

MANAGING THE KOSCIUSZKO ALPINE AREA: CONSERVATION MILESTONES AND FUTURE CHALLENGES



By Graeme L. Worboys and Catherine M. Pickering

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EXECUTIVE SUMMARY

The alpine zone around Australia's highest peak, Mt Kosciuszko is of high scenic, scientific, education and nature conservation significance. Although covering less than 0.001% of Australia, the area contains unique and distinctive biota including the mountain pygmy possum, 21 endemic species of plants and distinctive glacial features. It also has important social and spiritual significance both to aboriginal groups who have migrated to the area for thousands of years, and to European communities who have visited the area over the last 150 years. This beautiful environment is a conserved landscape, the result of a series of battles to protect the area from threats to the environmental integrity of the area. In the first part of this report, the four major conservation milestones achieved during the last 60 years are reviewed. These are: (1) removal of grazing, (2) amelioration of the impacts of hydroelectric scheme developments, (3) prevention of soil erosion and (4) management of tourism. These conservation milestones have required leadership, active management, effective planning and sheer perseverance by generations of scientists, conservation activists and managers. Future conservation will also require these skills and commitments to continue to preserve the alpine area.

As a result of past management achievements, the Mt Kosciuszko alpine area in 2002, is a major ecotourism destination, especially for summer day-walkers to the highest peak on the Australian continent. The popularity of this natural heritage not only vindicates the historical vision for its conservation but has also created a new conservation management imperative. Managing tourism in this very confined area is placing pressure on both infrastructure and the heritage values of the region. Numbers of tourists in the snow-free months have increased from 20,000 per year in the late 1970's to around 64,000 people per year in 2000. Around 21,000 of these visitors walk to the summit of Mt Kosciuszko. Tourism will continue to increase as it is actively promoted by tourism organizations as it is a critical industry for the local economy. Within this operating environment, the New South Wales National Parks and Wildlife Service (NSW NPWS), the agency responsible for management and conservation of the region, has undertaken

management planning and is implementing works to help conserve the alpine area. This will mean dealing with many management challenges, some of which have been identified in this report.

A new Management Plan for Kosciuszko National Park is expected to be completed for exhibition in 2003. The issues raised in this report illustrate the types of new conservation milestones that must be achieved to ensure that the management of Kosciuszko National Park conserves and sustains this scientifically significant and limited alpine environment for current and future generations to enjoy.

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1. INTRODUCTION

The most extensive contiguous alpine region in Australia is found around Mt Kosciuszko in the Snowy Mountains, part of the Great Dividing Range and associated mountains in the south east of mainland Australia (Costin 1989). Other alpine regions occur as relatively isolated areas centred on the higher peaks between Mt Hotham and Mt Bogong in Victoria and in the Central Highlands and higher peaks in Tasmania (Costin 1989). Mt Kosciuszko and the associated peaks of the main range are protected within the Kosciuszko National Park (698 000 ha) in New South Wales. This park is one of a series of linked Australian Alps National Parks that conserve around 62% (15 000 km²) of the mainland alpine and subalpine region (Worboys 1996, Figure 1).

The alpine region around Mt Kosciuszko extends from the upper limits of tree vegetation, at about 1830 metres, to the top of Mt Kosciuszko, at 2228 metres and covers around 100 km², less than 0.001% of Australia (Costin 1989). Unlike the steep saw-tooth mountain ranges characteristic of many alpine mountain ranges elsewhere in the world, the alpine region around Mt Kosciuszko consists of an undulating plateau with a gradual stepped fall to the east, and a steeper western slope (Costin 1989).

In many respects, the climate of the Mt Kosciuszko alpine region is similar to that of other alpine areas, with cold, snow-covered winters and short, warm summers. The mean temperature of the warmest month is approximately 10°C (Costin *et al.* 2000). Snow covers much of the area from June to October, leaving around seven months of the year snow-free (Galloway 1988, Brown and Millner 1989). The first major snowfalls often occur in May and by June there is often complete snow cover. Snowmelt occurs from September to October, although late snowfalls can delay the spring snow-thaw and snowpatches may persist for several months after the general thaw (Brown and Millner 1989).

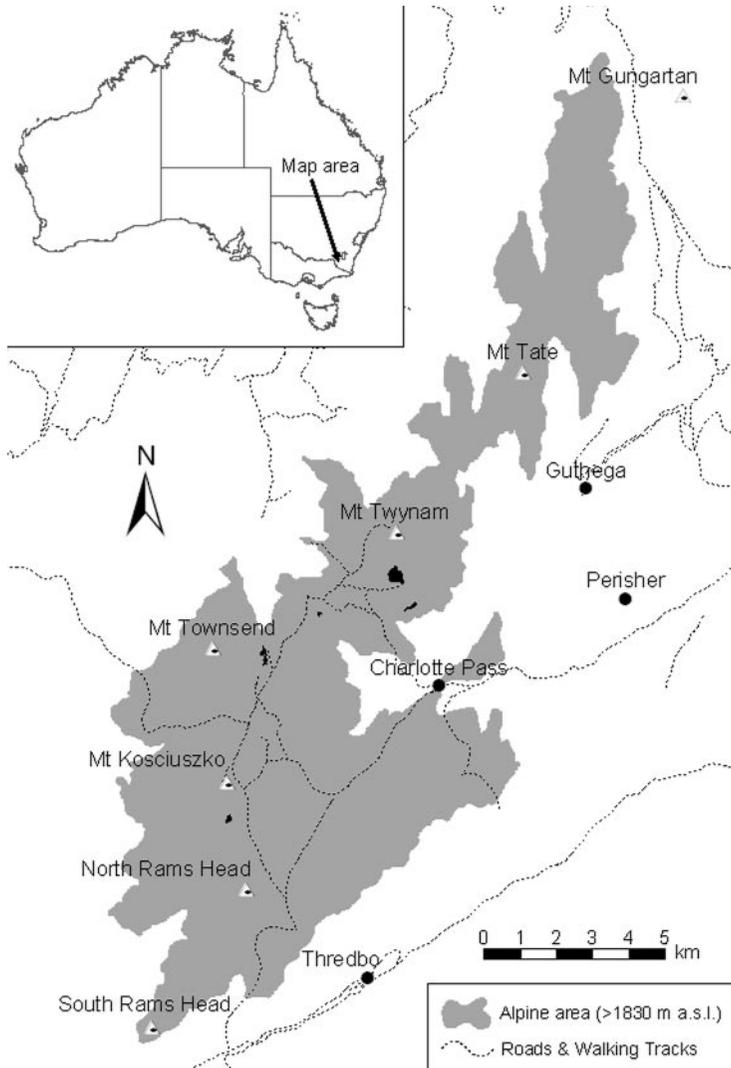
Mt Kosciuszko and the contiguous alpine area surrounding it (Figure 2) is considered to be of outstanding natural value, contributing to the potential World Heritage listing of the Australian

Alps (Mosley 1992, Costin *et al.* 2000). The alpine area is recognized as an 'Outstanding Natural Area' by the 1982 Kosciuszko Plan of Management. Along with the rest of the park, it has also been recognized as a World Biosphere Reserve under the UNESCO Man and the Biosphere Program since 1977 (NSW NPWS 1982, Costin *et al.* 2000). The management of this area is the responsibility of the New South Wales National Parks and Wildlife Service (NSW NPWS). The vision should be to conserve the characteristics that make the area of such outstanding conservation value.

Figure 1. The Australian Alps National Parks (Adapted from AALC 2000).



Figure 2. Mt Kosciuszko alpine area.
(Adapted from Pascal Scherrer 2001).



2. CONSERVATION SIGNIFICANCE

The Kosciuszko alpine area has great biological and geomorphological significance (Good 1992). It contains important natural features including glacial landforms such as 13 glacial cirques, and lakes, moraines deposits and glacial erratics. In addition there are periglacial features such as solifluction terraces and deposits, frost hummocks, block streams and string bogs (Worboys 1982, Galloway 1989, Good 1992). Although limited in area, these landforms represent important evidence of the effects of glaciation in the area and of the geological history of mainland Australia (Galloway 1989, Good 1992).

The Australian Alps are also of enormous biological importance, for Australia and internationally. The unique and distinctive biota contains a large number of endemic species, including the mountain pygmy possum (*Burramus parvus*), considered to be a living fossil (Broome and Mansergh 1989, Good 1992, Green and Osborne 1994). The flora is of particular importance, as it contains distinct combinations of plant species, some of which are related to those of alpine areas elsewhere in the world, but many of which are indigenous and mirror the biological isolation of Australian flora (Good 1992, Costin *et al.* 2000). This uniqueness is reflected in the large number of endemic and rare species amongst the flora, one of the highest proportions in the world (at least 21 endemic species, and 33 rare species out of some 204 species of flowering plants, Good 1992, Costin *et al.* 2000). Both plants and animals show a range of distinctive adaptations to the alpine environment, for example body temperature regulation by several grasshopper species, and a modified type of hibernation in the pygmy possum (Green and Osborne 1994). An impressive component of the biota are the interactions, particularly in the formation of specialised plant communities (Good 1992, Costin *et al.* 2000). These include the highly restricted and site specific snowbank and feldmark communities along the highest parts of the alpine area, both of which support endemic plant species of high conservation value.

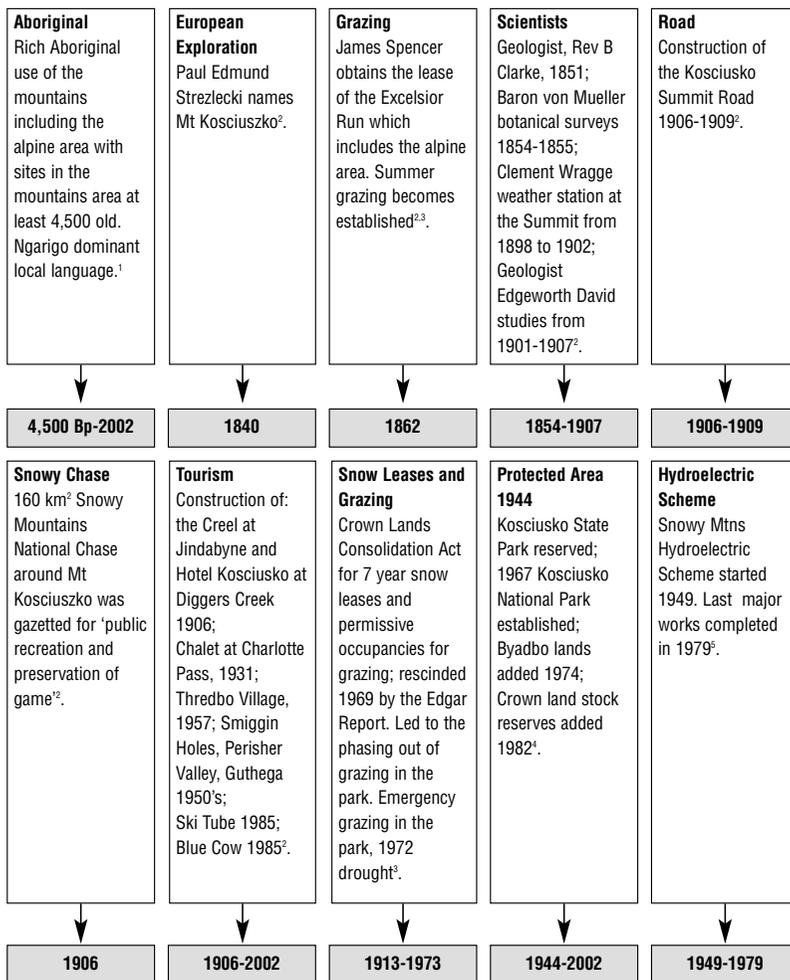
The region also has important spiritual and social significance. It has been an area of migration and occupancy for different Aboriginal groups for thousands of years (Good 1992, Young 2000). For many local residents and others who were involved in the early settlement

of the area it has special significance particularly for those involved in early high country domestic stock grazing. It is not only the story of stockmen but also that of permanent settlements such as Coolamine, Currango, Yarrangobilly, Lobbs Hole and Kiandra (Young 1991). The great aesthetic appeal of the landscape contributes to its value to tourists. The alpine area and surrounding region is an Australian icon.

3. SETTING THE SCENE: LANDUSE FOR THE SNOWY MOUNTAINS

The history of landuse for the Snowy Mountains including the Mt Kosciuszko alpine area is a rich story (Appendix A). There have been thousands of years of occupancy and use by the local Ngarigo Aboriginal people and other Aboriginal peoples during the summer months (Young 2000, Figure 3). Starting around 160 years ago there was European exploration of the area including the ascent and naming of Australia's highest mountain, Mt Kosciuszko by Paul Edmund Strezlecki in 1840 (Good 1992). Use of the region for summer grazing commenced in the 1860's and continued until the 1970's. Scientific studies of the area started in the 1850's including the very significant botanical surveys of Baron von Mueller (1854-1855). The studies continue to the present with extensive research into the ecology of the region and its management (e.g. Barlow 1986, Good 1989, Good 1992, Green and Osborne 1994, Green 1998, Costin *et al.* 2000, Johnston S. and Pickering 2001 a and b, Scherrer and Pickering 2001, Pickering *et al.* 2002).

Figure 3. Summary of landuse history from 4500 BP to 2002 for the Kosciuszko alpine area.



¹Young, M. 2000. *The Aboriginal People of the Monaro*. NSW National Parks and Wildlife Service, Sydney.

²Good, R. B. 1992. *Kosciusko Heritage: The Conservation Significance of the Kosciusko National Park*. NSW National Parks and Wildlife Service, Sydney.

³Young, M. 1991. *Kosciusko Grazing. A History*. NSW National Parks and Wildlife Service, Sydney.

⁴NSW NPWS 1982. *Kosciusko National Park Plan of Management*. NSW National Parks and Wildlife Service, Sydney.

⁵McHugh, S. 1995. *The Snowy: the People Behind the Power*. Angus and Robertson Harper Collins Publishers, Sydney.

Formal conservation of the region commenced in 1906 with the gazetting of the Snowy Mountains National Chase around Mt Kosciuszko. In 1944 the Kosciuszko State Park was declared, with the subsequent establishment of the Kosciuszko National Park in 1967 (NSW NPWS 1982, Good 1992). Mainstream tourism commenced with the construction of the Kosciuszko Summit Road in 1906. It expanded rapidly in the 1950-60's with the development of ski resorts in the subalpine and alpine areas, and continues to increase in popularity. The Snowy Mountains Hydroelectric Scheme constructed within the region was subsequently nominated by the American Society of Civil Engineers as one of the engineering wonders of the world (McHugh 1995).

