

**IUCN World
Commission
on Protected
Areas**

Guidelines for Planning and Managing Mountain Protected Areas

Synthesised and edited by
Lawrence Hamilton and Linda McMillan



IUCN
The World Conservation Union



South Africa's uKhahlamba-Drakensberg World Heritage Site, showing Didima Camp where workshop was held. *Photo: L. Hamilton*

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IUCN World Commission on Protected Areas

**IUCN – The World Conservation Union
2004**

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Dedication

P.H.C. “Bing” Lucas, as Chair of what was then the Commission on National Parks and Protected Areas, participated in the “Parks, Peaks and People” Expert Consultation in Hawai’i National Park, from which the original *Guidelines for Mountain Protected Areas* was produced. It was Bing who established the Mountain Theme in the Commission, and appointed me as its head, as a Vice-Chair. He subsequently, as a “mountain man”, strongly supported the Theme and its Network of professionals that grew from the original 42 to close to 500 today. Had he not died unexpectedly in December 2000 while hiking with his family, Bing would, I am sure, have been with us at the Drakensberg Workshop prior to the Vth World Parks Congress, which produced this present Guidelines Manual.



“Bing” Lucas
Photo: L. Hamilton

Bing was instrumental in shaping and strengthening New Zealand’s fine system of protected areas, serving in the Department of Lands and Survey from 1975 to 1986, and its Director General from 1981 to 1986. For this and his subsequent conservation work in New Zealand, he was the recipient of the Old Blue Award, the A. O. Glasse Award from the New Zealand Planning Institute, the Ian Galloway Memorial Cup and Outstanding Achievement Award from the New Zealand Institute of Park and Recreation Administration, and the 1990 Commemoration Medal from the New Zealand Government.

He joined IUCN’s Parks Commission in 1971, and over the next three decades served as Regional Vice-Chair, Deputy Chair, Chair, Senior Advisor, and finally Vice-Chair for World Heritage. His leadership was recognised by IUCN enrolling him as a Member of Honour, by being the recipient of the Companion of the Queen’s Service Order (Great Britain), and by being installed as an Officer of the Order of the Golden Ark by the Netherlands Government.

This man was short in stature but tall in friendliness, ability, and statesmanship. He was a giant in these and other personal and professional characteristics. He was respected among adversaries, earning the nickname Silver Fox. I also earned this name, from the same group of forest cutters in Queensland’s (then) potential World Heritage Site in the wet tropics. Since I was one day older than Bing (both born in June of 1925), I became Silver Fox I and he, Silver Fox II – names we wore with pleasure. Bing was friend, colleague and mentor to many, including the undersigned. Conservation and mountain protection lost a champion in his departure from the scene. It is fitting that this manual be dedicated to him, and to his wife, companion and support, Joyce Lucas.

Lawrence S. Hamilton
Charlotte, Vermont USA
January 2004

Preface

This publication is directed to those fortunate individuals who have some role in managing protected areas in mountain environments. It is by nature a handbook of principles and practical guidelines aimed at conserving the rich mountain heritage of nature and culture in the high places of our world. Today, mountain protected area managers may work for a wide range of entities: a government agency (e.g. Kenya Wildlife Service for Mount Kenya National Park); a community body (e.g. Village Forest Protection Committee for Jardhargaon Forest in Tehri Garhwal of Uttaranchal); the private sector (e.g. The Nature Conservancy for Heart Mountain Ranch in Wyoming's Absaroka Range); an NGO (e.g. Jatun Sacha Foundation for Guandera Cloud Forest Reserve in Ecuador), or even a combination of entities (e.g. King Mahendra Trust and local community groups for Annapurna Conservation Area in Nepal).

“Protected areas” are as defined by the IUCN World Commission on Protected Areas (WCPA). This definition is:

An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.

Management of these areas includes action for achieving a wide array of objectives. These have been classified by WCPA in a Category System based on objectives, and the labels vary from National Parks to Natural Monuments to Protected Landscapes, and include areas with other designations such as Community Conservation Areas, Nature Parks, and Biosphere Reserves. The latest (1994) version of the Categories and their objectives is given in Appendix 1. For a more thorough description of the Categories and case examples, consult the IUCN publication *Guidelines for Protected Area Management Categories*, 1994, which unfortunately is now out of print, but can be downloaded in pdf format from www.iucn.org/themes/wcpa/pubs/guidelines.htm#categories

“Mountains” have always been difficult of definition. We all know a mountain when we see it; mountain peoples all know that they are mountain peoples and are proud of it. Yet it is difficult to find a convenient definition that fits all mountains. There are, perhaps, only a few features which are common to all. They exhibit a vertical dimension, which results in an altitudinal gradient and stratification of climate, soils and vegetation; and they have different aspects and exposures. All other generalizations have exceptions. Most mountains rise above the tree line, but some near the equator are obviously mountains though their summits are scrub covered; most are very steep or precipitous, but the volcano Mauna Loa in Hawaii, evidently a mountain, has gentle contours; most rise to considerable altitudes, but the highest of the mountains of the Scottish Highlands, exposed to the rigours of a climate on the western seaboard of Europe, is not more than 1,344 metres above sea level and has a tree line at about 500 metres.



Though the tallest mountain – Ben Nevis – is 1,343 metres, these Scottish highlands are beloved and respected by Scots mountaineers. *Photo: L. Hamilton*

Becoming widely accepted, and used by the United Nations Environment Programme-World Conservation Monitoring Centre (UNEP-WCMC), is a system devised by Kapos *et al.* in 2000.¹ For our general purposes, let us label as mountains or highlands, those steep-sided, three-dimensional earth features that are conspicuous in the landscape, have more than one altitudinal vegetation zone, and are regarded as mountains by local people.

Using the Kapos *et al.* definition of “mountains”, UNEP-WCMC reports that as of 2002 there were 4,681,571km² in protected areas. Corresponding data for numbers of sites is difficult to interpret, since the numbers are for “geographic entities” rather than named protected areas. However, additional data from the same source shows that for Udvardy’s Mixed Mountain Systems,² there are 9,345 protected areas, covering some 16.32% of the biome. This relatively large coverage is not grounds for complacency. Selection has mainly been concerned with the protection of pristine landscapes, natural ecosystems and magnificent scenery; in most instances, the way of life of any people who live in these landscapes has not been included in the

¹ Kapos, V., Rhind, J., Edwards, M., Price, M. F. and Ravilious, C. 2000. Developing a map of the world’s mountain forests, pp. 4–9 in *Forests in Sustainable Mountain Development*. Price, M.F. and Butt, N. (Eds.) IUFRO/CABI Publishing, Wallingford, UK.

² Udvardy, M.D.F. 1975. *A Classification of the Biogeographical Provinces of the World*. IUCN/SSC Occasional Paper 18. IUCN, Morges (now Gland).

criteria for selection, though this has witnessed dramatic improvement of late. The suite of biodiversity of mountain areas was not captured by protecting mainly the pointy bits – summits of snow and ice and rock. Nor was the need for accommodating climate change, providing places to which migration is possible for displaced flora and fauna.

These Guidelines for Mountain Protected Areas (hereafter often referred to as MtPAs) are an update and revision of a set of 161 guidelines published in 1992. These were the synthesised output of an expert consultation workshop held in Hawai'i Volcanoes National Park, and organized by Lawrence Hamilton and Jim Thorsell.³ To those participants in the 1991 Parks, Peaks, and People Workshop we express our gratitude, for we have used much material from that publication. This new manual has benefited from the dedicated work of participants in a pre-World Parks Congress workshop held in the Drakensberg Mountains of South Africa, 5–8 September 2003. Those 59 participants from 23 countries are listed in Appendix 2, and we thank them sincerely for their expert contributions.

The workshop was made possible largely through funding by a GEF grant to IUCN, augmented by support from The Nature Conservancy, The World Bank, University of Aquila, and University of Torino, Global Environment Facility, and TransGrid (Australia). It was hosted by KwaZulu-Natal Wildlife at Cathedral Peak in the uKhahlamba-Drakensberg World Heritage Site.

We hope that the guidelines will be a catalyst for national and site-specific strategies that must follow if we are to have harmonious and effective management of MtPAs with myriad “benefits beyond boundaries” around the world.

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³ Poore, D. (Ed.) 1992. *Guidelines for Mountain Protected Areas*. IUCN Protected Area Programme Series No. 2. IUCN, Gland, Switzerland and Cambridge, UK.

Introduction

Just as great climbers draw their strength from the challenge of difficult-to-scale peaks, I believe that nature lovers have much to gain from experiences in the hills and mountains that surround us. It is from these heights that we can better appreciate the tapestry of life playing out in both small and grand scales, from the sight and feel of delicate lichens and wildflowers to the views of eagles soaring overhead, and the sound of bull elks bugling in the mountain valleys during the fall mating season.

John Sawhill (late President and CEO,
The Nature Conservancy) in *Mountain Reader*



South Africa's uKhahlamba-Drakensberg World Heritage Site, showing Didima Camp where workshop was held. *Photo: L. Hamilton*

Mountains are very special places. For many they are sacred; to most they bring an uplifting of the spirit and refreshment; to a few, they bring fear. They are the home of many different peoples in every continent. They occur in all biogeographical regions of the world, where, because of their history, isolation, and great variability of habitat, they are treasuries of high biodiversity and rich in endemic species. They contain a great variety of climates and of geological and physiographic features. They provide magnificent scenery and the qualities of remoteness and wilderness – a solace and a challenge to those who visit them. And they are the gathering grounds of much of the world's water. In fact, they are of untold value to those who live in them, those who visit them, and enjoy or study them, and those in the valleys and plains who count upon a dependable yield of high quality water, other products (wood, minerals, game, food, etc.) and recreational opportunity from them.

Because of their steepness, extreme weather conditions, and the instability of their soils, many mountain areas are marginal for commercial agriculture, though many support excellent subsistence systems of farming, grazing and agroforestry. Most too are remote and inaccessible, so that mountain communities are far from markets, and the provision of services, such as education and health, for them is expensive. Most of the communities have also, until recently, been very self-contained. Globalization, with improved communications and access, may prove a mixed blessing; as well as bringing the benefits of better services and more direct access to markets, they facilitate emigration and provide greater opportunities for people from the lowlands to influence and exploit the resources and cultures of the mountains. Small farms are disadvantaged as globalization is currently carried out.

In many countries, the lowland metropolitan centres have another conception of mountain areas. They are often viewed as supply areas, to be used or exploited for wood, water, wildlife, minerals, or recreational opportunity including mass tourism. Because they frequently form international borders, they are important for defence. The people who live there are often proud and independent, and considered unruly and backward by lowlanders. The mountains are often endowed with valuable minerals; have forests that can be exploited; they contain preferred sites for the impoundment of water for domestic and industrial use, for the generation of electricity and for irrigation. Mountains can be developed for tourism, recreation and for second homes. In fact, they are looked upon both as an economic asset and as a liability or special responsibility. But their very remoteness and difficulty of access often means they are the last bastions of wild, untrammelled nature and unfettered evolutionary processes. This makes them rich treasuries of native biological diversity. It also means that they possess some of the last remaining large wilderness areas, for those who crave or need solitude and as much absence of human disturbance as possible.

Since the earliest days of the establishment of protected areas, mountain areas have been a favourite choice. This has not always been for the best reasons. Many, it is true, have been selected because of their special merits, but others largely because of their remoteness and the fact that they were of limited value for more lucrative economic activity. Moreover, selection has mainly been concerned with the protection of pristine landscapes, natural ecosystems and magnificent scenery. In most instances, the way of life of any people who live in these landscapes has not been included in the criteria for selection, though this has witnessed dramatic improvement of late.

Mountains are indeed special places. Many of them have received legislative recognition by designation as parks or reserves of various kinds. It is for the planners and managers of this estate and any future areas that the guidelines in this booklet are intended. They were formulated for mountain protected areas (MtPAs) in the widest sense of both terms – “mountain” and “protected areas” (PAs).

These are general guidelines or recommendations. Specific guidelines, it is hoped using these as a foundation, need to be developed at a national level and then at a PA level. At this level they should be much more specific, and should have local community input to meet the special needs and circumstances which prevail at any specific site. These guidelines are not presented in any paternalistic way, but offered as a sharing of experience by 59 scientists and managers from 23 countries, assembled at South Africa’s Drakensbergs in a workshop in 2003.

It was the thesis of this Drakensberg workshop consultation, and the rationale for convening it, that mountains possess biophysical and cultural characteristics which merit special consideration and treatment in the matter of preservation and conservation. These include their three-dimensional nature involving steep slopes, altitudinal belts of varying ecosystems in a short distance, their different exposures or aspects and climates, and their frequent characteristics of spirituality, remoteness, inaccessibility and great cultural diversity – islands in a sea of tamed and transformed environment. Because of their elevation and steepness, and the processes of erosion, tectonic action, and mountain building, they are earth features of a dynamic nature, subject not only to many hazards, but also more susceptible to human-initiated damage than are other terrains. Planning, design and management of mountain protected areas thus call for a great sensitivity to special cultural and biophysical attributes of these environments.

It was a recognition of the special nature of mountains and the impact of development on them that led to a previous initiative by IUCN back in the late 1970s. Again, based on a convocation of mountain researchers and land managers in New Zealand, Dr Ray Dasmann and Dr Duncan Poore produced an excellent booklet, *Ecological guidelines for balanced land use, conservation and development in high mountains* (IUCN, Gland, 1980).

It was this same recognition that led to a focus on Mountain Protected Areas in the 1991 Hawai'i workshop. And finally, global concern was aroused over mountains with the adoption of a special mountain chapter (No. 13) in the United Nations Conference on Environment and Development at Rio de Janeiro in 1992. A "Mountain Agenda" has been developing since then as part of Agenda 21 from UNCED. International political and citizen concern was further expressed by the UN declaring 2002 to be the International Year of the Mountains, thus spawning a host of activities around the world.

And, finally, a recommendation on mountain protected areas as a key contribution to sustainable development was formulated and endorsed by the 59 participants in the Drakensberg workshop, presented to the entire World Parks Congress and accepted by it as part of the Durban Action Plan. This recommendation is given in Appendix 3.

It is evident that there are several issues which are of special importance to the management of protected areas in mountains. Some of these are related to the changing numbers and way of life of resident populations; some to the effect of visitors and the development of facilities on fragile soils and ecosystems and on the "fragile" cultures of the residents; and some linked with the special opportunities and problems which may be caused by the accelerated changes of climate which are now expected. An additional complication is the great variability of environments within a small compass.

The satisfactory conservation of protected areas in mountains depends, as indeed it does in other biomes, on the effective application of a number of procedures:

- Clear articulation of the purposes for which areas are to be protected and the criteria applicable to each of these purposes (e.g. preservation of biodiversity, protection of water catchments, etc.);
- Identification of those areas which qualify to meet each of the defined purposes. For this a survey must be made of the relevant resources;

- Legislation to provide for protection and the resources of staff and money to make the application of the law effective;
- Encouraging private bodies, NGOs and community organizations to dedicate lands to conservation management;
- Consultation with local communities who may be affected (and perhaps also with the wider public) on matters concerning the choice of area, the objectives for its management and the details of management. Some permanent mechanism for continuing consultation is desirable;
- Precise definition of objectives of management, co-management or even community management of the protected area as a whole and of parts of it where these have special requirements; this should form the basis of a formal but flexible management plan;
- Planning and management must not stop at the protected area boundary, but take into account adjacent land interactions, the watershed and the provision of benefits beyond boundaries;
- Compilation of geo-referenced natural and social base-line information and regular monitoring thereafter to follow the effectiveness of management. Monitoring should embrace not only physical and biological aspects, but socio-cultural ones as well;
- Good science is essential to informed stewardship. Research should be specifically directed towards the solution of problems which arise in the course of management;
- Periodic revision of the prescriptions and practice of management as a result of experience and conclusions derived from monitoring;
- The above procedures all apply even more vigorously when the area is a World Heritage Site.

