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Exploring factors influencing the attitude of ski tourers towards the ski touring management measures of the Gesäuse National Park

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Keywords: ski touring, grouse, visitor management, national park, questionnaire

Abstract

This study investigated factors influencing the attitude of on-site ski tourers towards the ski touring management measures recently implemented by the Gesäuse National Park for two ski tours in the Johnsbach valley in order to protect capercaillie and black grouse. Most of the respondents (n = 550) were long-standing regular day visitors frequently visiting the Johnsbach valley for ski touring. The majority of them were not aware of ski touring management measures. Two thirds of those who knew about it saw it as a useful concept. The regression analysis identified attitudes towards environmental impacts of ski touring, motives for ski touring, area dependence, perceived constraints to the individual's recreational activities and past experience as factors explaining the attitude towards the concept. From our findings we derived implications for the management of protected areas.

Profile

Protected area

Gesäuse National Park

Mountain range

Alps

Country

Austria

Introduction

Recreational activities in protected mountain areas can contribute significantly to the deterioration of the habitats of fauna and flora and to disturbing local species (Ingold 2005; Liddle 1997; Boyle & Samson 1985). According to Storch (2007), human disturbance is one major threat to grouse within Central Europe, together with habitat degradation, loss and fragmentation, small population size, predation, human exploitation and climate change. Particularly during the winter season, grouse can be severely affected by ski touring, snowshoeing and off-piste skiing. Disturbance effects from recreational winter activities, combined with difficult conditions in winter, predators, habitat deterioration and hunting can have severe consequences for wildlife. (Bundesamt für Naturschutz 2009; Patthey et al. 2008; Thiel et al. 2008; Arlettaz et al. 2007; Storch 2007; Ingold 2005; Menoni & Magnani 1998; Zeitler & Glanzer 1998; Spidso et al. 1997).

Managements of protected areas have to set up regulations and indirect management measures to avoid conflicts between people seeking recreation and nature conservation. However, the implemented management concepts are not always successful. Visitors often perceive these measures as constraints to their habitual outdoor behaviour and oppose these regulations (Hendee et al. 1990). Park management thus needs information about the success of their measures and about the characteristics of visitors who do or do not accept visitor management regulations in order to develop adequate measures.

Managing recreational winter activities

Ski touring in the Alps has increased steadily in recent years. Zeitler (2000) states for example that at regional level almost every mountain range or black grouse habitat of the Bavarian Alps is used for winter sports activities such as ski touring, snow-boarding, downhill skiing or snowshoeing. While ski touring is a traditional winter activity in the Alps, snowshoeing has become more popular only recently (Freuler & Hunziker 2007). Both activities disturb bird populations, particularly rare species like grouse, because they mainly take place off-piste in rather untouched areas (Ingold 2005).

In order to deal with these impacts on habitats and wildlife, visitor management initiatives have been implemented by Alpine associations, protected areas and private land owners (OEAV 2008; OEAV n.d.). Campaigns such as the "Mountain Wilderness" (Mountain Wilderness 2009) and "Naturverträgliche Wintertouren/Nature-compatible Winter Tours" of the Club Arc Alpin (Club Arc Alpin n.d.) inform users about

Tetrao tetrix *Gesäuse National Park.* © *Kerschbaumsteiner*

environment-friendly attitudes and ecologically responsible behaviour. Guidelines have been developed to integrate grouse and tourism in Natura 2000 areas (Suchant & Braunisch 2004).

Awareness of recreational impacts on wildlife and acceptance of management measures

Although impacts of leisure tourism on wildlife can be severe, few recreationists are aware of the disturbances they personally create for wildlife (Sterl et al. 2008; Taylor & Knight 2003; Roggenbuck 1992). Therefore, information and education are very important (Anthony et al. 1995). According to Wöss (1997), only 20% of the backcountry skiers interviewed were aware of the negative effects of their activities on wildlife and vegetation. In a survey by Bertl (1998), about 95% of the backcountry skiers interviewed believed that backcountry skiing was environmentally-friendly, caused only little damage to the vegetation (60%) and hardly ever disturbed wildlife (55%). Only 30% of the interviewees were aware of their own potentially disrupting effects on wildlife.

