



Managing mountain parks: Special challenges

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This article considers the special challenges of managing upland protected areas.

[Huascarán National Park in Peru \(also a World Heritage Site\) is currently threatened by mining activity](#)

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MOUNTAIN PROTECTED AREAS

The World Conservation Union (IUCN) designation of "protected area" has been given to many sites and landscapes throughout the world and over 25 percent of these are in mountain areas. Thorsell (1997), using data from the World Conservation Monitoring Centre (WCMC), claims that there are 473 sites in 65 countries totalling over 264 million ha, although at least 36 percent of this area lies in the Greenland National Park.

Mountain protected areas meet the following criteria:

- they are included in IUCN protected areas, categories I-IV (the more strictly protected categories);
- they have a minimum size of 10 000 ha;
- they have a minimum relative relief of 1 500m.

A mountain is characterized as having a minimum elevation of 800 m; this precludes hundreds of parks and reserves that are considered locally as mountain protected areas. A definition of mountains as distinct from hills, uplands or highlands is no simple task, and the establishment of an arbitrary standard frequently eliminates the beloved mountain of some individual or group. For instance, when IUCN used 1 500 m of relative relief as the defining factor, it evoked the anger of many Scottish highlanders (Thorsell and Harrison, 1992).

Providing effective management for these large areas of protected mountain lands presents a challenge since they range from Sagarmatha (the world's highest mountain) to Kailas (the most sacred), and from the tropical cloud-forested Ruwenzori in Uganda, to the cold temperate pinnacles of Chile's Torres del Paine. Each site has its own unique characteristics and problems, but there are also some common attributes that make lessons learned in one mountain region transferable elsewhere and enable basic guidelines for management to be proposed. This article considers the special challenges of managing protected areas in

mountain environments.

Sacred sites

The visible dominance of mountains in relation to the surrounding landscape evokes strong feelings of appreciation, joy and awe in most people. All major religions regard some mountains as spiritual, and this is portrayed exceptionally well in the publication, *Sacred mountains of the world* (Bernbaum, 1990). Many of these are protected in national parks, national monuments or some type of reserve as, for example, Nanda Devi (India), Huangshan (China) and Tongariro (New Zealand). The metaphysical quality of mountains (valued by poets, artists and alpinists alike) gives a special responsibility to managers, particularly where religious and cultural sensitivities must be taken into account. Indeed, there are often serious conflicts between those to whom the mountain is sacred and those who would climb it or propose any change to the landscape. Moreover, where a mountain is a destination for pilgrimage or a major cultural attraction to visitors and climbers, the authorities must try to control access and reduce multiple human impacts; for example, over one million people climb to the summit of Mount Fuji each year (Price, Moss and Williams, 1997). The fragility of alpine vegetation and the slow rate of recovery make mountain areas especially vulnerable to trampling.

Biodiversity considerations

The three-dimensional nature of mountains, with altitudinal zoning of biotic environments, together with differing orientations, results in considerable heterogeneity in habitats, and hence flora and fauna, over relatively short distances. Thus, there is great biodiversity in mountains and there may also be significant genetic variation and speciation owing to high levels of ultraviolet radiation. This heterogeneity over relatively small areas precludes easy, broad prescriptions for management. Not only is there great biodiversity but the flora and fauna of one mountain zone may be quite isolated from the corresponding zone of the next mountain in the range. This has been one of the factors responsible for a high degree of endemism in mountains. Pei Shengji, who had described the de facto protection given to the forests of the Holy Hills of Xishuangbanna, Yunnan, by the Dai people (Pei, 1993), reported that at the fair in Dali he identified 170 species of useful plants from the mountain forests, brought for sale or exchange (Pei, personal communication, 1994). Mares (1992) has shown that although the eastern slope of the Andean montane forests is only 3.2 percent of the continent, it holds 63 percent of its endemic animal species.

Indigenous dwellers

Mountains are home to a wide array of indigenous "highlanders". Cultural diversity is a component of many locations where people live in or near a protected area and have traditional use rights. Indigenous people and traditional cultures are extremely important factors in planning, decision-making and cooperative management. The Anna-purna Conservation Area Project in Nepal is a good example of local involvement; the comanagement in Kluane National Park in Canada is another.

Isolation

Mountain protected areas are generally distant from the main centre of park administration. This has usually led to relative neglect in comparison with resources allocated to similar areas in lowland or marine environments. Communication between headquarters and remote areas has often been difficult, although recently introduced electronic systems tend to mitigate this. Even today the remoteness of protected areas in the Himalaya or the Kamchatka Mountains is a major administrative concern, and access is especially difficult during the season of snow accumulation which occurs in high mountains, even in the tropics.