The chapters which follow are largely based upon the main themes of the 1991 International Consultation on Parks, Peaks and People, whose themes were selected to cover topics of wide general interest and applicability. These were published in 1992 as *Guidelines for Mountain Protected Areas* (edited by Duncan Poore, IUCN, Gland). Most of them address, to a greater or lesser extent, all the topics listed above. It was felt best to leave any resulting duplication among topics, as the importance of each of these themes is emphasised by being repeated in a different context.

The chapters which follow deal in turn with:

1. Mountain protected areas: to protect what?
2. General criteria for the selection of mountain protected areas
3. The preservation of mountain biodiversity and physiographic features
4. Transborder mountain protected areas
5. The sacred, spiritual and cultural significance of mountains
6. Communities as partners in mountain protected areas
7. Water and soil conservation in mountain protected areas
8. Management of threatening processes

9. Protecting mountains and the visitor experience: managing to engage tourists and recreationists
10. Education and interpretation
11. Issues associated with climate change and air quality

The topic of wilderness management is inserted as individual guidelines within the chapters where it applies.

Obviously in a brief manual of guidelines where an attempt has been made to limit text to short, specific statements (almost “bullet” form) not all complex management issues can be covered. For example, “fire” is treated under the heading of “Inappropriate fire”, as part of Chapter VIII, Management of Threatening Processes. The subject of positive use, e.g. fire management, is a whole science in itself, with a large literature which should be consulted. Similarly with grassland management for pasturage or for grassland birds or as water-yielding catchment cover, or with forest management, where these are permissible uses (Categories V and VI). It will be apparent in the chapters that follow, that we have a bias towards Categories I through IV, where objectives of biological and cultural diversity conservation, maintenance of environmental services and tourism and recreation, are dominant. We hope that users of these guidelines will excuse our lack of comprehensiveness in these other arenas, in order to produce a more compact, user-friendly manual and that they will consult other appropriate resource management literature when needed.

I. Mountain protected areas: to protect what?

It is true, broadly speaking, that protected areas in mountains have hitherto been mainly chosen for their spectacular scenery, their quality of wilderness, their biodiversity and the opportunities they offer for tourism; and the criteria used to select them have been based on these values. In many respects, these criteria are the same as those used in other biomes. Many existing mountain protected areas are empty of resident people, or nearly so; but there are others which have substantial populations, especially in the valleys. Here the landscapes have often been shaped by long occupation and many of their special qualities lie in the contrast between the tamed and the wild. These people, over centuries, have reached a way of life which is broadly in balance with the setting in which they live. Both they and the pressures upon them, are now changing fast; and the changes are in many instances harmful to the environment and too rapid or too violent to allow for harmonious adaptation by the local communities.

Because most mountain protected areas in the past have been chosen for their physical, biological and scenic qualities, the role of local people has usually been seen as one of maintaining these physical, biological and aesthetic qualities. Community livelihood and culture, the protection of them from unnecessary disruption and the conservation of the resources upon which they are based, have not been seen as special features which should be protected and upon which areas should, therefore, be selected for protection. This is no longer a tenable attitude. To provide sufficient protection to enable the ways of life of resident communities to develop without undue disruption should be one of the central aims of protected areas in mountain regions – consistent, of course, with broader environmental conservation. Ways of choosing the communities which deserve such protection should, therefore, be among the criteria for selection of protected areas.

If resident populations are to be included as an essential element in some mountain protected areas this has direct consequences for the category of protected area to be chosen and for the objectives of management. The IUCN Categories cover a wide range of characteristics and objectives and, by defining different zones within a protected area, many of these different objectives can be included in one area.

Perhaps the most flexible category is Category V (Protected Landscapes) because this, in theory, affords broad protection to the whole, while it can give greater protection to parts for specially defined purposes. The essential characteristic is a system of graded protection supported by legislation, controls and incentives, since much of the land is in human use for livelihoods; the nomenclature is less important, since many of these are called National Parks (Category III) by their countries.¹ Indeed, the greatest number of MtPAs are in Category IV Habitat/Species Management Areas, although the greatest area is in Category II.

It is not suggested that this flexible approach must be adopted for all mountain protected areas; there is clearly a place for areas which fall firmly into Categories I or II. In fact,

¹ The UNESCO Biosphere Reserve provides for this kind of graded protection, with a more protected core zone and a peripheral or buffer zone. It also includes a research component and monitoring as part of an international network.



Entlebuch Biosphere Reserve in Switzerland is a Category V Protected Landscape.
Photo: L. Hamilton

little-disturbed natural ecosystems of mountains offer unique opportunities for benchmark research and monitoring as global change occurs. But the whole concept of protected areas, applied flexibly, does provide for graded degrees or zones of protection within the chosen area which will enable development to take place in a controllable way and at a controllable rate, to the greatest possible advantage of both local communities and the environment. Indeed there would be merit in extending the general principles to policies affecting all mountain regions, whether formally protected or not.

The special significance and characteristics of mountains require in many instances that major portions of them be afforded extra care or protection. Designation of areas as parks, reserves, sanctuaries and the like has recognised these special qualities and “senses of place”.

Some reasons for protected area status and a few examples follow:

- Mountains are often associated with “sacred” aspects of nature. There may be pilgrimage to holy hills, or taboo places of fear that present unusual management situations (e.g. Maria Lionza, Huang shan, Bromo-Tengger-Sumeru).
- Mountains have mystique for scholars, visitors and the general public. This has plus and minus effects (e.g. Kilimanjaro, Elbrus, Lorentz).

- Traditional indigenous groups with threatened cultures often occupy or use the areas. They add greatly to the interest, can contribute much and represent a clear case for cultural diversity conservation. Cultural diversity may be more threatened than biodiversity (e.g. Pico de Neblina, Annapurna).
- Mountains are headwaters of valuable surface water resources (e.g. Australian Alps). Special care is needed to safeguard water quality for all downstream sites. The few remaining economically feasible water storage reservoirs for water and power are in mountain valleys. Of particular significance is cloud forest, which has endemic species and captures cloud or fog water (e.g. Kilimanjaro, Monteverde).
- Mountain biota, under climate stresses at the best of times, are particularly vulnerable to climate change from increasing greenhouse gases, as well as from exogenous air pollution. Protected areas crossing several altitudinal belts are needed. They offer great possibilities for global climate change and air quality research and monitoring (e.g. High Tatras, Great Smoky Mountains).
- Mountains are a last refuge for many rare plants and animals eliminated from more transformed lowlands. They are vital to biological diversity conservation. Freestanding mountains become biological islands (e.g. Kinabalu, Mount Apo).
- These are dynamic landscapes of relatively rapid change. Volcanism, uplift, erosion, glacial outbursts, seismic activity, avalanches and torrents all contribute to significant rapid alterations in topography, vegetation and land use. These are high-energy environments where some control over human alternations is often needed (e.g. Hawai'i Volcanoes, Tongariro).



Periodic and well-monitored volcanic eruptions characterise Hawai'i Volcanoes National Park, Biosphere Reserve and World Heritage Site. The volcano is the current abode of the Hawaiian goddess Pele.

Photo: Hawai'i Volcanoes NP

- There is a concentration of high scenic value, attractions for tourists and recreational use. Management is needed to maintain these values (e.g. Mount Cook, Hohe Tauern).
- The concentration of recreation/access in confined corridors demands a proactive policy and management approach to avoid overcrowding and degradation (rubbish, sanitation, erosion, etc.) of access routes and campsites (e.g. Himalayan parks, Tasmanian or New Zealand national parks, Huascarán).
- Mountaineering expedition pressures on highly impacted routes call for positive control to avoid site degradation and require that equipment, materials and refuse brought in be taken out (e.g. Sagarmatha/Everest or K2).
- Mountain ranges often form country boundaries and thus offer opportunities for the establishment of international border parks, peace parks and cooperative international action (e.g. Drakensberg and Maloti, Sagarmatha and Qomolangma and the proposed Mont Blanc Park and the convention on the conservation of the Alps).

II. General criteria for the selection of mountain protected areas

The selection of protected areas in the mountains should be related primarily to the sets of values which it is desirable to protect – physical features, biodiversity, catchment characteristics, metaphysical aspects, human cultures and the resources upon which they depend and scenery. But consideration should also be paid to the uses which may be made of these areas based upon their protected status – scientific or cultural studies, sustainable livelihoods, various forms of recreation or, simply, pure enjoyment – for it is the use made of such areas that will convince governments and the public that protection is in the national and public interest. Many of the difficulties of managing mountain protected areas are concerned with establishing the correct balance between protection and use.

There should be protected areas in every mountain range in the world, selected to protect the whole range of features for which mountains are valued and designed to meet various uses. These need to be planned and delineated within a bioregional context which links them to the larger region. Planning must recognise the contextual differences (e.g. ecological, socio-economic, institutional, cultural) of PAs in different places. It must also recognise the common characteristics of mountains (e.g. opportunities for network corridors, altitudinal/latitudinal compensation for climate change) and the unique qualities of mountain environments. All of this implies use of the full range of PA Categories.

Guidelines

Collaboration and communication are basic parts of planning, including capacity building, empowerment, institution building, governance, and protection mechanisms that do not require government ownership.

1. Within each mountain range, it should be the responsibility of the governments which contain parts of it to ensure that protected areas are set up which adequately include the valued biological, physical and cultural variation within their boundaries; though governments do not necessarily have to control the area.
2. Protected areas should be designed using the criteria of reserve design coming out of the science of conservation biology, e.g.
 - larger is better than smaller
 - one unfragmented area of any size is better than many unconnected small areas aggregated to that size
 - buffered is better than no buffer
 - minimum edge or perimeter (rounded or blocky rather than linear)
 - connected is better than disconnected

3. To accommodate climate change in order to protect biodiversity, mountain protected areas should be extended down slopes to the lowlands and, in places, to the sea (Summit-to-Sea).
4. In view of the increasingly critical high-quality water shortage, mountain headwaters are particularly desirable sites for land/water protection.
5. Protected areas should be planned and delineated on a bioregional scale, linked to the surrounding landscape/seascape.
6. Be proactive in finding areas of wilderness which are becoming increasingly valued in an urbanizing, commercializing, frenetic world.
7. Be alert to protection possibilities for private or communal “stewardship lands” which have been long and sustainably managed in farming, ranching and forestry.
8. Select and design with emphasis on the hydrologic unit of the watershed, upstream and downstream, as much as possible.



Mount Chimborazo, Ecuador, is the world's tallest mountain if measured from the centre of the Earth. It is protected in a Category VI Faunal Production Reserve.

Photo: L. Hamilton

III. Preservation of mountain biodiversity and physiographic features

Protected areas in the mountains have a particularly important contribution to make to the preservation of the world's biodiversity (species, ecosystems and the range of variation within species) and of its many different geological and physiographic features.

Mountain areas are significant reservoirs of biodiversity, containing rich assemblages of species (and their genotypes) and of ecosystems. There are a number of reasons for this richness, among them these:

- The isolated nature of many mountain ranges has led to the development of a high degree of local endemism;
- Mountains contain many different rocks, parent material and soils;
- Mountains are dynamic and unstable; thus many different successional stages of vegetation are present;
- Because of the small scale pattern of variability in physical conditions – temperature, radiation, moisture and wind exposure, snow cover – many different communities occur in a small compass;
- Because mountains are often remote, their ecosystems have been less modified by human action than those in more accessible areas.



Altitudinal life zones within short distances give mountains a greater heterogeneity for habitats for biodiversity than flatter terrain.

The maintenance of biodiversity transcends the boundaries of protected areas. Many species within protected areas depend on resources outside them and the existence of the protected area likewise affects areas outside.

Both geological and physiographical features are also richly represented in mountain areas – different rock types, folding, volcanism, degrees of metamorphism, glacial features etc. These should be preserved in their own right.

The steep environmental gradients and close proximity of different altitudinal zones have in the past allowed the migration of biota in response to climatic change. Protected areas in mountains have therefore a particular importance for the conservation of biodiversity in view of the high probability of future climatic changes involving temperature or changes in air quality.

Peoples living in the mountains have developed many cultivars which are well adapted to local conditions and have special knowledge of the uses of local plants and animals in food and medicine. It is important that the cultivars should be preserved and that the knowledge possessed by local people should not be lost.

The preservation of the full range of biodiversity and of physical features is an essential element in the selection of mountain protected areas. As an integral part of planning, provision should be made for the protection of large examples of natural ecosystems and of populations of plant and animal species, together with sites illustrating the principal geological and physiographic features and the processes at work in the landscape. These should be supplemented by the protection of a larger number of small areas representing the full local variety of species and ecosystems, including intra-specific genotypic variation.



Market at Dali, Yunnan, China where mountain tribal peoples brought 550 different species of plant and animal products harvested from the mountains. *Photo: S. Pei*

Guidelines

Design/planning

1. Areas should be selected for protection and established as protected areas, which will, as far as possible, ensure the maintenance of all genotypes, species, communities and ecosystems. Protected areas should be designed to encompass the full range of variation – altitude, aspect, rock and soil types (topodiversity), aquatic type – and viability to ensure functional integrity, including ecological processes.
2. Particular emphasis should be placed on conservation of endemic and restricted range and threatened species. Protected areas should be designed to capture the full range of habitats across the altitudinal gradient, including the lowland habitats and the transition zones between upland and lowland systems.
3. The size and characteristics of protected areas should be related to the needs of the plant and animal communities they are intended to protect (conservation targets) as well as the functional integrity of the ecosystem. They should be as large and intact as possible, to minimize fragmentation and to accommodate natural or human disturbance. Consult principles of conservation biology on “reserve design” dealing with size, shape, buffering and connectivity.
4. Wherever possible, areas set aside to safeguard samples of natural ecosystems should be surrounded by buffer zones, taking advantage of physiographic and other protective features and nature-friendly land stewardship promoted within the zone (as in Biosphere Reserves).

PA management

5. Mountain protected areas should have clear and explicit conservation objectives and be managed according to those objectives. Zoning within the PA should be determined according to biodiversity and conservation objectives, including establishment of core and wilderness zones, zones for recreational and other uses and buffer or peripheral zones where appropriate production uses might be carried out (such as harvesting of medicinal plants by locals).
6. Those areas with species or ecosystems that are extremely sensitive to human interference or use (*e.g.* Tibetan chiru, Afro-montane cloud forests) merit special protection status such as zones of Strict Nature Reserve or Wilderness (Category I).
7. The general policy in PAs should be to favour natural processes. Management practices such as grazing, fire, or other types of habitat management should only be considered as relevant if they are an integral part of the natural functioning of the system.
8. There should be no introduction of alien species and any recently introduced species should be eliminated as soon as possible. The interest is in native biodiversity, not total number of species. If any alien species are well established, their effects on biodiversity should be assessed and eradication or control concentrated on those whose effects are significant, or on areas of particular importance for their biodiversity or ecological characteristics *e.g.* fencing and hunting of wild pigs in Hawai'i Volcanoes NP.
9. Mountain PAs should be managed as part of a landscape context to maintain migration corridors for wide-ranging and low density species (metapopulations) and to maintain

connectivity with other PAs or areas of natural habitats. Regulating land or water use or promoting land stewardship in the areas between reserves can supplement the conservation estate and maintain natural corridors.



