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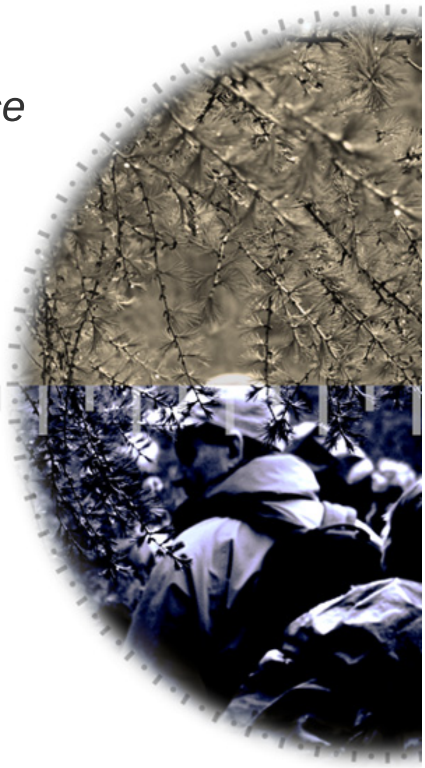
Policies, Methods and Tools for Visitor Management

Proceedings

of the Second International Conference on Monitoring and Management of Visitor Flows in Recreational and Protected areas



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Abstract
The second International Conference on Monitoring and Management of Visitor Flows in recreational and protected areas (MMV 2) -conference provided a forum for research presentations and for exchange of information and experience of managerial policies, problems, practices and solutions regarding issues related to monitoring and management of visitor flows in recreational and protected areas. These proceedings cover ten research topics, which were chosen to reflect current on-going research work internationally in the field of visitor monitoring and management. Monitoring visitor flows and also other types of recreational inventories are discussed in 16 articles and four posters on visitor monitoring methods, experiences of national, regional and on-site visitor inventories and visitor flow modeling and data management. Nineteen papers and three posters are discussing visitor management research from several perspectives. Articles related to issues of visitor conflicts, implementation of visitor information in management processes, different aspects of sustainability and carrying capacity issues in recreational settings make the largest group of papers. The third major subject group of articles (16) deal with visitor management policy issues, and nature tourism policies in recreational and protected areas. The last topics include economic and social impacts of recreation and nature tourism in the surroundings communities, regions and countries.

Keywords
visitor monitoring, visitor management, visitor survey, visitor counting, visitor conflicts, recreational impacts, nature tourism

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Preface

Tuija Sievänen and Seija Tuulentie

The Second Conference on Monitoring Visitor Flows in Recreational and Protected Areas (MMV) is taking place in Rovaniemi, in Finnish Lapland. The first MMV -conference was organized by Bodenkultur University Vienna in 2002. The location of the second MMV conference is very different from Vienna, Austria, the venue of the first MMV conference. Austria is a country with a well-developed tourist industry, including use of protected areas relating to nature-based tourism. Lapland in Finland represents a region in Europe where nature-based tourism has become the most important source of income only recently, and where the vast wilderness areas, the 'last in Europe', are the attraction for tourism. Nevertheless, in both places, a major management challenge faced by recreational and protected areas is how to successfully manage visitors. This is a necessary condition in order to maintain sustainable development of the natural areas in recreational use. Sustainability concerns the ecological state of the natural areas as well as the social and economic sustainability of life in local communities. The aim of the MMV conference is to exchange information and ideas among those researchers, administrators, and park managers and practitioners who are responsible for the sustainable recreational use of natural resources, particularly in protected areas.

The conference provides a forum where all those working with visitor management can share their experiences and know-how on the information base for monitoring and management of visitor flows in recreational and protected areas. The conference program includes presentations of research and development projects, which will hopefully lead to constructive discussions on managerial policies, problems, practices and solutions regarding issues related to the monitoring and management of visitor flows.

The ten conference topics were chosen to reflect current on-going research work that has aroused international interest and is also a focus of activity. All the topics have attracted great interest among the international community of recreation researchers and practitioners. The conference program covers all these topics. Some of them are more popular than the others, but interestingly, the presentations and articles presented in these proceedings are very representative of each topic group. Monitoring visitor flows and also other types of recreational inventories are discussed in the sessions on Visitor Monitoring Methods, Experiences of National, Regional and On-site Visitor Inventories and Visitor Flow Modeling and Data Management. There are altogether 16 papers on these subjects. Papers discussing visitor management research from several perspectives, such as issues of visitor conflicts, implementation of visitor information in management processes, different aspects of sustainability and carrying capacity issues in recreational settings are the largest group of papers. The third major subject group deals with visitor management policy issues, nature tourism policies in recreational and protected areas, and finally economic and social impacts of recreation and nature tourism in the surrounding communities, regions and countries.

We hope that the conference will fulfill all the expectations that the participants have for attending this conference. We also hope that these proceedings will be a useful document in recording the status of research on monitoring and management of visitor flows in recreational and protected areas in our international community of researchers and practitioners working in the field of nature based recreation and tourism.

Opening address

Director General

Dr. Hannu Raitio

Finnish Forest Research Institute

The Finnish Forest Research Institute along with our partners the Arctic Centre, University of Lapland, Metsähallitus and Rovaniemi Polytechnic, is happy and proud to host the Second Conference on Monitoring and Management of Visitor Flows during this week, here in Rovaniemi. This conference has brought people from 22 different countries and from four continents to Lapland. We hope that the conference will serve as a good example of international networking and cooperation among the scientists and practitioners involved in recreational and protected area management, in order to improve understanding and appreciation of these issues all over the world.

This conference is the first international scientific conference on nature-based recreation and tourism organized in Lapland and in Finland. The topic is an interesting one from the Forest Research Institute’s point of view of. We have a long tradition of inventorying forest resources in Finland, , and we are acknowledged as one of the top agencies in terms of methods and skills for producing good data on timber resources. But, the ability to inventory recreational use of the forests is a new challenge for our country. The Forest Research Institute has worked on visitor monitoring methods together with Metsähallitus, the Finnish Forest and Park Service, in order to develop these methods. We hope also to develop leading methods and skills for studying how people use the forests for recreation. We are happy to share our experiences with the scientific and professional community of recreation researchers and practitioners. Even more, we hope that this conference will provide good opportunities for us and for all participants to learn from each other and to bring new ideas, fresh approaches and deeper perspectives to the work done in their own countries.

I sincerely hope that this conference will serve as a creative forum between researchers and practitioners who are responsible for serving the general public in providing the best available recreation services and opportunities to experience the best of natural environment, forests and waters, for the benefit of society, families and individuals.

Nature-based tourism and recreation is an essential part of people's lives here in Lapland, since we have excellent opportunities for outdoor recreation activities in the many national parks and wilderness areas. The first professorship of nature-based tourism in all Finland, is also based here in the Rovaniemi Research Station and University of Lapland. Thus, thinking both academically and professionally, this is a perfect place to hold a conference on recreation research and management practices. I wish you all an enjoyable stay in Rovaniemi. I hope that you will benefit to the full from the conference discussions and that you will take pleasant experiences of Lapland and Finland back home with you.

Contents

Monitoring and Management of Recreation in Protected Areas: the Contributions and Limitations of Science

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Abstract: Scientists assist protected area managers by developing information and knowledge that can be used to better monitor and manage recreation use and its impacts. Most recreation management decisions have both a descriptive and an evaluative component. There is widespread consensus that science is well suited to discovering, synthesizing and applying descriptive information. This paper provides an overview of some of the most significant contributions of science to visitor monitoring and management. It covers the related scientific purposes of explanation, causation, prediction and assessment. As scientific enquiry moves from description to evaluation, from facts to values, from providing statements of "what is" to providing statements of "what ought to be", it ventures into more contested territory. While some advocate a substantial role for science in the establishment of normative standards about what ought to be, others believe science should be very cautious in this arena. Recreation examples, largely drawn from wilderness management in the United States, are provided.

Introduction

For close to a century, park and protected area administrators have struggled to monitor and appropriately manage recreation use. One challenge to effective management has been a chronic lack of staff, funding and resources. Politicians either do not understand that designation of a protected area does not result, in and of itself, in protection or they do not care enough to allocate sufficient resources to ensure that protection occurs. In my agency for example, the United States' Forest Service, less than 1% of the agency's funds are spent on wilderness management, despite the fact that 18% of Forest Service lands have been designated as wilderness. Less than 0.5% of Forest Service research funds are spent on wilderness management science.

A second barrier to effective monitoring and management is insufficient information and knowledge. Scientists have joined with protected area managers to confront this barrier. Depending on one's point of view, progress in this arena can be considered substantial or disappointing. Much has been learned over the decades but some of the most fundamental issues seem even more intractable than they did 30 or 40 years ago. It is my contention that much of the disappointment with progress derives from unrealistic expectations regarding the abilities of science. In this paper I review some of the most substantial contributions of science to improved monitoring and management of recreation use. I also comment on the limitations of science and the dangers of privileging scientific knowledge and the worldview of scientists to the detriment of other valid sources of knowledge and other legitimate stakeholders. I will attempt to draw equally from work in the social and the biophysical sciences. Many of my specific examples involve research related to visitor management in wilderness areas in the United States because that is the situation I am most familiar with. However, conclusions should be generally applicable across a broad array of recreation and protected areas.

Science and Recreation Management

Much has been written about science and the often contentious debate about the appropriate role for science in land and natural resource management. Ultimately science is a process for building understanding (Dietz and Stern 1998), particularly from knowledge gained through empiricism, rationality and logic, quantification, reductionism and specialization (Hall 2004). There is widespread consensus that science is a powerful tool for description.

Descriptive Science

The scientific method is an effective means of describing phenomena such that their most salient qualities are better understood. Scientists can also develop knowledge about phenomena that occur at spatial and/or temporal scales outside human sensory and perceptual capabilities (Hall 2004). Such descriptive information is critical to recreation managers, serving purposes ranging from identifying threats, adverse impacts and benefits, situations that might be considered problems and the most critical variables that should be monitored.

For example, substantial research has been conducted on the biophysical impacts of trampling. Initial descriptive research documented readily observable impacts – loss of vegetation cover, removal of soil organic horizons and compaction of mineral soil (e.g. Bayfield 1973, Liddle 1975) (Figure 1). Subsequent research has improved our understanding of less readily observable impacts, such as reductions in the functional diversity of microbial populations (Zabinski and Gannon 1997). Recently, critical interactions between vegetation and soil have been explored. For example, Alessa and Earnhart (2000) report that plants in compacted soils may be less able to utilize available nutrients because they grow fewer lateral roots and root hairs and because cytoplasmic streaming within root hairs is reduced.

As Figure 1 suggests, models of trampling effects contain many reinforcing (positive) feedback mechanisms. The insights that can be derived from this fundamental descriptive understanding of how this system operates are critically important to effective management. Due to the reinforcing feedback loops, recreation impacts can be long-lasting even where recreational disturbance has been eliminated. Consequently, restoration of disturbed recreation sites often requires implementing interventions that are capable of severing critical positive feedback loops.

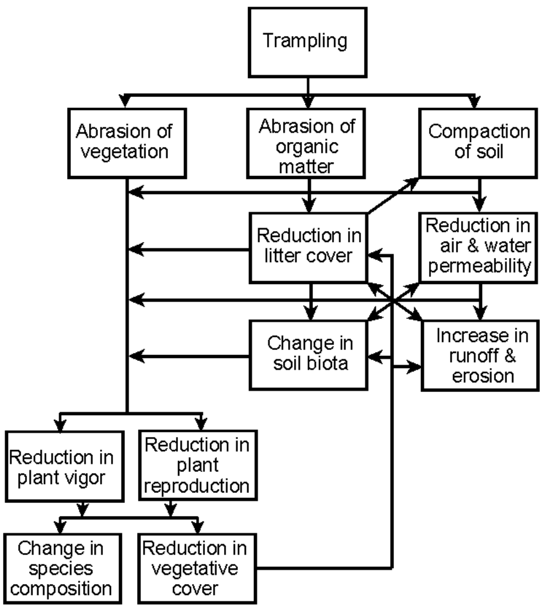

Figure 1. A conceptual model of the primary biophysical impacts caused by trampling (adapted from Liddle 1975).

Similarly, substantial fundamental descriptive information about recreation visitors has been developed. Initial research was focused on developing methods for counting recreationists and observing their activities and behaviours. Subsequent research delved into understanding phenomena that are less observable, such as visitors' motivations, attitudes, preferences and evaluations, as well as the linkages between these phenomena (Manning 1999). Special attention has been devoted to understanding the effect of amount of use on the quality of visitors' experiences. This system can be modelled in detail (Figure 2), providing managers with considerable insight. As use levels increase, perceived crowding increases and visitor experiences are adversely affected; however, the magnitude of adverse effect is often surprisingly small (Stewart and Cole 2001). Put simply, experiencing substantial crowding seldom makes a good trip bad.

Recently, visitor research has begun to move beyond relying solely on evaluations of what visitors experience (or of experience quality or satisfaction) as the metric of management success. Greater emphasis is being placed on understanding the effects of setting attributes, particularly those managers can control, on what visitors actually experience (e.g. Borrie and Roggenbuck 2001). A greater reliance on qualitative methods (e.g. Arnould and Price 1993) is one characteristic of this research thrust.

Relationships, Explanation and Causation

The model in Figure 2 describes functional relationships between different variables. Perceived crowding is a function of contacts and a number of variables that affect the influence of a given number of contacts on perceptions of crowding. Number of contacts, in turn, are a function of amount of use and

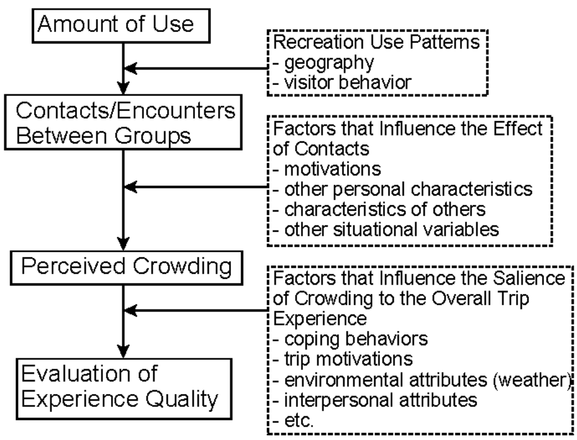

Figure 2. A conceptual model of the effects of amount of use on crowding and visitors' evaluations of experience quality (adapted in part from Manning 1999).

variables that influence the relationship between amount of use and number of contacts. Description of the functional relationships between attributes that managers can control and the outcomes that managers seek is among the most important contributions of science.

To manage visitor use such that biophysical impacts are minimized, managers must attempt to minimize both the area of impact and the intensity of impact per unit area. The primary factors that influence intensity of impact (Figure 3) are (1) frequency of use, (2) type and behaviour of use, (3) season of use, and (4) environmental conditions. The area of impact is primarily a result of the spatial distribution of use.

Given the interest in estimating an area's carrying capacity, considerable attention has been focused on the relationship between frequency or amount of use and the intensity of resultant impacts. Numerous studies, using varied methodologies, conducted in varied ecosystems and on varied types of recreation sites, and measuring different response variables, have all come to the same general conclusion. Across the most relevant range of use frequencies, this relationship is curvilinear and asymptotic (Figure 4). Relatively infrequent and small amounts of use can cause substantial impacts. At low use frequencies, small differences in use frequency can result in substantial differences in amount of impact. At high use frequencies, even large differences in use frequency typically result in minor differences in impact (Hammitt and Cole 1998). At extremely low use frequencies there may be another inflection point in the curve, suggesting that the relationship is best approximated with a logistic function (Cole and Monz 2004a). But it is generally not practical to manage for such low frequencies of use.

Cole and Monz (2004b) found, for a forest with low shrub groundcover, that vegetation cover was almost entirely eliminated by just 4 nights per year of camping on previously undisturbed sites. Use frequency could be increased many fold with relatively little further increase in impact. The same situation pertains to hiking impacts. In this same forest, 75 hikers per year eliminated all but about 20% of the vegetation, while 500 hikers per year eliminated virtually all the vegetation (Cole and Monz 2002). The importance of environmental conditions as a significant determinant of impact intensity is also apparent in these studies. In an alpine turf ecosystem, dominated by grasses and just 2 km from the forest, 1000 hikers per year caused about one-third of the vegetation impact caused by 75 hikers in the forest (Cole and Monz 2002). In this more resistant vegetation type, the relationship between frequency of use and intensity of impact is still asymptotic, as it is in the forest. However, the effect of a given use frequency is less profound.

Similar research illustrates how variation in type of recreation use and visitor behaviour influences intensity of impact. For example, the impacts of horses on trails have been found to be much more substantial than the impacts of similar use frequencies by hikers, llamas or bicycles (Wilson and Seney 1994, DeLuca et al. 1998). The relationship between visitor behaviour and impact intensity is more anecdotally documented. Many impacts of concern are entirely the result of either vandalistic or unnecessarily destructive behaviours. The relationship between time of use and impact is particularly apparent for impacts on wildlife populations. There are numerous reports of impacts on wildlife being particularly severe at certain times, such as during nesting, birthing or feeding times (Knight and Gutzwiller 1995).

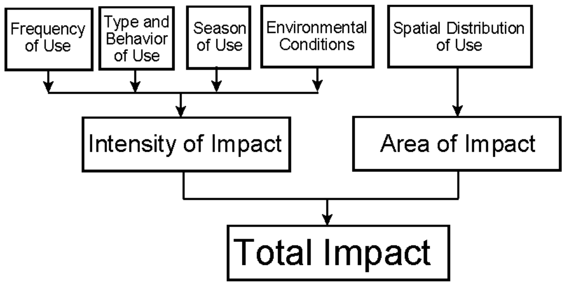

Figure 3. A conceptual model of the primary factors that influence the magnitude of biophysical impact from recreation use.

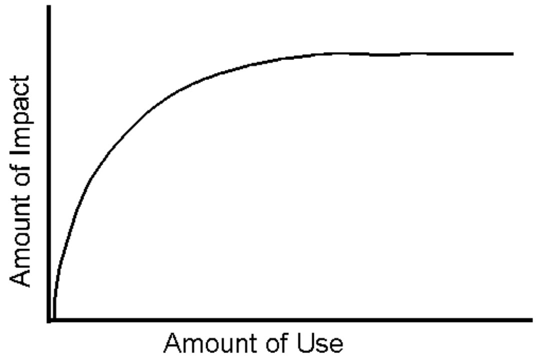

Figure 4. The relationship between frequency of use and intensity of impact is asymptotic.

The models in Figures 2 and 3, and associated research describing relationships between variables that managers can control (e.g. amount of use) and the outcomes that managers desire (appropriate or quality experiences, acceptable levels of impact), are critically important to recreation management. They illustrate the complexity of the management situation. For example, the numerous intervening factors between amount/frequency of use and desired outcome, in Figures 2 and 3, illustrate why the simple notion of establishing a carrying capacity (use limit) is both difficult and, by itself, of limited utility.

More fundamentally, this knowledge is at the core of selecting the management strategies and actions that are most likely to be effective. The model complexity also suggests that a successful management program will likely have to manipulate many variables – amount, type, season and location of use, as well as the expectations, behaviours, knowledge and attitudes of visitors. Knowledge about the nature of the relationship between frequency of use and intensity of impact has caused management to emphasize concentration of use more than dispersal of use (e.g. Marion and Farrell 2002). It provides the foundation for recommendations about appropriate low-impact recreational practices. Two of the fundamental principles of low-impact behaviour are to concentrate use and impact in popular places and to spread out and disperse use in infrequently used places (Hampton and Cole 2003).

Science is often capable of moving beyond simply describing relationships between variables to providing explanations for observed phenomena or to establishing cause-and effect relationships. Figures 2 and 3 are attempts to explain why evaluations of trip quality and levels of biophysical impact vary. They also imply causality; they utilize unidirectional arrows. The intent is to suggest that if managers manipulate the causal variables, the effects should change in predictable and desirable ways.

In many cases, however, our understanding of these relationships comes largely from correlational studies. Correlational studies are often a good first step at identifying probable causal relationships. Ideally they generate hypotheses regarding causality and then these hypotheses can be experimentally tested under controlled situations. For example, the initial insights regarding the use-impact relationship on campsites came from correlational studies. Impact levels on low-, moderate, and high-use sites were compared (e.g. Frissell and Duncan 1965). However, it is possible that observed differences in impact were the result of uncontrolled variables – how long these sites had been used or environmental differences – rather than the variable presumed to be causal. Multiple correlational studies, conducted under varying circumstances but arriving at the same conclusion, decreased the likelihood that reported relationships were spurious rather than causal. However, this possibility was most conclusively eliminated when differing levels of use were applied to experimental campsites (Cole and Monz 2004a,b).

Reliance on correlational studies and resultant uncertainty about causality is particularly problematic in recreational visitor research. The prevalence of experimentation in the parent discipline of psychology suggests that this limitation could be overcome. However, many important relationships are fundamentally difficult to study experimentally.

Even the ability to explain relationships can be problematic with some of the research designs that are most common in recreation visitor research. For example, numerous studies have used cross-sectional designs to understand the relationships between amount of use, crowding and assessments of trip quality (often operationalized as trip satisfaction). Metrics for these three variables are compared among different individuals in a population of visitors. Typically, reported relationships are weak; correlations are very low (Manning 1999). It is well established, however, that differences between individuals (in experience, motivations and the salience of crowding) have a huge influence on relationships between these variables. In these cross-sectional designs, this between-subjects variance is noise that obscures any relationship that might exist between the variables of interest. Stewart and Cole (2001) used a within-subjects research design to examine these relationships. Multiple assessments of each visitor made it possible to examine relationships within rather than between visitors. From this analysis a highly consistent and predictable relationship emerged. Encounters and crowding consistently caused small decreases in visitor evaluations of trip quality.

Progress in increasing explanatory insights can also be increased by designing tests capable of differentiating among competing explanations for observed phenomena or relationships. Hall (2004) provides an example regarding interest in the relationship between crowding and satisfaction and the unexpected finding that visitors in crowded wilderness are often satisfied with their experience. One explanation for this finding is that visitors who expect and desire an uncrowded experience have been displaced elsewhere, leaving only those who are likely to be satisfied even if conditions are crowded. An equally plausible explanation is that experiencing crowded conditions is simply not that bad, given all the other benefits and positive experiences that accrue during the visit. Research designed *a priori* to compare these alternative explanations could be much more successful than the more common approach – attempting in the analysis phase to tease apart a multitude of largely uncontrolled variables.

Prediction

The ability of good science to predict the likely consequences of alternative scenarios is another way that science can contribute to management. Much of the motivation for conducting trampling experiments (e.g. Cole and Monz 2002, 2004a,b) was to predict the levels of off-trail trampling and informal camping which different plant communities could sustain before they were substantially impacted. In places where predicted use exceeds these thresholds, managers should consider constructing trails rather than permitting off-trail travel and confining camping to established campsites rather than allowing visitors to camp wherever they want.

Similarly, managers would like to be able to predict how the actions they take and do not take will affect the number, type, distribution, behaviours and experiences of visitors. Unfortunately, the precision of predictions is limited by the multitude of variables that must be accounted for, substantial interaction among variables and how difficult it is to operationalize many of these variables. Heavy reliance on visitor self-reports is particularly problematic, since there is substantial evidence that such reports have low reliability (Cole and Daniels 2004).

For example, there has been considerable interest in identifying attributes that have a profound influence on the quality of experiences. Such attributes are strong candidates as indicator variables that could be monitored to ensure that quality experiences are protected. The most common approach to identifying such variables, however, is to simply ask visitors how much they think an attribute would influence their experience. In one such study, conducted in four wilderness areas in the United States, the second most influential attribute on peoples' experience (out of 19) was the number of trees around a campsite damaged by people (Roggenbuck et al. 1993). The difficulty comes in reconciling this finding with the findings of other studies that few visitors notice even substantial tree damage at campsites (Knudsen and Curry 1981) and that extent of tree damage has little relationship to either visitor evaluations of site conditions (Farrell et al. 2001) or their campsite choices (White et al. 2001). Do we believe what people say or what they do? Should we conclude that tree damage has a substantial effect on experience quality because people tell us, hypothetically, that it would? Or should we conclude that their behaviour indicates that tree damage has little influence on experience quality? Perhaps it is the "idea" of tree damage that is bothersome, not the reality of it? Should managers give higher priority to things visitors dislike in concept (like tree damage perhaps) or things visitors clearly respond adversely to behaviourally? Or more to the point of this portion of the paper, how should we predict that visitors would behave in response to management programs that result in higher or lower levels of tree damage? It is hard to know with much certainty.

Certain types of information about visitors is much more amenable to prediction, however. For example, Ploner and Brandenburg (2004) show how linear regression models and regression trees can be used to predict visitation from information on day of the week and the weather. Computer simulation models of visitor use and flow provide more powerful and flexible tools that increase the predictive capacity of visitor management (e.g. Itami et al. 2004). The predictive ability of simulation models helps managers monitor and manage more efficiently and effectively. They are capable of predicting what is going on in specific places and at specific times in the interior of a large park, using simple counts of visitors entering the area. Many protected areas attempt to monitor and control the number of encounters that occur between different groups of visitors. Although hard to monitor directly, predicted encounter levels are one of the standard outputs of simulation models.

Models can also predict the maximum use levels that can be sustained without violating an established standard. For example, at Delicate Arch, a visitor attraction in Arches National Park, Utah, a standard has been established limiting persons-at-one-time to 30. This standard is to be exceeded no more than 10 percent of the time. Lawson et al. (2002) used a simulation model to predict the maximum number of people who could hike to Delicate Arch per day without exceeding the standard (315 hikers between 5:00 a.m. and 4:00 p.m. They were also able to extend their model to predict that the standard for Delicate Arch was likely to be violated if more than 750 vehicles per day entered Arches National Park. Clearly, monitoring the number of cars entering the park (information that is already collected) is much more efficient than monitoring people at one time at Delicate Arch (entailing a hike of several km). Moreover, the model makes it possible to estimate the maximum use level that can be accommodated without having to go through a period of trial and error. Some monitoring will be necessary to calibrate and validate model predictions.

Paradise Meadows in Mount Rainier National Park, Washington, are fragile subalpine meadows that are among the primary frontcountry attractions for day hikers at the park. They are accessed by a complex web of paved and gravel trails. Visitors are required to remain on trails to avoid vegetation damage. In developing a public transportation system for the park, planners must make decisions about how frequently buses of varied capacity should arrive at the meadows with hikers. One approach to decision-making that is being considered is to link predictive biological models and visitor flow models. Experimental trampling research (conducted in vegetation similar to much of Paradise Meadows) indicates that just 25 people per year would disturb vegetation sufficiently to create noticeable bare ground (Cole and Bayfield 1993). Trampling resulting from high use levels primarily occurs at bottlenecks in the meadow trail system, such as stairways on steep trail sections. Research in walkway design suggests that people will be jostled off the trail when the density at such places is so high that there is less than about 40 ft^2 of walkway per hiker. A travel simulation model for the network of trails at Paradise Meadows is currently being developed. It will be able to predict use levels at the varied entry points to the trail system that should not be exceeded to ensure that the density standard is not violated. The public transportation system can then be designed to deliver a number of visitors that will not exceed these maximum use levels.

Monitoring and Assessment

As noted before, fundamental descriptive studies of visitors and their impacts provide the foundation for decisions about the most important variables to monitor. In addition, the methods developed by scientists conducting these descriptive studies provide reliable protocols for much recreation monitoring. Using their analytical and research design skills, scientists can adapt these protocols to maximize efficiency. For example, varied techniques are available for collecting different types of information on visitors and their recreational visits (Watson et al. 2000). New innovations are constantly being developed that improve and complement existing technologies (Cessford and Muhar 2004). Work on sampling designs is increasing efficiencies as well as contributing to better interpretation of results, particularly in regards to characterizing precision at various spatial scales (English et al. 2004).

For biophysical impacts, efficient and effective protocols have been developed for campsites and trails, where concern is primarily with impacts to vegetation, soil or the recreational facility itself (Cole 1989, Marion and Leung 2001). The ability to monitor impacts on mobile phenomena such as wildlife is much more problematic because it is seldom possible to isolate the effects of recreation use.

The systematic nature of scientific enquiry also makes it a powerful tool for assessing the effectiveness of established management programs. Once desired outcomes are clearly stated, good science can efficiently and effectively describe the extent to which these outcomes have been achieved.

Science and Normative Evaluation

Land management decisions, including decisions about appropriate visitor management and carrying capacity, have both a descriptive and an evaluative component (Shelby and Heberlein 1986, Manning 2002). Value-based decisions (the evaluative component) must be made about the public interest and appropriate normative standards. These standards establish management objectives and are the means for judging the success of a protected area's management program. Some recreation researchers have argued that science has much to contribute to discovering appropriate normative standards for visitor experiences and levels of resource impact – that normative data "are exactly the type of information that managers need to develop evaluative standards" (Shelby et al. 1996, p. 116).

Others disagree--arguing that description, not evaluation, is the proper domain for science (Hall 2004) – that the process of developing standards should rely on sources of knowledge beyond the limited but powerful domain of scientific knowledge (Williams and Matheny 1995, McCool and Stankey 2004). As scientific enquiry moves from description to evaluation, from facts to values, from statements of what is to statements of what ought to be, it ventures into arenas where many believe it should not go or at least should be careful about going. Freyfogle and Newton (2002, p. 864), for example, state that the fundamental "aim of science is to describe nature and how it functions, rather than to pass normative judgment upon it". They also note the substantial confusion that is created when single terms are used "in two ways – as both the descriptive *is* (or *will be)* and the normative *ought.*" (p. 870). Similarly, More (2002) reminds us that, since the 18th century when David Hume first drew the distinction between facts and values, it has been a general established point of logic that "you cannot derive "ought" statements (values) from "is" statements (facts)." (p. 115).

Within recreation, this issue has surfaced in a debate about the prescriptive utility of normative information derived from visitor surveys – the most common method used to develop standards that are "based in science" (Shelby et al. 1996, Manning 2002). In the "normative research approach", people (usually current on-site visitors) are sampled and asked for their opinion about acceptable conditions (about what standards ought to be). Typically these data from individuals are aggregated to define a social norm, usually the mean response. The mean neutral response for sampled individuals (on a scale from acceptable to unacceptable) is often considered to be the minimum acceptable condition – an empirically derived standard (Manning 1999). But how equivalent is this empirical standard (a description of *what is*) to a normative standard (a prescription of *what ought to be*)?

The normative approach has much in common with standard opinion polling, a method that is commonly used to gain input (or at least assess public sentiment) on policy issues. Freyfogle and Newton (2002, p. 866) note that the opinion poll lies at one extreme of available methods for gaining public input in the standard setting process. It is characterized by seeking evaluations from "isolated individuals without study or deliberation", by presuming "that people know enough to make determinations" and by allowing people to select whatever standards they want in making a decision. Freyfogle and Newton (2002, p. 866) contrast the opinion-poll approach with what they consider to be its opposite, the courtroom process. In this process, jurors are carefully selected so that they are not highly biased. They are provided with information "in a setting that encourages reflection". Decisions are made collectively using standards (laws) that are "established in advance and proffered when the time comes by the judge."

There are many methods for gaining public input regarding the public interest that lie between these two extremes. Each method varies in terms of who gets to decide, the type of knowledge considered, the spatial scale employed, the emphasis on information provided, the emphasis on learning and consideration of trade-offs, the explicitness of standards that are applied, the degree of interaction between stakeholders and the collectiveness of final decisions. Some rely more on scientific knowledge than others. Which process is best for defining the public interest – for defining normative standards? Should the normative, opinion-polling approach be preferred because the data gathered are empirical? There is no simple answer and this issue is currently being debated in academic journals (Manning 2003, Stewart and Cole 2003). But what is clear is that the standards that are ultimately selected are dependent on the method that is used to define the public interest. Consequently, the biases inherent to any method of gathering public input – or particularly to any scientific study – should be explicated as clearly as possible.

The power of science as a descriptive tool fosters a desire to base as many decisions as possible on science. Williams and Matheny (1995) note that the "search for correct public policies is seen as similar to the search for scientific knowledge…this search assumes there is a single answer to public policy problems, that this answer can be found within a single language, and that this language is one of scientific expertise"(p. 39). This can cause us to prefer a scientific answer to the wrong question to an answer to the right question that draws more heavily from some other source of knowledge.

Conclusions

Management of recreation in protected areas is primarily concerned with ensuring that appropriate experiences are provided and that acceptable levels of impact are not exceeded. Given agreement about clearly specified desired end states (what is appropriate and acceptable), science provides powerful tools for monitoring recreation use and impacts, for identifying management actions likely to be effective in achieving desired end states, for predicting the consequences of alternative actions and how current visitors are likely to be affected by those actions and for assessing the efficacy of management actions. These tasks play to the strengths of science – description, explanation, prediction and assessment (Hall 2004). As the preceding review suggests, progress on this portion of the recreation management process has been substantial.

Lack of progress in recreation management largely stems from paralysis during the step of specifying desired end states--standards for acceptable impact levels and for appropriate experiences or appropriate settings in which experiences occur. Managers face difficult decisions when choosing between the competing values of a diverse public. They have turned to science for help but the power of science at this step is much more limited. Science usually cannot provide good answers to the most important value-based questions. Consequently, scientists who venture into this arena, attempting to describe the values of the public, need to be overtly attentive to the potential biases in their descriptions (stakeholders included and excluded; information provided or withheld, etc.). As Freyfogle and Newton (2002, p. 865) note "Although we are confident in claiming that science…is purely descriptive…we do recognize …limits on the power of humans to engage in value-free description."

The relationship between management and science is a reciprocal one. Although the emphasis of this paper has been on science helping management, management decisions also help science. Science can be much more efficient and effective once controversial value judgments regarding standards are in place (Dietz and Stern 1998). Ultimately, recreation scientists may need the decisions of recreation managers (to give their research focus and meaning) as much as recreation managers need the empirical data of recreation scientists to help them develop desired end states.

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Trends Affecting Tourism in Protected Areas

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Abstract: This paper discusses 16 important trends that are predicted to affect the planning and management of parks and protected areas in the medium term. While there are many trends visible, the ones chosen are mostly likely to require a management response. There are both challenges and opportunities for tourism-related benefits in parks and protected areas.

Introduction

Park use and park management are reflections of societies' ideas and culture. Decisions in the past led to the present conditions, which in, turn lead to the future. Preparing for the future requires the manager to consider the past, the current conditions and possible challenges and opportunities that could occur. When thoughtfully considering the future, managers are better prepared to deal with the possible issues, questions, problems and opportunities that could arise (Eagles & McCool 2002).

Parks and protected areas are based on societal approval. Personal benefits obtained from visitation are the key element in societal acceptance and the approval of parks and their management. Park visitation is a *virtuous circle* of visitation, the gaining of positive benefits from the visit, the development of appreciation of the park and its resources, the long-term development of positive attitudes and further visitation (Figure 1). Therefore, park tourism is fundamental to the development of societal approval and interest in parks.

The base of park tourism is individual people seeking positive psychological, social, and physical benefits from a park experience. All tourism is dependent upon this search for benefits.

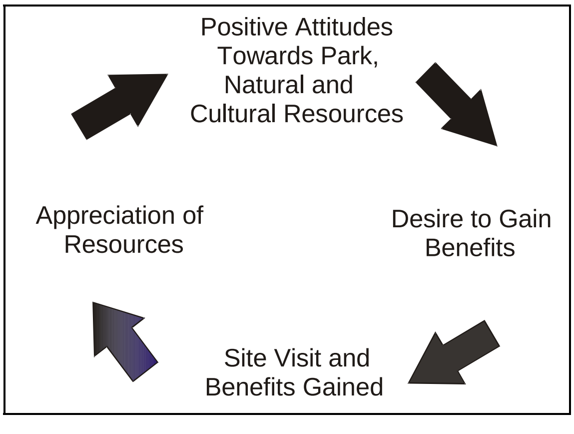

Figure 1. The Virtuous Circle.

This paper discusses 16 important trends that will influence the planning and management of parks and protected areas in the medium term. While there are many trends visible, the ones chosen will affect the practice of protected area tourism management. The roles of parks and tourism will change in response to changing social needs and environmental conditions. There are both challenges and equally many opportunities for tourism-related benefits in parks and protected areas.

National parks and protected areas exist within a dynamic social and political setting that is sometimes difficult to understand and challenging to predict. This sociopolitical setting influences both their day-to-day management and the long-term planning of parks (Gartner & Lime 2000).

Some trends are beyond the capability of park managers to handle, such as war or revolution. However, there are important trends that require a managerial response. The trends and the managerial actions will influence the societal roles of these areas.

Trend 1: *Park visitation will increase.*
In most park systems in most countries tourism use of parks and protected areas increased robustly over the last 100 years. Further increase can be expected in the current century. As shown by the visitation to the national parks of Costa Rica in Figure 2, a significant amount of this increase in some countries is due to international travellers (Baez 2004). This international element will also continue to be important in Costa Rica and elsewhere.

Trend 2: *Park tourism leads to increased public participation and collaboration.*
Park tourism is essentially about people, their interests, their attempts to gain personal benefits and their personal investment of time and money towards this goal. Citizens increasingly express concern for direct participation in decision-making affecting their lives.

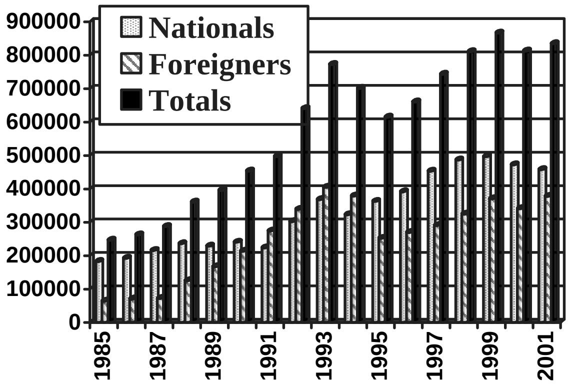

Figure 2. Park Visitation in Costa Rica.

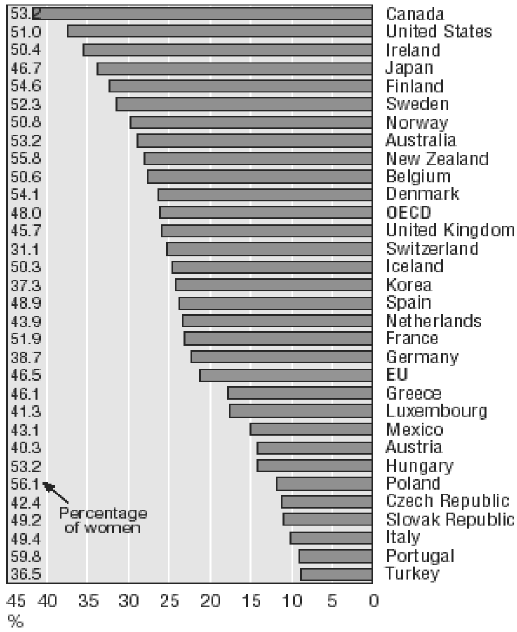

Figure 3. Tertiary Education Levels.

The needs and desires of park visitors combine with the larger trend for increased public participation in government decisions to lead to expanded demands for public participation in parks. Such a trend results from a number of factors including:

– Increasing recognition by park agencies that the needs of park visitors are important;
– Movement towards tourism marketing, ensuring that tourist needs are given higher priority in service planning;
– Moves to build trust between institutions and affected citizens;
– The desire by visitors for inclusive and responsive planning processes;
– A recognition that some planning methods marginalize important values; and,
– A general and widespread interest in democratic management of resources, such as parks.

These factors mean that the planning and management processes used by park agencies must be inclusive of potentially-affected values and interests, provide recognition of the legitimacy of different forms of knowledge, and require planners to have facilitation skills. These factors lead to increased prominence of park visitors and their needs in park management plans and in day-by-day operation.

Trend 3: *Increasing education levels in society lead to demands for increasing sophistication in park management and park services.*

Higher education leads to larger lifetime earnings, a broader view of society, and more desire and opportunity to travel. Globally, the average education attainment is increasing (Figure 3, OECD 2000, OECD 2003) leading to a populace with increased desire, money and opportunity to travel.

Use of national parks is predominately by the higher-educated sectors of society. In addition, highly-education citizens expect information-rich experiences and expect advanced forms of service delivery and management. This is both a challenge and an opportunity for information, interpretation and visitor service planning. Increasing education levels, higher incomes and higher public profiles of many parks should lead to higher use levels in parks and protected areas in the future. As people expand their education, their instincts for continuous learning develop. This leads to travel oriented towards intellectual enrichment, such as ecotourism. This trend leads to park managers seeing more demand for information, interpretation and knowledge about the area and the values it contains. Park information must be adapted to such a sophisticated audience. This involves all aspects of information management; from Internet Web sites to management plan contents, and from resource policy documents to pricing policy. Lifelong learning also means that interpretive services must be sophisticated in terms of what topics are discussed and how that information is delivered to an eager, willing and sophisticated audience.

Since visitors are increasingly knowledgeable about parks, interpretation of all types must cater to their skill and knowledge levels. This requires formal education and training of park staff both in the subject of the interpretive task and also the technology and approaches to dealing with people. Many parks will experience higher levels of use by specialized ecotourism and cultural tourism operators, private individuals providing programs to a niche clientele. This will range from adventure travel experiences for youth through to specialized nature education for retirees.

Trend 4: *A population shift in the developed world towards increasing numbers of older citizens results in significant change in activities, settings and experiences sought by visitors.*

The world population continues to grow and in the developed world the average age increases. An example of this situation is Germany. In 1950, 14.6%

of the population was age 60 or older. Today it is 23%. By 2050 it will be 35.8% (German Federal Statistical Office 2004). There is a similar situation rising in most developed nations. The world's developed nations have significant domestic tourism activities, and are also the generators of a major portion of the foreign visitation of many parks. What happens in these countries will affect park use worldwide. For example, Germany is the world's second biggest tourism spender, behind the USA; so social and travel trends in this country affect tourism income in many countries.

The baby boom generation enters the retirement phase of life in large numbers early in the 21st century (Figure 4). This generation will be the healthiest, wealthiest and most numerous retirement population in history. Tourism marketers know this concept very well and are aggressively moving to fill the developing tourism opportunities. However, park agencies are slow to plan for this important population shift.

As the population ages, there are potentially significant shifts in demands for recreation opportunities as well as changes in the nature of facilities and programs required at national parks and protected areas. For example, as people age there is some evidence that they participate more frequently in appreciative and learning activities and less in more active-expressive kinds of activities (Foot 1990).

Leisure scholars indicate that there are two categories of seniors, well seniors and un-well seniors. The former are fit, healthy and capable of travel. The later have a disability that negatively affects daily activities. A national survey in Canada found that the onset of a major disability on average occurs at age 73, suggesting that the age break between these two groups occurs at this age.

And as people age their needs increase for supplementary facilities such as wheelchair ramps, trails with lesser grades and other disabled access help. In tune with their changing interests, interpretive programs, particularly those dealing with cultural heritage, may change in demand and form. Older people are much less likely to camp, and much more likely to seek accommodation such as lodges, and hotels.

The rate of camping starts to decline rapidly as people enter their forties. Since most parks have a scarcity of roofed accommodation, this trend could reduce park use by older citizens and create a larger market for private accommodation providers near the park.

People in their healthy, early senior years will participate in large amounts of travel. Some of this travel involves nature-based travel, with national parks and private ecolodges frequently selected as choice destinations. With appropriate levels of infrastructure, services and accommodation, parks have a lucrative group of potential visitors. This group has the money to purchase park services, programs and products. Managers could benefit from abundant levels of volunteer effort from many highly skilled people. The possibilities for donations of money are high.

Conversely, without appropriate services, programs, and infrastructure these seniors will spend their talents, money and time elsewhere. It is a management decision whether or not to cater to the rapidly emerging market of seniors' tourism. Even if parks decide not to provide directly for these people, some use will occur indirectly, through a third party. Private ecolodges and tour operators are entering this seniors market aggressively, and some will bring their clients to parks and protected areas.

An example of a park that is well-situated to cater to the aging population market is Krueger National Park in South Africa (Figure 5). This park is a major international tourist destination. In addition, there are dozens of private ecolodges situated on the fringes of the park. Kruger has a full range of activity and accommodation options that cater to all ages. The well-equipped bush camps provide excellent accommodation and services to park visitors, and are especially attractive to older visitors who desire roofed accommodation, excellent interpretive programs, and a range of food services. The private ecolodges cater to an upscale market. These public and private establishments provide a unique blend of opportunities from the very modest camping mode to the very expensive upscale ecolodges.

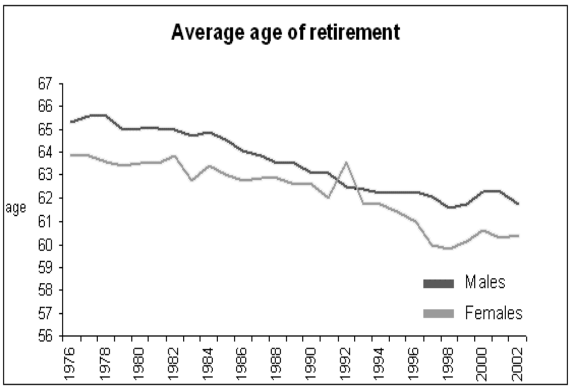

Figure 4. Retirement in Canada.

Figure 5. Kruger National Park Rondovels.

The rapid and successful development of ecolodges is a reflection of the private sector providing services to this market (Figure 6). Ecolodges are often complementary to parks and protected areas, providing compatible land uses around the parks and compatible recreation services. Many private ecolodges in Costa Rica are located adjacent to national parks. These reserves provide effective and complementary landscape conservation measures to the park and tap a high-income market not fully served by existing park programs. South Africa is aggressively moving towards the encouragement of the development of upscale ecolodges within national parks.

Figure 6. Maya Mountain Lodge, Belize.

Trend 5: *Increased accessibility of information technology means that potential, current and past visitors will be better informed and knowledgeable about what leisure opportunities exist, the current state of management and the consequences of management actions.*
The Internet is a revolutionary two-way means of communication. It allows institutions to communicate with clients and it allows clients to communicate with institutions. It leads to greatly increased access to information and knowledge of and by park visitors. It provides an inexpensive avenue for groups, ranging from tourism companies to environmental groups, to provide information about parks and lobby for their positions on park management policy.

This has several consequences for park planning and management. First, it means that potential visitors can more easily become aware of the various recreation opportunities and alternative destinations available both locally and globally. Potential visitors can have more certainty about conditions and facilities available within an area. Second, increased accessibility of knowledge and easier communication routes mean that visitors and others interested in protected area planning issues can provide more informed input into decision-making processes. Third, the widespread availability of Internet and digital communications means that it is easier for people to communicate across national boundaries and to organize themselves into activist groups promoting one cause or another. Fourth, the Internet is an inexpensive method of providing information.

The Internet allows many groups, such as tourism suppliers, environmental groups, and local community groups, to provide copious levels of information about parks and protected areas. It may be challenging for park managers to know what is being said about their park and to ensure that it is accurate and appropriately represents park policy. At present, in some poorer countries, third-party interests provide virtually all the park information to tourists. This loss of ability to be the gatekeepers of resource information, policy and management information can have profound impacts on the job facing park managers.

An analysis of the tourism content of park agency Web sites showed a large variability in usefulness and completeness. Generally, park managers show a lack of understanding of the needs of park visitors and therefore develop Web sites that do not fully provide the types and levels of information that are most appropriate (Murphy et al. 2004).

The consequences of information technology are profound for park managers. Generally, park managers must develop increased capacity in this area.

Trend 6: *Increasing availability of information technology profoundly influences park visitation.*
Advances in information technology are rapidly moving towards the situation where park visitors can obtain access to digital information on parks in real time any place on the earth's surface. The use of Geographical Position Systems (GPS) allows visitors to accurately locate their position in parks. Wireless communication allows access by hand-held devices to Internet-based information and databases and allows visitors to transmit information from their field location to data analysis devices. This leads to online, real-time, global communication by visitors in all areas, including those that are remote.

The implications are profound and can only be dimly perceived. One simple example can show the potential. A park visitor interested in birds hears an interesting bird song deep in a nature reserve. He records the bird sound on a hand-held device that also records the specific location. This information is digitally communicated via wireless technology to a remote computer that compares this sound to a database of bird sounds and provides species-level identification. After the record is placed into a central database, the visitor's hand-held device is told that this is the 5th record for this rare bird species in this location. Such an example shows the potential for park visitors to become major contributors to the science of natural resources. It also shows the profound implications for park use as park visitors have real-time access to global information technology and databases while travelling through parks.

Other examples abound. Prebooking of recreation opportunities becomes easier and more effective with Internet-based systems. For example, Ontario Provincial Parks manage 300,000 campsite reservations annually, with 45% occurring with an Internet booking system, and 55% through telephone contact with an agent. The Internet volume is rapidly increasing, and the telephone contact decreasing. With advanced booking of services, managers know months in advance the size and distribution of their future recreation programs.

Online feedback allows managers to have rapid assessment of the current situation in programs. Remote censusing of visitor transportation equipment allows managers to know the number and distribution of visitors. Wildlife cams allow park visitors to keep informed of the situation in the park that they enjoyed at some time in the past. Virtual Friends Groups allow people all over the world to participate in park activities.

The implications of rapid advances in information technology will be profound. They offer tremendous opportunities for managers with insight and initiative.

Trend 7: *Advances in the technology of travel and reductions in costs result in increased demand for park and protected area opportunities distant from one's residence.*

Over the last 100 years increased use of inexpensive light oil, development of advanced transportation equipment and higher levels of economic attainment resulted in massive increases in international travel. Such travel is expected to grow further in the early 21st century, thereby increasing the demand for national parks and protected areas distant from visitors' residences. The volume of air travel is expected to increase over the the first 10 years of the 21^{st} century as new airplane technologies come online reducing the price of the travel. By making travel more affordable more people can visit foreign destinations. This trend means that park and protected area managers must communicate with people with different languages and cultural backgrounds, as well as differences in custom and tradition. Many managers will be faced with visitors from very different cultural backgrounds from the current visitors. This will bring many challenges in information provision, safety, health provision, and supervision.

Technological advances in motorized recreation equipment such as snowmobiles, motorcycles, all-terrain vehicles (ATVs), jet boats and helicopters combined with GPS navigation technology allow more people to reach even the most remote wilderness areas and wild waterways. Such use will provide increased challenge to park managers. After 2010 the emerging gap between global oil supply and demand will cause large price increases in energy. The impacts of this are discussed in Trend 16.

Trend 8: *The increase in park area, number of parks, and park visitation exceeds the capability of many park management institutions.*

Globally, the public and many environmental groups demand new park creation. Most park systems experience increasing visitor numbers. Simultaneously, the public resists demands for increasing taxes. The growing area to manage, the increasing level of visitation, and the decreasing tax-based budgets negatively affect the institutional capacity of most agencies to manage their park lands.

One result of inadequate funding is the lack of personnel adequately trained to deal with park tourism management, long-range planning, and the new technology required to deal with increasing demand. In many park agencies these trends lead to crisis levels of managerial effectiveness. Fortunately, approaches are being found to deal with these issues.

There is concern that many government agency legislative mandates are not appropriate for these challenges. For example, centralized government agencies are notoriously poor in reacting to rapidly changing circumstances. The financial limitation of government agency structures also means that park tourism is often poorly served. These limitations lead to the adoption of a more flexible and interactive management structure in many park systems, such as the parastatal form of administration.

Trend 9: *Park management shifts gradually from government agency structures, with centralized financial control, to parastatal forms, with flexible financial management.*

There is increasing utilization of management structures beyond the government agency model for many park tourism functions. In some places this means contracting some park operations to private profit-making corporations, thereby replacing government employees and publicly-funded services. In other places, it means transferring some management functions to NGOs, such as park Friends Groups. In still others, it means restructuring the park agency into a corporate organization with a management structure similar to a private corporation. This later form of management, the parastatal, typically functions like a private corporation within government. It has wide abilities to earn income, retain income, hire staff, and set prices. It may have an appointed Board of Directors.

Some criticize this later approach because of the possibility of motivation driven more by income generation than one of public service or environmental protection. However, its financial and managerial effectiveness often outweighs these concerns.

Parastatal forms of park management now occur in many countries. Examples include South African National Parks, the Kenya Wildlife Service, Parks Canada and Ontario Parks. In each of these examples, this form of management has proven to be robust, flexible and effective with park tourism management. This form of management is much more client-focused, as the park visitor is seen as a benefit to the park and the agency.

Trend 10: *Park management funding increasingly shifts from government grants to park tourism fees and charges. This results in higher levels of visitor focus in management.*

Many people argue that the protection of natural and cultural resources benefit all and therefore should be paid for by societal taxes. Others argue that park visitation benefits those who use these sites and therefore these beneficiaries should pay for the corresponding costs. The conciliation of these two views results in a combination of tax-based government grants and tourist fees and charges in the provision of many park budgets. Limitations in the tax-based grants put increased emphasis on the use of fees and charges on tourists to provide the revenue necessary to fund park operations, the user pay approach.

Government policies in several countries now require the park agencies to collect increasing amounts of the budget from tourist fees and charges. For example, Parks Canada has a multiyear plan for increasing park income. The Government of Canada recognizes that it is not possible for national parks to earn all their financial needs from earned income. Therefore, the ultimate goal is to have a budget composed of income derived from both government allocations and earned income.

In some countries with strong competition for tax revenue, such as Tanzania, Kenya and South Africa, the parks do not receive government funding for operation. All operational budget income comes from fees and charges (Figure 7, Tanapa 2001). During the last few years of the 1990s and leading in the 2000s, the Government of South Africa required the national parks to earn their entire budget from fees and charges as virtually all tax-based government income was removed. SANParks was successful in this effort. In addition, the number of visitors increased as the services provided more carefully matched tourist demand.

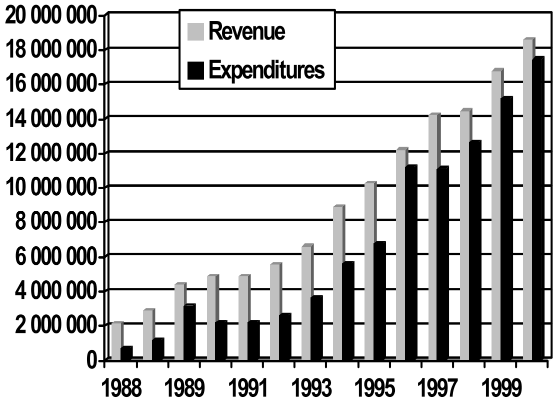

Figure 7. Tanzania National Park Finance.

Parks have many potential sources of tourism-based income, including: entrance fees, recreation services fees, special events and special services, accommodation, equipment rental, food sales (restaurant and store), parking, merchandise sales (equipment, clothing, books, information, supplies), contractual agreements with concessionaires, licensing of intellectual property, and cross-product marketing (Eagles 2002). All of these sources are used by some park agencies, but very few park agencies use the entire range. Park agencies have the potential to utilize a much wider range of income sources than is typically used.

The trend for increased use of fee revenue leads to several implications for park management and the services delivered to visitors. One important implication is higher levels of charges for park services. This may keep some people from enjoying parks because of high cost. However, there is little evidence of this trend as park use figures often show increases and strong willingness-to-pay. Another implication is that the only benefits flowing from a park are those for which a charge exists. A third implication is that only services and opportunities that will break even between income and expenses will be provided.

If park operations are funded entirely out of ongoing revenue from park visitors, the budget must stay in tune with projected revenues. If management costs increase, there is the need to increase revenues or cut costs. In some cases the increased revenue may come from promotional campaigns designed to increase visitation, which in some cases may lead to adverse visitor impacts. In other cases, better pricing policy, the collection of fees from visitation formerly ignored, and higher fees associated with higher service levels provide revenue that is sufficient to cover operating expenses. Increased fees also can raise expectations on the part of visitors about the quantity and quality of services that will be delivered. Evidence from several Canadian and Australian parks systems shows that increases in fees are associated with higher use levels in parks as visitors utilize new, more efficient, and better-targeted services. Therefore, park visitors increase use as park management better serves their needs.

Parks with income derived from park visitation are more client-oriented, than parks utilizing government grants. Such parks are much more concerned about the visitor's length of stay, the visitor's satisfaction with the programs and services, the visitor's recreational needs and the visitor's opinions about park management (Moos 2002).

Trend 11: *Parks and park agencies develop increased sophistication in their understanding and management of park visitation and tourism.*

Park visitor management has often been a hit-or-miss activity. Over time managers experimented with services and retained those that appeared to function properly. Additionally, much park tourism had a take-it or leave-it style. The visitor had to accept what was offered or go elsewhere.

Competition in park tourism, higher profiles of visitors in management, increasing demands for increased income and an increased scientific understanding of human-environmental interactions all lead to a more professional approach to visitor management.

One very important change is the move to service quality goals and measurement. Many park agencies now understand that park visitors have service needs and that quality is important. Increased measurement of visitor satisfaction with the services provided leads to better understanding of the visitor. Parks Canada may be the first park agency in the world to have a service quality standard as a goal. Each unit in the system, both national parks and national historic sites, is expected to achieve a standardized level of service quality. Any services that do not reach the standard are reviewed for change. Finland has a sophisticated customer management system, including service quality goals and advanced levels of public use measurement (Leivo 2002).

Park managers are typically well behind the private sector in developing a sophisticated understanding of clients' expectations and the level of fulfillment of those expectations. In the future, park managers must become more professional in their approach to using more sophisticated and effective methods of tourism management.

As databases about socioeconomic conditions become more widely accessible, park management has more information about potential visitors, the expectations the people bring with them, the life styles that different people live, the services they desire and their residence. This means that park and protected area managers can provide more tailored programs and recreational opportunities. They can deliver information ahead of the visit that will help form appropriate expectations on the part of visitors. Park managers may be able to influence where people visit. They may be able to design management programs that can fine tune visitor impacts and visitation patterns. Universities will be expected to increase their offerings in park tourism planning and management.

Trend 12: *Foreign aid and grants from NGOs increasingly fund biodiversity conservation and sustainable tourism development in developing nations in order to develop sustainable development that provides both conservation and economic benefit.*

Conservation and tourism are global and international concerns. Accordingly, park management often has an international focus.

In many countries the conservation demands are larger than the capacity of the government. The realization of this fact leads to bilateral aid, such as the Global Environment Facility, providing critical conservation funding. For example, in August 2002 there was agreement by representatives of 32 governments to contribute US $2.92 billion to fund GEF operations over the next four years. This money is to be applied through GEF grants for important conservation initiatives and sustainable development in countries with high biodiversity.

In some cases NGOs will continue to expand their roles in terms of funding and technical assistance and also direct management of parks and protected areas. For example, the Belize Audubon Society does park management. The Monteverde Cloud Forest Reserve in Costa Rica is a very important conservation reserve that is owned and managed by a several NGOs. At Monteverde these NGOs have a strong international focus and a strong element of involvement by concerned and committed reserve visitors.