Visitors of protected areas often perceive ecological and social problems differently from managers (Hendee et al. 1990). While managers usually consider human impacts on vegetation and wildlife as very serious, visitors are more concerned about littering and crowding. Consequently, visitors find management measures targeted at littering easier to comprehend and follow than measures targeted at minimising impacts on wildlife. Zeidenitz et al. (2007) stress the importance of visitors' willingness to behave in an environmentally sound way if it is easily possible. According to Hendee et al. (1990), regulations are often accepted as long as their necessity is explained. Nevertheless, this should not be misinterpreted: acceptance does not automatically mean that visitors like the measures. In this context, Hendee et al. (1990) point out the importance of knowing your visitors well enough to predict their responses to visitor management measures.

Zeidenitz (2005) shows that the acceptance for regulations based on voluntary arrangements between nature conservation and sports or alpine associations are higher than for seasonal use prohibitions, fines, mandatory and prohibition signs. Nevertheless, the respondent's assessments of the latter management measures were still neutral and not negative. It is agreed that multiple measures are the best approach for managing visitors of protected areas (Zeidenitz et al. 2007; Hendee et al. 1990).

Socio-psychological research on human behaviour in the fields of outdoor recreation and natural resource management has identified the important role of attitudes (Roggenbuck 1992). Several studies documented that pro-environmental attitudes could have a positive influence on the willingness to act ecologically (Freuler & Hunziker 2007; Zeidenitz et al. 2007). Zeidenitz et al. (2007) further showed that motivations played a role for attitudes and behavioural intentions. Another factor concerns the acceptance of management measures, which are perceived as constraints to an individual's leisure activities. Researchers have found that the degree of specialization and experience in specific recreation activities as well as the location dependence of specific activities could influence environmental attitudes and the acceptance of management measures (Dyck et al. 2003; Chipman & Helfrich 1988).

Research questions

During the winter season, the Johnsbach valley of the Gesäuse National Park is intensively used by ski tourers. As two of the main ski routes are overlapping good winter habitats for capercaillie (*Tetrao urogallus*) and black grouse (*Tetrao tetrix*), a ski touring concept with coordinated management measures was developed as part of the visitor management concept (Grünschachner-Berger & Pfeifer 2005; Zechner 2007). The ski touring concept was based on summer and winter habitat mapping as well as on an inventory of ski touring routes and the frequency of their use. The habitat quality of the relevant areas was assessed as good in summer and in winter. Hunting of grouse is not allowed in the national park. During the summer, recreational activities rarely take place in the relevant areas.

The concept was worked out in a participatory process involving the national park administration, wildlife ecologists, landowners, alpine associations, local stakeholders and authorities. One part of the ski touring concept was a sectional relocation of the ski routes in order to bypass sensitive grouse habitat. Each year before the start of the winter season, branches along the ski routes are pruned and signposting updated. Additionally, rangers patrol the ski routes on high-frequency winter days in order to track the ski routes after snowfall and inform ski tourers of the recommendations. Two brochures – "Fair play in winter" and "Ski touring in the Gesäuse National Park" – inform visitors about ecologically sound behaviour.

According to the ranger records from 2007/08 and 2008/09, the acceptance of the new ski routes increased. Nevertheless, only 46% of the observed ski tourers used the newly marked route to the Lugauer peak, while 94% used the new route to the Gscheideggkogel. This raised the question how the National Park could increase awareness and acceptance of its management concept. Information was needed about the winter visitors' acceptance and attitudes towards the management concept and about factors influencing this acceptance. A survey was carried out to explore the following research questions:

- How far are the winter visitors aware of the implemented ski touring management measures and what is their attitude towards them?
- Can respondents' attitudes towards the environmental impacts of ski touring, their experience of ski touring, the location dependence, the importance of and motivations for ski touring as well as

socio-demographics explain the attitude towards the concept?

Study area

Situated in the north of Styria, the Gesäuse National Park is the most recently established Austrian national park. It was founded in 2002 and designated by the IUCN as a Cat. II protected area in 2003. Since 2006, 94% of the national park area is part of the Natura 2000 network under the Birds and Habitats Directive of the EU. With an area of about 11 000 hectares, it stretches along the river Enns for about 10 km and includes the following massifs: Buchstein Group, Reichenstein Group and Hochtor Group. The river Enns runs at an altitude of about 600 m, the highest summit of the Gesäuse, the Hochtor, reaches 2369 m. The difference in elevation of approximately 1 800 m results in a high relief ratio with steep and sharp ridges. Nearly 50% of the national park area is forest, 25% rock, 16% dwarf pine scrub and the remainder are alpine meadows, high mountain pastures, water bodies and traffic and recreational infrastructure. In 2007, a visitor management concept for the whole national park (Zechner 2007) was developed, identifying areas of potential conflict and devising targeted measures.