The Yellowstone-to-Yukon Initiative is attempting to connect PAs along the Rocky Mountains in a Conservation Corridor of some 3200 kilometres. *Illustration: The Y-2-Y Coalition*

10. Restoration and repopulation. Where habitat is insufficient or degraded so that viable populations of key species cannot be conserved, efforts should be made to restore degraded habitats and intensively manage target species to promote their survival (e.g. mountain gorillas).
11. Monitoring. Management actions and key species should be monitored to assess whether management is achieving the PA objectives. The objectives and activities should be evaluated at regular intervals and adapted as necessary (adaptive management).

Local involvement

12. Planning and management of areas established for their biological diversity should involve local communities and build upon local and traditional knowledge for management, use and monitoring of habitats and species. Whenever possible, local communities should benefit directly from PA establishment and management.

13. Land use (cultivation, grazing, plant harvesting, hunting, fishing) within protected landscapes (Category V) or Resource Management Areas (Category VI) and specified use zones of other protected areas should be regulated to ensure that viable and functional populations of wild plants and animals are maintained. Monitoring programmes should assess the impact of such activities.
14. Conservation of agrobiodiversity, including “heritage” breeds, should be encouraged among local within-PA or neighbouring land users. Outside the MtPA boundaries, private or communal stewardship lands can provide both wild native-biodiversity buffers and domesticated valued biodiversity.

Research and education/interpretation

15. International, national and local databanks should be analysed in order to identify rare and endangered species, endemics and geoheritage types and should include biological, physical and ecological inventories.
16. Research in mountain PAs should target threats and management needs, including collection of information on the ecology of species that have a key role in the structure and function of ecosystems (“keystone” species) and “umbrella” species. Data should be collected and managed to facilitate decision-making, such as planning and monitoring.
17. Research on physiographic features, geology, palaeoecology and glaciers provides useful information on the history and functions of the areas and can provide input to management and educational activities.
18. Research on biodiversity and the history, ecology and cultural attractions of the PA should feed into educational, interpretation and outreach programmes.
19. Research should also be focused on aquatic biodiversity and watershed function.
20. All- taxa biodiversity surveys can be triggered by “biodiversity blitzes”, assembling teams of specialist scientists from other agencies or universities, as has been done in Great Smoky Mountains NP and The Australian Alps NPs.
21. Creative use of local, minimally trained para-taxonomists is encouraged, such as has been so effective in Costa Rica’s INBIO programme.
22. Educational programmes should be developed to inform local people, the general population and decision-makers of the area’s importance for biodiversity, watershed protection and other ecosystem services. Details of park management, research and conservation needs should be communicated to local stakeholders, with an explicit emphasis on the links between the PA’s biodiversity and local development and culture. Visitor and interpretation centres can provide an effective focus.

IV. Transboundary mountain protected areas

Mountain ranges often form the boundaries between countries, or span the territories of two or more countries or other large sub-national jurisdictions. There are compelling biological reasons why transboundary thinking and cooperation should prevail. Biota recognise no political boundaries and conservation of biodiversity and physiographic features should not stop at such borders. In addition, the communities who live in mountain regions, although they may be citizens of adjacent states, may have close affinities in language and culture and maintain strong ties.

Often far from national capitals, mountain regions and the people who live in them are frequently marginalized from the centres of economic or political power and suffer constraints of association and trade. Yet the relative remoteness and difficulties of access to mountain regions on the borders of countries has created conservation and development opportunities.

These opportunities have found expression in a steady increase worldwide of transboundary conservation initiatives, including the establishment and management of transboundary protected areas involving mountains.¹

A transboundary protected area is

“An area of land and/or sea that straddles one or more boundaries between states, sub-national units such as provinces and regions, autonomous areas and/or areas beyond the limits of national sovereignty or jurisdiction, whose constituent parts are especially dedicated to the protection and maintenance of biological diversity and of natural and associated cultural resources and managed co-operatively through legal or other effective means”.²

It is this last attribute which distinguishes a transboundary protected area from the more common situation that arises when two or more protected areas are simply adjacent to one another across a national or other boundary. A few good examples of such co-operative situations include:

- Waterton/Glacier International Peace Park (the first international park), Canada/USA
- Alpi Marittime/Mercantour, Italy/France
- Maloti/Drakensberg Conservation and Development Area, Lesotho/South Africa
- Manas Tiger Reserve/Royal Manas, India/Bhutan
- Australian Alps National Parks (9 units), 3 States and Commonwealth

Several transfrontier PAs are virtual “Peace Parks”, serving to reduce tension or conflict and promote friendly relations between political entities, e.g. Cordillera del Condor Reserves (Peru,

¹ Thorsell, J. (Ed.) 1990. *Parks on the Borderline: Experience in Transfrontier Conservation*. IUCN, Gland, Switzerland.

² Sandwith, T., Shine, C., Hamilton, L. and Sheppard, D. 2001. *Transboundary Protected Areas for Peace and Co-Operation*. IUCN, Gland, Switzerland and Cambridge UK. Best Practice Protected Area Guidelines Series; No. 7.



Hands across the border of Waterton Lakes/ Glacier International Peace Park, established in 1932 between Canada and USA.

Photo: Glacier NP

Ecuador); La Amistad International Park (Costa Rica, Panama); Ruwenzori-Virunga Volcanoes (Uganda, Rwanda, Democratic Republic of the Congo). Opportunities should be sought across frontiers of tension, for the establishment of joint protected areas for peace (see Sandwith *et al.* 2001).

In establishing cooperative management agreements, a fundamental principle is respect for the sovereignty of the individual countries or states in achieving mutually beneficial endeavours. Cooperative agreements now in use in several places transcend politics and are designed so that they are commitments, though voluntary, and may be terminated by either party at will.

In reality, transboundary conservation in mountain regions encompasses a range of situations where the areas on either side of a national boundary could be under different regimes of resource management and levels of co-operation. Many of these are being considered or developed towards being transboundary mountain protected areas consistent with the above definition. The transboundary mountain context confers particular opportunities and challenges for protected area agencies or other authorities which are not common to other mountain protected areas or indeed other transboundary protected areas. The following guidelines are restricted to the **specific context of transboundary conservation in mountains**. More general guidance on transboundary conservation is available in Hamilton *et al.* (1996)³ and Sandwith *et al.* (2001).

³ Hamilton, L.S., Mackay, J.C., Worboys, G.L., Jones R.A. and Manson, G.B. 1996. *Transborder Protected Area Co-operation*. IUCN, Gland, Switzerland and Australian Alps Liaison Committee, Canberra, Australia.

A very important point to remember when considering transboundary mountain issues is that the protected area manager must confront and deal with issues which extend far beyond the traditional biological and community concerns of management. Extending mountain conservation beyond national borders thrusts the manager into a complex set of issues which include biological, economic, social, legal/institutional and political dimensions.

Guidelines

Biological issues

1. Mountain regions are the habitats for a number of species which occur in low densities with wide-ranging movement patterns e.g. snow leopards, bearded vultures, jaguars, argali sheep, harpy eagles, black-necked cranes, etc.. Such species often have seasonal movement patterns that cross political boundaries in mountains and need to be managed jointly or with great collaboration. The diversity and complementary nature of these habitat requirements across borders requires that a landscape level approach to conservation management be undertaken, with adjacent jurisdictions recognising their essential and complementary roles to maintain access to habitats at different times/places and to harmonize management regimes.



Transboundary co-operation between Gran Paradiso (Italy) and La Vanoise (France) enabled the recovery of the threatened ibex population which requires summer and winter range on opposite sides of the frontier.

Photo: Gran Paradiso NP

2. Globally unique resources such as glaciers, high altitude wetlands, tree-line forests and other ecosystem types occur in mountain regions and are often shared by one or more countries. The rareness of these situations coupled with their unique transboundary character means that managers globally must work together and lobby collectively in international fora for special consideration regarding their management. Managers on each side of the border must collaborate with joint protection plans.
3. There is need for concerted action regarding global climate change where the impacts may be detectable through joint monitoring of transboundary mountain resources such as glaciers, high altitude cloud forests or mountain gorilla populations. The transboundary

Biosphere Reserve Krkonoše/Karkonosze (Czech/Polish) illustrates this collaboration well, with a joint science and monitoring programme.

4. Transboundary mountain resources may especially be at risk and specific measures should be put in place to counter the exploitation of endangered species, such as particular medicinal plants in the high altitude regions of Europe or *huemul* endemic deer in Argentine-Chilean Andes.

Economic issues

5. Transboundary mountain areas are often far from markets and therefore create difficulties for legitimate trade, but conversely provide opportunities for smuggling and other illegitimate cross-border movements because of the difficulties of access and many places to hide. Managers need to recognise if these activities are occurring and that they can compromise the effectiveness of management and the safe use of areas for tourism, for example. Transboundary conservation programmes offer managers the opportunity to promote interaction among agencies on either side of the borders for legitimate trading activities and for co-operative responses and protocols for dealing with illegal activities.
6. Protected area managers, both local and at national level, should engage in cross-border dialogue regarding their country's mutual dependence on effective watershed management. Mechanisms for monitoring cross-border impacts on water resources should be developed and discussions should be initiated leading to more formalized cost-sharing or compensation schemes.

Water resources are a primary economic resource in transborder mountain regions, where cross-border impacts can be of material significance to the quantity and quality of water run-off. In particular, the quality of watershed management on one side of the border can directly impact the water resources in an adjacent country, if they are in the same basin. Yet there is often not a recognition of this mutual interdependence of the countries concerned, let alone a specific protocol for compensating the managers of watersheds for the costs of maintaining this economic resource.

7. Mountain areas on boundaries are particularly prone to the development of hard infrastructure such as roads, cableways, telecommunications towers, etc., which can impact visually and directly on biodiversity qualities, compromising the senses of place and visitor experiences. Managers should co-operate to discuss combined responses to proposals for development to enable a more powerful co-ordinated response and to harmonize their influence on development decisions.

Social issues

8. Mountains often hold particular spiritual values for people especially to those communities who reside in them and whose communities may straddle the boundaries between countries. Protected area managers should recognise these shared values of communities regarding transboundary mountain areas and promote communication, awareness and understanding of these ties and their significance. Information regarding

transboundary mountain protected areas should be jointly prepared by managers on both sides of the borders and accessible in style and language to all relevant communities.

9. A particular concern of communities living in transboundary mountain situations regards transhumance (transborder movement and use of resources), free movement across borders and the need or requirement for dual nationality. Protected area managers must be informed about these issues and enabled to interact with both communities and authorities regarding the history and nature of these movements if they are to maintain and develop sound relationships with communities in these contexts.
10. Communities that live in transboundary mountain areas will have unique knowledge about the history and relationships in these specific contexts. Protected area managers would be advised to include consultation and involvement of local communities in deliberations regarding management policies, planning, programmes and activities.
11. Where languages are different on each side of the border, managers should take language training in the other language to promote better communication and avoid misperceptions.

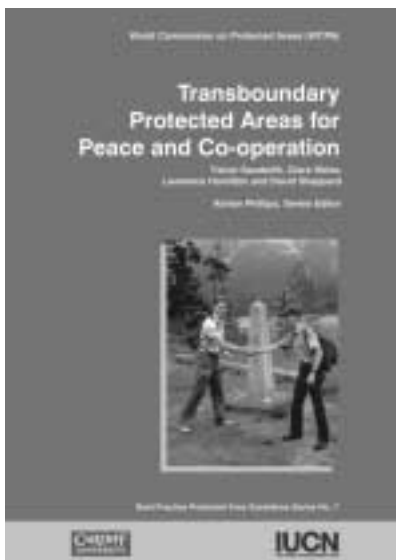
Legal and institutional issues

12. Mountain communities in transboundary situations have often developed their own customary rules and laws regarding their use of natural resources. Protected area managers should make an effort to understand these customary arrangements and harmonize these into their own management policies. In particular, there is a need to respect these arrangements and undertake activities in such a way as not to undermine functional arrangements which are generally supportive of sustainable management of the mountains.
13. People who live in transboundary mountain regions may effectively possess dual nationality, despite this not being recognised at the national level in each respective nation state. Protected area managers need to understand the perspectives and rights of these communities and to discriminate between the legitimate transboundary linkages and those that are not legitimate, e.g. outsiders who have no long-term commitment to the transborder mountain region.
14. There may be a need to establish legal, shared responsibility for transboundary natural resource management (especially for fire and alien invasive species and for education and interpretation). A Joint Memorandum of Understanding or Agreement such as in force for the 3-State/Commonwealth management of the Australian Alps National Parks is to be desired as a minimum binding agreement.
15. Protected area managers in transboundary mountain regions should work towards the harmonization of laws and management practices and the elimination of disparities in approach. In particular, there may be a need to harmonize grazing regimes in high altitude areas where grazing at particular times of the year could have negative impacts on fragile, high altitude resources such as wetlands or steep slopes.
16. The remoteness and difficulty of access to high altitude areas shared between countries emphasises the need for simultaneous co-operative scientific research and monitoring, with resulting economies of shared costs.

Political and security issues

17. Transboundary mountain areas may be a focal point for cross-border conflict and insecurity, because of their remoteness and attribute of being good places to conceal insurgency or other threats to national sovereignty. Managers need to be aware of these political situations and prepared to engage with the relevant role-players to ensure safe and secure management operations based on good information. In particular, managers should promote communication with security and other authorities to ensure the exchange of information and intelligence and to establish protocols for dealing with insurgency or armed conflict, especially as it might impact management staff or visitors.
18. Managers need to be aware of any situation regarding illegal trade and how this might adversely affect nature conservation values. Guidance should be provided to staff and visitors regarding appropriate responses to encountering these sorts of activities (e.g. not becoming involved by raising the alarm and making themselves targets).
19. Managers should promote discussion among authorities regarding peaceful co-operation in day-to-day management issues and draw the authorities' attention to the specialized management needs and community issues in transboundary mountain regions.

The international co-operation evidenced by the setting up of trans-border mountain protected areas should be extended, in appropriate instances, by associating these with the World Heritage Convention and the Biosphere Reserve Programme.



A recent IUCN publication giving additional guidelines for transboundary co-operation and peace parks.
Photo: L. Hamilton

V. The sacred, spiritual and cultural significance of mountains

Many mountains possess metaphysical significance which involves sacredness, fear, ceremony, history, pilgrimage and/or mystique. This already gives them some degree of protection. Managers, planners and interpreters should recognise and understand the special sacred, spiritual and cultural (including historical and wilderness) values which are often ascribed to mountains, the lofty and remote places in a landscape. Account should be taken of both the opportunities and problems presented by these values in mountain protected areas.



To the Japanese, the beautifully symmetrical cone of Mount Fuji is the Shinto Goddess of Flowering Trees, and is also revered by Buddhists as a place of power and sublime meditation. It is a national icon that “means” Japan.

Photo: L. Hamilton

Many areas can be chosen as illustrations:

- From two to four per cent of the Yunnan prefecture of Xishuanbanna in China lies in “holy hills” where dwell the spirits of ancestors of the Dai people and these mountain forests are largely intact because of the reverence in which they are held.
- Part of the central range of mountains of Venezuela is “la Sorte de Maria Lionza” or the sacred place of the Queen Maria Lionza, goddess of nature, who will enhance the welfare of the people provided that they do not destroy the “Sorte”, in which case they will first become lost and later die (it was easy to afford this area protected status).
- Highland dwellers in Tibet dispose of dead bodies by feeding the body to vultures in a “sky burial” at special mountain sites. If this were not done, cremation would require large amounts of fuel resulting either in depletion of scarce resources of wood or in the use of fragile cushion plants dug from the steep slopes.