In addition to these land use practices, there have been moves to conserve the region and restore areas adversely affected by the different land uses. As part of this process a series of conservation milestones have been achieved despite powerful political opposition, antipathy from sceptics and the reality that some deeply entrenched land uses existed. Milestones include the removal of grazing; protection from the impacts of several hydroelectric engineering works; prevention and rehabilitation of soil erosion, and development of more sustainable tourism practices.

3.1 Conservation milestone: removal of grazing

Grazing in the alpine and subalpine areas around Mt Kosciuszko may have started in the early 1830's (Young 1991). It was formalised with the granting of the Excelsior Run to James Spencer in 1862 with extensive summer grazing by cattle and sheep in the alpine and subalpine areas (Good 1992, Worboys *et al.* 1995, Figure 4). Snow leases were granted from 1913, with seven year snow leases being the standard lease condition for areas above 1300 m from the 1920's (Young 1991).

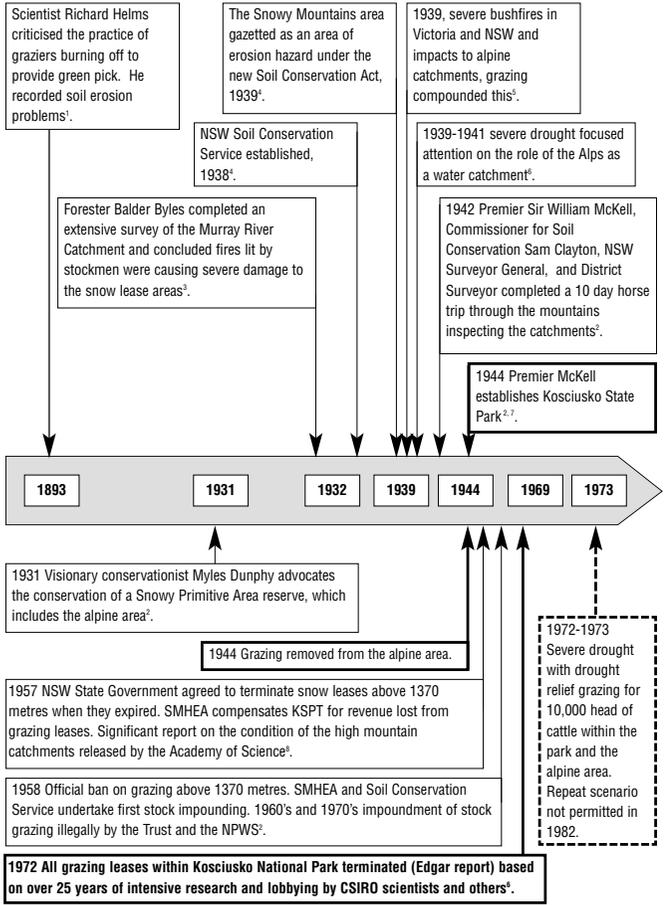
Richard Helms raised the first concerns about the environmental impacts of regular burning and grazing and consequent soil erosion in the alpine area in 1893 (Helms 1893, Figure 4). However it was during the 1930's that the first real stirrings of opposition to this land-use gained momentum as erosion had become severe in many areas (Byles 1932). Farsighted conservationists had recognised the

exceptional, intrinsic values of the mountains: in addition the significance of the mountains for water was becoming more important than the localised benefits of raising stock (Good 1992). The Snowy Mountains were critical for the regular flow of water to the major inland flowing rivers, the Murray and Murrumbidgee. The potential for hydroelectric developments had also been suggested and as a result the protection of catchment values became a strong ally for conservation objectives (Worboys *et al.* 1995).

Protection of the Snowy Mountains from the impacts of grazing was achieved following a key political decision. The visionary Premier of NSW, Sir William McKell, created the 5286 km² Kosciusko State Park by Act of Parliament on the 19th April 1944. Although this meant grazing was removed from the immediate alpine area, it took another thirty years of research, politicking, removal of illegal cattle grazing, concerted lobbying and immense personal courage by a few to finally end the practice of grazing in the mountains (Figure 4 and associated references). Grazing had been a landuse for over 120 years in the Snowy Mountains, and was part of everyday life for several generations of locals. Legends of the feats of mountain stockmen and their horses became a significant part of local and Australian folklore. The cessation of grazing was a major conservation achievement (Costin *et al.* 2000).

During the drought of 1972/73 grazing once again took place as politicians consented under enormous pressure from graziers and allowed 10,000 stock within the park (Young 1991). An attempt was made to repeat this precedent during the drought of 1982 but was found to be illegal under the new 1982 Kosciusko National Park Plan of Management. It was the end of grazing in the park.

Figure 4. History of campaign to protect the Kosciuszko alpine area from effects of grazing.



¹Helms, R. 1893. Report on grazing leases of the Mount Kosciuszko Plateau. *NSW Agricultural Gazette* 4: 530-531.

²Mosley, J. G. 1992. Conservers of the Australian Alps. In: *Cultural Heritage of the Australian Alps*. Scougall, B. ed. Australian Alps Liaison Committee, Canberra.

³Byles, B.U. 1932. *Report on the Murray River Catchment in New South Wales. Bulletin No 13*. Communication of Forestry Bureau Canberra.

⁴Irwin, F. and Rogers, J. 1986. *Above the Treeline*. Soil Conservation Service of NSW, Sydney.

⁵Worboys, G.L. 1996. The Australian Alps National Parks and protected area management. *PARKS*. Vol 6 No 1, February 1996. Mountain Protected Areas IUCN. Gland Switzerland pp. 33-40.

⁶Good, R. B. 1992. *Kosciuszko Heritage: The Conservation Significance of the Kosciuszko National Park*. NSW National Parks and Wildlife Service, Sydney.

⁷Byles, B.U. 1964. The Kosciuszko State Park. *Australian Forestry* 28: 4.

⁸Australian Academy of Science. 1957. *A Report on the Condition of the High Mountain Catchments of New South Wales and Victoria*. Australian Academy of Science. Canberra, May 1957.

3.2 Conservation milestone: amelioration of impacts from Hydroelectric Scheme developments

The Snowy Mountains Hydroelectric Scheme (the Snowy Scheme) constructed by the Snowy Mountains Hydroelectric Authority, the SMHEA, was an ally in the campaign to remove grazing from the alpine area (Good 1992, Worboys *et al.* 1995). This large-scale engineering scheme provides for the production of electricity and the provision of water for irrigation along the inland river systems. Water is diverted from the easterly flowing Snowy River and tributaries into the westerly flowing Murrumbidgee and Murray Rivers, using a series of dams and tunnels through the Snowy Mountains (Good 1992).

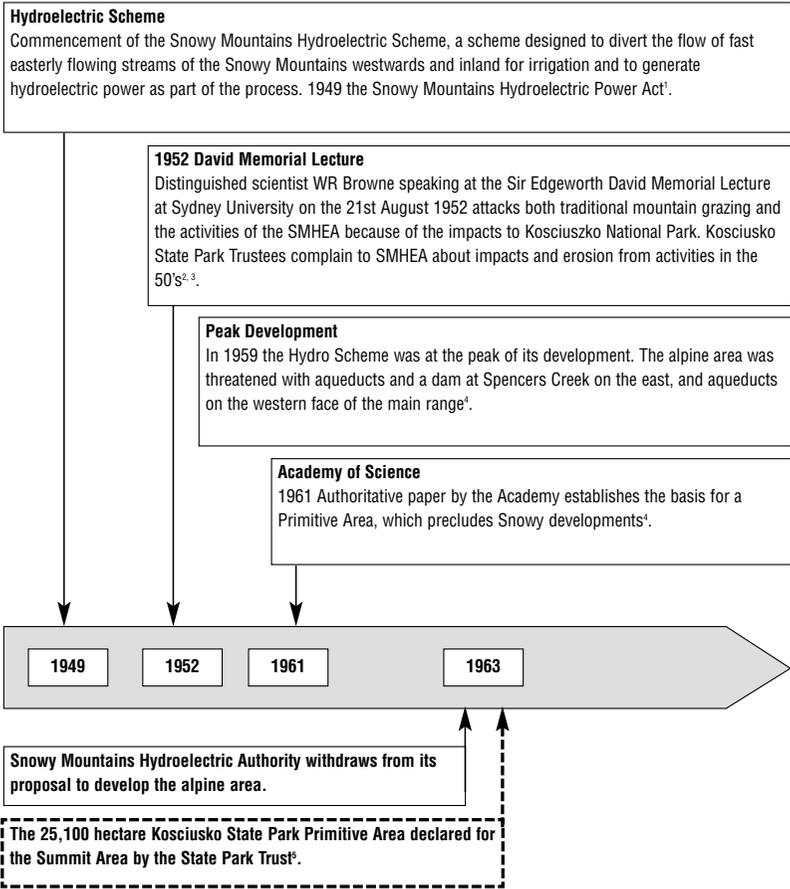
Soil erosion due to grazing and associated burning was a direct threat to the stability of the catchments of the Snowy Scheme and its operation. Studies had shown that the economic value of the catchments for water yield far outweighed that of grazing being around 120 times that of grazing (AUD \$700 per hectare for hydro electricity compared to AUD \$6 per hectare for grazing, Good 1992).

The Snowy Scheme itself soon became a new threat to the intrinsic values of the alpine area (Costin 1970, Good 1992, Figure 5). Ambitious engineering plans were devised to tap every possible source of water to achieve maximum advantage for the hydroelectric scheme. There were proposals for the establishment of a dam on the east side of the alpine area at Spencers Creek, and the placement of aqueducts in the alpine area and across the steep west face of the main range (Australian Academy of Science 1961). Thanks to a prominent campaign by the distinguished scientist W R Browne, the Academy of Science and the Kosciusko State Park Trust, for the establishment of a 25,100 hectare Primitive Area for the alpine area, these proposals were withdrawn (Australian Academy of Science 1961, Worboys *et al.* 1995, Figure 5). The unique alpine area and some of Australia's finest scenery was saved from major civil engineering works.

3.3 Conservation milestone: prevention and rehabilitation of soil erosion

Loss of vegetation associated with grazing and burning, combined with frost heave and other erosive factors, resulted in extensive soil erosion in the alpine area of Kosciuszko (Costin 1958, Costin 1970). The damage to soils and vegetation was so severe in many areas that erosion continued even though grazing was removed (Costin 1958, Good 1992). The degraded state of these catchments led to the development and gazetting of the NSW Soil Conservation Act of 1938. Some 20 years later, the Soil Conservation Service of NSW undertook an ambitious project to repair around 5,500 hectares of minor to severe sheet erosion and erosion gullies in the alpine area (Irwin and Rogers 1986). The work, which has been recognized as one of the first major ecological rehabilitation projects in Australia, took nearly 25 years to accomplish in one of the harshest climatic areas of the continent (Irwin and Rogers 1986). It has resulted in the stabilization of soil erosion and restoration of a stable native vegetation cover in the headwaters of two of the most important of Australia's river systems, the Snowy and Murray Rivers (Figure 6). It has helped to protect the longevity of the dams and infrastructure of the Hydroelectric Scheme (Good 1992).

Figure 5. Prevention of Snowy Mountains Hydroelectric Authority (SMHEA) Hydroelectric Scheme developments in the Kosciuszko alpine area.



¹McHugh, S. 1995. *The Snowy: the People Behind the Power*. Angus and Robertson Harper Collins, Sydney.

²Gare, N. 1996. *The Park and the Snowy: A Potted History*. A report for the National Parks and Wildlife Service of NSW, Jindabyne.

³Browne, W.R. 1952. Our Kosciusko Heritage. *Australian Journal of Science Supplement* December 1952.

⁴Australian Academy of Science. 1961. *The Future of the Kosciusko Summit Area: A report on a proposed Primitive Area in the Kosciusko State Park*.

⁵Mosley, J. G. 1992. Conservers of the Australian Alps. In: *Cultural Heritage of the Australian Alps*. Scougall, B. ed. Australian Alps Liaison Committee, Canberra.

3.4 Conservation milestone: managing tourism

The outstanding natural scenery of the alpine area has been a major drawcard for visitors (Good 1992, Figure 7). As early as 1906, improving access for tourism resulted in the construction of a road to the summit of Mt Kosciuszko. Other tourism facilities developed during this early period include the Hotel Kosciusko at Diggers Creek constructed in 1909, and the Chalet at Charlotte Pass constructed in 1931 (Good 1992). The advent of the Snowy Scheme resulted in a rapid expansion in mountain tourism with the Scheme actively promoting tourism to the area to view the construction works. Employees of the Scheme, many of whom were post-war migrants from Europe, were also frequent users of the park particularly in winter. As a result of the increased interest in ski tourism a series of ski resorts were established in the subalpine areas of the park (Good 1992). By the late 1950's, visitors to Kosciusko State Park, as it was then, were in the order of 100,000 per annum (N. Gare pers. com.).

Within the Kosciuszko alpine area, early pioneering skiers in 1950's had received permission from the Kosciusko State Park Trust to construct the Lake Albina Lodge (on the western facing slopes of the Lake Albina Valley) and the Kunama Lodge near Mt Northcote, located between Mt Kosciuszko and Mt Twynam (Figure 2). Materials for the lodges were transported using a bulldozer and sled provided by the Trust, with the resultant track marks still apparent in 2002 (Worboys *et al.* 1995, authors pers. obs.). Kunama Lodge was subsequently destroyed by an avalanche in 1956 but was never reconstructed. Professional park managers, who had been appointed by the Trust in 1959, recognized that the locations of Kunama and several other proposed lodges were inappropriate and stopped the reconstruction of Kunama. This was the start of a new era of active planning and conservation. Following extensive public consultation Lake Albina Lodge was removed in the early 1980's to prevent further sewage pollution of Lake Albina, one of the purest fresh water bodies in Australia (Virtanen 1993, Worboys *et al.* 1995).

