial events, which are also important. Monitoring sites to measure stone movement on Mt Twynam, karst processes at Cooleman Plain and Yarrangobilly Caves, and tree line dynamics in Thredbo Valley are also sites of outstanding cultural significance associated with scientific research. The level, range and importance of this suite of research have national significance.

The story of research in the park is associated with a range of internationally and nationally famous scientists many of whom carried out their seminal work within the park and the adjoining areas.

National significance of conservation and park management

The conservation of an area, which juxtaposed outstanding natural areas, opportunities for much-needed water harvesting and power generation, and economically important pastoral activity posed a challenge for the community and conservationists. The conservation effort, which created Kosciuszko National Park, was of historic importance in the development of the conservation movement at a national level, and its subsequent development as a major National Park has had an important national influence on the development of park management policies and procedures in Australia.

National significance of recreation

Some of the famous walking tracks and viewpoints have national significance because of their historic, aesthetic, inspirational and social qualities.

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

The Kiandra area, apart from its mining history, has national significance as the place where downhill skiing was first practised as a recreation in Australia.

National cultural heritage significance of recreation — huts

The extensive network of huts in the park, used for shelter safety and accommodation are part of a network of national significance and are in themselves of state historic and social significance as a response to the needs of recreation in a challenging often dangerous environment, and as reflecting the historic development and adaptation of a unique mountain network for this recreation.

National significance of recreation — ski fields and ski resort elements

Ski Tube and its associated engineering work have national historic and scientific significance as an innovative and excellent example of design, engineering and construction in a difficult and sensitive environment.

National significance of Kosciusko Huts

The Kosciusko Huts probably comprise the biggest complex of different types of huts, designed for the widest range of purposes, which exist in a comparative area anywhere in Australia. Individual huts have considerable archaeological, social historic or aesthetic significance, but it is the complex of huts, ruins and huts sites that have national historic and social significance. Within this general field we can identify a number of particular values:

- The complex has historic value, representing the major extant evidence for the major non-Aboriginal land use phases of the park. Many of the huts by their historic association, provide a major element of the evidence for types of work, which is no longer practised, or is a unique project such as the Snowy Mountains Scheme;

- The complex has social value as representing a way of life which has iconic status in Australia, and which is associated with important social movements and persons. The majority represent the work and lives of pastoral workers, small-time prospectors and migrant workers. Because so many continue to be used today for shelter and recreation, they constitute an important link between today's park users and those of the past, and for modern users they provide a tangible and important trigger to the historic imagination. The association with the Kosciusko Huts Association and the history of that association's recognition of their value and remarkable voluntary work to conserve and repair them and to maintain their use is a strong indication of their current social value;

- The huts between them represent a wide range of materials, design, construction, maintenance and adaptation techniques, and they constitute an important architectural, archaeological and historic research resource for this reason;

- Many of the huts, especially the slab huts, because of their vernacular construction and setting, have an element of simple beauty, which blends well with the dramatic and austere mountain landscape and environment and gives them aesthetic value; and

- The conservation and present curation of the huts represents an important milestone in the history of natural and cultural conservation in NSW — a gradual development by the NPWS of an understanding of the nature and value of non-Aboriginal cultural heritage, and of the necessity of involving and working with its traditional owners and the community generally to conserve it.

Social

National significance of social aspects — the Snowy Mountains Hydro Electric Scheme

The Snowy Mountains Hydro Electric Scheme was not just a great engineering vision, but also a great social vision. It left a mark on both the terrain of the region and the ethos of all Australian Society. At the same time, the Scheme laid a social foundation for the development of skiing into a major regional industry.

Tourism and recreation

National significance of tourism and recreation

The tourism and recreational value of an opportunity setting has been defined as a function of the perceived ability of that opportunity to provide certain activities and experiences. The tourism and recreational value of Kosciuszko National Park has been assessed as significant at a national level.

