

discussion. At a global scale, multi-stakeholder initiatives, such as the World Overview of Conservation Approaches and Technology (WOCAT) described by Liniger, are also of considerable importance.

The final section in this chapter brings together many of the issues covered in previous contributions with regard to one type of mountain forest ecosystem: tropical montane cloud forests (TMCFs). Aldrich notes that these are now restricted to a fraction of their original extent, yet they play many vital roles for both mountain and lowland people. Particularly vital among these is their 'stripping' of moisture from clouds; they are also important in providing watershed protection, wildlife habitat, and non-timber forest products; have high biological diversity; and possess strong cultural values. Aldrich provides a global overview of TMCFs, noting not only ongoing threats, but also those posed by climate change. A coordinated approach to TMCFs is being taken collaboratively by a number of international organizations, with the aim of maintaining and enhancing the diverse roles of TMCFs in tropical mountain regions.

7.1 Recreational uses of mountain forests

S.F. McCool and P.R. Lachapelle

Recreation and tourism have become social, economic and environmental forces of almost unbelievable proportion; few terrestrial areas have escaped their influence. Tourism is the world's largest industry, measured in jobs, much of it based on natural environments. The recreational activities tourists pursue in mountain environments, including skiing, snowboarding, snowmobiling, hiking, camping, fishing, hunting, nature study, horseback riding, wildlife observation, photography and backpacking – provide millions of people with important social psychological benefits, while at the same time leading to impacts on mountain ecology and cultures that are often pernicious and difficult to resolve.

Understanding the role of mountain-based recreation, in terms not only of demand and supply, but also of its ecological, cultural and economic consequences, is fundamental to montane management. Recreation is inevitable; management systems need to be in place to guide the character and intensity of impacts and ensure the potential positive benefits. There are few global-level organizations monitoring recreational activity.

7.1.1 Current state of knowledge about recreation and forests

Recreation continues to be a growing and extensive industry

Recent advances in recreation-related technologies enable participation in activities that were impracticable or difficult only a decade ago. Much of this

increase will occur in activities – frequently termed ‘ecotourism’ – heavily dependent on environments allowing close contact with nature. High-tech gadgetry including global positioning systems, cellular phones and powerful new off-road vehicles provide the opportunity for forest users to venture farther and into more remote terrain with greater ease and feeling of security. The use of technology itself is often controversial, particularly in areas managed for more primitive recreational experiences.

In the United States, approximately 94% of people 16 years and older annually participate in some type of outdoor recreation activity (Cordell, 1999). Manning (1999) reports that annual use of areas administered by the National Park Service and the Forest Service in the United States grew from roughly 35 million recreation visitor-days each in 1950 to over 250 million recreation visitor-days in the National Parks and nearly 350 million recreation visitor-days in the National Forests in 1998. The World Tourism Organization estimates that the number of people travelling internationally will increase from 612 million in 1997 to about 1.6 billion by the year 2020.

Cordell (1999) reports that certain outdoor recreation activities are expected to increase substantially between the present and 2040; projected rapid increases in activity days (in the USA) include downhill skiing (110% growth), snowmobiling (99% growth) and non-consumptive wildlife activity (97% growth). Among the slowest growing outdoor recreation activities in activity days are fishing (27% growth), primitive camping (24% growth) and hunting (negative growth). Cordell (1999) also suggests that rapid increases in diversity within the American population in terms of race, age, culture and income will change the demand for outdoor recreation, resulting in different preferences, expectations and methods of participation.

Economic returns resulting from recreation contribute significantly to many communities near mountain forests

Many mountain communities contain economic structures closely linked to subsistence resource use or processing of natural resource based commodities. Many of these communities are losing this economic base, and turning to tourism to both stabilize and diversify their base. Tourism can contribute to this goal through carefully designed developmental and promotional programmes – in Montana, USA, recreational activities dependent on the natural environment account for about 50% of all the non-resident tourist spending (Yuan and Moisey, 1992). Worldwide, the tourism industry generated an estimated US\$4.4 trillion in retail expenditures during 1998.