Trend 13: *Park tourism may be damaged by war and civil unrest, especially in Africa and parts of Asia.*

Tourism is very sensitive to reports of war, civil unrest and personal danger. Park management often ceases to exist in time of conflict. The Biwindi Impenetrable Forest National Park in Uganda was a site of military activity against national park visitors in the year 2000. This action killed many people and damaged a promising ecotourism industry, which has still not recovered. The terrorist bombing in Bali in 2002 damaged the tourism flow in much of Southeast Asia for several years. The terrorist bombing of a resort in Kenya in 2003 severely damaged the important Kenyan tourist economy as visitation dropped precipitously. The bombing in Kenya also badly damaged the tourism flows to neighbouring Tanzania.

Park managers can do little to effectively deal with dramatic and well-publicized incidents. However, they can do a lot to prepare for news reports that over emphasize the dangers. They can prepare public relations material in anticipation of negative news, news that is not accurate or news that provides too general a picture. Tourism can be restored after use levels drop due to publicity of civil unrest or war. Managers should understand this fact and prepare contingency plans for both real and media-created crisis in consumer confidence.

Trend 14: *The world's international travel will be strongly affected by decreasing supplies of oil and gas and large increases in energy cost in the second decade of the 21st century.*

The world's prosperity in the 20th century was largely due to the abundant and inexpensive energy available from oil and natural gas. Inexpensive energy led to widespread travel. However, the earth's supply of oil and gas is finite. As easily accessed oil fields become exhausted, more remote, deeper, and harder to access supplies must be found (Campbell & Laherre 1998). Figure 8 shows that the global production of oil and gas will peak between 2010 and 2020 (Campbell 2003).

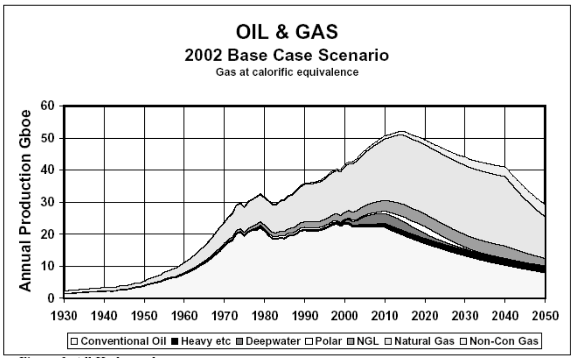

Figure 8. Global Supply of Oil and Gas.

Once over the peak of production, major economic and social changes will occur. One is rapid movement to other energy sources such as coal, nuclear energy, and renewable energy. Another is much higher energy cost. When energy costs increase, there will be changes in global consumption, economic and travel patterns. The implications for park tourism are considerable. Overall, long-distance travel may start to decline in volume. Conversely, some domestic travel volume may increase with local trips substituted for longer voyages. Decreased economic vitality of many societies will result in severe pressures on many parks and protected areas as people seek the resources, such as the oil, gas, timber, and hydro-electric potential found in those parks.

As the world moves out of the era of abundant and cheap oil and gas, the impacts on park and protected area management in general and on park tourism specifically will be profound. The increase in energy prices resulting from the divergence of the oil and gas supply and demand will be the most significant trend affecting park tourism in the first 25 years of the 21st century.

Trend 15: *Global climate change will affect many parks and much park tourism.*

Global climate change will be one the most important environmental issues affecting parks and tourism in the 21st century. According to the Intergovernmental Panel on Climate Change (2001) it is likely there will be:

– Higher maximum temperatures and more hot days over nearly all land areas;
– Higher minimum temperatures, fewer cold days and frost days over nearly all land areas;
– Reduced diurnal temperature range over most land areas;
– Increased heat index over land areas;
– More intense precipitation events;
– Increased summer continental drying and associated risk of drought in continental interiors;
– Increase in tropical cyclone peak wind intensities;
– Increase in tropical cyclone mean and peak precipitation intensities;
– Increase in ocean levels;
– A gradation of change according to latitude, with the changes becoming larger, moving from the equator towards the poles, and specifically,
– Much higher temperatures in higher latitudes, with arctic ecosystems affected strongly.

The implications are so large and profound that it is difficult to provide a succinct summary. However, a few trends are obvious. Globally, the climate will warm. The increase will be highest in the higher latitudes. Much warming in Arctic environments has already occurred and more will occur.

Global climate change may reduce the ability of some parks to accept tourism through intense heat, drought, and rising ocean level. It may increase the ability of parks in the temperate latitudes to accept tourism, with longer operating seasons occur due to warmer spring and fall periods. Longer and more ambient summer temperatures and less summer ice in the Canadian Arctic are already leading to increased cruise ship tourism.

Some of the impacts will be counterintuitive. Researchers note that in the Great Lakes area of North America winter warming results in less ice on the lakes. Wind moving over the resultant open water picks up moisture resulting in increased snowfalls in downwind areas. Therefore, warmer winters in this area lead to increased snowfall, with the concurrent impacts on travel and on snow-based recreation activities.

Increased tropical cyclone wind and precipitation intensity may cause severe damage to some parks, resulting in lowered attractiveness of visitation and lowered abilities to accept visitation. Regional impacts may be considerable. For example, increased drought and heat in the southern and central USA in the summer months may stimulate migration of people northward, both permanently and seasonally, increasing park visitation in the northern USA and Canada. Similar shifts could occur in Europe.

The implications of global climate change will be large and profound. All park planners and managers must consider these trends to their fullest extent. Some of the impacts can be dealt with under current management scenarios. Others will require entirely new approaches.

Trend 16: *Parks further develop as cultural icons.*

Parks will continue their traditional roles of providing opportunities for people to better understand cultural and natural heritage. Parks often become icons for various communities. Some become symbols of national identity. Most communities develop higher levels of appreciation over time as the cultural significance grows.

As parks become international symbols, there is stronger international pressure on management policies. International designations, such as Ramsar Wetland, World Heritage, and Biosphere Reserve, lead to higher levels of tourism as people recognize the sites as being globally significant, symbols of quality, and a well-recognized brand. Therefore, national parks and national wildlife refuges take on the stature of international parks and international wildlife refuges. Such a trend is a natural outgrowth of the global ecosystem concept of ecology and the global travel phenomenon.

Conclusion

The changes resulting from these trends are difficult to predict precisely. This uncertainty can lead to anxiety and even stalemate action, as people, including park managers, are confused about appropriate courses of action to initiate. While the future is difficult to predict, preparation is necessary. This preparation can be founded on understanding of management systems, the role of people, the social, political and economic forces affecting travel and the principles of ecosystem processes. Such a foundation must be coupled with intelligent responsiveness.

The chief resistance to preparing for change will be the complexity of the trends and their synergistic relationships. Many managers will be incapable or unwilling to consider the range of responses necessary to deal with the dramatic changes discussed in this paper. However, it is essential that long-range planning be done. The survival of many park systems, cultural sites and their associated tourism industries depend upon such planning.

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Designing a Sampling System for Concurrently Measuring Outdoor Recreation Visitation and Describing Visitor Characteristics

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Abstract: Two primary information needs for managing recreation areas and the visitors to those areas are: (1) good estimates of visitation volume, and (2) accurate descriptions of visitor characteristics, such as length of stay, frequency of visit, and primary activity. For National Forests in the United States of America with large undeveloped areas, efficient sampling for the two types of information may be to a large extent incompatible. Sampling plans that address visitation volume issues allocate most of the sample days to the largest and most internally variable strata. Sampling plans for studies of visitor characteristics allocate sampling effort to locations that most efficiently provide visitor information, such as at developed sites. Additionally, sampling plans for studies of visitor characteristics may need to ensure spatial or temporal dispersion of the sample, in order to ensure adequate representation of different visitor sub-groups. A method is demonstrated for allocating days into sampling strata which balances the contribution of sample days in improving the accuracy of the total visitation estimate with the contribution of the sample day to maximizing the quantity and dispersion of visitor information. The resulting sampling allocation provides an optimal solution to address both of the information needs through a single data collection effort. A second phase of the method addresses how to ensure spatial and temporal dispersion of sampling effort. Examples of applications on National Forests in the United States are provided.
Key Words: National Visitor Use Monitoring, onsite sampling, sampling plan, use estimation, visitor characteristics, sample allocation.

Introduction

Managers of recreation and Wilderness areas need information about both the volume of visitation and some salient characteristics about those users. Accurate measures of visitation volume are critical in estimating the social and economic benefits of recreation. Accurate estimates of the characteristics of recreation visitors are needed in all aspects of a customer-focused management strategy such as prioritizing facility development and maintenance or timing management activities. Obtaining good estimates for both these types of information is more difficult and expensive if there are many uncontrolled access points, or if much of the visitation occurs in relatively low use, dispersed settings. Both situations occur on lands managed by the USDA Forest Service.

Typical approaches for jointly estimating these two sets of information on Forest Service lands involve calibrating mechanical counts of traffic, combined with some form of visitor observation or surveying (English et al. 2002, Gregoire and Buhyoff 1999, Watson et al. 2000). Sampling frames for estimating visitation and interviewing visitors almost always incorporate both spatial and temporal dimensions. Sampling strata are usually defined by the expected volume and variability of visitation levels. Sampling strata may also be defined by the existence of certain types of visitation-related information that can be used to improve visitation estimates.

A difficulty comes in choosing how to allocate sample days across the strata. Optimal allocation of sample effort when the goal is estimating total visitation volume is unlikely to coincide with optimal allocation when the objective focuses on obtaining visitor characteristics. For estimating total visitation, many sample days are allocated to low-use dispersed settings because of the stratum's size. However, few visitor contacts are likely to result from sampling in those settings. Sampling for visitor characteristics could put more emphasis on sampling in locations that coincide with greater visitor volume in order to minimize the cost per visitor survey obtained, or allocate sampling effort such that either the number or proportion of visitors in each stratum are sampled.

This paper demonstrates a method for allocating days of sampling effort into strata in a manner that accounts for the need to obtain accurate visitation volume estimates, as well as attempting to maximize both the number and representativeness of the visitors who are contacted. The method is a refinement to the Forest Service's National Visitor Use Monitoring (NVUM) project. The initial design of the NVUM project focused on estimating visitation volume. However, it has become clear that accurate estimates of visit characteristics are of equal importance for many policy decisions. Presented first is a review of the method used for allocating sample days into strata for the first cycle of NVUM sampling. Then, the rationale and computation process for the proposed model are discussed. Empirical examples for allocation of sample effort for a national forest are provided. Results for the proposed allocation model are also compared to those obtained under several other allocation algorithms.

Background

The NVUM sampling design divides developed sites on each national forest into two types based on the nature of their intended use. Access points to undeveloped areas of the forest were divided into two types; undeveloped areas that are part of the National Wilderness Preservation System and those that are not. These four mutually exclusive site types provided the spatial stratification for the sample frame. These sites types are defined as:

1. Day-Use Developed Sites (DUDS) – developed sites intended mostly for day use such as ski areas, picnic sites, wildlife viewing areas, visitor centers, and swimming areas.
2. Overnight-Use Developed Sites (OUDS) – developed sites that primarily provide overnight accommodations such as campgrounds, cabins, lodges, resorts, or horse camps.
3. Wilderness Sites (WILD) – sites or access points for designated Wilderness areas.
4. General Forest Area (GFA) – access points to any other areas in the national forest that are not DUDS, OUDS or WILD.

The basic temporal unit was a calendar day at each site or access point. A second level of stratification focused on the level of last exiting visitation for the day[1]. Every day of the sample year was classified according to the expected level of last exiting recreation visitation, as High, Medium, Low, or Closed. Stratifying days by visitation volume should yield the most precise (i.e., minimum variance) estimate of visitation. Unfortunately, intervening factors such as fire, unusual weather, or re-scheduling events can greatly affect the actual visitation for any given day, and will introduce unanticipated variability into the system. Sample days were not assigned to the closed stratum, as it was assumed that visitation levels equaled zero. Money was transferred to forests to accomplish sampling on a flat rate per day. Allocation of sample days into the strata followed an optimal allocation formula (Cochran 1977, p. 98):

$$n_h = n \frac{N_h S_h}{\sum N_h S_h} \tag{1}$$

Where:
n = number of sample days for the forest
n_h = number of sample days in stratum h
N_h = number of site days in stratum h
S_h = standard deviation of visitation in stratum h

From this formula, more sampling effort is expended in strata with larger populations and/or higher within stratum variance. The average number of sample days per forest was a little less than 200. There was a concern that a strict adherence to the optimal allocation of days would not yield an adequate sample size for estimating either a mean or variance in some strata. For example, GFA site days accounted for well over 60% of all of the site days on the forest. Consequently, an initial allocation of 8 sample days was made to each stratum. The remaining available sample days were allocated across the strata according to the formula given in (1). In the initial sampling cycle, no reliable estimates of the standard deviations were available. It was assumed that the relative ratios of standard deviations for all site types would be Low=1, Medium=10, and High=20. To illustrate the results of this allocation method, the size of the site day population and resulting allocation of sample days are presented for the Cherokee NF in Table 1.

Single Dimension Allocation Alternatives

For determining a sample day allocation in the second round of sampling, a number of alternative algorithms that focus on one dimension were considered. Expected results for any of these can be based on information obtained in the first round of sampling. Three of these algorithms were considered.

The first was a fixed minimum allocation and optimal allocation thereafter as defined in (1) using standard deviations estimated from the first cycle. Minimum allocation was assumed to be 8 days. This method should yield the minimum variance visitation estimate. A common result is that both the number and proportion of days and interviews are unequal across strata. The exact formula would be:

$$OPTn_h = m + (n - mH)\frac{N_h S_h}{\sum N_h S_h} \quad (2)$$

Where:
m = minimum allocation per stratum
H = total number of strata

The second algorithm was a fixed minimum allocation (8 days) and thereafter allocation proportional to total visitation. More days are allocated to strata with greater visitation. This is similar to the optimal method, but weights according to visitation level rather than variance of the visitation estimate. The formula for allocating days beyond the minimum would be:

$$VISn_h = m + (n - mH)\frac{V_h}{\sum V_h} \quad (3)$$

Where:
V_h = total visitation estimate for stratum h

The third algorithm involved equalizing the sampling ratio of recreation visits across strata. This method allocates days so that about the same ratio of visits is sampled in each stratum. This method has the greatest benefits in analyzing the information obtained from the individuals surveyed to describe the visitor population, because each interview has approximately equal weight in representing the total visitor population. In the other methods, the sampling rate of the recreation visits is quite disparate. This method does not address variance in the visitation estimate. Here the allocation algorithm is:

$$SRVn_h = n * \frac{V_h / I_h}{\sum V_h / I_h} \quad (4)$$

Where:
I_h = Average number of recreation interviews per day obtained in stratum h

Multi-criterion Algorithm

The goal was to determine the sample size for any stratum, balancing between minimizing the variance of the overall visitation estimate and maximizing the amount and representation of the individual visitors surveyed. Designing sampling schemes to serve multiple purposes is not uncommon in biophysical forest monitoring efforts (Schreuder et al. 1993). The process followed initially allocates a minimum sample size to each stratum, as in equation (1). The minimum number of days can be set by the user, but for these examples it is assumed to be 8 days. The remaining sample days are assigned to strata iteratively. The algorithm computes the expected benefits for each of the objective criteria of placing the next sample day in each stratum. The values are compared, and the day is assigned to the stratum with the 'best' result. The algorithm is recomputed with the new number of sampling days, and the process continues until all available days are assigned.

The first objective criterion (O1) evaluates the marginal contribution of one more sample day to reduction in the variability of the visitation estimate. All else equal, increased sampled size in a stratum will reduce the standard deviation of the estimated visit total. Variance is reduced directly by increasing the number of sample days from which an estimate of

Table 1. Population and Allocation of Sample Days by Stratum for Cherokee National Forest.

Site type/Stratum	Site-day Population	Sample Days	Total Visits (000's)	Standard Deviation (000's)	Recreation Interviews per day
Day Use Developed:					
High	607	13	80	17	7.85
Medium	837	12	91	40	4.58
Low	5017	10	136	49	2.20
Overnight Use Developed					
High	121	9	22	4	12.33
Medium	1469	14	67	18	2.14
Low	3760	10	146	42	2.00
General Forest Area:					
High	3115	30	597	133	8.67
Medium	6179	30	262	60	3.17
Low	53182	27	978	283	1.11
Wilderness:					
High	559	11	5	2	1.91
Medium	1176	13	7	2	0.67
Low	5076	11	25	10	1.21

average daily visitation is made, and indirectly by increasing the number of visitor contacts used to calibrate traffic counts. To determine the contribution of a sample day to variance reduction, a regression equation was estimated for each stratum, using sampling results from 87 national forests. A double-log specification fit the data best, and ensured declining marginal contribution of additional sample days to expected variance. The model was:

$$\text{Log}(S_h) = f(\text{LOGVIS, LOGSIZE, LOGNH, LOGINT}) \quad (5)$$

Where:
LOGVIS = log(visitation estimate for stratum)
LOGSIZE=log(number of days in the stratum)
LOGNH = log(sample days in the stratum)
LOGINT = log(sample days * interviews/day)

Regression results for each of the twelve sampling strata showed R-square measures over 0.92, positive coefficients on visitation and stratum size, and negative coefficients on sample days and interviews obtained. Given the values for visitation, sample size, and average interviews per day, for any expected sample size (n_h) a fitted value can be obtained for the standard deviation (SDHAT(n_h)) The contribution of the (n_{h+1}) day to reducing the standard deviation of the visitation estimate for that stratum is equal to:

(SDHAT(n_h)) - (SDHAT(n_{h+1})).

The second objective criterion (O2) is the contribution of the sample day to the number of interviews of recreation visitors. The expected gain in interviews equals the average interviews per sample day from the initial round of sampling. The range of responses is shown in the last column of Table 1. The lowest return is for Wilderness Medium (0.67 per day), and the highest in Overnight High (12.33 per day). This gain is constant regardless of how many days are allocated to any stratum, and favors strata with the highest average interviews per day.

Clearly, the units and scale for the two criteria are quite different. Converting each into a standardized measure (subtracting the mean taken over all strata and dividing by the standard deviation) allows summation into a composite score (Zarnoch et al. 2002). The stratum with the highest composite score indicates the 'best' choice of allocation for the next sample day. The algorithm weights the two elements equally, although a different user-defined weighting can be incorporated.

Several controls are built into the algorithm to ensure that neither criterion dominates too greatly and so that some dispersion of sample days across strata results. These controls affect the composite score, and thus the allocation of days to sampling strata. The first control computes a standardized measure of the relative concentration of sample days in each stratum. Those strata with the most sample days (highest concentration of the allocated sample) get the lowest values. The effect is to dampen the attractiveness of putting days in strata that are already over the average sample size. In each iteration, the control value for the stratum ($C1_h$) is computed as:

$$C1_h = -\left(\frac{n_h - \overline{n_h}}{Sn_h}\right) \quad (6)$$

Where:
Sn_h = standard deviation of n_h over h strata

The second control functions as an override that is activated for any stratum that samples over a user-specified percentage of its site-days. The initial level was set at 15 percent. The override decrements the value of the composite score by a standardized measure of the proportion of unsampled days in the stratum. The effect is to limit the maximum sampling rate of site days in a stratum to about 15 percent. The computation for this control ($C2_h$) is

$$C2_h = (I2) * \left(\frac{UN_h - \overline{UN_h}}{S(UN_h)}\right) \quad (7)$$

Where:
I2 = 1 if (UN_h) < 0.85, and 0 otherwise
$UN_h = (N_h - n_h)/N_h$
$S(UN_h)$ = standard deviation of UN_h across the h strata

A second override control (C3) computes the expected sampling rate of visits in each stratum, and decrements the composite value by a standardized measure if the sampling rate in that stratum exceeds the minimum rate in all strata by a user-defined threshold factor. Our initial setting for this factor was fairly unrestrictive, at 400. This control reduces the likelihood of allocating any more days to a stratum that already samples a very high proportion of visits, until some days are allocated to strata where the sampling ratio of visits is over 400 times less. The data in Table 1 show that there were about 101 recreation interviews obtained in the OUDS High stratum, and the total estimated visitation for that stratum is about 22,000. Thus each of the 101 interviews represents about 218 visits. In the GFA Low stratum, only 30 interviews were obtained from a total visitation estimate of 978,000. Each of these represents about 32,600 visits. In other words, each one carries about 150 times the weight of each individual survey obtained in OUDS High sampling. The computation for this control is:

$$C3_h = I3_h * 100(\frac{1}{(1+n_h)}) \qquad (8)$$

Where:
$I3 = 1$ if $(V_h/(n_h*I_h))$ / $MIN(V_h/(n_h*I_h)) > 400$,
$= 0$ otherwise

Computation of the value of the algorithm at any iteration is simply the sum of the two objective criteria and the three controls.

Results

Results for these allocation methods for the Cherokee National Forest are presented in Table 2. The equal sampling rate for visits (SRV) allocates too few days to several of the strata to obtain accurate estimates of visitation, and yields the fewest number of interviews (361), or an average of less than 2 per day. The optimal method assigns about half the sampling days to GFA Low stratum, and yields only 508 interviews, only about 2/3 the number obtained in the first cycle of sampling (773). The proportional-to-visits method yields a sample allocation that is fairly similar to the allocation used in the initial sampling cycle. The biggest difference is 19 more days (10 percent of total sampling effort) in the GFA Low stratum. Because few interviews per day are obtained in that stratum, the number of total interviews is slightly lower. This method allocates only one more than the minimum number of days to any of the Wilderness strata, because total visitation is very small when compared to the developed site strata or general forest areas. If there is strong interest in obtaining a relatively large sample of Wilderness visitors, this allocation method may not be best.

The multiple-criterion method provides the greatest number of expected individual interviews (824), about 8% higher than that obtained in the first sampling cycle. The 80% confidence interval width for the first cycle was 17.5% of the total visitation estimate. The fitted values for variance for both the initial cycle and the multiple-criterion allocations were essentially equal. In other words, the multiple criterion method allocates a sample for this forest that could be expected to yield just about as precise a visitation estimate as the initial cycle allocation, but with 8% more information about recreation visitors. Given the equal importance of visitor information and precision of visitation estimates, this method appears to be worthwhile. However, the allocation of days to Wilderness sampling is not incremented beyond the minimum assigned level. Wilderness strata have low levels of visitor contacts per day, and make relatively little contribution to the precision of the overall visitation estimate.

These results indicate that a multiple-criterion algorithm can provide an allocation of sampling effort that is better than single-purpose allocation methods. Flexibility exists in designing minimum allocations, thresholds for triggering overrides, and weighting the relative importance of visitor contacts versus the algorithm. Given the increased need for information on recreation visitation, maximizing the total usefulness of data collection is essential. Standardizing units of the response variables for the criteria enables composite measures to be developed, and allows for compatible controls to regulate the allocation mechanism in unusual situations. Further refinements of the method presented here could come in the form of additional or more specific optimization criteria, improved estimation of the effect of sample allocation to the project objectives, or testing the sensitivity of the sample allocation to threshold levels for the override controls.

Table 2. Allocation of Sample Days by Stratum for Single Dimension Algorithms.

Site type/Stratum	OPTn	VISn	SRVn	Multi-Criteria
Day Developed:				
High	8	11	2	19
Medium	8	12	3	17
Low	9	13	9	14
Overnight Developed:				
High	8	9	1	12
Medium	8	11	5	15
Low	9	14	11	15
General Forest Area:				
High	10	31	10	27
Medium	10	18	12	18
Low	94	46	132	29
Wilderness:				
High	8	8	1	8
Medium	8	8	1	8
Low	8	9	3	8
Total Recreation Interviews	508	742	361	824

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End Notes[1]

Another portion of this stratification level focused on the existence and type of other information (such as fee envelopes, permanent traffic counts, skier visits, or mandatory wilderness permits) that could be used as a proxy for actual visitation for some set of the days of operation for any given site. To simplify the description of the model, we ignore those strata in this paper, although the process described can readily be expanded to include them.

Affects of Road Sign Wording on Visitor Survey – Non-Response Bias

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Abstract: On-site visitor interviewer data collection is a key component of the USDA Forest Service National Visitor Use Monitoring (NVUM) program. In many areas, especially higher speed roads and roads with non-recreation traffic, many vehicles may not stop for an interview. Wording on the sign may condition non-recreation visitors to self-select as to whether or not they decide to stop for an interview. Since the primary purpose of the interview is to calibrate a mechanical traffic counter, such behavior can lead to bias in the resulting visitation estimate. Non-response bias of national forest traffic was examined by using four different wordings for road signs during NVUM interview days. The experiment was performed using a randomized block design with each treatment (sign) being applied to five different road locations (blocks). Statistical analysis was performed to determine if any particular sign wording significantly affected (1) the rate of visitor response and (2) the mix of visitors who stopped for interviews. Data analysis show that the total number of all interviews obtained, the proportion of interviews obtained to overall traffic, and the proportion of non-recreation interviews obtained were different using different sign wording. The total number of recreation interviews obtained and the proportion of recreation interviews obtained were not different statistically.

Introduction

The USDA Forest Service National Visitor Use Monitoring (NVUM) program collects data about visitors on National Forest System lands (English et al. 2001). It utilizes a stratified multistage sampling design that is based on rotating panels spread over a five year sampling cycle. All national forests in the U.S. are sampled once every five years, with approximately one-fifth of the forests in each of 9 regions sampled each year. This statistical methodology follows conventional sample survey techniques with a few modifications to incorporate specific situations inherent in sampling national forest for recreation use. As in all sample surveys, it is important to accurately determine the measurement variable on each sampling unit selected for the survey. In most natural resource monitoring and sampling situations, the primary measurement variable is directly observable and easily replicated. For instance, in forest inventory a standard diameter tape is used to measure tree diameter or a relaskop is used to measure tree height.

However, unlike other natural resource monitoring efforts the target measure for the NVUM process cannot be obtained directly. In the NVUM survey, the desired measurement variable is the number of people completing a recreation visit at a given recreation site on a given calendar day (referred to as a site visit or SV). Optimally, the measurement process would entail a 24-hour on-site interview protocol in which all people exiting the site were required to participate. This protocol is not possible for several reasons including the length of permitted work day, road department regulations, and government prohibitions against mandatory traffic stops. Consequently, the NVUM sample uses a daily site estimator for SV that gets at the measurement variable indirectly. Basically, a 24-hour mechanical vehicle count is taken along with 6 hours of on-site observation and interviewing. During the 6 hours of interviewing the interviewer places a series of signs along the roadway which encourage visitors to pull off the roadway at a designated interview point. Mandatory stops of randomly selected vehicles are not allowed and the road sign used originally said “Voluntary Recreation Survey Ahead, Please Stop”. The NVUM process relies on the sign wording to minimize any self selection in the number and type of people who stop. The NVUM team suspected that non-recreationists may be less apt to stop for voluntary interviews, thus biasing upward the 6-hour exiting vehicle SV estimator towards more recreationists. Thus, three new signs that did not include “voluntary” or “recreation” in their wording were compared to the original sign.

The visitor use estimation process obtains:
- a ratio of exiting 6-hour observed vehicles to the 6-hour mechanical vehicle count which is used to calibrate the 24-hour mechanical vehicle count, yielding an estimate of total exiting vehicles for the 24-hour period (VEHC),
- an estimate of the proportion of exiting vehicles that are last exiting recreationists (PBAR), and
- average number of people per vehicle (PEOPVEH).

These three quantities are used to estimate SV, the 24-hour recreation use at the site with the estimator defined as

$$\widehat{SV} = PBAR * VEHC * PEOPVEH$$

The accuracy of the $\widehat{SV}$ estimator depends on how well each of the three components (PBAR, VEHC, and PEOPVEH) are estimated. The effects of various sign types should be most influential on the estimation of PBAR because it is totally dependent on the 6-hour interview and its computation is directly affected by the number of recreationists and non-recreationists that stop to be interviewed. For instance, if a new sign has a greater potential to "capture" a non-recreationist as compared to the original sign, the PBAR based on this new sign will be smaller than the original. Subsequently, this will reduce the site visit estimate due to its component in the $\widehat{SV}$ estimator. Obviously, if the new sign tends to be less conducive to non-recreationists, then the opposite effect is possible. Similar interpretations are also available for the behavior of recreationists to the sign. Thus, the effect of sign type on the accuracy of PBAR will be extremely important.

The VEHC component of the $\widehat{SV}$ estimator is virtually independent of the effect of sign types. It is obtained from data collected by the interviewer counting cars that are passing (whether or not they stop) by the interview station during the 6-hour interview period. It also uses the 6-hour and 24-hour vehicle counts, which are independent of the sign types. Thus, the accuracy of VEHC will not be addressed in this sign study.

Another result of non-respondent bias may be a bias of the demographic or occupancy level characteristics (PEOPVEH) within each exiting vehicle. It is conceivable that PEOPVEH may be affected by sign type. For instance, it is possible that parents driving a vehicle with numerous noisy children are eager to return home and would not stop for a "voluntary" interview sign whereas a middle-aged couple traveling leisurely would be more likely to stop. This may result in a negative biasing of the PEOPVEH variable. Although other similar scenarios could be possible, it is believed that this bias will be quite low, especially because past experience has indicated that PEOPVEH is quite stable between 2 and 3 per vehicle. Thus, the accuracy of PEOPVEH will also not be addressed in this sign study.

Methodology

Statistical Methods

This study evaluated the effect of the four sign types on non-respondent bias and variance using a randomized block design to test for differences in visitor response to wording on various road signs. The randomized block design is "an experimental design for comparing t treatments (in this case 4 different road signs) in b blocks (in this case 5 different roads). Treatments are randomly assigned to experimental units (site days) within a block with each treatment appearing once in each block" (Ott 1984, p. 551). Note that the most common randomized block has each treatment once in each block, but the generalized randomized block could have multiple occurrences as we had. In addition, a covariate called "cars" was used in the analysis to account for the differences in the total amount of car traffic on each road. This variable is the 6-hour exiting traffic count and was different for each road. By adjusting for this difference in traffic volume, the variability in the experimental design was reduced which increased the power for statistical tests and the comparisons between the sign means were adjusted to a common level of traffic volume. This design is referred to as a randomized block analysis of covariance.

Sign Types

NVUM tested four road signs with different wording at five locations. The signs consisted of the original sign plus three new signs with different wording. The wording chosen for the signs (treatments) was as follows:
- Sign 1: Voluntary Recreation Survey Ahead-Please Stop (original sign)
- Sign 2: Forest User Survey Stop Ahead
- Sign 3: Traffic Survey Stop Ahead
- Sign 4: Traffic Questionnaire Stop Ahead

The roads (blocks) were:
- Block 1: Grand Mesa Uncompahgre and Gunnison National Forest - Kebler Rd
- Block 2: Eldorado National Forest Ice House Road
- Block 3: Eldorado National Forest Mormon Emigrant Trail road
- Block 4: Eldorado National Forest County Road 63
- Block 5: Sequoia National Forest Hwy 180

Each of the roads had previously been surveyed at least twice using Sign 1. Interviewers then replaced sign 1 with signs 2, 3, and 4 at least one day each on each of the roads. All other interview procedures were followed as usual.

Variables

To assess the accuracy of the $\widehat{SV}$ estimator with respect to the sign types, several variables were defined to analyze the potential bias and variance of PBAR. Estimates of PBAR were compared between the four signs. If these estimates are similar, then it could be concluded that sign types do not alter any potential bias. If significant differences are detected, then it could be concluded that the signs do affect the bias and further consideration would have to be made to determine which has the most appealing bias. Three variables were used in the analysis to assess the bias and are defined as

- REC = number of last exiting recreationists that agreed to be interviewed,
- NREC= number of non-last-exiting recreationists that agreed to be interviewed and
- PREC=REC/(REC+NREC)= proportion of recreationists to all traffic

The variable PREC is analogous to PBAR in the $\widehat{SV}$ estimator and its value directly affects $\widehat{SV}$. The other two variables, REC and NREC, were analyzed to give information on what components of PREC are affected by the signs. For instance, if PREC changes among the signs, it is useful to further analyze REC and NREC to determine what component of the interviewed sampled is mostly affected.

In addition, the variance of the $\widehat{SV}$ estimator was investigated by comparing the number of interviews obtained by each of the four sign types. Generally, the variance can be decreased by simply increasing the total number of interviews obtained. Thus, signs that attract more interviews would possess a smaller, more desirable variance. The two variables used for this purpose are defined as:

- INTSDONE = the total number of interviews performed and
- PINTSDONE = the proportion of vehicles passing the interview location during the 6-hour survey that were interviewed.

INTSDONE is interpreted as the number of interviews that a sign has ‘captured’ and comparisons among the signs will determine which ones are most efficient sampling tools. However, since the traffic volume was not consistent for all survey days, it is conceivable that a specific sign type may have been exposed to more cars and, consequently, would be able to “capture” more for interviews. To adjust for this, the variable PINTSDONE was also used, which could be interpreted more as a rate of “capture” and this should be independent of traffic volume on any given survey day.

Results

The variables tested using the randomized block design analysis of covariance were based upon the number of interviews obtained REC, NREC, PREC, INTSDONE, and PINTSDONE (Table 1). A p-value of .05 or less indicates there was a difference between treatments. In most blocks sign 1 was used 3 or more times, while signs 2, 3, and 4 were used only 1 or 2 times (see Figure 1).

The total number of interviews obtained (INTSDONE) was significant (p=.025) and varied depending upon the sign wording used. The Tukey-Kramer test shows that sign 3 obtains more total interviews (38.3) than sign 1 (21.3). The results show that PINTSDONE (p=.037) and NREC (p=.027) also have significant differences for signs. However, for both variables the Tukey-Kramer test showed no significant differences between the means. However, it is highly likely that significant differences would have been found if the numbers of blocks were increased slightly. Thus, sign 3 and perhaps the other new signs tend to obtain more interviewed vehicles which should result in a decrease in the variance of the SV estimator.

The number of recreation interviews obtained (REC) and the proportion of recreation traffic that stopped for the different signs (PREC) does not show any statistically significant difference (0.757 and 0.121 respectively). However, it is interesting to note that although PREC did not meet the 0.05 significant levels, there is an indication that all three new signs tend to decrease PREC. The average for the new signs was approximately 0.50 while the original sign was 0.68. This difference was due to a larger NREC for the new signs while REC was about the same for all four signs. Since PREC is closely analogous to PBAR in the SV estimator, the effect of the new signs could decrease the SV estimator substantially. One may possibly conclude that NREC visitors did not stop at the original sign as eagerly as REC people, resulting in a non-respondent bias. The new

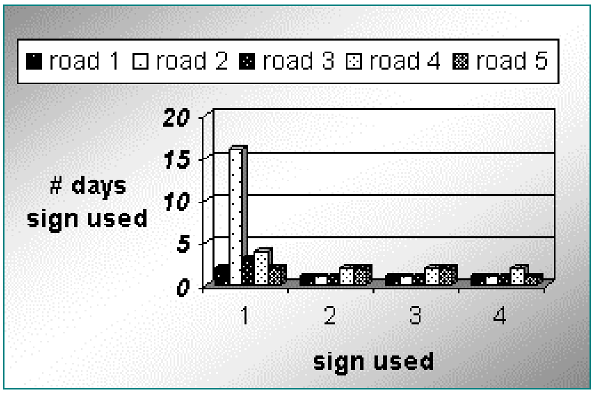

Figure 1. Number of days sign used on five roads using each sign treatment.

Table 1. Results of randomized block design analysis of covariance with ”cars” as a covariate.

Variable		Least Squares Means			
	P-value	1	2	3	4
REC	.757	14.20[a]	15.40[a]	17.90[a]	15.60[a]
NREC	.027	6.10[a]	8.80[a]	15.60[a]	15.40[a]
PREC	.121	0.68[a]	0.49[a]	0.53[a]	0.49[a]
INTSDONE	.025	21.30[a]	28.70[ab]	38.30[b]	35.60[ab]
PINTSDONE	.037	0.12[a]	0.18[a]	0.19[a]	0.21[a]
Cars (average exit car count)		162.9	309.4	211.1	286.3

Means for signs in a row followed by the same letter are not significantly different based on the Tukey-Kramer test at the 0.05 level.

signs then appear to be sampling the visitors more randomly. Since PREC is closely analogous to PBAR, it is then conceivable that there is a 36% (100(0.68-0.50))/0.50=36) difference in the bias of the SV estimates based on sign 1 as compared to the new signs.

Recommendations

Accuracy of the measurement instrument and its resulting SV visitor use estimate depended upon both the potential for bias of respondents and the variability. Based upon the analysis of covariance it appears that the proportion of last existing recreationists, PBAR is affected by sign wording, which affects the bias of the SV estimator. More total interviews were obtained with signs 2, 3 and 4, with sign 3 having significantly more interviews. This sign reads “Traffic Survey Stop Ahead”.

Management must then decide whether or not to use signs 2, 3, or 4. Ancillary information reported by the interviews, as well as the means in Table 1 showed that more people pulled over for signs that included the wording “Traffic” (signs 3 and 4) versus “Recreation” (sign 1) or “Forest User” (sign 2). However, in 3 of the 5 blocks tested, at least one non-recreationist was irritated when they were informed the survey was voluntary.

The NVUM team recommends using sign 3 to increase the total number of interviews obtained (INTSDONE) and to capture a more realistic picture of the proportion of recreation (PREC) traffic. Interviewers must be taught the proper approach with visitors. Since all the information collected from anyone who stops is used to obtain the SV estimate, all responses, whether REC or NREC are needed. The interviewer must be trained to:

– Thank the visitor for stopping and explain the purpose of the survey and
– Ensure the visitor knows their answers are used and valued.

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The development of a remote-download system for visitor counting

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Abstract: Following the first International Conference on Monitoring and Management of Visitor Flows in Recreational and Protected Areas, English Nature identified a need to implement a system of visitor counting on a selection of the 170 National Nature Reserves which it manages across England. A prime requirement of the system was that it should involve a minimal amount of field staff time to harvest the data. Following a competitive tendering exercise, Teknovisiot were appointed as contractors to develop their GSM-based system for use by English Nature.

This paper will discuss the requirements identifed by English Nature and how the system was developed in conjunction with Teknovisiot to meet those requirements. It will include a summary of problems encountered and how these were overcome. The presentation will include examples of data provided by the system.

It is believed that the system now developed by Teknovisiot on behalf of English Nature would have considerable potential for any site manager who has access to a mobile telephone network on their land and an internet modem in their office.

Introduction

English Nature is the government agency that champions the conservation of wildlife and natural features throughout England. There are more than 200 National Nature Reserves (NNRs) in England, of which around three quarters are directly managed by English Nature, and it welcomes over 10 million visitors to them each year.

Teknovisiot oy was founded in 1988. It has specialized in designing and installing datalogging, automation, CCTV and alarm systems, and is engaged in high technology product development for a wide range of customers in the private and public sectors. Today, the company is concentrating most of its resources into developing visitor-counting technology.

Visitor monitoring

Visitor monitoring can be broken into three components (Cope et al. 1999):

- visitor profiling describes the collection of demographic, socio-economic and recreational pursuit participation about users in order to describe visitors to a resource;
- *opinion surveys* are a means of assessing information concerning the attitudes, perceptions and motivations of visitors to a resource, and;
- *visitor counting* describes the collection of quantitative data, indicative of total usage, usage variations or the distribution of visitors to a resource.

While English Nature has engaged in a certain amount of visitor profiling and, somewhat more, opinion surveying; there has been little ‘formal’ counting of visitors to National Nature Reserves (NNRs) but that is the topic which will be discussed in this paper.

Visitor numbers are quoted in the *NNR Annual Report* but these are based largely on guestimates and assumptions as only a small number of NNRs have (or have had) counting systems in operation. Reported by the Site Managers, these systems include:

- “Best guess – roadside car counts – cars in car park – averaging the number of people/cars seen in at a certain time”
- “We have access to the data collected by the Yorkshire Dales National Park Authority who have stile counters on the main access routes to Ingleborough (a large upland site).”
- “Sample counts carried out by the Voluntary Warden Team through the year, then expressed for whole year.(ie. counts at busy weekends and quiet midweek combined).”
- “Sample hour-long counts of visitors entering the most-visited component of the NNR by the most-

used entrance during 1992/1993. These took place in all months during daylight hours, and on weekends as well as weekdays. Monthly averages were then calculated. Lots of extrapolation and guestimating used, hence results not very robust statistically!"
- "Manual step counters used in the past, replaced by pressure-operated data loggers in mid 1990s. Infra-red beam in visitor centre."
- "at Castor Hanglands, voluntary wardens used to write how many cars they saw parked at the entrance. This provided a very good spread of information through the day/month/year, which was extrapolated to give an annual figure.
- "Later we tried an electronic beam counter across the main entrance. This suffered from many problems to do with maintenance and inaccuracy due to wind and rain movements but still provided some useful data."
- "at Barnack: All the entrances were manned by voluntary wardens in a sample survey including some weekends, weekdays and evenings. This was multiplied up to give the final figure. Again, out of date."
- "Automatic system of a focussed beam mounted within a single bollard."

There has never been any strategic approach to the question of counting the number of visitors to National Nature Reserves and yet they are possibly the second largest of English Nature's audiences (second only to the TV and media audience) and one that is of considerable economic value. If the statistics reported in English Nature's annual report (2000) are to be believed, the value of visitors to NNRs during 1999/2000 is calculated as £61,305,000 - a not insubstantial sum when compared to English Nature's Grant in Aid of £47,083,000 for the same year. This value is based on figures from the *UK Leisure Day Visits Survey, 1998* (National Centre… 1999).

Why count visitors?

The reasons for counting visitors have been well rehearsed elsewhere (eg Cessford, et al. 2002) but can be summarised as:

- Firstly, the collection of sound empirical information enables decision-makers to move away from management practices based on guesswork, and misplaced assumptions.
- Secondly, it offers a valuable means of ensuring public participation, which can in turn engender support for management actions.
- Thirdly, and linked to the last point, monitoring provides valuable feedback about management performance and can help focus attention on key areas of concern.
- Fourthly, data derived from monitoring can help strengthen the case for organisations seeking funding, for example from European sources or from the National Lottery.

In addition, there are two further points to add:
- the value of visitors to the local economy which, as mentioned above, is not inconsiderable.
- volumetric data about visitors can be used as a performance indicator and an indicator in 'Best Value' considerations.

English Nature is currently engaged in a number of major projects to increase the accessibility of its National Nature Reserves and of increasing visitor numbers. It was felt to be essential that some means was put in place to measure the effectiveness of the activities undertaken to achieve these increases. The simplest measure to quantify is the number of visitors to the various sites, and it is to this end that a proposal for funding to install a visitor counting system was made. However, it was also recognized that the data collected should be available to be used for any and each of the purposes outlined above. In particular, there is a need to be able to assess the likely impact that extra people may have on the biodiversity of our NNRs and to put in place management methods which will lessen that impact.

How to count visitors?

Clearly there was already some, but limited, experience amongst English Nature's Site Managers of different methods of counting. In addition, Scottish Natural Heritage (SNH) (English Nature's 'sister organisation' based in Scotland) had undertaken research into visitor monitoring and, in particular, visitor counting. Their report (1995) describes a variety of automatic recording equipment and details the suppliers.

English Nature's National Nature Reserves vary widely in their accessibility to visitors. Some have a single footpath and entry point while others have virtually free access from roadsides. Most sites have a number of entrances, some more used than others. For practical purposes it is not possible to count each and every visitor to all of the National Nature Reserves, however it was thought possible to undertake counting at heavily used access points on sites where access is restricted to a small number of 'gateways'. These data would then be validated by random visual survey, and extrapolated to give a total figure for each Reserve.

What method to use?

Manual counts have certain advantages in that qualitative information can be gathered at the same time as quantitative. For example, direction of travel, age and gender of visitor, whether accompanied by a dog or dogs, whether in a group and so on. However, they are very costly in staff time and so it is suggested that they should only be used for 'calibration' purposes to assess the operational accuracy of automatic counters.

In recent years, a variety of automatic counters have been developed to include pedestrian counters, bicycle counters, horse counters and car counters and can now be used to give accurate figures of visitor numbers. The equipment includes break beams, pressure and movement sensors. They can produce a variety of data which, in some cases, can be automatically downloaded to computer for analysis.

There are a number of factors to be considered in planning a programme of visitor number monitoring and these include:

- size of the site
- type of recreational use made of the site
- commonly used access points
- perceived intensity of use
- particular attractions: view points and so on
- location of staff relative to the site
- physical constraints of counter installation
- propensity of vandalism

Further parameters which will dictate the selection of the equipment will include:

- cost
- information requirements
- locational constraints
- staff availability, linked to data-harvesting frequency and methods
- the scale of the proposed project

Two of the considerations given particular weight in English Nature's assessment were 'staff availability' and 'propensity of vandalism'. As with many public-funded organisations, English Nature's staffing is always stretched. It was felt that, any new work required of already hard-pressed site staff would be unwelcome and that any visitor counting system should involve as little staff involvement as possible. While, in England, few of the counter sites are particularly remote, the requirement of some systems for regular, relatively frequent visiting to harvest data was considered to be unacceptable for the project.

Secondly, a number of NNRs do suffer from vandalism from time to time and it was considered to be important that any equipment used for the project should be as well sheltered from vandalism as was possible.

From an assessment of potential counting methods it appeared that equipment at two ends of the spectrum were likely to be best fitted to English Nature's requirements but with an acceptance that there was likely to be considerable variety in the quality of the data they provide.

Mechanical, or 'bale' counters such as stile or gate counters are relatively cheap to purchase and install but only provide 'total count' data and the count data are prone to disruption through interference (ie extra numbers can easily be clocked up by 'trampolining' on a stile step or by swinging a gate to and fro). It was recommended that English Nature should purchase a number of mechanical, 'bale' counters to be used on stiles or gates on sites where visitor numbers were thought to be low. It was suggested that readings should be made from each of these on a quarterly basis, although monthly would be preferable – at least initially. Stile counters are currently used at Stiperstones NNR but the extension of this programme to other sites has not been taken forward as yet – largely because of the staff time input required to harvest data. Also, English Nature is currently engaged in a programme to replace stiles on all of its National Nature Reserves in a drive to increase their accessibility, especially to the elderly, infirm and to families all of whom may have difficulty climbing over stiles.

At the other end of the scale, it was decided to use *Pressure pad counters* since they could be readily concealed, buried within the path in a manner that cannot be detected. They operate by the weight of the pedestrian compressing the pad, thus triggering a count. For this counter to work effectively, the location of the pad is crucial and one potential drawback is that they may not work effectively when the ground is frozen. However, SNH suggest that "Generally speaking, this is the most reliable type of people counter at present (Scottish Natural Heritage, pers comm 2001) and the one which we would recommend for use on NNRs." The data-logger is located in a separate waterproof container and can be concealed some distance from the path.

Prior to the last conference, in January 2002, it had been intended to down load data on site, or through removing the EPROMs (Erasable Programmable Read-only Memory) for it to be taken back to the office to down-load. However, it was perceived that this approach had a considerable number of potential drawbacks – not least the staff input required to harvest the data on a regular basis regardless of weather and other conditions.

Teknovisiot and Metsähallitus (Forest and Park Service, Finland) gave a poster presentation during the First International Conference on Monitoring and Management of Visitor Flows in Recreational and Protected Areas, in 2002, which indicated that they were developing a remote-download facility which could overcome all of the concerns about on-site data harvesting. While relatively costly in terms of 'capital', the 'revenue' costs were much lower than traditional methods.

The Trial

A trial, or pilot study, was carried out by English Nature on twelve National Nature Reserves in different parts of England and with different habitat and visitor characteristics. The locations of these sites are shown in Figure 1.

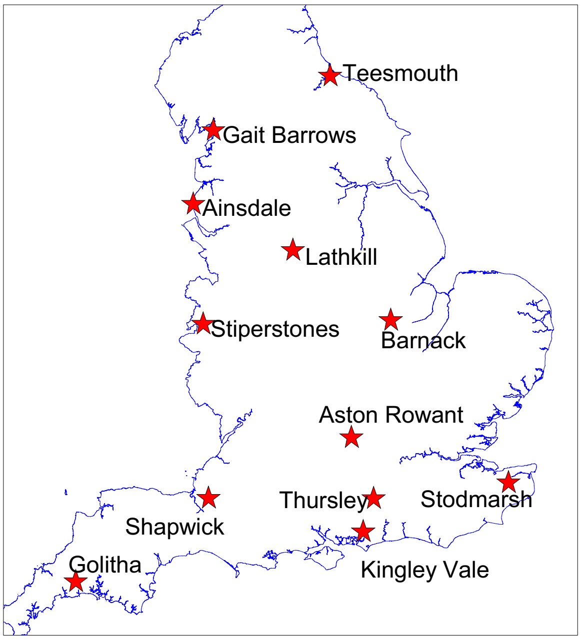


Figure 1. Location of visitor counters in trial.

The equipment involved

A total of 20 VisitLog™ units and 22 VisitMats™ were puchased by English Nature for use in the trials.

VisitLogs are data logging and system control units, developed by Teknovisiot ltd, which can take inputs from various counting sensors such as VisitMats. More than one sensor (typically a pair) can be connected to a VisitLog to give directional flow data or, as at two of the pilot sites, to record the use of two nearby paths.

VisitMats are constructed of robust vulcanised rubber and are embedded into the ground at a suitable depth. The sensitivity of the VisitMat can be adjusted according to the dynamic pressure on the mat's surface through the ground layer.

VisitMats can be supplied in a variety of lengths, typically from 1 to 10 metres, but for the purposes of this trail were bought in lengths from 1.5 to 2.5 metres dependant on the width of path under which they were to be placed. They were buried to a depth of c 10 cm and, where the ground was stoney, placed onto a 2–3 cm bed of sand as shown in Figure 2. A further, similar layer of sand was placed above the mat before the replacement of the original path surface material. The VisitMats were connected by cable to the VisitLogs which were buried, together with a power source, in a waterproof container a short distance from the path. The cable was led through a length of 25mm diameter water pipe, or similar, to give it some protection.

Figure 2. VisitMat *in situ* before path surface restoration.

The power source used in the initial tests was a 'leisure' type 12 volt battery sufficient to give a low power output over a long period. It was suggested that such batteries might need recharging on an annual basis because of the very low power use of the equipment. Following the initial tests, a further development has been to install a small solar panel at one location to test the possibility of powering the units this way. To date, this seems to have been successful, in which case, after a further period, such units might be installed at other suitable locations meaning that they might practically never need to be visited for maintenance (one of English Nature's prime considerations in the decision of which system to install).

The pits containing the battery and logger were lined with concrete blocks and either covered by a paving slab or by a steel manhole cover. The latter method made the unit look like a standard utilities inspection pit. In some installations, the battery and VisitLog were placed into a covered plastic box within the pit to give some protection from moisture or high water-tables (Figure 3).

Figure 3. VisitLog and battery in a plastic-box lined.

The only part of the system which remained exposed to view was a small aerial attached to a nearby tree or fence post. This meant that the whole installation was virtually invisible to the casual visitor, as can be seen from Figure 4, and so, that the system was more or less vandal-proof (another of the original important considerations).

Figure 4. Aerial attached to tree trunk.

The UK is generally well served with GSM signals although, in some of the remoter parts, signal strength may be variable. Consideration was given to installing a local radio set-up at one location where the VisitMat was situated at the bottom of a gorge. However, testing on site prior to the actual installation established that even in this location it was possible to obtain a GSM signal and so the radio link trial was abandoned. It is, however, quite possible that a workable link could be set up to 'bounce' the data from a location where a GSM signal is unobtainable to another where a signal is available.

An advantage of using a 'foreign' SIM card in the VisitLog units is that they will search for almost any network signal that is available in the UK and they are not restricted to, for example, a Vodafone signal or an Orange signal in the way that a UK-purchased Vodafone or Orange SIM card would be. This means that, where signal coverage by a particular network is poor, it may still be quite possible to install a GSM system if another network signal is of sufficient strength.

The data harvesting and data-transfer arrangements

Where this particular system differs from other similar 'pressure pad' visitor counters is in the manner of data harvesting and data transfer (see Figure 5).

The VisitLog unit contains a GSM modem which transmits the data via 'mobile telephone' technology to Teknovisiot's computer system in Pargas, southern Finland. This means that there is no need for staff ever to visit the counting site for the purpose of data harvesting.

The download from the collection points is controlled by Teknovisiot's computer based database system, where the collected data is stored. The VisitLog contains a memory buffer which will store up to 60 days worth of data in case contact cannot be made for some reason. The system also records the GSM signal strength and residual battery power and so can alert staff to potential problems.

From Teknovisiot, the data is available via the internet to authorised users (including the site managers and other English Nature staff) using reporting software. This provides the data in both tabular and graphical formats with the ability to download selected data into Excel spreadsheets or as PDF format files.

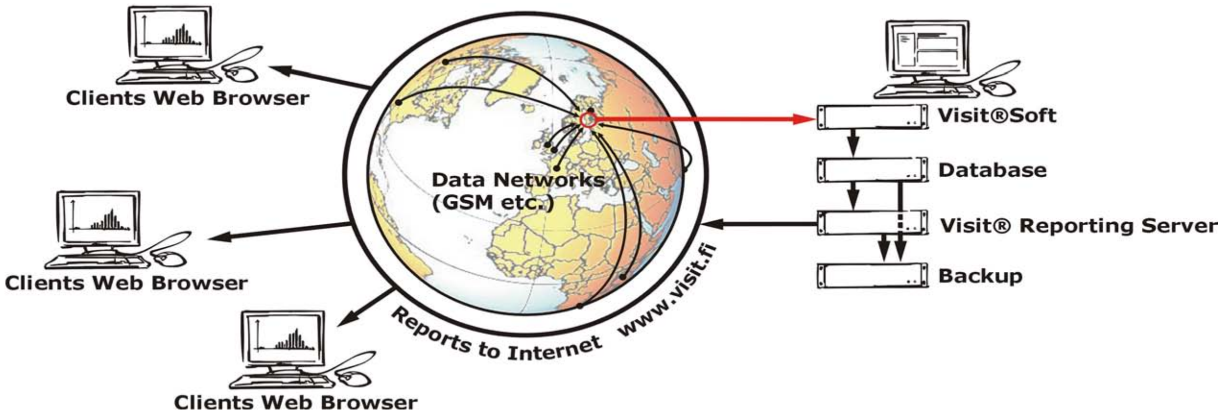


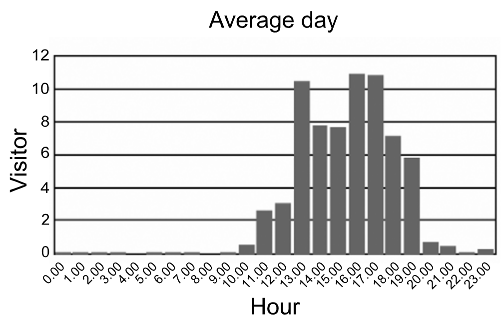
Figure 5. The systems operating principle.

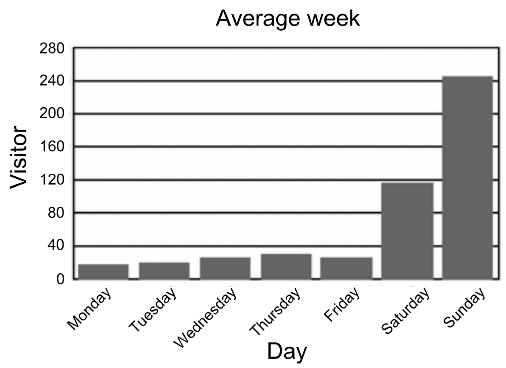
The structure and timing of these reports can be modified according to the requirements of the user. The automatic reports are typically generated daily but the data can be shown on other periodical bases. It is also possible to integrate the data from other databases to produce optimization tools.

Examples of data collected and how it may be used

The VisitLog records data at 6 minute intervals throughout the day. However, for English Nature's purposes data is reported on an hourly basis. This provides a wealth of data in a variety of standard report formats which were developed to meet English Nature's requirements.

The data shown in Figure 6 comes from a, currently little used, entrance to the Aston Rowant NNR in southern England. There is an objective to raise awareness and visitor levels at this Reserve over the next 24 months. The purpose of placing counters at the location now is to establish the datum from which it will be possible to see if the objective has been met.





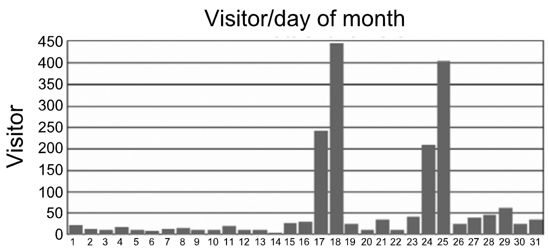


Figure 6. Examples of data collected. (NB the time of day is shown as GMT+2 and is yet to be corrected.)

Summary of problems encountered

The trials were not conducted without encountering a number of problems. These ranged from administrative matters such as lengthy discussions with other government agencies over the need for radio-telecommunications licences for the 'local radio link' which, in the event, was never installed; to a subcontractor making alterations in the specification of the VisitMats which led to the need to redesign part of the software in the VisitLog.

There were some problems thought to have been associated with dampness affecting the electronics of the VisitLog units which caused unusually high counts followed by failure of the system until it could be re-booted. In two cases, complete flooding of the count locations caused short-circuiting of the battery with the result that the counters were relocated to higher ground. In addition, more consideration has been also given to providing waterproof enclosures for the VisitLogs and batteries and for further waterproofing of the plugs and connectors.

Calibration of the amplifier in the VisitLog also caused some problems, as can be seen in the 'Visitors/Day of month' chart above. The unit mis-recorded for the first half of the month until it was properly adjusted.

The greatest problems were in establishing any lasting GSM communication between the VisitLogs on sites in the UK and Teknovisiot's computer in Finland. However, perseverance paid off in the end and, after a number of software upgrades carried out both in Finland and on site visits in England, a fully working network of counters has now been established.

Conclusions

We believe that, for simply counting numbers of 'visitations' or to establish the patterns of use of particular paths in more or less remote locations, a system based on that developed and trialled by English Nature and Teknovisiot is a perfectly viable option.

The system relies on the availability of a GSM network signal but these are becoming more and more widespread as mobile telephones become ubiquitous. We believe that the data can be 'bounced' from locations without GSM coverage to others that do and so can still be harvested in much the same way.

The system, once installed, never needs to be visited for data harvesting and rarely needs to be visited for routine maintenance – especially if it is linked to a solar or other similar local power source.

The system trialled is virtually invisible – particularly to the majority of visitors – and so the likelihood of vandalism or tampering is considerably reduced when compared to some other systems.

The system is 'capital expensive' but 'revenue cheap'. However, the cost of data manipulation software licences associated with some other commercially available systems makes their overall costs comparable to the capital costs of this system.

Data is made available to all authorised users concurrently through secure internet connection. Data is pre-formatted into pre-determined graphical formats as well as being presented in a raw numerical state.