National significance of for tourism and recreation - as a natural attraction

Kosciuszko National Park as a natural attraction is nationally important. The natural scenic qualities of Kosciuszko National Park, its mountainous landscapes, its size and its diversity of natural settings and the presence of snow are paramount in what is valued as a tourism and recreation attraction by visitors.

National significance of for tourism and recreation — as a cultural attraction

Kosciuszko National Park has a rich and varied cultural heritage and is considered to be nationally important. It is highly valued by Aboriginal peoples, artists, scientists, tourists, and locals. Historical artefacts within the park include; paintings; poems; legends; and, bush folklore, all of which help to underpin its nationally important cultural values.

National significance of for tourism and recreation — educational activities

Kosciuszko National Park is considered to have national importance as an educational opportunity.

National significance of for tourism and recreation — diversity of opportunities

The park is considered to be nationally important for its diversity of recreational opportunity settings. Snow and mountains are rare phenomena in a continent dominated by arid and flat lands. Access to snow and the possibility of participating in snow-based activities in a natural setting are highly valued by Australians and are a significant tourism and recreation attribute of Kosciuszko National Park. The park is especially valuable for its large areas of natural lands, which offer opportunities for solitude and self-reliant recreation. It is the exceptional variation of recreation opportunity settings within one park that establishes its national significance. This is underpinned by its importance for natural mountainous scenery, snow-based recreation and tourism, cultural heritage, Australia’s highest mountain, diversity of recreation opportunities, and educational opportunities

Use

National significance of irrigated agriculture as a use value

Under the Snowy Water Licence, Snowy Hydro is required to provide minimum annual releases of 2088 GL to the Murray and Murrumbidgee Rivers and these releases represent long term average contributions of approximately 5% to the Murray system and 14% to the Murrumbidgee system. Adopting a conservative approach and using long term average contributions the Snowy contributes at least 7% ($245 million) to the annual value of irrigated production in the Murray-Darling Basin. Thus, the contribution of the waters from the Snowy River to the value of irrigated agriculture in the Murray-Darling Basin is significant. The Murray-Darling Basin comprises about 70% of the nation's irrigated land and the value of production from the basin represents approximately 40% of the national total. As such, the contribution of the region's water to the national value of agricultural production is still highly important but less significant. However, the contribution to both the basin and the nation would show considerable variation depending on seasonal conditions and world prices.

National significance of power generation as a use value

The Snowy Mountains Hydro Electric Scheme has a generation capacity of 3,756 megawatts. As such it has the capacity to provide up to 11% of the total power requirements of the mainland of eastern Australia at any one time. However, over a twelve month period the Snowy Scheme produces approximately 3% of the total energy in the national electricity market, with the difference between capacity and production due to limits on the amount of water that it collects, stores and releases each year. Whilst the actual contribution of Snowy Hydro Limited to the national electricity market in the eastern states is not very significant, there is potential for this contribution to increase. However, it is considered to be an important peak load and emergency supplier because of the speed with which it can respond to sudden demands for power. From a national perspective it is also important as a generator of power using a renewable resource.

Economic value of tourism

National significance of domestic economic value of tourism

Kosciuszko National Park and the Victorian Alps are the only two mountain snowfield tourism destinations in Australia. While parts of Tasmania may lay claims, only Kosciuszko National Park and the Victorian Alps have well developed ski fields with on-mountain accommodation and significant tourism visitation all year.

Although Kosciuszko National Park does not rate in the top ten tourist destinations for Australian domestic tourism, the domestic tourism significance of the park lies not in the total number of visitors who are attracted to it, but in the uniqueness of the tourism experience. It is one of the few areas of Australia where people are able to experience the unique climate, scenery, history and danger of an alpine destination.

Values of state and regional significance

Earth science

State or regional significance of Ordovician to Lower Devonian features

State or regional significance of Tertiary features

 The gentler relief typical of most of the park has statewide significance. The rainforest fossils found under basalt at

Kiandra are rare testimony of a time when Australia's climate was very different and contribute to understanding the climatic evolution of the entire continent. The alluvial gold was the focus of an important gold rush around 1860 followed by half a century of placer mining.