- The volcanic fire of Tongariro NP (New Zealand) was lit by the gods to warm Ngatoroirangi, ancestor of the present day Ngati Tuwharetoa tribe. The mountain in turn was itself regarded as an ancestor. The land was given by the Maori people to the government in trust, to be protected. Recognition of these special values has limited the expansion of facilities on the upper mountain slopes of the park.
- Tarns like Suraj Khund in the Kumaon Himalaya and many of the Bhadeli Guars (the highest alpine pastures) are regarded as sacred gardens of the gods; shepherds believe that trespassing in these holy places would have dire consequences to them and hence never graze their sheep in these areas.
- Gauri Shanker peak in Nepal depicts the lord Shankar and his consort Gauri in Hindu religion; this peak is sacred and no mountaineering is permitted. This has resulted in a mountain and adjoining valleys which are clean and free of garbage.
- In Hawaii, the volcano goddess Pele, creator and destroyer by her lava flows, is both feared and loved; now within Hawai'i Volcanoes National Park fear of Pele's bad luck reduces the removal of lava for souvenirs and the desecration of natural or cultural sites.
- "The Sacred Valley" between Cuzco and Ollantai Tambo in Peru was once devoted to the crops used to feed the Inca warriors, while the cliffs were used for burial crypts for those of high rank in the Inca king's court; the place gave and still gives, some protection to the soils, wild flora and Andean crops.
- Wilderness means so much to the voting populace of New York State (USA) that they have protected in the New York State Constitution an Adirondack Forest Preserve of well over one million hectares, "to be kept forever as wild forest lands".

In addition, there are often spiritual or cultural values in many specific mountain physical features such as rocks, caves, summits and springs – and in special plants or animals.

This special significance provides an opportunity for some form of protected area designation including that of protected landscape or biosphere reserve, taking advantage of the protection already afforded by these values. In such instances, the paramount responsibility should be to protect and respect the "spirit of place". This may require special management measures.

The people whose spiritual and cultural values are at stake must have complete confidence in those responsible for stewardship of the protected area. This sense of trust must be carefully fostered and maintained. Those responsible for management should seek guidance from the people who hold the belief system before acting. Co-management is a viable option many times.

The landscapes in areas of cultural and spiritual significance have usually evolved through long interaction between people and nature. Because any alteration of the landscape may change the "spirit of place", great care should be taken to preserve the authentic landscape setting.

Areas of cultural and spiritual significance in mountains are much more complex than in other protected areas, because their qualities are not only physical and biological, but include also the metaphysical. As their management requires skills in dealing not only with the natural environment but also with the cultural and spiritual aspects of the area, there is a strong case for



The active volcanic crater of Ngauruhoe and all of Tongariro NP is the most revered and powerful of all of the sacred mountains of the Maoris. It was given by them, in trust, to the New Zealand people to be protected forever. It is both a Natural and Cultural World Heritage Site. *Photo: Tongariro NP*

selecting management staff primarily from the local people, or those for whom the place has special meaning and giving them the necessary training to deal with the usual aspects of management.

Where mountain areas are of special, sacred, spiritual or cultural significance, they should be included in protected areas wherever possible, and precedence in protection and management should be given to these values. Management should be based on full consultation and collaboration with the people to whom the area is significant, and a proportion of the benefits derived from the site should return to them.

Guidelines

1. Managers should consult with the people for whom the place is sacred and establish consultative mechanisms with them to ensure a co-operative approach to handling the opportunities and possible conflicts resulting from the presence of sacred sites in mountain protected areas. Mutually agreed-upon protocols should be developed and implemented.
2. Management plans and protocols should also include input from local people who, whether they agree with the sacred values or not, may be impacted by ceremonies, pilgrimages and the inevitable tourists.

3. Places of cultural and spiritual significance, especially sites of pilgrimage, may require development of some infrastructure to handle large numbers of people. Any new structures must be carefully designed to integrate harmoniously with the natural and cultural environment.
4. These places may attract many users, including tour businesses who may make profits from visitors and pilgrims. Arrangements should be made to ensure that a reasonable proportion of the profits of these tour operators returns to the local population through local spending; local employment; through investment in social services such as health and education; or through the maintenance or repair of traditional institutions such as temples and shrines.



The Historic Sanctuary of Machu Picchu (Peru) was built amid spectacular mountains by the Incas, and is both a Natural and a Cultural World Heritage Site. *Photo: L. Hamilton*

5. Special measures may be needed at sites of pilgrimage to reconcile the number of visitors with the quality of their experience and to provide for sightseeing by other tourists without disturbing the pilgrims. If there are problems, it may be necessary to limit access, such as in areas in which the number or timing of visitors is controlled, or in areas where visitors are excluded.

Many mountain sacred areas are also places of pilgrimage. Everything must be done to maintain the sacred character of these areas and to avoid detracting from the spiritual experience of those on pilgrimage to them.

6. Where there are great numbers of pilgrims, as for example at Kedarnath in the Indian Himalaya, the carrying capacity of the site should be assessed in terms of possible pollution, site deterioration and overloading of existing facilities. Attempt to predict and

- plan for expected pilgrimage impacts, so that adequate, environmentally sound facilities may be provided in good time.
7. Sites of metaphysical importance are often also of great significance for their natural features, both physical and biological. Excessive, concentrated use of such physical or biological features (for example of trails or ceremonial plants, or of valued wilderness areas) often leads to damage to them. The same measures applied in sacred places are also recommended for the conservation of nature in other parts of protected areas (see Chapters VII and VIII, Water and soil conservation in mountain protected areas and Management of threatening processes).
 8. To enhance the natural values and to avoid conflicts with cultural values, it may be necessary to establish sets of both ethical and practical rules to be followed equally by users and managers. Protected area managers and the tourism industry should, therefore, develop and implement culturally sensitive codes of conduct for visitors. These should be communicated to all visitors, either through publications, display boards, interpreters, tour guides or tour vehicle drivers.
 9. Sites of spiritual, sacred or cultural value are often significant to people of many different groups, backgrounds and traditions. MtPA managers must seek to minimize possible conflicts among them. Sites such as Taishan in China, for example, are sacred to both local communities and to the people from other regions; and Mount Belukha in the Altai is important to old established traditional peoples as well as to followers of newer religions.
 10. Some revered places depend for their special quality on their secrecy. These should not be open to the public. MtPA managers must carefully consult with the knowledge-keepers as to advisability of making them available to people, or even of studying these sites and the beliefs and practices associated with them.

Mountains with cultural, sacred and spiritual significance often contain monuments and artifacts of great importance. While there may be a legitimate desire among scholars to study these, there should be an absolute prohibition on the unauthorized disturbance of such sites, the removal of artifacts, or any vandalism.

11. There should on no account be any desecration of sites through destruction or unauthorized removal of sacred artifacts. Regulations should be promulgated and enforced and codes of behaviour drawn up, governing all research. These would clearly define the general prohibition of the disturbance of artifacts and the special conditions under which licences might be granted for the legitimate collection of specimens.
12. Stringent conditions should also govern the trading and taking of artifacts or scientific specimens as souvenirs. The managers of mountain parks should maintain an inventory of archaeological, historical and sacred objects (unless the knowledge-keepers object) and provide adequate controls to ensure that such items are not removed, damaged or defaced.
13. Any display and promotional sales of souvenirs depicting sacred qualities of the site should be done with discretion and sensitivity and with the approval of local cultural or religious leaders.



Elements of the San culture are revealed in secretive cave shelters in the Drakensbergs (South Africa), and must be carefully and sensitively interpreted to visitors. *Photo: L. Hamilton*

The interpretation of sacred sites must be done with particular sensitivity. For many of the world's people, religions are based on nature gods and goddesses that provide an overriding system of order – a cosmos – which includes all environments from mountains to the seas; “spirituality” is considered to be inherent in all natural things. Such a comprehensive approach to sacred values may provide a broad framework for giving special protection to very many specific elements of the MtPA.

14. Interpretive policies and programmes should be designed to present metaphysical and cultural values in mountain protected areas in a manner that respects local beliefs and also informs visitors by encouraging them to act in a sensitive manner towards the beliefs of others (see Chapter X, Education and interpretation).
15. Interpretation in such sites should be carried out by custodians who are repositories of the local values and beliefs.
16. Myth must be interpreted with great care and sensitivity, to avoid the extremes either of glorification or diminishment.
17. MtPA managers should work with traditional leaders to determine ways to base conservation and restoration programmes on ideas and practices that come out of local traditions and cultures. For example, priests have worked with scientists at Badrinath, the major Hindu pilgrimage shrine in the Indian Himalaya, to re-establish an ancient sacred forest. This has been accomplished by organizing tree planting ceremonies in which seedlings are blessed and given to pilgrims to plant for spiritual merit around the site.

VI. Communities as partners in mountain protected areas

Human communities are an important part of many present and proposed protected areas in the mountains. These communities, whether large or small, can range from self-sufficient tribal peoples with a subsistence economy, through those that are to some extent reliant on resources from outside, to groups which are more or less fully integrated into the market economy and the broader national society. Communities outside protected areas should also be considered as part of the management scenario, for there is a strong interdependence in the health and well-being of both the formal area and its surround.

Very few, if any, of these communities are not influenced to some extent by the world outside and this influence is bound to increase, through improved access and communications, health care, education, new technology, visitors from outside and the return of local people who have seen other places. “Change” is the order of the day. Improved communications, which are an inevitable result of development, can in time lead to out-migration (especially of the young) and a breakdown of the social fabric. Mountain protected areas can provide a legal and administrative framework within which communities may develop in an appropriate and controlled manner, while maintaining essential elements of their special cultures.



Mountain people have a pride and love for their mountains, and can be valuable allies in supporting mountain protected areas. *Photo: J. Ives*

Significant, positive evolution has occurred in how managers and communities regard each other and interact, and in fact, many communities are now actively involved in helping to co-manage recognised protected areas. Here are some of the changes that have occurred in the past decade that demonstrate this evolution:

- More emphasis placed on recognising mutual learning between communities and park managers.
- More recognition of stewardship/custodianship role of communities.
- Change in management regimes from centralized ones to more localized ones, with positive implications for community role.
- Greater understanding of the dynamics and demographics of the community, rather than seeing it as a homogenous group. There is better understanding of who key players and stakeholders are in communities, and how park managers should work with them.
- Improved understanding of the economic and social value of the PA to the national and regional economy.
- More realistic expectations of the results of working with communities, and recognition that successful outcomes usually require long-term commitment to the projects and relationships.
- Healthy, ongoing re-assessments to determine whether previous models for working with communities have been successful, and what we have learned from them. A new willingness to re-examine assumptions and stereotypes to see if they were accurate or relevant.
- Capacity building at the local level now regarded as fundamental so that local communities can more effectively assume more participation and decision-making in PA management.
- Increasing out-migration (especially the skilled and youth) from regions surrounding protected areas to others that offer more economic development benefits.
- New awareness of ways to use economic incentives to engage communities in stewardship of protected areas and neighbouring lands.
- More awareness by the commercial private sector of the important role they can play in stewardship and management issues.
- Better awareness by the general public that communities should be part of stewardship and management issues whether they are within or outside of the PA.
- Greater understanding of the impacts of tourism, including “ecotourism”, on protected areas and communities.
- A broader range of approaches to tourism implementations, more suited to community and protected area needs.
- Growing incidence of conflicts in or near mountain protected areas of people with wild (often protected) animals and with other people. Today protected area staff need enhanced skills to fill their increasing role in conflict management and peace building.

- A recognition of the important role of women as decision-makers and managers of land use.
- Greater need for local enterprise building with benefits flowing directly to communities, undiminished by intermediaries.
- General acceptance of the principle of “benefits beyond boundaries” for protected areas.

Protected areas can viably support interior or nearby land-users and small enterprises through a wide variety of community outreach programmes, such as local food promotion programmes and promotion of artisanal products. For example:

- Peak District NP (UK) has a fine programme of working with local farmers
- Alpi Marittime Nature Park (Italy) gives park recognition to restaurants that serve local foods
- A medicinal plant nursery in Huascarán NP (Peru) provides material to local healers
- Abruzzo NP (Italy) has raised Abruzzo mastiff sheep guard dogs for local shepherds to ameliorate the problem of increasing predators in the Park

There are many innovative ways that managers can engage and benefit the interior and exterior communities, and in turn be benefited by them.

Mountain protected areas which contain people may aim to protect not only natural features but also the essential elements of the cultural landscape, archaeological and historical monuments and vernacular buildings. They should provide a framework in which this can be done by encouraging sympathetic economic development which preserves the cultural identity of the resident communities who live in or near the protected area. Although the overriding goal for mountain protected areas should be biodiversity, water conservation and the maintenance of landscapes and wild lands, an essential and integral part of this goal must be recognition that the knowledge, rights, lifestyles and cultural values of people living in and near mountain protected areas, including identity grounded in places, must be integral to the goals of mountain protected areas.



A community consultation in Nepal to solicit input on proposed new management procedures.

Photo: L. Hamilton

Guidelines

1. Protected areas in the mountains should be planned and managed in accordance with the above principles and with full participation by local communities, both inside and outside park boundaries.¹
2. There should be full recognition of the right of any mountain community to define its own identity and cultural values. Protected area managers should support communities in maintaining their traditions and cultural practices that are in harmony with the objectives of the protected area.
3. The community should be provided with assistance in social and economic development within the framework of the overall objectives of the protected area. The management of the protected area should play an active part in supporting local development.
4. Communities should be assisted in their attempts to cope with any disruption to their culture and identities originating from outside influences associated with the presence of the park. This may be done by providing support in ways that are consistent with the above principles.



Local community members and politicians join with scientists and management staff to dedicate a plaque to Alejandro von Humboldt as the father of mountain ecology. On the upper flank of Chimborazo (Ecuador), at a Simón Bolívar monument, the plaque message is written in the indigenous Quechua language as well as Spanish and English.
Photo: L. Hamilton

5. Policies and programmes should be developed for mountain tourism which encourage mutual understanding, respect and cultural sensitivity between mountain people and their guests, and engage local communities in the management of tourism in their homelands.²
6. There should be a socio-economic analysis of the positive and negative effects of the protected area on the local culture and economy and measures should be included in the management plan to address the impacts, both positive and negative.

¹ The definition of participation will vary in each country, based on its own principles and legislative framework. For example, in Sweden, the participation by local communities in decision-making would require a change in the current legislation.

² For more detail on guidelines for tourism see Chapter IX, Protecting mountains and the visitor experience: managing to engage tourists and recreationists.

7. The management plan for any mountain protected area should include, in addition to the normal conservation component:
- a plan which provides for appropriate benefits to the community from the establishment of the protected area;
 - provision for an advisory or co-management structure which enables the representation of the community in decision-making bodies;
 - a mechanism for monitoring, review and updating interactions with the community;
 - a mechanism for continuing participation of the community in this process;
 - recognition of the key role of women in mountain societies, and the need to insure that they are involved;
 - a plan for the protection of all elements of the local culture, its documentation and appropriate interpretation;
 - a mechanism for discussion and exchange of information between the protected area staff and the community on any matters affecting either of them, including cultural changes, the effects of tourism and ways to incorporate traditional knowledge in the management of the protected area.

Doing so effectively sets the mountain protected area and its buffer or peripheral zones into the regional planning context.