The system counts 'visitations'. There has, as yet, been no attempt to convert these figures into real 'visitor' numbers.

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Further information is also available at:

www.english-nature.org.uk
www.teknovisio.com/visit/eng

Mapping the Intensity of Recreation Impact in the NP Losiny Ostrov, Moscow

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Abstract: General recreational situation in the NP Losiny Ostrov (Moscow) is analysed. The technique of field observations and computer mapping of recreation intensity and status of forest landscapes is described. Corresponding maps are represented and correlated with the location of residential regions, entrances, and basic visitor flows. Five areas of intensive effect of stationary recreation were revealed at the studied territory of ca. 600 ha. In most cases, extreme recreation is thought to be the main reason of forest decline and decrease in recreational carrying capacity. Top-priority areas of landscape improvement were revealed. Maps reflecting the spatial distribution of recreation intensity and status of forest landscapes are regarded as an appropriate instrument of territorial planning.

Introduction

National Park (NP) Losiny Ostrov is one of very few national parks of the world, which are situated in the national capital. Total park area is 128 km^2, which constitutes ca. 10% of Moscow area. One-quarter of its territory (31 km^2) is located within the city boundaries (Figure 1). The suburban part of NP territory is surrounded by cities – satellites of Moscow, with their developed industrial infrastructure.

The national park is visited mainly by the inhabitants of adjacent districts; only a minor part of visitors comes from remote districts of Moscow, predominantly as organised tourist groups.

Figure 1. National Park Losiny Ostrov and other green territories of Moscow and its suburbs.

The recreation in forested areas is very popular among urban population. The most common types of recreation are short-term visits to the peripheral areas of NP: walking, jogging, skiing in winter season, and picnics. The latter cause the most noticeable negative influence on NP landscapes, especially when they are accompanied by fire-making, which is prohibited in the national park and in Moscow in general.

The studies, carried out by the International Forest Research Institute (Moscow, Russian Academy of Natural Sciences) in 1990-s demonstrated that the recreational carrying capacity of peripheral forest massifs of the NP was exceeded by a factor of 5-6 (Proekt organizatsii... 1998).

Expert evaluations revealed that visitor flows were distributed extremely unevenly across the park territory (Gorokhov et al. 1990). Hence, there are several areas where the attendance is critical.

National parks have to combine nature conservation with the development of recreational and tourist activities. For this purpose, the evaluation of recreational impact, its spatial distribution, and recreational planning is extremely important.

Systematic studies of recreation impact were initiated in the NP Losiny Ostrov in 2000-2001. Twenty permanent observation plots were set in order to determine the effect of recreation on forest status. Trampling was found to cause soil compaction and decrease in radial increment of forest stands.

Monitoring at permanent plots helped to reveal the mechanisms of recreation effect and determine some critical values. However, permanent plots are point objects and prevent us from obtaining the picture of spatial distribution of anthropogenic effect. In 2001, a model territory with the area of ca. 150 ha was chosen in order to evaluate the character of spatial distribution of recreation intensity and its relation to the spatial distribution of forest stand characteristics. The method of circular relascopic plots, which is commonly used in forest inventory, was applied (Shapochkin et al. 2003). Survey units were evenly distributed across the model territory and represented maximal variety of forest landscapes and recreation intensity. As a result, the most visited and most damaged sites were found to concentrate in the 1-km belt along park boundaries or around the most attractive places (Shapochkin & Kiseleva 2002).

The next stage of recreation studies is continuous mapping of recreational situation. This paper represents the results of recreation studies undertaken in 2003 and aimed at:

– finding an appropriate and simple technique for large-scale recreation survey;
– exploring and mapping the recreational situation in the most visited sites of NP;
– revealing the sites with extreme attendance and/or damaged forest landscapes;
– suggesting the system of practical measures directed to the improvement of forest status and recreational carrying capacity.

Materials and Methods

Recreation intensity and impact were studied and mapped in the most visited sites of urban part of NP. Totally 3 sites with the area of 200, 140, and 330 ha were examined (Figure 2). They all border with high-populated residential areas. Maximal simultaneous attendance, calculated from the number of inhabitants, is evaluated as 7300, 4000, and 8300 persons, respectively. Since 1970-s, these sites were developed as local recreational areas, therefore, they are dissected by the net of pedestrian roads, often with asphalt and gravel coverage. In the westernmost site, in the valley of the Yauza River, complex landscape reconstruction was implemented in early 1990-s. As a result, the landscape became much more attractive and, accordingly, much more visited.

Forests of the sites selected differ by age and composition and thus, by attractiveness and carrying capacity. In fact, the sites represent three relatively independent recreational zones differing by natural conditions and social situation, in particular, interests of visitors coming from adjacent residential zones. Social structure and differentiated needs of visitors are to be studied in future.

Currently, the studies are focused on the issues of exceeding of carrying capacity and spatial distribution of visitor flows and recreation impact.

In order to evaluate the spatial distribution of recreation intensity and landscape status, a 100-m regular grid of observation points was used. In relatively intact sites, the grid was sparsed. The status of landscape at each point was characterised by a number of parameters. To make the work less labour- and time-consuming and avoid sophisticated measurements, semiquantitative indices were used.

The intensity of recreation was characterised by the percent of trampled surface, as trampling is the most pronounced and obvious aspect of recreation. According to the percent of trampled surface, the landscapes are assigned corresponding stage of recreational digression: I – below 1, II – 1-5, III – 5-10, IV – 10-25, and V - >25%.

Forest landscapes were characterised by the status of tree layer, undergrowth, and herbaceous vegetation.

The status of tree layer determines the stability of the whole forest landscape. The grades of sanitary status of forest stands are: 1 – healthy, 2 – depressed, 3 – strongly depressed, 4 – destroyed; subject guide was used to determine the grades.

The status of undergrowth determines the alternation of forest generations and thus, potential stability of forest landscapes. Undergrowth status was characterised by density and vitality, with corresponding

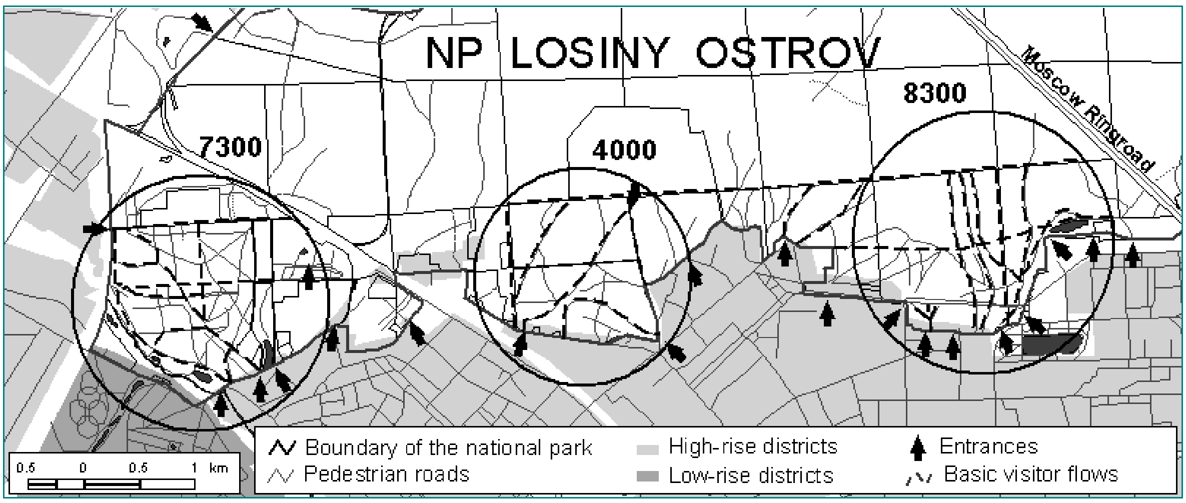

Figure 2. Location of studied sites (circled) in the south-western part of the NP Losiny Ostrov. Figures above the circles represent maximum simultaneous attendance.

grades: 1 – low, 2 – medium, 3 – high. Integral grade was obtained by multiplying the grades of density and vitality; product indices of undergrowth status were arranged as following: 0-1 – critical; 2-3 – unsatisfactory; 4 – satisfactory; 6-9 – undamaged.

The status of herbaceous vegetation is a clear indicator of intra-ecosystem changes. Predominant groups of species of herbaceous vegetations were described at each point: typical forest species, forest-meadow species, gramineous, or weeds.

Fireplaces and extremely trampled sites were mapped separately as point objects.

The data of field observations were put on the database, which was than used for the creation of new coverages in GIS projects with the help of ArcView, version 3.2.

At the first stage, the grid of point objects was created (Figure 3a). Then the groups of points with equal grades were encountered (Figure 3b), and the polygons reflecting the spatial distribution of studied characteristics were produced (Figure 3c).

The data were treated statistically in order to find interrelations among the characteristics of recreation intensity and forest status.

Results

Compiled maps reflect quite a complex and contrast recreational situation in the most visited sites of NP.

The analysis of *recreational digression* demonstrates that the status more than 50% of the territory corresponds to the second and third stages, which are assumed to be permissible for normal forest growth. At this background, large areas with the status corresponding to the 4th and 5th stage of recreational digression (>10 and >25% of trampled surface, respectively) are revealed. They are not obligatorily attributed to the basic directions of visitor movement but form continuous areas in the peripheral part. These areas are characterised by multiple fireplaces and frequently found rubbish. Totally, 5 large areas of this kind were detected at the maps (Figure 4a). In addition, the observations allowed us to detect multiple “hot points” characterised by extreme trampling.

This points to a pronounced lack of places for stationary recreation near residential zones.

The most common *status of forest stands* is characterised as depressed, with the fragments of healthy and strongly depressed ones (Figure 4b). The latter form relatively large areals in the zones of extreme recreation intensity. However, besides recreation, other factors of forest decline were revealed: site overmoistening, diseases, and pests.

The status of undergrowth is mainly satisfactory within the studied territory. The areals with critical and unsatisfactory status form linear contours along the directions of major visitor flows or are attributed to the most visited peripheral part of the territory (Figure 4c). In some cases, unsatisfactory undergrowth was observed under dense forest canopy.

The *composition of herbaceous vegetation* proves to depend much on recreation intensity. Gramineous and weed species appear with increasing recreation intensity when trampled surface exceeds 10% of the area.

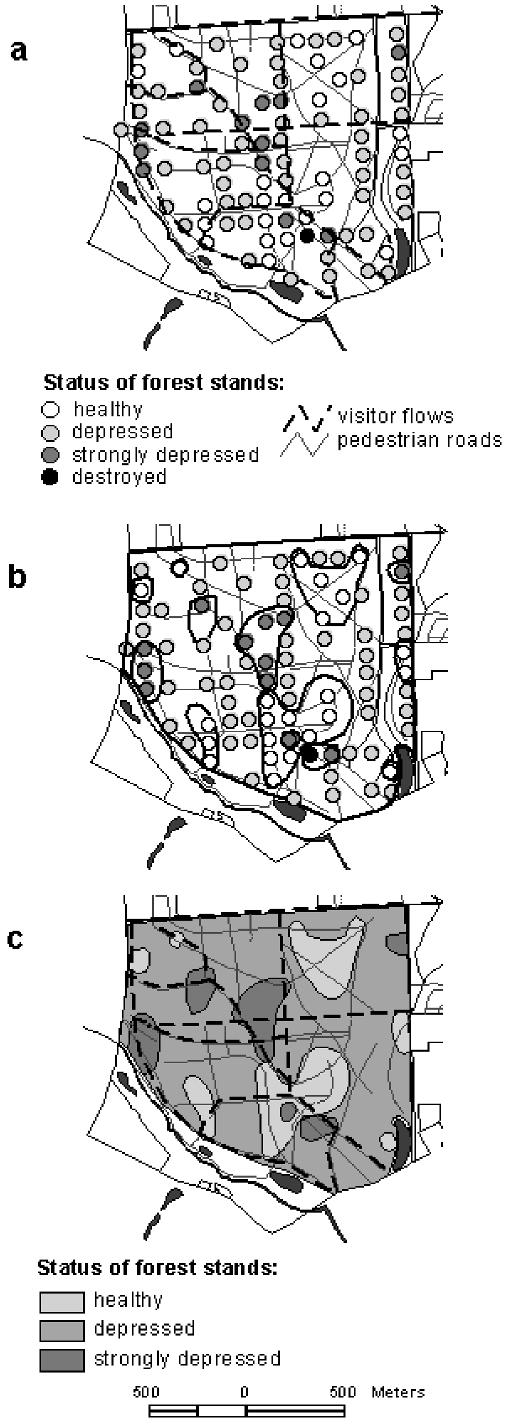

Figure 3. Stages of computer mapping: point objects (a), linear contours (b), and polygons (c).

This also points to the destabilisation of landscapes and decrease in their carrying capacity. Simultaneously, the islets of relatively undisturbed forest stands were found even in the most visited zones. This indicates that: (1) the net of pedestrian roads is temporarily stable, and visitors prefer to use them instead of searching new ways and (2) forest ecosystems possess a satisfactory potential of self-regeneration in case of reorganisation of visitor flows.

Practical Issues

The analysis of compiled maps allowed us to work out some practical recommendations considering the improvement of recreational situation.

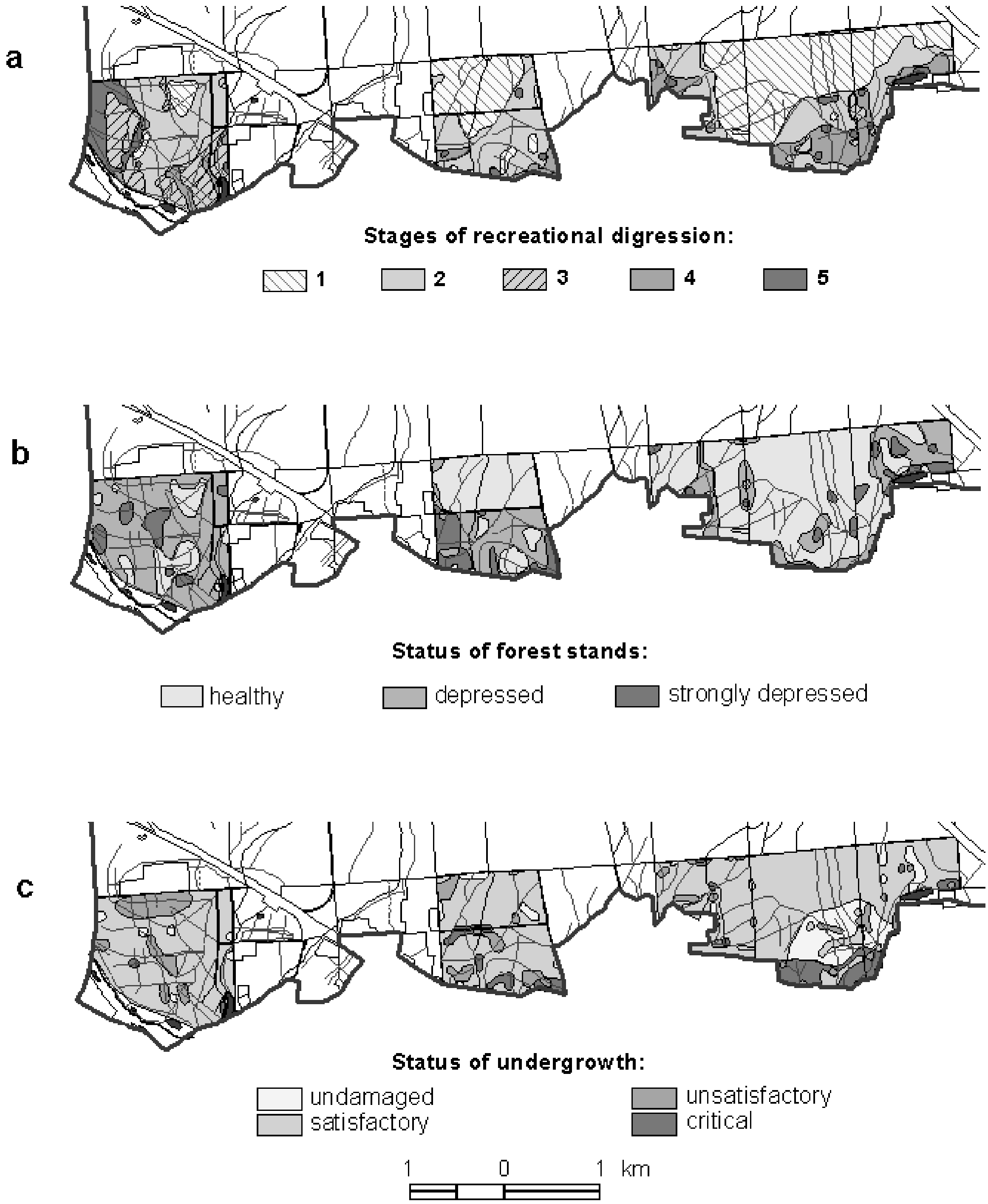

Figure 4. Maps illustrating the spatial distribution of recreation intensity (a), status of forest stands (b), and undergrowth (c).

(1) An obvious lack of facilities for stationary recreation leads to the emergence of stochastic picnic places spreading into the forest massif. In connection with this, there is a need in setting benches, tables, sheds, etc. along basic directions of existing visitor flows. They must be surrounded by hedges in order to avoid extra-trampling around.

In general, the development of recreational and tourist infrastructure should become the main instrument of management of visitor flows.

(2) Ground pedestrian roads should be covered with gravel or waste wood to protect tree roots.

(3) Stochastic fireplaces must be liquidated and replaced by groups of trees and bushes.

Simultaneously, the work with visitors should be conducted: more visitor-addressed information explaining the damage caused by fires is needed.

(4) In order to increase forest resistance to anthropogenic effect, it is necessary to restore full-component forest ecosystems by creating under-canopy cultures or planting groups of trees and bushes when necessary. These groups will serve as centres of regeneration of natural forest herbaceous vegetation and nesting areas for birds.

(5) Some fragments of significantly depressed and declining stands need reconstruction cuts: sparsing of upper weak tree layers in order to promote a proper development of undergrowth. At the studied territory, this will enhance natural restoration of oak and other broad-leaved trees, which are known to be more resistant to recreation effect and correspond to soil conditions of the territory.

(6) Sanitary cuts are recommended for elm stands destroyed by vascular stem disease, with the formation of half-open landscapes.

The recommendations also were mapped. The fragment of a map of this kind is represented at Figure 5. Visualisation of recreational situation and recommendations makes it possible to evaluate the volume and scale of indispensable work and determine top-priority objects.

Conclusions

(1) Applied technique of mapping of recreation intensity and impact on forest landscapes proved to be appropriate for large-scale inventory.

(2) Mapping of recreational loads demonstrates that the spatial distribution of recreation effect is contrast: both relatively intact and severely degraded sites were revealed; they often form the mosaic complicating territorial planning.

(3) The status of the most part of forest stands is characterised as depressed but not endangered.

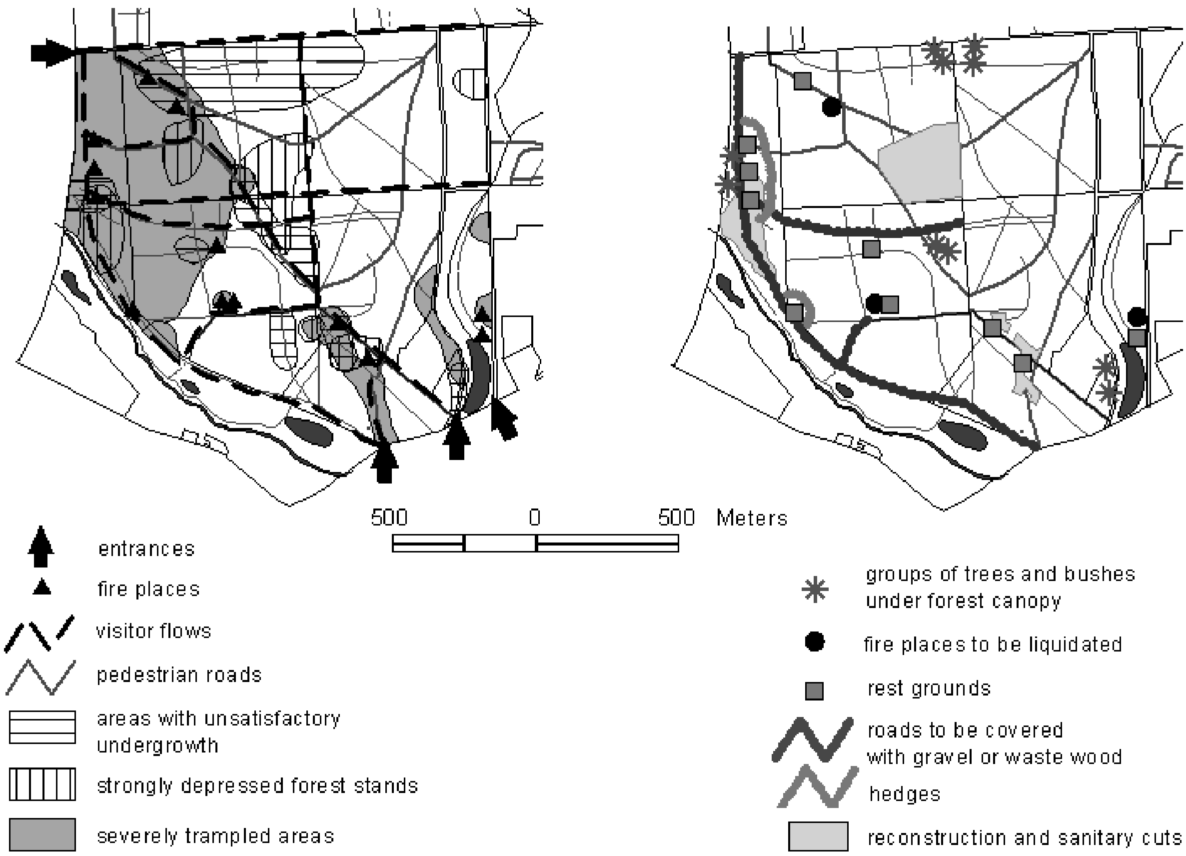

Figure 5. Example of integrated representation of endangered sites (left) and corresponding measures of landscape improvement (right).

Healthy stands usually are attributed to the least visited areas. The areals of severely depressed and declining forests are in most cases detected in the areas with the highest stages of recreational digression. The exceptions are the fragments with local overmoistening and the stands attacked by diseases or pests. This allows us to treat the intensity of recreation as a leading factor of forest decline.

(4) The undergrowth is mainly vital within the studied territory. The areals of undergrowth with critical and unsatisfactory status are related to the directions of major visitor flows or picnic places. In the same sites, crucial changes in the composition of herbaceous vegetation are registered. The absence of undergrowth and disappearance of typical forest species point to the destabilisation of ecosystems and decreased resistance to external effects, which may reduce the recreational carrying capacity.

(5) Within the studied territory of 600 ha, five areals demanding complex restoration measures were detected.

(6) Main principles of increasing the carrying capacity and stability of forest landscapes in the studied zone are:

– liquidation of fireplaces by planting groups of trees and bushes;
– organisation of facilities for rest along basic directions of visitor flows;
– strengthening of pedestrian roads with graved or waste wood;
– restoration and sanitary cuts in declining stands with following regeneration of more resistant broad-leaved species or formation of half-open landscapes.

The system of recommendations is visualised as a series of maps, which facilitate the work of decision-makers and practical workers. The results of recreational mapping represent an important stage in the development of recreational and tourist infrastructure in NP.

(7) The next stage of territorial planning is a substantiated development of tourist infrastructure, which will serve the instrument of management of visitor flows.

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Comparing Indicator Effectiveness for Monitoring Visitor Impact at Intervales State Park, Brazil: Park Ranger-Measured Versus Specialist-Measured Experience

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Abstract: This study was conducted to aid administrators in overcoming some barriers to implementation and maintenance of programs for monitoring visitor impact to Brazilian protected areas. One of the problems refers to continuity in collecting field data due in part to lack of institutional commitment. In order to verify the effectiveness of surveys carried out by park employees, the difference between data collected by park rangers and those collected by specialists was studied so that simple and dependable indicators could be selected. 26 indicators of physical attributes were analyzed for four intensive-use trails at Intervales State Park through systematic sampling of points. Results indicate that the group of rangers produced more homogeneous data than the group of specialists did. Significant differences were more frequent among quantitative indicators. Indicators chosen according to their dependability criterion were: bird sighting and hearing, vandalism to park facilities, rock graffiti, number of damaged or carved trees, number of perceptions of vehicle noise, number of exposed rocks, visible erosion, trail depth, traces of fauna and trash litter.

Introduction

Not until recently have studies on impacts of visitors and on monitoring methodologies been conducted in Brazilian protected areas. Even more recent is the use of planning systems such as Limits of Acceptable Change – LAC (Stankey et al. 1985) and Visitor Impact Management – VIM (Graefe et al. 1990), Kuss et al. 1990) in recreation management plans and technical work. Those plans, however, end up not being implemented or lack continuity in the management actions that they recommend.

Scarcity of resources, insufficient personnel, high personnel turnover, inadequate training in park management and lack of consistent and continued policies all hinder adequate implementation of management strategies in Brazilian parks.

In a study on protected area management in Brazil, Brito (2000) verified that many of the management actions are actually responses to critical situations requiring prompt action. According to the author, employees' action is usually based on their experience, with successes and failures, with consequences to biodiversity and to the public.

Despite park administrators' engagement in the planning process, specific plans for structuring recreational activities are devised by hired technical consultants. Thus, to enable continuity of implementation of management strategies as part of the administrative routine it is necessary to assure employees' involvement and commitment.

Having in mind the relevance of the impact of recreation on the environment and on visitor experience in protected areas, it is essential that management decisions be based on objective and dependable information. When gathered periodically as part of a monitoring program, that information may help identify changes before the impact becomes too severe or irreversible (Leung & Marion 1999). Obvious though it may seem, that does not represent reality in Brazilian parks.

Criteria for the selection of indicators and characteristics of good standards are suggested by some authors (Graefe et al. 1990, Whittaker & Shelby 1992, Manning & Lime 2000, Krumpe 2002). According to Cole and McCool (1998) an indicator's most relevant characteristic is its ability to measure and to quantify. For Belnap (1998) little attention has been given to studies that focus on the process of selecting indicators.

In some specific cases, programs for monitoring impacts of recreational use are not implemented due to the lack of credibility of data collected by field personnel. Feasibility and dependability are two essential qualities in choosing good indicators and they are related to that matter. Indicators that can be measured and quantified must have a direct relation with those two criteria.

A discussion of the characteristics of a series of indicators observed and measured by employees in a park as compared to those done by a group of specialists may help implement more dependable monitoring programs.

This study focused on assessing which indicators may be accurately measured by different observers. Two groups were studied, one comprising park rangers and the other made up of environmental specialists.

Research question and hypotheses

After recognition of the need to select dependable recreational impact indicators to implement a monitoring program at Intervales State Park the following question was proposed: do park rangers observe and measure indicators the same way as specialists do? That question led to the following hypotheses:

Hypothesis 1 (null): impact indicators are observed and measured the same way when collected by different individuals and groups.

Alternative Hypotheses:

Hypothesis 1a: analysis of impact indicators results in non-significance (p-value >0.05) between data collected by park rangers and those collected by specialists.

Hypothesis 1b: analysis of indicators results in non-significance **(**p-value >0.05) among data collected by distinct individuals within the group of park rangers.

Hypothesis 1c: analysis of impact indicators results in non-significance **(**p-value >0.05) among data collected by individuals within the group of specialists.

Methods

Study Area

Intervales State Park is located 270km south of the city of São Paulo, in southeastern Brazil. The 41,705-hectare park is connected to four other protected areas and is part of the Atlantic Forest Biological Reserve, a World Heritage Site as designated by UNESCO in 1999.

Most visitors to Intervales are involved in one-day hiking activities and the park's main attractions are caves and waterfalls. Over fifty caves have been recorded and surveyed to date. The park used to be an old farm and therefore is served by a large network of roads and trails. After more than twenty years without use, many of those paths are now being added to the system of recreational trails for visitors. They are short trails, ranging from 100 meters to 2,000 meters in length.

Heavy pedestrian traffic in recent years has led to impacts which are unacceptable to both the park's administration and to visitors. That problem was first discussed in the Visitor Impact Management Plan carried out in 1999 (Passold 2002), when serious problems of erosion and drainage were reported. A monitoring plan was then presented using a series of indicators. Part of the actions was implemented, but to this date the monitoring plan has not been put to use.

Sampling

Four intensive-use trails with a total of 1,824 meters in length were assessed by means of systematic sampling of points. Due to its simplicity of implementation, that sampling approach is mentioned by Leung and Marion (1999) as being probably the most usual in impact trail assessment and monitoring studies.

Data collection was carried out by nine persons selected to take part in this study. One group comprised four park rangers and the other was formed by five specialists. In a comparative analysis of both groups all sampling points of the four trails, totaling 33 points, were considered in bulk, as one set of data. Observations and measures of qualitative and quantitative indicators were taken at fixed intervals of 25m, 50m and 100m along routes and according to trail length. A list of all 26 indicators recorded during the assessment is presented in Table 1.

Table 1. Ecological and Social Impact Indicators.

Quantitative Indicators	Qualitative Indicators
1-Number of exposed roots	12 - Presence of exotic species
2- Number of trees with bromeliads and orchids	13 - Composition of vegetation
3- Number of trees or bushes with broken branches	14 - Density of vegetation
	15 - Amount of litter
4- Extent of diseased vegetation	16 - Apparent cause of social trails
5- Number of social trails	17 - Visible erosion
	18 - Drainage problems
6 - Number of exposed rocks	19 - Hazards
7 - Trail width	20 - Type of hazards
8 - Trail depth	21 - Bird sighting or hearing
9 - Number of carved/damaged trees	22 - Presence of Wildlife Sightings
10 - Number of perceptions of vehicle noise	23 - Vandalism against park facilities
11 – Number of noise or quarry explosion	24 - Rock graffiti
	25 - Presence of trash litter
	26 - Sanitation problems

Shapiro-Wilk's non-parametric test to assess normality of quantitative data was used in this study. For comparison between the two groups, data were analyzed by means of Friedman's test for quantitative variables (Zar 1984) and Likelihood Ratio Chi-square (χ^2) to assess independence or homogeneity of qualitative variables (Mann 1995).

Results

Parametric statistics could not be utilized for comparison between groups because of asymmetrical distribution of the data presented by the quantitative variables. In the comparison test between groups and among individuals within the same group the quantitative variables did not present normality either for t-Student parametric or for Shapiro-Wilk non-parametric tests.

Friedman's non-parametric test was thus used for quantitative variables while the Likelihood Ratio Chi-square test was used for qualitative variables.

Results of the comparison between the two groups (park ranger and specialist) and among individuals within the same group are shown in Table 2.

Hypothesis 1a: analysis of impact indicators shows non-significance (p-value >0.05) between data collected by the group of park rangers and those collected by the group of specialists.

Table 2. Comparison between the two groups and among individuals within the same group

Indicators	Between Groups	Park rangers	Specialists
Number of exposed roots	0.083(F)	**0.021*(F)**	0.891(F)
Number of trees with bromeliads/orchids	0.234(F)	**<.0001**(F)**	**<.0001**(F)**
Presence of exotic species	0.335 (G)	0.658(G)	**<.0001**(G)**
Number of trees or bushes with broken branches	0.215(F)	**0.030*(F)**	**0.036*(F)**
Extent of diseaded vegetation	**0.024*(F)**	**<.0001**(F)**	0.975(F)
Composition of vegetation	**0.004**(G)**	NR [a]	0.852(G)
Density of vegetation	**0.004**(G)**	NR [a]	0.323(G)
Amount of litter	**0.012*(G)**	NR [a]	0.603(G)
Number of social trails	**0.000**(F)**	NR [a]	0.994(F)
Apparent cause of social trails	**<.0001**(G)**	NR [a]	0.915(G)
Number of exposed rocks	**0.000**(F)**	0.467(F)	0.133(F)
Visible Erosion	**<.0001**(G)**	0.217(G)	0.079(G)
Drainage problems	**0.047*(G)**	0.774(G)	**<.0001**(G)**
Trail width	**0.000**(F)**	**0.002**(F)**	0.353(F)
Trail depth	**0.000**(F)**	0.891(F)	0.097(F)
Hazards	**0.002**(G)**	0.904(G)	**<.0001**(G)**
Type of hazards	**0.003**(G)**	0.428(G)	**<.0001**(G)**
Bird sighting or hearing	0.078(G)	0.845(G)	0.412(G)
Presence of wildlife sightings	**<.0001**(G)**	0.476(G)	0.314(G)
Vandalism against park facilities	0.788(G)	0.205(G)	0.537(G)
Rock graffiti	0.417(G)	0.764(G)	1.000(G)
Number of carved/damaged trees	0.843(F)	0.876(F)	0.933(F)
Presence of trash litter	**0.015*(G)**	0.424(G)	0.585(G)
Sanitation problems	0.123(G)	NR [a]	0.156(G)
Number of perceptions of vehicle noise	0.836(F)	0.149(F)	0.231(F)
Number of noise or quarry explosion	**0.007**(F)**	0.380(F)	**<.0001**(F)**

(G) Likelihood Ratio Chi-Square for qualitative indicators
(F) Friedman test for quantitative indicators
* Differences statistically significant at p= 0.01-0.05. (Indicated with bold letters)
** Differences statistically significant at 0.01 level, valor-p<0.01. (Indicated with bold letters)
[a]NR= (non registred indicator by wardens group)

Results showed that, from Friedman's non-parametric test (p>0,05) and the probability test in the assessment made by both groups, 16 indicators presented significant values and 10 presented non-significant values, as shown in Table 3.

Hypothesis 1 b: analysis of indicators shows non-significance (p-value >0.05) in the data collected by individuals within the ranger group.

Results of the test among individuals within the group of rangers indicated that there was a significant difference for five indicators: number of exposed roots, number of trees with bromeliads/orchids, number of trees or busches with broken branches, extent of diseaded vegetation and trail width. A total of 21 non-significant and 5 significant indicators were observed.

Hypothesis 1c: analysis of impact indicators shows non-significance (p-value >0.05) in data collected by individuals within the group of specialists.

Within the group of specialists 19 indicators were non significant, from a total of 26 indicators. The seven indicators which showed significant differences were: number of trees with broken branches, number of trees with orchids and bromeliads, presence of exotic species, drainage problems, hazards, type of hazards, mining explosion noise.

Those results suggest that in comparing both groups, the ranger group's evaluation was more homogeneous.

Nevertheless, five indicators, which were not recorded in the field by members of the ranger group, may have influenced that conclusion. Apparently rangers failed to record them because they are difficult to measure and are not directly observable. Those indicators include: composition of vegetation, density of vegetation, litter deposition in the area of degraded vegetation, number of social trails and apparent cause of social trails.

Trail surface and vegetation off official paths were significantly different for the two groups.

Number of exposed rocks, erosion and trail depth indicators were significantly different between the groups but not among individuals (Figure 1).

Statistically significant differences were more frequent among quantitative indicators, showing that they are less dependable and feasible. Van Bueren and Blom (1997) state that quantitative indicators are more preferable than qualitative ones as the latter are often ambiguous. Unfortunately, for many important criteria there are no quantitative indicators available and it is difficult if not impossible to develop them.

Table 3. Indicators that presented significant and non-significant values in the analysis of comparison between ranger and specialist groups.

Statistically significant	No statistically significant
1 - Extent of diseaded Vegetation	1 - Number of exposed roots
2 - Composition of vegetation	2 - Number of trees with bromeliads and orchids
3 - Density of vegetation	3 - Presence of exotic species
4 - Amount of litter	4 - Number of trees or bushes with broken branches
5 - Number of social trails	5 - Bird sighting or hearing
6 - Apparent cause of social trails	6 - Vandalism against park facilities
7 - Number of exposed rocks	7 - Rock graffiti
8 - Visible Erosion	8 - Number of carved/ damaged trees
9 - Drainage problems	9 - Sanitation problems
10 - Trail width	10- Number of perceptions of vehicle noise
11 - Trail depth	
12 - Hazards	
13 - Type of hazards	
14 - Presence of wildlife sightings	
15 - Presence of trash litter	
16 – Number of noise or quarry explosion	

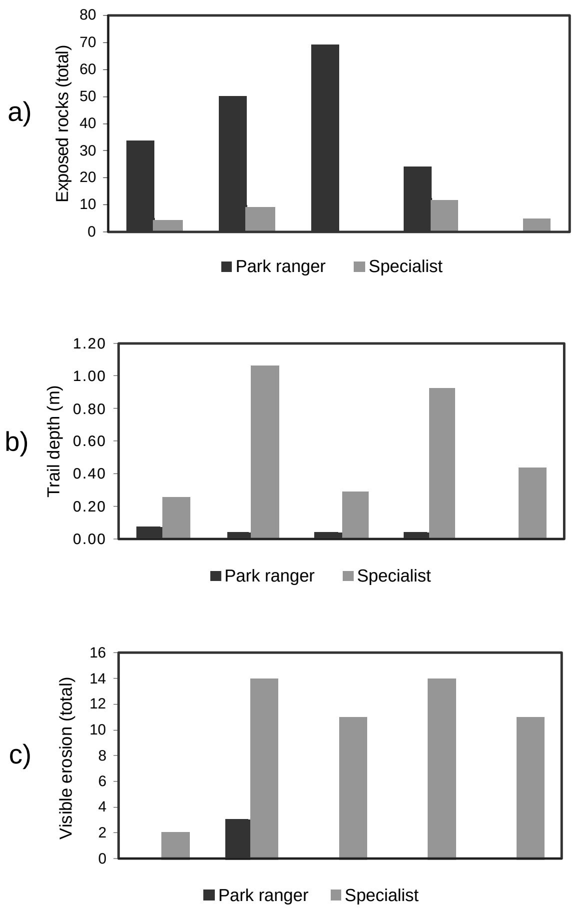

Figure 1. Evaluation of quantitative indicators: (a) number of exposed rocks, and (b) trail depth; and qualitative indicator: (c) visible erosion for different groups (4 park rangers and 5 specialists).

Final selection

In order to select the most representative indicators a comparative matrix was devised which contains 3 classes: 1) non-significant indicators between the two groups (park rangers and technicians); 2) non-significant indicators between the two groups and among individuals in the ranger group and 3) non-significant indicators between the two groups and among individuals in the group of technicians. Coinciding indicators between classes are indicated in the matrix shown in Table 4.

Considering that adequate indicators are those which do not present significant differences in the readings among the three groups which were compared, the following were selected: bird hearing or sighting, vandalism to facilities, rock graffiti, number of damaged or carved trees and number of perceptions of vehicle noise, all highlighted in bold characters in Table 4.

The second level of importance considered the non-significant difference among individuals within the same group (see Table 2): number of exposed rocks, visible erosion, trail depth, animal traces and trash litter.

Besides the selection of dependable indicators which can be evaluated on site by the field personnel themselves, it is important that data be collected as simply as possible. Krumpe (2000) points out that when it is necessary to use sophisticated equipment and complicated analyses the likelihood that field employees will abandon the method is high.

Conclusions

The purpose of this study was to compare the effectiveness of recreational impact indicators and to verify their dependability when data on them is collected by one group of park rangers and one group of specialists.

Table 4. Comparative matrix for selection of the most representative indicators

Indicators	Between Park rangers and Specialist	Between Groups and Park rangers	Between Groups and Specialist
Number of exposed roots			X
Number of trees with bromeliads/orchids			
Presence of exotic species		X	
Number of trees or bushes with broken branches			
Extent of diseased vegetation			
Composition of vegetation	X		
Density of vegetation	X		
Amount of litter	X		
Number of social trails	X		
Apparent cause of social trails	X		
Number of exposed rocks	X		
Visible Erosion	X		
Drainage problems			
Trail width			
Trail depth	X		
Hazards			
Type of hazards			
Bird sighting or hearing	X	X	X
Presence of wildlife sightings	X		
Vandalism against park facilities	X	X	X
Rock graffiti	X	X	X
Number of carved/damaged trees	X	X	X
Presence of trash litter	X		
Sanitation problems	X		X
Number of perceptions of vehicle noise	X	X	X
Number of noise or quarry explosion			

Results suggest that there is considerable subjective bias in assessing a great part of the indicators, thus confirming the importance of including this type of comparative test towards selection of indicators. Only 10 out of the 26 indicators recorded in the field proved dependable for application in the monitoring program at Intervales State Park.

Considering the first level for the selection of indicators which are dependable and feasible and comparing the results between the groups of evaluators, the following should be used: number of exposed roots, number of trees with bromeliads and orchids, presence of exotic species, number of trees or bushes with broken branches, bird sighting or hearing, vandalism against park facilities, rock graffiti, number of carved/damaged trees, sanitation problems, number of perceptions of vehicle noise.

In a more restrictive selection, considering the differences between and within both groups of evaluators, the most adequate indicators are: bird sighting or hearing, vandalism against facilities, rock graffiti, number of damaged or carved trees, number of perceptions of vehicle noise, number of exposed rocks, visible erosion, trail depth, animal traces and trash litter.

We believe that the results presented above may be used towards implementation of a monitoring routine and assist in the planning and management of visitor flows in other parks with similar problems.

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Assessing recreation in the Danish nature – present experiences, towards a future monitoring system

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Abstract: Research on Danish forest recreation reaches back to the mid-seventies. Two major surveys have been conducted: The Forest and Folk in 1975 and the Outdoor Life '95-'98 project. The latter was, in terms of overall objective and chosen methodology, a repetition of the first. Both surveys aimed at collection of base-line information about the recreational life and preferences of Danes and the pattern of use in the Danish nature. Both used a combination of household questionnaires – combined with verbal-statement-cards and photographs – and counting of cars combined with handing out questionnaires at parking-lots in the nature. The present paper presents and discusses the projects and campaigns of the past and looks forward, providing an outline of a future setting of a system for collection of statistical information regarding recreational use of the nature.

Key words: Outdoor recreation, recreational use estimates, forest preferences, general public, questionnaire, Denmark.

Introduction

Research on Danish forest recreation started in reality in 1975 with the Forest and Folk project, which conducted extensive surveys of the forest recreation activities and preferences of the general population. A research project aimed at producing a better basis for decisions in the field of forest recreation. The surveys are published in four parts: Parts I, II, III and IV of Forest Recreation in Denmark (Koch 1978, 1980, 1984, Koch & Jensen 1988).

In the mid 1990's a new series of surveys was initiated – the Outdoor Life '95-'98 project. Some of the aims of this project were: (1) to update the previous surveys of recreational forest use and preferences of the general population; (2) to analyse the trends between the 1970s and 1990s; and (3) to study new issues related to outdoor recreation – inclusive expansion of the area from only forest areas to cover the whole countryside. The surveys are published in four parts (Jensen & Koch 1997, Jensen 1998, 1999, 2003).

The Forest and Folk project developed methods for surveying the outdoor life of the Danish population. The surveys in the Outdoor Life '95-'98 project were based on these methods, to retain the best possible basis for comparisons between the two projects and thus analyse the trends.

The surveys of the past have influenced policy, planning, administration and management of Danish recreational resources (Jensen & Koch in press). Despite of this, there is an increasing need for higher frequency of the surveys. 20 years appears to be too long. Therefor the methods of the past must be assessed. A renewed approach is needed. The present paper provides some premature ideas and lays out a baseline for discussion of the matter.

Danish projects and experiences up to date

National household surveys of forest use patterns

Two national household forest use surveys has been completed in Denmark: Part I from the Forest and Folk project in the mid 1970s (Koch 1978) and the Outdoor Life '95-'98 project in the mid 1990s (Jensen & Koch 1997, Jensen 1999).

Method

Data were gathered in two national postal questionnaire-based surveys in 1976/77 and 1993/94, each involving some 3,000 people representing the adult Danish population. For representative purposes the mailing of the questionnaires was distributed over a period of one year (one portion each month).

The Danish population is required to register births, marriages, deaths, changes of address, etc. This provides a very reliable sampling frame (the Civil Registration System, Ministry of the Interior) from which a systematic gross random sample consisting of respectively 3,087 and 2,916 persons has been drawn in 1976 and 1993, representing the adult Danish population, 15–76 years. The samples (and the collected responses) were controlled for representativity (age, gender and county). No significant differences between the samples and the defined population were identified.

The following measures were taken to increase the response rate: (1) care in the design of the visual appeal of the questionnaire package; (2) care in the design of the verbal prompts; (3) a stamped, addressed reply envelope; (4) a relatively brief, simple questionnaire; (5) a potential personal gain for respondents (lottery – only in the 1976/77 survey); (6) the use of up to three reminders, mailed after 2, 3 and 5 weeks. The response percentage was 91.4% for the 1976/77-survey and 83.7% for the 1993/94-survey.

Selected result

Among the many obtained results, it can be concluded that the forests attract a considerably higher percentage of the adult Danish population than other leisure options like cinemas, libraries, and concert halls (both in 1976/77 and 1993/94). During the period between the two surveys the forests have been able to maintain (strengthen) their position as a very significant recreation option for the public. Despite of the fact that leisure options in the period have constantly increased.

In both 1976/77 and 1993/94 about 90% of the adult Danish population spent some time in the forest at least once a year. The average annual number of forest visits per individual has grown by 15% from 1976/77 to 1993/94. This corresponds to a rise between 1976/77 and 1993/94 of just under 25% in the number of visits to the Danish forests by persons between the ages of 15 and 76 – allowing for population growth. It should be emphasised here that one of the great disadvantages of collecting information from questionnaires is the risk of exaggeration. The exaggeration factor is estimated to be in the order 2. Totally the annual number of forest visits in 1993/94 for the adult Danish population, is estimated at some 75 million.

In general, the uses of the forest by the Danish population over the period 1976–1994 have remained relatively stable – although some changes has been detected, including an increase in the number of visits to the forest, and a decrease in the duration of the visits, in transport time, transport distance and group size. Finally, it was recorded that more forest visitors walked or cycled to the forest rather than driving there by car in 1993/94 than in 1976/77.

The connection of forest use with transport time, distance and type leaves the following main impression: the shorter the transport time/distance to the forest, the more frequent visits. The shorter the visit to the forest, the fewer participants in the group and the rarer the use of a car to get to the forest – an impression which at the same time illustrates the general direction in which Danish forest recreation has developed over the last 20 years.

For more results and details on the methodology, see Koch (1978), Jensen & Koch (1997), Jensen (1998) and Jensen (1999).

National household surveys of forest and nature preference

The Forest and Folk project included the first nationwide survey of Danish forest preferences (Part IV by Koch & Jensen 1988). As for the national forest use studies, also the preference studies was renewed with the launching of the Outdoor Life ‘95-‘98 project (Jensen & Koch 1997, Jensen 1999).

Method

Data were gathered in two national interview-based surveys in 1977/78 and 1993/94, each involving some 3,000 people representing the adult Danish population (15–77 years old). Contact was established by means of mailed questionnaires followed by up to three reminders, and several measures were taken to increase the response rate (see above). The response percentage was 89.4% and 83.7% respectively. The samples and responses were controlled for representatively as described above. The questionnaires were distributed over a period of one year, since the season is assumed to be a factor that influences forest preferences. In choosing the topics to be assessed by the selected persons, we attached considerable importance to the following factors: (1) whether the topic was likely to have impact on the experience of the forest visitor; (2) whether it had any commercial or socioeconomic significance; and/or (3) whether the conditions described could be regulated by the forest manager.

In the Experimental Method, respondents assess black-and-white photos which taken in pairs or groups only differ by a single factor. In addition, a series of less ambiguous subjects, only described verbally, were assessed. This method, which was developed by Koch (1974, 1977a and 1977b), is distinctive in its experimental design and its ability to cover many survey topics. An additional method – The Scenic Beauty Estimation Method – was modified by Koch (1977b) and used in the 1977/78 survey as well. 189 respondents assessed 80 colour slides representing broadleaved forest, coniferous forest, the countryside and facilities for forest recreation.

A total of 52 black-and-white photos were assessed in the 1977/78 survey and 64 in the 1993/94 survey. The reader may refer to Jensen & Koch (1997), where the photos are reproduced in the same size and quality as those mailed with the questionnaires. When the photos were taken, great care was taken to ensure that photos in a given “block” appeared as uniform as possible.

A total of 100 verbal stimuli were to be assessed in both surveys. They were printed in green, on yellow cards of the same size as the black-and-white photos (98 x 134 mm). To enable cross-checking certain survey topics were assessed on the basis of both a photo and a verbal stimulus.

The following techniques were used to elicit the population's preferences:

Black-and-white photo questions: Of the total of 52/64 black-and-white photos of different forest environments, 7 photos were randomly selected for each interviewee and appended to the questionnaire in a red envelope. Guided by explanations printed on the questionnaire and envelope, interviewees were asked to rank the 7 photos according to the criterion "Which woodland environment do you prefer to visit?".

Verbal stimuli questions: Of the total of 100 verbal stimuli, 7 cards with verbal stimuli were randomly selected for each interviewee and appended to the questionnaire in a blue envelope. The interviewees were asked to rank the text on the 7 cards according to the criterion "What do you prefer to meet in the woods?"

Thus the survey produced a series of independent rankings, by a representative sample of the population, of a number of different topics (presented as black-and-white photos and/or verbal stimuli), in a number of different, randomly selected combinations. On average, each photo was ranked about 335 and 260 times and each verbal stimulus about 175 and 165 times by the respondents in the two surveys respectively. And thus a basis was obtained for comparing the internal ranking of the photos and the verbal stimuli.

Results

The results from the 1993/94 survey show that it has not been possible to detect major changes in the preferences of the general Danish population over a period of more than 15 years. Minor changes have been found in relation to a few topics, like in preferences as regards natural regeneration; large/small unit forestry; the age of the forest stand; the use of herbicides and fertilisers; paths and visitor facilities; the provision of information; and meeting other forest visitors.

It is difficult to sum up these minor trends in Danish forest preferences in a single formulation; but one could say that management measures which are alien to a natural environment are judged more and more negatively by the Danish population. For results and details on the methodology, see Koch & Jensen (1988), Jensen & Koch (1997), Jensen (1999).

Specific surveys of destination-areas

Part II of the Forest and Folk project

What is the geographical variation in the intensity of forest recreational use in each region (county) of Denmark? To answer this question – and to give exact data for the manager of the specific forest area, Part II of the Forest and Folk project was initiated.

The yearly number of visitor hours and visits was estimated for 446 forest areas with a total area of 187,000 ha in 1976/77. Questionnaire results for the car-borne use regarding length of stay, group size, activities, travelling time and distance were obtained as well. The basic data collection consisted of 28,652 instantaneous, manual counts of parked cars and the delivering of 44,846 questionnaires. The response percentage for the questionnaires was 53.7% (impossible to use follow-ups). Nearly all state forests and many private forest properties participated voluntarily in the basic data collection. It is assumed that the more intensively used forests are over-represented in the investigation. Detailed instructions for the fieldwork was elaborated. The recording was carried out at 20 stratified randomly selected times and at 2 subjectively selected times at peak use. The stratification took the seasonally, weekly and daily variation into account.

Different models for the relationship between the instantaneous counts on each individual area and permanent automatic recording have been considered. (See the description of the permanent counting stations below). The rather simple multiple linear regression model was chosen. If the regression estimate was not significant, or if the regression estimate deviates significantly from the sample estimate, the sample estimate for the area in question has been used (based only on the 20 registrations at randomly selected times). Calculating the questionnaire results is only possible by sample estimates.

The total number of visitor hours was estimated from the number of car-borne visitor hours, the questionnaire results regarding the car-borne visitors' travelling distance distribution in each forest area, and the relationship between the percentage of the Danish forest visitors who travel to the forest by car at a give travelling distance. The total number visits were estimated from the average length of stay per visit (car-borne/non-car-borne ratios from the national household forest use surveys in Part I).

The results show a large variation in the intensity of use. In most counties it is found that some forests are used up to about a thousand times more intensively than others. In Koch (1980) detailed descriptions of the different methodological aspects are presented as well as the results.

The Outdoor Life '95-'98 project

As described for the national use- and preference-surveys, a need for updating the results was found. Due to this, the Outdoor Life '95-'98 project was initiated and a new data collection on the specific areas was accomplished in 1996/97.

The data collection in the Outdoor Live '95-'98 project follows the same outline as described above for Part II in the Forest and Folk project in 1976/77, although some extensions and limitations was introduced:

– Other nature areas than forests were included (e.g. beach areas).
– Instead of 446 areas divided into 1419 sub-areas in 1976/77, the surveyed area in 1996/97 consisted of 592 forest/nature areas (of 2159 sub-areas), with

an area of approx. 201,000 ha (174,000 ha forests).
- A total of 85,673 questionnaires were delivered and 46.7% was returned.
- The questionnaire-based survey was extended to include e.g. aspects of crowding as well as use of and preferences for a number of visitor facilities.
- Due to economic constraints regression estimates were not performed – only sample estimates.

The comparison between the two surveys shows the same tendency as found in the national household surveys of the general public: An increase in the number of visits. The geographical variation in use intensity as described for the 1976/77 survey is more or less retained. For more detailed results and more methodological aspects, see Jensen (2003).

Permanent automatic counting stations

Part III of the Forest and Folk project

Four permanent counting stations have been in use since 1976. These registrations have a two-fold aim:
1. To form the basis for the specific area surveys described above (Part II of the Forest and Folk project), and
2. To describe the time-dependent variation and the trends in the extent of the recreational use of selected locations.

The counting stations operate according to the ”net count procedure”. I.e. all cars entering and leaving an area (which is only served by a single road for cars) are counted individually, and the results are recorded at the same time and very frequently (every 15 minutes). If the counting is precise, the following variables can be determined:
- Number of cars present at an arbitrary time (difference between the summed up number of entering and leaving cars)
- Number of car visitor hours (with round-error depending on registration-interval)
- Number of car visits (directly from the separate in- and outgoing traffic)
- Mean length of stay per car visit (estimated from two last-mentioned variables).

The counting stations are still operating. The practical work of inspection and collecting the data is carried out in cooperation with the Danish Road Directorate. See Koch (1984) for detailed results of time dependent variations and trends in the car-borne recreational use of the four selected forest areas. Also detailed description of the methodology and discussion of counting errors are given.

Problems of the past – possibilities of the future

In brief the problems of the projects of the past can be related to the following issues:
a) Each campaign appeared to be very costly and time-consuming
b) A too low possible repetition rate
c) The selection of nature- and forest-areas was based on voluntarily enrolment which could introduce a bias in samples
d) Selection of nature- and forest-areas on the destination-side and respondents on the origin-side was set up to report on the general situation rather than specific thematic topics. Therefore it was not based on stratified sampling.

Due to a) a high prize per campaign it was not possible to remain a repetition-rate higher that one per approximately 20 years (b). This might be appropriate for national, gross-figures but might lack temporal accuracy when special cases (spatial or thematic) are to be assessed. The destination-areas were enrolled voluntarily; managers of forests and nature-areas included, regarded participation as a gain for the management of their areas. From a local-participation-point-of-view this of course definitely encloses advantages. Further, the facilitation of staff for the surveys by local managers was of course highly appreciated. But it introduced a source of bias to the data collected: The tendency was that areas that frequently visited were more likely to be part of the survey than those of lower visit-rates. Moreover, state forest were enclosed to a higher extent than privately owned areas. Since both destination-areas and respondents were not selected due to specified strata (d) it was hard later to investigate pattenrs related to specific relations between characteristics of respondents/areas and activities/visit-frequency. E.g. the relation between social character of respondents and nature-preference or the between accessibility of a nature-area and the actual number of visitors.

Introduction of new technologies as well as data-sources and concepts provides some new possibilities, including:
a) Introduction of systematic, digital handling of geographical data (GIS).
b) Monitoring of geographical indicators in terms of grid cells is becoming a national standard in Denmark.
c) New technical approaches are now available for data-collection, especially on the visitor-count and behaviour side.

Regarding a) GIS is still more used for assessment of recreation in the nature. Key-areas of application lists inclusion of existing (GIS-) data, analysing and modelling as well as presentation of results. For a review of application types see Skov-Petersen (2002). Over the past 5 years collection and distribution of spatial/statistic information based on square grid cells (b) is becoming more and more used (Sommer et al. 2004, Kort- og Matrikelstyrelsen 2002). Even the Danish Forest Inventory (NFI) is based on a square grid layout of sampling sites (Söderberg 2000). This enables a higher degree of integration of recreational data – both in terms of data-collection and analysis – with data from other sources. New tracking equipment, including GPS, Mobile telephones, video-equipment sensitive to movement etc. have provided methods for data-collection earlier not available.

Towards a future systematic approach

The present chapter is a presentation of some of the consideration a future system could be based on. It is not the intention to provide the full picture, nor the final design of a future system. It can be read as the authors' present state of ideas. Its takes its point of departure form breaking down monitoring and modelling recreational activities into issues related to *demand, supply and the mutual location of the two, with respect to the available transport system* (see e.g. Coppock & Duffield, 1975).

To facilitate planning of – and for – the recreational use of the nature, a monitoring scheme must address the facilities i.e. the nature areas as well as the users. *From a facility or destination point of view* it is interesting to know in specific how much a certain nature area is used or in general how much given nature types at given levels of accessibility is used. Levels of usage can e.g. be provided in number of visitors, per ha, per year. Seen *from a users or origin perspective* it has to be addressed how frequently the inhabitants of a given dwelling area are attending activities in the nature. Yet again, given general types of neighbourhoods can be focused on, rather than specific areas. In that case, measures can, as an example, be made in the number of yearly visits per inhabitant. Whereas the destination-orientated approach is the main interest of the *facility-manager or -planner*, the user-oriented approach is more the concern of the *urban planner*. Never the less, none of the two approaches can stand by it self. The nature-manager needs to know the potential number of users from surrounding dwelling areas (whether being planned or existing). The urban planner needs to understand the recreational capabilities of potential nature areas.

In the present context recreation as a phenomenon is understood as a chain of causally linked elements going through:

- Social and physical base-line structures, which leads to
- human behaviour, preferences and activities, which eventually leads to
- effects and consequences on the nature areas or the users

The *base-line structures* include the mutual location of origins and destinations taking into account their qualitative characteristics. That is e.g., the type of dwelling areas (average income, car-ownership or predominant building-type) and the type of nature (vegetation-type, presence of freshwater or terrain form). The mutual location can be included in terms of transport-options – typically public- or private transport-networks - and the transportational mobility of the population. The *human behaviour* – can for example be the frequency of making the decision to go to the nature (which can be seen as an attribute of the point of origin or a person). Likewise, on the destination side, the accumulated number of visitors actually entering a nature. Finally, *the effects* are the possible consequences of the human behaviour. It can – on the origin side – be effects related to health or attitudes to ecological issues. From a destination-point of view, it can be the wear of paths or disturbance of wildlife.