Tourism in Kosciuszko National Park increased in the 1970's with substantial increases in summer tourism in the alpine area (Virtanen 1993). By the early 1970's traffic jams were common along the old

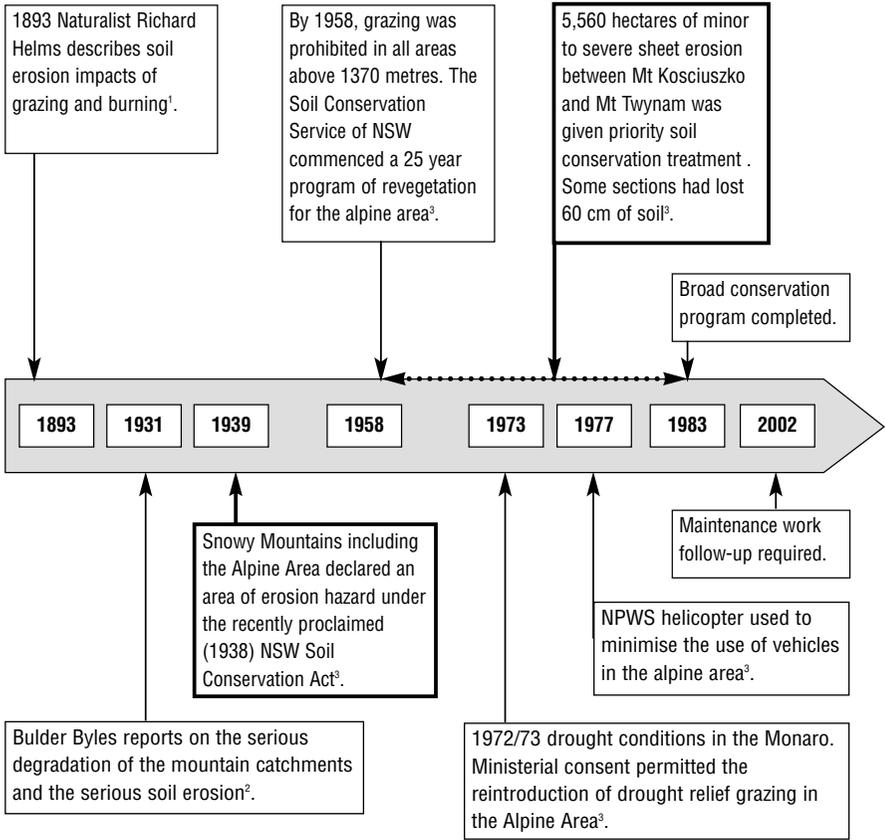
gravel Summit Road. A proposal for upgrading this road was the “obvious solution” as was development of a larger car park at Rawson Pass (just below the summit). Only the car park was completed despite the fact that road realignment and expansion had been surveyed and pegged ready for construction. Because of the congestion, private vehicles to the summit were banned, and a shuttle bus system used from Charlotte Pass to Rawson Pass (Figure 2). The NSW NPWS developed a planning discussion paper for the community in the late 1970’s outlining a different solution (Worboys 1978, NSW NPWS 1980). Despite some personal sceptical views expressed by several very senior staff members in the park agency, the discussion papers advocated a vehicle-free alpine area. There was overwhelming public support for the closure of the Summit Road at Charlotte Pass and this was accomplished legally in 1982. Restrictions on camping in the catchment of the glacial lakes were introduced soon afterwards in 1988 (Virtanen 1993, Figure 7).

4. THE CURRENT MANAGEMENT SETTING

Management of Kosciuszko National Park in 2002 is undertaken by two NSW NPWS regions; one based in a large National Parks and Wildlife Centre in Jindabyne in the southeast of the Park and the other at Tumut on the western side of the Park (Figure 1). Management of the park is now a major business. It is a far cry from when the first full time professional, Superintendent Mr Neville Gare commenced duties in Kosciuszko in 1959. He was responsible for four staff and an immense managerial task. Today there are over 60 staff based at Jindabyne with a specific management budget, and specialist alpine area research and management officers. Decisions about the alpine area are guided by the 1982 Plan of Management for Kosciuszko National Park (NSW NPWS 1982) which states that the park agency must:

1. Maintain the outstanding natural character of the area especially above the treeline.
2. Protect the alpine landscape from disturbance and to restore it to a state as close as possible to a natural condition.
3. Protect the most sensitive alpine plant communities from any disturbance and keep disturbance of even the most resilient plant communities to an absolute minimum.
4. Protect the glacial landforms and features.
5. Protect the periglacial landforms and features.
6. Maintain the water and aquatic communities of the glacial lakes in as natural a condition as possible.

Figure 6. Preventing soil erosion in the Kosciuszko alpine area.

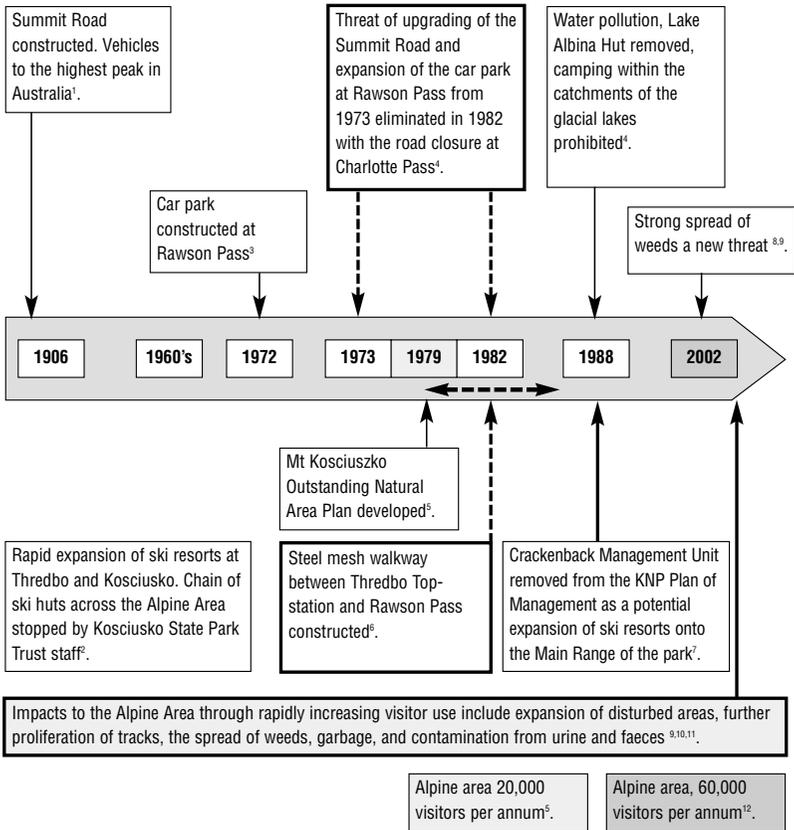


¹Helms, R. 1893. Report on grazing leases of the Mt Kosciuszko Plateau. *NSW Agricultural Gazette* 4: 530-531.

²Byles, B.U. 1932. Report on the Murray River Catchment in New South Wales Bulletin No 13. *Communication of Forestry Bureau*. Canberra.

³Irwin, F. and Rogers, J. 1986. *Above the Treeline*. Soil Conservation Service of NSW, Sydney, Australia.

Figure 7. History of tourism in the Kosciuszko alpine area.



¹Good, R. B. 1992. *Kosciuszko Heritage: The Conservation Significance of the Kosciusko National Park*. NSW National Parks and Wildlife Service, Sydney.

²Worboys, G.L., Pulsford, I. and Mackay, J. 1995. Conservation Gains, Setbacks And Opportunities, *Mt Kosciusko Alpine Area, Kosciusko National Park, NSW, Australia*. Paper presented to the IUCN Transboundary Mountain Protected Areas workshop, Australian Alps Liaison Committee, November 12-20.

³Blakers, L 1974. Personal communication to author G. Worboys.

⁴NSW NPWS 1982. *Kosciuszko National Park Plan of Management*. NSW National Parks and Wildlife Service, Sydney.

⁵Worboys, G.L. 1978. *The Mount Kosciusko Outstanding Natural Area Plan. A Supplementary Specific Plan to the Kosciusko National Park Plan of Management*. NSW National Parks and Wildlife Service, Jindabyne.

⁶Worboys pers. obs.

⁷NSW NPWS 1982. *Kosciuszko National Park Plan of Management. 1988 amendments to the Plan*. NSW National Parks and Wildlife Service, Sydney.

- ⁸Johnston, F.M. and Pickering, C.M. 2001. *Alien plants in the Australian Alps. Mountain Research and Development*. 21:284-291.
- ⁹Johnston, F.M. and Pickering, C.M. 2001. Yarrow, *Achillea millefolium* L.: A weed threat to the flora of the Australian Alps. *Victorian Naturalist* 118:230-233.
- ¹⁰Pickering, C.M., Johnston, S., Green, K. and Enders, G. 2002. People on the roof: Impacts of tourism on the alpine area of Mt Kosciuszko. In: *Nature Tourism and the Environment*. Buckley ed. Fenner Conference, Academy of Science, Canberra, 3-6 September, 2001.
- ¹¹Worboys, G and Pickering, C.M. 2002. Managing mountain ecotourism at Kosciuszko. *Proceedings of the Fourth Conference on the Protected Areas of East Asia*. IUCN World Commission on Protected Areas in East Asia Conference "Benefits Beyond Boundaries in East Asia" in Taipei, Taiwan, March 18-23 2002 p. 145-178.
- ¹²Johnston, S.W. and Pickering, C.M. 2001. Visitor monitoring and social expectations for track planning: a case study of the Kosciuszko alpine area. *Proceedings of the Mountain Walking Track Management Conference March, 2001*. Australian Alps Liaison Committee, Canberra. pp. 167-172.

The 1982 Plan provides a legal framework for management actions in the alpine area. It describes specific outcomes sought as well as a process for achieving them. Works such as track maintenance and construction for example, would be subject to a process that includes the preparation of a Review of Environmental Factors and a satisfactory report prior to any works being undertaken. This process usually involves public consultation on the proposed actions, a key step in enhancing the effective management of the area. The alpine area is sensitive to external pressures and the latest research and management techniques must be applied to ensure its conservation.

A series of plans guiding the management of the alpine area have been produced over the years including in 1965, 1974, 1978, 1982 and 1993 (Figure 8, Appendix B). Important conservation outcomes have been achieved as a result of these documents (Figure 9) but further planning is required to ensure current best practice is used. Specific operational plans such as the Mount Kosciuszko Outstanding Natural Area Plan (Worboys 1978) provided an inventory of actions to be undertaken. This document is now 24 years old but still serves as a checklist of progress for current managers (Appendix B).

Figure 8. Management planning for the Kosciuszko alpine area

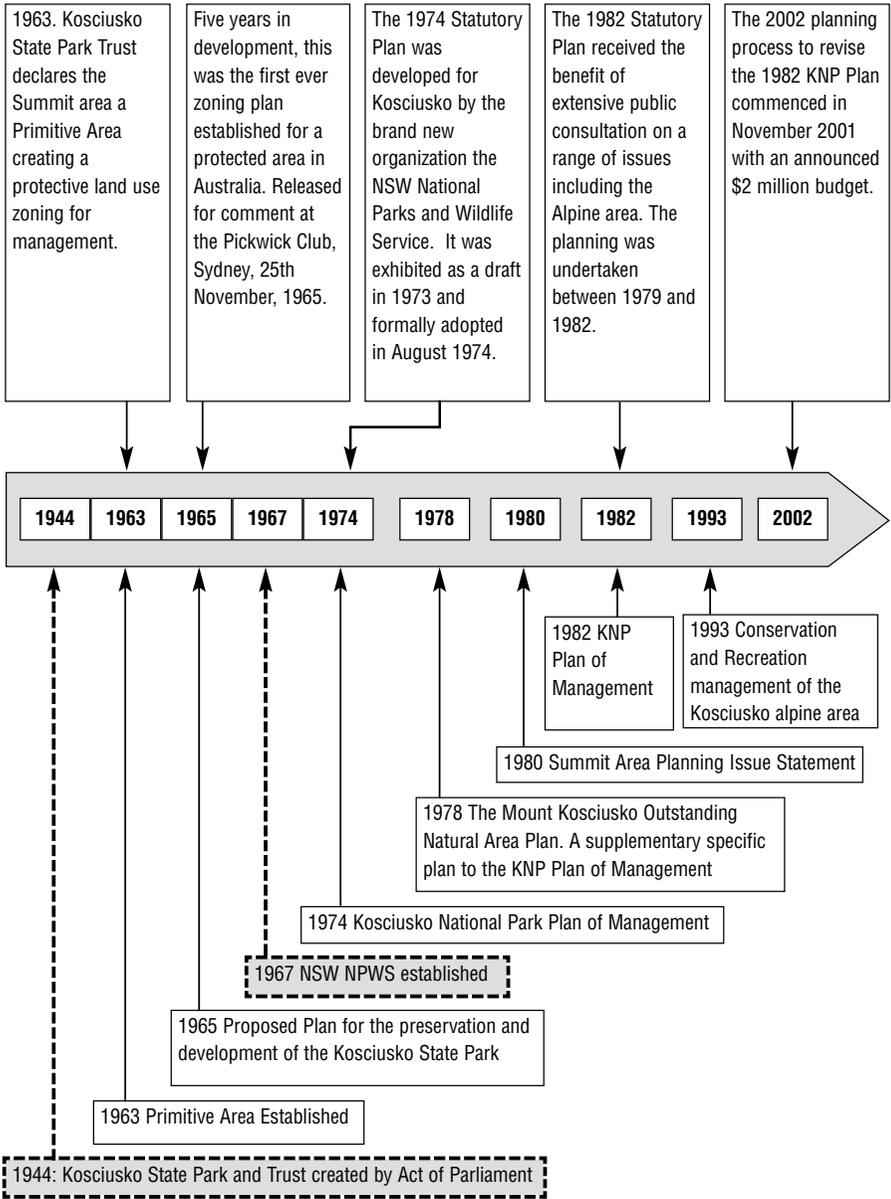
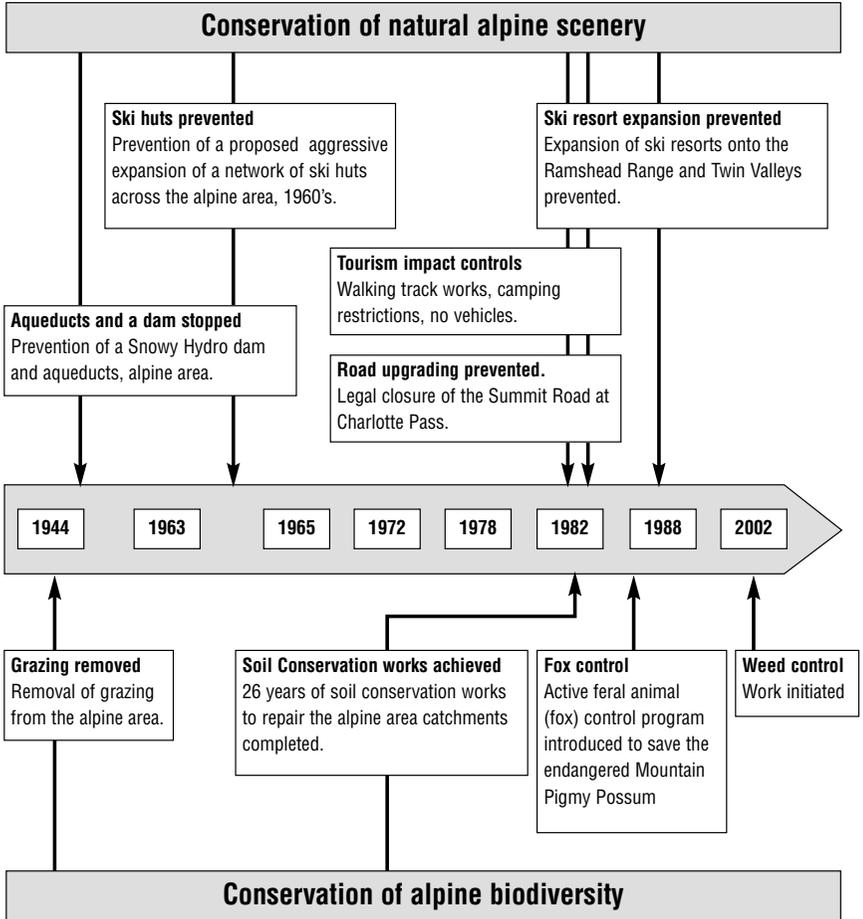


Figure 9. Significant conservation gains 1944-2002 for the Kosciuszko alpine area.