Natural hazards

Natural hazards are a constant threat in mountain areas owing to steep slopes, torrents, volcanic activity, avalanches, glacier crevasses, landslides, glacial lake outbursts and earthquakes. High altitude alone is a health hazard and the dynamic landscape increases the risks of injury to visitors. Search and rescue operations are an important part of park management, and rescue attempts are greatly impeded by altitude, hostile climate and remoteness. The rapidly increasing influx into mountain areas, especially into less accessible locations, of poorly conditioned, inadequately prepared and badly equipped urbanites seeking mountain wilderness recreation is a major anxiety for park managers. The cellular phone and Global Positioning Systems are no substitutes for good maps, a compass and good planning including contingency plans. It is interesting to note that, while in some regions avalanche control measures have focused on human safety, there is a new awareness of the positive value of recurring avalanches on natural habitats (Krajick, 1998). To ensure public health and safety, plans for possible emergencies, warning systems and rescue patrols need to be set up; such services are particularly well developed in North America and South Africa, and in some instances the costs of rescue must be paid by those who require aid.

Borders and conflicts

Mountain ranges or "divides" often form the boundaries between countries. Protected areas may abut a national frontier where security is a foremost concern, including factors of smuggling, customs and immigration control, and illegal cross-border poaching, especially if one country conforms to the Convention on International Trade in Endangered Species (CITES) and the other does not. If there is tension between the countries there may be a disruptive military presence in the protected area. However, when parks in two countries are contiguous, as for example La Amistad in Costa Rica and La Amistad in Panama, transborder park cooperation may result in mutual benefits that lead to collaboration in other arenas. Guidelines for effective cooperation in transborder protected areas are explained by Hamilton *et al.* (1996), based on a workshop for managers of abutting mountain parks. Good examples of transborder partnerships include Waterton Lakes (Canada) - Glacier (USA) International Peace Park and Parco delle Alpi Marittime (Italy) - Mercantour National Park (France).

Libiszewski and Bachler (1997) have pointed out that mountains are often the site of conflict and disorder, as in the Caucasus, the Balkans, northern Iraq, the Hindu Kush, Kashmir, Tibet, the Peruvian and Colombian Andes, the mountains of the Lao People's Democratic Republic and Viet Nam and the Ethiopian highlands. Furthermore, they may be a refuge for dissident minorities, or a cradle for revolution, as in the case of Cuba. Effective management in these areas is extremely difficult and the presence of government military personnel or guerrillas may be equally destructive. For instance, the damage to the mountain gorilla population (and to tourism receipts) in Rwanda's Volcans National Park is a major tragedy, and the affected area extends to the entire transborder complex which includes Virunga National Park in the Democratic Republic of the Congo and Gorilla National Park in Uganda.

Freshwater supply

As has been documented by Liniger, Weingartner and Grosjean (1998), mountains are the "water towers" of the world owing to enhanced precipitation and storage in the form of snow and ice. Protected areas play a key role in maintaining water quality and providing a naturally regulated flow, as for example in Canaima National Park in Venezuela. Managers have a clear responsibility to safeguard these upper watersheds, especially in terms of minimizing all types of pollution resulting from human impact. Eleven recommendations are presented in the publication *Guidelines for mountain protected areas* (Poore, 1992). Where cloud forests occur, these hydrologically and biologically important areas merit special protection, as for example on Mount Kinabalu, Sabah, Malaysia.

Mountain biota, under constant climatic stress, are particularly vulnerable to climate change and to exogenous air pollution, even from far away. The reduced snow cover of recent years ascribed to global warming is seriously affecting alpine flora in New Zealand and Australian parks. Severe damage by air pollution is well documented in the Czech and Polish national parks in the Giant Mountains (Flousek, 1997) and also in many other protected areas.

Sports and tourism

Mountain sports and recreation present unique problems for policy-making and management in protected areas. Mountaineering expeditions should be monitored to prevent site degradation, litter disposal and overcrowding of fragile summits. Mountaineering and trekking organizations, particularly the International Union of Alpinist Associations, are cooperating with park managers and, for example, codes of conduct, training programmes and mountain clean-up activities have been introduced in the Karakoram in Pakistan and in Sagarmatha National Park, Nepal. Alpine skiing imposes major demands not only for ski lifts, avalanche control, water for cannons to make artificial snow, but also for nearby accommodation, second homes and after-ski infrastructure. The Winter Olympic Games have created problems over the years for many mountain protected areas; the 1998 Winter Olympics in Nagano, Japan, left impacts in Chubu Sangaku National Park (Okutumi, 1998). Concern has already been expressed over potential adverse impacts of the 2006 Olympics in Tatra National Park in Slovakia (Z. Krzan, personal communication, 1997). Mountain topography tends to channel visitors to protected areas into increasingly constricted corridors, valleys or summit trails, and careful planning and control are needed to protect the carrying capacity in the fragile and highly visible upper areas.