Some of these causal elements are inherently recreational. Some are not: Social structure, even though it is a possible indicator for certain recreational behaviour or attitude, is not specific to recreation. Table 1 provides a schematic presentation of examples of recreational indicators based on the distinction between the origin/destination approaches on one axis and structure/behaviour/effect on one on the other.

Monitoring is repeated collection of comparative data over time. That is, data ought to be collected for units of measure, which can be compared when measures are repeated after a number of years. Most classical approaches to establish data-collection-tracts suffer from a lack of temporal stability. Parishes, zip-code zones, named forests or nature areas are not guarantied to be demarcated the same way through all times. Municipalities and parishes are fused, forests changes demarcation lines etc. Hence, an ideal setting would be based on temporal stabile zones. One of the reasons for applying *regular grid cells* is this temporal stability (Skov-Petersen, 1999). An example of this is registration in square grid cells which are being used increasingly for a variety of statistical applications. Numerous countries are supplying population and workplace information as square cells of 100 m – 1 km grids (Sommer et al. 2004, Kort- og Matrikelstyrelsen 2002). As part of the Danish National Forest Inventory (NFI) a regular grid system is applied (Söderberg 2000). Clusters of 4 sites (spaced 200x200 m) located in a 2x2 km grid is laid out. All sites that fall in forest are selected. Approximately 1/3 of these sites are permanent sites whereas the remainder 2/3 are temporary. Permanent sites will be revisited every 5'th year. Temporary sites will be relocated after each 5-year cycle. At each site, which are circles of 15 metres radius, information regarding the stand (size, density, health etc.), the soil and topography is recorded. A proposal for inclusion of data related to recreation has been proposed but not implemented (Söderberg & Johannsen 2000). Given the general setting of the scheme the proposed recreational data-collection only addressed stationary items like facilities (public toilets, benches, fireplaces etc.), accessibility (trails, roads and parking lots) and visible signs of wear, waste and vandalism. Accordingly, issues related to the actual use (number of visitors, number of cars, type of users etc.) of the forests are not proposed.

Table 1. Schematic presentation of *examples of recreational indicators* and related methods.

	Origin-orientated indicators	Destination-orientated indicators
Base-line structure	**Indicators:** • Amount of green space per inhabitant • Distance to the closest beach • Number of ha nature within 15 minutes drive by car **Methods:** • Direct use of GIS and statistical information • Mobility modelling by means of e.g. GIS-based network modelling	**Indicators:** • Number of inhabitants per area unit of nature • Distance to closest urban area • Number of people that can reach the nature area within 15 min. drive by car **Methods:** • Direct use of GIS and statistical information • Accessibility modelling by means of e.g. GIS-based network modelling
Behaviour, Preference or Activity	**Indicators:** • Frequency of visits to the nature • Attitudes and preferences for different types of nature **Methods:** • Household interviews • Household questionnaires • Telephone-based surveys	**Indicators:** • Number of visitors • Types of visitors **Methods:** • In nature-interviews • In nature-questionnaires • Automatic counts of visitors (infrared sensors, video, 'stepping boards' etc.) • Registration of actual, spatial behaviour (sketching on paper-maps, GPS, registration of mobile telephones)
Effect or Consequence	**Indicators:** • Health issues • Attitude to ecology **Methods:** • Interviews/questionnaires • Use of central registers on e.g. health or house prising	**Indicators:** • Wear of paths • Amount of litter **Methods:** • Registration of biodiversity changes • Registration of soil runoff

As a sampling strategy – like the one of the NFI – and to ensure comparability over time it is proposed that sites of investigation are laid out in a square grid system. That is, a number of square grid cells are selected, both on the demand- and the facility-side. The selection of cells should be stratified to cover certain aspects regarded significant for attitudes and levels of activity in relation to recreation. On the demand-site (the inhabited areas) sites could be stratified to cover classes of social structure (indicated by e.g. average income and demography) and classes of access to recreational opportunities (amount of opportunities within a given transport-time). The facility-sites (the nature) could be stratified to cover e.g. different types of nature (types of forest, heater, beach etc.), topographic characteristics, closeness to water and accessibility (closeness to inhabited places, number of people that can reach the place within a given transport-time, local accessibility etc.). To facilitate monitoring some of the cells will be permanent. Others will be included permanently, when new dwelling- or nature-areas appears or temporarily when special issues or demands emerges.

Within the selected demand-sites individuals for interviews or questionnaires can be selected from the Danish Civil Registration System (CPR). On the facility-side registration based on square cells might provide some practical problems. Therefore it might be feasible to include the entire nature area that the cell lies within or touches, this of course jeopardises the temporal comparability mentioned above. It is therefore important that the collected data are 'fed back' to the grid cell as a post-process.

Potential users, potential applications

When designing a system for the future it is obviously important to thoroughly investigate the potential uses, their administrative level and the type of application resulting data will be used for. This includes:

a) Administrative level.
b) Type of user.
c) Type of application.

Regarding a) options include uses at supernational, national, regional and local level. Since information at higher administrative levels often are more aggregated that those for the lower levels indicators ought to be set up in a hierarchically system, enabling aggregation of groups. Regarding b) user-types can include governmental institutions, owners/managers, NGO's and individual layperson, all having their specific needs and requirements. Application type (c) can e.g. include plain statistics, monitoring (statistics over time), mapping (requiring data and results to be geocodable) and modelling in terms of inferential statistics or predictive modelling for assessment of future situations.

Conclusion and perspectives – the way forward

The present paper has presented in brief the Danish experience in relation to collection of recreational information. Further a range of premature ideas of a future system have been presented. As is apparent the work of designing is in its initiate phase. The further development of the system will proceed through:

– Dialog with potential users of collected data (as well as collectors),
– appraisal of the present international knowledge and experience and
– further development of the present methods and techniques developed at Forest & Landscape, Denmark (including use of GIS).

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Actual condition and problem of visitor use in Jozankei National Forest, Japan

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Abstract: Jozankei National Forest, a part of the Shikotsu Toya National Park, is located in a mountainous area about 30 km south of central Sapporo. The forest is managed by selective cutting based on high-density forest road network. Because of the roads, visitor access is easier than it is in other surrounding forests. From spring to autumn in 2003, visitor flows were monitored at two entrances of the forest road network using Trail Traffic Counter. There was a remarkable visitor concentration in spring and the behaviour of visitor varied at each season. It was considered that the reason for the difference could be the different purposes of visits to the park as well as the characteristics of the forests visited.

Introduction

The 28 parks of National parks of Japan cover about 2.06 million ha, which is about 5.4 percent of the total land area of Japan. According to National Parks statistics, there were 934.7million visitors to the parks in 2001 (Ministry of the Environment 2002). The statistics were based on the report of municipal governments. Aoki and Hosono (1991) conducted a questionnaire survey to the municipal governments to determine the data source of the statistics. In most cases, the data was based on the number of guests at hotels and hot springs. The information concerning day trips was not used. Furthermore, it seems that some explanation should be provided for the fact that some of the information is unreliable. It appears that the statistics regarding visitors to the national parks may not be accurate, which determines the need to monitor the visitor flow at national parks.

Visitor flow was monitored at the Oze National Park and at the Shirakami World Heritage area. Because of the limits of power supply and accuracy of the sensor, only the limited area was monitored (Hirata 1999). A standalone automatic system for counting climbers was developed and the number of climbers in the Yakushima national park was monitored by the system. Total number of climbers was estimated about 45,000 in year 2000 (Hirata 2001).

There have been several studies focusing on the visitor flow in the forest parks. Yamaki and Tsuchiya (1993) conducted a study using automatic counters to determine the number of visitors to two forest parks in Hokkaido. It was observed that both of the forest parks had unique seasonal and daily pattern of visitor flow. Takahashi et al. (1994) studied the use of a forest road in the Chiba university forest of the University of Tokyo. The results show that the forest road was used as a fast road to Famous Temple near by the University forest. A questionnaire and visitor counts have been used to monitor the visitor flow to the University forest in Ashu of Kyoto University since the 1990s. As a result, the number of visitors was estimated to be at least 15,000 people per year (Hirata et al. 1992, Hirata et al. 1993, Hirata et al. 1994).

Most of the studies targeted climbers and hikers and there are few studies dealing with vehicular access focused on the use of forest roads. Limited study related to car access was done especially the usage of forest roads.

Thus, objective of this study was to know how forest roads in National Parks are used by continuously monitoring them with automatic counters and to discuss the conflict between visitor use and forest management.

Study Area and Method

The Shikotsu Toya National Park has 99,302 ha, including Lakes Shikotsu and Toya, Mt. Yotei, Mt. Usu, and Mt. New Showa. More than 90% of the area is a part of the national forest of the Ministry of Agriculture, Forestry, and Fisheries.

The study area, Okujozankei National Forest, which has about 11,000ha, is located in the southern end of Sapporo City at an elevation in the range of 500 to 1,300m. Selective cutting has been used to manage the forest since 1969, and a dense network of roads has been established (Figure 1). The density of forest roads is 46.7 m per ha. Yamaki (1997) clarified the characteristics of recreational access in the Shikotsu Toya National Park. He mentioned the potential of forest roads for recreational access. Okujozankei national forest has one of highest potential area for recreational use because of the dens forest road net-

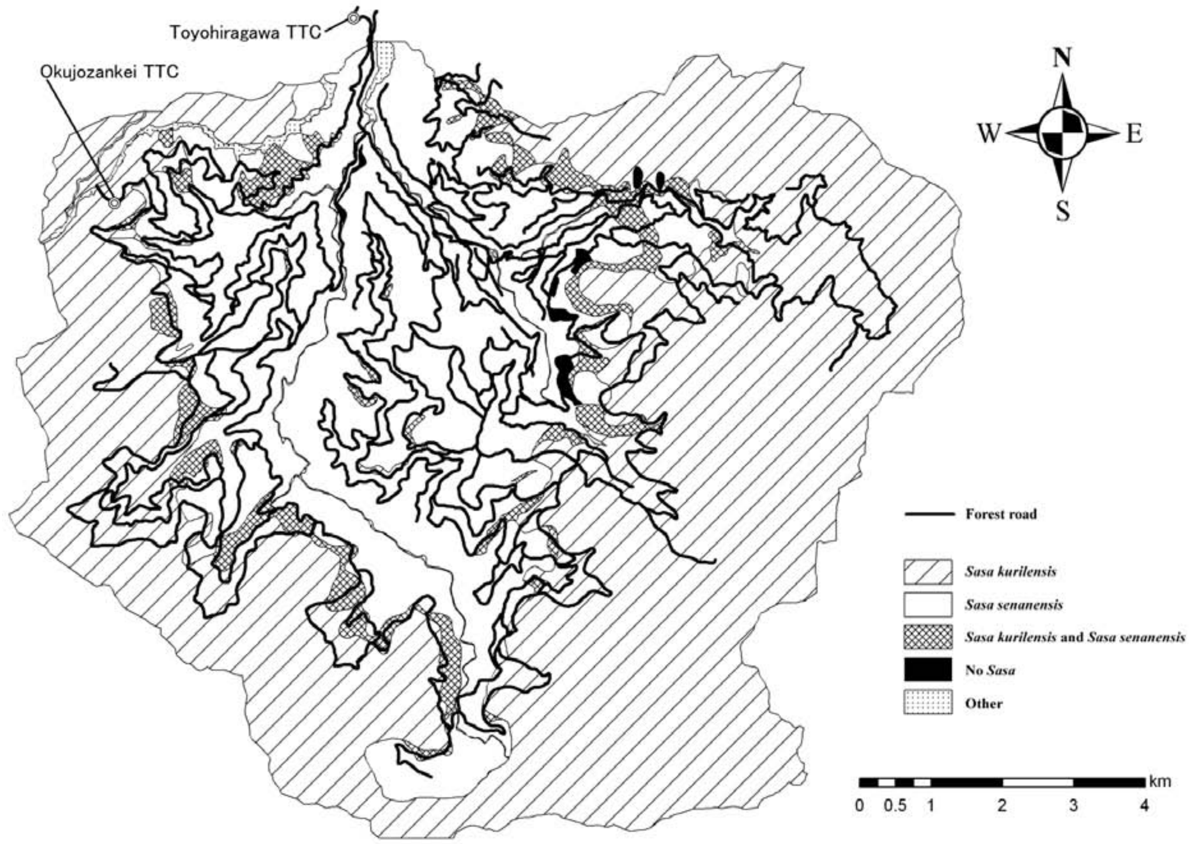

Figure 1. Study area and type of *Sasa* vegetation.

work. Therefore, Okujozankei national forest is characterized as an easy access area (Yamaki 1997).

The Forest roads connect with public roads in three places. One of them is strictly controlled by the Jozankei Dam management office. The other two, Okujozankei forest road (Okujozankei) and Toyohiragawa forest road (Toyohiragawa), connect with National Road No. 230 (Figure 1). In addition, the forest road network does not connect with the adjoining forest road network; visitors must use these two entrances. Consequently, the flow of visitors using these entrances could be monitored with the use of a trail traffic counter (Ivan technologies inc. TTC). A TTC is an active infrared counter comprising an emitter and detector. If the infrared signal is interrupted, the time is recorded. Both the emitter and detector are comparatively small, and long-life batteries are built in. The accuracy of the TTC was checked and confirmed in outdoor experiments (Gasvoda 1999, Takahashi et al. 2003).

TCC devices were installed at the entrances to the forest roads. The flow of visitors using the two forest roads was monitored for 170 days, from 28 May to 13 November 2003. The visitors were assumed to arrive at the entrance by car or on foot. Therefore, emitters and detectors are set up 3 to 10 m apart from the edge of the forest road using wooden pile and plate and detection area was set about 60 to 80 cm above ground. The distances between the emitter and detector were about 14 meters at Okujozankei and about 24 meters at Toyohiragawa. The logged data were corrected once every one to three weeks. At that time, to avoid miscounting, the vegetation around the equipment was trimmed, and the detector and emitter were inspected.

The Hokkaido Regional Development Bureau of the Hokkaido Development Agency monitored the weather at the Nakayama Pass at the Nakayama weather station, which is located about 1 km south from the entrance to the Okujozankei Forest. Weather, temperature, and wind speed were corrected at noon to detect errors in counting and analyze the fluctuation of the visitor flow. In addition, foresters at the Ishikari Forestry Office completed a questionnaire as a part of the study.

Results and Discussion

Detection and correction of errors in counting

A total of 15,786 were counted at Okujozankei and 6,697 at Toyohiragawa. The counts were exceptionally high when the wind speed was high and when snow was falling, which was apparently due to a malfunction of the TCC device. The dubious counts were attributed to bad weather.

Therefore, the following counts should be considered erroneous observations and thus deleted from the data for analysis:

– Data obtained when the wind speed was over 8 meters in Okujozankei
– Data obtained when snow fell in Toyohiragawa.

There is a technical possibility to obtain the counts at less than five second intervals. However, high frequency counts with short intervals should be considered to be erroneous observations. Hence, it is eliminated from the analysis that the day, which more than 30 % of whole day counts were, observed less than 5-second intervals

After exclusion, counts in Okujozankei were 7,149 and 6,152 in Toyohiragawa.

Trends observed in the visitor flow

The monthly ratio of the counts at Okujozankei and Toyohira are shown in Figure 2. At Okujozankei, the counts in June reached 63.3% of the total counts. Interviews with foresters indicated that the main purpose of the visits in June was collecting edible wild vegetables, in particular, shoot of *Sasa kurilensis*. Okujozankei could provide an easy access to *Sasa kurilensis* covered area.

On the other hand, in Toyohiragawa, about 30% of all counts were noted in July. June, August, and October shared around 14–20% of the total counts. Interviews indicated that visitors' activities included picking wild edible vegetables and mushrooms as well as fishing. However, Toyohiragawa was partially unavailable to visitors in June because of a landslide the previous winter. Therefore, it might be possible that most visitors would concentrate in Okujozankei in June.

Average counts by weather condition showed that weather condition affected significantly in Okujozankei, but insignificantly in Toyohiragawa (Figure 3). Elevation of Okujozankei was relatively high to Toyohira. Additionally, Toyohira went through the bottom of the valley. Visitor could use Toyohira in all winds and weathers.

In forest parks in Hokkaido, more than half of visitors visited on Sunday (Yamaki & Tsuchiya 1994). The daily counts in Figure 4 shows that the average counts on weekends were larger than that on weekdays. Compare to the result of the Forest Parks, there are not concentrated on Sunday significantly. It is considered that Okujozankei national forest mainly manages for forest management and facility for visitors did not built.

According to the interview of the foresters, it was estimated that 50 counts were generated by forest management work, 62 by forest research work and 156 by permitted events. In addition, several construction and maintenance work were in progress in the forest in 2003. It was estimated that 836 counts were generated by road maintenance and 1,238 by several construction works. Therefore, 2,342 counts were generated by forest management related work and permitted use. It means more than 10,900 counts were generated by visitors in 2003 (Figure 5), which indicates that counts by visitors was four times or more than forest management related counts.

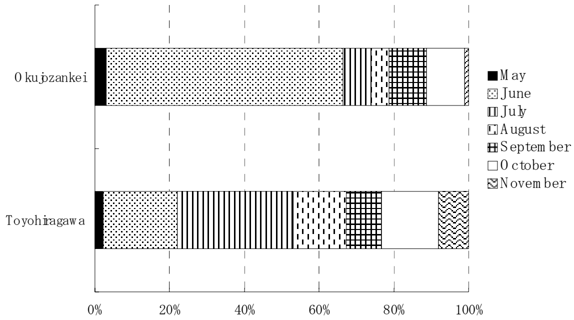

Figure 2. The monthly ratio of the counts.

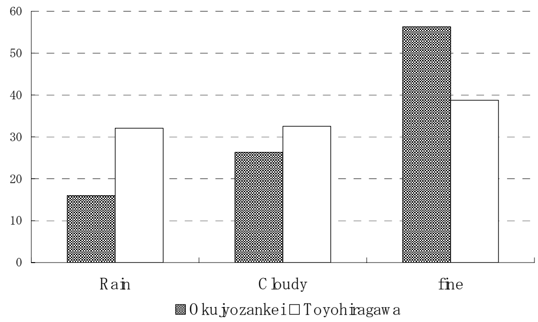

Figure 3. Average counts by weather condition.

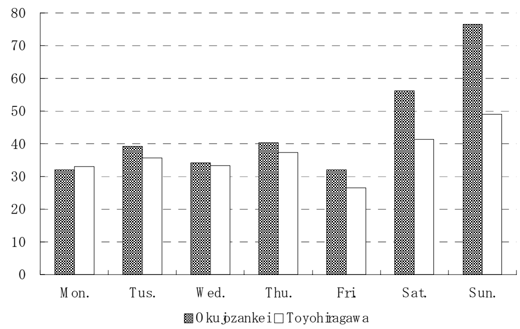

Figure 4. Average counts by the day of the week.

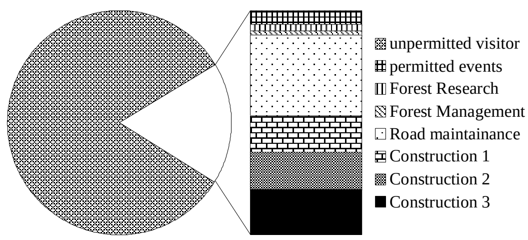

Figure 5. Count Raito by type of visitors.

Conflict between forest management and visitor use

As a result of questionnaire survey, more than 80% of foresters in Ishikari forestry office were recognized that so many visitors were used their managed forests (Figure 6). Half of them recognized that visitor use made problem for their management activities (Figure 7). Examples of the problems ware damage for forest roads, illegal dumping, and rescue work for casualty.

Almost all forest in Okujozankei national forest has *Sasa kurilensis*, one of typical edible wild vegetable, as major forest floor vegetation. Additionally, *Sasa kurilensis* grow very fast and has rhizomes. Therefore, there is no damage of *Sasa kurilensis* vegetation by picking bamboo shoot.

On the other hand, other edible wild vegetables do not have rhizome. Some of them are picked not only leaf or bud but also rootstock. Thus, it is a high possibility to incur resource depletion of wild edible vegetables.

Ando et al. (2002) reported that recreational fishing strongly affected fresh water fish in Hokkaido. Same situation might be concerned in Okujozankei national forest.

The forestry agency determined that visitors could access the national forests on foot but not by automobiles. Thus, most of the forest roads have a gate to control the traffic. However, at least in Hokkaido, people can buy keys at household goods stores in the city to unlock the gate. Most counts at both Okujozankei and Toyohiragawa were the result of automobiles crossing the gate illegally. This indicates that the gate system is not adequate and has a bad effect on forest management.

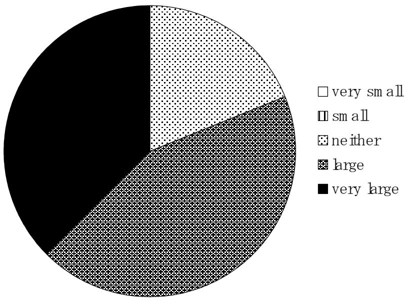

Figure 6. The Amount of visitors in forests of Ishikari forestry office.

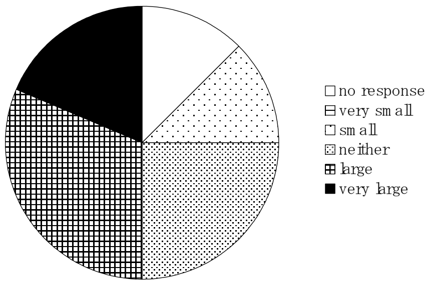

Figure 7. The amount of the effects for forest management caused by visitor use.

Conclusions

Automatic infrared counters were used to monitor the flow of visitors who used two forest roads at Okujozankei national forest in Shikotsu Toya National Park. Above 13,000 counts were noted, and the ratio of visitor use to forest management activities was 4 to 1.

Ineffective control of the gate of forest roads affects not only forest management but also depletion of wild edible vegetables and fish resources.

Improvement of visitor flow control is strongly needed in national parks and national forests.

Acknowledgements

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A Framework for Integrating Visual Quality Modelling within an Agent-Based Hiking Simulation for the Swiss Alps

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Abstract: While the visual qualities of a landscape are often key factors in attracting and retaining tourist visitors, they have been overlooked in recent simulation approaches to recreation modelling. While there has been a long history of modelling the visual quality of a landscape, particularly in forestry, due to computational restrictions these models have tended to be rather coarse and primarily suited for avoiding catastrophic impacts due to large-scale interventions in a landscape. However, the experience of the visual quality of a landscape for recreationists is much more subtle. Relatively small changes to spatial patterns and land use, when viewed cumulatively, can have a large impact on the attractiveness of a landscape for tourists. Methods for evaluating the changing visual quality of a landscape are invaluable for comprehensive long-term landscape planning.

This paper describes a computational approach for integrating visual quality information into an agent-based simulation of summer hikers in the Swiss Alps. The benefits of microscopic modelling (where the activities of individual hikers are simulated) are combined with detailed 3D models to provide the possibility of a highly nuanced visual quality analysis of a recreational area. Using real-time computer graphics techniques, simulated agents interpret computer generated 3D images of what they 'see' as they move through the landscape. Various landscape metrics are calculated based on these representations, including visual quality indicators such as view composition, enclosure, and depth of view. These metrics are evaluated over the course of an agent's hike, and integrated with more traditional parameters (such as hike distance, steepness, congestion and availability of amenities) in an agent-based simulation. Unlike other raster based visual quality models, analyzing 3D representations allows the model to easily incorporate subtle screening effects, and allows the model to determine visibility from any location in the model. The technique allows for very detailed visual representations, and scales easily to include more detail as required by the analysis. Currently, the model represents terrain, vegetation communities, structures, path and road networks and information aids such as signage.

The paper describes a working implementation of the technique, and discusses its advantages and limitations, including its substantial data requirements. The paper uses a specific case study in the Gstaad-Saanenland region of Switzerland to articulate how this integration of visual information within an agent-based simulation has advantages over more traditional methods of visual quality modelling.

Introduction

There has recently been a revival in the use of computer simulation in many research areas related to natural resource management, including recreation. Encouraged by the rapidly increasing computing resources available to researchers, and by the dispersion of theoretical and technical ideas from other disciplines, increasingly complex models are being developed to assist researchers and resource managers understand the implications of different management options (Wang & Manning 2001). There is seldom a right answer for resource managers: modelling is a tool that allows the researcher or resource manager to test different scenarios and examine different ways that conflicting priorities can be handled.

A particularly powerful technique that has been used in recreation modelling is individual agent-based modelling. Using this technique, software agents, each representing an individual or small groups of individuals, are given individual goals, preferences and attributes. A set of rules is developed by the modeller which describe how the agents react to each other and to their environment. These agents are then introduced into a synthetic environment where they strive to complete their goals. They interact with each other and the environment, and make decisions (in the case of recreation modelling, this is usually their movement choices) based on their individual experiences. The modeller can observe how the agents react, either as individuals or as a system. By changing either the modelled environment or the calibration variables, the modeller can explore how the agents react. As Itami, Raulings et al. (2002) describe, an advantage of this technique is that complex system behaviour emerges that is difficult or impossible to predict based on the actions of the individuals.

The use of simulation in recreation modelling in general (see for example Wang & Manning 2001), and agent-based modelling specifically (see Gimblett et al. 2001, Itami et al. 2002), has generally been restricted to recreational areas where the primary concern has been to limit the amount of interaction between visitor groups or to manage large numbers of visitors that potentially exceed the sites' carrying capacity. This is a common concern in popular parks and recreational areas where there is a high demand and limited carrying capacity. Typical to these kinds of models is the assumption that demand is fixed or increases predictably in time.

In general these models investigate how changes to the available capacity of the recreation infrastructure (such as trails, campsites, and parking lots) impact the experience of users. This kind of model, while very useful for certain questions and applications, assumes that recreational infrastructure is the limiting factor that influences recreational choice.

However, in many recreational landscapes, particularly those that are not uniquely attractive or are facing non-recreational development pressures, the situation is more complex. For private communities dependent on tourism, and in particular those not operating at capacity, the concern is often how land use changes (such as increased development or changes to agricultural policy) will affect the experiences of their visitors.

As the primary attraction for many recreational areas is their scenic qualities**,** understanding how these land use changes affect users' satisfaction from a visual perspective is important. However, it is not enough to study visual quality in isolation, as numerous factors combine to contribute to a visitor's satisfaction with a given recreational area, and potentially entice them to return in subsequent years. It is anticipated that changes to the landscape would have a very complex effect on recreational choices, which makes these situations particularly well suited to individual agent-based modelling techniques (Bishop & Gimblett 2000). Even for areas with a single dominant recreational activity there are different types of visitors (such as couples with young children, elderly visitors or fitness oriented day-hikers) with differing expectations. Agent based modelling allows one to model how these different groups will react to changes, and to see how their reactions will impact on other groups (i.e. if one group displaces the others).

It is important to point out that while recreational managers are generally most interested in models that have been closely calibrated to reality and can therefore be easily operationalized, modelling and simulation has another, perhaps more important role to play in the social sciences: providing an inexpensive platform suitable for testing hypotheses (Gilbert & Troitzsch 1999). Data collection in this field is expensive and time consuming. For some particular questions relating to the impact of scenic quality on overall visitor satisfaction, it is far from clear how one would even go about collecting the data. A robust modelling framework that allows the researcher to experiment with scenarios and calibration value can be a great help in identifying areas requiring further investigation.

As part of the Swiss National Science Foundation's 48th Research Program, *Habitats and Landscapes of the* Alps, a software system is being developed to integrate visual quality concerns within an individual agent-based simulation in order to evaluate the impact of prospective land use changes on tourism demand in Switzerland's Alpine regions.

Study Site: Schönried, Switzerland

The specific test site is a valley in the Gstaad-Saanenland region of south-western Switzerland. The communities of Schönried and Saanenmöser are at the two ends of the site; their economies are highly tourism dependent. While the primary tourism draw to the area used to be winter skiing, long term climate change is forcing the community to focus its efforts on building up a more diversified tourism economy. This includes capitalizing on its already strong reputation for summer hiking. The landscape is a mixture of pasture and coniferous forests. The test site is characterised by significant topography and is considered ideal for walking and hiking. The trails are very accessible to a wide range of hiking abilities due to the summer operation of one chair-lift and two gondolas. In the high season, the area is busy with hikers and walkers who easily fill the two main parking lots in Schönried.

A recent study in the area (Müller & Landes 2001) identified that the biggest attraction for summer tourists are the area's scenic qualities. Hiking and walking is the primary recreational activity in the summer months. The focus on visual elements was confirmed by our own study (Cavens & Lange 2004), where views and landscape variety were identified as the most important factors that influenced hikers in their choice of hiking routes.

In addition to the community's desire to diversify its recreational economy, there are landscape policy issues that have the potential to change the desirability of the area for summer tourism. These issues include changes to the pattern of the landscape due to changing agricultural policy, shifts in forestry practices, closing of the gondolas and/or chairlifts, and increased holiday home construction. All of these changes will impact on how the valley is perceived by visitors, and any of these changes would have complex repercussions for the tourism industry: future scenarios to test the agent model are being selected from them.

Visual Quality Modelling

In order to integrate visual concerns within an individual agent-based modelling framework, the agents need to be able to percieve the visual environment around them. In effect, one needs to make the agents 'see', and make judgements based on what they see. For computer modelling, this means that one must be able to quantify visual quality.

While everyone has an intuitive idea of what makes a landscape scene visually attractive, it is not something that most people are used to quantifying. However, there is a long history of studying the visual preferences of individuals in natural settings (Daniel & Boster 1976, Zube et al. 1982, Kaplan & Kaplan 1989). By asking individuals to rate images of a landscape for their scenic quality researchers are able to gain insights into what kinds of landscapes are preferred. These studies have identified, among other things, consistent preferences for natural scenes, in particular ones with views of water. Recently, the technique has been extended to use realistic 3D computer simulation of landscapes (Lange 2001), in order to better control variables and develop a more nuanced understanding of what landscape elements influence public preferences.

While these studies are useful in advancing our understanding of what people find attractive in landscapes, their descriptive nature makes it difficult to translate these understandings to other locations, or even to other nearby viewpoints, in a systematic manner. In order to overcome this limitation over the past 30 years a number of researchers have built predictive visual preference models based on quantitative studies. These models predict, using variables such as view composition, distance from the viewer and other spatial/visual metrics how attractive a particular location or view is.

These visual quality models can be divided into two broad categories: image-based, and GIS based. Image-based visual preference models were first introduced by Shafer et al (Shafer et al. 1969). This class of model involves directly measuring perspective images, in order to calculate statistics about the view. In Shafer's case, these statistics included the area and length of edge for different permutations of landscape type and distance from the viewer. Using regression analysis against test subjects' stated preference, Shafer found that well over 60% of the viewer's preference could be explained by the variation of six relatively simple variables. These variables include the perimeter of foreground/middleground and background vegetation, the area of middleground vegetation, the area of any kind of water, and the are area of background non-vegetation.

While Shafer's model is intuitively quite simple to apply, as it is based on an analysis of perspective images it is conceptually and practically rather difficult to extrapolate it to an entire landscape. In order to overcome this limitation, and to enable visual quality to be integrated into standard GIS-based planning processes, a number of GIS based visual quality models have been developed (Steinitz 1990, Lynch & Gimblett 1992, Bishop & Hulse 1994, Bishop 1996, Palmer 2004). In general, these models use rather coarse grid representations of landscape type, coupled with a simplistic GIS-based visibility analysis to generate a map which gives a scenic beauty rating for every location in the the entire study area.

While useful for some kinds of landscapes and planning problems, the fact that these models rely upon raster representations of land types (usually at a coarseness of at least 30m), means that GIS-based visual quality models are not able to capture how small features (such as a copse of trees that provides screening for a housing development) can have a significant impact on perceived landscape quality. For agent-based models that operate at a considerably smaller spatial resolution the results might end up being nonsensical.

Recently, Bishop (Bisho et al. 2000, 2003) has proposed a return to image based visual quality models, taking advantage of recent developments in computer graphic technology. These developments, fueled largely by the demands of the visual simulation and computer gaming industries, allow for very fast rendering of 2 dimensional images from an underlying 3D model. Rather than rely on simplified GIS visibility calculations Bishop's proposed technique uses the dedicated graphics hardware present on most modern PCs to create images of what can be seen from any given point. By colour coding objects of interest, the resulting images can be analysed automatically to determine what can be seen and where in the field of view these objects are located. As a by-product of the rendering algorithm, the depth of every object in the scene is also available to be analysed. This allows for a much wider range of variables to be calculated than was available for traditional image-based visual quality models, where distance could only be estimated.

This is the approach that has been adopted for our agent visibility framework. The return to the image-based approach has the particular benefit that it is conceptually easy to make the connection between a rendered image and what an agent would "see" from a given point. And, as most GIS-based visual quality models were derived (at least in a conceptual sense) from image-based models, it provides the most flexible framework for testing different models within our agent-based system.

There are a few crucial questions that has not been addressed in the recreation or visual quality literature to date. These include: how exactly does a visitor's experience of visual quality contribute to their decision-making and overall satisfaction? Is there a minimum threshold below which a hike/walk is not considered scenic enough for a repeat visit? Does a single negative scenic experience invalidate another positive experience, or does the visitor simply require a high average scenic quality to be satisfied?

These are crucial questions for communities making decisions about land-use changes and the answers are far from clear. It is expected that as part of the construction and calibration of our visual quality model within the agent based simulation, these questions will be explored and directions for further research will be elucidated.

Integrating Visual Quality within an Agent-Based Simulation

Overall Agent Framework

Our overall model structure has been influenced by the authors' related projects in traffic simulation (see (Raney et al. 2003), and is described in more detail in other publications (Gloor et al. 2003). The modelling software is modular in nature, with each module being a separate software program (see Figure 1). The modules communicate with each other via network messages. Although all of the programs can be run on a single computer, the modular structure facilitates distributing the simulation across multiple computers when performance issues require it. While this modularity increases the complexity of the software somewhat, it also makes it easy to test different approaches without having to redesign the entire system.

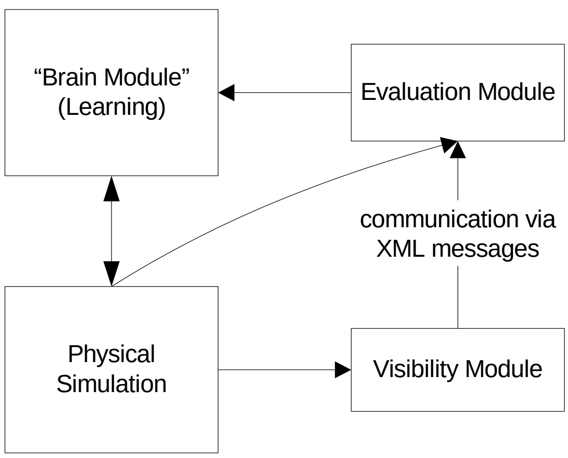

Figure 1. Modular Simulation Framework (simplified).

Every program in the framework uses the same XML data files as their source data (XML is a structured data format that is generally human readable). These files, generated automatically from specially prepared GIS coverages, describe the physical features of the landscape that the agents move in. This includes information about the underlying terrain, the road network, the locations of services such as restaurants and signage, and the location and distribution of vegetation. As each module has different data requirements, each is responsible for parsing the subset of the available data that they require.

At the beginning of a model run, the simulation is populated with agents, each having particular characteristics and goals. The characteristics include sensitivities to slope (indicating fitness), scenic quality, and walking speed, etc. Initially, goals are non-spatial (e.g. go hiking today for 3 hours, eat in restaurant, go hiking for 3 more hours). The system fleshes out these non-spatial goals into highly detailed trip plans that indicate start and end points (including when to start), as well as intermediate waypoints. However, the agents have no initial "knowledge" about features and locations within the simulated landscape, so initially their trip plans are populated semi-randomly.

In order to learn about these features, the simulation is run hundreds of times, with agents exploring their environment, and each developing a "map" of the environment which contains knowledge about which locations meet or don't meet the agents' particular goals and requirements. Some of the characteristics stored are time dependent (such as encounters with other agents, delays at public transit infrastructure, etc.), while other spatial characteristics are time independent (such as restaurant locations, slope, etc.) Currently, scenic quality evaluations are stored as being time-independent, but there is some discussion about this as the attractiveness of a given spot is influenced by the time of day and weather which are time dependent.

The physical simulation module is where fine-grained decisions are made about where the agent is, and how it moves towards its destination. This module is responsible for avoiding collision with other objects, and determining the agents' speed and direction. The module broadcasts the locations of all of the agents every 10 seconds (simulation time.) It also indicates to the other modules when an agent has reached its waypoint/destination, or is unable to complete its strategy.

The evaluation model is where a score is calculated for each segment of the agents' journey. This score is calculated based on a number of factors including (among others): energy expended; time required; congestion; as well as scenic value. These scores are compared against the agents' goals, and used to determine if the agent will use the same route in subsequent runs.

Visibility Module

Central to the vision system is the visibility module (see Figure 2). This module receives messages indicating where the agents are, and calculates what the agents can see. This information is sent to the evaluation module for interpretation. It is written in C++, and is based on the Openscenegraph (Burns & Osfield 2004) 3D graphics library.

The visibility module maintains a complete 3D model of the environment including the underlying terrain, road/trail network, vegetation, as well as other objects such as buildings, directional signs and benches. This visual model is described in the scenario XML files, and can be as simple or complex as the scenic quality model requires it to be. The visibility module reads the following information for each object from the XML file:

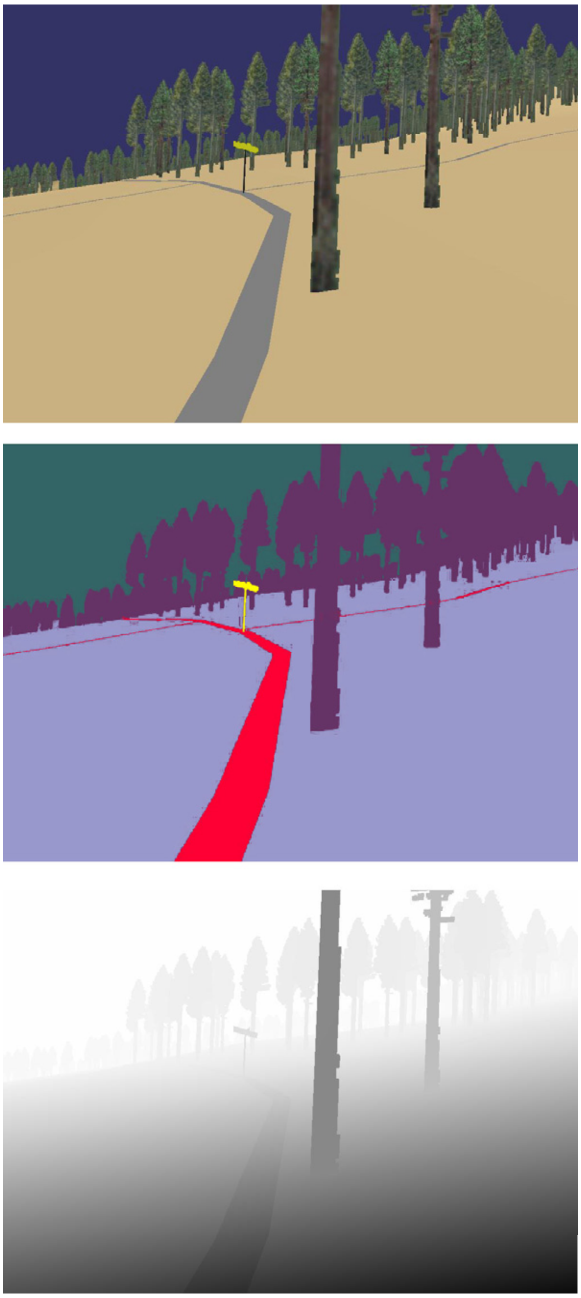

Figure 2. Images rendered by the visibility module. Uppermost image is “true” colour for previewing/ presentation purposes; middle image is the false colour, with different colours assigned to different groups; bottom image is the depth image (darkest colour is closest to viewer. The bottom two images are analyzed by the visibility module.

– **object location**: where the object is, either as an x,y coordinate pair for objects like trees and signs, or the object boundary for objects like buildings or forest stands
– **visual description:** either a link to an external 3D file (such as a house or sign), modelled using an external 3D modelling program, or a list of plant species and densities for vegetation communities
– **group ID:** an identifier which is used to classify the object, depending on the needs of the visual quality model. For instance, in our current test implementation, all objects are classified into only three categories: vegetation, water, and non-vegetation. For more complex models where one might want to distinguish based on tree species, or between different types of buildings, more groups are required
– **unique ID:** a unique identifier for each object, in case the visual model is interested in particular objects

A particular advantage of using this kind of model description is that it is very easy to add new types of objects to the visual database, or introduce new distinctions between objects. For instance, if one’s visual model requires information about the visibility of park benches, they are very easily added to the object database, with absolutely no reprogramming required.

Each time that the visibility module receives a message from the physical simulation indicating that an agent has moved, it generates a perspective view of what the agent would see at this point. Depending on the requirements of the model, the module colours each object with either a unique colour, or with a colour corresponding to its group ID. The resulting image includes both objects from the environment and any other agents that are within the agent’s field of view.

The visibility module analyses this image by looking the colours up in a table of object/group IDs, determining which objects (or groups of objects) are visible. Using the accompanying depth image, the distance of the objects from the viewer is also computed. The module then sends a list of objects or groups to the evaluation module with the following information:

– **object/group ID:** identifier of the object
– **percent of visual field:** how much of the agent’s field of view is covered by this object
– **average, maximum and minimum depth:** how far away the object is from the agent

– **percent of object in foreground / middleground / background:** indicates how the object/group is distributed across the depth plane. Thresholds for the 3 categories are designated in a setup file.
– **self-adjacency:** how many, in percent, of the pixels are adjacent to other pixels from the same object/group (used as a surrogate for perimeter calculations)
– **view angle:** direction from agent to center of object
– **horizontal and vertical angle of object:** indicates the objects' shape in the visual field.

All of this information is sent to the evaluation module as an XML message. One downside of splitting the visibility module from the evaluation module is that huge quantities of data are produced that must be passed between the modules, as the visibility module has way of knowing which kinds of information are important or not. One can, however, filter out objects whose only value is to provide screening by not assigning them an object or group id, thereby preventing them from being recognized by the visibility module.

Speed-up techniques

While the dedicated graphics hardware makes this process much quicker than traditional GIS-based visibility algorithms, it is still too slow to be useable if the simulation is run on a single machine. While the calculation time depends heavily on the complexity of the model and on the available hardware, currently our test system is able to produce and analyze ~60 agent positions per second. As our current simulation involves about 500 agents, and the simulation requires hundreds of runs to stabilize, this is not fast enough to be acceptable in a useable model. In order to speed this up, we have implemented two alternative strategies for speeding up the process.

The first is to distribute the visibility module over multiple machines. As the visibility module is a separate program from the rest of the simulation, this is a trivial operation, and is completely transparent to the rest of the simulation. Rather than listening for all agents' positions, and handling each position event in turn, each machine in the "visibility" cluster is assigned a different set to listen for. As the bottleneck in the visibility calculation is related to the graphics hardware and analysis, adding more machines means that the performance scales nearly linearly as new machines are added to the visibility cluster (until other parts of the simulation framework become the bottleneck.)

The second strategy for speeding up the visibility module relies on the fact that for many visual quality questions, the landscape is essentially static and does not need to be recalculated every time an agent moves during the simulation. Instead, visibility is pre-computed before the simulation starts, in a preprocessing phase. As the physical simulation operates in continuous space (agents are not restricted to walking on the path), the entire landscape is presampled in a regular grid pattern. At each point in the grid (currently using a grid cell size of 5m), the visibility calculation is done for 30 degree slices of the complete 360 degrees. The resulting output is stored in a database. During a simulation run, the visibility module determines the nearest point in the database to the current agent location, and reconstructs the view from the 30 degree slices. (i.e. if the agent has a field of view of 150 degrees, then the software combines the database entries from the 6 slices that overlap with its field of view.) While this does result in a considerable speed increase, it has the disadvantage that the simulation is unable to calculate whether or not other agents are visible. While this can be computed using other means – such as those used in RBSim2 (Itami 2002), this adds another layer of complexity to an already complicated modelling framework.

Evaluation Module

Although the visibility module provides a key and innovative part of the visual quality framework, the heart of the visual quality model resides in the evaluation module. This module is responsible for interpreting data sent by the physical simulation and the visibility module, and interpreting it to ascertain if the goals and expectations of the agents have been met. This information is calculated at different spatial scales, depending the scale at which the brain module is operating (this ranges from the scale of a single trail segment to that of an entire day's trip)

Two different visual quality implementations have been implemented: one roughly corresponding to Shafer's original visual quality model (1969), and another to Bishop et al.'s (2000). The two implementations calculate a visual quality score for each agent every 10 seconds during the simulation.

The module also uses the data from the visibility module to calculate a landscape variability metric, based upon the degree variation between views over time (see Kistler 2004 for a description of how this variability metric is calculated). In the current implementations, it is assumed that the agents' visual goals are to achieve at least a minimum average scenic value and variability over time.

Calibration and Validation

The model is currently operational, and current effort focuses on calibrating the model. A crucial part of this calibration is determining the relative weights between scenic value and other factors such as time, steepness, and availability of services (i.e. a restaurant.) For instance, is it better for an agent to spend slightly longer than expected on a 3 hour hike in order to avoid a particularly steep section or visit a scenic point?

The goal of the calibration is to have an agent simulation where the agents' behaviours are both plausible and reflective of existing usage patterns with current landscape conditions. Only then will one be able to have some degree of confidence that the agents will react appropriately to a changed landscape. As part of a study conducted in 2002 (see Cavens & Lange 2004), existing usage patterns in the area were identified (see Figure 3).

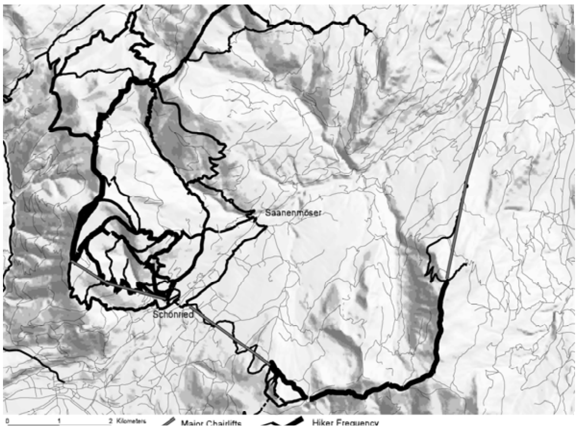

Figure 3. Summer usage patterns near Schönried in the study area.

Work is also being done to investigate how the visual quality ratings of different paths in the area correspond to observed usage patterns. At first glance, the most heavily used trails are the ones with the highest scenic value, but it is not clear if scenic value influences the secondary choice of trails.

Unfortunately, as this form of modelling is relatively new, very little literature exists to assist in the determination of calibration values, so initial calibration values will be a combination of expert opinion with some empirical backing.

Conclusion

We have described a framework for integrating visual quality into an agent-based recreation simulation. While considerable work remains in the calibration phase, the framework provides a test bed for examining how visual quality evaluations influence recreationists' decision making.

While the visual perception system described above was originally designed for integrating visual quality evaluations with agent-based simulations, it could also be applied quite easily to other related research questions, such as the analysis of wayfinding systems (see Filippidis et al. 2003).

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FORVISITS: modelling visitor flows at a regional level

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Abstract: The Netherlands Environmental Assessment Agency (MNP) is trying to develop a coherent set of indicators to monitor nature areas in the Netherlands. One of the proposed indicators is the recreational use of nature areas. Besides indicating the social value of a specific area, recreational use may be also be used as input for modelling habitat quality, another MNP-indicator. Recreational use itself is likely to depend on the attractiveness of the area, such as its scenic beauty. This attractiveness is yet another MNP-indicator. Because the MNP wants a national overview of the recreation use of all nature areas, on-site monitoring is not a feasible option. Therefore we have started to develop a model to predict the number of recreational visits to forests and nature areas: FORVISITS. Although the model is still in its early stages, a first nation-wide application has taken place and will be presented.

Background

The MNP indicator framework

To assist policy makers in their decision-making, the Netherlands Environmental Assessment Agency (MNP) is developing a framework of indicators to assess the quality of nature and landscape. These indicators have to provide easy understandable and objective scientific information on the state of the natural environment. For eleven themes indicators are under development. One of these themes is recreation. Indicators for recreation have been developed into two directions. The first and main indicator for recreation deals with recreation as a goal in itself: to provide the Dutch population with enough nearby opportunities for outdoor recreation in a natural environment (RLG 2004). The initial development of this indicator has already been reported elsewhere (De Vries & Goossen 2002a). The second indicator, and the topic of this paper, deals with the recreational use of natural areas. This is thought to be important for the ecological functioning of the area. The intention is that the indicator can be used as input for ecological models. In this sense this second indicator is more a part of another theme within the MNP-framework: conditions for bio-diversity.

The link between the 'recreational use'-indicator and the main recreation indicator is that, as much as possible, both will use the same data set and basic assumptions as input. Beyond that, they are developing in quite different directions. The main recreation indicator is quite normative in nature and leads to judgements on for which residential areas the local supply of outdoor-recreational opportunities is too small to accommodate the local demand. The present indicator, on the other hand, is intended to predict the actual usage of forests and nature areas as well as possible. Of course this intensity of recreational use also supplements the main recreation indicator, in that it signifies the social function of specific natural areas.

Besides the link with ecological models behind the 'conditions for bio-diversity' theme, the recreational use indicator also has a link with yet another MNP-theme: landscape appreciation. The indicator for landscape appreciation is intended to also function as input in the model behind the ‘recreational use’-indicator. It is thought to be an important part of the recreational quality of a natural area, and thereby influence the usage of this area. At a more abstract level, it may be partly by way of visits to natural areas that people (learn to) appreciate nature. In this way the present indicator may also be relevant for a fourth theme within the MNP-framework: social support for nature and landscape. However, this latter relationship has not yet been formalised within the MNP-framework.

Scale of the model and other models

The fact that the FORVISITS-model is to be used at a national level has certain consequences. For one thing, given the information available in national GIS-databases, the model is relatively simple, as well as coarse. In this respect it clearly differs from other models that aim to describe/predict how visitors move about in a specific natural area (see e.g. Gimblett et al. 2000). Such a more detailed model is also under construction for the Netherlands, and has been given the name MASOOR: Multi-Agent Simulation Of Outdoor Recreation (Visschedijk & Jochem 2002). The FORVISITS- and the MASOOR-model can be combined, in that the first provides input for the latter. The FORVISITS-model generates numbers of visits for each access point of a natural area, at which point the MASOOR-model takes over and models how the visitors distribute themselves over the area during their visit.

The only other model for visits to natural areas that has been applied nationally is the one developed for Denmark by Skov-Petersen (2002). His model deals with car-born visits only, as does the FORVISITS-model, at least up till now. In the remainder of this paper we will point out some other similarities, but also differences with this Danish model.

The FORVISITS-model

In this paper a first attempt to develop a specific indicator for recreational usage of natural areas is presented. The Assessment Agency would like the indicator to be available for all natural areas within the Netherlands. It also desires the indicator to be suitable for monitoring purposes. These two requirements bring along certain conditions with respect to the way the indicator is operationalised. For example, the fact that the indicator should be available for all natural areas within the Netherlands makes field studies as a way to determine the number of visits infeasible, because the associated costs are prohibitively high. That is why it was decided to try to model the recreational use of natural areas. However, the two requirements with regard to the indicator also have consequences for the way the model may be developed. Because a nation-wide application of the model is desired, the data needed as input should be easy to collect, or preferably, already be available nation-wide. To be able to use the indicator for monitoring purposes, these input data should be updated regularly, always in the same, standardised way. Below we will show how these requirements have shaped the form that the model has taken thus far.

The model developed to generate the 'recreational use'-indicator has been termed FORVISITS. At this time, the model only deals with visits made to a forest or nature area by car, with the intention to go for a walk in the area. Furthermore, up till now only visits originating from local residential areas are taken into account. In other words, the model covers only a part of the recreational usage. Other parts concern visits to natural areas made by other means of transport (by bicycle, by foot) and visits originating from holiday resorts (campgrounds, bungalow parks).

The FORVISITS-model is an adaptation of an earlier model developed for regional application (De Vries & Goossen, 2002b). The model distributes the visits to forests and nature areas originating from a residential area to destination areas in the local choice set. The local choice set is defined as all destinations within a given airline distance of the residential area. In the national application this action radius was set at 15 kilometres. Empirical data show that on average about 75% or more of the local visitors of a given forest live within this range (Segeren & Visschedijk 1997, Visschedijk 1997). For all destinations within the choice set of a residential area, the attraction value is calculated. This attraction value is based on three components:

– distance by road from residential area to destination area
– size of the destination area
– recreational quality of the destination area

We will discuss each of these components in more detail.

Distances between origins and destinations

Distance, or even better, travel time, is known to have a considerable influence on the probability and intensity of visitation (Brainard et al. 1999). Distance has already an important effect within the model, in that it determines the local choice set: destinations outside this set will be ignored (with regard to the residence at hand). But also within this choice set distance is assumed to play a role. Because we are dealing with rather short trip distances, the road network needs to be quite complete and have a high level of spatial detail. On the other hand, because the model has to be applied nation-wide, the road network also needs the cover the whole of the Netherlands.

The digital road network we used, was the National Road Database (NWB). This is a highly accurate spatial database (scale 1:10,000) that is updated several times a year. However, this network does not include the type of road for each segment, nor the average speed that can be travelled by road segment. The first is needed to ascertain that the road segment is accessible by car, the second to determine travel times. The first problem was solved to a large degree by transferring information on the type of road from another database, Top 10 Vector, to the NWB-database, although this involved a rather complex GIS-analysis. The latter problem was not solved, precluding the use of travel times within the model.

To determine the road distances from origins to destinations, the location of both need to be identified. For the origins the midpoints of neighbourhoods as distinguished by Statistics Netherlands (CBS) have been used. The Netherlands is divided into over 10,000 of such neighbourhoods, together covering the whole of the Dutch land area. The size of a neighbourhood is about 340 hectares on average, but tends to be smaller in towns and cities and larger in the countryside. This spatial unit is convenient because, besides being quite small, also information on the population is nationally available at this neighbourhood level. We will return to this when we describe how we arrived at the total number of visits originating from a given place of residence. For the distance analysis, the centroid of the neighbourhood is snapped to the nearest road in the network database.

Destinations and their access points

The identification of the access points of destination areas posed a more difficult problem. In the previous regional application (De Vries & Goossen 2002b) maintenance units were used as destination areas. For most of these maintenance units, e.g. the ones of the National Forest Service, information was available on where the parking lots were located. For the remaining units the access points were determined by hand. At a national level, this proved to be too laboriously. Therefore a different approach was used. To start with, destination areas were defined as all forests and/or nature areas within the spatial land use database of Statistics Netherlands, over 5 hectares in size. Sometimes natural areas are fragmented by roads etc. Areas that are located within 500 metres of each other are defined as one destination, with one exception. Motorways and highways were considered not to be crossed by visitors. If a motorway of highway ran through a destination area, it was split up using the road as a borderline. The whole operation resulted in a data set with over 1800 (concatenated) destination areas, with an average size of about 250 hectares.

The network analysis used to calculate road distances requires points rather than polygons as input. Access points of the destination areas, or ‘pseudo parking lots’, were determined by an automated procedure based on the following rules:

– destination areas can only be accessed by local roads, not from a highway or motorway
– a local road has to penetrate the area at least 10 metres in order to create an access point
– if a road cuts the recreational area multiple times, only the two outer access point will remain
– access points have to be situated at least 500 metres Euclidean distance apart; if not, the access point closest to the centre of the area will be removed
– the size of the destination area divided by the number of access points should be above 25 hectares; if not, the access point closest to all other access points will be removed, until this criterion is met
– if no local road is accessing the destination area, then the centroid of the polygon representing this area is snapped to the nearest local road

The whole procedure was aimed at arriving at a minimum number of access points that still would give a good estimate of the distance by road to the destination area at hand. Too few access points are likely to lead to an overestimation of this distance, and too many access points to a underestimation. The total number of resulting access points was about 8000, which implies an average of about 60 hectares of destination area per access point.

The same problem was addressed in a different manner by Skov-Petersen (2002). He used the nodes of the road network as a sort of access points in his model. Natural areas within a certain distance of such a node (including end nodes) were uniquely assigned to this node. The main differences between the two approaches seem to be that we explicitly created new nodes to serve as access points, but on the other hand did not consider all nodes to be access points.

Other characteristics of destinations

In the model the size of a destination area is an important factor. The assumption is that, all things being equal, each *hectare* of destination area will draw the same number of visits, rather than each destination area. In the next phase of the analysis each access point will be considered a separate destination, competing with other destinations. Therefore it is necessary to determine the size of the part of the destination area that may be considered to ‘belong’ to the access point. In this first application it was decided to simply divide the size of the destination area equally over all its access points.

Besides road distance and size, the third factor determining the attraction value of a destination within the model, is its recreational quality. The quality figures were taken from a study by Goossen and Langers (2000). They developed a GIS-based model to assign quality scores to each 500x500 metres grid-cell of countryside within the Netherlands, per recreational activity. Obviously we used the figures for walking. Aspects included in this quality score are type of land use, density of recreational infrastructure (paths and quiet roads), relief, banks & shores, tranquillity, and distance to nearest city. The relative importance of these aspects was determined by a survey among walkers, using a conjoint measurement method. The quality score for a destination area was defined as the average score of all grid-cells covered by this area. So, each access point of a destination area got the same quality score. This completes the input for the destination side of the model.

Visits originating from residential areas

As already mentioned, neighbourhoods are used as the smallest unit of origin. For each neighbourhood the number of inhabitants is available. This is an important factor in estimating the number of forest and nature visits originating from each neighbourhood. The other element that is needed, is the number of these visits per person. At this time, this number is still independent of the local supply of destination areas. For simplicity's sake, we make the (unrealistic) assumption that an individual makes the same number of visits, regardless of whether there are many attractive destinations nearby or not.

In a previous, regional application the population was subdivided into five segments that differed in their average number of visits (De Vries & Goossen 2001). This segmentation was largely based on age, family-stage and socio-economic status. However, it appeared that the segmentation had little effect on the number of visits to different destinations. The reason for this is that local populations tend to be quite mixed in their composition according to these segments (see also De Vries 2000).

Combining data from different sources, we estimated that the actual number of visits to forests and nature areas (as opposed to retrospectively reported) is about 13 visits per year on average (De Vries & Goossen, 2002b). Based on the monitoring of visits to several forest areas (Segeren & Visschedijk 1997), it is further estimated that of these 13 visits, on average roughly 8 visits are made by car.