5. TOURISM TO THE ALPINE AREA IN 2002

Tourism in 2002 is the single largest form of landuse for the alpine area, and the second largest landuse for Kosciuszko National Park after the Snowy Mountains Hydroelectric Scheme (Good 1992). It is a multi-million dollar industry, and supports the economies of the principal towns surrounding the park. Tourism has grown from 100,000 visitors in the late 1950's to over three million in 2000. The alpine area shows the same trend, with growth in summer visitor use from an estimated 20,000 in 1977-78 (Worboys 1978) to 64,000 in 1999-2000 (Johnston S. and Pickering 2001, Figure 10).

5.1 Tourism characteristics

Winter tourism to the alpine area involves snow boarding, ice climbing, cross-country skiing and independent camping, with most people accessing the area from the adjacent subalpine resorts (Buckley *et al.* 2000, Pickering *et al.* 2002). Tourism during the snow-free period is far more popular and involves a greater range of activities and areas. Popular activities include day walks, often to the summit (81% of visitors), sightseeing (10%), camping, (2%), running, late season snowpatch skiing, photography, painting, rock climbing, abseiling, fishing and educational activities (collectively 4% of visitors to the area, Johnston S. and Pickering 2001, Figure 11).

Tourists tend to access the alpine area from just two sites; the top of the Crackenback Chairlift at Thredbo Village (68%), and from the road-head at Charlotte Pass (31%). Within the alpine area itself the most popular walk is from the Crackenback Chairlift to the summit of Mt Kosciuszko, with around 16,000 people undertaking the 10 km return trip along the raised metal walkway to Rawson Pass and then on to the summit of Mt Kosciuszko. Many people do not complete the full walk, but turn back before the first lookout (34%), or stop once they can see Mt Kosciuszko (10%). Eleven percent turn off the track and descend into the subalpine along the Dead Horse Gap walk (Arkle 2000).

Figure 10. Growth in Summer tourism to the Kosciuszko alpine area 1977 – 2000.

Estimate for 1990-91 only includes people spending a half day or longer in alpine area and thus underestimates total numbers (Virtanen 1993).

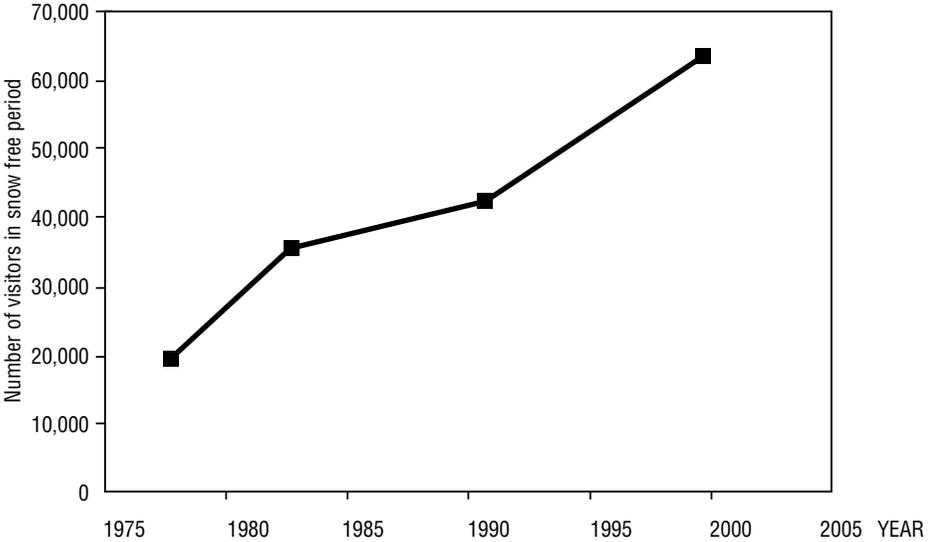
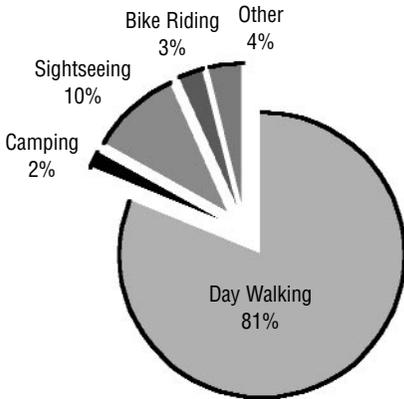


Figure 11. Popularity of tourist activities in the Kosciuszko alpine area for the 2000 Summer.

Percentage of visitors engaged in each activity (Modified from Johnston S. and Pickering 2001).



The most popular days to visit the alpine area are the main public holidays (Christmas, New Year, Australia Day Weekend, and Easter). On any given day at these times around 1500 people visit the alpine area, with 700 reaching the summit of Mt Kosciuszko. The next busiest times are weekends, particularly during the school holidays when around 234 people per day visit the summit. Low visitation days are during school time, when only around 134 people per day visit the summit (Arkle 2000).

There is considerable variation in usage patterns within a day. This is particularly apparent on the summit of Mt Kosciuszko with about half of all tourists (48%) arriving between 1200 and 1330 hours. As a result there can be crowding resulting in people spreading out onto rehabilitated and natural areas damaging native vegetation (Arkle 2000).

Weather conditions also strongly affect visitor numbers and activities. On days with low visibility, rain, sleet or wind, visitor numbers decline. However, the impacts of visitors at this time can be greater. This is in part due to the potential for greater damage to natural vegetation and soils when conditions are wet, and also because visitors move from the hardened area around the summit onto rehabilitated sites in the lee of the mountain (Arkle 2000).

5.2 Tourism benefits

Tourism is big business in the Snowy Mountains and benefits local towns and a range of tourism ventures. It is an important source of employment providing seasonal (winter and summer) jobs for a large number of casual workers and a smaller permanent core of employees. There is bipartisan political support for tourism with an expectation that tourism will continue to increase. Equally, it is viewed that the NSW NPWS will manage tourism in an ecologically sustainable manner. Therefore the park as a tourist destination and its effective management is critical for the well being of the local economy (Good 1992).

5.3 NSW NPWS Tourism Services, 2002

Servicing the tourism industry is a major management task for the NSW NPWS. It provides a range of visitor facilities and services that promote minimum impact tourism. Tourism infrastructure such as picnic facilities, scenic observation lookouts, access roads, toilet facilities and walking tracks are provided and maintained by NSW NPWS. Services provided include summer and winter emergency search and rescue support, a weed control program, garbage collection, along with regulatory and other essential services. There is a seasonal ranger program in the high country, which in conjunction with interpretation brochures and educational signs foster minimum impact behaviour and visitor safety (Worboys *et al.* 1995, McMasters 2000). School education programs are also conducted through the Kosciuszko Education Centre. The Centre commenced operations in 1989 and over 13 years has provided personalised environmental education to 47,000 young Australian school children (P. Darlington NSW NPWS pers. com.). The heritage values of the alpine area along with safety and tourism use issues are discussed in these education programs.

6. SUSTAINABLE TOURISM: THE CONSERVATION MANAGEMENT CHALLENGE

There is no doubt that there have been major gains in conservation in the alpine area in the last century but management is a continuous process that operates in a dynamic environment. Since the last major planning statement was produced for the alpine area in 1993, there has been a steady growth in visitor numbers and activities and a resultant increase in associated environmental impacts. The current major challenge for the alpine area is to ensure that tourism is ecologically sustainable.

6.1 Tourism impacts

Tourism to the alpine area is having a range of negative environmental impacts. Direct impacts include; compaction of soil, erosion, trampling of vegetation, urine and faecal contamination of waterways particularly glacial lakes, disturbance to wildlife, noise pollution, and increased feral animal activity (Edwards 1977, Keane *et al.* 1979, Hardie 1993, Virtanen 1993, Good and Grenier 1994, Good 1995, CDT 1997, Parr Smith and Polley 1998, Arkle 2000, Buckley *et al.* 2000, Scherrer and Pickering 2001, Pickering *et al.* 2002). Some infrastructure provided for tourism, such as walking tracks and huts are having impacts including compaction of soil, clearing of vegetation, assisting the introduction of alien plants, leaching of nutrients into adjacent areas, and visual impacts (Virtanen 1993, Good and Grenier, 1994, Johnston F. and Pickering 2001a, Pickering *et al.* 2002).

The spread of weeds is a serious issue for the alpine area. Gravel roads and walking tracks combined with regular pedestrian and vehicle (bike and motor vehicle) disturbance appear to favour weeds such as yarrow (*Achillea millefolium*), white clover (*Trifolium repens*), browntop bent (*Agrostis capillaris*), flat weed (*Hypochoeris radicata*), cocksfoot (*Dactylis glomerata*), dandelion (*Taraxacum officinale*) and pellet clover (*Trifolium ambiguum*, Mallen-Cooper 1990, Johnston F. and Pickering 2001a, 2001b, Pickering and Hill unpublished data). Research has shown that weeds readily colonize gravel track verges and road disturbance sites. This results in a bright-green weed verge

commonly found on parts of the gravel-based and paved tourist walking track system in the alpine area. Given that weeds are still spreading in areas of natural and human disturbance (Mallen-Cooper 1990, Johnston F. and Pickering 2001a, 2001b), limiting the spread of these weeds should be a key conservation goal.

Other developing management challenges include limiting the spread of new tracks and erosion areas caused through overuse, and preventing trampling disturbance to the most sensitive of the plant communities, such as the wetland and short alpine herbfield. Human waste also contributes to increased nitrification and contamination of pristine waterways, and has negative impacts on the tourism experience. Temporary toilets at Rawson Pass have helped to deal with some of the problems of human waste, but not adequately (Leary 2000). The withdrawal of camping from within the catchment areas of the glacial lakes has also helped, but increasing usage of other areas by campers may result in new areas being impacted (Figure 7).

6.2 Management response in 2002

The NSW NPWS is currently focusing on the provision of permanent toilet facilities at Rawson Pass and the continued construction of gravel walking tracks in the alpine area based on recommendations/priorities of the 1993 Virtanen report. In designing a toilet facility for Rawson Pass, the NSW NPWS must plan carefully to protect the visual integrity of the site. The aesthetically magnificent, natural and gentle concave sweep of the Rawson Pass landscape must be maintained. Therefore the toilet block will need to be buried or an appropriate temporary facility established that does not need to be serviced by road access.

Both Rawson Pass and the old Summit Road from Charlotte Pass to Mt Kosciuszko need to be rehabilitated to a weed free walking route in keeping with the vision to rehabilitate the natural alpine landscape.

6.3 Management lag effect

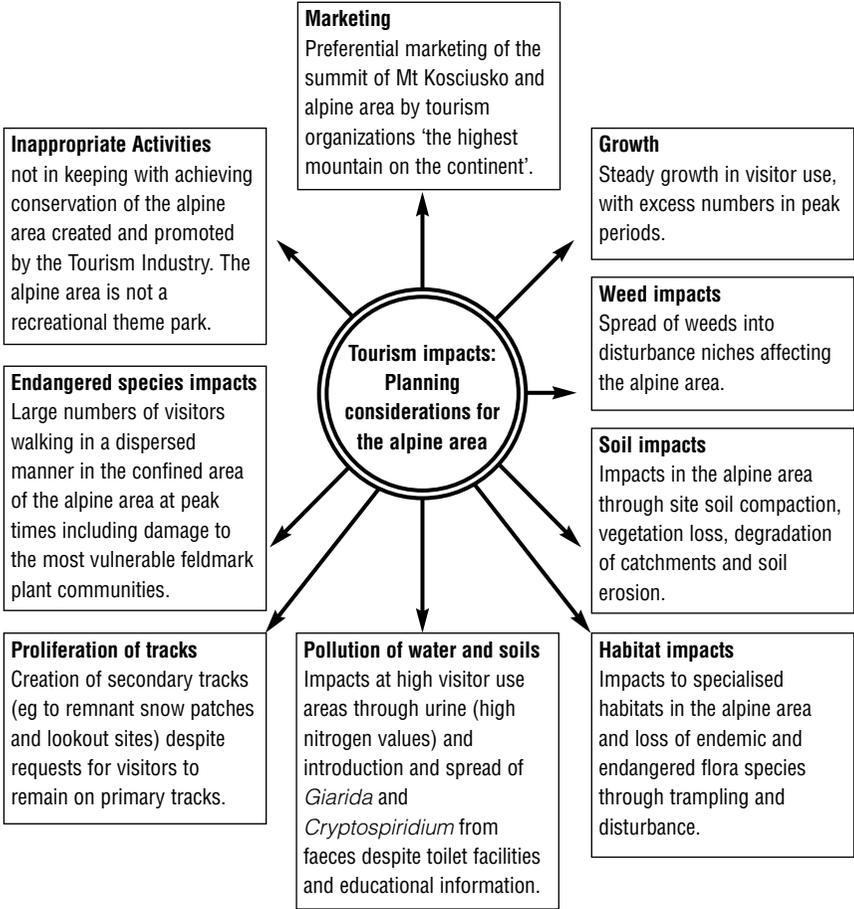
It takes time to achieve planned outcomes: sometimes it takes too long. Timeliness for some management responses is crucial. Management of issues such as appropriate levels of tourism requires leadership, constant attention and sustained and adequate investment, in preference to a low frequency but big effort approach. Research and adaptive management can also play a critical role. Improved information about the outcome of management interventions and their relative success can guide the nature of management responses (Figure 12).

