Chapter 21
knowledge gaps

Lorraine Cairnes

The role of knowledge in management of the values of Kosciuszko National Park

This report identifies the values of Kosciuszko National Park, based on existing knowledge that has been interpreted by experts in areas related to those values.

Adequate knowledge is needed to understand the values of the park, and to conserve them by appropriate management, even though there will always be gaps in that knowledge. The Australian Natural Heritage Charter (2nd Edition 2002) acknowledges the principle of uncertainty:

> *that our knowledge of natural heritage and the processes affecting it is incomplete, and that the full potential significance or value of natural heritage remains unknown because of this uncertain state of knowledge.*

This principle can be extended to other values.

Perfect understanding and knowledge of the park's values is not possible, and in fact is not needed for management, provided that the park is managed conservatively and changes are made only when there is sufficient knowledge to give confidence that the values will not be degraded or lost.

In Kosciuszko National Park, research, studies and monitoring will remain a priority because the changing landscapes and shifting pressures placed on the park require continuous management responses and new decisions. Also, improved knowledge will provide increased opportunities for education and interpretation across a wide range of topics.

The Independent Scientific Committee (ISC) has identified areas where additional understanding is needed to manage and protect the park's significant values.

Key knowledge needed to manage and protect significant park values

General

There is a need for knowledge and understanding of the way in which changes in management direction, actions and approaches may impact on the values of the park.

Natural values

The report identifies certain actions that need to be taken to provide the knowledge required to manage and conserve the park's natural values. These are summarised in Table 21.1.

"The ISC is aware that the park holds much more information than is yet known."

Table 21.1 Natural values — knowledge needed and actions required

Knowledge gap	Actions needed to fill the knowledge gap
Impacts of climate change on the park's biodiversity assets, particularly the alpine environments	Establish monitoring of key indicators to determine feasible management options, including the role of the park as refugia for species outside the park
Detailed information on geological features such as periglacial features, especially in ski resort areas and high visitor use areas	Carry out detailed geological mapping to identify and date key features; radiometric dating of periglacial features
Information is needed on impacts on Holocene values: • What effect will the use of artificial snow have on stream processes? • How much erosion and other effects might occur in a 100 year flood? • Will significant climatic change occur and, if so, what will be its effects on earth processes?	
The Cooleman and Yarrangobilly karst areas are lacking information on terrestrial flora, subterranean fauna, hydrological relationships, long-term fire history and landscape evolution.	The manifold values of karst provide many opportunities for research and interpretation of natural environments
The tufa deposits at Ravine / Lobbs Hole have not been investigated for any evidence of vegetation or climate change.	More study of these Quaternary landscape features is warranted
Status of aquatic ecosystems (needed to establish pressures, thresholds and impacts caused by recreation management)	Monitor water quality in key streams across the park
There is little seasonal and no long-term data on species composition and the stability of the assemblages for benthic fauna. This might give some idea whether climate change is affecting lakes in Kosciuszko National Park.	Sampling of at least the littoral zone of the four lakes once every few years in summer would be feasible
Streams and rivers have been examined only in small sections of Kosciuszko National Park. Park-wide surveys of freshwater invertebrates should be made, emphasising taxonomic aspects, as there may well be undescribed species in these groups endemic to the park	Studies should target groups such as mayflies, stoneflies and caddis flies, which are thought to be most sensitive to human disturbance
The broad-scale sampling of reference sites for the alpine AUSRIVAS model should continue. The current model is based on collections from a single summer period.	Additional sampling will increase the reference site database, which should improve the reliability of model predictions; and continued sampling may indicate the extent of any secular changes in benthic fauna due, for instance, to climate change
Changes in biodiversity and ecological integrity	• Establish quantifiable reference points for monitoring such changes • Establish framework (habitat hectares) for measuring egetation condition. • Examination of meso predator release and exotic grazing pressure on ecological function.
Understanding of ecological processes at a landscape scale	Continue or initiate studies
Understanding of the mesopredator system in the park, with the aim of restoring the dingo–quoll predator system and establishing landscape-scale control of both foxes and cats.	Extend existing research
Extent of erosion over the whole park(including post-grazing recreational tracking, service roads and tracks, development sites, and other disturbance sites)	Survey and map current erosion
Ecology of, and threats from, pest animals and weeds	Map weed distribution; assess potential for spread of pest animals (including release of mesopredators) and weeds; monitor introduced plants (particularly in ski resorts and areas with high visitor use)
Strategic knowledge to thwart the expansion into alpine areas in the park of the suite of feral grazers (eg horse, deer, pig and rabbit), which are profoundly altering the natural ecological grazing regime	Research initiated, with the aim of efficient and effective control or elimination
Potential for introduction of diseases (eg phytophthora fungus) and possible impacts on the native biota	Assess risks