The distribution function

To start with, we already mentioned that the number of visits to a destination area is assumed to be directly proportion to the size of the area. Every else being equal, every hectare of natural area is assumed to draw the same number of visits. This leaves the two other factors to determine differences in the density of visits: recreational quality and road distance. As for recreational quality, we assume that the distribution of quality scores is more or less normal. This implies that a score of 10 out of 10 is much less common than a score of 7. To model this feature, we decided to make the attraction value of a destination proportional to the square of its quality score. This implies that the attraction value of a destination with a quality score of 10 is four times as high as that of a destination with a score of 5.

As for distance, functions with very high distance decay are quite common in the literature (see Sen & Smith 1995, p. 93). However, in some models competing destinations are not explicitly taken into account (see e.g. Brainard et al. 1999). This means that the distance function has to take care of intervening opportunities also. The number of such opportunities may be expected to be more or less linearly related to the size of the area that is within the reach defined by the distance to the destination under consideration. This makes a quadratic function quite reasonable in those cases. However, in our case the competing destinations are explicitly taken into account. Furthermore distance already has a quite strong effect in the sense that the local choice set for an origin only includes only the destinations within a range of, in this application, 15 kilometres.

A study by Ploeger et al (2000) suggests that once people get in their car, they seem to be quite willing to drive somewhat further to go to a more attractive destination. There is also other evidence that Dutch people are quite willing to travel a considerable distance to visit a forest area (De Vries 2000). Therefore we decided to make the attraction value of a destination inversely proportional to the square root of the road distance between origin and destination. So, within the 15-km radius people are expected to be quite sensitive to the quality of an area. Together the proposed relations lead to the following function for the attraction value of a single destination:

$$A_{ij} = (S_i * Q_i^2) / \sqrt{(D_{ij})} \qquad \text{Equation (1)}$$

with:
- A_{ij} - attraction value of destination access point i for origin j
- S_i - size of destination area assigned to access point i
- Q_i - quality score of destination area assigned to access point i
- D_{ij} - distance by road from origin j to destination access point i

Within the model, the number of visits from a given origin to this destination is proportional to the size of this attraction value:

$$V_{ij} = V_j * (A_{ij} / A_j) \qquad \text{Equation (2)}$$

with:
- V_{ij} - annual number of visits to access point i originating from origin j
- V_j - total number of visits per annum originating from origin j
- A_{ij} - attraction value of destination access point i for origin j
- A_j - sum of attraction values of all access points in the local choice set of origin j

Because an access point may receive visits from several origins, the final step is to sum the number of visits for all origins that have this destination access point within their choice set.

$$V_i = \sum_j (V_{ij}) \qquad \text{Equation (3)}$$

with:
- V_i - annual number of visits to access point i
- V_{ij} - annual number of visits to access point i originating from origin j

The model is kept quite simple in the sense that calculations can be made for each origin separately: there is no interaction between origins. The number of visits to a destination is not limited in any way, nor is the attraction value of a destination influenced by the number of visits it has already received.

Skov-Petersen (2002) used more detailed information on the number of visits per origin. He divided the total number of visits over four (travel) time bands, and within these time bands over type of natural area (forest, beach, etc.). This distribution was sensitive to the local supply situation, in that if a type of natural area was not available within a certain time band, the number of visits was set to zero. At the same time, the average number of visits to this type of area within the time band was increased for the people that did have the resource available, in keeping with the national total number of visits. As a consequence of this approach individuals are assumed not to compensate for the lack of a certain type of natural area within a time band, neither with visits to another type of natural area, nor with more visits in other time bands to this type of area. This seems a clear difference with the present model, in which different types of natural area at different distances all compete with each other, as long as they are included in the local choice set.

Results of national application

At first instance the model generates results for each destination access point. Since these access points, or pseudo parking lots, do not really exist, the results are converted to annual visiting densities for the 'original' destination areas. The number of visits assigned to each access point of a destination area is summed, and then divided by the size of the total destination area. This gives the annual number of visits per hectare. Results for the Randstad region are shown in figure 1.

The density figures range from 0 to 19,100 per hectare per annum. Clusters of high densities can be found in the natural areas situated closely to or in between the very densely populated cities of the Randstad, a conurbantion in the west of the Netherlands. But densities are also high in the most southern part of the Netherlands. By and large this is a logical outcome, because these areas are densely populated and, certainly in the case of the Randstad, there are not many opportunities to go for a walk in a natural area (except for urban parks).

To get a better idea on what constitutes a high density of visits, we will take a look at an urban forest, the "Amsterdamse Bos", directly south of the city of Amsterdam. This area of about 900 hectares includes recreational water surfaces and many recreational facilities. Given the location of this area and its special features, it is likely to be one of the most densely visited areas in the whole of the Netherlands. The "Amsterdamse Bos" is reported draw about 9 million visits per year. This is a density of 5000 visits per hectare per year. Higher densities are unlikely to occur in natural areas outside the city limits. The model estimate for this area is about 3700 visits per hectare per year. Since the additional features of this area are not completely accounted for in the model, this too low estimate does not seem unreasonable, also given the fact that other than car-born visits by residents are not yet included in this

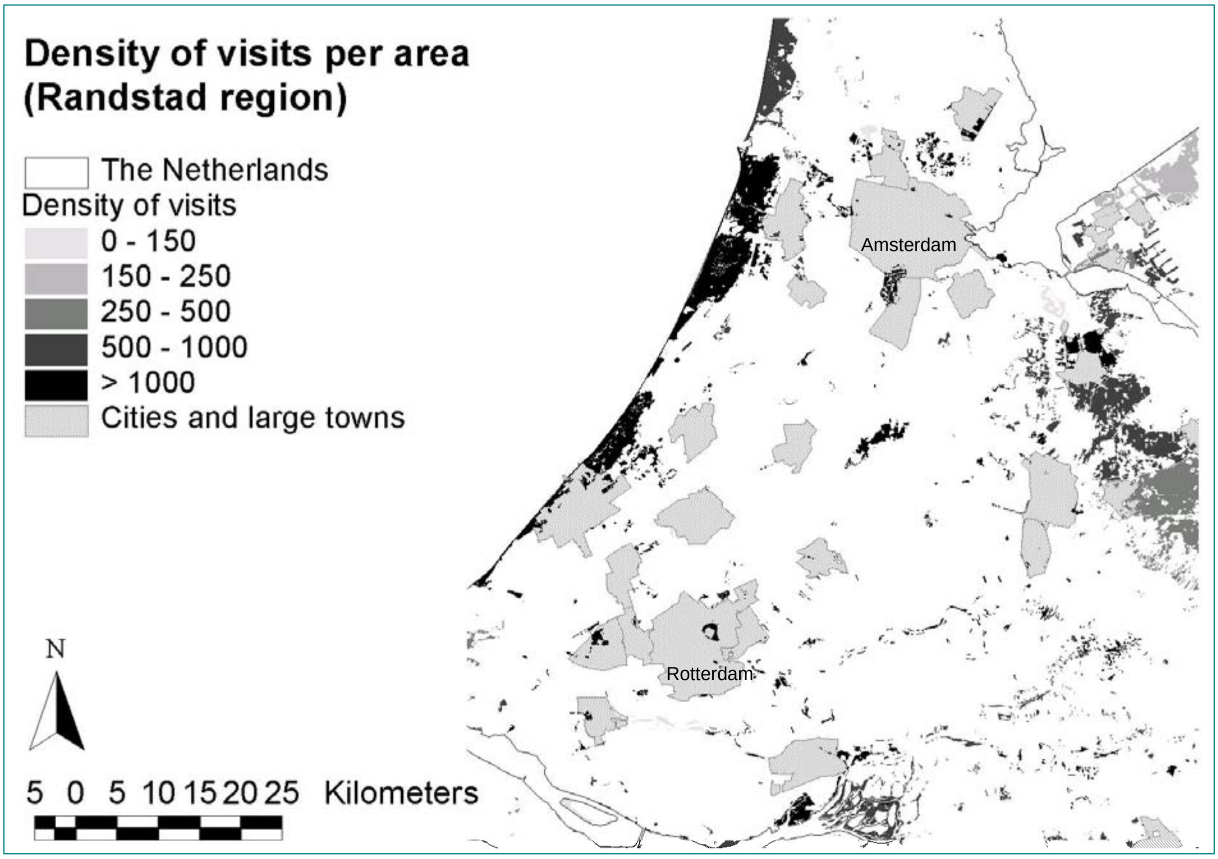

Figure 1. Density map for the Randstad region.

estimate. Given this reference, the estimates for some destination areas are clearly way too high.

The Dutch National Forest Service (SBB) has assigned recreational targets to their areas. Visschedijk (1995) estimates that the areas with the highest recreational target realise a visiting density of about 1300 visits per hectare per year on average. Based on this estimate, we concluded that certainly areas with an estimated density of over 1600 visits for car-born visits by residents only, should be areas that are well known for their recreational function. Using this density as a criterion it appeared that about 12% of the destination areas had intensities above 1600 visits per hectare per year. Of these 210 areas about 50 areas even had densities above 5000 visits. All 50 areas were located near the Randstad. And only in a few cases these areas were well known for their recreational function, e.g. the "Kralingse Bos" in Rotterdam, with an estimated density of about 13,600 visits. When looking closer at the areas with high visitation densities, it appears that they mainly are small areas within the 15-km reach of one or more cities. In fact, 62% of the 210 destination areas with visiting densities above 1600 per year are smaller than 15 hectares. From the other 1590 destination areas, with lower densities, only 44% are smaller than 15 hectares.

Also destination areas with densities below 400 visits per hectare per year were examined in more detail. About 970 of the 1800 natural areas (54%) fall into this category. By and large these areas are located in the east and south of the Netherlands, especially on sandy soils. This part of the Netherlands is more forested. Notable exceptions, with higher densities, are the southern part of the province of Limburg (most southern part of the Netherlands) and the area around the conurbation of the cities of Enschede, Hengelo and Almelo in the east. Clearly this has to do with the concentration of demand in these areas.

Also remarkable is that the well-known national park "De Hoge Veluwe" falls within this low-density category. Partly, this may be due to the visits originating from holiday resorts and campground not being included in the model yet. On the other hand, it is also likely that only a small part of this national park is subject to high visiting densities: other parts have little or no recreational infrastructure. Precisely because all visitors have to follow the (few) paths within the park, they are likely to experience the park as being heavily visited. On a per hectare basis, however, the density may not be that high at all. The estimated density is 136 visits per hectare per year. Given the size of the park, about 5000 hectares, the estimated number of car-born visits by residents is 680,000. According to the official web-site of the park, the actual total yearly number of visits is 'only' 600,000. So, the present estimate is already on the high side. It may be that the very low density of paths within the park is not sufficiently reflected by the quality score.

Conclusions and discussion

Given that up till now the model is limited to car-born visits by local residents, it is difficult to compare the estimated visiting densities with observed densities. Nevertheless, there clearly are destinations for which the predicted density is (much) too high. Since this seems to be the major flaw in the model thus far, we will briefly discuss a number of reasons for these over-estimations.

The model forces every inhabitant to make a certain number of visits. No distinction is made between different segments of the population. In an earlier, regional analysis such a distinction was made, but proved to have little effect on the outcomes (De Vries & Goossen 2001). The reason was that the composition of local population according to this segmentation was quite heterogeneously. However, there may be another segmentation that is not only relevant with regard to the number of visits made, but also spatially more segregated: autochthonous inhabitants versus inhabitants from ethnic minorities. The latter segment appears to visit natural areas outside the city limits less often (with a possible exception of beaches) and lives concentrated in the larger cities (De Vries et al. 2003). In the reported analysis this segment was assumed to make the same number of visits as the autochthonous population.

Another issue is that the local choice set may have been defined too narrowly. Fifteen kilometres is a relatively small distance and people are known to travel further. If the small choice set offers no attractive, large destination areas, people are ‘forced’ to visit small areas, even though they may be not very attractive. This brings us to the issue of the recreational quality of the destination areas. The method used to determine this quality, is one that has been developed for the countryside as a whole. As a consequence natural areas tend to score rather high, compared to agricultural areas. Since the FORVISITS-model focuses on natural areas, the level of discrimination may be too small. However, for more discrimination at the upper end of the scale additional information is likely to be required, e.g. on the type of forest. Perhaps also the information that already is available can be used more fully, e.g. that on the density of the recreational infrastructure.

Another issue, also having to do with discrimination between destination areas, is the fact that originally separate areas have been concatenated when not too far apart. In some cases this has led to quite extended areas. Furthermore, in this first national application each access point was given an equal share of the total size of the destination areas, as well ass the same, overall quality score. In a future application it may prove worthwhile to divide the destination area by means of Thiessen polygons, and calculate separate quality scores for each part of the destination area.

Finally the FORVISITS-model also needs to be extended to visits from residents made by bicycle or by foot, and to visits originating from holiday resorts. In some areas the latter are responsible for more than half of the total number of visits. Extending the model in this direction is important, because of the intended use of its outcomes as input for ecological models, estimating the effects of visitor density on habitat quality. What is needed, are good estimates of the absolute number of visits to specific natural areas. Clearly, we still have a long way to go, but the journey has been worthwhile thus far.

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Recreational Trail Use of Residents in Jasper National Park, Canada

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Abstract: This paper reports the results of a survey of recreation activities by the residents of the town of Jasper in Jasper National Park on the eastern slope of the Rockies in Canada. During the summer, residents enjoy hiking, jogging, mountain biking and horseback riding. In order to better understand the importance of trail attributes, the attitude towards encounter levels, and the possible acceptance of trail management options, a discrete choice experiment was administered in a mail survey. We identified three distinct user groups based on activity patterns, and these three groups differed significantly in their responses to most attributes in the discrete choice model. In the discussion we elaborate how the results of a discrete choice experiment can be used to simulate the affects of various management options on the three user groups. Simulating the likely recreation behaviour by the residents of Jasper produces insights for both visitor management and wildlife management.

Introduction

Over the last few decades, ecological integrity has become a growing concern for managers of Canada's national parks. In 2000, Parks Canada (2000) strengthened its commitment to maintaining ecological integrity by endorsing the report released by the Panel on Ecological Integrity which detailed the precarious state of some national parks. In this same year, ammendments to the National Parks Act declared ecological integrity the predominant concern for parks management.

While these documents make it clear that visitor enjoyment will continue as an important activity in all National Parks, human use must be managed accordingly. Therefore, studies of parks users are an integral component of proactive and adaptive parks management.

Maintaining ecological integrity while providing satisfactory recreation opportunities is a particular challenge in some of the older mountain parks for two reasons: 1) these particular parks contain settlements, and 2) the location of townsites and most human use is concentrated in the valley bottoms and low lying areas, which also contain precious ecological areas. When these settlements are of significant size, as in Jasper, Alberta, residental recreational demands augment the stresses associated with regular human use by visitors considerably.

Recreational use by residents

Important attractions for living in a park community are the high level of environmental quality and the ample recreation opportunities available around the community. Consequently, in addition to the typical park users who stay in the community for a few days and enjoy scenery, wildlife, and the recreational opportunities, residents also use these resources extensively year round. The main activities in a mountainous environment like Jasper are hiking and mountain biking, and residents also enjoy jogging and simply walking their dogs.

The recreation behaviour of these user groups has been documented in the literature extensively, by focusing on the conflict between hikers and mountain bikers (Cessford 2002, Federal Highway Administration n.d), and on crowding and encounter norms (Donelly et al. 1992, Manning et al. 1996, Manning et al. 1999), but only few studies have focused on residents' activities in a national park setting. In effect there is a rather unique array of uses in the sense that far-away tourists who visit only once-in-a-lifetime, or very sporadically, mix with frequent outside visitors from nearby urban centers, and with residents, who will partly enjoy the same activities, but also have need for the more routine daily or several-times weekly recreational activities such has dog walking, jogging or casual mountain biking.

In this paper we report on the results of a survey of Jasper residents undertaken during the summer of 2003. The purpose of the survey was to obtain human use information that is complementary to the ecological data that have been collected for the parks lands surrounding the town. The survey focused on patterns of use, motivations, and attitudes towards management options. One core component of the survey was a discrete choice experiment to explore the residents' preferences for certain trail characteristics, and their trade-offs between different management options.

Next, we briefly describe the study site, followed by a description of the survey instrument and the methods used. The presentation of results is organized using a segmentation of the respondents based on their recreation activities and focuses on the discrete choice experiment and responses to some management questions. The paper concludes with a discussion of these findings for human use management.

Study area

The town of Jasper, Alberta is on the east slope of the Canadian Rockies, located in an area of Jasper National Park known as the Three Valley Confluence (TVC). Named for the confluence of the Athabasca, Maligne, and Miette Rivers, this broad valley supports the greatest concentration of development and human use in the park (AXYS 2001, Cardiff 2000, Parks Canada 2001). Jasper National Park is one of seven Canadian national parks housing a townsite within its boundaries. As a result, in addition to the 1.6 million annual visitors, human use management in the park also needs to consider the presence of 4,800 year-round residents, which grows even larger with seasonal residents during the summer.

The TVC is not only special for the value it provides to humans, it is also of significant ecological value. This low-lying area forms part of the montane ecoregion which provides habitats for more species of plants and animals than are found at the park's higher elevations (Cardiff 2000, Parks Canada 2001).

High levels of human use in the TVC translate into significant recreational pressure. The 154 km network of day-use trails near the Town of Jasper is heavily used by both residents and visitors who enjoy hiking, jogging, mountain biking, and horseback riding in the summer, as well as cross country skiing and snowshoeing during the winter. However, not only humans enjoy access to these trails; because transportation routes cut through their travel corridors, wildlife also relies on these areas. Challenges presented by the overlap of ecological and human use values highlight the need to devise more effective strategies for managing trail use in the TVC (AXYS 2001).

While ecological research has granted park managers an understanding of wildlife movement through this area, so far little is known about the patterns of recreational use on Jasper's day-use trail system (Parks Canada 2001). The current research attempts to characterize how both residents and visitors use the trails in the TVC.

Methods

Survey

During the summer of 2003, trail use was monitored in the TVC using both trail counters and observer based counting. An intercept survey recorded the users' activities on the day of observation, their level of satisfaction with their trail experience, and asked for their participation in a more detailed mail survey. The intercept survey produced a total of 150 addresses for the later mail survey.

Questions in the mail survey explored residents' patterns of use, their motivations for using the trail network, the influences affecting their choice of particular trails, their level of satisfaction with the existing network, and their reactions to hypothetical management actions. A total of 700 mail surveys were distributed to Jasper residents. In addition to the 150 resident addresses collected through the intercept survey, 440 surveys were distributed randomly through the post office, and 110 surveys were given to specific target groups.

Stated choice model

To analyse the trade-off behaviour, stated choice models have been applied extensively in recreation research. Typically respondents are asked to make choices among alternative configurations of a hypothetical multi-attribute good (Louviere & Timmermans 1990). A strength of choice models lies in their ability to predict how the public will respond to various policy and management alternatives, including arrangements of resources, quality of visitor experiences, facilities, and/or services that may not currently exist, and avoid the problem of multicolinearity (Haider 2002). Stated choice analysis has been applied to study public preferences concerning a range of recreation-related issues such as visitor preferences for wilderness management issues (Lawson & Manning 2002, McCormick et al. 2003), tourism destination choice (Haider & Ewing 1990), beach preferences (Stewart et al. 2003), and trail characteristics preferred by mountain bikers (Morey et al. 2002).

In stated preference/choice models, alternatives are defined as combinations of a set of attributes, and each set is evaluated as a whole. The alternative profiles are constructed by statistical design principles, such as fractional factorial designs (Raktoe et al. 1981, Montgomery 2001). If respondents rate or rank each full profile separately, the technique is usually referred to as conjoint analysis (Green & Srinivasan 1978). In a discrete choice experiment (DCE), however, two or more such hypothetical profiles are combined to choice sets, and respondents choose the most or least preferred alternative (profile) from each set they are asked to evaluate (Louviere et al. 2000).

The advantages of stated choice over traditional conjoint analysis are that behaviourally, the analysis of choice – even though it is only hypothetical choice – is closer to actual behaviour than a rating or ranking task, and that the statistical analysis has a rigorous error theory included.

The theory posits that choices can be modelled as a function of the attributes of the alternatives (McFadden 1974, Ben-Akiva & Lerman 1985). Individual behaviour is considered as deterministic, but because of the inability of the research process to account for all influencing attributes and the need to aggregate individual choices across individuals, the modelling of behaviour is undertaken stochastically (Train 1986, Ben-Akiva & Lerman 1985). Therefore, it is assumed that the overall utility (U_i) contained in any one alternative is represented by a utility function that contains a deterministic component (V_i) and a stochastic component (ε_i). Selection of one alternative over another implies that the utility (U_i) of that alternative is greater than the utility of any other alternative (U_j). The overall utility of alternative i is represented as (McFadden 1974, Train 1986):

$$U_i = V_i + \varepsilon_i \qquad (1)$$

Given this stochastic component, the probability of an individual choosing one alternative over another will depend on the relative sizes of the systematic components of their utilities compared with the size and sign of their random components. The larger the difference in systematic components compared with the difference in random components, the more likely is the alternative with the larger systematic component to be chosen (Louviere et al. 2000).

$$\text{Prob }\{\text{i chosen}\} = \text{prob }\{V_i + \varepsilon_i > V_j + \varepsilon_j;\ \forall_{\ j} \in C\} \qquad (2)$$

where C is the set of all possible alternatives. If one assumes that, for the entire sample, the stochastic elements of the utilities follow a Gumbel distribution, the multinomial logit (MNL) model can be specified as

$$\text{Prob }\{\text{i chosen}\} = e^{Vi} / \sum e^{Vj} \qquad (3)$$

The analysis produces regression estimates, standard error and *t*-values for each attribute level, which are referred to as part-worth utilities. This standard MNL model supports the estimation of parameters that allow one to express the choice probability of a given alternative as a function of the attributes comprising that alternative and those attributes of all other alternatives in the choice set.

Attributes

The purpose of the DCE was to investigate the importance of certain trail characteristics, including crowding situations by various types of users, and the reaction to certain regulations. The focus of this study was on the three most prominent user groups jointly, rather one specific user group. Therefore the attributes had to be selected in such a manner that the profiles were relevant to all user groups.

The first set of attributes related to trail management options. It simply listed the activities that would be allowed on a trail (hiking, mountain biking, horseback riding), inferring that if the activity was not listed, then the activity would not be allowed. It also stated if the trail was patrolled by wardens, and if signage was posted at trail junctions. Thereafter, trail characteristics referred to the trail surface (soil, hardened, or exposed roots), the topography (flat, many small hills, few long hills), whether the trail was actively maintained or not, and the type of forest surrounding the trail (evergreen, mixed, leafed, or mixed and unforested). Three variables referred to whether or not possible trip highlights were available along the trail, such as lake / river, viewpoints, wildlife viewing, and finally four variables were used to describe different mixes of encounter situations between the various activities (0-10 encounters with hikers; 0-6 encounters with mountain bikers; and 0-3 encounters with horseback riders) and also large groups (0-3 encounters).

The 17 variables were combined into one hypothetical trail description (profile). Three profiles were joined to one choice set (Figure 1). In each choice set, respondents evaluated three profiles and the option of pursuing their favourite activity outside of the trail network surrounding Jasper. While in most DCE applications respondents are asked to choose one alternative, in this case we asked respondents to allocate a total of ten outings among the three trail profiles, and the base alternative of going outside of the trail network served as a fourth option. Such a response task is relevant for repeat users such as seasonal and year-round residents, and provides more accurate data for the model.

The profiles and choice sets were developed by following a Resolution III main effects design plan (Raktoe et al. 1981). In order to estimate a statistically valid model a total of 64 choice sets were required. These were divided equally among eight versions of the survey instrument, so that in effect each respondent evaluated only eight choice sets.

The evaluations of the choice sets were analysed in a multinomial logit (MNL) regression, in which the aggregate frequency of responses to each alternative served as the dependent variable, and all the independent variables described above were coded with effects codes (Louviere et al. 2000). Only the encounter variables which were numerical, were coded as continuous variables with a linear and quadratic term using orthogonal polynomial coding (Louviere et al. 2000). Data analysis was undertaken in LIMDEP 7.0 (Green 1998).

	Option A	**Option B**	**Option C**	**Option D**
Trail Management	(Trail 1)	(Trail 2)	(Trail 3)	
Activities allowed:	Hiking Mtn. Biking	Hiking Mtn. Biking Horse Use	Hiking Mtn. Biking Horse Use	I would pursue this activity on trails outside of the day-use network.
Patrolled by wardens?	Yes	No	Yes	
Signage at junctions	No	No	Yes	
Trail Characteristics				
Trail surface	Soil	Exposed roots	Hardened	
Topography	Few long hills Straight	Flat Winding	Flat Winding	
Maintained?	Yes	No	Yes	
Forest type?	Evergreen Forest	Mixed forest & Non-Forested	Leaved Trees	
Trip Highlights				
Lake/River	Y	Y	-	
Viewpoints	-	Y	Y	
Wildlife viewing	Y	-	Y	
# of each user group you meet				
Hikers/joggers	2	6	8	
Mountain bikers	6	3	1	
Horseback riders	0	1	1	
Total # groups with. more than 6 people	0	1	0	
Given a total of 10 trips, how many would you allocate to each option?	___ +	___ +	___ +	___ = 10

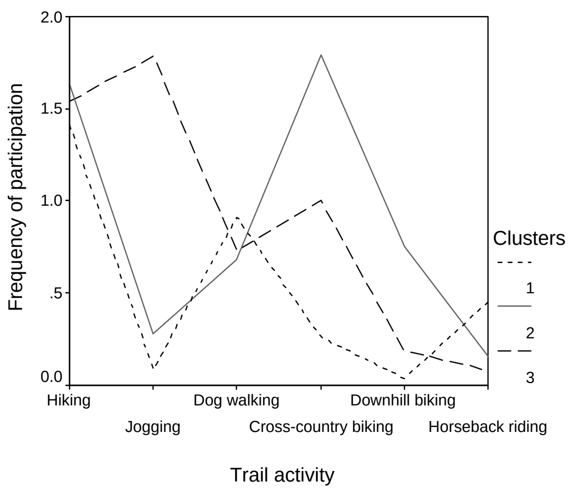
Figure 1. Example choice set.

Results

Resident recreation behaviour

Survey results indicate that Jasper residents are on the trails an average of 19.9 days each month. While almost all were able to identify a preferred activity, most residents participate in more than one trail activity.

The 92.5% of residents who reported hiking as forming part of their "top three" activities hike the trails 7.3 days each month. Cross-country biking is the second favourite trail activity, with 55.7% of respondents citing it as one of their three most preferred activities. Horseback riding is least popular, as only 13.2% of respondents consider it part of their top three activities. While hiking is considered the most popular trail activity, dogwalkers are the most frequent participants in their activity. The 42% of respondents listing dogwalking amongst their top three activities walk their dogs on the trails 9.6 days each month. In order to differentiate between different users in our analysis, a cluster analysis using the Ward method was performed to identify groups of respondents who are most similar in pursuit of their recreation activities. The responses to the frequency of participation were recoded to never, occasionally (= 1-3 times a month), and regularly (= more than 4 times a month. A highly interpretable three cluster solution (see Figure 2) showed that hiking and dog walking were enjoyed about equally by all three groups. On the other hand, participation rates in jogging and mountain biking differed significantly, with members of Cluster 2 (N=57) focused on mountain biking, and being adverse to jogging, while Cluster 3 (N=37) preferred jogging over all other activities. Cluster 1 (N=80) members hiked and dog walked as frequently as the others, but participated much less in mountain biking. This cluster also contained a few horseback riders. In the analysis of the choice responses we distinguished between these three clusters.



Y axis: *0 = Not at all; 1 = 1-3 times/month*
2 = 4+ times/month

Figure 2. Frequency of trail activities by cluster.

Choice model results

Table 1 presents the MNL parameter coefficients, their standard errors, and *t*-values each attribute level. The intercepts differ dramatically between Cluster 1 and the two other segments. The highly negative intercept for Cluster 1 indicates that the casual users are opposed to the changes that were proposed in the scenarios in one form or another. The two other groups however indicated that everything else being

Table 1. Results of MNL-model by activity clusters.

		C1 (Casual users)			*C2 (Active bikers)*			*C3 (Active joggers)*		
Attribute and Levels		Coeff.	SE	*t*	Coeff.	SE	*t*	Coeff.	SE	*t*
Intercept		-0.465	0.035	-13.18	0.044	0.043	1.02	0.118	0.055	2.13
	Trail Management									
Activities allowed - Hiking	No	-0.850			-0.068			-0.556		
	Yes	0.283	0.016	17.93	0.023	0.013	1.69	0.185	0.020	9.50
Activities allowed - Mtn Biking	No	0.254			-0.533			-0.093		
	Yes	-0.085	0.014	-6.17	0.178	0.017	10.72	0.031	0.020	1.57
Activities allowed - Horse use	No	-0.013			0.250			0.144		
	Yes	0.013	0.022	0.60	-0.250	0.025	-10.17	-0.144	0.030	-4.75
Patrolled by wardens?	No	0.019			0.017			0.088		
	Yes	-0.019	0.020	-0.91	-0.017	0.022	-0.78	-0.088	0.028	-3.10
Signage at junctions	Absent	-0.091			-0.061			0.002		
	Present	0.091	0.021	4.36	0.061	0.022	2.75	-0.002	0.029	-0.05
	Trail Characteristics									
Trail Surface	Soil	0.125			0.014			-0.078		
	Eposed Roots	-0.133	0.028	-4.66	-0.083	0.030	-2.71	-0.057	0.038	-1.49
	Hardened	0.007	0.032	0.23	0.068	0.035	1.95	0.136	0.046	2.94
Topography 1	Flat	-0.160			-0.257			-0.019		
	Many Short Hills	0.052	0.029	1.79	0.101	0.031	3.27	-0.003	0.040	-0.08
	Few Long Hills	0.108	0.034	3.13	0.156	0.037	4.22	0.022	0.046	0.48
Topography 2	Straight									
	Winding	0.062	0.022	2.84	0.046	0.024	1.94	0.065	0.030	2.17
Maintained	No									
	Yes	0.079	0.022	3.56	0.138	0.024	5.62	0.089	0.030	2.95
Forest Type	Evergreen	-0.075			-0.087			0.043		
	Leafed	-0.054	0.039	-1.40	0.057	0.041	1.38	-0.109	0.052	-2.09
	Mixed Forest	0.020	0.037	0.56	0.035	0.040	0.88	0.041	0.048	0.86
	Mixed and Non-forested	0.108	0.038	2.86	-0.006	0.040	-0.14	0.025	0.051	0.49
	Trip Highlights									
Lake/River	Absent	-0.094			-0.064			-0.050		
	Present	0.094	0.021	4.57	0.064	0.021	3.01	0.050	0.027	1.86
Viewpoints	Absent	-0.027			-0.047			-0.134		
	Present	0.027	0.021	1.29	0.047	0.023	2.07	0.134	0.029	4.71
Wildlife viewing	Absent	-0.035			-0.042			-0.059		
	Present	0.035	0.021	1.69	0.042	0.022	1.87	0.059	0.029	2.06
	Number of Each User Group Met									
Hikers/joggers	Linear	-0.070	0.015	-4.58	-0.024	0.018	-1.32	-0.051	0.021	-2.41
	Quadratic	0.002	0.006	0.28	-0.013	0.007	-2.03	-0.004	0.008	-0.55
Mountain bikers	Linear	-0.100	0.019	-5.16	-0.051	0.020	-2.56	0.051	0.027	1.91
	Quadratic	-0.001	0.007	-0.17	-0.007	0.008	-0.89	-0.018	0.010	-1.84
Horseback riders	Linear	0.006	0.011	0.52	-0.018	0.013	-1.40	-0.007	0.015	-0.47
	Quadratic	0.002	0.004	0.48	0.002	0.004	0.54	-0.017	0.005	-3.23
Large Groups of ≥6 People	Linear	-0.029	0.007	-4.28	-0.020	0.008	-2.60	-0.050	0.009	-5.44
	Quadratic	-0.005	0.003	-1.83	-0.004	0.003	-1.37	0.016	0.004	4.09
	Encounter Interactions									
Hi x Bi	Linear	0.031	0.010	3.11	-0.021	0.011	-1.95	-0.005	0.012	-0.38
Hi x Ho	Linear	-0.003	0.005	-0.59	0.008	0.006	1.27	-0.003	0.007	-0.35
Hi x LG	Linear	0.007	0.004	1.73	-0.005	0.005	-1.12	-0.015	0.006	-2.72
Bi x Ho	Linear	0.010	0.006	1.57	0.003	0.007	0.40	0.004	0.009	0.46
Bi x LG	Linear	-0.011	0.004	-2.51	-0.006	0.004	-1.46	0.017	0.006	2.93
Ho x LG	Linear	0.003	0.003	1.12	-0.002	0.003	-0.74	0.004	0.003	1.19
Hi x Bi x Ho	Linear	-0.005	0.004	-1.45	0.001	0.004	0.15	0.001	0.005	0.21
Hi x Bi x LG	Linear	0.001	0.003	0.24	0.003	0.003	1.04	0.005	0.003	1.50
Hi x Ho x LG	Linear	-0.001	0.001	-1.02	0.001	0.001	0.75	0.002	0.001	2.08
Bi x Ho x LG	Linear	-0.002	0.002	-1.03	0.001	0.001	0.85	-0.003	0.002	-1.29
Hi x Bi x Ho x LG	Linear	0.002	0.001	2.35	0.003	0.001	2.70	0.001	0.001	0.47
		Rho^2 = 0.070 Rho^2adj. = -0.152 Log Likelihood (0):-7088.12 Parameter model: -6593.38			Rho^2 = 0.040 Rho^2adj. = -0.190 Log Likelihood (0):-5420.61 Parameter model: -5643.61			Rho^2 = 0.047 Rho^2adj. = -0.180 Log Likelihood (0):-3378.01 Parameter model: -3544.75		

even, they prefer the managed scenarios presented in the choice tasks over the base alternative of using trails outside the immediate Jasper trail network. All other attributes have signs in the expected directions, and most attributes have at least one significant difference in each of the three clusters. The preferences for trail activities allowed certainly reflects the main interests of the respective users. For the casual users, a hiking trail is considered extremely important, while they are adverse to mountain bikers and indifferent to horseback riders. The mountain bikers have a strong desire for mountain biking trails, and also have a positive disposition towards hiking, but are strongly opposed to horseback riding. As to be expected, the active joggers strongly desire hiking trails, and are indifferent to mountain bikers being present, but also dislike horseback riding. All groups agree in their opposition to warden patrols, although the estimates were not significant for individual segments, they were for the overall sample (estimate= -0.03; t=-2.46; not shown in table), and they all agree on the importance of trail maintenance. There is some disagreement regarding trail signage, which is desired by the casuals and mountain bikers, while the joggers are indifferent to it.

Several interesting differences also emerged in the groups' preferences for trail characteristics. They all dislike exposed roots (only for joggers insignificant), and while bikers and joggers prefer hardened surfaces the most, casual users prefer soil surfaces, obviously because walking is the most important activity for them. Joggers are indifferent to the topography (flat vs. steep), while bikers want anything but flat terrain, and the casual users prefer many short hills the most. They all agree that winding paths are preferred over straight trails.

All groups have significant positive estimates for the various trip highlights, such as lakes/rivers and seeing wildlife. Joggers are much more in search of a view than the two other groups. They also have different preferences for the forest environment, as mountain bikers really prefer deciduous trees along their trails, which are disliked by joggers; The casual users on the other hand prefer mixed and unforested trail sections.

The encounter levels with other user groups were estimated in linear and quadratic terms, and also included interactions. Therefore we graphed the results for ease of interpretation (Figure 3) as sensitivity tables by showing a different graph for each encounter type. The casual users have the steepest encounter norm curve for hikers, while the two other groups are much more accepting of hikers. This is interesting, because the members of the casual group are most likely to be hikers themselves. Casual trail users are also more opposed to mountain bike

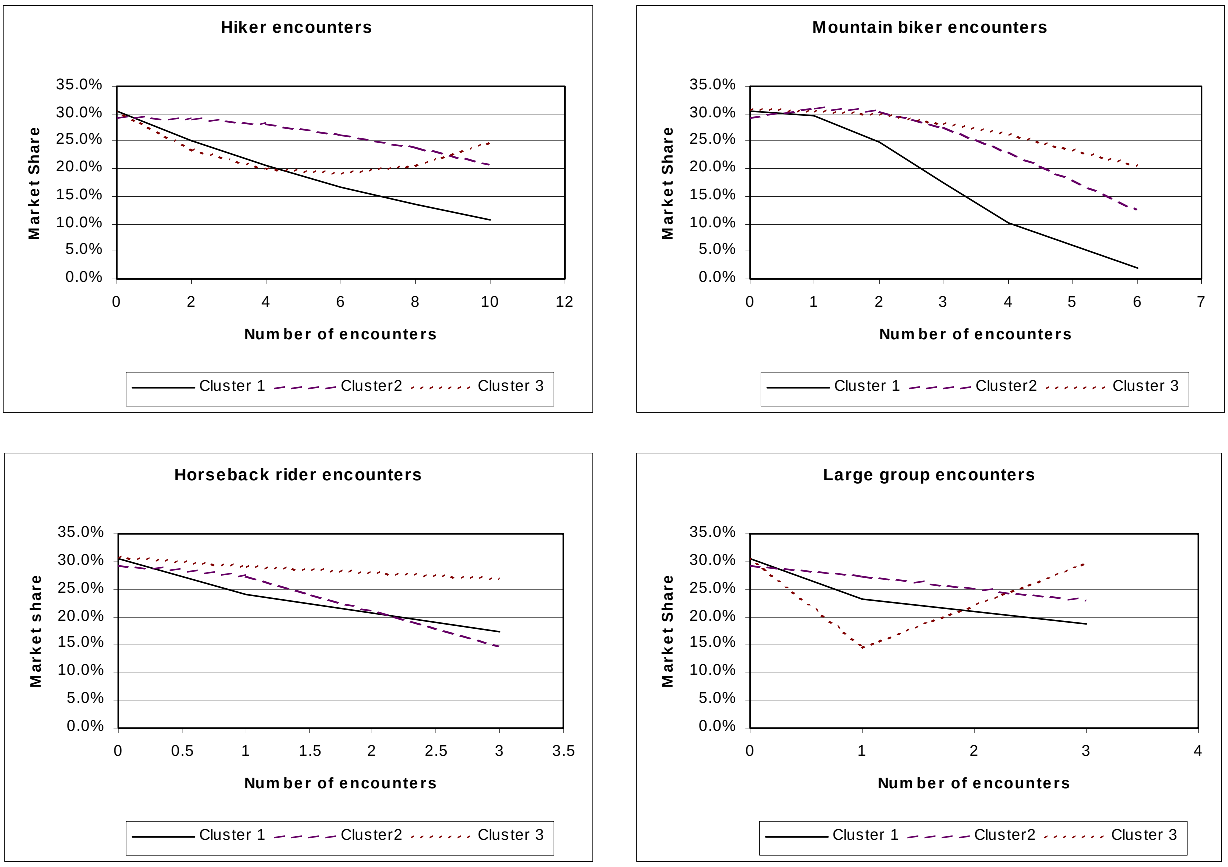


Figure 3. Preferences for encounters with various user groups by activity segments (MNL-results).

encounters, especially above three encounters; of interest here is that mountain bikers actually are more opposed to higher encounters with other mountain bikers than joggers are. Horse encounters are disliked by casuals and bikers, while again the joggers are more accepting of them. Group encounters are perceived as negative by all segments; the aberrance by joggers defies explanation.

Other results

Obvious differences between these three segments are also apparent on the other survey questions. Using the trails to "exercise and challenging myself" is more important for active bikers (sig=0.021) and active joggers (sig=0.031) than for casual users. Similarly, “the presence of challenging or technical sections” is considered a more important trail characteristic by active bikers (sig=0.000) and active joggers (sig=0.023) than it is by casual users.

The responses of casual users and active bikers also differ on some of the management questions. Casual users are more in favor of designating trails for both hikers/joggers (sig=0.013) and mountain bikers (sig=0.043). “Seeing others using unofficial trails” detracts more from their experience than it does from that of active bikers (sig=0.029). Results also suggest that “seeing few other users on the trail” enhances the experience of casual users much more than that of active bikers (sig=0.005). These differences in other survey sections confirm the heterogeneity of these segments.

Discussion

The results above indicate that the residents around the town of Jasper are a heterogeneous group of users. Of interest to researchers is the fact that these segments did not differ drastically among a long list of regular survey questions (most are not reported here), but that they differ in many respects when responding to the trade-off questions posted in the discrete choice experiment.

When the results of the DCE are used to calculate the likely support for certain management scenarios by substituting the estimates into Equation 3, one can derive shares for the various management profiles. In the simulation tool consisting of three trails and a base alternative (just like the survey), with all trails set to the most preferred level, and encounter levels at the respective highest levels, it turns out that more than half of the casual users would opt to recreate somewhere else, while only 19% of the joggers, and 33% of the mountain bikers would do so. When simulating the effects of closing a trail to mountain biking, which also implies that there will be no encounters with these users, the likelihood of choice for this trail changes from 16% to 47% for casual users, while it would drop from 22% to 20% for mountain bikers (obviously members of that segment would still use that trail for other activities), and would also drop for joggers from 27% to 26%, presumable because they could no longer mountain bike. Equally important is the fact that the demand for trails outside of the study area would actually decrease with this managed segregation of use. Our model is limited in the sense that we investigated only up to a limited number of encounters. There are several management implications from this.

From a recreation management point of view, it appears to make sense to separate certain uses, as different user groups desire different trail characteristics for their enjoyment. Towards that goal, apparently physical trail characteristics, including signage and whether or not the trails are patrolled, are less important than regulating user type and the actual encounters with various user groups. Wildlife managers are especially concerned about managing the recreation activities in the most sensitive habitats. Trails on the periphery of the network are considered particularly important for wildlife movement. While use volumes are generally lower in these areas, some individuals ignore the voluntary closures in place on these trails. Identifying the trail attributes valued by these users could help park managers to develop similar trails in less sensitive areas.

While some other survey questions indicate that the majority of respondents are opposed to trail closures, the choice experiment results indicate that closing select trails for one use appears to be an option acceptable to most users, as long as they find compensating alternatives. Given these results, trail closure to some user groups may be an option, especially when considering that the area contains a total of 145km of trails. However, if too many trails get closed, then the number of users on adjacent trails will most likely increase, leading to unsatisfactory conditions there.

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Development of a Spatial Values-Based Recreation Planning Framework for Canadian Crown Lands

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Abstract: Managers of Canadian Crown lands are beginning to recognize that all values the public associates with forests should be given due consideration in management actions. Arguably, recreation and tourism are the least understood values of the resource and typically receive only secondary consideration in management decisions on an ad-hoc basis. This situation partly results from the lack of a systematic framework for recreation management in Crown lands outside of protected areas at either the provincial or the national level. This presentation discusses the development of a spatial recreation planning framework that uses recreation values to assess the effects of various forestry activities. The framework expands upon traditional planning approaches that are primarily supply driven to directly address core user values rather than traditional user preferences. A spatial GIS model was developed that incorporates interactive data layers of the study area including high resolution orthophoto mosaic, forest resource inventory, recreation facilities locations, ROS type classification, activity participation, spatial trip patterns, and recreation values. These data layers are overlaid on the forest management plan that details the harvesting and silvicultural treatments that are planned for the next 20 years. Operation of the interactive model is based on maintaining recreation portfolios, recreation class consistency, and sets of contextualized recreation values. A process is discussed as to how this new framework will provide managers with a tool to evaluate recreation related impacts a priori to resource management actions, and allow the public to ask "what if" scenarios in an interactive mode.

Introduction

Public forests, commonly referred to as Crown lands in Canada, are increasingly administered through integrated management approaches that acknowledge non-commodity resource values in addition to traditional wood products. Management of non-commodity resource values on Crown Lands in Canada has developed through a course of evolution. There is a resulting increase in pressure from the public that forest sustainability requires an integrated approach to management (Bull 1993). Central to this premise is that all values in a forest area should be given due consideration in management actions (Crockett 1993). As pressures increase for both commodity production and non-commodity uses of the same resource, there is a concomitant need to better understand the interrelationships among these competing values as it relates to sustainability.

Aplet and Olson (1993) state that a sustainable forest is one is which ecological sound, economically viable, and socially desirable. While the need to achieve a balance in achieving sustainability is acknowledged, Crown forests have sought sustainability through the concept of sustained yield of timber. However, sustained yield does not appropriately describe forest sustainability in the greater social, ecological and economic context (Cook and O'Laughlin 2000). The public discourse over how our resources should be managed has been defined by the value we place on the resource. Sustainability is defined by human values (Lele and Norgaard 1996). People place a range of values on the resource for many reasons and the importance of these values determines how sustainability is viewed. While describing the importance of forest values, it is apparent that people view many areas as special places (Galliano and Loeffler 1995). These special places give meaning to an area and drive the socially defined importance of the resource. The political process has repeatedly demonstrated that the civic debate over how publicly owned lands should be cared for ultimately centers around the 'meaning' of place and the reconciliation of competing values associated with them.

Decision making on Crown lands has been driven by a tradition that dictates reliance on natural-science experts that focus on commodity production. It is only recently that managers realize that many production issues should not be addressed without examining social based factors associated with recreation. Concerns with visitor use cannot be appropriately addressed through traditional natural science driven processes (Machlis and Tichnell 1985). Many of these past management responses centered on the concept of maximizing benefits from the forest. In juxtaposing recreation benefits against timber benefits, it was easy for the public to value the quantifiable timber related benefits (jobs, wood products, etc.) over qualitative defined recreation related benefits (experiences, relaxation, etc.). Simply contrasting recreation and timber based on economic values did not articulate the real value of recreation and place it in a competitive position in resource use deliberations.

Much of the current debate on values and sustainability in Ontario has come out of the Lands for Life process that occurred in Ontario in 1998 (OMNR 1999). This publicly driven process resulted in the doubling of the amount of land in Ontario for parks and protected areas from the current six percent to twelve percent. As the amount of land being withdrawn from commodity production increases (to create new protected areas), there is acknowledgement that more wood fiber will have to be taken out of existing allowable cut areas to meet demand. The areas that will be most impacted will be lands closer to urban areas because of proximity to mills – these are the same areas that have the greatest demand for recreation and other non-commodity values (Cook and O'Laughlin 2000).

Until fairly recently though, Canada's Crown forests served foremost as commercial forest lease areas. This aspect is compounded by the fact that Crown lands are administered by provinces that have independent jurisdiction and governance. Recent developments towards more integrated, sustainable forest management practices have demonstrated the need to better understand the relationships between competing forest values in Canada. While the need for true multiple use of Crown forests is being publicly debated, its application at the planning and policy levels are still lacking. Because recreation does not have specific legal standing in Crown lands, it has been given little consideration in forest planning overall across Canada even though some provinces (such as British Columbia) do address recreation to a greater degree than others. Although this paper focuses on Crown lands in Ontario, it is suggested that its application may be applicable to Crown lands in other provinces.

Arguably, recreation and tourism are the least understood values of the resource and typically receive only secondary consideration in management decisions (Hawley et al. 1998). While certain recreation values may be considered on an ad-hoc basis, at present, there is no systematic framework for recreation management in Crown forests outside of protected areas at either the provincial or the national level. Recreation is peripherally addressed after major decisions toward timber harvesting decisions are already made. The lack of a scientifically defensible framework for recreation has made the forest planning process into an expert driven model. Public involvement is used only as a tool to mitigate perceived problems related to recreation after the forest plan is developed rather than to help develop the plan. The resultant forest management plan (FMP) treats recreation as a secondary concern.

This lack of focus for recreation may be problematic for resource managers since resource-based recreation use has had substantial yearly increases for the past 20 years (Cordell et al. 1995). For some resource-based activities such as bird watching, hiking, camping, mountain biking, hunting and fishing, an increase between 50–100 percent over a ten-year period has resulted in North America (Schuet 1995). Demand for recreation opportunities in Northern Ontario is especially strong given the nature of the region's resource base in defining its character and quality of life. Residents feel that resource-based recreation is one of the factors that determine their sense of place and attachment to the area (Dilley 1993, Suffling 2003). Indeed, communities such as Atikokan, Ontario (immediate to the project's study area) are planning their region's future based on tourism use of the surrounding crown lands. They are attempting to transition and diversify from a resource-based economy to a more tourism-based economy. Municipalities and businesses focusing on economic development are using tourism as the economic vehicle for growth. In turn, the tourism product is defined by the region's natural resources and the activities that occur on this land. The great majority of resource land is managed under the auspices of the Crown but surprisingly, recreation is often not seen by the Ministry of Natural Resources (agency which manages Crown lands) as being an important factor in the land's management. As demand for both commodity and non-commodity (such as recreation) resources increases on Crown lands, it becomes even more apparent that questions about allocating existing supplies will need to be answered.

The current planning system for Crown forest management in Ontario is based on the Strategic Forest Management Model (SFMM). The SFMM is a non-spatial simulation and optimization program that allows forest managers to principally optimize wood fiber production by forecasting future forest yields and compositions. Typically, the yields are set on a 20-year basis. The SFMM is overlaid on a forest resource inventory (FRI) to maximize yield efficiency. This information is then used to develop a Forest Management Plan (FMP) every five years. This model does take into account some non-commodity values such as those related to wildlife habitat supply. Recreation is not well integrated into the

SFMM-based forest management decisions, but is rather seen as a post-hoc decision evaluation factor. While producing wood fibre is acknowledged to be important, some resource managers recognize that there are many shortcomings of the current management system as it is lacking numerous components (such as recreation) considered important to the assessment of resource sustainability (Bull 1993). A primary reason for the lack of incorporating recreation in the FMP process is that no integrated recreation based decision-making framework exists on Ontario Crown Lands.

Critical to better understanding of forest sustainability is the development of a framework that is predictive of proposed management actions toward recreation (Payne and Graham 1993). This framework should (1) build on existing models, (2) incorporate behavioural indicators, (3) have extensive pubic input (4) be spatially driven, and, (5) able to be incorporated into existing management planning structures. As shown in Figure 1, the recreation planning framework should have public input at all stages of the decision making process – currently public involvement is simply used as a reactive response measure.

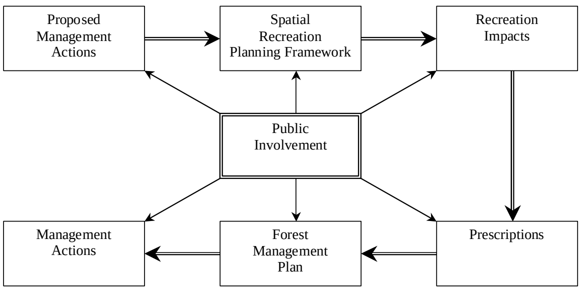

Figure 1. Use of Public Involvement in the Forest Management Planning Process.

The process used to make decisions about the provision of recreation opportunities in an area is key to the success of the overall forest planning effort. The social-political context of the planning effort suggests that plans and projects are likely to be controversial, since a variety of interest groups will be affected by proposed developments. Planners must therefore try to ensure that the investments made in the planning process itself will pay back returns, in terms of cooperation and coordination, between the Crown and stakeholders in the process.

In this context, the planning framework must encompass simultaneous processes. First, it must use an appropriate recreation planning process that not only represents the state-of-the-art in knowledge about recreation and visitor behavior, but can also be integrated into other resource planning activities. This provides not only technically correct resolutions, but will also be defensible if publicly challenged. Second, because of the social-political context, the process must include continuous involvement of affected publics. Early incorporation of the public and their concerns into the planning process will create "ownership" of the process and its outputs.

In order to better incorporate recreation in forest planning, this project has developed a Spatial Recreation Planning (SRP) framework for Crown Lands by combining the supply component of the Recreation Opportunity Spectrum (ROS) with a public defined values demand component, while focusing the framework on a working forest study area. This framework is GIS based and allows spatial interactions among the various components that define the resource. Prescriptive management parameters will be developed for areas that are to maintain ROS class consistency, valuation zones, and recreation portfolios thereby ensuring the continued availability of specific recreation opportunities. The SRP model would be able to predict the recreation related outcomes of resource modification including differing intensive forest management practices.

Study Goals

The goals of this study are to establish a Spatial Recreation Planning Framework that:

- Ensures that resource-based recreation opportunities on Crown lands are optimized to provide opportunities for satisfying experiences to current and future users, and
- Fits into the broader forest planning framework so that the effects of intensive forest management on recreation can be evaluated.

Study Area

The study area for this project encompasses the southern section of the Dog River-Mattawin Forest and the adjacent area of Quetico Provincial Park in Northwestern Ontario. The lower portion of the Dog River-Mattawin Forest is approximately 400,000 hectares in size while Quetico Park is approximately 475,000 hectares. The study area abuts the Boundary Waters Canoe Area and the Superior National Forest directly across the U.S. border. The Dog River-Mattawin Forest lease is held by Bowater Forest Products Incorporated. Bowater is in the process of revising its current FMP due in 2005.

The highly diversified forest, aquatic and wetland vegetation represents the convergence of three major ecosystems, the confluence of three major climate systems, the headwaters of three continental watersheds, and the continental north-south divide. This area also possesses the necessary variation in forest management and protection with significant demand for both timber and non-timber values (Lakehead University 2002).

The study area is very rural in nature with Atikokan (population, 1,000) being the only incorporated community in the immediate area. Upsula and Ignance are smaller unincorporated communities near the study area. Thunder Bay (population, 120,000) is located about 75 kilometers east. The Loc La Croix First Nation is immediately southwest of Quetico Park. Within the Dog River-Mattawin area are a number of private inholdings, mainly around water bodies, that contain cottages and other seasonal use structures.

Framework Development

The Spatial Recreation Planning model is shown in Figure 2 with each phase explained in detail below. The input phase is based around the premise that appropriate valid and reliable data are necessary in any framework and decision making context. Data gained from the information input phase were analyzed to develop a spatial planning framework. This framework will be used to evaluate potential management actions and produce assessments that are used in the decision phase. The decision phase takes the assessments and the public evaluates them based on a set of management criteria including funding and political constraints. A recommended action will result in the output phase. These actions are then implemented and monitored to ensure that management objectives are met.

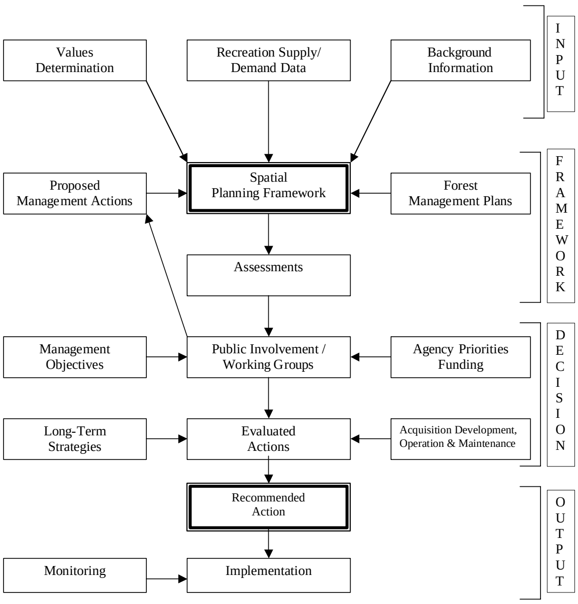

Figure 2. Spatial Recreation Planning Model.

Phase I – Input

The objectives of this phase are to understand how recreation was managed in the past, develop a sensitivity to both public and private sector needs, and better understand how recreation can play a more integrated role in future resource management. The input phase is based on three types of information sources: values determination data, recreation supply and demand data, and background information (Figure 3). Because the development of the SRP necessitates a substantial amount of data, much effort was given to this phase.

Existing research on recreation in the study area was reviewed and showed incompatibility and inconsistency in methodology among studies. As such, baseline data on recreation had to be established for the study area through extensive public input. Existing resource agencies' recreation data were incorporated as much as possible into the larger data collection efforts while keeping in mind the potential inconsistency among existing datasets.

To determine baseline standards, recreation studies were conducted for 12 months at developed and dispersed recreation sites in the study region encompassing Northwest Ontario during winter 2002 through fall 2003 (for more details, refer to Payne et al. 2004, this Proceedings). Data were collected based on winter and non-winter use and by resident and non-residents groups. A map of the region was given out to visitor to record their travel routes. In addition, visitors indicated on the map where they spent the night and activities participated in. All of this information was subsequently digitized into a GIS system.

Recreation supply was determined through an existing inventory of facilities and resources conducted by the Ministry of Natural Resources (MNR). Information from field verification and activity location data from the recreation surveys were used to supplement the MNR's data. Bowater, Inc. provided the transportation supply inventory database.

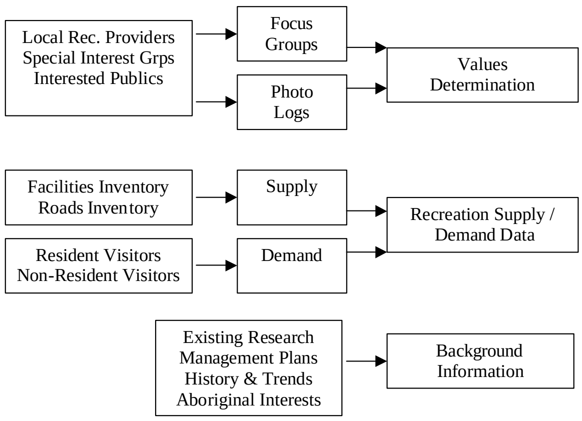

Figure 3. Input Information Sources.

Data on user values were collected so that their preferences and needs for specific resource attributes are better understood (for more details, refer to McIntyre et al. 2004, this Proceedings). A series of 11 focus groups were used to elicit data on the special places visited in the study area. Individuals then described the values they associated with these places. A mapping exercise was used to gather specific locations on the special places and their associated values. The focus groups included representatives from local recreation providers, special interest groups, and the interested public.

Values data were also gathered through the use of photo-logs and daily diaries. Visitors were given cameras and asked to take photographs of their trip and record details about their experience. A sample of visitors was also given diaries in which they recorded the details about the most memorable event of the day. Statements were analyzed for value expressions. All activity and value location points were digitized into a GIS database.

Phase II – Framework

The values-based approach in designing the SRP is shown in Figure 4. The framework is a systematic means to evaluate proposed management actions for final decision-making. This framework must be sensitive to public needs and, at the same time, respect the inherent natural setting of the area. A hybrid evaluation framework was developed to achieve this goal. The framework uses the components of the ROS to define recreation supply as expressed by the inherent characteristics of the land. Demand is defined by the public's expression of values contextually and spatially, and activity participation.

The ROS was developed as a response to better understand recreation opportunities on resource lands and has been adopted by many resource agencies in the world (Yuan and McEwen 1989) (although not widely applied in Canada). The ROS is a supply driven model stating that the inherent characteristics of the resource should dictate the best type of recreation opportunity to provide to the public, and certain management actions based on set prescriptions are required to achieve these results (Janten and Driver 1998). As long as the resource is managed based on established parameters (termed ROS class consistency), then the opportunity for certain types of experiences will be optimized. The study area was typed into ROS classes based on size, naturalness, and access.