Karst

State or regional significance of Cooleman Plain karst

There is much more to Cooleman Plain than scientific values as is evidenced by the number of visitors, including many who have come back frequently over many decades. It is important for recreation (both active and passive), as a destination, for its indigenous and European heritage of occupation, grazing, use of caves and as a gateway to other parts of the park notably the Bimberi Wilderness and Namadgi National Park. Its significance for these sorts of values is at a least a regional level.

State or regional significance of Upper Goodradigbee karst

The significance of Upper Goodradigbee is probably at best regional to local. However, the long-documented Aboriginal heritage and recent discoveries point to the importance of this area from this viewpoint. Its pristine nature adds to its value.

State or regional significance of Indi karst

The significance of the Indi karst is local to regional. Although some research on the geomorphology of the karst and its regional setting has been conducted nothing has been published. The regional level of significance here arises from the perched watertable, the possible palaeoclimatic significance of the clay sediments and from the associations with Aboriginal prehistory. The area has not been adequately surveyed for its biospeleological attributes – especially aquatic invertebrates.

State or regional significance of ravine (O'Hares Creek/Lobs Hole) karst

The karst significance of this area appears to reside entirely in the massive tufa deposits, which are considered to be of regional significance. It may be that the tufa preserves some record of vegetation and hence climatic change.

Natural flora

State or regional significance of upper slope tree lines

The upper slope tree lines of Kosciuszko National Park are the only ones in NSW, making the conservation of the phenomenon in the state totally dependent on the park.

State or regional significance of long term vegetation study sites

Long term scientific study sites, particularly those on the tree line (the only upper slope tree lines in NSW), are very highly significant for understanding of the vegetation's responses to dynamic ecological processes and anthropogenic pressures.

Aquatic

State or regional significance of aquatic habitats of lakes formed by glacial action

There are four small (1.6–14.4 hectare) natural lakes in Kosciuszko National Park (Albina, Blue, Club and Cootapatamba). These are unique in that they are the only lakes on the Australian mainland that were formed by glacial action. (Tasmania is the only other region in Australia to have glacially formed lakes.) Thus at the state, regional or park scales these glacially formed lakes are significant habitats. They are the highest lakes (1890–2070 m) in Australia. Such alpine or glacially formed lakes are, however, not unique or uncommon on an international or national scale: they occur widely in Tasmania and in the northern hemisphere (Europe, North America, Asia, and Africa) New Zealand and South America.

State or regional significance of aquatic habitats of other small natural lakes

There are some other small natural lakes in Kosciuszko National Park. Hedley Tarn is downstream from Blue Lake, on the stream that connects both water bodies to the upper Snowy River. Two further lakes, both less than one hectare, are found in the north of Kosciuszko National Park. Both are associated with karst systems and are dolines (karst depressions) fed by ephemeral streams. 'Bung Harris Dam' is found at Cooleman Plain and is part of the integrated karst drainage system rising at Blue Waterholes; the other, unnamed, is several hundred metres to the west of the Jounama Pine Plantation. Its karstic affinities are quite unclear. Nothing is known about the ecology of any of these lakes, although the two northern lakes contain trout.

State or regional significance of aquatic habitats of subterranean water bodies

There are a number of subterranean water bodies within Kosciuszko National Park. The most obvious of these are those associated with karst systems. Cooleman Plain is of at least state, possibly higher, significance as a result of its relatively rich aquatic invertebrate fauna. Hyporheic systems (underground water in the gravels and sands underlying and adjoining rivers and streams) are widespread but their communities, let alone ecology, have not been investigated within the park. The same comment applies to the potential ecosystems dependent on the deep leads underneath the basalt flows in the northern parts of the park.