By focusing development on the unique cultural and natural heritage of the area, communities may successfully increase income, enhance the ability of the community to adjust to change and achieve important socially defined, community-level objectives. Development of ‘ecotourism’ opportunities,

however, requires sensitively placed, designed, and managed facilities and programmes in order to protect resources.

Forest users prefer multidimensional recreation experiences

Visitors to mountain forests generally seek a variety of recreational aspects; adventure, challenge, learning, experiencing and appreciating nature, solitude, stress release, escape from pressures of everyday living, being with friends/family, skill development and risk. The relative importance of each of these expected benefits varies across time, populations and areas. Managers seeking to profit from growing levels of recreational demand will investigate the most important for their area. Often, programmes providing opportunities for these experiences will be consistent with the purpose of the area.

Palacio and McCool (1994) describe several different nature-based tourist types visiting the country of Belize in Central America. Each type of visitor held different levels of importance for solitude, learning about nature, group cohesiveness, and escape and was found to have somewhat different preferences for level and type of facility development. Thus, mountain forest managers, when considering recreational developments, must ask 'For whom am I managing?'

The ability to understand what users seek is crucial to understanding how to manage forested ecosystems. Manning (1999) describes four levels of demand for outdoor recreation. This hierarchy is made up of activities at the top, and continues with settings (environmental, social and managerial), motivations and lastly, benefits that include personal, social, economic and environmental. Managers who are able to discern this hierarchy are more able to satisfy recreation user needs and avoid conflict.

Impacts occur quickly and can be difficult to predict, monitor and/or mitigate

Projections of use of mountain forests for recreation are few but at least in the USA, use is expected to increase dramatically over the next 40 years. Managers will need to determine whether to focus or disperse that demand, in time and space. Each strategy, combined with other management approaches – such as information and regulation – can be used to manage the growth in impacts accompanying higher levels of use and development.

Sustainable mountain development implies that forest impacts must be limited to an acceptable level. Such impacts occur at two major scales: along trails and at campsites; and at major development areas, such as ski areas. Research on recreation impacts (at the site level) demonstrates that both biophysical and social impacts initially grow disproportionately to use levels (Cole, 1987). Impacts are often more influenced by behavioural patterns

of visitors, soil and vegetation characteristics and season than by the actual numbers of visitors themselves. Impacts may occur off-site and may not be observed for a long time. Impact characteristics, intensity and persistence are often site-specific – predictions are difficult to make and have wide latitude of error.

At larger scales, impacts are influenced by location, design, construction and management systems; engineering and architectural principles that minimize energy requirements and pollution are well established and only need implementation by sensitive developers (National Park Service, 1993). Careful consideration of geological, topographic and vegetation characteristics will be helpful not only in reducing impacts but in enhancing the architectural character of the facility itself. Understanding how people move from one point to another can reduce impacts of unnecessary transportation systems and control the number of visitor-created trails.

Commercial use of forests associated with recreation is growing

Recreation activities such as non-consumptive wildlife activities (including bird watching and wildlife viewing) and angling are information-intensive and often require the use of outfitting and guiding services.

The use of concessionaires, or private administrators, to maintain and operate public recreation sites on public land is becoming well-established in the United States. Concessionaire-run sites operated just under 50% of the nearly 4000 US National Forest fee sites in 1996, compared with only 7% of the non-fee sites. Overall, more than 31% of the recreation sites on US National Forest land charge a fee for public use, with almost two-thirds of the camping sites charging a fee. Within the National Park system, more than 650 commercial and non-profit concessionaires provide lodging, food and transportation services.

Additionally, a significant recent trend in the United States in recreation management is toward the use of expanded visitor fees. More than 50 'fee demonstration' projects are now in use in various National Forests, to estimate the feasibility of reinvesting recreation use fees on-site, but more importantly to assess public acceptance of the increases in costs and benefits. Initial evaluations of the projects reveal that the new fees are not universally accepted by customers and that the programme does have impacts on the work force and visitor behaviour (Cordell, 1999). As land management agencies are increasingly constrained by a lack of financial and personal resources, the use of fees (entrance fees, admission fees, use fees, licence and permit fees, and sales and concession fees) in forests is likely to increase.