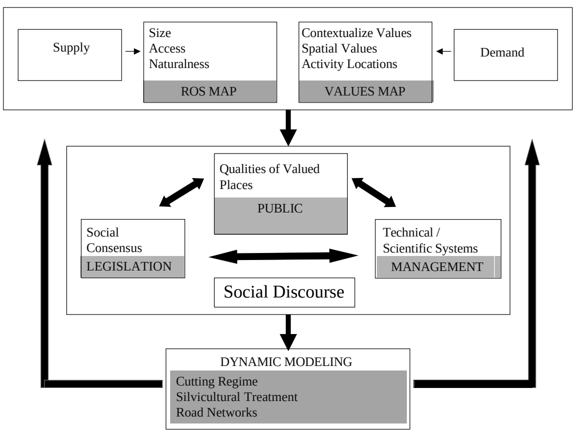

Figure 4. Values-Based Framework.

While the ROS has shown to be useful in a broad macro landscape level context, it has not worked as well toward the developed end of the spectrum and toward site or area specific uses (Driver et al. 1987). This weakness is primarily due to the constraints of the model and that the framework is resource supply driven. No demand information is directly used in traditional ROS exercises but only inferred through the supply. This hybrid framework defines demand as a spatial distribution of values that have contextualized meanings (for more details, refer to McIntyre et al. 2004, this Proceedings). These values will determine what is important to the visitor independent of the ROS based supply and addresses the inherent limitation of the ROS's supply based design.

The recreation supply and demand are then involved in dynamic modelling (Figure 4). Based on the current forest resource inventory and proposed forest management plan, resource decisions such as cutting regimes, silviculture treatments and road network development will be evaluated. A social discourse approach is used in the modelling that utilizes social consensus as defined through legislation, social utility as reflected through management objectives, and public involvement as viewed from assessments of valued places. In this manner, appropriate decisions are reached through negotiations among the many affected parties. The results of these assessments are used in the decision- making matrix in the next phase.

The data layers (Figure 5) used in the framework were mapped into Patchworks, a GIS software program. Patchworks is a spatial and visual GIS system which can be used in simulations of future conditions. The interactive system can be used to address "what if" types of questions and provide realistic real-time results.

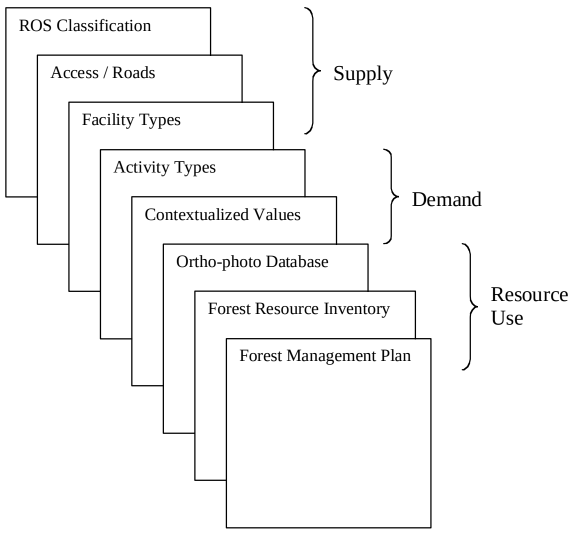

Figure 5. GIS Map Layers.

Phase III – Decision

The decision-making phase takes the assessments from the planning framework and evaluates them for potential implementation (Figure 6). The goals of the decision matrix are to maintain recreation diversity and stability. In this manner, diversity of opportunities will be encouraged leading to a greater range of opportunities for visitors to choose from, and stability of opportunities over time will result in producing more realistic expectations and higher levels of satisfaction. In addition, the matrix encourages the maintenance and enhancement of the ROS classes at the primitive end of the spectrum that are highly sensitive and not very common.

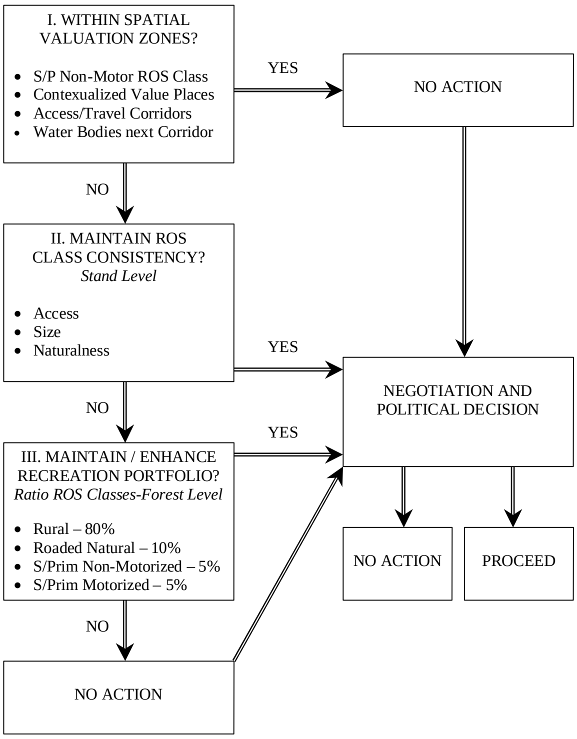

Figure 6. Decision Making Matrix.

Three decision components are assessed in the matrix: spatial valuation zones, ROS class consistency, and recreation portfolios. Spatial valuation zones are places that visitors have expressed as having high value through actual visitation or place association. Because these zones reflect actual demand, the objective is to protect these areas to maintain recreation stability. ROS class consistency is defined as maintaining the class indicators of access, size, and naturalness within the prescribed values for that class at the stand level. If the ROS class indicators are within the range for that class, then the ROS class is considered to be consistent. The current conditions of the resource are defined as the baseline conditions that should be maintained. The recreation portfolio is a concept of providing a combination of preferred recreation opportunities at the forest level in much the same manner as a timber portfolio maintains a preferred combination of species in certain age classes. In this manner, recreation diversity is encouraged. The recreation portfolio is defined by the ratio or percentage of ROS classes on a forest-wide basis. Because the forest is dynamic, the ROS characteristics at different stand level areas will change to compensate and maintain the overall portfolio of the forest. It is this dynamic interaction that is important as the resources goes through various modification scenarios.

Although it is acknowledged that the decision-making matrix attempts to provide evaluations based on an established framework, alternative decisions may also result through changes in management objectives or external political decisions. Once a decision is made to proceed with an action, the process continues to the next phase.

Phase IV – Output and Action

The output and action phase takes the list of recommended management actions at the various site or stand levels and develops a plan for implementation at the forest level. Forest working groups (including local citizens committees, special interest groups, affected publics) along with agency and industry personnel will negotiate on implementation procedures. The results of these negotiations will be incorporated in the forest management plan. A monitoring process will also take place to ensure that implemented management actions meet the goals and objectives set out in the evaluation process

Application of Spatial Framework

Decision making on Crown lands related to recreation has been limited by the lack of public involvement and a framework to base decisions on. Decisions are usually static and do not examine the interrelational impacts that occur. This spatial framework addresses the fact that a resource modification in one area will potentially affect the recreation opportunities in a different area (Figure 4). Only when effects are known at the contextualized local level (defined as stand level) and its spatial interrelationship at the broader forest level, will the overall impacts be known.

When combined with the ROS system, the framework can be used to model change and its effect on opportunity class consistency. The amount and effect of spatial redistribution related to the recreation portfolio will determine the amount of resulting inconsistency at the forest level. The GIS can also be used to predict potential recreation displacement and social succession. When sites and facilities are spatially linked, a new development's effect on existing opportunities can be estimated before actual development. For example, if a new development is proposed to change the character of a fishing access area from low to high user density, the framework may predict that the existing users of the area will be displaced and then potentially affect other areas negatively. These changes, in turn, may change the desired opportunity class in the development area and in the area where the users are displaced. These interactions and linkages provide an indication of what may occur when a management action causes significant change in the area.

Another advantage of using a spatial framework of this type is its visual capabilities. The public can visually see the spatial distribution of recreation supply through computer simulations and understand the resultant impact of a proposed change. Public input can be obtained at various stages of decision making using the framework, thus giving ownership of the process to the people who will be most affected. Instead of totally relying on charts, figures, and expert opinion, the public can visually see resulting changes from proposed actions. Because of the high detail orthophoto maps of the area, the resulting simulated changes can be contrasted to current conditions in a realistic depiction. The ability to predict potential impacts is a powerful tool and gives the public and decision makers additional information to prioritize management actions.

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A Model for Evaluating Dispersed Outdoor Recreation Use Estimation

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Abstract: An outdoor recreation use simulator (ORUS) has been developed to simulate dispersed recreation survey data similar to that collected by the National Visitor Use Monitoring (NVUM) Project's survey of the national forests of the U.S.A. Statistical distributions are used to represent the various behaviors of recreationists during their visit to a dispersed area. The beta distribution is used to model arriving times and last exiting times. The number of intermediate exits from a site is determined by the Poisson distribution while their times are selected randomly according to the uniform distribution. Finally, three trap shy behaviors are assigned to the recreationists to quantify their probability of capture by the interviewer. The arriving and last exiting beta distributions are fitted to the NVUM data. The functioning of the simulator is demonstrated with a simple example with explanations of each recreationist's actions with respect to the sampling methodology. The utility of ORUS in evaluating the bias and coefficient of variability of various estimating scenarios is also presented.

Introduction

Since outdoor recreation has become an important valued component of forests, accurate recreation use estimates have become critical necessities in forest level planning. In 1996 a pilot study was performed to develop a field survey for estimating recreation use on the national forests throughout the United States (Zarnoch et al. 2002). This was later modified and expanded to include characteristics of the visitors, their satisfaction with the recreation resource and their economic impact on the local community (English et al. 2002). This has lead to the National Visitor Use Monitoring Project (NVUM) that currently surveys recreation use across the national forests of the U.S.A.

To validate the NVUM survey, a critical evaluation of the visitation estimators must be performed to determine the potential bias and variance properties under realistic recreation site scenarios. Thus, an outdoor recreation use simulator (ORUS) has been developed that has the capabilities of providing typical data similar to what has been collected by NVUM sampling.

There were several purposes for the creation of ORUS. First, the model outlines a structure that decomposes the complex system of visitor behavior into a set of more easily understood components and demonstrates their relationship to the visitation estimator. Second, the model provides the ability to evaluate the statistical properties (bias and coefficient of variation) of the visitation estimator. Third, the model enables a researcher to evaluate the effects of different assumptions about one or more visitor behaviors on the properties of the visitation estimator.

The objectives of this paper are to (1) describe the ORUS simulation model for outdoor recreation use estimation in dispersed areas and (2) demonstrate the evaluation of the NVUM visitation estimator under various site day scenarios.

The NVUM Sampling Design

The NVUM survey consists of a stratified multistage sampling design based on rotating panels that are spread over a five year sampling cycle. All national forests in the U.S. are sampled once every five years, with approximately one-fifth of the forests in each of 9 regions sampled each year. The statistical methodology follows conventional sample survey techniques with a few modifications to incorporate specific situations inherent in sampling national forests for recreation use.

The NVUM sampling design divides each national forest into areas that are called site types which contain a multitude of individual sites exhibiting similar recreational attributes. There were four mutually exclusive site types that served as stratification variables for reducing variation in the survey's estimates. These site types were defined as:

– Day-Use Developed Sites (DUDS) – thoses sites intended for day use only.

- Overnight-Use Developed Sites (OUDS) – include campgrounds, cabins, hotels and any other overnight facility.
- Wilderness Sites (WILD) – sites that are designated official wilderness areas.
- General Forest Area (GFA) – all other areas in the national forest that are not DUDS, OUDS or WILD.

In this paper, only dispersed area recreation sites that are defined as GFA's will be considered.

As in all sample surveys, it is important to accurately determine the measurement variable on each sampling unit selected for the survey. In most natural resource monitoring and sampling situations, this issue is of little concern because a standard measuring device is used. For instance, in forest inventory a standard diameter tape is used to measure tree diameter. In the NVUM survey, the primary measurement variable is the number of recreationists who were completing a visit to a given site on a given day, called last exiting recreationists. The term distinguishes these individuals from recreation visitors who are making intermediate (non-final) exits and then returning to the site. An exact value for the measurement variable would be obtained under a 24-hour monitoring on-site interview protocol wherein all people exiting the site were required to participate in the survey process. Such a protocol is not possible for several reasons. Consequently, the NVUM project uses a methodology that estimates the measurement variable indirectly. A 24-hour mechanical count of all traffic is obtained along with 6 hours of vehicle occupant interviewing and exiting vehicle counts. This is performed at a designated interview point traversed by visitors exiting the site. This process obtains (1) a calibrated estimate of total exiting vehicles for the 24-hour period (VEHC), (2) an estimate of the proportion of exiting vehicles that are last exiting (PBAR), and (3) average number of occupants in a last exiting vehicle (PEOPVEH). These three quantities are used to estimate recreation site visits at the site for 24 hours.

The site visit estimator used by NVUM is defined as

$$\widehat{SV} = PBAR * VEHC * PEOPVEH \tag{1}$$

For more details on the NVUM methodology, see English et al. (2002).

The accuracy of the site visit estimator depends on how well each of the three components in (1) is estimated. PEOPVEH is an easily observed quantity because it is obtained by simply counting occupants in vehicles determined to be last exiting recreation vehicles. The accuracy of VEHC depends largely on the consistent performance of the mechanical traffic counter over the 24-hour period. PBAR is a complex variable that is highly dependent on several aspects of visitor behavior at the recreation site. Thus, the focus of this paper is on simulating and evaluating the effect of PBAR on the site visit estimator.

Model Components

Types of Site Visitors

The model recognizes five distinct types of visitors who may be at a site. The typology is based on their specific behavior patterns of arriving time and last exiting time. These types are defined as follows:

- LERB = a recreationist that will be last exiting the site on the survey day but was at the site before the official beginning of the survey day at midnight
- LERD = a recreationist that will be last exiting the site and arrived on the site during the survey day
- NLERB = a recreationist that will not be last exiting but was on the site before the official beginning of the survey day at midnight
- NLERD = a recreationist that will not be last exiting the site and arrived on the site during the survey day
- NREC = a visitor who is on the site for non-recreation purposes (agency personnel, contractors etc.)

The four types of recreationists could have similar or different arriving or last exiting distributions and intermediate exit rates as will be explained in the next sections.

Arriving and Last Exiting Times

The fundamental behavior for visitors involves arriving at the site, engagement in recreation, and then leaving the site. The distributions of these actions relative to the six hour interview times are key elements of the simulation model. Arriving and last exiting times are modeled using the beta distribution which is defined as

$$f(p) = \frac{\Gamma(a+b)}{\Gamma(a)\Gamma(b)} p^{a-1}(1-p)^{b-1} \tag{2}$$

where $a > 0$, $b > 0$ and $0 \le p \le 1$

The mean of this distribution is a/(a+b) and the variance is ab/[(a+b)^2(a+b+1)]. The beta distribution takes on a wide variety of shapes depending on its parameters a and b. For instance, the uniform distribution is a special case of the beta when a=b=1 with a mean of 0.50. If a=1 and b=5 then the beta is skewed to the right with a hump in the left of the distribution and, consequently, a mean of 0.17. On the other hand, if a=5 and b=1 then the opposite is true with a mean of 0.83. A symmetric bell-shaped distribution occurs when a=b=5 with a mean of 0.50. If a and b are both less than 1 then a u- shaped distribution results. Figure 1 shows the beta distribution for some values of the parameters.

The arriving time (*AT*) of a recreationist is determined by selecting a random variate p_1 from the specified beta distribution and determining the

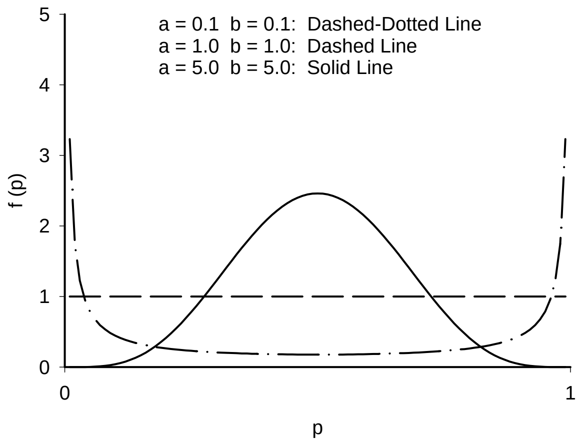

Figure 1. The beta distribution f(p) for some values of the parameters a and b.

arriving time as that proportion of the recreation day after the start of the recreation day. Mathematically, for LERD and NLERD this is

$$AT = D_S + p_1(D_E - D_S) \tag{3}$$

where
D_S = time when the recreation day[1] starts and
D_E = time when the recreation day ends.

Since LERB and NLERB recreationists are on the site previous to the site day, they have no arriving time for that site day.

The last exiting time (*LET*)of a recreationist also uses a variate, p_2, selected from the beta distribution and is defined for LERB as

$$LET = D_S + p_2(D_E - D_S) \tag{4}$$

and for LERD as

$$LET = AT + p_2(D_E - AT) \tag{5}$$

Since NLERB and NLERD recreationists do not exit the site on the site day, they have no last exiting time.

Number of Intermediate Exits

Some visitors will make intermediate exits from the site before completing their recreation visit. Intermediate exits are defined as an exit and re-entry into the recreation site on the same day. The number of intermediate exits a recreationist performs for the site day is modeled with the Poisson distribution which assumes that they are at random. The Poisson distribution is defined as

$$f(x) = \frac{e^{-\lambda}\lambda^x}{x!} \tag{6}$$

where x = 0, 1, 2, … and $\lambda > 0$

The mean and variance of the Poisson are both λ. The parameter λ represents the intermediate exit rate of a recreationist for the length of the recreation day, $D_E - D_S$. Although this could be the total 24 hour day, more realistically, these exits are usually from around a little before dawn to somewhat after dusk, which would encompass at most 15 hours. The simulator provides for such flexibility by defining λ as the intermediate exit rate only during the assumed active intermediate exiting period defined for that specific survey day. All individuals within a recreationist type have the same λ but adjusted by the length of the individual's time on the site. Thus, a recreationist that is there only a third of the active recreation day will have the parameter set at λ /3 and the number of intermediate exits will be selected from a Poisson distribution with this parameter. It is possible to assume that the intermediate exit rate is the same for all recreationist types or it may vary depending on the parameter chosen for each.

Time of Intermediate Exits

The specific times of intermediate exits are selected at random from the total length of stay that a recreationist has for the survey day. This appears to be a reasonable assumption because each recreationist is unique and its intermediate exiting behavior is nearly impossible to predict. Some may wander off the site as soon as they get there just to merely see what's around the next bend. Others may go out to the store only to immediately leave again when they find out they forgot to get an important item. Still others may never leave the site until they depart for home. The total length of stay interval is defined by the arriving times and last exiting times. Then the number of intermediate exits is used to select a time at random from the interval for each exit. The uniform distribution defined on the interval length is used to generate these variates.

Trap Shy Behavior

The estimation of PBAR used for the site visit estimator is based on the assumption that interviewed vehicles are selected at random from those passing over the vehicle counter. Unfortunately, stopping to be interviewed is optional. Thus, some exiting individuals may choose not to be interviewed. In particular, the probability that a recreationist stops for an interview may very well depend on the previous history of being stopped on that survey day. For instance, the probability that a recreationist stops for an initial interview may be 0.9. However, after being interviewed that day on an intermediate exit, the recreationist may not be so eager to be interviewed again and the probability may drop to 0.1. This phenomenon is commonly known as trap shyness, a term that originated in animal studies where trapped animals learn to avoid traps after they are captured once. Thus, trap shy behavior by the recreationists will change the probability of being interviewed and invalidate the random sample needed for an unbiased estimate of PBAR.

Although an infinite number of trap shy behaviors could be modeled, only three will be discussed here. First, the not trap shy situation is defined as

$$P_0 = P_1 = P_2 \tag{7}$$

where P_i is the probability that a recreationist will stop to be interviewed given i previous interviews on that site day. In this situation, all probabilities are equal. For a mild degree of trap shyness, the probabilities diminish in half after being interviewed once, specifically

$$P_0 \rightarrow P_1 = \frac{P_0}{2} \rightarrow P_2 = \frac{P_0}{2} \tag{8}$$

The extreme case of trap shyness results in zero probability of an interview after the first, yielding

$$P_0 \rightarrow P_1 = 0 \rightarrow P_2 = 0 \tag{9}$$

Here it is assumed that the probability of an interview after the second is equivalent to P_2, although this assumption could be easily modified.

Methodology

The PBAR estimator for the proportion of last exiting vehicles that exit from a site is defined as

$$\widehat{PBAR} = \frac{LC_{11}}{LC_{11} + LC_{01}} \tag{10}$$

where LC_{11} is the number of last exiting vehicles that were stopped for an interview and LC_{01} is the number of non-last exiting vehicles that were stopped for an interview. These could be computed from the data produced by ORUS under a specific scenario. The true proportion of last exiting recreationists could be computed as

$$PBAR = \frac{LC_{10} + LC_{11}}{LC_{10} + LC_{11} + LC_{00} + LC_{01}} \tag{11}$$

where LC_{10} is the number of last exiting vehicles that were not stopped for an interview and LC_{00} is the number of non-last exiting vehicles that were not stopped for an interview.

Comparison of the estimated $\widehat{PBAR}$ to the true $PBAR$ for a given simulation scenario reveals the quality of the site visit estimator. However, since comparisons from only one simulation are difficult to judge because the simulated values are stochastic, 10,000 simulations were performed. The percent bias is used as a criterion for the quality of the site visit estimator and is defined as

$$\%\,Bias = \frac{100}{10000} \sum_{i=1}^{10000} \frac{\widehat{PBAR_i} - PBAR_i}{PBAR_i} \tag{12}$$

To judge the variability of the site visit estimator, the typical coefficient of variation is used. Although the site visit estimator could be evaluated under hypothetical beta distributions, it is more realistic to fit the beta distributions to the NVUM sampled survey data. Estimators for the a and b parameters of the beta distribution were obtained by using the methods of moments and are defined as

$$\hat{b} = \frac{\left(1-\overline{X}\right)\left[\overline{X}\left(1-\overline{X}\right) - S^2\right]}{S^2} \tag{13}$$

and

$$\hat{a} = \frac{\hat{b}\overline{X}}{\left(1-\overline{X}\right)} \tag{14}$$

Recreation visitor arriving times were obtained from the NVUM survey to fit arriving beta distributions for LERD and NLERD. Last exiting times were used to fit beta last exiting distributions to the LERB and LERD. The last exiting beta distribution for LERD recreationists was assumed to be dependent on the arriving time of an individual. Thus, two linear regression models were used to predict $\overline{X}$ (mean) and S^2 (variance) for each individual as functions of arriving time and then used in (13) and (14) to estimate the individual's beta parameters.

Results

Parameterization of Dispersed GFA Sites

The arriving and last exiting beta distributions for the dispersed GFA sites were parameterized to the NVUM data collected over the first two sampling years. It was assumed that on-site recreation could occur only from D_S=6.00 to D_E=21.00, so the beta distributions are based on this recreation day length. There were only four distributions to parameterize. The LERB recreationists have only a last exiting distribution for a given survey day. The LERD type has both arriving and last exiting beta distributions. The NLERB neither enter nor exit during the survey day, so they have no beta distributions to parameterize. Since the NLERD only enter and do not exit, they have only arriving distributions. These fitted beta distributions are shown in Figure 2. The LERB recreationists (n=1,322) were fitted to the last exiting beta distribution, yielding a=3.694 and b=4.150. The distribution was approximately symmetric with a mean last exiting beta variate of 0.471, which when equated to last exiting time with equation (4) represents the time 13.06. The LERD recreationists (n=10,822) had an arriving beta distribution with a=1.602 and b=3.422 which was highly skewed to the right, indicating a tendency for most of these one day visitors to come early in the day. Their average beta variate was 0.319 which represents a time of 10.78 based on equation (3). These same LERD recreationists had a last exiting beta distribution with a=2.022 and b=4.402 which gave a mean beta variate of 0.313. Using the mean arriving time and equation (5), this represents an average last exiting time of 13.98. The NLERD recreationists (n=1,240) had an arriving beta distribution with a=1.520 and b=1.687 and a mean beta variate of 0.474, which yields an average arriving time of 13.11 using equation (3). This was not a skewed, asymmetrical bell shape distribution like the LERD. This is probably because these recreationists arrived on the site more uniformly throughout the day.

Simple Simulation Example

A simple example illustrates the ORUS model's capabilities. Assume for simplicity that a dispersed GFA site that is open for recreation from 6.00 until 21.00 will be surveyed from time 8.00 to 14.00. In addition, let the site have LERD=10 recreationists each with a high daily rate of intermediate exits set at λ=4. Their arriving and last exiting distributions were both selected from the NVUM fitted GFA beta distributions. To illustrate the effect of trap shyness, the probability of capture on the visitor's first exit was set at 1.0, and set at 0.0 for any subsequent exits, including the last.

Results from this scenario site day are shown in Table 1. There were a total of 18 exits from the site during the 15 hour day, 10 of which were obviously last exiting. Only 4 of the 10 last exiting recreationists were captured. Four visitors last exited the site after the interviewers left at 14.00 and, thus, could not be captured. The other two were interviewed first during an intermediate exit and trap shyness precluded these individuals from being interviewed on their final exit from the site. A total of 10 recreationists were stopped by the interviewers. Thus, an estimate of *PBAR* from equation (10) is $\widehat{PBAR}$ = 4/10=0.40. The true proportion is *PBAR*=10/18=0.56 computed from equation (11). This is a considerably poor estimate and could result in poor estimates for visitation on this site. Assuming that the vehicle counter recorded correctly 18 exiting vehicles for the 24 hour period and there was an average of one person per vehicle (for simplicity), the SV estimate would be $\widehat{SV}$ =0.40(18)(1)=7.2 while the true would be SV =0.56(18)(1)=10.0. This represents a negative 28 % bias.

Estimator Evaluation

Evaluation of the bias and coefficient of variation of an AM estimator (8.00 to 14.00 survey window) and a PM estimator (12.00 to 18.00 survey window) under a range of number of intermediate exits was performed on a dispersed GFA site (Figure 3). Specifically the site was open from 6.00 to 21.00 with an equal mixture of 10 visitors from each of the four recreation types each with probability of capture of 0.9 for all exits. The results indicate that both estimators are unbiased when λ=0. However, as λ increase the AM estimator becomes negatively biased, approximately 10 percent when λ=5. The PM estimator showed the opposite effect with a large positive bias of approximately 50 percent when λ=5. The coefficient of variation of both estimators average about 10 percent, which is quite reasonable, with the PM being somewhat smaller.

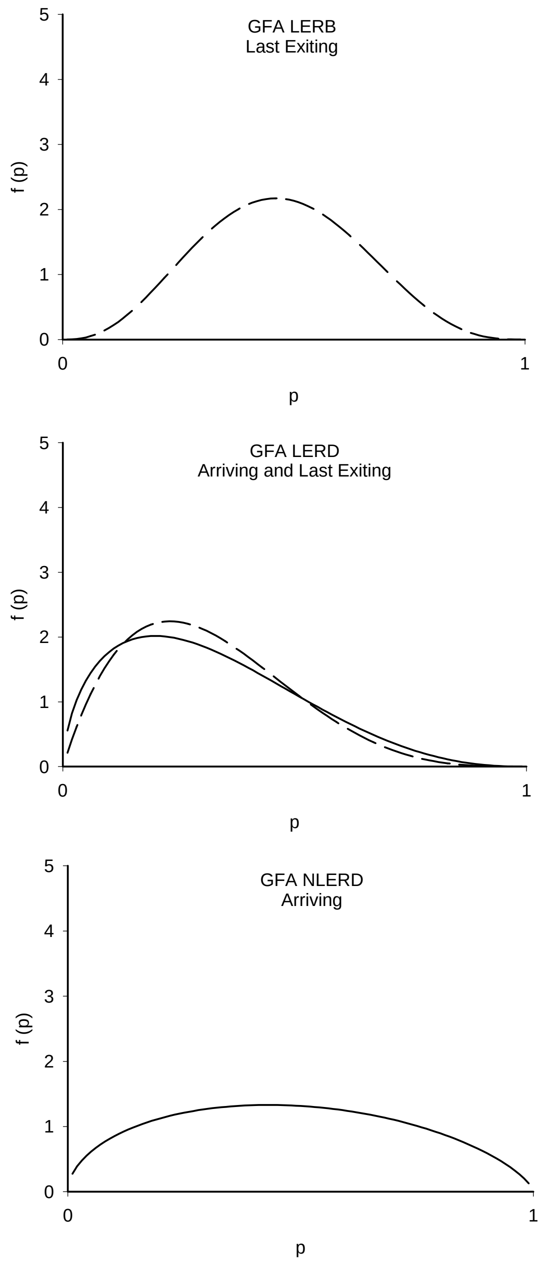

Figure 2. The beta distribution f(p) for dispersed GFA recreation visitors where solid lines are arriving distributions and dashed lines are last exiting distributions.

Table 1. Simulation of a dispersed GFA survey day.

Visitor	Last Exit	Time	Captured	Remarks
1	Yes	12.10	Yes	Captured because P_0=1.0.
2	Yes	12.75	Yes	Captured because P_0=1.0.
3	No	11.62	Yes	Captured because P_0=1.0.
3	No	14.77	No	Not captured because left after interviewers and became trap shy.
3	Yes	16.74	No	Not captured because left after interviewers and became trap shy.
4	No	10.80	Yes	Captured because P_0=1.0.
4	No	14.47	No	Not captured because left after interviewers and became trap shy.
4	Yes	14.63	No	Not captured because left after interviewers and became trap shy.
5	No	11.01	Yes	Captured because P_0=1.0.
5	Yes	11.22	No	Not captured because became trap shy.
6	No	11.34	Yes	Captured because P_0=1.0.
6	Yes	14.17	No	Not captured because left after interviewers and became trap shy.
7	Yes	13.50	Yes	Captured because P_0=1.0.
8	No	10.73	Yes	Captured because P_0=1.0.
8	Yes	12.91	No	Not captured because became trap shy.
9	No	12.99	Yes	Captured because P_0=1.0.
9	Yes	17.72	No	Not captured because left after interviewers and became trap shy.
10	Yes	9.83	Yes	Captured because P_0=1.0.

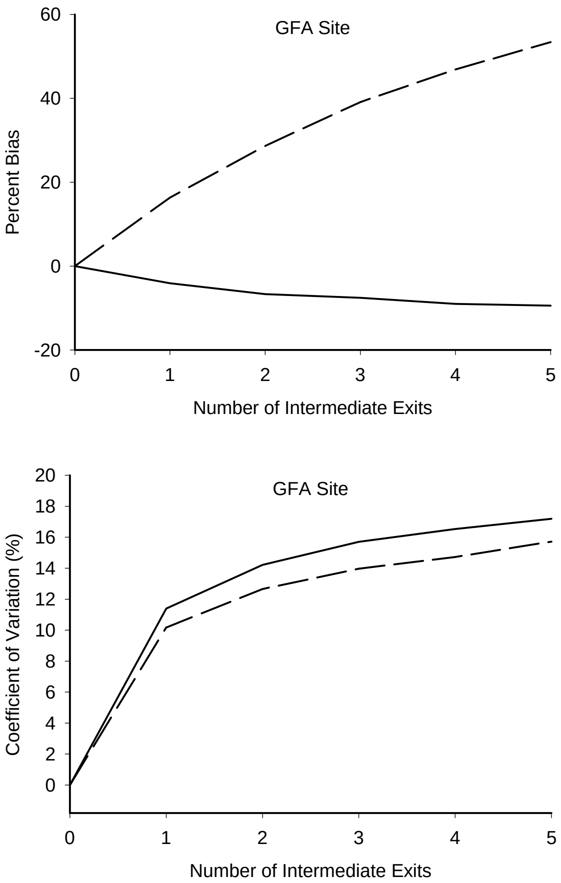

Figure 3. Evaluation of the bias and coefficient of variation of a GFA site that is open from 6.00 to 21.00 with LERB=10, LERD=10, NLERB=10 and NLERD=10 recreationists each with probability of capture of 0.9 for all exits. The AM (8.00 to 14.00) (solid line) and PM (12.00 to 18.00) (dashed line) estimators are evaluated over a range of number of intermediate exits.

Conclusion

The ORUS model appears to be simulating the behavior incorporated into it by the various statistical distributions that describe the model components. Examination of several survey site scenarios demonstrated the evaluation of the bias and coefficient of variation. Similar analyses should isolate problems and help formulate refinements in future survey methodology. It should be kept in mind that ORUS is a very simple model at this point and does not include many other problems that can occur in field sampling. For instance, the variation in the SV estimator does not incorporate any biases due to commuter traffic or to the "voluntary survey" sign effect that are believe to occur in the field. The effect of these on the estimate is unknown. Future refinements in the model are possible to help quantify these sources of bias or to make the recreationist behavior more realistic.

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[1] Times used throughout this manuscript are represented as real numbers for computation purposes. The hour component is analogous to standard military time while the minute component represents the decimal part of the hour. Thus, 6:30 am is represented as 6.50 while 4:15 pm is represented as 16.25.

Monitoring and Managing Recreational Use in Backcountry Landscapes Using Computer-Based Simulation Modeling

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Abstract: In the United States, legislation dictates that wilderness areas should be managed to, among other things, provide recreational visitors with opportunities for solitude. The growing popularity of outdoor recreation in backcountry settings presents managers with challenges in their efforts to achieve this objective. Recent research suggests that computer-based simulation modeling is an effective tool for helping to address the challenges associated with managing visitor use in backcountry and wilderness settings. This paper describes the development and application of a computer-based simulation model of recreational use in the John Muir Wilderness Area in the Sierra Nevada Mountains of California, USA. The results of the study demonstrate how simulation modeling can be used as a tool for understanding existing visitor use patterns within the John Muir Wilderness Areas and estimating the effects of alternative management practices on visitor flows and visitor use conditions.

Introduction

In the United States, legislation dictates that Wilderness Areas should be managed to, among other things, provide recreational visitors with “opportunities for solitude or a primitive and unconfined type of recreation” (Wilderness Act of 1964). However, the growing popularity of outdoor recreation in backcountry settings threatens the ability of wilderness managers to achieve these objectives. For example, increasing recreational use of wilderness areas can result in perceived crowding and increasing conflict among different types of users (e.g., hikers and packstock) (Manning, 1999). These problems are exacerbated by the fact that backcountry recreation use tends to be concentrated both spatially and temporally (Hendee & Dawson, 2002, Lucas 1980). For example, most wilderness areas are used most heavily during the summer, and within the summer months, use can be heavier on the weekends than during weekdays. Similarly, recreational use tends to concentrate geographically along established hiking trails/routes, along the periphery rather than within the interior of an area, and close to desirable natural features (e.g., water bodies, scenic views).

Rules and regulations designed to manage recreation-related impacts such as crowding, conflict, and damage to natural resources can diminish visitors’ sense of spontaneity and freedom, thus eroding the primitive and unconfined nature of the wilderness experience (Cole et al. 1987). Managers are faced with the challenge of preventing and mitigating recreation-related impacts to wilderness with the most unobtrusive, indirect, light-handed means possible (Hendee & Dawson 2002). That is, managers are expected to identify the “minimum tool” required to achieved desired conditions within wilderness. Consequently, decisions about how to manage recreational use of wilderness are complex.

Recent research suggests that computer-based simulation modeling is an effective tool for helping to address the challenges associated with managing visitor use in backcountry and wilderness settings (Daniel & Gimblett 2000, Gimblett et al. 2000, Lawson & Manning 2003a, 2003b, Lawson et al. 2003a, Lawson et al. 2003b, Wang & Manning 1999). For example, simulation modeling can be used to describe existing visitor use conditions. That is, given current management practices and existing levels of visitor use, where and when is visitor use occurring? By providing managers with detailed information about how visitors are currently using the area, this baseline information can assist managers in identify “trouble spots” or “bottlenecks”, as well as areas that may be capable of accommodating additional use. Simulation modeling can also be used to monitor the condition of “hard to measure” indicator variables (Lawson et al. 2003a, Wang & Manning 1999). For example, how many encounters do backpacking visitors have with other groups per day while hiking? How many nights do visitors camp within sight of other groups? In addition, simulation modeling can be used to test the potential effectiveness of alternative management practices in a manner that is more comprehensive, less costly, and less politically risky than on-the-ground trial and error (Lawson & Manning 2003a, 2003b). For example, what effect does a permit quota have on the number of encounters visitors have with other groups while hiking? How would the number of hiking encounters change as a result of redistributing use from heavily used trailheads to less commonly used entry points? These capabilities make computer-based simulation modeling an effective tool for assisting managers in identifying recreation-related problems and evaluating the effectiveness and costs to visitors of potential solutions to these problems.

This paper describes the development and application of a computer-based simulation model of recreational use in the John Muir Wilderness Area in the Sierra Nevada Mountains of California, USA. The paper describes data collection methods, simulation model design, development and validation of outputs related to visitor use, and evaluation of alternative backcountry visitor use management practices. The results of the study demonstrate how simulation modeling can be used as a tool for understanding existing visitor use patterns within the John Muir Wilderness Area and estimating the effects of alternative management practices on the condition of crowding-related indicators of quality.

Description of Study Area

In this study a computer-based simulation model of recreation use was developed for a portion of the Humphrey's Basin area of the John Muir Wilderness Area. The John Muir Wilderness covers 584,000 acres in the Sierra and Inyo National Forests, in the Sierra Nevada Mountains of California. The area is characterized by snow-capped mountains with hundreds of lakes and streams and lush meadows. Lower elevation slopes are covered with stands of Jeffrey Pine, incense cedar, white and red fir and lodgepole pine. The higher elevations are barren granite with many glacially carved lakes.

Data Collection

Visitor Characteristics

During the 1999 visitor use season, diary questionnaires were distributed to backcountry visitors in the John Muir Wilderness. Questionnaires were distributed at trailhead self-registration stations and at ranger stations when visitors picked up their agency-issued permit. Randomly selected self-registration stations were periodically attended by data collectors who distributed diaries to visitor groups and collected completed questionnaires from groups as they finished their trips. In addition, questionnaires were distributed by commercial packstock outfitters, following instructions given by the research team.

The diary questionnaire included a series of questions concerning group and trip characteristics and a map of trails and natural features. Respondents were instructed to record their route of travel during their visit, including the trailhead(s) where they started and ended their trip, and their camping location on each night of their trip. Respondents were also asked to report the duration of their visit, the number of people in their party, and their mode of travel. The response rate for the Humphrey's Basin area of the John Muir Wilderness was 32.2%, resulting in a total of 324 competed diaries.

Site Characteristics

Trail Network

Data concerning the trail network within the study area were provided by the USFS Inyo National Forest in Bishop California as a GIS overlay. These data were supplemented with information from a campground inventory completed in the summers of 1999 and 2000. The data included all trail segments and intersections within the study area.

Campsite Clusters

"Campsite clusters" were created from the visitor surveys by grouping visitor reported camping locations based on proximity and common access. A single campsite cluster was comprised of all reported camping locations that were within a (subjectively determined) reasonable distance of each other. The campsite clusters were used to determine camping encounters within the travel simulation model. Specifically, groups camping in campsites within the same campsite cluster were considered to be within close enough proximity to have had a camping encounter with each other.

Travel Simulation Model Design

The data described in the previous section of this paper were used as inputs in the construction of a dynamic travel simulation model. The travel simulation model was developed using Extend software, and a duplicate model was developed using RBSim2 software (see Lawson et al. 2003a and Itami et al. 2004 for a detailed description of Extend and RBSim2, respectively). The scope of this paper will be limited to discussing the results of the Extend travel simulation model. However, additional research conducted by the authors of this paper found no statistically significant differences between the outputs of the Extend and RBSim2 travel simulation models of the study area.

The travel simulation model was designed to simulate backpacking use within a section of the Humphrey's Basin area during the peak summer months of the visitor use season. Data concerning trips starting before July 1, 1999 and after September 30, 1999 were excluded from the simulation. Furthermore, data concerning packstock trips and day trips were excluded from the simulation. This resulted in a total of 190 useable trip itineraries included as inputs into the travel simulation model.

The Humphrey's Basin travel simulation model is a probabilisitic steady state simulation (Law & Kelton 2000). Steady state simulations are designed to model a system during the period when it reaches its full operating level (e.g., during the peak period of the visitor use season). Consequently, steady state simulations require a "warm up" period to reach the target steady state operating level. Furthermore, steady state simulations require substantial replication (e.g., simulated visitor use days) in order to obtain reliable outputs that are not biased by short-term effects of the probabilisitic components within the model.

In this study, the travel simulation model is designed to model visitor use patterns and the effect of alternative management practices on visitor use-related conditions during the busiest period of the visitor use season. In all of the simulations conducted in this study, the model was run for a total of 2000 simulated visitor days. The first 500 days of each simulation were dropped from the study analyses in order to avoid potential start-up effects within the simulation. The outputs from the remaining 1500 days were used to generate the data reported in this study.

The travel simulation model is designed to allow the user to manipulate several parameters within the model. This feature of the model allows the user to estimate the effect of alternative management practices and visitor use scenarios on visitor use densities and hiking and camping encounters within the study area. For example, the model is designed to allow the user to control the number and timing of trips starting each day from each of the three entry points into the study area. This capability allows the user to design simulations that test the potential effect of increasing total use levels, trailhead quotas, and temporal and spatial redistribution of visitor use on crowding-related indicators of quality within the study area.

Simulation Analysis

Outputs

A series of simulations were conducted to generate a common set of outputs concerning visitor use densities and hiking and camping encounters. The common data generated within this series of simulations included:

1) Average hiking use per day, by trail segment.

Average hiking use per day is calculated for each trail segment by summing the number of groups that pass through each trail segment during the course of the simulation and dividing by the total number of days simulated.

2) Average hiking encounters per group per day, by trail segment.

Hiking encounters are calculated for each trail segment on each day that at least one group passes along the trail segment. Two types of hiking encounters were calculated within the simulation model. "Overtaking encounters" are defined as one group passing another group while travelling in the same direction along the trail. "Meeting encounters" are defined as two groups passing each other while travelling along the trail in opposite directions. The average number of hiking encounters per group per day is calculated for each trail segment by summing the total number of hiking encounters along the trail segment throughout the simulation and dividing by the number of groups that hiked the trail segment during the simulation.

3) Average camping use per night, by campsite cluster.

Average camping use per night is calculated for each campsite cluster by counting the number of groups at the campsite cluster each night of the simulation and dividing by the total number of nights simulated.

4) Average camping encounters per group per night, by campsite cluster.

Average camping encounters per group per night are calculated for each night that a campsite cluster is occupied by one or more parties. A camping encounter is defined as the number of other groups camping in the same campsite cluster on the same simulated night. The average number of camping encounters per group per night is calculated for each campsite cluster by summing the total number of campsite encounters throughout the simulation and dividing by the total number of groups that camped at the campsite cluster during the simulation.

Baseline Simulation

The first simulation conducted with the travel simulation model developed in this study was designed to generate the outputs described above based on existing visitor use levels in the study area observed during the 1999 sampling period. This simulation is referred to as the 1X simulation throughout the remainder of this paper.

Increasing Visitor Use Simulation

A second simulation was conducted to estimate the potential effect of increased visitor use of the study area on visitor use densities and encounters along trail segments and within campsite clusters. Within this simulation, the average number of trip starts per day was increased from baseline levels by 400% at each of the three trailheads in the study area. The outputs described above were generated for this scenario. This simulation run is referred to throughout the remainder of this paper as the 4X simulation.

Maximum Allowable Use Simulation

A series of simulations were conducted to demonstrate the capability of travel simulation modeling to assist managers in estimating the total daily use that can be accommodated within an area without violating crowding-related standards of quality. Specifically, this series of simulations was designed to estimate the maximum level of use that could be accommodated in the study area without the number of groups in a selected campsite exceeding five for more than 5% of nights (a potential standard of quality for camping use density). This was done by incrementally increasing or decreasing the simulated use levels evenly across the three entry points until the result "converged" on the desired level of campsite cluster use (Lawson et al. 2003a). This analysis illustrates how simulation modeling can be used to establish trailhead quotas to achieve desired social conditions within a wilderness area, and is referred to as the maximum allowable use simulation throughout the remainder of the paper.

Validation

Outputs concerning campsite cluster use generated in the 1X simulation were used as the basis for validating the travel simulation model output reported in this study. Specifically, the distribution of campsite cluster use derived from the camping locations reported in the trip diaries was compared to the distribution of campsite cluster use estimated in the 1X simulation (for a more detailed description of the validation methods used in this study see Law and Kelton 2000).

Results

Simulated Use Levels: 1X and 4X Simulations

Table 1 reports the mean number of simulated trip starts per day by trailhead for the 1X and 4X simulations. The trailheads are differentiated with a code number that was assigned to them during the data collection process. As the data in Table 1 suggest, the baseline level of visitor use in the study area is relatively low, with an average of less than two trip starts per day from the most heavily used of the three trailheads (Trailhead 93). Even with a 400% increase in visitor use, two of the three trailheads would have less than one trip start per day into the Humphrey's Basin area.

Table 1. Simulated mean number of backpacking trip starts per day, by trailhead.

Simulated mean trip starts per day, by trailhead - 1x simulation		
trailhead 93	trailhead 94	trailhead 999
1.89	0.01	0.14
Simulated mean trip starts per day, by trailhead - 4x simulation		
trailhead 93	trailhead 94	trailhead 999
7.61	0.04	0.56

Camping Use and Encounters, by Campsite Cluster: 1x And 4x Simulations

Table 2 reports average camping use per night and average camping encounters per group per night, by campsite cluster for the 1X and 4X simulations. Results of the 1X simulation suggest that under existing conditions, camping densities are low throughout the entire study area. In all of the campsite clusters within the study area, there is an average of less than one camping group per night. Similarly, the data suggest that under existing conditions, very few visitors encounter other groups while camping.

The 4X simulation results suggest that if use were to increase by 400% at each of the three trailheads in the study area, visitors who camp within campsite clusters 7 and 37 would encounter an average of three other groups per night. Furthermore , visitor use densities and camping encounters would be moderately high in several other campsite clusters, including clusters 42, 44, 46, and 47. However, throughout the remainder of the study area, camping densities and encounters would remain relatively low.

Table 2. Average camping use and encounters, by campsite cluster – 1X and 4X simulations.

Campsite Cluster ID	1X Avg. Use Per Night	1X Avg. Encounters Per Group Per Night	4X Avg. Use Per Night	4x Avg. Encounters Per Group Per Night
7	0.86	0.90	3.43	3.40
36	0.12	0.14	0.47	0.44
37	0.74	0.75	3.04	3.01
38	0.05	0.06	0.22	0.28
39	0.15	0.12	0.52	0.51
40	0.05	0.03	0.21	0.19
41	0.26	0.22	0.95	0.90
42	0.32	0.33	1.44	1.41
44	0.44	0.43	1.84	1.93
45	0.13	0.12	0.66	0.65
46	0.48	0.51	1.90	1.89
47	0.31	0.25	1.21	1.12
48	0.14	0.14	0.56	0.59
49	0.04	0.00	0.13	0.14
50	0.12	0.15	0.46	0.47
51	0.07	0.04	0.25	0.26
52	0.02	0.00	0.08	0.10
53	0.04	0.10	0.18	0.14
56	0.10	0.09	0.33	0.39
57	0.14	0.13	0.60	0.61
80	0.11	0.09	0.42	0.46
81	0.07	0.02	0.25	0.23

Hiking Use and Encounters, by Trail Segment: 1X and 4X Simulations

Table 3 reports average hiking use per day and average hiking encounters per group per day, by trail segment for the 1X and 4X simulations. Results of the 1X simulation suggest that, under existing conditions, hiking densities are low throughout most of the study area, with moderate levels of visitor use along several trail segments (e.g., trail segments 2, 4, 5, 9, 10, 11). In addition, there are very few hiking encounters among groups under existing conditions.

Results of the 4X simulation suggest that while hiking densities would increase along several trail segments in the study area if use were to increase 4-fold at each of the trailheads, hiking encounters would remain low throughout the trail network. In fact, the model estimates that hikers along only one trail segment (segment 5) would have an average of more than 1 encounter per group per day.

Table 3. Average hiking use and encounters, by trail segment – 1X and 4X simulations.

Trail Segment ID	1x Avg. Use per Day	1x Avg. Encounters per Group per Day	4x Avg. Use per Day	4x Avg. Encounters per Group per Day
2	3.51	0.20	14.02	0.75
3	0.08	0.00	0.35	0.00
4	3.51	0.11	14.02	0.42
5	3.43	0.34	13.75	1.48
6	0.58	0.03	2.35	0.11
7	0.14	0.03	0.55	0.06
8	0.04	0.00	0.18	0.01
9	3.35	0.11	13.41	0.40
10	3.28	0.10	13.17	0.40
11	3.20	0.05	12.83	0.17
12	0.12	0.00	0.42	0.02
13	0.20	0.01	0.86	0.04
14	0.80	0.04	3.31	0.16
15	2.95	0.20	11.72	0.80
16	1.10	0.02	4.56	0.06
17	2.47	0.11	9.77	0.42
18	2.41	0.05	9.61	0.19
19	0.15	0.01	0.62	0.05
20	0.99	0.01	4.13	0.07
21	0.90	0.03	3.70	0.10
22	0.77	0.06	3.21	0.20
23	0.09	0.00	0.43	0.03
24	0.13	0.01	0.49	0.05
25	2.31	0.07	9.16	0.27
26	0.15	0.02	0.50	0.04
27	1.08	0.06	4.47	0.22
28	0.15	0.01	0.68	0.08
29	0.45	0.02	1.93	0.08
30	1.29	0.01	5.34	0.02
31	0.68	0.03	2.77	0.12
32	0.63	0.05	2.61	0.18
33	0.04	0.00	0.16	0.02
34	1.87	0.09	7.22	0.37
35	0.07	0.00	0.26	0.03
36	1.43	0.08	5.54	0.30
37	0.29	0.02	1.13	0.07
38	0.88	0.06	3.66	0.35
39	1.29	0.21	5.03	0.76
40	0.22	0.01	0.84	0.04
41	1.25	0.07	4.87	0.35
132	0.06	0.00	0.26	0.02

Maximum Allowable Use Simulation

As stated earlier, simulation modeling can be used to help managers estimate the impact of alternative policy decisions related to visitor use and visitor flows within a recreation area. Table 4 reports the results of a series of simulations designed to estimate the maximum amount of use that could be accommodated in the study area without the number of groups camping within a selected campsite cluster exceeding 5 more than 5% of nights. The results of this simulation suggest that use could be dramatically increased from existing levels without exceeding this standard. While the standard and campsite cluster selected for this analysis are hypothetical, the analysis demonstrates the capability of computer-based simulation modeling to assist managers in estimating the total daily use that can be accommodated within an area without violating crowding-related standards of quality.

Table 4. Maximum allowable use for hypothetical camping use density standard.

Simulated mean trip starts per day, by trailhead – cg 46 use <= 5 groups 95% of nights			
	trailhead 93	trailhead 94	trailhead 999
Mean=	10.95	0.06	0.78
95% c.i.=	[10.80, 11.10]	[0.05, 0.08]	[0.74, 0.82]

Validation of Simulation Model Output

Table 5 reports the paired-t confidence interval for the difference between the distribution of campsite cluster use reported in the visitor survey and the 1X simulated trips. The results suggest that the data generated by the travel simulation model are valid estimates of visitor use conditions within the study area.

Table 5. Travel simulation model validation results.

	Reported trips vs. Simulated trips
Mean difference	0
95% c.i.	0.00 +/- [0,0]

Conclusion

The study described in this paper illustrates the potential usefulness of computer-based simulation modeling in monitoring and managing recreational use in backcountry and wilderness landscapes. Dispersed recreation in such areas is inherently difficult to observe directly. However, by collecting representative data on recreational use levels and patterns by means of trailhead counts and a diary survey of a sample of visitor groups, a simulation model was developed to estimate detailed levels and patterns of visitor use. The model developed for the Humphrey's Basin area informs managers about levels of use and resulting encounters at all trail segments and campsite clusters within the study area, and this information can be used for several purposes, including identifying potential bottlenecks or congested sites, scheduling maintenance and patrol activities, and educating visitors about the conditions they are likely to experience.

The simulation model of Humphrey's Basin can also be used for monitoring purposes. Monitoring is becoming increasingly important in park and wilderness planning and management, and plays a vital role in application of the Limits of Acceptable Change (LAC) (Stankey et al. 1985) and Visitor Experience and Resource Protection (VERP) (Manning 2001, National Park Service 1997) frameworks developed and used by the U.S. Forest Service and U.S. National Park Service, respectively. These frameworks require formulation of indicators and standards of quality for resource and experiential conditions in parks and wilderness. Indicator variables must be monitored to help ensure that standards of quality are maintained. The simulation model developed for Humphrey's Basin can be used to monitor crowding-related indicator variables such as trail and campsite encounters. Trailhead counts (gathered on a periodic basis by means of automatic trail counters, self-registration stations, or permit data) can be used to run the model and estimate trail and campsite encounters. Moreover, the model can be used in a more "proactive" way by estimating the total daily use that can be accommodated without violating crowding-related standards of quality. In this way, a trailhead quota or permit system could be designed to ensure that crowding-related standards of quality are maintained. The Humphrey's Basin model estimates that visitor use could be substantially increased without violating a camping encounter standard of 5 more than 5% of the time.

Finally, travel simulation model can be used to test the potential effectiveness of management practices, such as those designed to reduce trail and campsite encounters. For example, travel simulation modeling provides managers with a tool to estimate the potential effect of redistributing use among entry points to a wilderness area, or altering the temporal distribution of use on visitor flows and visitor use-related conditions. While the level of visitor use in the Humphrey's Basin area is too low to demonstrate this capability of travel simulation modeling, several other studies have illustrated this (Manning & Potter 1984, McCool et al. 1977, Potter & Manning 1984, Smith & Krutilla 1976, Underhill et al. 1986, Van Wagtendonk & Coho 1986, Wang & Manning 1999). For example, in a study at Isle Royale National Park, a travel simulation model was developed to test the effectiveness of a range of management practices designed to reduce crowding within the Park's backcountry campgrounds (Lawson & Manning 2003a, 2003b). Travel simulation results from the study suggest that redistributing use among the entry points to the Park's backcountry would not be an effective strategy for reducing crowding in backcountry campgrounds. These findings assisted managers in identifying management practices that would effectively reduce campground crowding, while avoiding the costs associated with instituting potentially ineffective management policies. Findings from a travel simulation model of visitor use along the Appalachian Trail suggest that the number of hiking encounters along the Trail could be reduced by altering the number and timing of arrivals at various trailheads (Manning & Potter 1984, Potter & Manning 1984). In fact, spatial and temporal redistributions of use along a section of the trail were found to be more effective at reducing the number of hiking and camping encounters than across-the-board use limits. In such cases, simulation modeling is a useful tool for optimizing the design of trailhead quota systems and/or information and education programs that redistribute use across starting locations and starting times.

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Computer Simulation as a Tool for Developing Alternatives for Managing Crowding at Wilderness Campsites on Isle Royale

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Abstract: Isle Royale National Park is experiencing increased backcountry visitation, resulting in crowded camping conditions during peak periods. For example, during July and August, backcountry campground capacities are commonly exceeded and visitors are required to share sites with other groups. During the summers of 2001 and 2002, two phases of research were conducted to assist Park managers in addressing this issue. In the first phase of research, computer simulation modeling was used to test the effectiveness of alternative management practices designed to reduce or eliminate campground crowding. The simulation results provide numerical estimates of campground crowding (i.e., campsite sharing) under alternative management approaches, including permit quotas, trailhead quotas, campsite development, and fixed itineraries. The second phase of research used stated choice analysis to evaluate visitors' attitudes toward alternative management scenarios developed with the simulation model. Results of the stated choice analysis suggest that visitors are willing to tolerate some campground crowding in order to avoid "heavy-handed" management practices. Together, findings from the two phases of research assist Park managers in estimating the outcomes of alternative management practices and anticipating the likelihood that visitors will support those outcomes.

Introduction

Since the establishment of the National Wilderness Preservation System in 1964, recreation use of wilderness has grown steadily and continues to be on the rise today, particularly in the National Parks (Cole, 1996). In the face of burgeoning public demand for outdoor recreation, national park and wilderness managers must make decisions that integrate a broad array of public values. For example, wilderness recreationists value, to varying degrees, opportunities for solitude, pristine resource conditions, and recreation opportunities unconstrained by management restrictions. Decisions about how to integrate these diverse values are complex and involve tradeoffs among potentially competing values (Lawson & Manning, 2002b).

This study uses computer simulation modeling to quantify tradeoffs associated with management options for improving backcountry camping conditions at Isle Royale National Park. The results of this study are assisting park managers in understanding current crowding-related conditions in campgrounds, comparing current conditions to proposed standards of quality for camping-related indicators, testing the effectiveness and implications of alternative management strategies, and informing the public about the implications of various management alternatives.

Isle Royale National Park

Isle Royale National Park is located in the northwest corner of Lake Superior, approximately 75 miles from Houghton, Michigan and 20 miles from Grand Portage, Minnesota, USA. Approximately 99% of the park's land base is designated wilderness. The park has a system of 36 campgrounds, with a total of 244 designated tent and shelter sites dispersed along lakeshores and a network of 165 miles of trails. Primary recreation activities at the park, which is open to visitors from mid-April until the end of October, include hiking and camping. During the 1990's, visitation to Isle Royale National Park grew at a rate of 4–5% annually, and, on a per acre basis, the park has one of the highest number of backcountry overnight stays in the National Park System (Farrell & Marion, 1998).

Visitors interested in backcountry camping at Isle Royale National Park are required to obtain a permit. As part of the permitting process, visitors are asked to report their anticipated itinerary, identifying the number of nights they plan to be in the park and the campground they intend to stay at each night of their camping trip. However, visitors are not required to follow their proposed itinerary and there are no restrictions on the number of permits issued for camping in the park. While visitors do have the option to obtain special permits for off-trail hiking and camping, the vast majority choose to camp at the designated campground sites (Farrell & Marion, 1998).

Isle Royale National Park's approach to backcountry camping management is designed to maximize public access to the park and to maintain visitors' sense of spontaneity and freedom. However, recent research suggests that this management approach, coupled with increased backcountry visitation at the park, has resulted in campground capacities commonly being exceeded during peak periods of the visitor use season. Campers who arrive in full campgrounds are asked to share campsites with other groups, and most campers surveyed indicated that having to double-up with other camping groups detracted from the quality of their experience (Pierskalla, Anderson, & Lime, 1996, 1997).