6.4 Adaptive management

Recent research in the alpine area provides valuable information that can contribute to effective management. It provides an opportunity for current management practices to be considered and reassessed and for on-going monitoring and adaptation. Some of the most recent tourism research in alpine areas in Australia has focused on pollution, weeds and walking tracks and has shown:

1. Gravel tracks and roads provide habitats for weeds in the Mt Kosciuszko alpine area (Mallen-Cooper 1990, Johnston F. and Pickering 2001a, 2001b, Pickering and Hill unpublished data).
2. The Thredbo top station to Rawson Pass steel mesh walkway provides a weed free environment and socially is a far more acceptable surface for visitors (Johnston S. and Pickering 2001, Pickering and Hill unpublished data).
3. Human waste is a serious long term problem for alpine areas (AALC 2001, Bridle and Kirkpatrick 2001).
4. Visitor use is concentrated at fixed times of the year (Christmas, New Year, Australia Day weekend, Easter), and specific times of day (lunch time). This pattern of use of the alpine area exacerbates impacts (Arkle 2000).

Figure 12. Tourism planning considerations for the Kosciuszko alpine area: direct and indirect impacts.



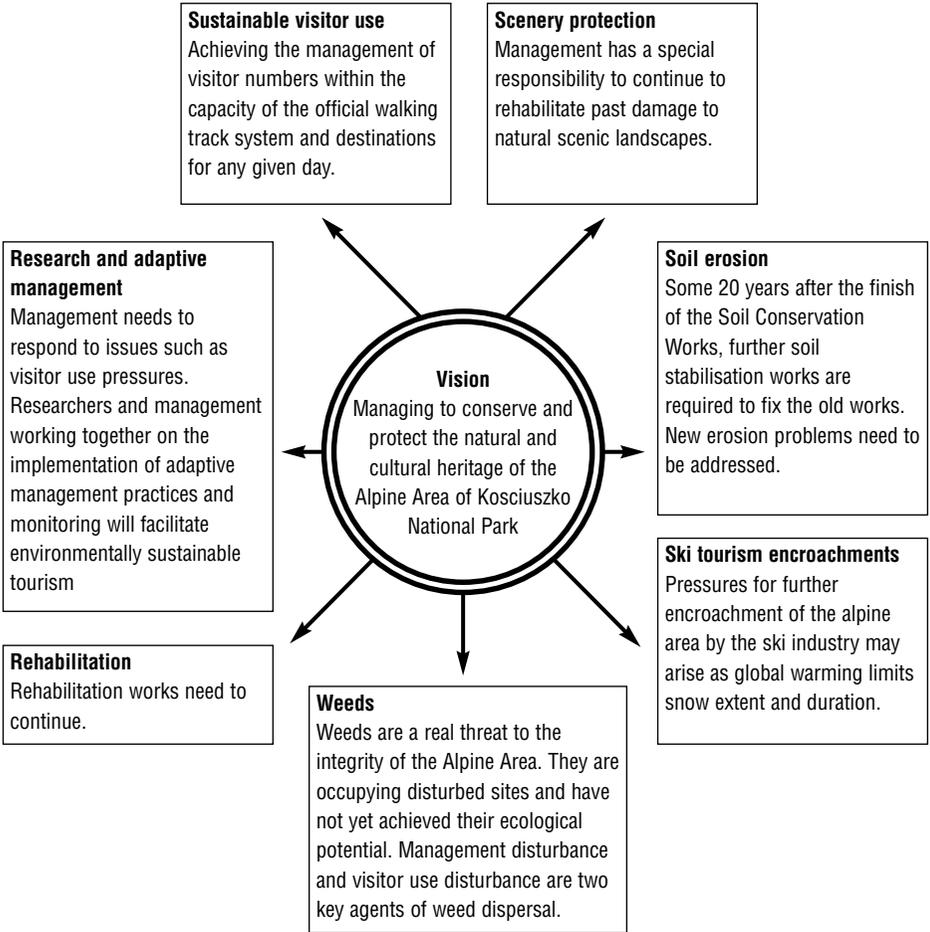
In the light of current research and historical information (Appendix C, Figure 11), future management responses to the provision of access for tourists to the Mt Kosciuszko alpine area must consider:

1. Minimising the spread of weeds by;
 - rapidly evaluating where weeds are found in the alpine area, including their presence in relation to the walking track/old road system;
 - assessing the potential for spread to new track construction sites and adjacent natural areas,
 - a careful evaluation of the nature, cost and impacts of different methods of weed control.
2. Reviewing the real cost of the range of walking track surfaces over a long-term time-frame For example, the continued construction of gravel tracks builds into the life time costs of such tracks, gravel replacement, weed control on track verges and adjacent natural areas and drainage maintenance. The steel mesh walkway track, by comparison inhibits the establishment and spread of weeds and is relatively low maintenance (Authors pers. obs.).
3. Determining a sustainable tourism use limit for the track system and destinations, as well as maximum tourist use numbers for specific days and time of day.
4. Establishing a 'keep to the track policy'
5. Reviewing how the tourism industry can work with the NSW NPWS to achieve the goal of ecologically sustainable visitor use as well as contributing to the costs of providing and maintaining an access system which services visitor use of the alpine area.

7. FUTURE MANAGEMENT OF SUSTAINABLE TOURISM FOR THE ALPINE AREA

Tourism use of the alpine area is expected to continue to grow. It is the principal future management challenge for the NSW NPWS in this area. The target is simply to achieve ecologically sustainable visitor use for the alpine area and involves minimising/eliminating direct and indirect impacts of tourism. This will mean dealing with many management challenges, some of which have been identified (Figure 13). A necessary approach for the future is for the NSW NPWS to work with the tourism industry more closely. It could also see an industry clearly understanding how they, as individual organisations, can help to contribute to a sustainable future for the alpine area. A new Management Plan for Kosciuszko National Park is expected to be completed in 2003. The issues raised by this paper illustrate the types of new conservation milestones that must be formulated and achieved to ensure that the management of Kosciuszko National Park conserves this rare and valuable alpine environment for current and future generations to enjoy.

Figure 13. Management challenges for the next 20 years for the Kosciuszko alpine area.



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APPENDIX A

CHRONOLOGY OF SIGNIFICANT EVENTS DIRECTLY AND INDIRECTLY INFLUENCING THE MANAGEMENT OF THE KOSCIUSZKO ALPINE AREA.

4,500 BP – present	Continual Aboriginal use of alpine area with strong spiritual and cultural links to the land (Young 2000).
1821	Grazing runs established in valleys below the alpine area. The Pendergast family first settles in the Jindabyne District (Good 1992).
1840	First recorded ascent of Mt Kosciuszko and Mt Townsend by a European (Paul Edmund Strezleckii) (Good 1992).
1846-47	Mapping of the Kosciuszko alpine area commenced by Deputy Surveyor-General Thomas Townsend (Good 1992).
1851-52	First geological survey of the mountains undertaken by Reverend William Clarke who recorded gold near Jindabyne, Jagungal and Round Mountain (Good 1992).
1854-55	First botanical surveys of area near Mt Kosciuszko by Ferdinand von Mueller – Victorian Government Botanist (Good 1992).
1860-80	Summer grazing became established as an annual management practice in the high country (Good 1992).
1862	Excelsior Run established by James Spencer over all of the 'alpine' lands (Good 1992).
1884	First proposal of Snowy River irrigation scheme by NSW Surveyor-General Philip Adams (Good 1992).
1885	Major geographical, geological and meteorological investigations undertaken in the high country by Robert von Lendenfeld (Good 1992).
1889	NSW Crown Lands Act brought a measure of control to grazing in the alpine area in the form of Snow Leases. The Act aimed at providing the Government with full sovereignty over the mountain pastures and to control unlawful grazing practices and to secure revenue for Treasury coffers (Gare 1968).
1889-93	Surveys of flora and glacial features of the alpine zone undertaken by Richard Helms. He warns of potential damaging impacts of stock grazing (Helms 1893).
1890	Snow leases were measured for some parts of the mountains, and in 1891, 42 leases comprising 153,010 acres were offered to bidders for summer occupancy for a term of seven years. 64,550 acres were leased, the total annual rent being \$1786 (£893) (Gare 1968).
1890-1901	Severe drought impacted the area and additional relief grazing was permitted in the mountains (Good 1992).
1897	First recorded winter ascent of Mt Kosciuszko by Charles Kerry and James Spencer (Good 1992).

- 1898 Old Betts Camp, a shelter for tourists near Spencers Creek was constructed by the NSW Tourist Bureau (Hueneke 1982).
-
- 1898-99 Flora surveys of high country undertaken by NSW Government Botanist, J. H. Maiden. He recorded concern over damage from grazing (Good 1992). One introduced species was found in the alpine area (but may be native), with four species in subalpine and four in montane zone. Introduced species were thought to be associated with the impacts of grazing (Johnston F. and Pickering 2001a).
-
- 1898-1902 Weather observatory established on Mt Kosciuszko by Clement Wragge. Weather observations recorded (Hueneke 1982).
-
- 1901-07 Program of geological research including glaciation effects established by Professor Edgeworth David. (David 1908).
-
- 1906 Construction of Kosciuszko Summit Road commenced (Good 1992).
160 sq. km. reserve established around Mt Kosciuszko (Snowy Mountains National Chase) 'for public recreation and preservation of game' (Good 1992).
-
- 1906-09 Tourism initiated in areas below alpine zone with building of Hotel Kosciusko, Yarrangobilly Caves House and Creel-at-Thredbo (Good 1992).
-
- 1908 Betts Camp was built as a staging camp or rest camp for bullock teams and individuals riding to the summit of Kosciuszko along the new road. Located near Spencers Creek, it was officially opened in 1908 (Hueneke 1982).
-
- 1909 Summit Road completed with tourists now able access Mt Kosciuszko by vehicle (Good 1992).
-
- 1913 Crown Lands Consolidation Act gazetted. This led to the regular granting of Snow Leases and Permissive Occupancies. The Act allowed for seven year Snow Leases (Good 1992).
-
- 1914 Wragge's observatory was destroyed by a lightning strike and a subsequent fire (Hueneke 1982)
-
- 1915 Murray Waters Act passed by the NSW and Commonwealth Governments and investigations were first undertaken into the use of the Snowy River for electricity generation (Good 1992).
-
- 1925 A decision was taken to construct the Hume Weir on the Murray River (Good 1992).
-
- 1925-26 Illawong Hut (or the old Pounds Creek hut) was built by the NSW Government for ski touring (Heuneke 1982).
-
- 1928 Old Betts Camp near Spencers Creek burnt down, but the hut had deteriorated substantially prior to this (Hueneke 1982).
-
- 1929 There was a marked increase in the use of Snow Leases and Permissive Occupancies (Gare 1968).
Seamans Hut, a memorial hut was constructed by the NSW Government and financed by the parents of Laurie Seaman who perished along with Evan Hayes in August 1928 (Kosciusko Huts Association 1989).

- 1931 Chalet built at Charlotte Pass adjacent to alpine area (Good 1992).
Prominent conservationist Myles Dunphy advocates conservation of the alpine area through a Snowy Primitive Area reserve (Good 1992).
-
- 1932 A 'Report on the Murray River Catchment in NSW' was prepared by Forester Baldur Byles after a major field survey. Byles noted the damage caused to the catchment by the practice of grazing and burning and the subsequent impacts on vegetation and soils (Byles 1932).
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- 1935 First proposal for the Snowy-Indi 'Primitive Area' for Kosciuszko (Good 1992).
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- 1938 NSW Soil Conservation Service established. The excessive erosion of the Kosciuszko high mountain catchments played an important role in the creation of the Soil Conservation Service (Irwin and Rogers 1986).
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- 1939 Gazetting of the Snowy Mountains 'as an area of erosion hazard' under the Soil Conservation Act (Irwin and Rogers 1986).
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- 1939-41 Importance of mountains as catchment recognised during severe drought and bushfires (Irwin and Rogers 1986).
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- 1941 W.J. McKell Labor Government elected in May 1941 (Gare 1968).
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- 1942 Improved controls on grazing in high country established by NSW Premier W. J. McKell (Good 1992).
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- 1943 In September W.J. McKell announces the proposed Kosciusko State Park to be established under special legislation (Charles 1998).
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- 1944 Kosciusko State Park Act passed on 19th April creating 518,220 hectares (1.28 million acres) park including the opportunity to create a 'primitive area'. Management of the park was to be undertaken by a Trust (Charles 1998).
Kosciuszko State Park Trust requested the NSW Lands Department to withdraw from grazing 3992 hectares (9860 acres) in the vicinity of Mt Kosciusko and 1215 hectares (3000 acres) near the Hotel Kosciusko (Diggers Creek) (Gare 1968).
Grazing administered by the NSW lands Department. They had four rangers whose job it was to police the lease conditions, to count the stock in and out and generally ensure that the lessees stayed on their blocks. The rangers reported to a Lands Inspector based at Waste Point (Gare 1968).
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- 1949 Snowy Mountains Hydroelectric Scheme commenced (Good 1992).
-
- 1950 A further 16,150 hectares (39,890 acres) were withdrawn from grazing in the Mt Kosciuszko area, 1049 hectares (2,590 acres) near Diggers Creek and 7,287 hectares (18,000 acres) in the Mawson's Hut area. Government was spending \$50,000 (£25,000) per annum on soil conservation measures. The Snowy Mountains Hydro Electric Authority contributes approximately half of this (Gare 1968).