Simple methods of forecasting future recreation have been used by USA federal agencies. Loomis and Walsh (1997) describes four methods: time series, resource capacity, informed judgement, and market surveys. The time

series method is a simple observation of past trends that show regularity and predicts future expected outcomes accordingly. The resource capacity method seeks to determine whether excess demand exists in the market area of a recreation site, in order to utilize the additional capacity of a new site. Informed judgement uses both available data and subjective appraisal of non-measurable variables in order to incorporate special insights into forecasting the use of a recreation site. The market survey approach incorporates individual or household quantitative surveys to gauge the intentions of recreation consumers. All of these methods can help to predict economic returns from recreation.

Increased recreation use of forest resources can promote ecological understanding and contributes to a conservation ethic

Rolston (1991) argues that leisure and preservation are intertwined and that nature-based recreation provides the user not only with numerous benefits including health, spirituality and aesthetics, but also has the potential to promote a sense of environmental appreciation and thus preservation.

Ecotourism has become the latest buzzword to describe 'responsible travel to natural areas, which conserves the environment and improves the welfare of local people' (Lindberg and Hawkins, 1993). Ecotourism has experienced a 30% annual increase as compared to a 4% increase in the overall US travel industry (Honey, 1999). Practitioners of ecotourism are said to apply the principles of low-impact travel with benefits directly influencing local communities. Most importantly, ecotourism is said to promote education and a sense of awareness, not only of nature, but also of human-nature interactions. The World Tourism Organization predicted that by the year 2000, the majority of the increases in worldwide tourism receipts would come from active, adventure, nature and culture-related travel (Honey, 1999).

Social-learning models of planning and management emphasizing public involvement are most appropriate when goals are contested and uncertainty exists about cause and effect relationships

Forest recreation has been typically managed under the same assumptions as other types of forest resources: a consensus about what recreation experiences and other values should be protected exists and scientists agree on cause-effect relationships. While many management approaches are scientifically based and expert-driven, they have largely failed in implementation as they lack basic social acceptability. The planning and management process itself is often the source of conflict; promoting dissension among groups competing for the scarce forest resource and recreation values.

Science-based, expert-driven approaches often fail to acknowledge critically important emotional and experiential knowledge peculiar to a specific forest, important for building effective, local solutions. Research shows that approaches based on social learning and consensus building lead to implementation of effective actions, greater political and financial support for management, and better solutions. In this context, planning for sustainable development of mountains requires less of an emphasis on engineering solutions and more focus on learning.

Managers have learned to direct management systems towards protecting important resources, experiences and cultures

Forest managers in situations typified by high levels of demand and impact have often turned to the concept of recreational carrying capacity, which has then led to immediate attempts to limit recreational use. Such attempts, conducted outside an overall strategy or system, have had little effect on reducing the level and distribution of biophysical or social impacts. In some cases, focusing and limiting recreational use at a few sites has reduced the biophysical impacts, but increased the social impacts by reducing opportunities for solitude (Cole *et al.*, 1997).

Scientists and managers have increasingly turned to understanding how much impact (biophysical and social) is acceptable, given the area's management objectives. Acceptable level of impact is different from the preferred amount. Since a little recreational use may cause a relatively large impact, the only way to prevent degradation is to prohibit recreation – an option not available to most mountain forest managers. By focusing instead on determining how much impact is acceptable or appropriate, managers can use an array of tools to control the impact, limit its spread, and restore conditions to those identified as acceptable. Such a system is termed the 'Limits of Acceptable Change' (LAC) planning system, used in many US backcountry protected areas, such as designated wilderness (Stankey *et al.*, 1985), and in a variety of national park and marine reserves. The system structures the management process to make decisions explicit, focus on outcomes of decisions, consider a wide range of management tools, and establish clear, quantitative-based standards of acceptable biophysical and social change. A recent evaluation suggests that the LAC system has great potential for a variety of protected area and forested mountain situations (McCool and Cole, 1997). While the success of the LAC process is subjective and difficult to quantify, several US federal agencies have applied the LAC process with satisfactory results, including planning in the Bob Marshall Wilderness in Montana, and the Poudre Wild and Scenic River in Colorado. As the LAC process is based on the proposition that planning and conflict resolution in most natural resource settings is often contentious and based on value judgements and social choice, it is grounded