The morphology of the small valley of the Johnsbach at the edge of the national park makes it very attractive for ski touring. It has been well known for alpine ski touring for many years and is intensively used by backcountry skiers. The ski touring management measures focus on two ski routes in the Johnsbach valley: the Gscheideggkogel route and the Lugauer route. The ski route to the Gscheideggkogel is a comparatively easy tour that can be used even in bad weather and at times of avalanche risk. The Lugauer route is one of the most challenging ski routes of the Gesäuse with a high altitude difference of approximately 1 200 m. During the winter seasons of 2007/08, rangers counted 833 ski tourers on 51 observation days. In the 2008/09 season, the numbers were 1 091 ski tourers on 69 observation days.

Methods

A visitor survey was carried out between December 2007 and March 2008 (Arnberger et al. 2009). On weekends and holidays, questionnaires (to be sent back free of charge by return-envelope) were distributed on parked cars at the main car parks along Johnsbach. These car parks are the starting points for the most relevant alpine ski routes of the area. In total, 550 questionnaires were returned, resulting in a response rate of 25.8%.

The questionnaire covered the following topics: socio-demographic data (age, gender, visitor type), visit-related data (e.g. means of arrival, route taken, group size), visitor motivations, experience of ski touring (number of ski touring trips taken, overall and in the Gesäuse, years of ski touring in the Gesäuse), perceived importance of the Gesäuse for ski touring (location dependence), perceived importance of ski touring compared with other activities, attitudes towards environmental consequences of ski touring and its management, acceptance of visitor management measures in general, perceived constraints to individuals' recreation activities arising form measures established by the national park, as well as parameters indicating the quality of recreation, such as satisfaction and perceptions of crowding. As regards knowledge of and attitudes towards the ski touring management concept of the national park, visitors were asked at the beginning whether they had heard of it and if so, whether they considered the ski touring concept useful or useless for nature protection.

Ski tourers in the Gesäuse National Park. © Kren

We used a binary logistic regression (Hosmer & Lemeshow 2000) to analyse the influence of socio-demographics, attitudes etc. on the position of the respondents towards the ski touring concept. The binary dependent variable was the attitude towards the concept; the independent variables were socio-demographics, experience, location dependence, importance of ski touring as leisure activity, motivations, attitudes towards environmental impacts of ski touring and perceived constraints to their recreation activities. We used the statistical programme SPSS to analyse the data and chose a significance level of $p < 0.05$. Additionally, data from the records of rangers were analysed to supplement the information gathered by the questionnaires.

Table 1 – Socio-demographics, experience, location dependence, motivations and attitudes towards ski touring management (n = 550)

Variables	**Levels**	
Age	mean	45.1
Gender	males in %	77.1
Visitor type in %	local (< 10 km distance to Johnsbach valley)	6.5
	day visitor (≤ 50 km distance to Johnsbach) valley)	10.9
	day visitor (> 50 km distance to Johnsbach) valley)	49.8
	overnight guest (< 3 days)	27.3
	overnight guest (≥ 3 days)	5.5
Province in %	Upper Austria	33.3
	Lower Austria	28.2
	Styria	27.1
	Vienna	9.1
Education in %	no school-leaving certificate, primary school	3.5
	apprenticeship	11.3
	others (technical college …)	27.7
	high school diploma	20.0
	university	37.5
Group size	mean	4.5
Satisfaction with Gesäuse for recreational activities	mean, scale: 1 = very good, 5 = bad	1.5
Satisfaction with the ski tour	mean, scale: 1 = very good, 5 = bad	1.4
Experience and location dependence		
Experience of ski touring in the area	first-time visitors in %	6.3
	years visiting Gesäuse (mean; excluding first-time visitors)	14.3
Ski touring experience	average number of ski tours per year in total	20.0
	average number of ski tours per year in the Gesäuse	4.8
"The best ski tours are possible in the Gesäuse"	mean, scale: 1 = totally disagree, 5 = totally agree	3.0
"Ski touring is my most important outdoor activity"	mean, scale: 1 = totally disagree, 5 = totally agree	3.6
Motivations for ski touring	experience nature (Mean, scale: 1 = very important; 5 = unimportant)	1.2
	quiet, recreation, relaxation	1.5
	sporting challenge	1.9
	solitude	2.2
	meeting friends and family	2.2
	stress reduction because of job	2.2
	observing wildlife	3.1
	cheap activity	3.2
Management		
Knowledge of the ski touring concept	yes, in %	40.6
Attitude towards the management concept	useless ski touring management concept in %	32.0
	useful ski touring management concept in %	68.0
Perceived constraints in recreational activities resulting from measures introduced by the national park	mean, scale: 1 = no limitations to 4 = severe limitations	1.78