Knowledge gap	Actions needed to fill the knowledge gap
Ecological role of invertebrates, including soil invertebrates (the major grazers in the alpine zone), including subterranean biodiversity and nutrient availability	Initiate study
Ecology of key fauna species and groups (eg relationship between arsenic, Bogong Moths and *Burramys*)	Extend or initiate studies to assist their management and meet statutory recovery requirements for threatened species
Ecology and taxonomy of alpine animals and plants and their relationships to flora and fauna in other countries	Initiate co-operative studies
Tree lines, frost hollows and karst terrains	Study to improve knowledge and understanding of the environment before grazing stock were first introduced
Techniques for unbounded patch burning within the dry eucalypt and lowland grassland ecosystems of the park	Research directed towards developing required techniques
Ecology of montane and lowland eucalypt communities in terms of past and present fire regimes throughout the park	Study with reference to tree rings, pollen, karst, tufa deposits and soils
The condition of the vegetation (and habitat) of the park, linked to surrounds to assist resolution of questions concerning seral stages and area of mature vegetation, and fire regimes	Geographic information system (GIS)-based systematic evaluation
It is important that KNP takes the opportunity following the 2003 fires to correlate the fire intensity with vegetation condition and fauna habitat, and track this through time and to quantify vegetation and habitat condition with catchment condition, both within KNP and the down stream ecological services	Post-fire study to quantify vegetation and habitat condition with catchment condition, both within KNP and the down stream ecological services

Landscape values

The report identifies certain actions that need to be taken to provide the knowledge required to manage and protect the park's landscape values, these are summarised in Table 21.2.

Table 21.2 Landscape values - knowledge needed and actions required

Knowledge gap	Actions needed to fill the knowledge gap
Natural aesthetic usage and the nature of people's perceptions of naturalness	Landscape analysis using viewfield analysis and social research
Understanding of means of integrated protection of landscape and catchment quality	Develop effective method of measuring.
Understanding of the economic, social and environmental benefits and costs of fire trails and other management access roads in wilderness	Critical review of issue
There are no data on the penetration of unnatural noise into the undeveloped parts of the park	Sampling study

Cultural values

The report identifies certain actions that need to be taken to provide the knowledge required to manage and conserve the park's cultural values, these are summarised in Table 21.3.

Table 21.3 Cultural values - knowledge needed and actions required

Knowledge gap	Actions needed to fill the knowledge gap
Aboriginal use and values of the park area	Systematic study to compile e database and knowledge of Aboriginal use and values of the park area controlled by Aboriginal community (an Aboriginal heritage study is currently being conducted that may yield information useful to managers)
Non-Aboriginal cultural heritage	Research identified by Australian Alps Liaison Committee

Recreational values

The report identifies certain actions that need to be taken to provide the knowledge required to manage and protect the park's recreational values, these are summarised in Table 21.4.