State or regional significance of aquatic habitats of streams and rivers

All the large rivers in Kosciuszko National Park (Snowy, Murrumbidgee, Tumut, Swampy Plains) are dammed either within the park or just outside the park boundary. In some cases extensive reaches of riverine habitat have been inundated; for example, 50 km of the Tumut river are submerged by Blowering and Talbingo dams. Large rivers above altitudes of 900 m could be considered an endangered habitat in the Snowy Mountains region. Small streams are still common in Kosciuszko National Park and surrounding regions.

Natural landscape

State or regional significance of wilderness

In the Kosciuszko National Park, nine wilderness areas are legally recognised under the NSW wilderness legislation; they constitute 346,257 ha, or 50.15% of the park. Two of these areas are contiguous with Victorian wilderness areas, and one is contiguous with natural area in a national park in the ACT.

- Byadbo (80,725 ha) — The Byadbo wilderness includes extensive areas of cypress pine and white box woodland in the rain shadow of the alps, as well as some dry montane forest and woodland.
- Pilot (80,168 ha) — This wilderness area contains subalpine grassland and woodland, montane forests, and dry forest and woodland. The Murray River rises within this area, which is contiguous with legally defined wilderness in Victoria.
- Jagungal (67,188 ha) — This wilderness area includes subalpine grasslands and woodland in the snow country, and montane forest in areas of high relative relief.
- Bogong Peaks (28,797 ha) — The Bogong Peaks wilderness ranges from cypress pine woodlands on the lower slopes to subalpine woodlands and heath on the plateau, with rugged country occupied by montane forest in between.
- Goobaragandra (33,666 ha) — This highly rugged wilderness area in the north of the park and consists largely of montane forest and woodland.
- Bimberi (18,004 ha in Kosciuszko National Park, 56,088 ha in total) — The Bimberi wilderness extends from Kosciuszko National Park to other reserves, including Namadgi National Park in the Australian Capital Territory. In the Kosciuszko National Park it covers steep slopes ranging from the alpine environment of Mount Bimberi to dry forest in lowland river valleys.
- Indi (11,636 ha) — This small wilderness area extends from near the Murray River to the Alpine Way, south of Khancoban, on the western slopes of the park. Most of the area is steep and heavily forested, with some areas of old growth.
- Western Fall (15,174 ha) — The Western Fall wilderness encompasses much of the steep western fall of the Main Range. Its steep slopes support much wet eucalypt forest, some of which is old growth.
- Bramina (10,899 ha) – This area at the northern end of KNP is centred on Bramina Hill (1400m), cascading via Cooleman and Bull Flat Creek's deep gullies, to the Goodradigbee River at 700m. Moist montane forests dominate with Alpine Ash and Snow Gum communities at higher elevations.

The wilderness areas have a high degree of significance at a regional and State level. State significance has been recognised legislatively.

Cultural heritage

State or regional significance of Aboriginal history and heritage

Aboriginal cultural heritage values within Kosciuszko are manifest by the continuity of Aboriginal history represented by their connection with the natural environment (landscape, habitat, plants and animals), ethnographic accounts, traces of past occupation revealed by archaeological investigation and the ongoing involvement and knowledge of current local Aboriginal groups. The Snowy Mountain alpine and subalpine regions are of high cultural significance to the descendants of the Aboriginal tribal groups that occupied and visited them in the past. The Aboriginal cultural significance of these sites encompasses both material and non-material aspects.

This alpine and subalpine Indigenous cultural landscape includes places and pathways of special significance to Aboriginal people some remembered in oral tradition, some documented in nineteenth century records, and some revealed by archaeological investigation.