Results

Sample characteristics, activities and motivations

About 77% of the respondents were male; the average age was 45 years (Table 1). Respondents appeared mainly in groups of two, the mean group size was 4.5. The winter visitors were mainly day visitors, about 33% characterized themselves as overnight visitors; 6% were first-time visitors. About 14% of respondents spent some time in local accommodation during their Gesäuse ski tour. Most of them were from Upper and Lower Austria and Styria; only 7% were locals. About 38% had a university degree. On average, respondents have been visiting the Gesäuse for ski touring for 14 years.

On average, the ski tourers went on 20 ski tours per winter and 4.8 of these tours were made in the Gesäuse. Consequently, every fourth ski tour of the interviewees took place in the Gesäuse. About 20% of the respondents believed that the Gesäuse provided the best ski touring possibilities and for about 53% ski touring was their most important outdoor activity. The top three visiting motivations were "nature experience", "quiet, relaxing, recreation" and "sport". The visitors were (very) satisfied (95% of the interviewees) with the Gesäuse in general as well as with their tour on the day of the survey.

Attitudes towards environmental impacts of ski touring and its management

The majority of respondents agreed to the statement that they enjoyed seeing wildlife during ski touring and would accept limitations on access in habitats of rare or endangered species while ski touring (Table 2). Most of them believed that ski touring had no negative ef-

Table 2 – Attitudes towards environmental impacts of ski touring (1 = totally disagree, 5 = totally agree) and results of factor analysis using varimax rotation for the extraction of orthogonal factors (Bartlett's test of sphericity: $p < 0.001$; KMO = 0.82; items were assigned to dimensions on the basis of a factor loading ≥ 0.40)

		Attitudes						
Items	**Mean**	**1**	**2**	**3**	**4**	**5**	**Factor 1**	**Factor 2**
I enjoy seeing wildlife or tracks of wildlife during ski touring.	4.11	5.7	2.4	13.5	42.8	35.6		0.636
In habitats of rare or endangered species limitations to ski touring are acceptable.	4.04	5.8	2.4	17.5	40.8	33.5		0.626
Ski touring has no negative impact on nature and wildlife as long as ski tourers do not turn up in crowds.	3.92	7.5	1.3	16.8	27.4	47.0	0.737	
Damages to nature caused by ski tourers are marginal and play no role.	3.72	8.7	0.7	31.2	22.8	36.5	0.706	
Ski touring has no negative impacts on the environment.	3.57	9.6	1.5	37.7	17.9	33.3	0.694	
Ski touring should be possible without any limitations.	3.54	13.6	4.4	29.0	23.7	29.2	0.605	
Wildlife is used to ski tourers and hardly reacts to that disturbance.	3.21	18.3	3.0	40.3	7.3	31.2	0.642	
Ski tourers might disturb wildlife.	3.18	21.7	2.4	39.5	8.6	27.7		0.668
Ski tourers might damage vegetation.	2.96	28.4	3.2	41.7	3.8	22.9		0.650
Nature conservation necessitates temporal or spatial limitations of ski touring.	2.67	29.9	15.2	33.1	5.5	16.3		0.675
Eigenvalue							2.63	2.49
Variance explained							26.3%	24.9%
Cronbach's α							0.772	0.723

fects on nature and wildlife as long as ski tourers did not turn up in crowds and that ski touring caused only marginal damage to nature and had no negative impacts on the environment. The majority agreed to the statement that ski touring should be possible without any limitations. Respondents agreed in approximately equal measure to the statements "Wildlife is used to ski tourers" and "Ski tourers might disturb wildlife and damage vegetation". The statement "Temporal or spatial limitations of ski touring are necessary for nature conservation" received the least agreement.