Table 21.4 Recreational values — knowledge needed and actions required

Knowledge gap	Actions needed to fill the knowledge gap
Specific, detailed information about tourism and park visitation, such as: social and environmental impacts of visitor use and visitor infrastructure tourism supply and demand issues trends in visitor's expectations of services and facilities regional recreational opportunities and the packaging of opportunities extending beyond Kosciuszko National Park opportunities for educational use and interpretation, modelled on the success of current programs.	Develop a management model of opportunity settings for tourism and recreation within the park; gather information about recreational activities, uses and trends; develop a model of thresholds to show unacceptable levels of impact. Review of activities appropriate inside and outside the park
Baseline environmental and social performance levels for sustainable tourism for Kosciuszko National Park	
Visitor use limits related to physical impacts and visitor experience for areas of high use and high environmental sensitivity (eg Kosciuszko Summit in peak periods, individual caves at Yarrangobilly, Blue Waterholes area and horse riding trails and sites)	
Access information, particularly the limits needed for access arrangements in their current form; visitor-use profiles for the different forms of access to the park; alternative access opportunities for the park; cost–benefits of investments in the provision and maintenance of access for tourism and recreation; environmental and social effects of the provision of access; and the carrying capacity of access roads to the ski resorts.	

Social values

The report identifies certain actions that need to be taken to provide the knowledge required to manage and protect the park's social values, these are summarised in Table 21.5.

Table 21.5 Social values - knowledge needed and actions required

Knowledge gap	Actions needed to fill the knowledge gap
Information on the social aspects of visitation within Kosciuszko National Park, which is critical for management	Additional research
Information about the views and values of park communities and visitors, including information on the regional perspective of park neighbours	Additional research
Information aimed at understanding the diverse values and views of the range of people who regard themselves as having a relationship with Kosciuszko National Park	Additional research

Economic values

The report identifies certain actions that need to be taken to provide the knowledge required to manage and protect the park's economic values, these are summarised in Table 21.6.

Table 21.6 Economic values — knowledge needed and actions required

Knowledge gap	Actions needed to fill the knowledge gap
Economic benefits of the park and its values	Implement economic valuing or a choice modelling survey to identify these benefits and values (would need to be within a wider state or national context)
Costs of NPWS providing specific services and facilities to implement key aspects of the plan of management	
Value of catchment services in the water supply equation (would provide basis for determining cost of repair and maintenance of the catchments, including bushfire management)	Economic modelling
Value of other ecosystem services provided by the park	Economic modelling
Pricing, demand management, elasticity of demand and regional economic contributions through tourism	Economic modelling of tourism supply and demand as a basis for understanding (this is a variation of choice modelling)
A more detailed economic evaluation will need to be completed should significant changes to the management of the Park be considered. Such an evaluation would require the extra level of detail that can best be pursued once details of various options for changes to park management are known. Such an evaluation would also need to consider how the different values could be expected to change over time.	The evaluation would need to consider the impact of the various management options on the value of the future stream of goods and services provided by the Park. Such an evaluation would need to be conducted against an estimate of how the value of that stream could be expected to change in the absence of such management changes. It would also need to consider the distributional effects of those changes ie how the management changes could be expected to affect

Findings — knowledge gaps

The Kosciuszko National Park Plan of Management would benefit by inclusion of, or reference to, a protocol for knowledge management for the park that would:

- make existing knowledge available;
- incorporate and disseminate new knowledge as it becomes available; and
- record advice on existing and new knowledge needs of the park.

The values of the park should be reviewed from time to time to incorporate new knowledge and understanding. This process should not be dependent on a review of the plan of management, but should be a periodic and systematic procedure.

The actions needed to provide the knowledge for effective management of the park's significant values have been identified in the topic chapters and summarised here. In addition, there are gaps in our understanding of generic ecological processes in the Kosciuszko National Park and its region. These knowledge gaps include vegetational succession, predator-prey interaction, fire processes, ecosystem recovery from fire, and erosion.

A program to acquire the knowledge should be part of the monitoring framework, and an adaptive management approach should be used to determine further knowledge needs.

The cooperative management and liaison arrangements established for the Australian Alps national parks should be encouraged and strengthened, as they offer opportunities to share knowledge about the alps.

Unfortunately, the in-house resources devoted to research by the NPWS continue to decline; therefore, opportunities for collaborative research between the NPWS and other organisations should be pursued. The NPWS must maintain a high level of expertise in all of the park's value areas, otherwise there will be loss of understanding of essential knowledge areas and diminished ability to translate this knowledge into appropriate management responses (e.g. fire ecology and research over the past 15 years).

The knowledge gaps about the Kosciuszko National Park identified by the ISC should be addressed systematically in conjunction with the implementation of the plan of management.