[*Mount Kinabalu in Sabah, Malaysia is largely a protected area, but conversion of forest to agricultural land is evident on the lower slopes*](#)

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Illegal activities

In mountain areas the cultivation of illegal crops is not uncommon - cocaine in the highlands of Peru and Colombia, opium and heroin in the Golden Triangle of Thailand/Myanmar/Lao People's Democratic Republic and the tribal areas of northwestern Pakistan, and marijuana on the slopes of Mauna Kea and Mauna Loa in Hawaii. Illicit activities in remote areas are a cause of concern for visitor safety and potential conversion of native vegetation to drug crops. Illegal hunting of endangered, or otherwise protected, wildlife is especially difficult to control in rugged remote topography.

Another common problem is the relatively poor database for design, planning and management. On account of their isolation and poor access mountain areas are usually the last selected for national survey and inventory of basic natural and cultural resources, even when local traditional knowledge is available. There is a great challenge, even in protected areas in developed countries, to capture local indigenous wisdom before the death of the community elders who serve as the repositories of such knowledge.

CHALLENGES FOR THE FUTURE

The major challenges for the twenty-first century are:

- To link together the isolated existing mountain protected areas by conservation corridors along the mountain ranges. This not only increases effective size, but provides migration corridors for gene flow and species movement. As the climate changes, poleward migration corridors in north-south ranges (e.g. the Andes) will better accommodate temperature change, and migration along the east-west

ranges (e.g. the Western Tien Shan) will be a response to rainfall changes.

- To provide for greater altitudinal species movement, either by extending the boundaries of protected land farther down the mountain slopes or by establishing a buffer zone of protection around the core area, as far into the lowlands as possible.

Principles and strategies for the design of more adequate protected areas to conserve habitats for rare species and to conserve biological diversity have been suggested by Noss in several publications (see, for example, Noss, 1991). There may be few new opportunities to designate additional areas that are strictly protected, such as national parks or conservancy reserves. Increasingly the task will be to devise cooperative ways of achieving and maintaining nature-friendly management in areas now devoted to forestry, grazing and agriculture. New partnerships are needed between governmental agencies (e.g. forest services), the private sector (e.g. ranchers) and communities (e.g. common property areas or indigenous tribal lands) in order to protect the environment (Miller and Hamilton, 1998). Proposals have recently been made to enlarge and link mountain protected areas with larger ecoregional corridors or ecozones. One of the earliest was in the Central Apennines, using Abruzzo National Park as a nucleus with proposals to link it with seven other national or regional parks and a series of 21 small nature reserves, refuges and oases, to create a conservation area of some 600 000 ha (Tassi, 1994). One of the most ambitious projects is the Yellowstone-to-Yukon (USA/Canada) Corridor along the Rocky Mountains, at least 2 100 km.

An excellent example of an altitudinal "corridor" is the recent establishment of controlled forest management units and a conservation area that almost link Jigme Dorji National Park in the High Himal with Black Mountain and Royal Manas National Parks (all in Bhutan) and with India's Manas Tiger Reserve in the subtropical lowlands (Minga Sherpa, personal communication, 1997). These initiatives and others were presented as a global overview by Hamilton (1997). There appear to be about 38 proposals worldwide to establish mountain conservation corridors.

Jim Thorsell, senior adviser on world heritage with IUCN, envisions an inter hemispheric conservation corridor of the Americas, from Tierra del Fuego to the Bering Strait; then, perhaps, through Beringia and on to Asia and into Europe (Thorsell, 1996). This may be a daunting challenge for proponents and managers of protected areas, but without vision little progress will be made. The Mountain Theme of the World Commission on Protected Areas within IUCN has adopted this concept, as well as the task of increasing management effectiveness of existing protected areas.

"Protected areas" as defined by IUCN include much more land than national parks and strict reserves, and managers or researchers working in any category of mountain "protected" areas are invited to join the existing Mountain Theme Network. For further information, please contact WCPA Vice-Chair for Mountains, 342 Bittersweet Lane, Charlotte, Vermont 05445, USA; e-mail: LSx2_Hamilton@together.org.

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