8. Protected area management should facilitate the creation of an endowment mechanism and expertise pool for community self-help.
9. Zoning land use and conservation areas should be an important tool for working with the community and for negotiation of protected area management and use (*e.g.* light pollution management zones for the protected area and for the in-park or near-park community).
10. Discussions should be held with local people using culturally acceptable and sensitive channels of communication, while trying to ensure that all groups are heard.
11. Capacity building is needed for local people and protected area staff. For local people, there needs to be capacity building on empowerment, building social capacity, technical skills to manage protected area, decision-making skills, group organization, traditional knowledge, wildlife management, compatible development and social capital. Protected area staff need capacity in communications skills and compatible development for local communities.
12. Park managers should facilitate a broader constituency of support for protected area that involves a wide array of key stakeholders (private enterprise sector, communities, politicians, etc.) to provide more sustainability to parks.
13. Managers need to be aware that some of its constituency, and sometimes key supportive stakeholders, may reside far from the protected area (*e.g.* mountaineers in distant countries, nature lovers in cities who visit the park frequently) and they deserve inclusion in management events and discussions. Managers should make efforts to travel to those locations to meet with these constituents/stakeholders, or be sure to make it feasible for them to attend when events and discussions take place at the protected area.



A cultural community festival, sponsored by Abruzzo NP (Italy).

Photo: L. Hamilton

14. Park managers need to understand the real underlying causes of wildlife and human conflicts, and find solutions that are cost-effective and have a long-term acceptability to the community. Solutions can be a change in natural resource use, direct payment for damages, etc.
15. Managers should make every effort to recruit at least some park management staff from the local populace.
16. Protected area planners, managers and staff should be trained in the skills of communication and local languages, to enable them to be more responsive and sensitive to the needs, rights, ways of life and cultures of the community in which the park is imbedded.
17. Protected areas should consider direct compensation, combined with commitment to conservation by the community, where resources once used are no longer available.
18. Celebrations combining local cultural heritage with protected area values should be used to maintain harmonious relations and promote goodwill (e.g. the annual rye festival in Alpi Marittime Nature Park, or the European National Day of National Parks celebrations).
19. Integrate ecotourism within the protected area with tourism outside the park, and try to assure that a large share of tourism benefits accrue to the community rather than to distant hotel chains and travel organizations.

VII. Water and soil conservation in mountain protected areas

The provision and safeguarding of sufficient, safe, high-quality water in and from mountain protected areas is necessary to accommodate visitors as well as to sustain mountain inhabitants within the protected area and off-site downstream. Appropriate land conservation measures are needed to assure these benefits. Sanitation measures are also necessary for visitors and residents alike in order to safeguard water supplies both within and downstream from the protected area.

The quality and total yield, and, to some extent, the timing of water delivered to the lowlands and its communities is influenced by land use in the mountain headwaters of the catchments. Undisturbed natural vegetation represents a *status quo* condition for delivery in quantity, timing and quality, to which the downstream environment and society have become adjusted. The alteration of vegetation through human activity and changed land use usually increases erosion and thus water-transported sediment. Heavy sediment loads and deposition have a host of consequences, most of them causing harm to aquatic life and to the human use of water and causing flooding, changes in the stream and river regime and ultimately the marine environment. Quantity and timing are also changed and therefore environments and life, both human and wild, must adjust; this often entails some cost, such as less total water, more total water, or seasonal changes in quality. Human use of land which adds fertilizers, pesticides or other wastes also creates problems and contributes to environmental change downstream. Natural protected areas, or human use areas where practices are water-quality sensitive, are the safest for water resources.



Dryland irrigation from Karakoram mountain water. It has been said: “Without mountain water, there would be no viable Pakistan”.

Photo: J. Ives

The degree of adverse hydrological change downstream depends on the practices of the users of mountain land, on the size of the water catchment and its geomorphic characteristics. There will be substantial effects in small catchments (up to 5000ha) which are close to the place where the land has been altered, less effect for larger catchments and least in large river basins such as the Ganges caused by activities in its Himalayan headwaters. The effects will be more pronounced in smaller, more frequent storm events and very much reduced in the case of infrequent major storms.

Mountain soils are generally thin and poorly developed and very sensitive to external impacts and pressures and hence catchment management in mountain protected areas should place a high priority on soil management in planning water programmes.

Capacity to provide high quality water is dependent upon an understanding and appreciation of the soil/water/vegetation relationships and the role that each individually plays in the stability of the catchments.

Land managers need to have the capacity to adequately address individual resources within the soils-vegetation hydrological cycle. This will require development of skills and capacity within the management agencies in soils and water science and the use of and application of new and available technologies, e.g. advanced remote imagery. In some regions, this will require education of the local or indigenous population within or around the protected area, as well as a change in attitudes in appropriate land management techniques.

Climate change will impact on water management with changes in river flow regimes as a result of changes in form, distribution and amount of precipitation. This will place new and largely unpredictable impacts on erosion patterns, the ecology of streams and the length and distribution of snow cover habitats and glaciers.

Climate change will impact on water management through a change in flow regimes due in many cases to precipitation falling as rain instead of snow and recession of glaciers (it is projected that at present melt rates, the famous snows and ice of Kilimanjaro will have disappeared by 2020 and Glacier N.P. will have lost all of its ice fields by 2030). Climate warming will result in new and unusual erosion patterns, in changed ecology of streams and reduction or loss of period of under-snow habitats.

Managers should be aware of emerging trends in the valuation of ecosystem services with respect to water rights, values and markets and acquaint themselves with the latest legislative mechanisms appropriate to soil, water, vegetation and catchment management.

Those mountain protected areas where human impacts are largely excluded (e.g. Category 1), or are controlled both inside their core and in their buffer zones, represent the very best option for soil and water conservation. Mountain “cloud forests” are especially important for their capture of “occult” or horizontal precipitation which can provide a significant addition to the water budget of the catchment. The costs of catchment management could be recovered from the price of water to downstream consumers with the benefits of alternative catchment land use reflected in the return of lost opportunity cost where protected area occupation is forced to change land use. Payments for environmental services provided off-site, especially for pure water, are becoming a source of revenue to protected areas (as in Quito City’s payment to the Condor BioReserve).

Guidelines

1. Protected area management must provide safe, high quality water to visitors. Source areas should be identified and protected from other developments that would impair the quantity or quality of the water. Particular attention should be paid to groundwater sources and to maintaining mountain springs for use in more remote areas or piping to lower elevations.



Potable mountain springs should be protected from contamination to benefit PA users.

Photo: L. Hamilton

2. “Cloud forests” on mountains are valuable for their capture of occult water which is significant for water recharge and yield both locally and downstream. They are also habitats for plants and animals that occur nowhere else. Because the clearing of these forests is increasing worldwide, especially on isolated mountains, these “water towers” and repositories of biodiversity are seriously threatened. Whenever found, they should command special attention, either for the possible establishment of a protected area or, if already within one, for special protective measures.
3. Where good water sources can be developed, those who are responsible for the planning and management of the protected area should consider the provision of water to inhabitants or bordering communities as part of a partnership in assigning benefits to local people (who have usually forgone some utilization of resources in the protected areas).

While the full direct and indirect effects of protection on downstream water are quite site-specific and not yet entirely understood, this much is certain: protected areas provide the greatest hydrologic and erosional safety in these steep lands. The inhabitants of the populous lowlands might well value them for this reason alone. Protection of the natural condition is effective in minimizing erosion at lowest cost and with the maintenance of the highest scenic value. It thereby keeps sedimentation damage to a minimum and reduces impairment of water quality – both very important downstream benefits to aquatic life, reservoirs, turbines, navigation, irrigation, and potable water for people and their livestock.

4. In all IUCN categories of protected areas, steep lands should be examined to see what part they play as hazards for landslips or surface erosion, in water collection or as sources of overland flow. These should be zoned in management plans so that use is strictly prohibited or, if allowed, is associated with strong conservation measures.
5. Mountain protected area managers should emphasise the protective role of their areas for soil and water conservation benefits to those downstream within and outside the reserve. On the other hand, managers must refrain from making large claims for flood disaster control in the distant lowland of major rivers. Nevertheless, benefit can be substantial in reducing damage caused by those frequent small storms close to the protected area which can still harm many people.
6. Where forests are being harvested within mountain protected areas, logging guidelines that have been developed to minimize adverse soil and water consequences should be rigorously applied. This applies particularly to road and skid trail location, design and maintenance.
7. Where agriculture or grazing are carried out within mountain protected areas, measures should be taken to prevent the breakdown of traditional farming systems which have often been, by necessity and long adaptation, very conservative of soil and water. Where pressures have already led to a breakdown and the site has deteriorated, every effort should be made to rehabilitate the land and to encourage, by education, incentives, or even sanctions, the reinstatement of well-known soil and water conservation practices. Assistance with water supply can be a positive inducement.
8. There are many techniques, using both vegetation and structures, for stabilizing already eroded areas, and persistent sediment sources must be treated as part of protected area management.
9. All bridges, ditches, culverts and fords associated with roads need to be carefully designed, installed and maintained, based on the best available hydrologic information, with the addition of safety factor made necessary because of the general inadequacy of data on rainfall and run-off from these remote areas (guidelines are available from FAO and elsewhere).
10. Micro-hydroelectric development is often looked upon as a solution to the energy problem in mountain protected areas. Such developments must be carefully planned, sited and maintained, not only from a hydrological standpoint but also from an aesthetic one.
11. Waste disposal of any sort must be kept away from surface water supplies, whether used in the protected area or further downstream. Groundwater contamination must also be avoided by the proper disposal of waste.

12. A capacity and expertise for soil and vegetation management is required for effective protected area management and needs to be included in mountain protected area management staff.
13. Soils and water research, combined with long term monitoring, should be used as a basis of soil and water management plans.
14. Where grazing and fire together are used as management tools, research should be undertaken to define appropriate carrying capacities and fire frequency to minimize erosion.
15. Research, mapping and identification of water recharge zones should be done to ensure prevention of potential pollution and retention of appropriate vegetation regimes.
16. Restoration of eroded or degraded sites should be undertaken, using good soil and water conservation methods and native plant material.
17. Set clear objectives in management plans for reforestation and revegetation to avoid conflict between water yield objectives and biodiversity objectives. Catchment rehabilitation programmes should set very high priority for wetland and groundwater protection.
18. Over-used trails or other areas showing early signs of erosion should be “retired”, possibly rehabilitated and alternative routes or areas established.



Damaged alpine area being restored in Australian Alps NPs. *Photo: L. Hamilton*

19. Fragility to trampling is related to soil type and sensitive soil types need to be mapped.
20. Proposals for dam and reservoir developments should account for their impact on aquatic environments and biota and flow regimes.
21. The intestinal parasite *giardia* is now present in waterbodies even in remote forested areas. Where this exists, warnings should be instituted and users advised to take water or filtration devices.

VIII. Management of threatening processes

This chapter deals only with the management of threats, and not all management issues. For example, for fire we have only listed the guidelines pertaining to dealing with fire as a threat. All the other issues around fire management are not covered in the manual, as explained in the Introduction.

Guidelines

Inappropriate fire

1. Allow the use of fire only in designated areas; hikers should use only portable gas or liquid fuel stoves (building of open fires should be banned to reduce fire threat and use of wood).
2. Ban all open fires during extreme fire danger periods. Preferably, ensure that non-recyclable waste that cannot be removed from the PA is burnt in an incinerator.
3. Ensure that there is a fire management plan in place, dealing with management burns, sensitive sites, monitoring, training and reaction plans. Specific attention must be given to preparation of boundary and internal firebreaks.
4. Educate neighbours, stakeholders and visitors about fire management plans, and communicate often with them about fire dangers and precautions. By consistently promoting good relations with these groups, helping them understand the rationale of fire management plans, and gaining their acceptance of them, arson fires can be reduced or eliminated. Monitoring the extent and number of arson fires, and communicating this back to these groups, is also an important way to show concern and elicit their help in preventing arson.
5. It is essential to be familiar with all relevant local legislation and context pertaining to fire; formal agreements should be entered into with neighbouring landowners with regard to preparation of firebreaks.
6. All staff should be properly trained and equipped to fight fires. The basics of fire safety awareness should be understood and consistently promoted by all staff.

Fire can be a good servant, but a bad master. The ideal fire regime, in fire-determined ecosystems, is one that allows for the maintenance of all elements of biodiversity in a mountain area. This may require planned fires in some areas, and regular fire suppression in others. High winds in mountains and steep slope updrafts present difficulties for fire suppression. This has been well demonstrated in recent fires in the Australian Alps and Australia's Blue Mountain NPs, and in Yellowstone in the USA.



Wildfire during the January 2003 conflagration in Australian Alps, in Kosciuszko NP, in sub-alpine eucalypt forest and heath. In total, the fires burned 1.9 million ha.

Photo: Graeme Worboys

Soil erosion

7. Road and trail networks must be properly planned to minimize erosion risk, with special consideration given to soil types, gradients, shape and length of slope, and water diversion.
8. All sources of human activity-induced erosion must be minimized and managed, and any eroded areas stabilized or restored, using native vegetation or non-intrusive mechanical devices.
9. Herbivores (domestic and/or wild) must be maintained within appropriate stocking rates and management regimes to avoid trampling compaction and erosion.
10. Illegal access must be controlled to prevent damage to trails and creation of inappropriate and possibly hazardous new paths. Alpine zones are particularly susceptible to such abuse.

As it is impossible to prevent all damage, it must be decided whether to disperse use or to concentrate it along defined corridors such as footpaths, horse trails, roads or designated ski areas. Prevention is better than cure.



Snowmobile-caused erosion in Waterton Lakes NP (Canada) due to insufficient snow cover. Are snowmobiles appropriate in Category III National Parks?

Photo: A. Mendoza

Pollution

Visitors and residents generate waste, rubbish and excreta. Mountain areas vary enormously in their capacity to absorb these but, in general, their capacity is lower than most other environments. On fertile and warm mountains, decomposition and oxidation are rapid while on cold and infertile mountains, plastics and cans may become almost permanent. Some well-known summits have major refuse problems. The nitrogen in urine and food waste may encourage the invasion of alien plants. Burial of waste may pollute groundwater and streams. The ideal would be to export all solid wastes and to deal with all liquids in ways that cause least harm. Summits of famous mountains and the routes to them are particular problem areas for litter.

11. A “pack it in, pack it out” rule should be clearly communicated to visitors and implemented by education and enforcement programmes.
12. All trash (from both visitors and staff) should be sorted at source, and all waste that can be recycled must be recycled. Use this opportunity to educate the public about the importance and multiple benefits of recycling and how everyone, including PA staff and management, can do their part. Publish periodic information to staff, visitors and neighbours about innovations or notable examples of recycling successes. Consider giving special recognitions or awards for these achievements to reinforce the importance of recycling.
13. Wherever possible all waste that cannot be recycled should be disposed of at registered waste disposal sites outside the protected area.
14. Toilets should be provided wherever people are concentrated; especially in mountain protected areas human waste should be treated to a high standard before being released back into the environment from these higher places in the watershed.
15. Where septic tanks are used, when these are emptied the waste must be discarded at a registered waste site and not dumped within the protected area. Composting toilets have proven successful where climates permit.
16. Rules about human waste should be instituted, clearly communicated, and enforced in remote areas in order to minimize environmental damage and risk of disease. Enlist help with this from relevant stakeholder groups, such as hiking or climbing organizations whose members and friends might frequent the remote areas.
17. Waste must be managed in such a way as to minimize conflict with wildlife such as bears, hyaenas, baboons and crows e.g. baboon-proof trashbins in those areas with baboons.