- 1950 300,791 hectares (742,956 acres) were leased for grazing under Snow Lease conditions and 211,014 hectares (584,509 acres) as Permissive Occupancies. Snow Leases entitled the holder to occupy the block from the 1st November to the 31st May the following year. Permissive Occupancies were for 7 years and allowed the holders to graze their blocks throughout the year (Gare 1968).
-
- 1951 Lake Albina Lodge was constructed by the Australian Alpine Club in 1951 (Kosciusko Huts Association 1989).
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- 1952 New tourism facilities established with amendment of the Kosciuszko State Park Act to provide for lease for lodges. First ski club lodge built (Good 1992).
- Distinguished scientist WR Browne presents Sir Edgeworth David Memorial Lecture at Sydney University on 21st August. Highlights impacts of grazing and the Snowy Mountains Hydroelectric Scheme (Gare 1996).
- Kunama Lodge was built by the Ski Tourers Association for skiing. It was pre-fabricated in Dee Why, trucked up the Summit Road and out the saddle between Mt Northcote and Mt Clarke. It was located below Mt Clarke and Mt Northcote. This eight bed lodge had all the comforts of a European Ski Lodge. A ski rope tow took skiers up the steep slope of Mt Northcote (Hueneke 1982).
-
- 1953 At the request of the Snowy Mountains Hydro-Electric Authority Kosciusko State Park Trust withdrew 8,900 hectares (21,980 acres) from grazing (Gare 1968).
-
- 1954 'A Study of the Ecosystems of the Monaro Region of New South Wales' by scientist Alec Costin published. This landmark text provided guidance for ecologists in conserving the alpine area. It included definitions of the vegetation types for the whole Monaro including the alpine area. It outlined threats of grazing and other human activities (Costin 1954).
- Alex Costin recorded six introduced plant species in the alpine area, 38 in the subalpine and 25 in the montane zone. The occurrence is principally ascribed to the impacts of grazing and burning (Johnston F. and Pickering 2001a).
- Cootapatamba Hut was constructed by the Snowy Mountains Hydro Electric Authority to assist their survey work (Kosciusko Huts Association 1989, R. Good pers. com.).
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- 1955 CSIRO Alpine Ecology Section established at Island Bend near Jindabyne (Good 1992).
- Murray Valley Development League recommends elimination of high altitude Snow Leases (Good 1992).
-
- 1956 At the request of the Snowy Mountains Hydro-Electric Authority Kosciusko State Park Trust withdrew 1304 hectares (3,220 acres) from grazing. The total area withdrawn from grazing since 1944 was 39,840 hectares (98,540 acres). Although this area was nominally withdrawn from grazing, there were many cases of illegal grazing in the areas concerned and it was apparent that little action was taken by the Lands Department to rectify this position (Gare 1968).
- Kunama Lodge below Mt Northcote and Mt Clarke was destroyed by avalanche on the 12th July 1956. Tragically Roslyn Twynam Wesche was killed during the avalanche. The lodge was not rebuilt (Heuneke 1982).

- Illawong Hut was upgraded by the Australian Alpine Club (led by Charles Anton) after Anton secured approval from the State Park Trust (Hueneke 1982).
-
- 1957 Australian Academy of Sciences seeks removal of grazing from the alpine catchments (Australian Academy of Science 1957).
- Commercial ski tourism established at Thredbo based on a lease granted by the Kosciusko State Park Trust (Good 1992).
- Revegetation trials in alpine zone were commenced by the Soil Conservation Service of NSW in the Mt Carruthers area (Irwin and Rogers 1986).
- The seven-year term of existing Snow Leases and Permissive Occupancies expired. The demand for the total removal of grazing above 1500 metres (4,500 feet) reached unprecedented levels. The Trust decided, on a split vote, to retain grazing above that level, and the issue became one for the NSW Cabinet. The Minister for Lands held out strongly for the retention of grazing and the Minister for Conservation, on behalf of the Catchment Areas Protection Board, threatened to resign his portfolio if high-level grazing was not banned. The Lands Department endeavoured to compensate by terminating the Snow Lease system and offering 1.25 million acres of the park for relief grazing as Permissive Occupancies on an annual basis. The NSW Cabinet then decided the high-level grazing issue by banning grazing generally above 1500 metres (4,500 feet), a give and take boundary being determined (Gare 1968).
-
- 1957-58 Grazing above 1500 metres phased out with ban enacted in 1958 by NSW Government following the Academy of Science report on damage to catchments by stock grazing. In the first years, the policing of the grazing ban was handled by the Soil Conservation Service and the SMHEA on behalf of the Trust (Gare 1968).
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- 1958 Strong action taken to control illegal grazing (Gare 1968).
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- 1959 Neville Gare appointed as the first professional Park Superintendent by the Kosciusko State Park Trust with staff of four. The Kosciusko State Park Trust employed three rangers to police the illegal grazing in the high country (Gare 1968).
- Commercial ski tourism developments commenced at Perisher Valley.
- Strong action taken to control illegal grazing. Senior Ranger Bob Leach appointed to help control grazing. He was supported by a stockman with horses (Gare 1968).
- Initial work commenced on a Master plan for the Kosciusko State Park by new KSP Superintendent Neville Gare (Worboys 2001).
-
- 1960 Impounding of illegal stock in the Bulls Creek Area near Thredbo, 3rd March 1960 (Gare 1960).
- Visitor numbers to Park exceed 100 000 for first time (N. Gare pers. comm. 2001).
- 1st November 1960, the Member for Wollondilly, the Hon Mr Tom Lewis presents a Private Members Bill to Parliament to establish a National Parks Service (Charles 1998).
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- 1960's Betts Camp removed by the Kosciusko State Park Trust (Kosciusko Huts Association 1989).

- 1962 Approximate date of construction of the Thredbo Village to Top-Station Chairlift (R. Good pers. com.)
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- 1963 Kosciusko Primitive Area declared for the Kosciusko Alpine Area in January 1963 as a result of strong representations to the Kosciusko State Park Trust by the Australian Academy of Science (Australian Academy of Science 1961). The action was regarded by conservationists as a milestone in nature conservation in Australia, and was attended by considerable publicity. The declaration led to a confrontation with the Snowy Mountains Hydroelectric Authority, which involved the Trust, the Academy of Science, individual scientists and various conservation groups. Indirectly, there was little doubt that the SMHEA was greatly influenced by this confrontation when it finally abandoned the proposed Spencers Creek Dam and its attendant aqueduct system. This prevented further ski related developments for the area (Gare 1969).
- NSW Soil Conservation Service commences revegetation and rehabilitation of severely eroded areas in the alpine area (Good 1992).
-
- 1965 After four years of work (usually after hours) between other pressing duties and with the support of a new Minister, Superintendent Neville Gare completed the Master Plan for Kosciusko State Park. The "Proposed Plan for the Preservation and Development of the Kosciusko State Park" was launched at the Pickwick Club in Sydney for public comment. It included, probably for the first time in Australia, the concept of Zoning, and recognised the alpine area as a Primitive Area (Worboys 2001)
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- 1966 A submission was made to the Park Trust by Superintendent Gare to close the Summit Road to vehicles at Charlotte Pass and to prevent proposed upgrading of the Summit Road by the Department of Main Roads. The submission was not approved by the Trust (Gare 1966).
-
- 1967 NSW National Parks and Wildlife Act (1967) passed establishing the National Parks and Wildlife Service (NSW NPWS) which takes over management of the Park including alpine area. Mr Sam Weems appointed as the first Director of the National Parks and Wildlife Service (Charles 1998).
- Transfer of responsibility for the management of Kosciusko State Park from the Kosciusko State Park Trust to the new National Parks and Wildlife Service. The park becomes Kosciusko National Park and is supported by an Advisory Committee (Good 1992).
-
- 1967-68 A prolonged drought on the Monaro created problems for parks management. As illegal grazing increased, Park forces moved in quickly to effect control by the traditional methods of mustering and impounding. The closure of Cooma pound created a difficulty, but reasonable progress was being made by temporary impounding at Waste Point, where owners were collecting stock and paying fees. State elections intervened however. The Minister instructed that impounding would cease for three weeks. During this period estimates of 100,000 sheep and 3,000 cattle entered the Park. Park staff focused on removal of cattle, which still had some worth for the owners (Gare 1968).

- 1969 Dr Grahame Edgar, former State Director General of Agriculture conducted an inquiry into the future of summer grazing in Kosciuszko National Park. The Edgar report was released in May 1969 and recommended that all grazing in the Park should cease when the present leases expire (Ashton 1969).
- Lake Albina lodge was acquired by the NPWS (Gare 1969).
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- 1969-72 Grazing was phased out from entire Park, with all leases within the Park terminated in 1972 (Good 1992).
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- 1970 A discussion paper was delivered to the NSW NPWS outlining recreational impacts affecting the alpine area and suggesting that careful management was required.
- 70,800 hectares surrounding Mt Byadbo were added to Kosciuszko National Park (Charles 1998).
- The Mountain Pygmy Possum, *Burramys parvus* was found in the Kosciuszko National Park alpine area by Hans Dimpel after being discovered as a living fossil at Mt Hotham, Victoria in 1966. He found the endangered possum in a boulder field right at the very summit of Mt Kosciuszko (Calaby *et al.* 1971).
- The NPWS purchases a Bell helicopter in May 1970 at a cost of \$65,000 to assist with field operations. This pioneering step significantly influenced the nature of low impact conservation works in the alpine area. (Charles 1998).
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- 1971 A suspension bridge designed by Tim Lamble was installed across the Snowy River near Illawong Hut. Assistance was provided using the NPWS helicopter (Hueneke 1982).
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- 1972 NPWS prepares an 'Interpretative Prospectus for the Summit Area of Kosciusko National Park', highlighting the importance of the area for tourism. The prospectus utilises the direct access route to the Summit from Rawson Pass. Input from leading scientists questioned the direct access route and recommended use the old road route (NSW NPWS 1972).
- A car park was constructed at Rawson Pass by a National Park engineer to cater for the increased traffic and demand for parking spaces at this site.
-
- 1972-73 Severe drought affects the Monaro and elsewhere. Political pressure leads to grazing again being permitted in Kosciuszko National Park with 10,000 head of cattle entering the park including the alpine area (Good 1992).
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- 1972-75 The walking track from Rawson Pass to the Summit upgraded progressively with gravel and sleeper steps up south-eastern face of Mt Kosciuszko (Worboys pers. obs.).
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- 1973 Planning process for Kosciuszko National Park undertaken by planner Terry Barret, based in the new Head Office of the NPWS in Kent Street Sydney. A draft plan was prepared for public comment and a final plan prepared (Worboys 2001).

- 1974 First Plan of Management gazetted for Kosciuszko National Park by the NSW NPWS. Important conservation based management recommendations made for the Kosciuszko alpine area (Worboys 2001).
- Commencement of major period of ski resort development in the Park centred on Thredbo, Charlotte Pass, Perisher Valley, Smiggin Holes and Guthega (Good 1992).
- Upgraded National Parks and Wildlife Act (1974) passed which provided improvements to the previous (1967) Act. Came into effect on the 1st January, 1975 (Charles 1998).
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- 1974-75 Tourist vehicle traffic jams occurring on the Summit Road between Charlotte Pass and Rawson Pass, and particularly at Rawson Pass (Worboys pers obs).
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- 1976 The Kosciuszko Summit Road was closed to private motor vehicles between Charlotte Pass and Rawson Pass. Commercial tourist buses were organised to provide tourist access to Rawson Pass car park during peak holiday periods in the summer (non-snow) months. Because of the narrow road, buses would operate as a convoy, with up to four buses at any one time travelling between Charlotte Pass village and the summit car park at Rawson Pass. Visitors would alight from their bus at Rawson Pass and ascend the summit by the direct walking track route. A large snow patch above Lake Cootapatamba also attracted visitors, and incipient tracks developed (Worboys pers. obs.).
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- 1977 International significance of the Kosciuszko alpine area recognised with Kosciuszko National Park being declared a UNESCO Man and the Biosphere World Biosphere Reserve (Charles 1998).
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- 1977-78 Visitor numbers to alpine area during snow free period estimated at 20,000 (Worboys 1978a).
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- 1978 Completion of the Thredbo Sponars T-Bar Assessment of Impacts, the first environmental impact statement for the Kosciuszko National Park.
- Completion of the 'Mt Kosciusko Outstanding Natural Area' plan for the alpine area, including recommendations for improved conservation of the alpine area and the removal of Lake Albina Lodge, closure of the Summit Road to vehicles, revised access routes to the Summit, and experimental trials for walking track materials. Evaluation of the least environmentally sensitive walking track routes completed. Recommendations made for the investigation of material types (Worboys 1978a).
- Walking track from Rawson Pass to the Summit (direct route) closed (Worboys 1978a and b).
- Trials of different walking track material types and structures (including the elevated steel mesh walkway) conducted for the walking track from Crackenback chairlift top-station (edge of Thredbo Lease) to Rawson Pass by the NSW NPWS. Use was made of the NPWS Aerospatiale Gazelle helicopter to transport materials to site and to conduct the management experiments (Worboys 1979, Worboys and Pickering 2002).
- Charlotte Pass road terminus visitor facility prospectus completed (Worboys 1978b).