in intricate negotiation between affected parties instead of an engineered compact using a rational, linear process between competing interests, often with one dominant party. Success using the LAC process is often measured multidimensionally with respect to the amount of learning, relationship building, representation, social and political accountability and 'ownership' of the plan by various affected groups. LAC is a process more than a procedure and thus, is viewed as a continual succession of implementing actions, evaluation, and modifications as necessary.

7.1.2 Research needs

A number of research questions confront managers of mountain forests. These include the following:

- What should be sustained by recreation and tourism development occurring in mountainous forests? What would be appropriate indicators of the things to be sustained? Over what time period should these be sustained?
- How do we manage the recreational opportunities located in mountain forests to enhance economic opportunity, protection of the local cultural and natural heritage, and improve the quality of life of local residents? How do we make, through sustainable tourism development, local communities more resilient?
- What experiences do recreational visitors to mountain forests expect? How do those expectations mesh with objectives for mountain resources? How can forest settings be managed to enhance those experiences? What variables should be monitored to show when experience expectations are being met? How are these indicators monitored? To what extent are expectations compatible with extractive and subsistence uses of mountain forests?
- Why do certain forest recreation activities conflict with others? What is the character and intensity of the conflicts? What management mechanisms are effective and efficient in reducing conflict? What positive social functions does conflict serve?
- What is the capability of mountain forests to sustain recreational uses? What are the appropriate and acceptable conditions by type of area? What is the relationship between use/development and impact in different types of systems? How do we determine when impacts are unacceptable? What are the management actions that are efficient and effective in managing impacts?
- What is the role of the public in developing systems to manage recreational use of mountain forests? What information does the public hold that is useful? How is public knowledge integrated with scientific knowledge when developing management plans? What techniques are

useful in involving the public? How do we know if public involvement has been successful?

7.2 Recreation and landscape management impacts in mountain forests

U. Pröbstl

7.2.1 The significance of mountain regions for leisure and recreation

Globally, mountain regions are among the most favoured recreation locations; both high and low mountain ranges are frequently visited, as demonstrated by the tens of millions of visitors each year to the European Alps and the national parks of North America and Korea.

Descriptions and pictorial representations of natural beauty have a long tradition in many places, and indicate one of the most important reasons for tourists' use of mountain regions: an exceptional experience of landscape. Seasonality is particularly noteworthy, from spring flowering to autumnal colour changes and the formation of bizarre shapes due to the action of snow and ice. A further important motive is proximity to nature.

In many mountain regions, forestry is restricted by unfavourable soil conditions, poor access, the high cost of timber exploitation or nature conservation legislation. In such areas, natural phenomena can be experienced that have become rare in intensively managed forests; the presence of giant trees, original forests with a high proportion of dead timber, wind-sculpted trees in exposed places, sabre-growth (sharp-angled tree-growth) in regions of snow-drift, or the growth of impressive tree roots over rocks.

Mountain forests have a particular species composition related to extensive exploitation and environmental conditions. These are the last refuges for many rare species – especially forests of considerable size that can accommodate large predators, game and other species which require large areas. The possibility of experiencing some of this rich fauna and flora increases the attraction for recreation-seekers, and high altitude adds to a varied and attractive spatial experience. These important factors constitute the attraction of the mountain forests.

In recent decades, however, visitors have come not for the natural scenery, but for sporting activities; hikers looking for natural beauty and 'wildlife' have been joined by downhill and cross-country skiers, mountain bikers, hang-gliders, paragliders, joggers and cross country runners, to name a few (Fig. 7.1). The sport and leisure industries exploit this interest with the constant invention, promotion, and effective marketing of new trends, sporting equipment and types of activity in the mountains. In this context, nature, including mountain forests, often becomes a secondary consideration, a use-value to commerce and tourism (e.g. CIPRA, 1998;

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