Park managers have decided to address this backcountry camping issue by formulating a standard for campsite sharing (Manning, 1999). As park staff attempt to identify an appropriate and feasible standard for campsite sharing, they are faced with a number of difficult questions. For example, to what extent would use limits or fixed itineraries need to be imposed in order to reduce sharing to achieve alternative standards? Could efforts to provide public access, visitor freedoms, and reduced campground crowding be optimized by redistributing use temporally and/or spatially? Could alternative standards for campsite sharing be achieved by adding new campsites to the park, rather than by limiting use? If so, how many additional campsites would be needed, and where would they need to be located? Answers to these questions can assist managers in more precisely describing what the alternatives are and how they affect visitor freedoms, spontaneity of visitor experiences, public access, facility development, natural resource protection, and opportunities for camping solitude. This paper shows how computer simulation modeling of visitor travel patterns can assist managers in answering such questions.

Methods

Data Collection

Backcountry camping permits issued by park staff during the 2001 season provided the primary source of data needed to construct the travel simulation model. Information from the permits concerning the starting and ending date of each group's trip, camping itinerary, and group size were used as inputs to the simulation model. Data needed to test whether the simulation model outputs are valid estimates of on the ground conditions were gathered through a series of campground occupancy observations conducted throughout the park's 2001 visitor use season. For a more detailed discussion of the data collection and validation processes see Lawson and Manning (2003a).

Computer Travel Simulation Model

The travel simulation model developed in this study was built using Extend software (Extend, 1996; Lawson & Manning, 2003a, 2003b; Lawson et al., 2003; Wang & Manning, 1999). The structure of the simulation model consists of objects called hierarchical blocks that simulate various aspects of the Park's camping system. Entrance blocks generate simulated visitor groups and assign values for a set of attributes to groups (e.g., group size, camping itinerary) designed to direct their travel through the simulated backcountry camping trip. The model contains entrance blocks for each of the primary entry points to the Park. Entrance blocks allow the user to control the simulated amount and spatio-temporal distribution of backcountry camping use by specifying the simulated average daily number of trips starting from each of these locations. Routing blocks direct simulated visitor groups to the next (or first) campground on their itineraries, at the beginning of each simulated day, and direct groups that have completed their itineraries to exit the park. Campground blocks record the number of groups camping at each campground and the number of groups sharing campsites on each night throughout the simulation period.

Model Runs

Simulation runs were conducted to estimate the extent of campsite sharing in the Park under status quo conditions. Model runs were also conducted to estimate the effectiveness of management actions at reducing or eliminating campsite sharing, including a permit quota, fixed itineraries, and increasing the number of campsites on the Island. In addition, a workshop was conducted to instruct park staff how to use and modify the simulation model to continue meeting their planning needs. The park staff's use of the simulation model is ongoing, allowing them to evaluate management strategies as new ideas emerge throughout the Park's backcountry and wilderness planning process.

Results

Backcountry Camping Permit Data

All 3,810 backcountry camping permits issued by the park during the 2001 season were used as inputs to the computer travel simulation model. These data include permits issued to backpackers, kayakers, canoeists, powerboaters, and sailboaters. Data reported in Table 1 indicate that, on average, 27 more permits were issued per day during July and August than during the remainder of the season (referred to throughout the remainder of the paper as the July/August peak and the low use period of the

Table 1. Mean Number of Permits Issued per Day, by Trip Starting Location – 2001 Visitor Use Season.

	Windigo	Rock Harbor	All Other Locations	All Locations Combined
July/August weekdays	12.8	19.0	2.3	34.2
July/August weekend days	17.9	29.8	4.3	52.1
July/August all days	14.2	22.0	2.8	39.1
Low use period weekdays	2.4	5.0	1.4	8.7
Low use period weekend days	6.4	9.5	2.6	18.5
Low use period all days	3.6	6.3	1.7	11.6

season, respectively). The permit data indicate that substantially more visitor groups started their backcountry camping trips on a weekend than on a weekday. Most visitors access the Park by commercial boat, landing at either Windigo (on the west end of the Park) or Rock Harbor (on the east end of the Park). Consequently, the vast majority of backcountry camping trips started at Windigo or Rock Harbor.

Model Output

Table 2 summarizes the results of simulation runs conducted to estimate the current extent of campsite sharing in the Park and to estimate the effectiveness of alternative strategies for reducing or eliminating campsite sharing. The alternatives outlined in Table 2 were selected for analysis with the simulation model because they reflect a range of management approaches that emphasize campsite solitude, visitor freedoms, public access, and facility development to varying degrees.

Park managers have the option of managing backcountry camping to maintain status quo conditions. Under this alternative, an average of about 39 permits would be issued per day, there would be no new campsite construction, and visitors would not be required to follow prescribed itineraries. Simulation results for the "Status Quo" alternative suggest that under the Park's current management approach, an average of about 9% of groups are required to share campsites per night during July and August, with 24% sharing during the busiest two weeks of this period. Less than 1% of groups are estimated to share sites during the low use period of the season.

Simulation runs were conducted to assess the effectiveness of a permit quota at reducing or eliminating campsite sharing. Under the "Permit Quota" alternative, there would be no new campsite construction and visitors would not be required to follow prescribed itineraries. However, the average number of permits issued per day during July and August would be reduced to ensure that an average of no more than 5% of groups share campsites per night (a standard for campsite sharing that the Park is considering). Such an approach would continue to emphasize visitor freedoms and place limits on facility development in wilderness, while allowing for greater camping solitude than the status quo for those groups able to obtain a permit. However, some individuals who wanted to take a backcountry camping trip during July or August would not be able to obtain a permit to do so. The simulated "Permit Quota" alternative suggests that the Park would need to reduce visitor use during July and August by nearly 25% to ensure that an average of no more than 5% of groups share campsites per night.

Decisions to limit public use of national parks and wilderness are inherently controversial. To avoid this controversy, Park managers could institute a fixed itinerary system, rather than a permit quota, to reduce or eliminate campsite sharing,. Under this approach, everyone who wanted to take a backcountry camping trip would be able to obtain a permit to do so and no new campsites would be constructed. However, visitors would potentially have fewer choices of itineraries and would lose the freedom to spontaneously alter their camping itinerary during the course of their trip. The results of the simulated "Fixed Itineraries" alternative suggest that, by requiring visitors to follow prescribed camping itineraries, the Park could issue approximately 30% more permits than they did during the 2001 visitor use season, while at the same time virtually eliminate campsite sharing.

Rather than institute a permit quota or require visitors to follow prescribed itineraries, Park managers could try to reduce or eliminate campsite sharing by building new campsites. The park's recently adopted General Management Plan allows for construction of up to 13 additional campsites in specific campgrounds. If the Park were to adopt this "Campsite Construction" alternative, the simulation results suggest that, without instituting any limits on use, the park could reduce campsite sharing by about 2%, resulting in an average of approximately 7% of groups sharing campsites per night.

As the results of the simulated "Status Quo" alternative indicate, campsite sharing is a problem primarily during the months of July and August, while there is virtually no campsite sharing during the low use period of the season. Further, results of the "Permit Quota" alternative suggested that Park managers would need to reduce the number of permits issued during July and August by about 25% to ensure that an average of no more than 5% of groups share sites per night. However, rather than turning those visitors away completely, Park managers could shift "surplus" peak season use to the low use period of the season. This "Temporal Redistribution" approach would allow managers to maintain season-wide visitor use levels, reduce campsite sharing during July and August, avoid building new campsites, and maintain visitors freedom with respect to camping itineraries. Results of the simulated "Temporal Redistribution" alternative suggest that campsite sharing would increase from an average of approximately 0.4% of groups per night during the low use period of the season, to just over 1% of groups per night.

Simulations conducted to estimate the effect of redistributing visitor use evenly across the two primary starting locations for backcountry camping trips (i.e., Windigo and Rock Harbor) or evenly across the days of the week suggest that neither strategy would reduce campsite sharing. Therefore, the results of these simulations are not included in Table 2.

Results of simulation runs conducted to test the validity of the model indicated no statistically significant differences between observed campground occupancies collected by park staff during the 2001 season and travel simulation model output. More importantly, there were no *substantive* differences between the observed campground occupancies and the corresponding model output. This suggests that the travel simulation model accurately represents backcountry camping conditions at the park during the 2001 season. For more information about the validation of the simulation model see Lawson and Manning (2003a).

Park staff's use of the simulation model is ongoing. For example, park staff have used the model to estimate the effect of shifting some use to secondary entry points, differentially altering the visitation levels of hikers, paddlers, and powerboaters, and setting alternative standards for campsite sharing at different times of the season. In addition, park staff have used the model to estimate where and how many new campsites would need to be added to the Park to eliminate campsite sharing during peak season demand. Using simulation results as a guide, park staff conducted site visits to determine the feasibility and desirability of campground development needed to meet peak camping demand, based on considerations of physical constraints of wetlands, fragile habitats and topography as well as appropriate size of campgrounds in different areas of the park. In Isle Royale's case, the number of new sites the simulation model estimates would be needed to accommodate peak demand is greater than the number of sites that could be added to the Park, given the constraints listed above. However, the new sites could mitigate campsite sharing to some extent.

Discussion and Management Implications

The findings from this study have implications for management of backcountry camping use at Isle Royale National Park in particular, and for management of visitor use in parks and wilderness in general. Isle Royale National Park managers have made a commitment to adopt campsite sharing-related indicators and standards of quality and to develop and implement strategies to improve social conditions in campgrounds while also protecting park resources. To do this in an informed manner, park managers not only need to identify feasible manage-

Table 2. Management alternatives quantified based on simulation model output.

Wilderness Values	Status Quo	Permit Quota	Fixed Itineraries	Campsite Construction	Temporal Redistribution
Public Access	Current use	22% reduction in July/August use	30% increase in July/August use	Current use	Current use (shift 22% of peak)
Facility Development	No new campsites	No new campsites	No new campsites	13 new campsites	No new campsites
Visitor reedom	No fixed itineraries	No fixed itineraries	Fixed itineraries	No fixed itineraries	No fixed itineraries
Camping Solitude July and August	9% of groups share sites/night	5% of groups share sites/night	<1% of groups share sites/night[1]	7% of groups share sites/night	5% of groups share sites/night
Camping Solitude Low Use Period	0.4% of groups share sites/night	0.4% of groups share sites/night	<1% of groups share sites/night[1]	<1% of groups share sites/night	1.4% of groups share sites/night

[1]Assumes permits are issued to achieve 80% occupancy rate to adjust for non-compliance

ment options, they must also understand the effects of alternative options on a diverse array of wilderness values (Cole, 2002). This study assists park managers in defining and assessing management alternatives not only in terms of how effective they are at reducing or eliminating campsite sharing, but also in terms of their consequences with respect to visitor freedoms, public access, and resource impacts associated with facility development. Consequently, the simulation modeling results aid managers in better informing the public of the costs and benefits of different management options, resulting in more effective public involvement in the planning process.

Results from this study are consistent with findings from previous research at Isle Royale National Park, suggesting that campsite sharing is prevalent during certain periods of the visitor use season. Although it would be possible to reduce campsite sharing through backcountry camping use limits alone, results from the travel simulation model suggest that the park would have to issue approximately 22% fewer permits during July and August to ensure that an average of no more than 5% of groups share campsites per night.

The outdoor recreation literature generally suggests that use limits should be considered a last resort for managing crowding, and that less intrusive alternatives should be considered first (Behan, 1974, 1976; Dustin & McAvoy, 1980; Hall, 2001; Hendee & Lucas, 1973, 1974). The computer simulation model developed in this study helps managers identify effective management actions with relatively low "costs" to visitors and avoid those that are less effective or that come at a relatively high "costs" to visitors. In Isle Royale's case, modeling suggests that the extent of use limits necessary to achieve certain standards for campsite sharing could be minimized by also redistributing use and/or modifying campground capacities.

Although this study provides managers with descriptive information related to backcountry camping at Isle Royale National Park, managers are still faced with difficult judgments concerning the most appropriate strategies for managing backcountry camping. These judgments require managers to reconcile tradeoffs among potentially competing wilderness values. For example, do the costs in visitor freedoms and spontaneity associated with a fixed itinerary system outweigh the benefits of increasing use and eliminating or substantially reducing campsite sharing? Is it in the public's interest to limit backcountry camping use during the peak period of the season in order to minimize campsite sharing? If so, to what extent should use be limited to achieve a greater degree of camping solitude? Is it acceptable to shift a percentage of peak season use to the low use period of the season, or does the historically low use period of the season offer a type of wilderness experience that should be preserved? While these judgments must ultimately be made by managers, a growing body of recreation research has been conducted to provide managers with a more informed basis for making such judgments (Lawson & Manning, 2001a, 2001b, 2002a, 2002b; Manning & Lawson, 2002).

The simulation results from this study formed the basis of a visitor survey conducted at Isle Royale National Park during the 2002 visitor use season (Lawson & Manning, 2003b). The visitor survey was designed to assess public attitudes toward management alternatives derived from the simulation model. Results of the visitor survey provide managers with estimates of the proportion of current visitors that support alternative strategies for managing backcountry camping (Table 3). Each alternative in Table 3 is defined in terms of the amount of backcountry camping use permitted, the number of new campsites constructed, whether visitors are required to follow a prescribed itinerary, and the extent of campsite sharing during July and August. The last row of Table 3 reports the proportion of visitors estimated to support each alternative.

The results suggest that the greatest support among visitors is for the "Status Quo" and "Permit Quota" options, with 36% and 39% of visitors estimated to support each of these alternatives, respectively. While the "Campsite Construction" alternative is less popular than the "Status Quo" and "Permit Quota" alternatives, nearly 20% of visitors are estimated to support this option. The "Fixed Itineraries" alternative is substan-

Table 3. Preference proportions for management alternatives.

Status Quo	Permit Quota	Fixed Itineraries	Campsite Construction
Current use (39 permits/day)	22% reduction in use (31 permits/day)	30% increase in use (52 permits/day)	Current use (39 permits/day)
No new campsites	No new campsites	No new campsites	70 new campsites
No fixed itineraries	No fixed itineraries	Fixed itineraries	No fixed itineraries
9% of groups share campsites/night	5% of groups share campsites/night	<1% of groups share campsites/night[1]	<1% of groups share campsites/night
36%	39%	6%	19%

[1]Assumes permits are issued to achieve 80% occupancy rate to adjust for non-compliance

tially less favorable to visitors than any of the other alternatives, with just over 5% of visitors estimated to support this option. These findings suggest that visitors would prefer to tolerate some amount of campsite sharing in order to ensure that the park does not build a large number of new campsites or require visitors to follow prescribed, fixed itineraries. In this way, the simulation model provides managers with information about the consequences and benefits of alternative management strategies, and the visitor survey assists managers in evaluating public acceptance of the consequences and benefits associated with those management alternatives.

This paper describes how simulation modeling can be used as a tool to contribute to improved management of parks and wilderness. In particular, simulation modeling can more precisely describe the "packages" of attributes (social, environmental, managerial) that are the real management alternatives from which one future must be selected. The simulation results can be used to focus visitor surveys and other public input processes on assessing public support for real management options. In these ways, simulation modeling can be a very effective way of communicating with the public and informing decisions throughout the planning process.

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Understanding Recreation Flow to Protect Wilderness Resources at Joshua Tree National Park, California

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Abstract: Joshua Tree National Park (JTNP) has the highest concentration of rock climbing routes in the world and an estimated 250,000 people visit JTNP each year to rock climb. Although less than 5% of rock climbers visit the designated wilderness areas, a steady increase in the number of climbers has focused attention on managing wilderness climbing resources to retain wilderness character. The main controversy centers on rock climber's placing fixed anchors, or bolts, while establishing new climbing routes. Park staff believes that continued unregulated placement of bolts in JTNP's wilderness leads to greater impacts and is unsustainable. This paper describes a method for understanding wilderness climbing in order to develop fair and effective wilderness recreation policy. Behavior and spatial modeling is based on two years of data that include a comprehensive climbing resource inventory, wilderness visitor flow data, and psychological test results. Static and dynamic models consider factors such as travel networks, climbing route difficulty and quality, sensitive resources, landscape complexity, and climber preferences. A comprehensive understanding of recreation flow allows fixed anchor regulations and wilderness management to address site-specific issues.

Introduction

Understanding the relationships between resource impacts, visitor experience and visitor flow is a fundamental issue addressed by Joshua Tree National Park (JTNP) wilderness managers. Over one million people visit JTNP each year due to its proximity to three major metropolitan areas and international acclaim. Nearly 80% of JTNP is designated as wilderness and is thereby managed according to the Wilderness Act of 1964. The Wilderness Act (Section 2[c]) states that wilderness should afford "solitude" and "untrammeled" landscapes.

JTNP is world renowned for the quality of its rock climbing and boasts the highest concentration of rock climbing routes in the world. The number of new climbing routes has dramatically increased since the 1940's, with the most significant period of route development between the early 1970's and present day. There are more than 5,000 published rock climbing routes, and there are hundreds, if not thousands, of unpublished, established rock climbing routes. Approximately 35% of the climbing routes are located within the JTNP wilderness boundary that currently encompasses 593,490 acres of the park. An estimated 250,000 people visit JTNP each year to rock climb. A steady increase in the number of climbers, and climbing routes, has focused attention on managing wilderness climbing resources to retain environmental integrity and wilderness character.

Some of the climbing routes follow cracks that allow the climber to use removable protection, although many routes necessitate fixed anchors in order to safely (relative to no protection) ascend and/or descend. Fixed anchors are defined as any piece of climbing protection that is left in place to facilitate a safe ascent or rappel. Typically, fixed anchors are bolts (1/4"-1/2" diameter and 1/2"-3" long) equipped with small steel hangers.

The main controversy regarding climbing in wilderness centers on rock climber's placing fixed anchors, or bolts, while establishing new climbing routes in designated wilderness. Since February 1993, JTNP has prohibited the placement of fixed anchors in wilderness until it understands the potential environmental and social impacts associated with rock climbing and fixed anchors. Environmental impacts may include the proliferation of social trails and the degradation of cliff and cliff-base ecosystems. In addition, some environmental groups believe that fixed anchors are not acceptable according to their interpretation of the Wilderness Act of 1964. The majority of climbers, on the other hand, believe that fixed anchors are an insignificant impact on wilderness (Waldrup and McEwen 1994, Schuster et al. 2001). The 1998 JTNP Wilderness Management Plan states that rock climbing is an appropriate wilderness activity. However, park staff believes that continued unregulated placement of bolts in JTNP's wilderness leads to greater impacts and is unsustainable. Therefore JTNP must determine a management action that allows for wilderness rock climbing, including new climbing route development, and protects the finite wilderness resource.

Study Design

This study examined wilderness rock climbing in order to: 1) evaluate the temporal and spatial distribution of wilderness climbers with regard to fixed anchors and sensitive wilderness resources, 2) identify the wilderness climbing resource attributes that are most responsible for attracting heavy use, and 3) design and assess potential fixed anchor regulations and permitting processes.

JTNP wilderness climbing resources are located in the Mojave desert within a complex and rugged landscape dominated by large (up to 300 feet tall) quartz-monzonite formations. There are relatively few designated trails to the climbing sites, and climbers can begin their approaches from about 20 different locations. Approach times vary from five minutes to three hours. Day-use wilderness permits are not required. The majority of climbers gain information about climbing routes from published climbing guidebooks. Landscape vastness and complexity, limited established trail networks, and the typically solitary nature of wilderness climbing dictate the study design.

To understand the relationships between the activity of wilderness climbing and biological resources, cultural resources and wilderness attributes, such as solitude, one must examine the entire wilderness climbing resource system. The wilderness climbing resource system is composed of climbing sites, travel networks, and wilderness climbers. This study combined a climbing resource inventory, wilderness visitor monitoring data, and behavior profiles to model the current spatial and temporal distribution of wilderness climbers and to predict future scenarios.

Erik Murdock, a National Park Service researcher and University of Arizona graduate student, coordinated this study. Fieldwork began in February 2002 and was completed in March 2004. Nineteen volunteers were used to administer surveys, collect climbing resource data and maintain monitoring equipment.

Climbing Resource Inventory

The climbing resource inventory cataloged all established wilderness climbing formations, routes, and access trails. There are over 1800 climbing routes on an estimated 500 climbing formations in JTNP wilderness. The location of each formation was recorded in a GIS (geographic information system) database. For each climbing route on every formation, the location, difficulty, number of fixed anchors, number of fixed anchors at the belays or lowering stations, quality, approach time, and cliff-base environmental condition were recorded. In addition, the safety of the fixed anchors, presence of litter, cliff-base vegetation, and other notable route characteristics were recorded. A relational database was used to link climbing route data to formation locations. In this way, researchers can map the spatial distribution of climbing opportunities as each formation affords a unique opportunity with regard to variances in route difficulty, quality, and fixed anchor availability.

Wilderness climbing resource approach trails were mapped using GPS (Global Positioning System). Although other wilderness users, such as equestrians and hikers, use wilderness trails, the trails serve as the travel network to climbing sites. Trails were classified according to width, use level, and character (braided, discrete, or vague). Conditions at various points along trails were documented and recorded using highly accurate (less than 0.5 meters) GPS techniques so that future studies can return to those locations to monitor conditions. Many of the trails do not deposit climbers at the bases of formation, and therefore climbers typically scramble through boulders or bushwhack short distances. In these situations, travel path locations were estimated and recorded as non-existent. Modeling requirements necessitated that the travel network connects to all destinations. This baseline data is critical not only to modeling, but also because the park plans to monitor both climbing resources and wilderness access trails in order to understand whether the ecological integrity of wilderness resources is being degraded.

Wilderness Visitor Monitoring

Wilderness visitors were monitored to determine the percentage of visitors that are climbers, the temporal distribution of use, and the wilderness access trails that are used. A combination of people counting devices, visual observation, and time-lapse cameras was used to collect data.

Infrared counters and pressure sensitive pads were placed at wilderness access locations to record the time and date of every wilderness entry (Figure 1). Monitoring equipment was placed as close to the designated wilderness boundary as possible. Passive infrared counters, that sense motion and heat differences in an approximately thirty foot square area, were used at low use wilderness access locations that do not have a discrete trail. The main drawback of the passive infrared counter is that it records one event for each group that passes through the monitoring zone. Active infrared counters, that transmit a pulsing infrared beam across a trail, were used in high-use areas with well-used trails and record an event for each person that passes through the monitoring zone. Pressure sensitive pads, that are triggered when the pad is weighted, were used on high-use trails in open areas that preclude above ground monitoring equipment. Monitoring devices were left in place for nine months to two years (depending on wilderness access location) so that seasonal variations and anomalous periods are identified.

Visual observers were positioned at wilderness access locations to record the percentage of wilderness users that are climbers and to validate the people

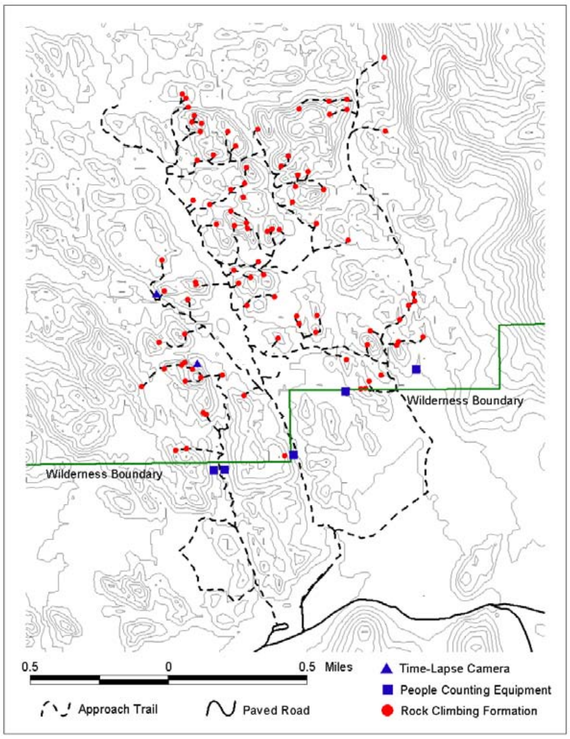

Figure 1. Monitoring equipment locations, approach trails and climbing formations at one of JTNP's many wilderness climbing areas.

counting devices. Visual observers also recorded group size. Random observations were scheduled to sample approximately 15% of the year and were stratified according to day of week and season (Watson et al. 2000).

Time-lapse cameras recorded use patterns at high-use wilderness climbing formations. Cameras were placed at formations that offer a variety of climbing experiences, in effect creating a revealed preference choice experiment. Chosen formations were initially observed to determine the typical amount of time needed to ascend and descend climbing routes. Camera timers were set to expose film during daylight hours at an interval suited to the specific climbing routes so that each climber would be photographed during either his or her ascent or descent. The purpose of the time-lapse photography was two fold. First, it identified the types of climbs that are commonly ascended. Formations that afford a variety of climbing route types insure that climbers can freely choose the difficulty, fixed anchor availability, and quality without being restricted by availability. Second, the photographs recorded the use levels at popular climbing formations. The photograph logs were compared to the wilderness access location monitoring data to determine the percentage of climbers that visit high-use climbing resources relative to the percentage of climbers that disperse throughout the wilderness. The result of this detailed monitoring program is a complete picture, in terms of both space and time, of wilderness climbing resource use. This data also provides JTNP with important baseline trend information.

Climber Behavior Profiles

Climber behavior profiles link destination choice to a climber's individual attributes. Mitchell (1983) describes a climber's decision to visit a specific destination as an opportunity to achieve flow, a euphoric state that occurs during activities that are freely entered into and freely chosen. Climbers seeking flow must successfully match desire, preferences, skill level, and social influences (individual attributes) with an appropriate climbing destination. Studies show that individual attributes, such as experience level, frequency of participation and locus of control, are useful to classify adventure recreation participants and are related to destination attributes such as difficulty, solitude and risk (Fesenmaier 1988, Ewert and Hollenhorst 1989). Ewert (1985) found that more experienced climbers will tend to seek climbing routes that are more rugged, less crowded, and less controlled. However, other researchers found that experience level is related to the perceived detail and specificity of an activity setting and is not correlated to destination attributes (Shreyer and Beaulieu 1986). In other words, dissimilar participants may seek different experiences from the same destination.

JTNP's wilderness climbing resources provide an ideal laboratory to test the relationship between climber's individual attributes and destination choice. Within a relatively small geographic area, JTNP contains thousands of choices that represent every combination of destination setting attributes. A combination of survey techniques was implemented to determine the aforementioned relationship.

The JTNP wilderness climbing survey was designed to collect information on experience level, skill level, frequency of participation, and locus of control. The composite of these attributes describes each climber's level of engagement (Ewert and Hollenhorst 1989). Climbers were asked to state their preferences, using a Likert scale, on the importance of the following destination attributes: solitude, risk, fixed anchors, difficulty, quality, and approach distances. In addition, they were asked to report all of the climbing routes that they visited that day, revealing their preferences for specific destinations. Finally, each survey participant completed a conjoint choice tool that asked climbers to choose preferred destinations from a set of hypothetical choices. Conjoint choice analysis determines mathematical relationships between physical attributes of the landscape and perceptual judgments of wilderness visitors. The analysis inductively calculates importance values for each attribute (Louviere 1988, Haider et al. 1998). It elegantly applies to climber behavior profiles because many of the attributes, such as difficulty and quality, are already quantified. The majority of wilderness climbers is familiar with standard rating systems, and tends to perceive the wilderness resource in quantifiable terms.

The survey was administered at various locations within JTNP including wilderness access locations, campgrounds, picnic areas, and parking lots. Adult climbers were asked to participate in the survey upon exiting the wilderness or at the end of their climbing day. Survey refusals were recorded to identify non-response bias. Scheduled survey days at each location were stratified according to the day of week and the relative climbing use levels at each location. Preliminary visitor flow models showed that more than 50% of wilderness climbing occurs on weekends and that the majority of wilderness climbers approach wilderness climbing resources from two access locations. During busy periods, up to 60 visitors (climbers and non-climbers) per day use popular wilderness access locations. 430 surveys were administered between September 15, 2003 and February 8, 2004. Eighty eight percent of the wilderness visitors who were asked to complete the survey participated.

Results

The climbing resource inventory, wilderness visitor monitoring data and survey results were combined to understand the spatial relationship between wilderness climbing and fixed anchors. Two years of visitor monitoring showed that 90% of the wilderness climbers used only two of the wilderness access locations. Weekend wilderness visitation varied between 59% and 90% of total visitation depending on the season and wilderness access location. Seasonal variations were predictable, with visitation falling distinctly in the hot, summer months. The percentage of climbers versus non-climbers that visit the wilderness also depended on the season and wilderness access location. At the most heavily used wilderness access location, on average, 54% were climbers. Between January 2002 and December 2003, an estimated 2,150 climbers visited the wilderness from the two most heavily used wilderness access locations.

Time-lapse photography was compared to visitor counts at wilderness access locations. The comparison showed that between 53% and 100% of the climbers, depending on day of week and season, which visited the wilderness, climbed at one of only three climbing formations. Survey results confirm this finding. Fifty five percent of the reported wilderness climbs were located on one of the same three climbing formations.

The climbing resource inventory, when compared to wilderness visitor monitoring data, showed that the geographic distribution of fixed anchors weakly correlates to both high-use trail locations and high-use wilderness formations. In the Wonderland on Rocks wilderness area, 59% of the climbing formations have fixed anchors although visitation was observed and/or reported at only 12% of the climbing formations. In addition, survey results show that only one of the six most reported wilderness climbing routes is completely equipped with fixed anchors. The other five are either entirely naturally protected or are only partially protected by fixed anchors. Forty eight percent of the total reported wilderness climbing routes are entirely naturally protected, 48% are partially protected by fixed anchors, and only 2% are completely protected by fixed anchors. These results lend evidence to the argument that climbers do not visit JTNP to exclusively climb fixed anchor protected climbing routes. Fifty percent of the survey respondents ranked traditional (mostly naturally protected) climbing as their top activity whereas only 15% ranked fixed anchor protected climbing as their preferred activity. Not surprisingly, 73% of the survey respondents visit JTNP equipped with a complete set of climbing hardware for naturally protected climbing routes. Visual observation, climbing resource inventory, and survey results agree that fixed anchors are not the most significant climbing resource attractor in JTNP's wilderness.

If fixed anchors are not responsible for the concentrated distribution of wilderness climbers, what climbing resource attributes are most attractive to JTNP climbers? Climbing route difficulty is a major factor in a climber's decision-making process. Figure 2 shows the percentage of available and reported climbing routes at JTNP according to climbing route difficulty. Difficulty is measured using a standard open-ended interval scale called the Yosemite Decimal System (YDS).

Climbers are not randomly choosing climbing destinations. Thirty four percent of the reported wilderness climbs and 25% of the total reported climbs have a difficulty grade of 7, whereas grade 7 climbing routes only constitute 7% of the total available climbs. Seventy six percent of the reported wilderness climbs have difficulty grades between 7 and 10. These results are in sharp contrast to the distribution of total available climbing routes.

Table 1 lists the five most often reported wilderness climbing routes. These five routes attract 55% of the total wilderness climbing visits. All five routes have difficulty grades between 7 and 10.25. However JTNP's wilderness offers hundreds of routes in that grade range. The other attributes that these route share are quality and approach distance.

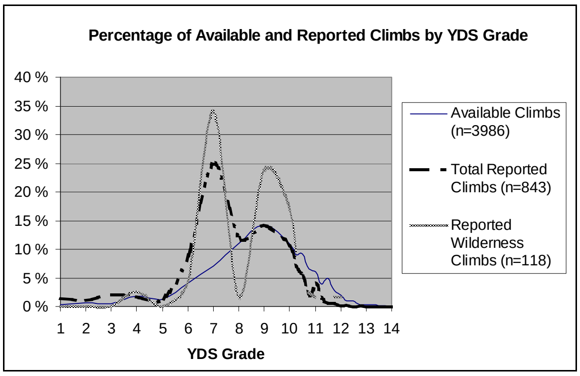

Figure 2. Normalized distribution of available and reported climbs.

Table 1. Top 5 reported wilderness climbing routes.

Name	Grade	Bolts	Quality	Approach
Solid…	10	Some	4	0.98 miles
Figures…	10.25	Some	5	0.98 miles
Hex…	7	None	3	0.96 miles
Dazed…	9	All	3	1.25 miles
Mental…	7	Some	4	1.25 miles

Quality is an interval scaled assessment of a route's aesthetics that considers rock quality, route length, protection, sustained nature, and climbing style. Quality ratings at JTNP range from 0 to 5. A quality rating of 5 denotes an outstanding climbing route and is reserved for routes of unique character. Published JTNP climbing guidebooks list quality ratings next to difficulty grades. Eighty five percent of JTNP climber's own climbing guidebooks and most all climbers are aware of route difficulty and quality prior to visiting climbing destinations. All of the top five reported wilderness climbing routes have a quality rating between 3 and 5. These routes are considered exceptional although there are other, though not many, exceptional climbing routes in the wilderness that have similar difficulty grades and quality ratings.

Approach distance from parking lots appears to be a limiting factor that helps determine destination choice. The top five reported wilderness climbing routes are within 1.25 miles from a parking lot. Hiking times to these climbing routes vary between 30 and 45 minutes. Out of the 843 reported climbing trips (in and out of designated wilderness), not one trip involved more than a 50 minutes approach hike. For perspective, there are over 85 climbing formations, and hundreds of associated climbing routes, that necessitate more than 50 minutes of approach hiking. Figure 3 shows that wilderness climbing trips are more concentrated, relative to overall reported climbing trips, to specific destinations. Revealed preference data (reported climbing routes, time-lapse photography and visual observation) show that climbers are seeking a high return for their hiking investment in the wilderness and are less concerned with specificity when less energy is expended.

This study shows that JTNP climbers that visit the wilderness tend to seek similar destinations, but are the climbers similar to each other? Are climbers with greater experience, higher frequency of participation, and higher locus of control (i.e. level of engagement) more likely to visit the wilderness and/or climb more difficult routes?

The average level of engagement score only slightly increases the further away from roads and parking lots (Table 2). Climbing routes were separated according to hiking approach times. Category 1 includes approaches between 0 and 5 minutes, category 2 includes approaches between 5 and 30 minutes and category 3 includes approaches that are 30 minutes and greater (typically wilderness). Chi-square analysis shows that level of engagement and hiking approach time are related. However, hiking approach times are more closely correlated for lower levels of engagement. In other words, climbers with lower levels of engagement are constrained to lesser approach times, whereas climbers with a greater level of engagement are likely to climb anywhere. When considering the entire population of climbers at JTNP, climbers with a greater level of engagement have a higher probability of exploring wilderness areas. Although the relationship is weak, these results support the findings of Ewert and Hollenhorst (1989), though this study shows that less experienced climbers have greater tendencies to stay out of the wilderness than experienced climbers have of visiting the wilderness.

The correlation between level of engagement and climbing route difficulty is moderate (correlation coefficient = 0.35). The average difficulty level increases with level of engagement (Figure 3). Interestingly, the variance for difficulty is high and relatively the same for all engagement levels. This means that climbers are willing to climb many climbing routes well below their upper difficulty limits. This is an important result for park managers to consider because it means that climbers will visit a wide variety of activity settings. As mentioned earlier, this behavior is less evident in the wilderness where climbers are more particular with their destination choices.

Table 2. Average level of engagement by hiking approach time category.

Approach Category	Average Level of Engagement	Standard Error
1 (0–5 miniutes)	6.95	0.12
2 (5–30 minutes)	7.08	0.15
3 (over 30 minutes)	7.12	0.18

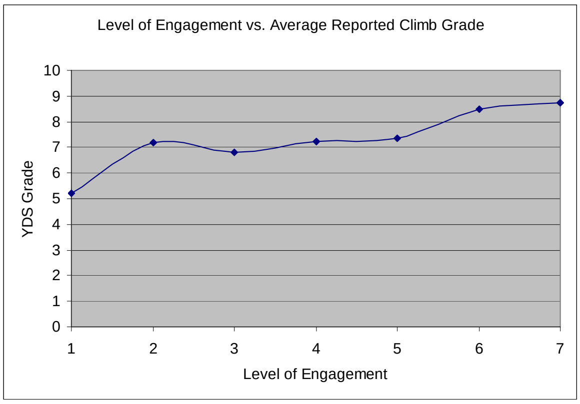

Figure 3. Level of engagement vs. average reported climb difficulty grade (YDS).

Modeling Wilderness Climbing

Wilderness managers strive to protect resources and limit social encounters to an acceptable level. The negative relationship between encounters and experiential quality is considered weak-to-moderate (Stewart and Cole 2001, Manning 2003). However, in a fragile desert with no designated trails, such as JTNP, crowding in the wilderness not only affects solitude, but also creates long standing environmental impacts. Therefore, managers and researchers need to recognize the geographic extent of high-use areas in order to focus management actions and research studies. In this instance, wilderness fixed anchor regulations could range between continuing the existing moratorium to regulating fixed anchors at specific, high-use locations. Modeling allows wilderness managers to see the geographic area that proposed wilderness regulations could affect, and explore the cascading consequences of management plans prior to field implementation.

The boundaries of high-use climbing areas are described in three different ways. First, high-use climbing areas can be defined by the perimeters of high-use climbing formations. Second, high-use areas can be defined by a viewshed that encompasses the high-use portion of climbing formations and areas within a predetermined distance that are within view of each climbing formation. And third, high-use areas can be defined as any area within a buffer zone around trailheads and parking lots equal to the farthest distance to a high-use climbing formation. Cartographic models of the three concepts are developed using GIS (Figure 4).

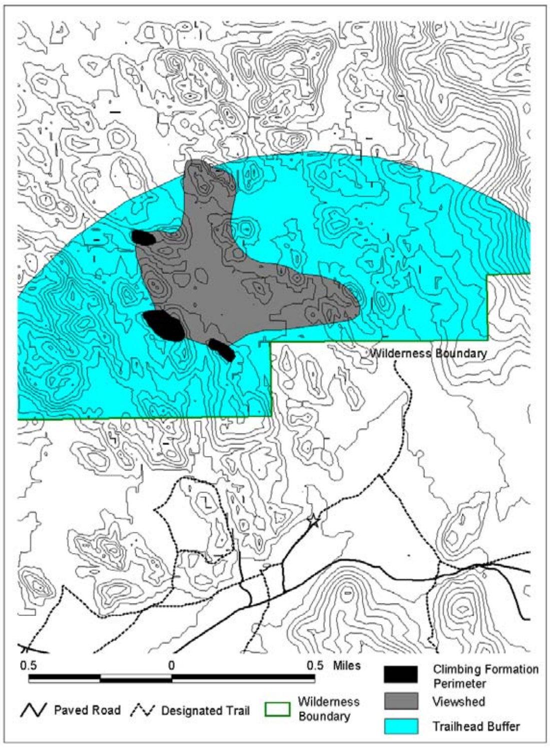

Figure 4. Example of different ways to define high-use climbing area boundaries in South Wonderland, JTNP.

Recreation Behavior Simulation

Wilderness managers need to understand whether new climbing routes equipped with fixed anchors within high-use areas will create crowded conditions at cliff bases or increase social encounters on approach trails to unacceptable levels. They also need to know whether new climbing routes equipped with fixed anchors in low-use areas will attract enough climbers to warrant attention. Recreation Behavior Simulation (RBSim), a model based on artificial intelligence principles to simulate discrete, temporospatial behavior, tests these questions (Gimblett et al. 2002). The following RBSim model is being developed at the time of this writing.

RBSim uses GIS to represent the simulation landscape. Intelligent agents that behave according to hierarchical rules represent wilderness climbers and move through the simulation landscape (Gimblett 2002, Itami 2002). The simulation landscape is composed of a transportation network that links access nodes to destination nodes. The destination nodes represent each of the climbing formations. Each destination node is classified according to climbing resource attributes such as difficulty and quality. Biological and cultural resource locations are also represented in the simulation landscape. Monitoring nodes are inserted into the transportation network to record agent visitation at sensitive resource locations. Agents are grouped according to activity type and preferred activity/setting attributes. Agent behavior is governed by hierarchical rules that are derived from climber behavior profiles and wilderness visitor use data. Wilderness visitor use data also determines the number of agents that enter the landscape during the simulated time period. These “departure curves” reflect the actual temporal variations for specific wilderness access locations.

The simulation environment will provide the opportunity to test and evaluate a variety of scenarios through the manipulation of the number of agents (surrogate climbers) or landscape variables. Test scenarios include increased wilderness use, temporary closures, new climbing routes equipped with fixed anchors and new trail designations. Simulation outputs include the number of social encounters logged by agents and the time and date of every visit at each climbing or monitoring site. The outputs identify locations where crowding or resource impacts, as a result of new scenarios, are probable. Identifying these locations will help determine the shape of the regulated area while avoiding over-regulation.

Implications

A comprehensive understanding of recreation flow in JTNP’s wilderness will help protect resources while avoiding blanket regulations that unnecessarily overburden wilderness visitors. Recognizing high-use areas, behavior patterns, and overall temporospatial distribution allow wilderness managers to explore the possibility of implementing site-specific solutions. With this information, mangers can consider a fixed anchor permitting process for high-use areas. Climbers would submit permits to place fixed anchors in high-use areas. Using the results of this study, JTNP staff would predict the consequences of the new climbing route based on route attributes, route location, and visitor flow patterns. With this information, they could make an informed decision as to whether or not to grant the permit. Permits would be unnecessary in low-use areas where visitation, regardless of route attributes, is minimal.

Study results show that JTNP wilderness climbers employ a systematic decision-making process when choosing climbing sites. Climbers seek a quality experience and particular site attributes when they invest the energy to reach wilderness climbing areas. The predictable nature of wilderness climbing lends itself to cartographic and simulation modeling techniques that allow wilderness managers to tailor regulations to specific sites within greater wilderness areas.

Acknowledgments

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Simulation modeling of visitor flows: where have we been and where are we going?

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Astbract: The Wilderness area Simulation Model was developed in 1972 by Resources for the Future with programming assistance from IBM. It simulates parties moving through a wilderness and records the number of encounters each party experiences. The model has been applied to the Spanish Peaks Primitive Area in Montana, the Adirondack Forest Reserve in New York, the Desolation Wilderness in California, the complex of the wilderness areas surrounding and including Yosemite National Park, the Green and Yampa Rivers in Dinosaur Monument, the Colorado River in Grand Canyon National Park, and the Appalachian National Scenic Trail in Vermont. In its time, the model was a useful tool for establishing the relationship between use levels and encounters and testing management alternatives. As innovative as the model was, recent advances in behavioral science and computer technology have rendered it out of date.

Introduction

Recent application of simulation modeling to wilderness and river settings has revived interest in the Wilderness Simulation Model first developed by Smith and Krutilla (1976). The model was stimulated by ideas expressed by Stankey (1972) in a book on the theoretical and applied analysis of natural environments (Krutilla 1972). He hypothesized that visitors' satisfaction with a wilderness experience was inversely related to the number of encounters they had with members of other parties. Fisher and Krutilla (1972) conceptualized this idea into a model that established the optimum level of use of a wilderness area to be the point at which the incremental benefit of an additional party is just offset by the decrease in the benefits of the parties encountered. The practical application of this concept required that an empirical relationship between the benefits enjoyed during an outing and the number of parties encountered be determined and that a means for estimating encounters be developed. Numerous sociological studies were launched to elicit the relationship between benefits and encounters, but, other than laborious field work, no means existed for enumerating encounters.

In order to overcome this obstacle, researchers from Resources for the Future began to develop a computer model that would simulate travel behavior in a wilderness and track encounters between parties. They soon found that the programming expertise needed far exceeded their capabilities, so they approached IBM for assistance. The result was a simulation program written by Heck and Webster (1973) in the General Purpose Simulation System (GPSS) language running on an IBM mainframe computer.

Visitor data required to run the model included weekly, daily, and hourly distributions of use; party size distributions, and mode of travel mix. For example, small parties on horseback were distinguished from large hiking parties. Area information included the trail segments and camps in the network and the time it took parties of different sizes to hike or ride each trail segment in each direction. Finally, the various routes that might be taken were enumerated along with their probability of being selected. The model scheduled parties of different sizes and types to arrive on different weeks, days of the week, and hours of the day. It then assigned each party a route that included the trails over which they travel and the campsites they used. By keeping track of parties, the model recorded the number of encounters for each party, with whom each encounter occurred, the location of those encounters, and the types of encounters (meeting, overtaking, or camp). Output from the model included numerous tables showing encounters by party type, location, trip length, and total use level.

Prototype testing of the model was conducted on the Spanish Peaks Primitive Area (Smith & Krutilla 1976) and the Adirondack Forest Reserve (Smith and Headly 1975). Subsequently, the model was enhanced by Resources for the Future under contract with the Forest Service (Shechter 1975). This new model was applied to the Desolation Wilderness in California (Shechter & Lucas1978) and to the complex of wilderness areas surrounding and including Yosemite National Park (van Wagtendonk 1979). Modification of the model for river settings allowed it to be applied to the Green and Yampa Rivers in Dinosaur Monument (Lime et al. 1978) and to the Colorado River in Grand Canyon National Park (Underhill et al.

1986). A final application of the model to a trail system was done by Potter and Manning (1984) on the Appalachian National Scenic Trail in Vermont.

Spanish Peaks Primitive Area

Smith and Krutilla (1976) were the first to apply the Heck and Webster (1973) model to a field area. They used the Spanish Peaks Primitive Area, now a 63,300-acre (25,320-ha) unit of the Lee Metcalf Wilderness Area, located in the southwest corner of Montana, USA, just northwest of Yellowstone National Park (Figure 1). The area was administered by the Gallatin National Forest. Data collected by the Forest Service in 1970 and 1971 were used to initialize the model and develop different simulation scenarios. Examination of USGS and Forest Service maps identified eight trailheads, 79 trail segments, and 34 campsites. Diaries and sketch maps from some 400 parties were used to determine arrival patterns, party sizes, modes of travel, routes, and route selection probabilities by mode of travel. One-hundred-four unique routes of various lengths were identified, with up to six nights of stay. Segment travel times were derived by applying results from a previous study (Cunningham 1971) and through discussions with users and wilderness staff.

The base case simulation was run with 177 hiking parties and 48 riding parties entering during a four-week period (Smith & Krutilla 1976). Hiking parties had a total of 390 encounters with other hiking parties and 112 trail encounters with riding parties, while riders recorded an additional 32 encounters with other riding parties. Hikers had 60 total camp encounters, while riders had 20 camp encounters.

Smith and Krutilla (1976) validated the model by having managers familiar with the Spanish Peaks judge the reasonableness of the inputs and the outputs and by looking at the variance of the outputs. Sensitivity analyses using 10 replications each of nine different scenarios showed that the model was relatively insensitive to variation in travel times, that use levels were directly related to encounters, and that evenly distributing arrival patterns reduced encounters. Based on these analyses, the model was considered valid, although further testing was recommended.

Figure 1. The Spanish Peaks in the Lee Metcalf Wilderness. Photo courtesy of Ryan Turner.

Adirondack Forest Reserve

Smith and Headly (1975) conducted a limited application of the simulator to the West Canada Lakes Wilderness Area in the Adirondack Forest Reserve in 1974. Interviews with 76 people in 22 hiking parties were used to develop the base case scenario. During a four-week simulation period, these parties had an average of 2.2 trail encounters per day. Even with such a small sample, the study showed that there was a linear relationship between total use level and mean encounters.

Desolation Wilderness

As a result of the Spanish Peaks experiment, Smith and Krutilla (1976) suggested that a large-scale field test be conducted. The Forest Service contracted with Resources for the Future to conduct such a test on the heavily used Desolation Wilderness in California. A workshop was convened in Missoula, Montana, in 1974 to gather information and to plan for the Desolation application. In attendance was a team of scientists from Resources for the Future, the Forest Service, and Yosemite National Park, as well as field personnel from the Desolation Wilderness and Region Five of the Forest Service.

The Desolation Wilderness is located in the Sierra Nevada of California east of Lake Tahoe. The 63,475-acre (25,390-ha) wilderness was originally established as a primitive area in 1930 and was designated as a wilderness area in 1969. The wilderness is managed by the El Dorado National Forest and the Lake Tahoe Basin Management Unit. Visitor use was over a quarter million visitor-days in 1975 and continues to be heavily used today.

The workshop participants suggested model modifications to the model. These included the ability to track visible encounters that occur when two parties are close enough to see each other but are not occupying the same trail or campsite, additional output tables on camp and trail use levels, the ability to simulate large numbers of parties for extended period of time in complex trail networks, and the ability to set probabilities for trailhead selections before routes are selected. The visible encounter suggestion was based on my personal experience of settling into camp only to be passed by a large group of hikers on their way to my next day’s destination. Because trailhead quotas are one alternative that mangers can use to regulate use, I also felt that it was important to be able to simulate various trailhead allocation patterns. All of these suggestions were incorporated into a new version of the simulator written by Shechter (1975).

The team helped gather use data from mandatory wilderness permits, trip map-diaries returned by 4,400 visitors, and new field surveys (Shechter and Lucas 1978). These sources provided information on arrival patterns, hiker-rider ratios, party sizes, trails and campsites, routes, travel times, and trailhead and route selection distributions. Ninety-nine percent of parties were hiking parties and most of them (38 percent) arrived on Friday or Saturday. A review of existing maps showed 16 trailheads feeding a network of 111 miles (178 km) of trails, 286 trail segments, and 125 campsites. Out of this network, the groups used 797 unique routes. All of these data were laboriously encoded by the team on punch cards and incorporated into the model deck that was then taken to the U. S. Mint computer in San Francisco to be run at night.

Thirteen different scenarios were run on the model depicting various use levels and trailhead allocation patterns (Shechter & Lucas 1978). The base case simulated 1,400 hiking parties per week using arrival patterns and route selections as recorded in the visitor diaries and travel times from the field survey. The average number of trail encounters per party-day for these parties was 10.8, and the average number of camp encounters per party-night was 6.4. When use was increased or decreased by 25 percent and 50 percent, both types of encounters changed proportionally; for example a 50 percent increase in use resulted in roughly a 50 percent increase in trail and camp encounters. Regressing camp encounters per party-night over party-nights yielded a strong linear relationship (Figure 2).

Total use for eight scenarios that dealt with different trailhead selection patterns ranged from 1,278 parties to 667 parties. The highest use occurred when trailhead quotas were implemented for only the five most heavily used trailheads as prescribed in the wilderness management plan. The lowest use occurred when the heavily used trailheads were limited to 10 parties per day and the lightly used trailheads to 5 parties per day. Trail encounters for these two scenarios ranged from 9.1 to 3.5 per party-day, while camp encounters ranged from 5.6 to 3.1 per party night. The scenario that allowed 10 parties per day to enter all trailheads had 10.8 camp encounters per-night even though total use was only 1,120 parties. This resulted from an increase in longer trips being taken from lightly used trailheads and a decrease in short trips taken from heavily used trailheads.

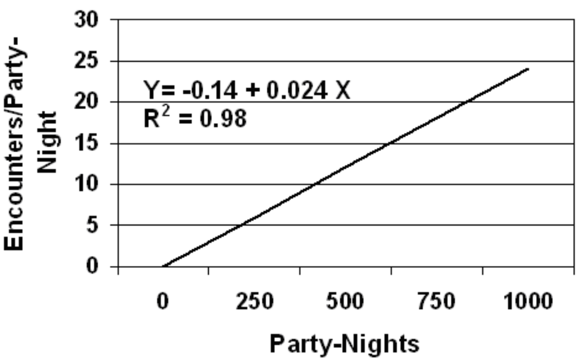

Figure 2. Encounters per party-night for the Desolation Wilderness.

Shechter and Lucas (1978) concluded that the simulator had great potential for application to actual management situations. The combination of managers and scientist on a team to gather the data and develop and test scenarios proved useful and realistic. Output from the simulator provided an accurate picture of use and encounters that could not be obtained by other means, replacing guesses and intuition. In addition, it was felt that an indirect benefit of the simulator derived the information required to run it; data about the area and its use would be valuable for making management planning decisions.

Yosemite National Park

Simultaneous with the effort to apply the simulator to the Desolation Wilderness, scientists and managers at Yosemite National Park began assembling the necessary information to run the simulator (van Wagtendonk 1979, 2003). The Yosemite Wilderness was designated in 1984 and encompasses 704,638 acres (281,855 ha) of the park (Figure 3). Contiguous wilderness areas include the 112,227-acre (44,891-ha) Emigrant Wilderness on the Stanislaus National Forest, the 48,601-acre (19,440-ha) Hoover Wilderness on the Toiyabe and Inyo National Forests, and the 93,958-acre (37,583-ha) Ansel Adams Wilderness on the Inyo and Sierra National Forests. There are 55 trailheads that lead to 695 miles (1,112 km) of trail and 375 traditional campsites in the Yosemite Wilderness. An additional 46 trailheads feed 416 miles (666 km) of trail and 197 campsites on Forest Service wilderness areas adjacent to the park. Use peaked in the Yosemite Wilderness in 1975 when nearly 219,000 visitor-nights were recorded (van Wagtendonk 1981). Approximately four percent of the use in Yosemite originates on adjacent Forest Service wilderness.

Wilderness use in the Yosemite complex has been regulated through the use of wilderness permits since

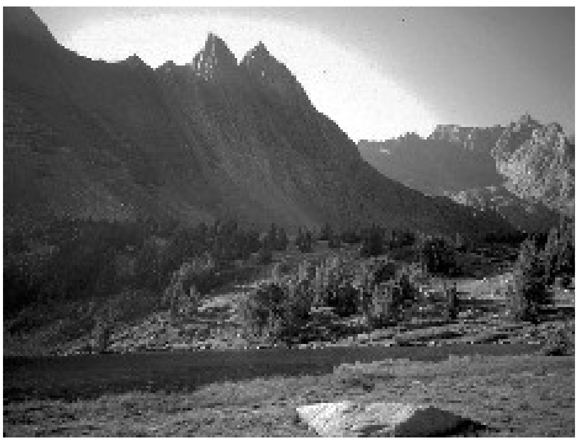

Figure 3. Matterhorn Canyon in the Yosemite Wilderness. Photo courtesy National Park Service.

1971. Because most of the information needed to run the simulator is recorded on the permits, it was decided to use permits as the primary data source (van Wagtendonk 1978). Party size, mode of travel, arrival patterns, and the zones through which a party plans to travel are all easily obtained from the permit. Zone information was converted into routes using methods described by van Wagtendonk (1978). Permits avoided the costs associated with visitor surveys and allowed all routes actually recorded to be simulated rather than just a sample of possible routes. The validity of the information on the permits and the travel behavior of parties that do not get permits was also determined. In Yosemite, van Wagtendonk and Benedict (1980a) found that 92 percent of the parties had permits and that 62 percent of them made changes to their trips. The average trip was shortened by one-half day and spatial changes were common.

A special study was conducted in Yosemite to determine trail travel times for parties on one-mile trail segments (van Wagtendonk & Benedict 1980b). It took an average of 34.8 minutes for backpacking parties, 36.4 minutes for day hiking parties, and 27.3 minutes for horse riding parties to travel all of the sample trail segments. Party size was not significant for all three types of parties, and slope-direction class was significant for only backpacking parties. For these parties, average times for uphill travel were greater than downhill travel, and time increased as slope increased. These data were used as input to the simulator.

Modifications to the simulator made for the Desolation Wilderness allowed the Yosemite study to focus on trailheads, campsite encounters, and campsite use levels. The decision to concentrate on campsites was based on work by Absher and Lee (1981) that indicated that the sociological effect of trail encounters depended more on the behavior of the encountered party and the location of the encounter than on the number of encounters (Figures 4 and 5). A single encounter with an ill-behaving party could have much more impact than meeting numerous parties exhibiting acceptable behavior. In areas where people expected to meet others, the impact of an encounter was less than in areas where they were not expected. Trailhead quotas were selected by Yosemite managers as the preferred method for rationing use because external controls allowed maximum freedom to visitors consistent with wilderness experience and resource constraints (van Wagtendonk & Coho 1986).

The 20,000 wilderness permits issued in 1973 were used for the base case simulation because travel behavior that year was not limited; use in subsequent years might have been affected after use limits were imposed (van Wagtendonk 1981). Two use levels and two trailhead allocation patterns were examined and compared to the base case. The use levels were a 50 percent increase from the base case and a 50 percent decrease. The first trailhead allocation scenario was based on daily entry quotas derived from a computer program called QUOTA (van Wagtendonk & Coho 1986). The program compared actual levels of use levels in zones to desired levels and reallocated entries until no zone exceeded its limit Desired zone use limits were based on van Wagtendonk (1986). The second trailhead scenario rounded the daily quotas up to the nearest number divisible by five.

Across all runs, the relationship between camp encounters per party-night and party-nights was positive and linear (Figure 6). The resulting number of encounters was less than half that predicted for the Desolation Wilderness. Two reasons accounted for this difference. First, a greater number of trailheads gave visitors more opportunities to disperse and, consequently, experience fewer encounters per party-night. Second, the wilderness permits provided thousands of potential routes compared to only hundreds from the diaries used for the Desolation Wilderness. This diversity of routes dispersed parties during the simulations, resulting in fewer encounters per party-night.

Trailhead entries for the base case scenario ranged from one person per day through the most lightly

Figure 4. Encounters with others is a matter of personal choice. Some prefer to experience wilderness alone. Photo by Jan W. van Wagtendonk.

Figure 5. Others are willing to tolerate a greater numbers in the same setting. Photo courtesy of National Park Service.

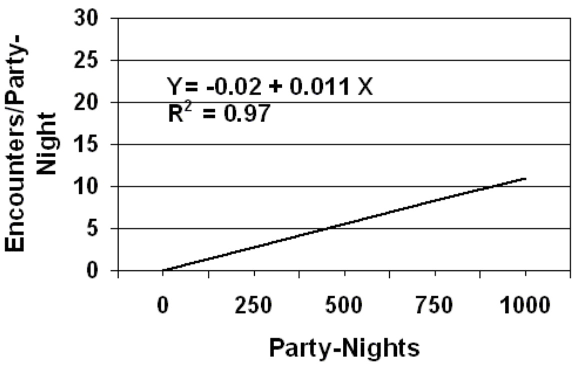

Figure 6. Encounters per party-night for the Yosemite Wilderness complex.

used trailheads to over 100 people per day through three of the most popular trailheads. The scenarios based on the trailhead quotas reduced the peaks both temporally and spatially but did result in increased encounter levels in the more sparsely used areas. These results were similar to the results from the Desolation Wilderness as would be expected when use is dispersed.

Combined with the trailhead quota program, the simulation results provided the information needed by managers to implement quotas for the Yosemite complex of wilderness areas. In that sense, the simulator was a success. However, the cost of running simulations on a remote mainframe computer exceeded US$ 1,000 per scenario, limiting the feasibility of further experiments.

Dinosaur National Monument

Rivers present unique situations for simulating wilderness use. A river represents a single trail with only a few entry and exit points, there is only one direction of travel, and travel times are similar because they are determined by the flow. The first application of the simulator to a river was by McCool et al. (1977) on the Green and Yampa Rivers in Dinosaur National Monument in Utah. They chose these rivers because the problems and issues there were representative of those experienced on other rivers in the US, and much of the information necessary to run the model was available.