All of the artefact occurrences are considered to have historic and social significance to the local Aboriginal community. These sites provide a tangible link to a past way of life and manifest a cultural tradition of Snowy Mountain occupation and a sense of social identity which is given a high cultural value amongst many members of the Aboriginal community. The archaeological potential of these sites to provide information about a long history of Aboriginal occupation in the alpine areas of Australia is a recognised component of their cultural significance. The

surviving archaeological resource within the park is a historically and scientifically significant component of the alpine and subalpine cultural landscape. The proven occurrence and distribution of subsurface artefacts within the alpine and subalpine environment provides both a marker of past Aboriginal occupation and an opportunity to study Aboriginal adaptation and exploitation of the high country. They demonstrate successful adaptation to new environments unique to Australia and have potential to provide important new information about the length and nature of Aboriginal occupation.

The potential use of sites such as these for teaching and education about Aboriginal culture is also a recognised component of significance.

Predictive analysis from surveys to date show that large areas of the park have significant research potential, in the form of surface scatters of stone artefacts and possible archaeological deposits, which will provide more information about Aboriginal occupation of the area and probably push back the date at which it can be demonstrated that Aboriginal people first settled in Kosciuszko. New evidence for increased Aboriginal use of the alpine country, as well as being significant to Aboriginal people, provides important information for non-Aboriginal Australians interested in the story of human adaptation to this ancient landscape.

The Kosciuszko high country was the traditional gathering place for the bogong moth festival, one of the most important Aboriginal cultural and social events in southeastern Australia. The ethnographic evidence, the continuing Aboriginal tradition about this event and the sites, routes and physical remains of the activities associated with it are of scientific, historic and social value at a state level.

State or regional significance of pastoralism — historic

The huts, homesteads, transhumance routes and associated remains constitute physical evidence of pastoral life that is only found at these altitudes. Likewise, the topography of the region, its severe and unpredictable weather and the exceptional adaptation of the Aboriginal people to these conditions meant that the initial assistance of Aboriginal guides and the use of Aboriginal routes for transhumance played a crucial role within the Alps, of regional historic significance.

State or regional significance of pastoralism — historic and social

A darker side of the pastoral theme was played out in Kosciusko. The pastoral history and landscape of the park contributed to the disappearance of the viable and uniquely adapted Aboriginal hunter-gatherer lifestyle of the alps, the remarkable decline in Aboriginal population and the abandonment of many traditional places and items within the park. These happenings and remaining evidence of them constitute important values of historic and social significance at a regional level.

The whole Kosciuszko landscape has been affected by the pastoral phase in Australia's national development, and it presents continuing evidence of this era. Significant evidence of the pastoral era on the landscape includes impressive and appealing cultural landscapes, vegetation change, changed fire regime, the presence of wild horses and other introduced species, and distinctive erosion patterns. Much of this evidence constitutes damage to the pre-European environment left by the Aborigines, but this record also has significant historic and scientific value.

State or regional significance of mining — 19th century mining rushes

The significance of this theme in the alps can be summarised as:

- first bringing significant numbers of Europeans into the mountain environment;
- bringing colonial government action into the alps;
- stimulating regional service industries such as agriculture and saw milling, and developing regional economies; and
- overlaying an infrastructure on the alps, particularly towns, roads and tracks.

The mining rushes of the 1850s and 1860s, of which the sites in Kosciuszko, especially Kiandra, were a part, represent a theme of national historic importance, encompassing a major historical development which had crucial social and economic consequences. Mining had a major impact on the alps, not so much because of the actual area mined, but because of the intensiveness of the operations. Mining brought large numbers of people into the alps at a time when they were sparsely settled or unexplored, and provided considerable impetus to infrastructure development (roads etc.), regional supply and service industries (farming, saw milling etc.) and the development of fledgling towns of the region. The complex of sites taken as a whole has the capacity to vividly illustrate the drama of the mining rushes of the 19th century and the intensity of individual effort and expectations. Together they provide a regional expression of a theme of national importance.

State or regional significance of mining

At the level of state significance, Kiandra has significant historic themes which relate to the importance attached to the discovery of gold by NSW, and the hopes and infrastructure invested in field as a potential solution to the state's economic woes and as successful competition to the Victorian gold fields.