A factor analysis was applied to determine the underlying dimensions of the respondents' attitudes towards environmental impacts of ski touring. It resulted in two factors explaining about 50% of the total variance (Table 2). The reliability analysis resulted in acceptable values for the factors (Cronbach's alpha > 0.700). Factor 1 included items which indicated that ski touring had more or less no impacts on natural environment, while Factor 2 contained items which described a negative impact of ski touring on the natural environment and the need for ski touring management.

Acceptance of the management concept and influence factors

About 40% of the ski tourers were aware of the ski touring concept and nearly 70% of them classified it as a useful strategy (Table 1). Only 11% perceived any restrictions on their recreational options as a result of measures established by the national park; as much as 36% experienced no constraints at all.

The regression analysis identified eight variables influencing the acceptance of the concept (Table 3). The model explained more than 50% of variance, indi-

Table 3 – Results of the binary logistic regression using backwards Wald regression (dependent variable: 1 = useful ski touring concept; 2 = useless ski touring concept); the Wald-statistic [(coefficient value/s.e.)²] tests whether a variable is significantly different from zero

Variables	**Regression coefficient**	**Standard error (s.e.)**	**Wald-statistic**	**p-level**
Attitudes towards environmental impacts of ski touring (Factor 1)	1.016	0.248	16.730	0.000
Attitudes towards environmental impacts of ski touring (Factor 2)	−1.099	0.248	19.633	0.000
Perceived constraints of recreational activities resulting from measures introduced by the national park	1.259	0.305	17.056	0.000
"The best ski tours are possible in the Gesäuse"	−0.776	0.282	7.548	0.006
Years visiting the Gesäuse for ski touring	0.040	0.015	6.694	0.010
Ski touring motive 'observing wildlife'	0.570	0.194	8.651	0.003
Ski touring motive 'sport'	0.525	0.226	5.383	0.020
Ski touring motive 'solitude'	−0.439	0.217	4.102	0.043
Constant	−3.973	1.517	6.854	0.009
Nagelkerkes R^2 =	0.504			
Correctly predicted cases	81.2%			
Hosmer-Lemeshow-Test	p = 0.172			
N	218			

cated by the Nagelkerkes-R^2 which is similar to the R^2 in a multiple linear regression. The Hosmer-Lemeshow goodness-of-fit statistic indicates a useful model ($p > 0.05$) which correctly predicted 81 % of cases.
The variables included both factors of attitudes towards environmental impacts of ski touring, three visitation motives (solitude, sport, wildlife observation), perceived constraints to their recreation activities due to the regulations established by the national park, experience with ski touring (years of ski touring in the Gesäuse), and location dependence (perceived importance of the Gesäuse for ski touring). Socio-demographic data (age, group size, gender, visitor type), two experience-related variables (frequency of ski tours in total and in the Gesäuse), the importance of ski touring compared with other outdoor activities and five motivations were not significant.
The more respondents saw environmental impacts of ski touring, the more they perceived the ski touring concept as being useful for nature protection, while respondents who believed that ski touring had fewer impacts on fauna and flora classified the concept as less useful. Respondents who perceived constraints to their recreation activities resulting from measures established by the national park showed a negative attitude towards the management concept. Respondents who had been ski touring in the Gesäuse for many years and those who thought that the Gesäuse provided the best ski touring options judged the concept as not useful. A higher importance of the motives of 'sport' and 'observing wildlife', together with a lower importance of 'solitude' for the visitor, correlates with a higher probability of a negative attitude towards the concept.