18. “Best practice” guidelines for waste management should be adopted.
19. Where appropriate, benchmarking and monitoring of environmental threats such as acid rain, ozone, persistent organic pesticides and visibility-diminishing “haze” must be undertaken. Data from these efforts should be used for monitoring overall ecosystem health, and to lobby for better environmental management and oversight of the sources of these threats.

Alien organisms

Because mountains are essentially island habitats, they are often highly susceptible to harm from introduced organisms. The risk is enhanced because of the high proportion of disturbed ground (from both natural and human causes) and the low growth rates of plant communities, at least within the sub-alpine and alpine zones. Some mountains appear to be more susceptible than others; mountains on oceanic islands are particularly so. There are a number of sources; tourists may unwittingly introduce species on their boots, clothes, person, vehicles or packs; visitors often wish to bring pets into mountain protected areas; and local people may wish to introduce new animals, crops or ornamentals.

20. The introduction of alien organisms that may become invasive should be strictly prohibited.
21. The introduction of any alien species should be subject to rigorous screening and assessment.
22. All potential sources of introduction of alien organisms should be minimized, including insistence on sterilization of boots and ensuring that clothing and equipment is propagule-free where appropriate.
23. There may be a need to place restrictions on the use of potential vectors such as horses and vehicles in areas affected by invasive alien organisms.



Using hunting dogs in alien pig removal project in Hawai'i Volcanoes NP (USA). Areas are then fenced against re-invasion.

Photo: L. Hamilton

24. There must be an active long-term alien species eradication and control programme in place, and protected area managers must ensure that this is adequately funded (e.g. hunting of introduced wild pig, together with fencing, in Hawai'i Volcanoes NP).
25. Where possible, employment or business opportunities for local people should be established around the control of alien species, e.g. firewood and charcoal production from alien hardwood tree species, as is done for *Acacia* (wattle) removal in South Africa.
26. Educating visitors and staff about the negative impacts of alien species is an essential part of their control and eradication.
27. All staff must be able to identify current and potential future alien species (e.g. Australian Alps NPs have produced a pocket booklet "Alps Invaders" for plants, which has proved helpful in control).

Diseases and insects

The establishment of pathogens or damaging insects in a mountain area may have wider implications because of their tendency to spread rapidly downhill. Some may cause permanent damage to plant and animal communities, irreversible changes to habitats and/or considerable human inconvenience.

28. All potential sources of introduction of alien diseases or insects should be minimized, including insistence on sterilization of boots, screening of introduced animals, and inoculation of domestic pets where appropriate.
29. Human waste must be managed appropriately to prevent introduction of pathogens, e.g. *Giardia* to streams, or human parasites to mountain gorillas.
30. There must be an active long-term eradication and control programme in place for major pests, and protected area managers must ensure that this is adequately funded.
31. An incident plan should be in place for responding to any disease or insect outbreak.
32. Movement of people and/or animals in and out of any infected areas should be controlled.
33. Monitoring and mapping of any extent of infections and infestations is important.
34. Appropriate education and communication processes must be established with visitors and neighbours, and joint action taken as appropriate to eliminate re-infection sources.
35. Favour bio-control systems over most herbicides and insecticides.

Vegetation destruction

36. Use of dead wood by visitors, staff and neighbours for fires should be discouraged because of the impacts on biodiversity, ecosystem processes and nutrient cycling (e.g. in South Africa the removal of dead branches and limbs from forests resulted in a decline in hole-nesting bird diversity). Where firewood is required, this should be obtained from outside the protected area or from the felling of alien trees.
37. The illegal felling of forest trees should not be tolerated, other than where this is part of a formal resource utilization programme and where the limits of sustainable utilization have been determined and can be monitored and enforced.

38. Protected area managers should assist in finding and providing alternatives in order to reduce demand for wood and non-wood forest products (unless part of the management plan) from protected areas.
39. Protected area managers should encourage and promote wise management of biodiversity outside protected areas in preference to use of protected area products, e.g. PAs can provide propagules for the re-establishment or breeding of medicinal plants outside the PA, but extractive use should only be allowed where the sustainable levels of use can be determined, monitored and enforced.
40. Stocking rates of wild and/or domestic animals must be calculated and adhered to in order to prevent vegetation degradation and soil erosion.



In Sagarmatha NP (Nepal), there is a programme to reduce use of fuel-wood from trees and shrubs by substituting kerosene fuel.

Photo: J. Thorsell

Poaching

41. The poaching of indigenous animals should not be tolerated, and vigorous anti-poaching patrols should be undertaken by motivated, well-equipped and adequately trained staff. This is especially important when threatened, rare or endangered species are involved.
42. Informer networks should be established and managed in order to provide valuable information leading to the prevention of crimes or subsequent arrest of suspects.
43. Providing opportunities for hunting and access to meat on a controlled basis may reduce demand for illegal hunting, and serve as population control where game numbers are so excessive that habitat is being degraded. This may be especially needed where the former large predators have been extirpated. Hunting of alien species might be considered.

Inappropriate development

In general, there should be as little new construction as possible, and, where it is essential, the greatest possible care should be taken in design and siting, and local materials and indigenous mountain “styles” should be used.

44. In preference, develop infrastructure outside the protected area; if development has to occur inside, then apply the concept of “peripheral development”.
45. All development (visitor and management) must follow Integrated Environmental Management principles, including allowing for stakeholder participation and for mitigation of potential impacts.
46. Each protected area should have a Zonation Plan and an Integrated Development Plan that specifies the types and nature of developments permissible in any area; all developments must conform to this plan.
47. Developments must be designed and constructed to blend in with the natural mountain environment; Geographical Information Systems (GIS) can be used to assess potential visual impacts of developments.
48. There is a need to balance the needs for environmental protection (e.g. boardwalks, concrete paths) with the visual intrusion that they may cause.
49. Screening and stabilization of developments should be done with species indigenous to the area.
50. All structures that are no longer required should be removed and the site rehabilitated.
51. All developments must be monitored and audited during construction to ensure compliance with site protection measures, environmental approvals and mitigation measures.



A well-designed entrance and visitor information centre at Royal Natal NP, South Africa.
Photo: J. Thorsell

Inappropriate use

52. Given the protected area objectives, Zonation Plans should define what types and intensity of use are appropriate in each area. This must take into account biodiversity and cultural values, as well as seeking to minimize inter-user conflicts.
53. Ensure that appropriate legal instruments are in place to regulate use.
54. Utilize appropriate tools, including enforcement and education, to discourage anti-social behaviour.
55. Be proactive – anticipate future demands and regulate these before damaging patterns of use are established. This is easier than trying to change such patterns of use after they have become established (e.g. snowmobile use reduction and elimination from Yellowstone NP).
56. Find mechanisms to control the intrusive use of air space, and to control noise, night sky and visual pollution.

Civil conflict

57. Anticipate any inevitable wildlife/people problems and proactively initiate species protection plans (translocation) if necessary.
58. Ensure good communication with the police and military, and understand potential threats to biodiversity, staff and visitors, from any civil unrest or outright conflict.
59. When the MtPA is on a frontier, especially in a transboundary park situation (See Chapter IV) a proactive Code of Conduct should be developed for conflict situations. Such a Code is provided in the IUCN publication *Transboundary Protected Areas for Peace and Co-operation* (Sandwith *et al.* 2001).

IX. Protecting mountains and the visitor experience: managing to engage tourists and recreationists

Humans are attracted to – and awed by – mountains and the important challenges they offer to develop and restore body, mind and spirit. Many MtPAs have been established with outdoor, nature-based re-creation as a major objective. But today, managers of mountain areas must recognise and adapt to a much broader spectrum of visitors who eagerly seek their own special “mountain experience”.

This spectrum has shifted greatly over the past decades. Today, most of the people of the world live in cities and mountains offer them much-needed contrasts of solitude and unfettered freedom in these wild natural landscapes. Recreational users and adventure travel groups are emerging as the fastest growing segments of this visitor spectrum and so deserve particular attention as powerful, untapped constituencies hidden in the word “tourism”. Because these groups tend to be self-identifying and well organized, they can be important allies for managers in resource stewardship programmes.

Wise managers can leverage the inherent alignment of interests between recreationists and conservationists, both of whom deeply appreciate mountains. Recreational users can in fact be key advocates and allies for conservation, as exemplified by the itinerant hiker/climber John Muir in the United States, who founded the Sierra Club, an effective advocacy organization, to safeguard his beloved mountains. By learning and adhering to responsible behaviour to protect resources and the sensitivities of local and indigenous communities, recreationists can serve managers as self-motivated and self-funded assistants. They can offer managers who engage them effectively an additional way to educate visitors to mountain areas.

*There can be much mutual support between the interests of those who appreciate mountains and take their recreation in them, and those whose concern is conservation of biological and cultural diversity. In turn, visitors to mountain protected areas have a responsibility to exercise care in the way in which they behave and use the area, in the interests of both protection of the resources and the sensitivity of local communities. Given today’s realities of budgets, staffing and visitation, managers now realize the increasing need to find ways to protect publicly accessible mountains **with**, rather than **from**, visitors. Doing so increases management effectiveness by 1) reducing impacts on the resource as visitors gain a greater sense of resource stewardship behaviour, and 2) creating broader consensus for the political support and funding of protected areas in mountains. Some mountain protected areas, or parts of protected areas, may not be accessible to recreational use, for example strict nature reserves, or areas closed in order to reduce the risk of threatening processes. For example, in Western Australia, introduced plant diseases such as *Phytophthora cinnamomi* are a major threat to exceptional biodiversity values including critically endangered plants, and the risk of importation of infected soil on walkers’ boots must be absolutely minimized.*



Frequent visitors for hiking in Mount Triglav NP are this Slovenian family, whose ties to the Park make them staunch supporters of the area.

Photo: L. Hamilton

Guidelines

1. In addition to conservation values, management plans need to take particular account of the special recreational value of mountains, including wilderness and wildland qualities and the opportunity for challenge, exploration and self-discovery. Freedom of access to these areas, by all sections of society, should be encouraged while balancing due regard for certain locations or ecological communities that are particularly vulnerable to impacts. To achieve this, mountain area managers should remain aware of visitor aspirations and the cooperative policies and practices of outdoor recreation organizations, such as the environmental objectives and guidelines of the International Mountaineering and Climbing Federation (UIAA) and its national associations or clubs.
2. Management plans for mountain areas should include rational policies and prescriptions for recreational users and sightseers. These plans must recognise the general principle, endorsed by IUCN, that all citizens need to have access to land and water for the appreciation of nature and scenery, subject to reasonable conservation, management, land ownership, safety and security needs.

Stakeholder involvement

3. Irrespective of whether mountain areas are open or closed to visitors, managers should establish dialogues with visitor stakeholder groups representing outdoor recreation, tourism and other interest groups, ensuring that they understand and are engaged in and involved in, the planning and operational aspects of the protected area.
4. Take the time to identify, acknowledge and engage the major stakeholders, including outdoor recreationists and their representative organizations, in mountain area management. Where possible, ensure that they have an appropriate, long-term involvement in the planning and operations of the mountain area by allocating places in the park board or

ultimate decision-making body for them. By following these recommendations, managers can much more easily negotiate and if necessary adapt to any new visitor activities that might develop in the future. Visitor compliance with management policies will be enhanced if new recreational activities are considered “possible” or “appropriate” until proven otherwise, by agreement between managers and stakeholders.

5. Clearly written plans formulated with the understanding and active involvement of user groups will help promote compliance and reduce enforcement burdens on land managers. As noted in the previous guidelines, engaged and enlightened user groups can not only effectively manage and control their own impacts, but can also serve as mentors and examples for other user groups. Active intervention should be restricted to essential operations issues such as public safety.
6. To maximize enjoyment while minimizing problems, visitors should be introduced to regulations and the behavioural standards expected of them **before** they enter mountain areas. Managers should strive to inform visitors of universally accepted mountain area codes of conduct such as the *Kathmandu Declaration on Mountain Activities* and the *Tyrol Declaration* adopted and published by international organizations such as the International Mountaineering and Climbing Federation (UIAA) or the International Mountain Bicycling Association’s (IMBA) “International Rules Of The Trail”. National or local protocols as described in Guidelines 1 and 2 above should also be promoted. Optimally, visitors should have access to this information before they leave home, either via the Internet, outreach lectures, classes, written publications (booklets, brochures, magazine articles, newsletters, etc.), television or radio. This preliminary introduction should be reinforced with information provided upon entrance to the mountain area. In all cases, this information should stress the positive results of compliance on the health, preservation and enjoyment of the mountains now and in the future, including the benefits to themselves and other users. Stressing the positive results of compliance is especially important where potentially hazardous or invasive conflicts in visitor use and enjoyment may occur. For example, alert visitors to the benefits of compliance on hiking trails that are: near the base or top of climbing sites, or recreational abseiling cliffs; on areas shared by skiers and snowmachiners; or shared by hikers, horseback riders and bicyclists.

Nature-based tourism or recreation may have pre-existed or subsequently develop outside of the PA. Such activities should be integrated into the planning and management of activities inside the PA.

Management on the ground

7. Written management plans can be very useful in dealing with large, well defined and well understood user groups such as sightseers and some recreational user groups such as hikers, anglers, skiers, snowmachiners, mountain bikers and backpackers. The goal of any such plans should be to include policies and practices designed to enhance the visitor experience while minimizing resource impacts. A regular aspect of periodic review should be included in the plans, offering the ability to revise and adapt them to emerging issues or realities.
8. It may be difficult or impossible to develop formal, written management plans for smaller, less defined or less understood recreational groups such as rock climbers,

mountaineers and boulderers. However, these groups often have strong traditional “leave no trace” ethics, so can be engaged proactively and positively by land managers to be in effect “self-managed”. In cases where such groups have formally established ‘protocols’, guidelines or internal regulation, it may be expedient for the management plan to simply recognise and manage to these protocols for all practitioners of the particular activity, whether members of the body or not.



Camping sites at upper elevations need to be carefully sited and regulated, as here in Brazil’s Itatiaia NP.

Photo: L. Hamilton

Special uses

9. The protection of wilderness and wildland values is an extremely important feature in many mountain areas. Besides safeguarding biological, cultural or spiritual resources, such areas often provide outstanding opportunities for high quality outdoor recreation. Policy development and management action must ensure that they remain in as near a natural condition as possible. Land and water use of surrounding areas must be as sympathetic as possible to these aims. This may well require good liaison with, and the support of, other managing agencies, communities or private landholders. Wherever possible, managers should attempt to protect the viewsheds of and from mountains as the landscapes surrounding protected areas can have a major impact – both positive and negative – on the ‘sense of place’ and wilderness value.
10. Whether “wilderness” is enshrined in national legislation or formally recognised as an administrative zoning category, protection and management should meet the international standard set by the IUCN Category 1(b). Similar protection and management should be granted to areas considered “wildland”, “backcountry”, or “wild country” in nations where such protection is not formally legislated or bestowed by administrative zoning. Though such lands may not technically be pristine “wilderness”, citizens almost universally regard them as such in the context of their national heritage and expect them

to be managed accordingly. It is important for managers to realize that even though few citizens may ever actually visit wilderness or wildlands in their country, studies have shown that far more consider their existence inherently important and will vote accordingly.