- 1978 The direct-staircase route to the summit of Mt Kosciuszko was causing significant impacts to rare snow patch feldmark plant communities below the summit. It was closed, with tourists required to walk to the peak via the old Summit Road (Worboys 1979).
-
- 1979 Completion of major works of the Snowy Mountains Hydro-Electric Scheme (Good 1992).
- ‘Kosciusko Alpine Flora’ published (Costin *et al.* 1979).
- The series of papers examining Trends in vegetation at Kosciuszko by Wimbrush and Costin published reporting results of long-term monitoring work for grazing trials (1957-1971), sub-alpine range vegetation transects (1959-1978) and alpine range transects (1959-1978) (Wimbrush and Costin 1979).
- NSW Environmental Planning and Assessment Act (1979) was assented to on the 21st December 1979 requiring the preparation of Environmental Impact Statements for developments that may cause a significant impact.
- NPWS walking track investigations Thredbo Top Station to Rawson Pass demonstrate the noticeable success of the steel mesh raised walkway as a track design (Worboys and Pickering 2002).
-
- 1979-1982 Kosciusko National Park Plan of Management process commenced and conducted over three years. It included a Planning Discussion Paper for the Summit area that advocated the closure of the Summit Road and special measures to protect the Alpine area. 1,800 Issue Statements were distributed with 95 responses. There was overwhelming support for improved conservation of the alpine area (Worboys 2001).
-
- 1980 Plan of Management Review for Kosciusko National Park Planning Issue Statement for the Summit Area released for public discussion. This advocated the closure of the Summit Road from Charlotte Pass and other conservation initiatives (NSW NPWS 1980).
- April 1980. Community response to the Summit Area Issue Statement demonstrated strong support for conservation initiatives in the forthcoming Kosciusko National Park Plan of Management (Worboys 2001).
- August 1980. ‘The Conservation Status of Kosciusko National Park Conference Proceedings’ published by the Canberra College of Advanced Education and the NSW National Parks and Wildlife Service which provided strong support for the heritage values of Kosciuszko being conserved (Turner 1980).
-
- 1982 1982 Plan of Management formally gazetted on the 16th July 1982 (Worboys 2001).
- Kosciuszko Summit Road closed to all vehicles (excluding management) (Worboys 2001).
- Drought relief grazing in park strongly was advocated by the grazing lobby. Under the new Plan of Management it was illegal. Minister Bedford had no choice but to refuse permission for grazing in the park. The day after the decision, a major fire was ignited by an arsonist at 11 separate locations on the Tin Mines Trail to form one large fire at Mt Pilot (Worboys pers. obs.).

- 1982 'Huts of the High Country' published, an important statement of the cultural heritage values of huts of the alpine area and Kosciusko National Park (Hueneke 1982).
Approximate date for start of construction of the steel mesh walkway from the Thredbo Lease boundary above the Thredbo Chairlift Top-station to Rawson Pass. (Worboys and Pickering 2002).
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- 1982-83 Visitor numbers in summit area over the summer (non-snow period) were estimated at 36,000 (Virtanen 1993).
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- 1984 Lake Albina Lodge removed by the NPWS following the 1982 Kosciusko National Park planning process (Kosciusko Huts Association, 1989)
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- 1986 Memorandum of Understanding signed by NSW, Victoria, ACT and Commonwealth Ministers to establish co-ordinated management of the Australian Alps National Parks (Good 1992).
NSW NPWS staff after evaluating the heritage values of the Crackenback Management Unit recommend the removal of the Crackenback Management Unit as a potential ski resort expansion area.
Approximate completion date of the steel mesh walkway from the Thredbo Lease boundary above the Thredbo Chairlift Top Station to Rawson Pass (Worboys and Pickering 2002).
-
- 1988 Revision to the 1982 Plan of Management for ski resorts including, the removal of the alpine area Crackenback Management Unit as a potential expansion area for ski resorts. This work was conducted over a number of years and was completed immediately prior to the 1988 State Government elections (Worboys 2001).
Camping in the immediate catchments of the glacial lakes of the alpine area banned (R. Good, NSW NPWS, pers. comm.).
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- 1989 'Scientific Significance of the Australian Alps. Proceedings of the First Fenner Conference' published. Important contribution to the understanding of the significance and heritage values of the Australian Alps (Good 1989).
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- 1990 Visitor numbers to Kosciuszko National Park exceed three million per annum (Good 1992).
Study completed on introduced plants in the park. 48 introduced species recorded in alpine, 81 in alpine and subalpine, with a total of 215 species recorded in alpine, subalpine and montane zones. Occurrence of weeds strongly associated with tracks in alpine zone (Mallen-Cooper 1990, Johnston F. and Pickering 2001a; 2001b).
First Australian Alps Liaison Committee three year co-operative works plan and budget developed (Worboys *et al.* 1990).
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- 1990-1 43 000 tourists estimated to have spent more than half a day walking in the alpine area, with 1 300 visitors estimated as visiting the summit area. (Virtanen 1993)

- 1992 1991 'Cultural Heritage of the Australian Alps Conference Proceedings' published, an Australian Alps National Parks initiative which published critical information of the cultural values of the alpine area (Australian Alps Liaison Committee 1992)
-
- 1992-93 Revegetation and rehabilitation of the lower section of the staircase from Rawson Pass to the summit of Mt Kosciuszko (S. Johnston pers. comm.).
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- 1993 1537 tourists recorded at Rawson Pass on Easter Saturday (Virtanen 1993).
 'Towards Conservation and Recreation Management of Kosciuszko Alpine Area' report produced for NSW NPWS. Makes major recommendations for management of tourism in alpine area (Virtanen 1993).
-
- 1994 'Wildlife of the Australian Snow-Country' by Ken Green and William Osborne was published, a critical text for the management of the alpine area (Green and Osborne 1994).
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- 1996 Portable toilets installed at Rawson Pass and Charlotte Pass (Leary 2000).
 'Tilting at Snowgums, Australia's High Country in Poetry and Photos' by Mark O'Connor was published: a very important contribution to the cultural heritage of the mountains (O'Connor 1996).
-
- 1997 Sampling of weeds on edges of tracks and in adjacent native vegetation found 46 introduced species in the alpine area and 58 species in the subalpine area (Johnston F. and Pickering 2001a).
 Name of National Park and Mountain changed from Kosciusko to the correct spelling of Kosciuszko.
-
- 1997-98 Revegetation and rehabilitation of the top section of former staircase from Rawson Pass to the summit of Mt Kosciuszko (S. Johnston pers. comm.).
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- 1998 The invasive weed Yarrow (*Achillea millefolium*) recorded for the first time above 2000 metres including along the ridgeline of the Main Range in old tracks (Johnston F. and Pickering 2001a).
 Conference held on climate change and potential impacts on alpine and subalpine environments in Jindabyne in February. Highlights potential reduction in number of days of snow cover for Mt Kosciuszko of between 15 and 95 days (best and worst case scenarios, Green 1998, Whetton 1998).
-
- 1998-99 Composting rotating toilets designed by Integrated Eco-Villages installed at Charlottes Pass (Leary 2000).
-
- 1998-2000 Visitor monitoring undertaken in the alpine area by the NSW NPWS with support from the Cooperative Research Centre for Sustainable Tourism (Johnston S. and Pickering 2001).
 1535 tourist observed on summit area between 10.00 am and 4.00 pm on Easter Saturday (Arkle 2000).
 64,000 tourists estimated to visit the alpine area over the summer, non-snow months (Johnston S. and Pickering 2001).

- 2000 Second edition of the 'Kosciuszko Alpine Flora' (Costin *et al.* 2000) published. 'The Aboriginal People of the Monaro', a documentary history compiled by Michael Young published, reflecting the history and significance of Aboriginal heritage to the local area (Young 2000).
-
- 2001 Planning process for the revision of the 1982 KNP plan of management commences in November 2001 for completion in 2003 (Worboys 2001)
-
- 2001-02 Upgrade of path from near summit of Mt Kosciuszko to Mawson's Pass. Includes regrading of Summit Road and extensive transport of gravel to Rawson Pass. Cost for 2 km length \$375,000. This is first stage of 10 year project with a total cost of \$2.5 million. Concerns expressed about environmental impacts of gravel tracks raised (Australian Broadcasting Commission 2002).
-
- 2002 Paper presented at the IUCN Conference "Benefits Beyond Boundaries in East Asia" in Taipei, Taiwan, includes recommendations for management of alpine area. (Worboys and Pickering 2002).
- United Nations International Year of the Mountains, including conference in Australia held in Jindabyne, November 2002.
- Study found weeds associated with gravel and paving tracks in alpine but not steel-mesh raised walkway (Pickering and Hill unpublished data).
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APPENDIX B

PLANS OF MANAGEMENT, 1965-1993 FOR THE KOSCIUSZKO ALPINE AREA.

ALPINE AREA PLANNING ACTION	PLAN				
	1965	1974	1978	1982	1993
<p>(Abridged), key management objectives for the park (Lewis 1967, KSPT 1965):</p> <ul style="list-style-type: none"> • Protect and conserve scenic, scientific, wilderness, indigenous wildlife values. • Protect, preserve and rehabilitate the mountain catchment area. • Develop a range of facilities and encourage maximum public enjoyment without loss of values. • Provide a Ranger service for visitor safety and protection of values. • Implement park interpretation. • Control use so unique natural values are passed on unimpaired to future generations. 	•	•	•	•	•
Kosciusko Primitive Area (Summit Area) zoned as a Unique Natural Area. The paramount aim is the preservation of the unique natural features and values (KSPT 1965).	•		•	•	•
Graded walking tracks and interpretive signs and markers to facilitate public inspection and understanding of the unique features introduced. The public may be excluded from certain areas, except under permit.	•			•	•
Alpine Area will be protected from; (KSPT 1965):					
• Wheeled and tracked vehicles (except official fire control vehicles).	•		•	•	
• Buildings, except simple survival huts where absolutely necessary.	•			•	
• Ski lifts or tows.	•			•	
• Constructed roads except essential fire trails which shall be closed to the general public.	•	•		•	
• Commercial operations of any type, including grazing.	•	•	•		
• Deliberate alteration of the landscape in any way, including the treatment of timber stands and erection of fences.	•			•	
• Horse riding, except by Trust officers in the control of illegal grazing.	•	•	•	•	

ALPINE AREA PLANNING ACTION	PLAN					
	1974 PLAN (ADDITIONAL TEXT ONLY)	1965	1974	1978	1982	1993
Objectives of management: • Encourage scientific research. • Provide education. • Rehabilitation of disturbed areas. • Work with the community.		•	•	•		
Summit area recognised as an Outstanding Natural Area. Special protection measures which prevent developments or use which might affect the scientific values.		•	•	•		
Removal of the obsolete and dangerous chairlift aerial connecting the Charlotte Pass Chalet to the Alpine Way.		•				
1978 MOUNT KOSCIUSKO OUTSTANDING NATURAL AREA PLAN	1965	1974	1978	1982	1993	
Rehabilitation						
Continuation, soil conservation works, summit walking track.			•	•		
Continuation erosion control, Carruthers – Tate area.			•	•		
Removal of <i>Pinus mugo</i> , slopes of Carruthers Peak.			•			
Prevention of erosion by mountain streams by flow rate controls.			•			
Rehabilitation of gravel pits between Rawson Pass and the Summit.			•	•		
Removal of the 'blasted' rock fragments from the David Moraine.			•			
Control of erosion on walking tracks.			•	•		
Prevention unauthorised walking tracks.			•	•		
Restoration of damage by vehicles in the Rawson Pass area.			•			
Rehabilitation of the access road up the old chairlift line.			•			
Removal of structures						
Old stock fence, Albina saddle-Mt Twynam.			•	•		
Old fences, Spencers Creek Valley.			•			
Cairn and concrete structures on the Summit.			•	•		
Snow depth poles, Cootapatamba Valley.			•	•		
Pathway to the Summit.			•	•		
Kunama hut debris.			•	•		
Concrete Bridge, Betts Creek.			•			
Mileage posts, Kosciuszko Road.			•			
Road signs between Charlotte Pass and Rawson Pass.			•			
Concrete dam structures between Lake Cootapatamba and North Ramshead.			•	•		

ALPINE AREA PLANNING ACTION	PLAN				
	1965	1974	1978	1982	1993
Environmental planning					
Prepare an EIS for any major or minor works within the Outstanding Natural Area.			•		
Scientific reference areas					
Walking tracks will by-pass scientific reference areas.			•		
Education of values of specific vegetation to help protection.			•		
Visitor use impacts					
Establishment and monitoring of key sampling points.			•		•
Establishment of permanent photographic points.			•		•
Establishment of permanent walking track cross-sections.			•		•
Assessment of damage to the environment by walkers...threshold damage to plants.			•		
Fire management					
Very limited prescribed burning.			•		
Free burn for natural fires (where controllable).			•		
Human caused fires extinguished.			•		
Bulldozer free zone.			•		
Closure of MR 286					
Closure of the old Summit Road at Charlotte Pass.			•	•	
Rehabilitation of the old Summit Road to a walking track.			•	•	
Facilities provided at Charlotte Pass including:			•	•	
• Viewing points.					
• Interpretation information.					
• Walks.					
• Toilets.					
Exotic plants					
Undertake studies to investigate the nature, extent and impact of exotic plants to evaluate control methods.			•	•	
Feral animals					
Studies to evaluate the nature, extent and impact of feral animals.			•	•	
Rubbish					
Pack out of garbage, no depositories (bins etc).			•		
Walking tracks					
Relocation of walking tracks from critical areas.			•	•	•
Helicopters					
Confined to official use only.			•		

ALPINE AREA PLANNING ACTION	PLAN				
	1965	1974	1978	1982	1993
Air space					
Restriction of air space to minimise low level flights.			•	•	
Visitor use patterns					
Determine the total numbers of visitors who hike to the Summit.			•		
Determine the numbers of visitors using the different facilities.			•		
Walking track system					
Complete a plan for a walking track system for the Summit Area.			•	•	•
Design and materials research					
Conduct research into the optimum design of structures and the types of materials used for the Summit Area.			•		
Impact of huts					
Conduct water quality monitoring tests at Lake Albina Lodge to measure impacts of use.			•		
Visitor information					
Improve information on safety etc for visitors (number of recommendations made).			•		
Camping					
No camping above the snowline during snow-free months.			•	•	
Winter camping permitted.			•		
Cooking fires					
Fuel stoves only in Outstanding Natural Area.				•	
Scientific research					
Encouraged, but no special access provisions.			•		
Interpretation			•		•
Visitor centre at Thredbo.					
Visitor centre at Charlotte Pass.					
Track head information provided.					
Walkway interpretation plates.					
Information booklets.					
Viewing platforms at strategic locations.					
Seasonal Ranger program.					
Educational films.					
Marketing film in relation to no vehicular access to the summit.					