Discussion and management implications

In our study we investigated factors influencing the attitude towards the ski touring management measures implemented by the Gesäuse National Park for two heavily used ski tours of the Johnsbach valley, which had partly overlapped with two important winter habitats of capercaillie and black grouse. This information is needed by the national park management to evaluate the success and acceptance of its management measures. Information about the characteristics of visitors who do or do not accept the visitor management regulations is useful for the ongoing development of objectives and adequate measures.
Most of the respondents were long-standing regular day visitors to the Johnsbach valley for ski touring. For many of them the Gesäuse was their most important area for ski touring and many of their total ski tours took place in that area. The survey revealed that the majority of respondents were not aware of the ski touring management concept and that two thirds of those who knew about it saw it as a useful concept. The regression analysis identified eight variables explaining the attitude towards the concept. Attitudes towards environmental impacts of ski touring, ski touring motives, location dependence and experience influenced the attitude towards the concept, while socio-demographics did not explain the attitude.
The results showed that visitors who had used the area for a long time and perceived it as very important for ski touring disapproved of the concept. For these visitors, the area was a familiar ski touring area with hardly any alternatives. Consequently, they depended on it and any regulations imposed by the national park were seen as an impact on their own ski touring backyard.
The interviewed ski tourers diverged considerably in their answer patterns on the impacts of ski touring on wildlife. Up to one third of them attributed no negative impacts on wildlife in general to ski touring and half of them perceived individual ski tourers as harmless as long as they did not turn up in groups. This finding agrees with that of Hendee et al. (1990) who concluded that visitors to protected areas rank social impacts much higher than ecological ones. Overall, about one-third sees hardly any negative impacts on wildlife, even though ski touring impacts on grouse can be severe (Arlettaz et al. 2007; Storch 2007; Ingold 2005; Zeiler & Glanzer 1998). Similarly, Sterl et al. (2008) worked out that visitors with problematic behaviour were unaware of their impacts and that only about 20–30 % of backcountry skiers were aware of the negative effects of their activities on wildlife and vegetation (Bertl 1998; Wöss 1997). Visitors who were less aware of the disturbances they can create for wildlife and environment were less in favour of the concept.
Seeking a sporting challenge leads to a negative attitude towards the concept. This study confirms that people who are outdoors for sporting motives are less interested in nature and may disagree with visitor management measures to protect nature. At first glance, the negative influence of the motive 'wildlife observation' on the attitude towards the concept was surprising. It is true that the new routes will probably result in fewer wildlife contacts because they have been shifted away from the grouse habitats. In the long run, however, the chance of seeing wildlife might rise because of better habitats and increased grouse populations. A higher importance of the motive 'solitude' for visitors correlated with a higher probability of a positive attitude towards the concept. Moreover, this motive also correlates with ski touring in smaller groups and the perception of the area as overcrowded as well as a higher importance of the motives 'experiencing nature, quiet and wildlife observation'. Maybe these people expect visitor management to improve the quality of their recreational experience (less crowded and more nature experience).
From the results of the visitor survey and the experiences of the rangers we could derive the following management implications: only 40 % of the ski tourers know the ski touring concept. Wasem and Mönnecke (2006) point towards the importance of informing us-

ers about visitor management as early and as detailed as possible using so-called information gates such as sport shops or touring books. The management of the national park should integrate these details better in ski touring guide books and on websites. Additionally, more information about the importance of visitor management should be disseminated in ski touring courses such as those offered by alpine associations.

Attitudes towards environmental impacts of ski touring have shown to influence the attitude towards the ski touring regulations. Information campaigns about these impacts seem to be effective in influencing ski tourers' attitudes. This implies an important role for national organisations such as the association of "National Parks Austria" and alpine associations in communicating the effects of ski touring on wildlife. Such organisations also have their own media, such as journals and websites, and can have access to high-impact media such as television.

Results from the survey show that long-standing regular visitors tend to disapprove of the visitor management. The Alps are a traditional ski touring location and many protected areas face the challenge of traditional recreational uses such as ski touring. The management of protected areas like the Gesäuse National Park might increase their efforts to communicate with long-standing regular ski tourers. Local awareness campaigns could range from positive feedback about visitor behaviour given in the protected areas' journals and in local newspapers to "thank you" notes on parked cars (Freuler & Hunziker 2007). The focus of public relation contents should be on the nature experience and less on the sporting challenge of ski touring.

For the Gesäuse National Park, it seems necessary to conduct a chaired round table with the group of sceptics about the ski touring concept. About 70 % of those respondents who know about the management concept see it as a positive strategy. The above mentioned positive feedback in newspapers would be an additional motivation for those already convinced of the importance of the concept.

Continuous appropriate measures seem necessary to avert a decrease of the existing acceptance of the measures (Freuler & Hunziker 2007). The presence of rangers is important and should be continued. Swearingen & Johnson (1995) showed that the presence of uniformed park employees was an effective deterrent to off-trail hiking; 97 % of the visitors interviewed did not respond negatively to the presence of uniformed staff, in fact, they reported an improved quality of their visit. Other management measures, such as continuous improvement of signposting and information, will be necessary in the long term, with the information being put as simply and concisely as possible (Zeidenitz et al. 2007).

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