Other places within the park have been assessed as being of state significance because they are outstanding examples of different types of mining of different minerals — gold, copper, silver-lead. The sites hence have considerable historic and scientific value because of their research potential in a number of fields. They have representatives of a large range of structures and artefacts. They are outstanding examples of living and working conditions in a remote and rugged Australian environment. The sites at Grey Mare and Tin Mine and New Chum Hill, South Bloomfield and the Empress Mine within the Kiandra historic area fall into this category. The Tin Mine is notable for its extant huts with their wealth of associations and representative construction techniques.

State or regional significance of recreation — Yarrangobilly Caves complex

Yarrangobilly Caves complex and Caves House and associated developments, have state\regional historic and aesthetic significance as part of complex of cave sites developed for tourism as part of an important national social movement. The remains of the other government built accommodation within the park is of state significance, reflecting an important historic state government initiative, the associated typical architecture and infrastructure, and as representing an important social movement

State or regional significance of recreation — ski fields and ski resorts

The ski fields and ski resorts have elements of State or regional significance for historic, aesthetic and social reasons because of the important social movement they reflect and represent, and because of elements of the architecture and layout, which reflect important developments in the history of post-war design, and its adaptation to the high country. Individual buildings that have been listed in Freeman's *Ski Resorts Study* of 1998 include Rock Creek, Telemark and Edelweiss at Perisher Valley Resort, and the Chalet at Charlotte Pass resort as being of State significance, and the Perisher Valley resort and Smiggin Holes resort as a whole as being of regional significance for the cultural landscape values implicit in their development plans. Freeman's *Ski Resorts Study* of 1998 lists 27 other buildings and elements as being of regional significance and 34 as being of local significance.

Social

State or regional significance of social aspects — birthplace of recreational skiing

Kiandra was the site where it all began with the establishment of a ski club. It is sometimes claimed that this was the birthplace of skiing as a recreation (rather than as a mode of movement for work or military purposes). But for present purposes, it did provide the beginning of a significant change in land use within the alpine area. Participation in skiing and other snow sports has increased to a remarkable degree, but more importantly, the snow sports have changed from a relatively informal community-managed activity to be a major industry.

Use

State or regional significance of recreation as a use value

From a regional perspective the recreation use values are significant; it has been estimated that the value of recreation in the NSW part of the Australian Alps is in the order of $5 billion per annum. It is harder to classify the values from a national perspective, because there is little information on recreational use values for different sites within Australia.

Values of local and park significance

Earth science

Local or park significance of Ordovician to Lower Devonian features

Areas of particular significance at state and park levels are the limestones with associated karst features, identified elsewhere in this statement. The landforms surviving from the later part of this period and on into the Tertiary are of significance in understanding the evolution of much of eastern Australia.

Gold around Kiandra and the Grey Mare Range, copper and gold at Ravine-Lobbs Hole and tin in the southwest were economically significant and were the basis of former mining activities.

Local or park significance of Tertiary features

The deep weathering of granitic rocks seen in road cuttings is a common feature in Australia and most mid-to-low latitude countries; it is of park significance only.

Karst

Local or park significance of Cooinbil karst

Significance is local, but the area is potentially significant as site for education/interpretation of karst and the impacts consequent on climate change and European occupation.

Local or park significance of Jounama Creek and Black Perry Mountain karst

The significance of the karst and caves at Jounama Creek and Black Perry Mountain is local.

Local or park significance of Cowombat Flat karst

Significance is local.

Cultural heritage

Local or park significance of mining

The majority of mining sites within Kosciusko, being of a fairly low yield on alluvial deposits, were mined for a short period with very simple methods and using machinery only on a very small scale. They demonstrate basic technologies that are commonly represented elsewhere, and they exhibit low key and not easily interpreted evidence of mining and settlement that are duplicated throughout the alps. They are of regional or local significance.