“Wilderness” is not a term that is in universal use. In Spanish, for instance there is no equivalent word that conveys the correct meaning. Wilderness may even arouse anxiety in some cultures. In Europe, perhaps the term “wildland” would be appropriate. IUCN Category 1b defines it: “Large area of unmodified or slightly modified land and/or sea, retaining its natural character and influence, without permanent or significant habitation, which is protected and managed so as to preserve its natural condition”.

11. Any permitted activities such as hot air ballooning, hang-gliding, paragliding, *parapente* and BASE jumping, should be addressed in management plans. By working collaboratively with such interest groups, these activities may be accommodated with some restrictions on locations and times. Remember that managers can enhance public safety and compliance with restrictions or prohibitions if their policies are both rational and inclusive of input from interest groups.
12. Recreational activities that do not depend on the special qualities of the MtPAs (e.g. sky diving, gliding, tennis courts or golf courses) should not be allowed in them. Instead, they should be located in outlying inhabited/developed areas, in agreement with local communities, which might financially benefit from such activities.
13. Mountain areas should be shielded as much as possible from all kinds of nuisance and disturbance caused by roads, military training and mechanized recreation, whether on the ground, on the water or in the air. There should be strict controls on intrusive overflying, whether civilian or military (e.g. as is done for Grand Canyon NP). Sudden loud noises can terrify, endanger and even kill people and animals. If overflying cannot be forbidden, it should be minimized by attempting to establish no-fly zones in protected areas. Wherever possible, military and other training operations should be redirected to alternate or permitted zones, as in Triglav NP or the Entlebuch Biosphere Reserve.

Access

14. It is very important to provide visitors with a broad range of opportunities to explore mountain areas on foot, in different settings and seasons and with different degrees of difficulty. Keep in mind the increasing mobility of people with disabilities and their ability and desire to enjoy the outdoors. Advances are constantly being made in personal mobility devices (such as motorized scooters) or programmes such as those using specially-trained horses for mobility. Planners should bear this in mind when making decisions on the width, composition, grade and shared use policies of paths and trails. They should also consider and accommodate the needs of service animals such as “seeing eye” dogs.
15. While some visitors will appreciate signposted and surfaced routes in safe settings, others will prefer areas with minimal or no such features. Footpaths should be durable and should be planned to assist or complement conservation needs and provide visitors with a

safe and high quality experience. Similar principles apply where the use of horses, donkeys, llamas, yaks or other riding or pack animals or mountain bikes are permitted and used. Whenever possible, riders/packers and walkers should not be forced to share the same path. This provides a safer and more pleasant experience for all.



Use of llamas as pack animals instead of hoofed animals like horses, donkeys or mules helps to minimize impacts on trails, soils and vegetation. Llamas have padded feet like camels.

Photo: L. Hamilton

16. Existing paths should be stabilized before new paths are opened up, unless the latter are deemed essential. Camping sites, footpaths and trails that become degraded by use should be closed in rotation to allow time for repairs and restoration. By working proactively with hiking, riding and other outdoor recreation groups, greater compliance with closures can usually be achieved. When engaged in the management process, such groups can serve to both monitor and restore resource degradation in a cost-effective way.
17. Roads and other types of access should be designed to provide safe travel consistent with acceptable levels of environmental impact (e.g. crash barriers and guardrails should not be used unless absolutely necessary). Public safety considerations may require clearly identified and maintained routes used for rapid evacuation during medical and other emergencies.
18. *In situ* safety devices such as ladders, chains, abseil posts or other anchors, fixed bolts and pitons all present a dilemma for the manager. It may be necessary to distinguish between those which are only of interest to specific groups (e.g. bolts and pitons on climbs) and those that may also impact upon more general visitors (e.g. ladders, Ben Nevis abseil posts, etc.). As a general guide, unless there are over-riding conservation or safety issues to other visitors, bolts and pitons should be dealt with through protocols and codes of conduct as discussed above. Where devices are placed and allowed to remain in areas accessible to other visitors, it is less easy for the managing agency to transfer responsibility and liability for incorrect use or failure. Such situations may well require regular testing to agreed standards and additional information to less experienced visitors.



Rock climbing and mountaineering are old and traditional sports in many mountain areas, as in Yosemite NP (USA). Mindful of possible impacts, climbers have proactively developed low-impact climbing equipment and techniques, and have published climbing “codes of conduct” that encourage appropriate resource stewardship ethics to protect mountain and cliff areas.

Photo: Valerio Folco

IUCN has worked with UIAA (the International Mountaineering and Climbing Federation) to develop and publish “Access and Conservation Strategies for Climbing Areas”.

Information and signposting

(see also Chapter X on Education and interpretation)

19. Information that is of high quality and conveys a positive message to visitors is a key tool of management. Any information or interpretation should be provided with great sensitivity and in ways that are appropriate to the area. Though signposting generally should be used to warn visitors of unexpected dangers (avalanches, rockfalls, volcanic fumes, etc.), it is important for managers to clearly convey to all visitors the constant need for personal vigilance and responsibility.

The inherent hazards and inconveniences of mountain environments are part of the full experience of these landforms and should be recognised, even celebrated. But visitors need to be sensitively alerted to them – informed without being patronised.

20. High quality interpretation materials, guidebooks, maps and lectures enhance visitors’ sense of discovery, build appreciation for the resources and are welcomed at visitor centres and other informational kiosks. They also contribute greatly to public safety. As a general rule however, on-site interpretation is not appropriate in wilderness, wildland or backcountry zones. Generally, the provision of both information and interpretation

should decrease rapidly with distance from points of entry. Mountain visitors should be informed and instructed in ways that avoid making them feel they are being patronised.

Appropriate visitor accommodation

21. Accommodations in mountain areas should be appropriate for their setting. They should meet essential visitor needs while being as unobtrusive as possible. As an overall policy, they should be kept near main protected area entrance points, where they might also provide economic benefits to local communities and indigenous people. An appropriate exception to this would be to allow very rustic, low impact tent sites, bivouac huts and shelters on commonly-used hiking and climbing routes to mountain peaks. In all cases, accommodations must be located in such a way that resource damage and pollution are minimized, while scenic qualities are maintained.
22. Where public mountain huts or emergency shelters are provided, they should be left unlocked and be subtly yet clearly marked to enable them to be found in bad weather. Discreet reflective track markers may be necessary, particularly in areas with heavy annual snowfall. Emergency shelters and any private huts should be marked on all maps and stocked if possible with minimal survival supplies. Maintenance and stocking of these shelters can be done without impact on management budgets and staff if effective collaborations are worked out with recreational user groups such as climbing and hiking clubs or hut owners. Educational materials are placed in all Italian Alpine Club huts by the Club, aimed at new users, particularly youth. On New Zealand's Milford Track, shelter maintenance is done by helicopter to minimize impact in remote sites.

Visitor health and safety

23. There are inherent, unavoidable hazards, risks and inconveniences that are a natural part of being in the mountains. Visitors should be helped to understand that regular and special hazards like avalanches, rockfalls, mudslides, wildfires, earthquakes, floods, eruptions, severe weather and wildlife activities must be allowed to prevail as part of the natural order in the mountains. Visitors will gain confidence in the mountains from 1) being instructed in how to protect themselves from these hazards and 2) knowing that managers have established contingency plans for visitor protection from these types of hazards.



Precautionary signage can reduce problems for both bears and humans. Done with humour at Great Smoky NP (USA).

Photo: L. Hamilton

- Any special hazards, especially those that might not be obvious, should be described clearly to visitors.
24. Be aware that some recreational groups, such as rock climbers, mountaineers, hikers, skiers and horsemen, may rely on old maps or guidebooks that do not alert them to new dangers posed by significant, rapid deglaciation and meltouts. For example, some of the most popular climbing routes in the Alps (routes on both the Grande and Petite Dru, the Grandes Jorasses and the Matterhorn/Cervino) are now either closed or considered extremely dangerous due to increased rockfall caused by warmer seasonal temperatures. For such groups, be sure to provide updated route and trail information that alerts them to these changes and resultant dangers.
 25. Visitors also need to be aware of medical hazards such as altitude sickness, contamination of food and water, hypothermia, exposure to heat or sunlight, noxious or poisonous plants and animal toxins. They should be given advice and urged to prepare themselves with proper equipment, clothing, survival items and a first aid kit. *Giardia* is now a health factor even in many mountain water sources and water filtration or treatment kits should be advised, if there is a problem.
 26. Where search and rescue (SAR) resources are available, saving human life should be the highest priority when they are called into service. SAR services should be available equally to management, support staff, local residents and visitors. Calling up SAR units should be considered only when self-rescue is deemed impossible or improbable. It should be regarded as “an act of mercy” and provided to victims free of charge unless their insurance coverage provides payment or reimbursement for services rendered. Visitors should be informed that “convenience” rescues needlessly imperil SAR workers and that fees may be charged for this service. Managers should recognise that experienced recreationists may have better local knowledge and technical experience than rescue organizations in many parts of the world. In the absence of formal SAR groups, other experienced visitors may well be the most valuable rescue resource available to a manager.
 27. A consistently high quality, humanistic and culturally-sensitive programme of staff public safety training should emphasise skills building, visitor relations, proper equipment and its use, advance planning and scenario exercises, evacuation rehearsals and the judicious use of helicopters and motorized sleds. The training of users, managers and local interest groups is an essential component of visitor safety and resource impact reduction. In many mountain areas, local climbing and hiking organizations volunteer manpower, equipment, training and funds to support public safety efforts, particularly SAR. Best practices from other public safety groups and locales should be sought and incorporated as needed. Public safety staff and volunteers should be made fully aware of any local sensitivities and practices that might come into play while carrying out their work.

Management monitoring and evaluation

28. Effective management of the visitor experience will include ways to adapt to new realities over time. Programmes of management monitoring and evaluation should be simple, inexpensive and replicable. All elements should be covered in the monitoring and evaluation process including any that affect the health and safety of staff, visitors,

residents, local communities and indigenous people. Including feedback from visitors about public safety provisions will help managers discover new ways to enhance their enjoyment of the mountains.



Privately operated ecotourism facility (“Adventure and Culture”) in indigenous style, plus llamas, in peripheral zone to Chimborazo PA in Ecuador. *Photo: Marco Cruz*

X. Education and interpretation

Education and interpretation (E and I) programmes are essential to advancing the mission and goals of mountain protected area management. Information and interpretive services are essential to a proper park experience and need to be designed and delivered so that at least some elements of them will reach all visitors. The principal purpose of such programmes should be to encourage visitors to assist in caring for the protected area through a process of enjoyment, appreciation and understanding of the values of the area. They cover natural, cultural and spiritual aspects of protected areas where appropriate. The interpretation of cultural and spiritual elements that are held by local and/or indigenous communities should only be done with the full permission and cooperation of those communities. MtPA managers need to engage the assistance of other relevant stakeholder groups in E and I whenever possible. Programmes are fully integrated into the MtPA management plan.

Good education and interpretation require specialist skills, should be based on solid evidence and research and should engage the minds and spirits of the audience. Education and interpretation should be socially equitable in its content and delivery.



Educational guided walk for visitors to Glacier NP (USA) by Interpretive Naturalist.
Photo: L. Hamilton

Guidelines

General issues

1. Education and interpretation (E and I) should endeavour to link local MtPA issues to landscape-level issues and even global issues where appropriate.
2. E and I programmes should be developed in concert with local people, as a means of providing them with some ownership of the MtPA and informing them of its values.
3. In addition to targeting visitors, consideration should also be given to providing information and education for non-visitors, including politicians whose support is so essential for the MtPA.
4. A code of visitor conduct should be developed, clearly stating expectations and explaining why the area's specialness warrants special care. The benefits to the park and to the visitor for following the code should be explained.
5. Reasons for temporary or permanent restrictions on visitors must be clearly explained, in terms of safety and protection of values, especially those involving area closures.
6. Discussion with local people should use culturally appropriate channels. This requires a thorough understanding of local culture by staff, acquired through training, involving local people as instructors.
7. Communication with locals should be in the local language whenever possible. All interpretive media should be multilingual as necessary. Maps should be available showing the names of the MtPA features in the local language(s).
8. Resources that are important to local people should be identified in interpretive and educational media where appropriate and the reasons why they are important explained to other visitors.



Sturdy, informative panel explaining glacial phenomena at Hohe Tauern NP (Austria).

Photo: L. Hamilton

9. E and I should support the protection of local culture, including documentation of cultural beliefs, language, etc., as appropriate.
10. Visitors and people in neighbouring communities should be educated about all critical resource issues: biodiversity, air and water quality, alien species, recreational impacts, etc.
11. Positive steps visitors can take to reduce their own recreational impacts on the MtPA should be presented. Less-impactful alternative routes, times of use, etc. should be identified and communicated.
12. Basic safety information for mountaineering and mountain travel must be provided to all visitors. It should be tailored to different skill levels.
13. Outdoor interpretive material should be carefully selected so that it withstands harsh mountain conditions.
14. Private-sector recreation leaders (e.g. guiding services, bus drivers, outfitters, etc.) should be required to provide appropriate interpretive messages in their interaction with visitors as a condition of their permit to operate in the MtPA. This is becoming increasingly important as more and more private guiding services use MtPAs. Training and guide-service “certification” should be considered (fees charged to cover costs?)
15. Where local cultures have elements exclusive to men or women, programmes for or about local people should be gender sensitive.
16. Both males and females need to be included in the interpretation of indigenous cultures, as well as elders and youth.
17. The experience of MtPAs and physical access to them, can be made accessible to people with disabilities. Much good work with nature trails for the non-sighted has been done and can be accessed. MtPA managers should not assume that people with disabilities cannot engage in mountaineering and other strenuous activities and should plan E and I activities with this in mind. During the International Year of Mountains (2002), IUCN and UIAA co-sponsored a series of summit climbs for peace in the Swiss Alps, including both Indian and Pakistani mountaineers and a quadruple amputee from Scotland. These climbs also celebrated the achieving of World Heritage status by the Jungfrau-Aletsch-Bietschhorn complex.
18. A lead individual (or organization) should be appointed to coordinate all park-related education and interpretation, no matter whether the activities are being performed by park staff or by outside entities.
19. All staff, from administrative personnel to entrance station guards to maintenance staff, should be trained in basic communication skills and given information on principal park features so that they can give accurate information to visitors, if asked.
20. MtPAs should recruit volunteers to augment paid staff, particularly where financial resources are scarce. Play to the strengths and interests of the individual volunteer. A mix of ages and socio-economic backgrounds (e.g. students and retirees) can bring in new perspectives and enthusiasm and reach out to different age and interest groups in the public.
21. Interpretation to on-site visitors is not enough. Educational outreach to non-visitors is a critical component of an overall park programme and specific outreach programmes

should be carried out by staff and fostered in outside organizations, such as schools, libraries, local civic organizations, nearby places of accommodation, etc.

22. In transboundary areas, education and interpretation should be coordinated across the border, in particular for shared resources or cultures. It should be in a style and language relevant to both sides of the border.

Sacred places and sensitive cultural issues

(See also Chapter VI)

23. I and E programmes should be designed to present metaphysical and cultural values in MtPAs in a manner that respects local beliefs and also which informs visitors, encouraging them to act in a sensitive manner towards the beliefs of others.
24. Present these subjects with respect.
25. Sacred sites should only be interpreted either by custodians who are repositories of the local values and beliefs, or others who have community approval.
26. Myth must be interpreted with great care to avoid extremes of either glorification or belittlement.



Some sacred places need to be closed to visitation or be carefully regulated. A site reserved for aboriginal women in Australia.