ALPINE AREA PLANNING ACTION	PLAN				
	1965	1974	1978	1982	1993
Information sheets.					
Prepare interpretation and education plan.					
Education					
Education support facilities to assist school groups.			•		
Publicity					
To help acquaint the public with the road closure; to help publicise conservation actions.			•		
Private vehicles					
No private vehicles beyond Charlotte Pass.			•	•	
Shuttle bus					
Provision of planned visitor facilities (1978) at strategic locations for the Summit Area in anticipation of the cessation of the shuttle bus in 2-3 years (1980/81).			•		
Oversnow vehicles					
Official use of oversnow vehicles with the exception of the route between the Charlotte Pass Chalet and Thredbo Top Station.			•		
Blue Lake cliff climbers					
Impact of use appraisal needed, especially in relation to glacial evidences.			•		
Diving					
No recreational diving within the glacial lakes.			•		
Handicapped facilities					
Facilities for handicapped people to be investigated.			•		
Charlotte Pass					
Design as a future terminus with limited car park.			•	•	
Utilise Perisher Valley for supplementary parking with a shuttle service to Chalet in peak times.			•		
Conduct feasibility study for free aerial Gondola from the Charlotte Pass Chalet to Charlotte Pass to move large numbers of visitors or a free shuttle system between the Chalet and Charlotte Pass.			•		
Plan for toilet facilities for Charlotte Pass, assess using the disused gravel pit at Charlotte Pass.			•		
Walking track system from Charlotte Pass proposed.			•		
Visitor Information Centre at the Charlotte Pass Chalet.			•		
Number of rehabilitation works (listed).					

ALPINE AREA PLANNING ACTION	PLAN				
	1965	1974	1978	1982	1993
Rawson Pass – Summit Area					
Closure of the direct walking track to the Summit plus erosion control measures.			•	•	
Access to the Summit utilising the old road.			•	•	
Information to help deal with the 'visitor surge' created by the shuttle Buses.			•	•	
Rehabilitate the Rawson Car Park.			•		
Rehabilitate the Rawson Pass to Summit Road to a walking track.			•	•	
Locate seasonal rangers in the Summit Area.			•		
Provision of high quality interpretation information.			•	•	
Lakes Walk					
Prepare a detailed report on the method of rehabilitating the walking track.			•	•	
Provide some low key viewing platforms to help protect sites.			•		
Provision of interpretive information.			•		
Removal of Lake Albina Hut.			•	•	
Rehabilitation of the Soil Conservation Track from the Soil Conservation Hut to Mt Anton.			•		
Removal of Soil Conservation Hut.			•		
Rehabilitation of the Carruthers Peak to Charlotte Pass section to a walking track.			•	•	
Thredbo Top Station to Rawson Pass					
Testing of potential materials and structures for the walking track to be undertaken.			•	•	
Use of the helicopter wherever possible to transport the materials, non-use of machinery for construction.			•		
Provision of interpretation material.					
1982 PLAN OF MANAGEMENT	1965	1974	1978	1982	1993
Kosciuszko Management Unit includes all of the alpine area. Additional planning considerations include;				•	
To allow environmental processes to continue with as little disturbance as possible.				•	
To maintain the waters and aquatic communities of the streams and glacial lakes in as natural a state as possible.				•	
To protect Aboriginal sites.				•	
To protect features of outstanding historic interest.				•	

ALPINE AREA PLANNING ACTION	PLAN				
	1965	1974	1978	1982	1993
To maintain the area as free as possible from man-made intrusions into the scenery.				•	
To maintain the outstanding natural character, especially above the treeline.				•	
To protect the most sensitive alpine communities from any disturbance.				•	
To protect the glacial landforms.				•	
Management strategy for the Kosciuszko Management Unit: provision of access and facilities at the edges rather than within the area.				•	
Removal of the old Stilwell Restaurant and Chairlift station.				•	
Remove Rawson's Hut.				•	
Toward conservation and recreation management of the Kosciuszko alpine area (Virtanen, 1993)					•
Redirection of visitor use from the alpine area.					•
Major education programme to help redirect visitor use.					•
Permit system for overnight campers for the alpine area.					•
Need to actively manage events assess appropriateness of some activities for the alpine area.					•
Need for toilets at Rawson Pass.					•
Need for appropriate interpretation.					•

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APPENDIX C

History of the Thredbo Top Station to Rawson Pass steel mesh walkway

G.L Worboys, 2002

A raised steel mesh walkway extends from near the Thredbo Chairlift Top Station to Rawson Pass below Mt Kosciuszko. It is the primary access route for tourists wishing to climb Australia's highest mountain, Mt Kosciuszko. It was constructed in response to erosion and multiple tracking impacts to the alpine area caused by tourists walking to and from the summit of Mt Kosciuszko from Thredbo. The elevated steel mesh walkway was designed to be light transmitting to promote the growth of native species under the walkway. In 2002, after 20 years of service, the steel mesh walkway has proven to be very successful. At least 300,000 tourists are estimated to have used it. The native species are flourishing beneath it and there appears to be a mini-green house effect created by the mesh. It limits the potential for pedestrian disturbance to the alpine soils. Recent research (Pickering and Hill unpublished data) has shown that areas under and immediately adjacent to the raised steel mesh walkway are essentially weed free. It is popular with visitors. It has been effective. A brief history of the planning and development of this walkway has been provided here.

A planning study was to be undertaken for the Mt Kosciuszko Outstanding Natural Area during 1978. The request for the study came from the Chief Operations Officer of the NPWS Mr Geoff Armstrong at a time when there was an urgent need to determine the future conservation management of the alpine area. The planning work was initiated in February 1978 and was to be completed by April (Worboys 1979). Not even the Mt Youngal fire emergency of 1978 could interfere with the plan preparation. The work was to be project managed by ranger-naturalist Graeme Worboys assisted by consultant Marian Genner.

Research of the literature was completed, and a planning overlay (Kosciuszko National Park reference collection) was developed

identifying the most environmentally sensitive locations. The study demonstrated the need to close the stairway from Rawson Pass to the summit of Mt Kosciuszko and redirect tourist access along the old Summit Road route. It exposed the problems of flora and erosion impacts created by tourist access from the summit shuttle bus system and the threat to the alpine landscape of a road upgrading. It covered a wide range of issues. It also illustrated that the walking route from the Thredbo Top Station to Rawson Pass had less environmental impact than other access routes such as the Lakes Walk. It was identified that the route could potentially provide future alternative access to the summit should vehicle access be prohibited in the alpine area. The plan recommended an upgrading of the Thredbo-Rawson Pass track given the severe erosion that had already developed. The planning question was what track surface materials should be used in the alpine environment?

Little guidance was available from the literature in Australia about suitable materials to use for walking tracks in the alpine environment. By necessity, it was decided to undertake some basic research. There were two broad vegetation types to deal with; the wet communities of bog and fen vegetation such as those found in the catchments draining to Thredbo Village and the tall alpine herbfield communities of the better drained sites dominating the route. Some snow patch communities were also present. There was a need for a raised structure for the wet areas, and the potential use of a gravel surface was proposed for the free draining areas.

Influenced by a recent personal study of North American national parks, the project manager believed that boardwalks could be appropriate for the wet areas (Worboys 1978). They had many advantages, the most important of which was that they influenced the behaviour of tourists. Tourists tended to stay on the slightly raised structures, which prevented impacts elsewhere. Already multiple tracking in the wet areas was a major problem needing a solution. He was however concerned about the negative aspects of such raised walkways. They were usually constructed from timber requiring regular maintenance. In addition, they blocked out critical sunlight needed for the survival of plants in such harsh alpine communities. The examples he witnessed in Yellowstone and Yosemite national parks showed a barren, plant free zone below the

very boardwalk designed to protect the environment. The boardwalk idea was good, but not good enough. A better design was needed.

Based on this experience, the project manager bought forward the concept of a light transmitting raised walkway. In addition he employed the benefit of the NSW Soil Conservation Service experience and its finding concerning the negative impacts from zinc toxicity from galvanised mesh used for the earliest soil conservation works in the Mt Kosciuszko alpine area (Johnston and Good in Worboys *et al.* 2001, p 235). The prototype raised walkway was called a 'bog bridge' given its function. It was designed with an un-galvanised 'cut-corrugated grip' steel mesh of the kind used in the engine rooms of merchant ships to provide a safe, slip free platform for servicing equipment. Black iron was specified given that the oxidation rates through rusting were calculated to be low for the alpine environments. Iron oxide, the product of such rusting was a natural part of the alpine soils given the granitic host rock and the very old soils present. The original bog bridges were approximately five metres in length and about 90 centimetres in width. They were designed to have lineal structural strength and height above the ground through support from eucalypt logs placed approximately every metre and at right angles to the length. Extra precaution was taken with the experimental design to ensure that the structure would not be a problem for skiers during the snow months. The issue of the interconnected bog bridges being a giant lightning conductor was raised, considered and found to be of no concern given the degree of earthing of the structures. The first prototypes were installed on the walking track in badly degraded wet heath areas prior to the winter of 1978/79 (Worboys 1979). Inspection during the winter months found that they would be buried by the winter snows (and not be a wind scour, exposed feature). The design of the bog bridges was not intended for snow patch areas, where the gravitational forces and impacts of snow creep were well documented by Jennings and Costin (1978).

Experimental plots using gravel were also installed at selected sites along the track route prior to winter. Three sites were selected including a ridge top flat site, a snow patch site and a modestly sloping site. The plots were approximately 1 metre wide and 4 metres in length. The depth of gravel was greater than 10 centimetres for the plots. The plots used timber edges and aluminium insulation material running over the edge of the plots to capture any gravel lost from the

plots. They were placed in an essentially horizontal position for their width. Their length followed the natural slope of the terrain. The total volume of the gravel was measured. It was intended that any materials lost from the plots would be captured and measured.

Two gravel types of the same composition were selected. The project manager was firm that the same basic parent rock compositional material for the majority of the route (the Mowambah Granodiorite) was to be used with the experimental material. He was also very aware of the geological compositional differences to be accommodated both at Rawson Pass (Ordovician metasediments) and the very summit area itself (Rawson Pass Adamellite). After examining stockpiles of Snowy Scheme tunnel spoil, he organised for the sieving of two size classes of the correct material type for the plot locations. He had received advice that free draining material would be important for the alpine area freeze-thaw environment, but may be uncomfortable to walk on. It was considered however that the free draining gravel material could have application in the snow patch areas where free drainage of melt water would be especially important. It was considered worth testing.

The second gravel type was a mixture of all sizes below a maximum sieve class suitable for walking track material. This material would be expected to be more stable underfoot, but the fines could be subject to winnowing and loss in the extreme alpine conditions. The fines were to be crushed rock fines rather than clay fines because of the freeze-thaw conditions and the particular susceptibility of the clays to frost heave. The two types of gravels became the experimental types. The two experimental gravel types were used at three locations. The gravel sieving was achieved thanks to the help of Field Officer Mr Rueben Byrne. They were bagged, and flown to the test plot sites by the NPWS helicopter. The plots were installed with the assistance of Ranger Naturalist Mark Butz and Rangers, Chris Lehman and Steve Elkin just prior to winter 1978/1979.

The experiments found that the bog bridges were extremely successful and posed no problem to skiers over winter (Worboys 1979). The gravel plots showed poorer results however. The free draining material worked well in terms of the retention of gravel but was uncomfortable to walk on. There was also mechanical scatter of the material. The

gravel with fines was found to lose a proportion of fines, and that maintenance top-up of the material would be required on a regular basis if permanently installed. The frequency of top up was calculated from the winter results, but was potentially flawed given that not all of the winnowed material was captured when it was lost from the plot. It would have been an underestimate. The conclusion in 1979 was to use some gravel, with additional terra firma support, but to install more bog bridges than previously planned. It was estimated that the trial steel mesh 'bog bridges' would have a lifetime of approximately 40 years. When costs of installation and maintenance of the gravel were compared with the trial steel mesh 'bog bridges', it was calculated to be cheaper to install the steel mesh. This assessment, and the clear success of the bog bridges functionally, aesthetically and socially contributed to the decision to construct the steel mesh walkway all the way from near the Thredbo Top station to Rawson Pass (Worboys *et al.* 2001 p 199, Johnston and Pickering 2001).

The bog bridge experimental concept design was further improved during construction. Design improvement ideas were contributed from key players such as NPWS Engineer Les Blakers and Soil Conservation Service Officer John Rodgers. They were instrumental in the walkway construction expanding from one mesh width to 2 mesh widths. Their vision of an extremely popular walking route and a desire of groups to walk side by side talking as they walked to the summit has been vindicated. Project managers including Ranger Ross Constable and Field Officers including Hughie Pederson and others further improved the construction design. The cumbersome eucalypt log supports were replaced with steel pylons. The bog bridges were transformed by trial and error and continuous improvements over a number of construction seasons into the steel mesh walkway found today. Construction efficiencies were introduced, including on-site welding and manufacturing and rapid and efficient helicopter transfer of the materials. Reinforcing of the steel mesh walkway assisted with snow patch areas, though for the most extreme sites, the use of a concrete bonded granite rock paver walkway was a far better solution than the originally proposed free draining gravel. The original gravel test plots were removed from the site. In 1982, with the permanent closure of the Summit Road to vehicles at Charlotte Pass came into effect, the steel mesh walkway became the dominant tourist access route to the summit.

Some twenty years later in 2002, the mesh has proven resilient, requiring some maintenance where it was dubiously installed in snow patch areas, and some maintenance attention where it has been worn smooth. The free drainage below the mesh has been especially successful. The multiple natural water-courses are no longer impacted by tourists and are steadily repairing. The multiple tracking erosion damage that was present in the late 1970's is rehabilitating (Scherrer and Pickering, unpublished data). The steel mesh structure blends aesthetically into the landscape thanks to the natural vegetation growing up through the mesh. The concept of a light transmitting elevated walkway has been very successful. Importantly the walkway also has an absence of weeds thanks to the vigorous growth of natives and the absence of disturbance (Pickering and Hill unpublished data,). The mesh walkway surface is very popular with tourists (Johnston. and Pickering 2001) and it appears that the most serious additional costs for the maintenance of the steel mesh walkway are linked to the mesh being worn smooth in some locations. The steel mesh walkway has been very successful in catering for at least 300,000 visitors to Mt Kosciuszko over the last 20 years. The long-term estimates of the viability of the mesh appear sound despite the significant increase in the numbers of tourists using it. With modest maintenance improvements to worn locations, it will continue to be successful for the next twenty years and longer.

The light transmitting steel raised mesh walkway concept has since been exported to the United States of America. Superintendent Dave Mihalic of Glacier National Park, whilst participating in a November 1995 IUCN workshop on Transboundary Protected Area Management in Australia viewed the steel mesh walkway. He saw that it was an immediate solution to problems he had with tourist lookouts at the very sensitive Logan Pass on the 'Going-To-The-Sun-Road' in Glacier National Park. The steel mesh was installed in the following summer to replace the failed timber boardwalks.

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