Photo: J. Thorsell

The interpretation of sacred sites must be particularly sensitive. For many of the world's people, religions are based on nature gods and goddesses that provide an overriding system of order – a cosmos – which includes all environments from mountains to the seas: “spirituality” is considered to be inherent in all natural things. Such an approach may provide a broad framework in which may fit the specifics of particular sites, and documentation of beliefs, as appropriate.

Wilderness areas

(See also photo of wilderness area at end of Epilogue)

27. Wilderness areas should receive special E and I to reduce physical and social adverse human impacts, in order to have as few regulations as possible.
28. “Leave No Trace” and minimum tool intervention concepts should be promoted among MtPA wilderness users.
29. On-site E and I should be minimized or eliminated in wilderness areas. Safety and regulatory information should be provided at contact points outside the wilderness.

XI. Issues associated with climate change and air quality

This chapter, mainly on climate change, also includes changes in air quality due to pollutants. Both arise from activities or processes outside the PA, over which the planner or manager has little control. The guidelines apply equally.

Global climate change presents an unprecedented challenge to those concerned with MtPAs. The present global network of protected areas already approximates to a representative sample of mountain landscapes. It affords, therefore, a unique opportunity for innovative conservation, which should include scientific and educational programmes on climate change.

Because of their steepness and relief, protected areas in mountains are exposed to a range of atmospheric and climatic conditions. This fact, combined with their distribution around the world, means that they provide unequalled opportunities to detect and monitor changes in climate and in air quality, and their effects (e.g. measurements on Mauna Loa in Hawai'i Volcanoes National Park of carbon dioxide and acid rain). Innovative strategies will be essential to manage mountain protected areas against the background of likely climatic change.

In coming decades, climate changes resulting primarily from human activities are likely to be more rapid than any experienced in the development of present mountain ecosystems. Changes are likely not only in averages but also in seasonality and the frequency of extreme events. Such changes will be critical for both natural processes and human uses of mountain protected areas. While existing models agree to some extent on changes at the continental scale, they are only just beginning to provide reasonable projections of probable climatic trends for regions, especially complex ones such as mountains.

Palaeoecological studies show that species may respond individualistically to climate change, forming assemblages that may not be the same as today's. The timing and magnitude of changes in species distribution may vary unpredictably. Particularly relevant are the different life-spans of different components of mountain ecosystems: from days to centuries. Increased stresses on mountain ecosystems due to climate change may increase their vulnerability to insect pests, pathogens, invasive species and airborne pollutants including acid rain.

Mountain landscapes contain many species and ecosystems that are highly sensitive to environmental change and are refuges for populations of flora and fauna, many of which are endemic and thus especially threatened. Precipitation changes will affect watershed hydrology and available water resources. Mountains have a rich cultural heritage and are important locations for recreation and tourism. Future patterns of tourist use may be greatly affected by changes in weather conditions and air quality and by increases in transport fuel prices that have been pushed upwards by controls on carbon release.

Considerable data on climate, hydrology, biology, palaeoecology and culture have been amassed in some mountain protected areas by outside research institutions. These data are frequently more detailed, and representative of longer time sequences, than data from other parts of the mountain regions in which they are situated. Such data are essential inputs to predictive models and actions to react and adapt to climate change at both regional and global levels.



Monitoring glacial retreat in European Alps. *Photo: J. Ives*

Guidelines

1. In order to make full use of existing information, scientists and managers in MtPAs should:
 - promote the uses of MtPAs as leading locations for research and monitoring of climatic change by encouraging and contributing to regional, national and international programmes, such as Global Mountain Biodiversity Assessment, Global Observation Research Initiative in Alpine Environments (GLORIA) and Mountain Research Initiative;
 - foster the development of a network of MtPA research by establishing cooperative programmes that contribute to global conservation strategies for climate change;
 - list and evaluate the practical uses of existing data, the nature and usefulness of present models, local knowledge of climate and its cultural implications and gaps in the knowledge required for predicting and understanding regional climate change;
 - use uniform standards for the collection, analysis and storage of climatological, environmental and biological data in MtPAs.

The ability to detect climatic change and its effects requires baseline information on the present state and distribution of natural resources. The identification of key species which are likely to provide early indications of climatic change is crucial within each mountain area.



Measuring basic climatic data over time is important to detect changes in páramo climate in Venezuela's Sierra Nevada NP. Adding in acidity of rain or other pollutant data should be considered.

Photo: L. Hamilton

2. Park managers should develop an understanding of the vulnerability of their MtPA to climate change in a regional context. Thus, they should undertake sensitivity analyses, particularly of climate-sensitive species and their position in the landscape. These analyses should consider:
 - Geography (slope, aspect, elevation);
 - Climatology and hydrology (including snow and glaciers);
 - Biodiversity elements and ecological processes, especially emphasising ecotones and endemic species;
 - Human uses of ecosystems and species and their links to climate.
3. Park managers should develop and implement monitoring programmes based on these sensitivity analyses, including
 - Standardized scientific methods (e.g., micro-climate, fauna, flora);
 - Traditional ecological knowledge with a focus on key locations identified in the sensitivity analyses;
 - Extent of glacier retreat or disappearance and resulting changes in hydrology.
4. Park managers should incorporate: a) the outcomes of sensitivity analyses in management planning (e.g. species, fire management) and b) the results of monitoring in resource management actions and revisions of management plans.
5. Education and interpretation programmes should incorporate understanding derived from sensitivity analyses and monitoring and stress the wider implications of climate change on mountain ecosystems and hydrological systems. Specific programmes should be developed for diverse groups of key stakeholders (including park personnel, local people and visitors).

Because air pollutants are transported long distances, protected areas in mountains, even though remote, are atmospherically linked with upwind urban and industrial areas, and can suffer damage. Pollutants tend to concentrate in deep valleys and in cloud belts on mountains. Visibility is often reduced, affecting scenic quality. Mountains may provide suitable sites for monitoring regional pollution, and sensitive species in them (e.g., certain lichens) can be used as an early warning system.

6. Monitoring should be instituted in the following fields:
- Visibility and the deposition of wet, dry and gaseous pollutants using standard methods (this is being achieved in the International Biosphere Reserve Krkonoše (Czech)/Karkonosze(Polish) with respect to serious impacts of air pollution);
 - Extent of glacial retreat or disappearance;
 - Identification and monitoring of species sensitive to those pollutants that may threaten any particular protected area;
 - The biological and physical effects of those air pollutants which are known or suspected to cause harm.

Changes in the atmosphere will occur at a global scale and may have effects that can be measured only over long periods of time. Effective mountain research and monitoring of change at the global scale require long-term financial support. Research within developing countries requires adequate resources in order to develop indigenous expertise.

7. Mountain protected area managers and governments should seek to adjust PA boundaries (or establish co-operative agreements with adjacent landowners) to maximize the effective size of the PA, to include as great a range of elevations, slope aspects and habitat mosaics as possible.
8. Managers should incorporate the outcomes of sensitivity analyses in management plans especially for water flows, endangered or keystone species and fire.

The rivers flowing from mountain protected areas are vital sources of water for agricultural, industrial and domestic uses, and power for both mountain and lowland people. Since changes in regional precipitation are likely to result from climate change, this could lead to major, and perhaps rapid, changes in water flows. Both increases and decreases in total and seasonal flows are possible. Glacial melting rates are important components.

9. Agencies and individuals responsible for mountain protected areas should:
- provide leadership in developing educational programmes in response to climatic change – these programmes should be designed to benefit these areas, surrounding landscapes and their inhabitants and the global community;
 - encourage timely communication of important facts arising from research and monitoring to the media and to those responsible for education;

- develop interpretive programmes that demonstrate the various options for responding to global climate change.

Uncertainty about the timing and magnitude of global environmental changes forces the managers of mountain protected areas to make decisions with inadequate information. If dramatic changes in the physical environment occur, it will be impossible to maintain ecosystems in their present or desired state. There should be flexible plans for the spatial and temporal reorganization of ecosystems, which may include actions to ensure the survival of populations of individual species.

Epilogue

Every mountain area is different from every other – in geology and climate, in its plants, animals and ecosystems, in its human cultures and the pressures for change to which it is subject. Any general guidelines, such as these, can only give an indication of the kinds of actions that are needed; the details must always be tailored to fit local circumstances.

These guidelines are offered by 59 scientists and managers having special knowledge of mountain protected areas in over 30 countries and builds on previous work from another group of 40 mountain men and women. It is hoped that they will be useful as general guides wherever they are applied; but in addition, they need to be adapted to fit different mountain regions. In some areas, it may be possible to use them as a check list against which the completeness of local guidelines may be evaluated.

Also, many of the principles will be found to apply with equal force to the management of areas outside those formally protected. They should, therefore, be applied as widely as possible to cover whole catchments or mountain regions.

The golden rules when designing any local application are:

- Understand the ecology of the region;
- Understand the culture of its people;
- Understand the nature of the changes – physical, biological, cultural and socio-economic that affect it; and
- Secure participation in planning and management decisions from the local communities and as wide a range of stakeholders as possible.

Remember the caveat in the Introduction that the emphasis has been on conserving biological and cultural diversity, with a bias toward IUCN Categories I–IV. The resource management methods that must be applied for sustainable horticulture, agriculture, grazing and forest harvesting are not dealt with because they represent land-use systems with their own body of knowledge and experience.

The increasingly large and comprehensive literature that has been produced for mountain land-and- water-use since the placing of “Mountains” on the global political stage in 1992 at the UN Conference on Environment and Development should be consulted. The process flowing out from UNCED has been known as Mountain Agenda and its official “base” is Chapter 13 of Agenda 21. Highly recommended as one of the more comprehensive works emanating from this process is the book *Mountains of the World: A Global Priority* (Edited by B. Messerli and J. D. Ives, 1997, Parthenon Publishing Group, New York and London). It has sections leading to other works on the topics of mountain agriculture, grazing, forestry and the like, including mining and energy, which are persistent issues in MtPAs.

Public awareness of the importance of mountains has increased substantially since UNCED and received an impetus forward by the UN declaration of 2002 as the International Year of Mountains. This spawned an amazing array of celebrations, festivals, music, films, climbs, conferences and workshops all around the world. It culminated with a World Mountain summit in

Kyrgyzstan. And now, December 11 has been declared as International Mountain Day each year. This all should make the work of MtPA managers easier. Managers of MtPAs may find it useful to keep abreast of the wider mountain world and its issues through joining The Mountain Forum (which has regional groupings): Secretariat@mtnforum.org or www.mountainforum.org

Remember that IUCN and especially its World Commission on Protected Areas, is a source of advice and assistance. The fine IUCN/Cardiff University Best Practice Protected Area Guidelines Series will prove useful to planners and managers of MtPAs. They cover such topics as: national system planning, economic values, financing PAs, evaluating effectiveness of management, indigenous and traditional people, as well as the aforementioned transboundary PAs. Where the MtPAs contain caves or karst, a guidelines manual somewhat akin to this one, is available. Consult IUCN Publications Services Unit info@books.iucn.org or www.iucn.org/bookstore/pro-areas-5.htm#B326



A wilderness area surrounds Mount Assiniboine on the border between Banff NP and Mt. Assiniboine Provincial Park, included in the Canadian Rocky Mountain Parks World Heritage Site.

Photo: Harvey Locke

Appendix 1

IUCN protected area categories and management objectives

The current IUCN WCPA categories are as follows:

- I. Strict protection
 - a. Strict Nature Reserve
 - b. Wilderness Area
- II. Ecosystem conservation and recreation (National Park)
- III. Conservation of natural features (Natural Monument)
- IV. Conservation through active management (Habitat/Species Management Area)
- V. Landscape/seascape conservation and recreation (Protected Landscape/Seascape)
- VI. Sustainable use of natural ecosystems (Managed Resource Protected Area)

Appendix 2

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Appendix 3



Drakensberg Workshop recommendations for Durban Action Plan

Recommendation 06 Strengthening Mountain Protected Areas as a Key Contribution to Sustainable Mountain Development

Mountains and their protected areas provide “Benefits Beyond Boundaries” for a significant proportion of humanity, in both mountain and lowland areas. In particular, they are the water towers of the world.

The establishment and effective management of an adequate and representative system or network of Mountain Protected Areas are essential ingredients of sustainable development in mountains as well as a paramount means of conserving biological and cultural diversity. Mountain areas are often along international frontiers where conflict occurs.

Chapter 13, the Mountain Chapter, of Agenda 21 from UN Conference on Environment and Development (Rio de Janeiro, Brazil; 1992) calls on all countries with mountains to strengthen national capacity for sustainable mountain development, and to prepare long-term mountain action plans.

2002, the International Year of Mountains, provided a remarkable and diverse array of events at local, national and international levels, which placed mountain ecosystems squarely on the global agenda as a priority concern.

The Bishkek Global Mountain Summit (Bishkek, Kyrgyzstan; October–November 2002), and the World Summit on Sustainable Development (Johannesburg, South Africa; August–September 2002), reinforced these calls for action.

The close relationship between mountain biodiversity and protected areas will be a focus at the forthcoming Conference of Parties to the Convention on Biological Diversity (Kuala Lumpur, Malaysia; 2004).

With these points in mind a Pre-World Parks Congress Workshop on Mountain Protected Areas, held in South Africa’s uKhahlamba-Drakensberg Park World Heritage Site (5–8 September, 2003), involving 60 managers, scientists and policy makers representing 23 countries:

1. **ENDORSE** the establishment of an adequate and representative network of Mountain Protected Areas in all mountain regions as a key part of sustainable mountain development, including appropriate conservation linkages to adjacent landscapes and seascapes and working with local communities and land managers;

2. WELCOME the support for Mountain Protected Areas from outdoor recreation interests, as expressed in the Environmental Objectives and Guidelines of the International Mountaineering and Climbing Federation (UIAA), published during the International Year of Mountains;
3. URGE IUCN – The World Conservation Union, to:
 - a. Support the Mountain Initiative Task Force as an Inter-Commission group involving primarily the World Commission on Protected Areas and the Commission on Ecosystem Management, with opportunities for other Commissions to contribute as appropriate;
 - b. Give particular attention to implementing the WCPA 2004–2008 Mountain Strategy, as endorsed by the Mountain Initiative Task Force;
 - c. Engage fully in the International Partnership for Sustainable Development in Mountain Regions, as a method of implementing Chapter 13 of Agenda 21;
 - d. Continue to press for recognition, during this International Year of Freshwater and beyond, of the vital role of Mountain Protected Areas in safeguarding water quality and quantity;
 - e. Provide leadership to highlight the vital relationship between biodiversity, mountains and protected areas as the CBD considers these topics at its 2004 meetings;
 - f. Give a prominent role to mountains and their protected areas at the 2004 World Conservation Congress; and
 - g. Provide a forum to discuss and advance transboundary protected areas in contributing to the conservation of regional biodiversity, recognising the special circumstances of transboundary mountain communities, and resolving regional conflicts through mechanisms such as Peace Parks.

Stream: Mountains

Stream Lead: Larry Hamilton



A wilderness area surrounds Mount Assiniboine on the border between Banff NP and Mt. Assiniboine Provincial Park, included in the Canadian Rocky Mountain Parks World Heritage Site. *Photo: Harvey Locke*



IUCN – The World Conservation Union

Founded in 1948, The World Conservation Union brings together States, government agencies and a diverse range of non-governmental organizations in a unique world partnership: over 1000 members in all, spread across some 140 countries.

As a Union, IUCN seeks to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.

The World Conservation Union builds on the strengths of its members, networks and partners to enhance their capacity and to support global alliances to safeguard natural resources at local, regional and global levels.

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