The Green River runs for 53 miles (85 km) through the monument and is joined there by a 43-mile (69-km) segment of the Yampa River. Each river has one primary launch site, and there are three access points below their confluence. Twelve developed campgrounds and 14 primitive campsites are designated along the rivers. Parties wishing to float the rivers apply for reservations and are assigned launch dates and campsites (McCool et al. 1977). In 1973, a seasonal use limit of 17,000 people was implemented. Most of the information necessary to run the simulator was available from records kept by the National Park Service. Diaries from sample parties provided information on travel times and routes for private and commercial trips by group size. From these data, detailed travel behavior including lunch stops, stops to scout rapids, and hikes up side canyons were included in the routes.

A one-week period in June 1975 when 44 parties launched trips was chosen for the simulation. In addition to the base case, six different scenarios were run for increasing the number of parties, redistributing launches over the days of the week, and adding or eliminating campsites (Lime et al. 1978). Occupancy rates at one heavily used campsite and overall encounter rates in camp and on the river were the focus of the experiments. Increasing use had a proportional effect on both camp encounters and river encounters and reduced the number days and nights without encounters. Redistributing daily launches increased use at the heavily used site slightly but did not appreciably change encounter rates. Adding new campgrounds and closing others had little effect on encounters but did shift use from the heavily used site to the new sites.

Lime et al. (1978) concluded that the simulator was useful as an aid to river planning and management. In particular, simulating the effect of different launch dates and times allowed managers who have control over access points the ability to see the effects of those actions before implementing them. Lime et al. (1978) recommended that efforts be made to monitor and evaluate the resulting use patterns if the model is to used to test management policies.

Grand Canyon National Park

The Colorado River runs through Grand Canyon National Park in Arizona for 255 miles (360 km) from Lees Ferry in Utah to Diamond Creek in Arizona (Figure 7). Underhill et al. (1986) adapted the wilderness use simulation model for application to the Colorado River. They used National Park Service records, trip logs kept by rafters, river patrol records, and their own records to develop the input data for the model. Trip itineraries from 1984 for oar boats and motorboats were based on actual frequencies of use for the 199 river segments, 110 stopping points, and 141 campsites. A computer program took these data, calculated routes, and coded them for input to the simulator. Like the Yosemite example, this method provided a myriad of possible routes rather than a limited set based on trip diaries. Forty-eight routes were generated for the 29 parties that launched each week of the five-week simulation period. Of these parties, 18 were commercial motor trips, six were commercial oar trips, and four were private oar trips.

Use and encounter levels were evaluated for the base case and five scenarios that varied the mix between oar boats and motor boats, the total number of boats, and the launch schedule (Underhill et al. 1986). Because the Park Service was considering phasing out motorboats, two of the scenarios were for different number of oar boats only. Two more sce-

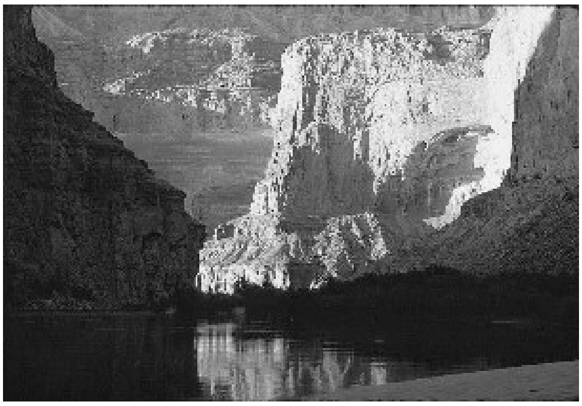

Figure 7. The Colorado River in Grand Canyon National Park. Photo courtesy of the National Park Service.

narios increased use for both oar boats and motorboats and changed the ratio between the two types of boats. The fifth scenario evenly distributed launches over days of the week and hours of the day. The relationship between number of parties per week and encounters was linear with each party averaging approximately 0.5 encounters per day. Changing launch days and times to an even schedule decreased encounters by 25 percent. Interestingly, the scenarios with only oar boats resulted in more visitor days of use because these trips took longer to float the canyon. Underhill et al. (1986) felt that the model was useful for predicting changes in the use of sensitive areas and the encounter rates between parties. Their modification for deriving itineraries provided a realistic suite of routes at a reduced cost.

Borkan and Underhill (1989) used the simulator to study the impacts of flow releases from the Glen Canyon Dam on Colorado River raft trips in the Grand Canyon. In this case they modified the time it would take to float the various segments on the river given different flow releases. Flow rates were determined by the Streamflow Synthesis and Reservoir Regulation Model developed by the U. S. Bureau of Reclamation. Oar boat and motorboat parties had their travel times changed as flows in two ways: the time it would take to float a segment and the delay time at rapids due to low water. Five flow alternatives were tested with the model: 1) variable releases from month to month with no daily or weekly fluctuations, 2) wide fluctuations consistent with maximum power production, 3) higher minimum and lower maximum flows than alternative two, 4) steady flows during the rafting season with fluctuations the rest of the year, and 5) low winter flows and higher summer flows with moderate fluctuations.

The conclusions were that that higher flows allowed more time at attractions sites, that low flows increased delays at rapids, and that an increase in the number of parties increased the encounter rates (Borkan & Underhill 1989). This study showed that the simulator was useful for evaluating different management alternatives beyond the normal scope of wilderness managers.

Appalachian National Scenic Trail

The Appalachian National Scenic Trail traverses 2,160 miles (3,456 km) in 14 states from Georgia to Maine. From a simulation stand point, a linear trail system is similar to a river except that movement is in two directions rather than one. Potter and Manning (1984) applied the simulator to a heavily used 63-mile (101 km) section of the Appalachian Trail in Vermont. Access to this is through five roads and ten maintained side trails. There are three heavily used camp areas by ponds and 16 primitive shelters. Data for the simulator were obtained in the summer of 1979 from a sample of hiking parties stratified by trailhead use levels. A questionnaire and map diary were used to determine party characteristics, entry points, arrival and departure patterns, and routes including campsites and rest stops.

Simulation of actual use of 550 parties during a two-week period resulted in an average of 3.3 trail encounters per party-day and 2.3 camp encounters per party-night (Potter & Manning 1984). Management scenarios included evenly distributing entries over access points, evenly distributing entries over days of the week, and reducing use by 100 parties. Potter and Manning (1984) felt that temporal and spatial redistributions of use were more effective than decreasing overall use for reducing trail and camp encounters. They also concluded that camp encounters appeared to a more limiting factor than trail encounters.

Manning and Potter (1984) used the Wilderness Use Simulation Model as a teaching tool in a recreation class at the University of Vermont. Their experience showed that the model reduced the complexity of the system under study, allowed students to devise and test various management strategies, and provided the opportunity for students to become familiar with actual parks and wilderness areas.

Future Applications

The Wilderness Use Simulation Model has proven its usefulness in applications from simple, linear river systems to large, heavily used wilderness areas. All of these studies showed that trail and camp encounters are directly related to total use levels; management alternatives that reduce use will lead to reduced encounter levels. In addition, the model was effective for evaluating the temporal and spatial effects of various trailhead allocation patterns that were then applied to a complex of wilderness areas in California. Equally effective was a test of the impact of fluctuating dam releases on encounters and use levels in the Grand Canyon.

Recent advances in computer technology and behavioral science have rendered the wilderness use simulation model out of date. As early as 1985, Rowell (1986) presented a version of the model that ran on a personal computer. That model had the capability to be used interactively and geographically display outputs. It does not appear that it was ever applied on the ground, and, since it was written in the Pascal, it probably will not be. The concepts developed by Rowell (1984) have been incorporated into newer models, however.

Wang and Manning (1999) used an object oriented dynamic simulation package to model carriage road use in Acadia National Park in Maine. Lawson et al. (2002) applied the same model to simulate user encounters at Arches National Park in Utah. A geographic information system was used to derive routes for the model, but graphical output was not part of the model. Gimblett et al. (2000) combined object-oriented technology with geo-referenced temporal data to dynamically simulate visitor behavior in a heavily used natural setting in Sedona, Arizona. Output from the simulator can be displayed in graphs and as two-dimensional or three-dimensional maps. Using the same autonomous agent-based model, Daniel and Gimblett (2000) simulated river trips on the Colorado River in the Grand Canyon. Gamblett et al. (2002) plan to apply their model to derive patterns of dispersed use in the Ansel Adams and John Muir Wilderness areas in California, returning to one of the areas where the Wilderness Use Simulation Model was first applied. These innovative new models show how far the science of simulating wilderness has come in less than three decades. The old Wilderness Use Simulation Model is probably gone but not forgotten.

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Interaction between nature protection and leisure groups, an example of the largest protected area surrounding Lake Greifensee, canton Zurich, Switzerland

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Abstract: Lake Greifensee is surrounded by the most continuous environmental protection area (sanctuary) within the canton Zurich (Switzerland). The lake shelters many national swamps and other biotopes in distress. On beautiful summer days, however, you will find thousands of people spending their leisure time e.g., on mountain bikes, roller skates or swimming.

In 1994 a new protection regulation became effective, which allows for intensive utilization and protection of the nature and separates diverse demands. With various measures sanctuaries and recreation areas are spatially separated, and the visitors are guided to keep them off the sanctuaries. During the entire year rangers inform visitors on the possibilities of nature observation, explain them where the recreation areas are located and remind them to keep off the sanctuaries. The number of violations such as trespassing of protected shores and sanctuaries continuously dropped thanks to the effective publicity and the presence of rangers. As a consequence, the vegetation is visibly recovering from the burden of trespassing. To further increase the awareness of the sanctuaries, it is, therefore, important that the rangers continue to regularly supervise the protected and recreational area and to inform and guide the visitors.

Introduction

Most habitat conservation efforts typically focused on setting aside lands as parks or reserves, and restricting uses in those areas. More recently, it has become clear that protection of lands is insufficient; we must also heal and restore areas that have been damaged by human use and misuse (Upper Newport Bay Program 2004). Different programs, mainly in the United States with its vast countryside, are working to enlist community support for habitat restoration by engaging the public in hands-on restoration work and teaching them why this work is important. The programs collaborate with local organizations working in ecology, education, and conservation, and provide the leadership, planning, and funding to help connect volunteers and neighborhood groups with the affected ecosystem. In Europe, the different programs and organizations which are responsible for sanctuaries are not yet engaging the public in hands-on restoration work or neighborhood groups. In addition, the national parks and sanctuaries are much smaller, the environmental protection areas need to be protected and conserved as an important part of the national heritage, but at the same time they need to satisfy the demands of the population: intensive utilization for leisure and recreation.

The sanctuary Schliffkopf in the northern Black Forest, Germany, for example, was used to work out a concept to guide and sensitize the visitors. Schlund (1998), head of the centre of nature conservation Ruhestein, stated that the rangers realized that (1) the closure of a footpath is only accepted if there is information on the spot, and if other interesting alternatives are given. (2) The softly guided footpaths should not represent restrictions but rather enlargements or ameliorations of the recreation areas. (3) A constant presence of rangers and tours increase the awareness of the visitors. Similar results are documented in a study by Grabher (1995): The visitors should be lead to interesting areas with species which are not sensitive to disturbance. Whereas other areas should be kept free of any disturbance (separation of utilization and protection). Further, they realized that effective publicity is important to increase the understanding of the visitors for necessary measures.

The Greifensee district knows similar problems and the most beautiful areas are the sanctuaries. There is no doubt that the peaceful inlets in the swamps with the sandy shores or reeds at Lake Greifensee are the most ideal locations to relax. But to maintain the Greifensee district as recreation area nearby the city of Zurich, restrictions are necessary for everybody. If everyone was allowed to camp, make a fire or go swimming wherever they wanted to, then the damage would be much bigger than everybody's advantage. The aim of this research is to study how to best combine environmental protection and recreation areas at Lake Greifensee close to a densely populated district.

Setting

Lake Greifensee is located southeast of Zurich, Switzerland, and measures 6.5 km in length and 1.8 km in width. The Greifensee district, which is in the surroundings of Lake Greifensee, covers an area of 12.6 km^2 (Figure 1). Originally, the lake was formed at about 12,000 B.C., when the Rhine-Linth glacier retreated. In those days, the lake level was 20 m higher than today. The end moraine defined the lake, which was several times bigger. Due to the erosion at the outflow of the end moraine, the lake level dropped.

Around 1890 the river Glatt, which is the outflow of Lake Greifensee, was straightened and the lake level was artificially lowered to the actual level. The lake filled up by sedimentation and swamps originated. The entire district developed to a precious area for agriculture and biology. It shelters many birds, which use the district as a wintering, resting, food, and brood area. But the Greifensee district also offers habitat for amphibious animals, dragonflies, other insects, and various kinds of fish. The reed belt, which typically grows in flat-water, is only a couple meters wide. To stimulate its growth, the shores are artificially restored with an ecological engeneering method. In the adjacent reeds and swamps, 300 different plants are growing, which are threatened to become extinct.

Origin of protection regulation

The Greifensee region district shelters about 300 different plants. Several of these and about ten times more animals are threatened to become extinct. The Greifensee district contains moorlands of national importance. It is also a place for several birds to bread, to pass while migrating, and in winter to shelter and feed. Furthermore it is a very important recreation area for the people. As the population growth has increased from about 20,000 inhabitants in 1950 to 68,000 in 2003, a protection of the area has become very important.

The first protection agreement was already signed in 1929 between a bird protection organization and land owners at the lower end of the lake (Schwerzenbacher Riet). Only two years later, the agreement was enlarged by incorporating adjacent reed areas (Fällander Riet). In 1935 an organization was founded to protect Lake Greifensee. Involved were representatives of different clubs such as fishers, sailors, windsurfers, and nature protection organizations. In a far-seeing action, a protection regulation was released in 1941. Thanks to this regulation, the shores are hardly obstructed. Visitors can hike around Lake Greifensee on a path near the shore and enjoy the beautiful view over the lake and the panorama of the Alps. Motor-boats were prohibited with the exception of one shipping line, the marine police, the marine rescue service, and a professional fishermen. In 1983, the canton Zurich worked out a draft for a new protection regulation, which was limited to the protection of nature and lake. The communities turned the draft down, because the recreational use was not taken into consideration. The communities around Lake Greifensee, which were played off against each other by the canton, joined to a working group. In 1988, they worked out a rough draft of utilization and protection to be used as a constructive basis for a new and complete protection regulation. The regulation incorporated the new recreational demands and the protection of landscape.

In June 1992, nature and lake protection zones were determined based on the inventory for swamps of national importance and based on the ornithological opinion of the bird protection of Zurich (1992). There it says that birds during breeding time and birds traveling through or passing the winter require the same areas. They especially want the big swamps

Figure 1. Protection regulation around Lake Greifensee. Darkly scored: Protection area, brightly scored: recreation areas. The protection area is surrounded by the dashed line.

with the bordering shores at the upper and lower lake end and between Uster and Greifensee at the northern lake side. In January 1994, the communities handed the draft of the protection regulation of Lake Greifensee over to the construction management. And only three months later, on March 3rd, 1994, the regulation was released. The entire district underlying the protection regulation now contains 12,6 km^2, off it the sanctuaries measure 2 km^2, the recreational areas 0.278 km^2. The regulation further contains for example forest, orchard, and landscape protection as well as settlement borderland. Sanctuaries in Switzerland are rather small. The reason being that Switzerland itself is pretty small, it is about eight times smaller than Finland (41,285 km^2; Finland 337,030 km^2) but counts 10 times more inhabitants/km^2 (176 versus 17.1). Consequently, only small sanctuaries can be established and small actions are taken for protection.

Methods of protection

1. Basis for the protection of the Greifensee district: In 1997, the Greifensee foundation was founded to realize the regulation to protect Lake Greifensee in collaboration with the office of regional planning and nature of the canton Zurich. The foundation board is made up of executive members of the seven communities bordering Lake Greifensee. The purpose of the foundation is the publicity (e.g., information, guided tours, courses, contact to regional groups of nature protection and recreation), the organization and realization of projects to revalue the sanctuaries and recreation areas. The separation of protection and utilization must always be kept in mind to minimize conflicts. The office of nature protection is responsible for all sovereign duties such as to grant permission and to organize or pay maintenance work.

2. Marking of sanctuaries: The sanctuaries at Lake Greifensee are to be kept off. To clearly define, where sanctuaries are located and what is allowed, they are marked with notice boards and special colophons – which are used in the entire country. At Lake Greifensee the idea of separating recreation and protection area is strictly followed. In revalued areas, the paths are displaced as far away as possible from the sanctuary and restricted with specially planted barriers such as hedges and ditches.

3. In Switzerland, the supervision of rangers is arranged individually by each canton. Some cantons have no supervision at all. Others have honorary collaborators, part-time collaborators as at Lake Greifensee, or fulltime supervisors with police authorizations. The rangers at Lake Greifensee are instructed on the subject and trained in communication, but they do not have the function of the police and do not take a solemn oath. Hence, they are not allowed to issue a fine, to stop visitors, and the visitors do not need to name personal data. Repeated violations, however, are reported and forwarded to the police. In such case, the stay in the sanctuary with a dog and a fishing rod can be penalized with up to 200 Euros.

Two rangers are usually working together riding their bikes around the lake and controlling the protected areas. They register all infringements such as entering a protected area, or fishing in a protected area. All infringements are catalogued and analyzed. A second group of rangers called “service rangers” are supporting the rangers in all technical works: They are building fences, replacing destroyed information panels etc. Nevertheless, the most important job of the rangers is to inform visitors without stirring up aggressions against nature protection but asking for some understanding.

At Lake Greifensee, seven rangers are sharing a full-time job: (1) they inform visitors of the extent of the sanctuary, of biologic aspects, of possibilities to observe nature and wild life, and to show them the closest recreation area. (2) They control whether visitors enter sanctuaries, and if so, they remind them to keep off. (3) They control barriers and notice boards. Since summer 1995, the rangers of Lake Greifensee are supervising the sanctuary on weekends, on holidays, and once or twice during the week. Rangers control all protected areas, shown here are three areas: Storen/Platten, Uessikerdelta and Aabachdelta (Figure 2).

4. Maintenance work is restricted and only allowed at certain times. Without maintenance work, the swamps and other shore areas will very soon be supplanted by bushes and trees. Especially alders and willows are quickly taking over the reeds. The farmers mow the reeds every autumn in September or October and remove the bed of straw to reduce the enrichment of nutrients. The reed vegetation is adapted to low nutrients. If farmers remove the bed of straw in spring, then 2/3 of the biomass is already decomposed. An increase of nutrients would automatically lead to a change in vegetation – adapted to more nutrients.

The young trees are pulled out with the roots and removed in tiresome handwork, (1) to prevent the reeds from being supplanted by bushes, (2) to only remove the undesirable plants without doing a lot of damage to the existing vegetation, and (3) to ensure the growth of closed reed vegetation. To diminish the areas with a lot of bushes, the following two measures were verified: (1) to cover the bushes with a canvas cover. The vegetation under the cover burns off and is dying. (2) To mill cut the bushes, whereas the roots are cut subsurface. The undesirable vegetation can then be eradicated and removed.

5. The data taken by the rangers are statistically analyzed using the Kruskal Wallis Test.

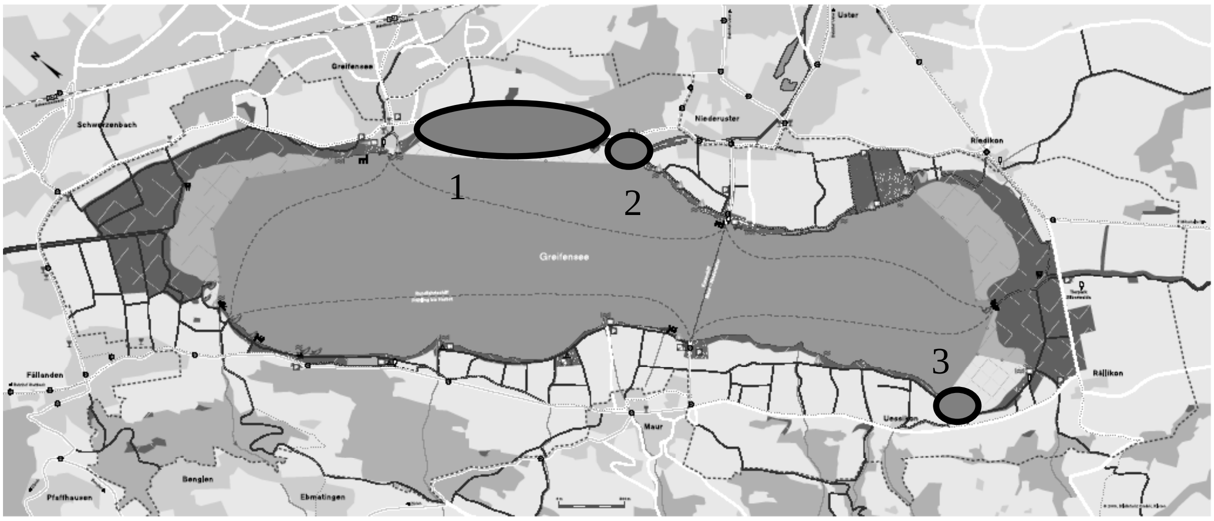

Figure 2. Locations of three sanctuaries controlled by the rangers: 1 = Storen/Platten, 2 = Aabachdelta, 3 = Uessikerdelta. The areas 1 and 3 are closed since the introduction of the protection regulation. Consequently, the infringements decreased, as expected. The Aabachdelta (2), however, is only closed since 2002. Unfortunately, people first have to get used to the new regulation before a decrease in infringement can be expected.

Data and results

Potential for conflict and collaboration with interested parties

The protection regulation is fundamental for the utilization and conservation of the Greifensee district. Considering the intense utilization, the district rather represents a leisure park than a sanctuary, and, therefore, is a hotbed for conflicts.

On a sunny day, thousands of people from the vicinity spend their leisure time at Lake Greifensee. 75 % of the visitors arriving by car are living within 10 km. They are coming for a walk, to observe nature and enjoy the fresh air, to sail, to wind surf, to fish, to go swimming, to gill, to play, to sun bath, to bike, to skate, to hike, and to stroll about. Most people are riding some kind of bicycle and there are only few pedestrians (Table 1). Pedestrians especially group around those places on the lake side with the availability of car parking and buses, such as Niederuster, Greifensee and Maur (Figure 3) The visitors are either coming alone, with kids, with their family, in groups, or with their dog. They are looking for silence, rest, relaxation, entertainment, fun, adventure. There are so many visitors expecting so many different things, that sooner or later they are complaining about each other: pedestrians, bikers, cyclists, joggers, dog owners, young people, old people, skaters, fishers, swimmers, people observing nature, rangers. Everybody wants to satisfy his demands. Everybody has the right to do so. But there is not enough room available, unless one shows consideration for others.

The Greifensee foundation regularly organizes meetings with nature protection and leisure organizations. The meetings are used to inform the participants on actual topics such as measures of revaluation (in favor of the nature or the recreation). The meetings involve lectures, answering the questions of the participants, listening to their comments and critiques, and talking about their fears and doubts. That way both sides have confidence in each other. Further, the foundation annually invites cultivators of restored areas and informs them on the spot on special animals or plants occurring in the area. The cultivators also have the opportunity to discuss

Table 1. Different types of slow traffic (not motorized) using the Greifensee district (destinations in Fällanden, Riedikon, Greifensee and Uster) on Sundays and Wednesdays. The numbers represent the average counts per hour of eight locations (mobility concept leisure transport Greifensee, Gossweiler engineers, 10.11.2003).

	Sunday, average of 8 locations	Wednesday, average of 6 locations
Pedestrians (people going for a walk, in wheel chairs, babies in a stroller etc.)	28	24
Other vehicles (inline-skates, roller-skates, mini scooters, kickboards, kids' bikes, skate boards etc.)	89	85
Cyclists (e.g., mountain bikes, racing bikes)	179	174
Total	296	283

Figure 3. The counting of the slow, not motorized traffic (cyclists and other vehicles) took place at three destinations (black circles). Pedestrians usual group at Greifensee, Uster and Maur at the lake sides (lighter circles).

uncertainties or how to optimize the cultivation, e.g. time to mow, or tract of fallow. Such collaboration motivates the cultivators to follow the guidelines of the canton in favor of the nature. In addition, all cultivators of the Greifensee district are annually invited to be informed on the maintenance and discuss them. Another important part of the publicity involves excursions with classes, companies, and organizations but it also involves maintenance work. The participants of maintenance work are informed on the necessity of maintenance and protection. And because they get to know the areas, which are usually restricted, they are becoming fond of the sanctuaries and protect them.

Marking of sanctuaries and examples of successfully guiding visitors

At the beginning, when the protection regulations were introduced in 1994, the sanctuaries were restricted with fences. This restrictive method led to strong resistance and damage on the infrastructure. Since the visitors are softly guided using other footpaths and restrictions with natural barriers (such as hedges and ditches), the damage has strongly reduced. There are no numbers to document the amount of damage done, but the financial effort to repair the damage strongly reduced (about 30,000 € in 1994 versus about 5,000 € in 2003).

Before the introduction of the protection regulation, the area Storen/Platten (Greifensee) was intensively used as bathing resort. Today the footpaths are generally limited with piles of wood, so that the visitors cannot get into the area. Consequently, the infringements are declining since 1999 (Table 2). Except in 2003, there is an increase of people sunbathing, which can be explained by the very hot summer. For all analyzed datas there is N 1999= 416, N 2000=1118, N 2001= 1391, N 2002= 1196, N 2003= 1339.

The Uessikerdelta (Maur) used to be a camping place. It was closed 10 years ago in 1994 when the protection regulation was introduced. From then on, the area was restricted with a hedge against the footpath to keep people off. Unfortunately, such changes always need a couple years until they are respected by the majority of the visitors. Nevertheless, the infringements are declining (Table 3). The strong increase in 2003 is again related to the hot summer. Since the Uessikerdelta is a romantic, small and well shielded bay, it was used for sunbathing and swimming.

The first project of the Greifensee foundation helped to revalue 1 km^2 of rich meadow (field) to reed-lands. Additional shallow ponds and an abandoned course of a river were set up. During the restoration, the footpath was placed back and a bridge was displaced to create a better connected and

Table 2. Amount of infringements at Storen/Platten per 50 control days listed in the years 1999 to 2003.
[1)] d: infringements are decreasing.

Storen/Platten	1999	2000	2001	2002	2003	P
Entering sanctuary	35	45	31	36	31	<= 0.05 d [1)]
Offence with dog	8	13	13	5	2	<= 0.05 d
Fishing in sanctuary	8	2	2	1	1	<= 0.05 d
Swimming/sunbathing	12	30	14	16	18	Not sign.

Table 3. Amount of infringements at Uessikerdelta per 50 control days listed in the years 1999 to 2003.

Uessikerdelta	1999	2000	2001	2002	2003	P
Entering sanctuary	33	21	10	8	17	<= 0.05 d
Offence with dog	5	5	3	3	3	<= 0.001 d
Swimming/sunbathing	9	14	6	4	13	<= 0.1

undisturbed area. A special attraction represents the observation tower with its magnificent view over the lake (Figure 4) and the restored area, where different birds can be observed such as wading birds or migrants.

At many locations, the shores are being eroded due to the missing reed belts. Using ecologic constructions it is possible to fill up the shorelines and, hence, to create flat-water areas, but also to stimulate the growth of reed and cane brake. From then on, these shorelines are closed for visitors. Instead, additional inlets are arranged, which are separated from the protected areas by osier stakes.

At the mouth of the stream Aabach (Niederuster), for example, the shoreline was restored in 2002. The footpath, which originally led along the lakeshore, was placed back and an observation platform was added. On the platform one can view the delta and the lake. The lakeshores were partially flattened to allow the stream to branch. On land, new wetlands were created, which immediately were occupied by greenbacks. Although the lakeshores always represented a part of the sanctuary, it was accepted to fish, swim and sunbath. In 1999, lack of the missing clear guiding route only few people were informed that they are not allowed to enter the place. Whereas several infringements have been accepted (Table 4). Since the restoration in 2002, the area is controlled and the visitors are sent off. The increase in infringements in 2002 and 2003 is related to the fact, that the area has been restored and people for the first time consequently dismissed. We are expecting that the infringements will decrease in the following years.

Figure 4. View from the observing tower overseeing the restored Riediker-/Rällikerried.

When summarizing infringements over all controlled areas (Table 5), it clearly shows that the measures to keep visitors off the sanctuaries are successful: there are fewer offences with dogs, less fishing; there generally are less swimming and sunbathing, and less boats. The protection regulation finally seems to be accepted.

Maintanance work

In order to prevent growing bushes and trees in the reeds, the continuous care such as the regular cut of the reed (once a year in autumn) is very important. The examined measures to remove young trees have shown that if the young trees are pulled out with the roots and removed in tiresome handwork, damage to

Table 4. Amount of infringements at Aabachdelta per 50 control days listed in the years 1999 to 2003.

Aabachdelta	1999	2000	2001	2002	2003	P
Entering sanctuary	14	14	no data	60	61	<=0.001 i
Offence with dog	8	1	no data	18	15	<=0.001 d, i
Fishing in sanctuary	9	1	no data	6	13	<=0.001 d, i
Swimming/sunbathing	2	0	no data	7	16	<=0.001 i

Table 5. Total amount of infringements of all sanctuaries per 50 control days listed in the years 1999 to 2003.

Total infringements at Lake Greifensee	1999	2000	2001	2002	2003	P
Entering sanctuary	131	142	87	146	157	<=0.001 di
Offence with dog	195	158	147	158	134	<=0.001 d
Fishing in sanctuary	94	44	20	14	22	<=0.001 d, i
Boats driving in protected lake and shore zones	no data	45	31	14	7	<=0.001 d

the existing vegetation, and to ensure the growth of closed reed vegetation is smallest. Neither the method to cover the bushes nor to mill cut the bushes was successful. They were both dismissed as they are counteracting. These interventions are destroying large parts of the ground and the vegetation. And at the same time they leave open areas, which are not only colonized by undesirable ruderal plants but they also form the basis for the seeds of trees, which then start the process of natural succession, building forests in the end. The additional removal of individual groups of trees in the reeds helps farmers to better care about the reeds. As a consequence the reed vegetation becomes richer in species.

Conclusions

The sanctuaries and recreation areas are spatially separated to take into account the protection as well as the utilization. Barriers with fences, however, were contra productive. If the measures to separate the sanctuaries and recreation areas are clearly visible, then they provoke and lead to vandalism. All measures that contain a prohibition (all kinds of fences, notice boards, and new barriers) lead to aggressions among the opponents and then to damage. Consequently, the visitors are now softly guided and included: they are informed on the possibilities of nature observation, where the recreation areas are located, and reminded to keep off the sanctuaries.

Another method of separating sanctuaries and recreation proved effective, although violations are still occurring years later: visitors are guided around a sanctuary, but at the same time see into it. If reshaping has to be done within the sanctuary, then the path is placed as far away from the sanctuary as possible and on the other hand the path is restricted through natural obstacles. Such obstacles include wetlands, ditches, hedges, or fences made of willows. To further prevent people from entering sanctuaries, platforms are built. They are created to allow the visitors to view the areas which are not accessible.

The continuous care of the reeds led to a reed vegetation that is richer in the species. The care involves (1) a regular cut in the autumn, (2) the removal of individual young trees, (3) the removal of older groups of trees, and (4) the removal of trees along the shores (to reduce the shadow on the ground and, therefore, promote the growth of reed). Further, the decreased pressure by visitors leads to less disturbance of the vegetation. Consequently, the vegetation already recovered in areas, which originally have been frequently used and now are restricted. The typical reed vegetation and reed belts are spreading again.

Finally, it was the publicity, interesting restorations and ameliorations of the recreation areas that led to a different behavior of the visitors. Thanks to the continuous information and presence of the rangers, the acceptance of the protected areas increased whereas the infringements, violations and vandalism decreased.

To encourage the visitors to accept the protection regulation also in future, we will keep the following crucial points: (1) discussions with different people and groups, (2) public relations, guided tours, and maintenance work, (3) notice boards on the spot, (4) ameliorations of the infrastructure within the recreation areas, (5) distinct separations of the sanctuaries without provoking the visitors, and (6) constant information and controls of the rangers

To guarantee the protection of the sanctuaries, good publicity and information on the spot is necessary, but it also requires sufficient recreation areas. Especially in densely populated areas, the sanctuaries represent nature parks and are, therefore, rather used as recreation areas. The big crowd further needs appropriate infrastructures and activities without stressing nature. Equilibrium must be found between protection and utilization. The two areas must be separated without patronizing and provoking the visitors.

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Do walkers stay on footpaths? An observational study of Cwm Idwal in the Snowdonia National Park

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Abstract: Access to the countryside of England and Wales is at present being extended through new powers created by the Countryside and Rights of Way Act (2000). This has for the first time introduced a statutory right of open access to areas designated on maps as mountain (land situated above 600m), moor, heath, down or registered common land. This paper considers the behaviour of visitors in relation to whether they choose to exert their 'right to roam' at Cwm Idwal, a popular mountain area located within the Snowdonia National Park in north Wales where access to open countryside is *de facto* (through custom). The study used an observational technique to establish the distribution and group size of visitors over a pre-defined observation area. The results showed that visitors predominantly stayed on paths with only 9.5% of groups of size twelve deviating from linear access routes.

Introduction

This paper is concerned with visitor behaviour in relation to access to the countryside. Access is a very broad term and its meaning varies depending on the context in which it is used. However it can broadly be considered as a 'right to enter'. For countryside recreation this can be considered a 'right to enter the countryside'. In England and Wales the public have access to the countryside through a number of mechanisms:

- **rights of way** (PROW) comprising of a legally defined network of footpaths, bridleways, restricted byways and byways open to all traffic. PROW are by their nature linear access.
- ***de jure*** (in law) access such as areas defined as common lands or areas with a management agreement that specifies a right of access. This is a form of area access.
- **voluntary access** whereby landowners allow free access to their land. This can be as part of a agri-environment agreement such as Countryside Stewardship or land owned by organisations such as the National Trust or the Forestry Commission. Voluntary access can be linear (permissive paths) or area.
- ***de facto*** (through custom) access where access is tolerated by a landowner but where walkers often assume they have a right of access. Such access is normally based upon traditions and has no legal protection and can be terminated at any time. It can be linear or area access.

As such access into the countryside can be considered to be linear (along predefined routes on the ground) or non linear (where the visitor has the 'freedom to roam' off of linear access routes without fear of committing a trespass).

After years of campaigning by pressure groups (Curry 1994, Keirle 2002, Shoad 1997, 1999) new rights of access for England and Wales are being introduced through the Countryside and Rights of Way Act (2000). Once implemented this Act of Parliament will create *de jure* access to 'open countryside', considered within the Act to be land that consists wholly or predominantly of:

- mountain (land situated above 600m)
- moor
- heath
- down
- registered common land

The Countryside Agency and the Countryside Council for Wales are required by the Act to prepare draft maps of such areas, to consult with the public and, following consideration of objections, publish a definitive map of open access land for given areas. The process of drafting maps and consulting is now ongoing and it is hoped that open access can be granted to areas defined by the Act by 2005 (Countryside Council for Wales 2002). Such access is for the purposes of open air recreation on foot and excludes many activities such as cycling, horse riding, camping, paragliding and vehicular access.

Once areas are designated under the Act as access areas the visiting public will have the freedom to stray off of defined linear access routes and roam at will across open countryside.

Issues associated with open access

During the long history of debate about the rights and wrongs of creating a legal 'right to roam' over certain types of countryside, much concern has been raised as to the potential impacts that such a right would have. In particular landowners, often represented by bodies such as the Moorland Association, the National Farmers Union and the Country Landowners Association, have raised concerns about the impacts of access on land management and on the conservation value of land. These concerns include:

- the impact of dogs on livestock
- the ability of landowners to run shoots across their land
- the issue of liability associated with access
- the potential increase in crime
- the impact of access on conservation, in particular on ground-nesting birds (Country Landowners Association 1996).

The Act attempts to alleviate these concerns with specific provisions being made to address them. For example, the issue of dogs worrying lambs has been addressed by a requirement for dogs to be on a lead of fixed length between the period beginning 1st March and ending 31st July. The conservation issue has been addressed within the legislation by giving the relevant authority the power to exclude or restrict access during any period if it is satisfied that the exclusion or restriction is for the purpose of conserving flora, fauna or geological or physiographical features. However there is still some remaining concern about the impact that access will have on conservation, in particular ground nesting birds. Such notions are based upon the assumption that walker numbers will increase once designation of access areas has occurred and that walkers will exert their 'right to roam' and wander at will across areas designated for open access. To date however, there is little research concerned with visitor behaviour in open access areas and in particular as to whether walkers will stay on linear access routes such as footpaths and bridleways when they have the option to exert their 'right to roam'. This paper uses an observational methodology to study this aspect of visitor behaviour in Cwm Idwal in the Snowdonia National Park, a popular mountain area with traditional de facto rights of access.

Description of the study site

The Cwm Idwal valley is a popular walking site located within the Snowdonia National Park in North Wales. It is managed as a National Nature Reserve (NNR) by the Countryside Council for Wales for its botanical, geological and geomorphological interest. It is an open mountain environment with an altitudinal range from 300 to 700 metres. The site was until recently grazed by sheep such that it is largely free from scrub and heather making walking off of paths reasonably easy. The site is popular with walkers, climbers and educational groups and is served by a car park located at Ogwen Cottage and by lay-bys on the A5 road. Access onto the site is via a network of well-established paths which run from the car park and the road upwards into the mountains. The principle paths have been treated for erosion by surfacing them with pitched stone. The site has no formal access agreements but access off linear routes is a traditional and accepted practice. Figures obtained from stile counters indicate that 77,190 visitors used the site between January and October 2002. A study of the use of the NNR by education groups (Wilkinson 2001) found that 634 education groups visited the site between 25th July and 31st October 2001, and that the average group size was fifteen. The site was chosen for the study because of its high visitor numbers, its tradition of open access and because the topography allowed for a high observation station to be established allowing observation of a wide area.

Methodology

An observation point located at the base of the cliffs of Clogwyn y Tarw (SH 6495 5960) was chosen as it afforded a good view of a large area of the bottom of the Cwm, including the main metalled path from Ogwen Cottage to Llyn Idwal. The range of vision was established by placing a red flag at the observation point and walking around the area to establish the zone in which the red flag could be seen. Boundaries of this zone once established were fixed using GPS. Co-ordinates of the boundary could then be plotted on a 1:25,000 base map. Figure 1 shows the survey site, observation point and linear access routes. A pilot study indicated that the majority of users passed through the survey area within fifteen minutes, and accordingly observations were taken at fifteen minute intervals.

Observations were recorded on a 1:25,000 scale base map that had the observation zone and linear access routes marked onto it. At fifteen minute intervals each individual observed was marked onto the base map as precisely as possible, with a code alongside to indicate the size of the group. Due to the nature of the landscape several locations within the observation zone were obscured by local topography. To compensate for this recording was begun at the allocated time and observation continued for a short time afterwards and any visitors who had been obscured were recorded during this time. In order to standardise results a five-minute cut-off point was used after which no further observations were taken. Where visitors remained stationary over several time

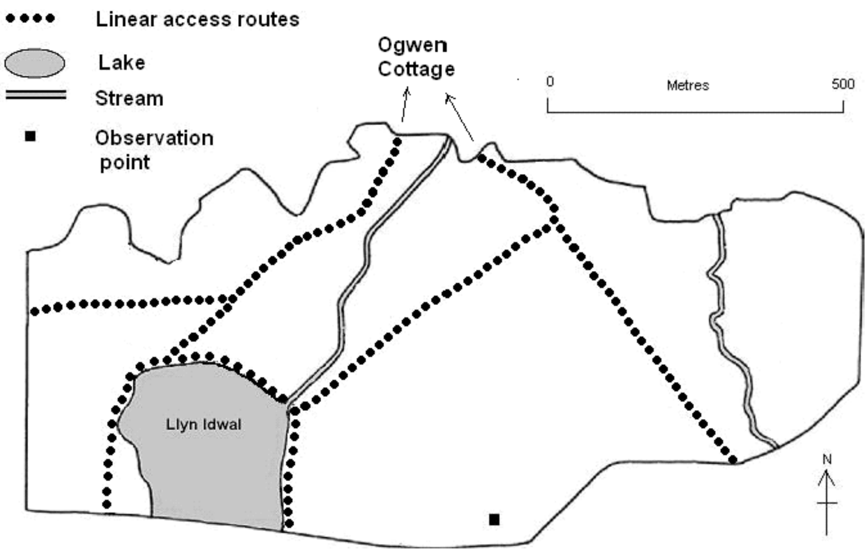

Figure 1. Map of the observation zone showing linear access routes and the observation point.

periods they were not recorded again until they moved on. The Countryside and Rights of Way Act (2000) does not entitle a person to a right of access to areas defined for open access under the Act if they are engaged in an activity which is organised or undertaken for any commercial purpose (Schedule 2 section 2 (l)). Accordingly for the purpose of this study an attempt was made to segregate organised parties from the ‘private’ walker. From observation this can be difficult but for this study an organised group was recorded as having twelve or more individuals. Such groups were recorded and analysed separately. A pilot study was undertaken on 12th January 2002 and the full survey carried out on the 3rd of February 2002 and the 3rd of March 2002 between 11.30am and 16.30pm.

Results

A total of 1,347 visitors were recorded during the two survey days. The spatial distribution of observed visitors can be seen in Figure 2. From this visual representation of the data it can be seen that the majority of visitors observed were on some form of linear access route. In particular, the bulk of visitors were found using the public footpath from Ogwen

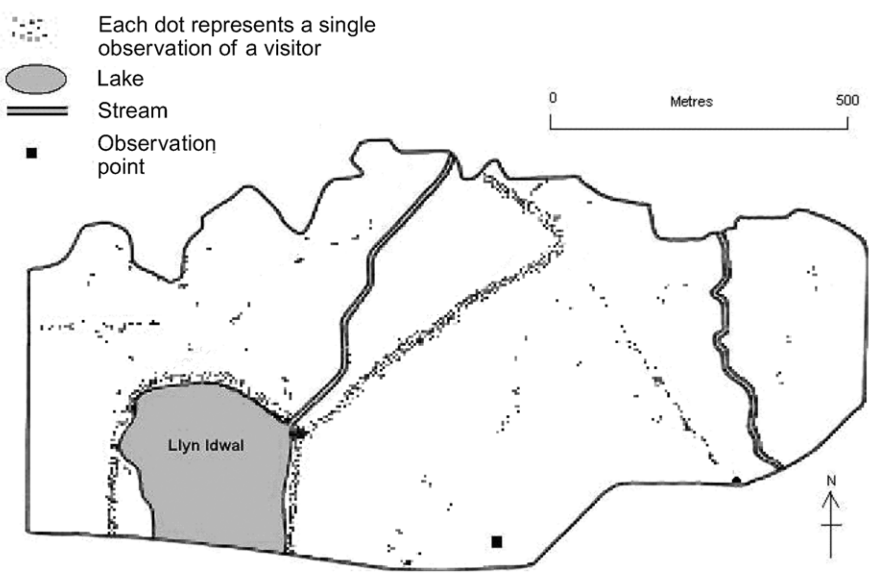

Figure 2. The spatial distribution of observed visitors.

Cottage to Llyn Idwal. Once at the lake more visitors chose to use the more clearly defined path to the east of Llyn Idwal than the path to the west of it. There were considerably fewer visitors using the other paths recorded on the map.

In terms of visitor distributions it was found that for visitors not in large groups (in groups of twelve or less), 90.5% of visitors were observed using linear access routes. For groups of thirteen or more visitors, the level of use of linear access routes was less, with 83.9% of groups using these routes. Therefore 9.5% of visitors observed that were not in large groups were walking 'cross country' and roaming away from managed access routes. For groups of thirteen and over this figure rises to 16.1%.

Figure 3 shows the number of visitors observed by group size and number of individuals. It can be seen that groups of size four or less predominate with a modal group size of two. Groups of thirteen and over made up only 2.3% of observations although these groups did account for 16.7% of individuals counted. These figures compare closely with the pattern of group size obtained from questionnaires for the 1994 National Parks Visitor Survey (Table 1) with the differences that more people on their own were observed in the Cwm Idwal study and there were fewer large groups.

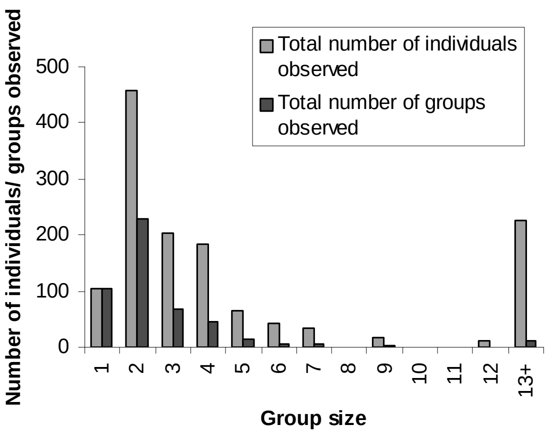

Figure 3. The number of individuals and groups observed by groups size.

Table 1. A comparison of group size as recorded by the 2002 Cwm Idwal observation survey and the 1994 All Parks Survey (Snowdonia).

Group size	Cwm Idwal observation survey 2002	All Parks Visitor Survey (Snowdonia figures) 1994)
1	21.4	5
2	47.1	42
3	14.0	16
4	9.5	15
5	2.7	7
6 and over	5.3	14

When it comes to analysing visitor behaviour in terms of where visitors were observed (on linear access routes or in 'open countryside') some interesting results are apparent. Figure 4 shows the percentage of groups of given sizes and individuals within group size categories observed off of linear access routes (i.e. observed in 'open countryside'). This shows that the number of visitors in groups of size thirteen and over make up 51.2% of visitors walking off of linear access routes. The graph also shows that there appears to be a relationship between group size and the propensity to walk off of linear access routes for group sizes of twelve of less. To test the strength of this relationship, a chi-squared test (Siegel & Castellan 1988) was carried out. For this test groups of size five to twelve were amalgamated into one group and groups of thirteen and over were not included in the calculation. This is because it was considered that as groups of thirteen and over made up such a large proportion of those observed away from linear access routes that it would skew the data. Groups of twelve and over are therefore considered separately. The result can be seen in Table 2. This shows a highly significant relationship between group size and location observed.

The chi-squared test demonstrates that there is a relationship between group size and propensity to walk off linear access routes for groups of size twelve or less. However, this may just be because more groups of a smaller size were observed. To ascertain the true relationship it is necessary to establish the proportion of walkers on and off the linear access routes for the differing group sizes. The proportion P can be worked out by the equation $P = 100(A \div B)$ where A is the number of groups of a selected group size observed on or off a linear access route and B is the total number of groups of a selected group size seen anywhere on the study site. The results of this calculation can be seen in Figure 5. This graph clearly indicates that the propensity to walk off linear access tracks is greatest for groups of thirteen and over (45.45%) and that a relationship exists between group size and propensity to walk off of linear access routes for group sizes of 12 and less.

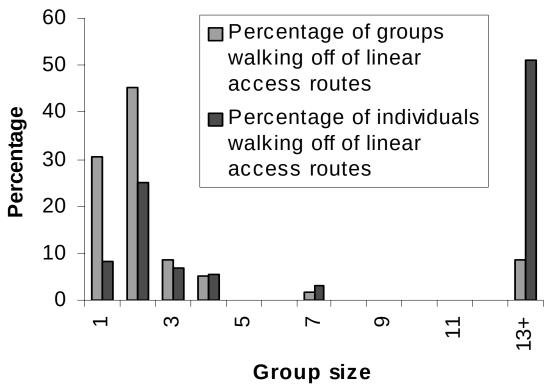

Figure 4. The percentage of groups and individuals seen walking off of linear access routes.

Table 2. Chi-squared test for group size, and location observed.

Null hypothesis	Chi-squared	Degrees of freedom	Significance	Accept or reject null hypothesis
Ho: there is no relationship between group size and location of visitors on and off linear access routes	19.15	4	$p = 0.001$	Reject Ho

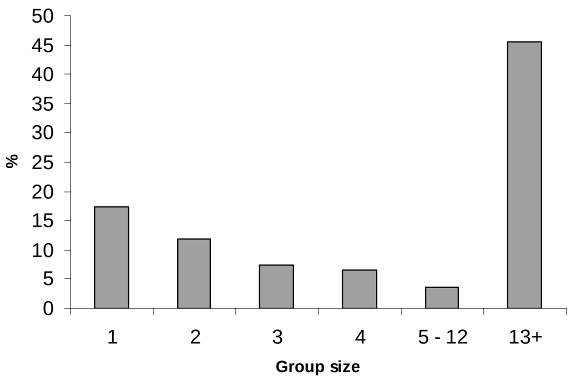

Figure 5. The proportion of groups of given size observed off of linear access routes.

Discussion

The Countryside and Rights of Way Act (2000) once it is fully implemented will create new access rights over many areas. The impacts that this access will have on land management, conservation, erosion and the local economy will depend on the relative increase or decrease in the recreational use of areas and the behaviour of visitors. This study was concerned with the second of these factors.

In considering the results, the nature of the site requires consideration. The main paths on the site are surfaced with pitched stone to prevent erosion, thereby facilitating relatively easy access along them. In addition the paths lead from the A5 road and associated car parking, to specific places that the visitor will wish to go to such as Llyn Idwal and Twll Du, and the access it gives to the Glyder range of mountains. Walkers who were observed away from linear access routes were found in three distinct areas: between the cliffs at Clogwyn y Tarw and the main Ogwen Cottage to Llyn Idwal path, between the paths in the north east of the study area in the direction of the road and associated car parking, and finally around the western end of the northern limit of the study area. Most visitors observed deviating from linear access routes appeared to be carrying out specific journeys between a starting point and a destination, be it for rock climbing, partaking in scenic views or simply to take a 'short cut'. It was also noted that visitors found in open countryside were often following 'linear handrails' such as streams or undesignated and un-maintained track ways. This can be seen in Figure 2 where the location of visitors away from linear access routes appears to conform to predominantly linear patterns.

The finding that large groups (of thirteen or more) were more likely to use open countryside than other groups was interesting and may reflect the nature of the site, which is used by a large number of groups for education activities and outdoor pursuits. The nature of such activities means that groups frequently need to leave linear access routes to view geological or geomorphological features, for navigational training or to access climbing sites. In addition, groups are normally led by an experienced leader who will be familiar with the site and confident in navigation. A group leader may therefore be more likely to deviate from linear access routes and walk across open countryside.

Figure 2 showed that behind groups of size thirteen and above the groups most likely to walk off of linear access routes were single walkers and pairs of walkers. It may well be that single walkers and small groups could potentially be more experienced and confident in their navigational abilities, while climbers usually operate in pairs. Single walkers in particular will not be influenced by other walkers needs and do not need to talk and often walk on their own to seek peace, quiet and solitude. Such walkers are potentially more likely to use open countryside. Larger groups of between three and twelve will often represent groups of friends or family groups and will not necessarily have the 'organised' structure that larger educational groups will have. In such groups the social element plays a large part of a days walking and it is easier to communicate whilst walking on well surfaced paths that allow walkers to walk side by side. The organisation of such groups is likely to be informal and the range of ability of walkers variable. It is therefore often the simplest option for such groups to take the easiest route on the ground, which will normally be formalised linear access routes. The potential composition, motivations, organisation and experience of differing group sizes is suggested in Table 3. Although not the focus of this study the relationship between the variables shown in this table and propensity to walk on or off of linear access routes deserves further study.

What then are the implications of this study on open access areas in general? The main finding is that walkers predominantly stay on linear access routes. Cwm Idwal is a well known walking location in the Snowdonia National Park as well as being a National Nature Reserve. It is one of the most attrac-

Table 3. The potential composition, motivation, organisation an experience of groups according to group size.

Group size	Potential composition	Potential motivation	Organisation	Potential experience of the group
1	*Individual*	*Challenge* *Peace* *Seclusion*	*Informal*	*High*
2	*Couple* *Friends* *Relations*	*Challenge* *Peace* *Social*		*Low – high*
3 – 12	*Friends* *Relations* *Group*	*Challenge* *Peace* *Social*		*Mixed range of experience*
12 +	*Friends* *Organised Group*	*Education /training* *Challenge* *Social*	*Formal*	*Led by experienced leader*

tive and recognised locations within Snowdonia for walking and climbing and as such attracts a large number of visitors many of which have considerable mountain walking experience. The site is open in its nature and walkers are not confined by fences and walls. It also attracts a large number of educational and outdoor pursuits groups. As such it could be considered that Cwm Idwal is a site where the use made of open countryside should be large. However, excluding large groups (size thirteen and above), only 9.5% of visitors were observed not on a linear access route. The implications for other sites is therefore that the use of open countryside is likely to be less than this figure, provided that there are linear access routes that link specific destinations that walkers wish to travel between. If there is a good track to walk on and follow then it appears that walkers will out of choice follow it even though there is a ‘right to roam’.

A further implication of this study is in relation to conservation. It can be seen from Figure 2 that the majority of walkers stay on linear access routes and those that do not, tend to be distributed in specific locations and follow ‘linear handrails’. In addition, the frequency of use made of open countryside will probably be less than that for linear access routes. Disturbance to conservation interests will therefore be intensive in quantity, duration and frequency on and alongside linear access routes. However, as the majority of walkers concentrate on such routes, there are will be large areas of sites that will be totally or predominantly undisturbed by walkers.

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Hofstede's Measure of Cultural Values in a National Forest Recreation Context

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Abstract: Hofstede's measure of cultural values is one of the most widely used among international management and marketing scholars. However, there is no research that employed Hofstede's measure in a National Forest recreation context. This study examined the validity and reliability of Hofstede's cultural measure from an ethnically diverse sample in a National Forest recreation context. We used confirmatory factor analysis, exploratory factor analysis, correlations, one-way analysis of variance, and multiple regression to test Hofstede's measure of cultural values. The results suggested that seven items, two items from Hofstede's original Power Distance dimension, one item from the Individualism dimension, two items from the Masculinity dimension, and two items from the Uncertainty Avoidance dimension, best represent the measure of cultural values in a National Forest recreation context. Discussion of the results and future research were suggested.

Introduction

Current demographic trends indicate population growth for ethnic minority groups is increasing considerably faster than the overall rate of the U.S. population (U.S. Bureau of the Census [USBC] 2000). According to current projections, non-Hispanic Whites will make up barely one-half of the total population by 2050 and will lose their majority status by 2060 (Riche 2000). To better understand the current demographic change, we will present a study of cultural values that promise to impact the diverse population (Chick 2000).

A culture can be defined as shared information and the behaviors and artifacts that are manifestations of that information (Chick 1997). The distinctive patterns of recreation behaviors result from differences in cultural value systems, norms, and leisure socialization patterns between racial and ethnic groups. Studies investigating recreational patterns among different ethnic groups suggest that cultural factors result in different styles of leisure behaviors among ethnic groups (Floyd et al. 1993). In the most exhaustive cross-cultural study to date, Hofstede (1980) surveyed 117,000 questionnaires, translated into 20 languages. The data from 80,000 IBM employees in 66 countries allowed him to establish four dimensions of national cultural values: power distance, individualism, masculinity, and uncertainty avoidance. Hofstede's study is now one of the widely used among international management and marketing scholars. Hofstede is among the 20 most cited Europeans in the 2000 Social Science Citation Index, at 57th in the world. Sodergaard (1994) found 1, 036 quotations from *Culture's Consequences* (Hofstede 1980) in journals during the period from 1980 to 1993. Additional studies have shown Hofstede's cultural measure to be generalizable across multiple contexts and societies (e.g., Furrer et al. 2000, Mattila 1999). Moreover, Clark (1990) argued that Hofstede's measure might account for many cultural differences among individuals, suggesting that such measure might also prove useful for assessing ethnic differences related to perceived service quality in forest recreation settings (Donthu & Yoo 1998, Li et al. 2003).

While Hofstede's measure of cultural values has been widely used, several researchers (e.g., Horton et al. 2001, McSweeney 2002) also questioned the validity of these cultural measures. For example, IBM employed mostly males at the time of the survey. More differences were likely to exist between men and women than from country to country, especially when analyzing things like masculinity/femininity, and power distance (Horton et al. 2001). As Hofstede suggested that "….. *my theory of cultural differentiation is like a product of research laboratory, which awaits the efforts of development technicians to elaborate it into something of particular use*" (2001, p. 462). Further analyses of these cultural measures are needed to determine their validity and reliability in a forest recreation context. Thus, the purpose of this study is to examine Hofstede's measure of cultural values in a National Forest recreation context. In other words, we intend to evaluate Hofstede's measure of cultural values to see whether they are applicable to another context.

Method

During the summer of 2002, purposive sampling was used at 14 sites on the Angeles National Forest (ANF) known to be heavily used by visitors of particular ethnic backgrounds (Hispanic, Asian and White). Each person that agreed to participate was asked to fill out a short survey and return it to the field researcher onsite. A total of 1,332 subjects were approached and 1,172 completed the survey for an 88 percent response rate. Overall, we obtained a sample of 38% Anglo-Americans (n=444), 27% Hispanic-Americans (n=312), 27% Asian-Americans (n=319), and 8% others including African-American, American-Indian, others, and missing values (n=97). See Table 1.

Result

Socio–demographic Profile. Participants were more likely to be male (60%) than female (40%). They were likely to be young adults (mean age = 36), with only 5 percent reporting that they were 60 years old or older. Forty–seven percent were married, and 46 percent were single. The remainder were divorced or widowed. Mean number of children (21 or under) living in the household was one, but 53 percent of the participants had no children in their household. More than 70 percent were employed outside the home; 12 percent were full–time students; and 14 percent were full–time homemakers, retired, or other. Over 80 percent of the participants had attended some school beyond high school, and 58 percent had earned a four–year college degree or graduate degree. Fifty–four percent (n = 501) of the participants had household incomes over $50,000 and 26 percent (n = 246) had household income over $80,000.

We used confirmatory factor analysis (CFA), exploratory factor analysis (EFA), correlations, one-way analysis of variance (ANOVA), and multiple regressions to test Hofstede's original cultural values measure in a forest recreation context. Our initial intention was to use CFA to confirm Hofstede's four dimensions, Power Distance, Individualism, Masculinity, and Uncertainty Avoidance. Our test (with four items per dimension) revealed a poor fit according to several indicators, such as Normed Fit Index (NFI) = 0.695, Root Mean Square Residual (RMR) = 0.134 (Table 2) via the LISREL 8.50 program. Given the poor fit of the original four-dimension cultural value model, we used EFA to explore the dimensionality of the items in the National Forest recreation context. We considered both orthogonal (uncorrelated factors) and oblique (correlated factors) solutions, via Varimax and Direct Oblimin rotation. The results of both the orthogonal and the oblique solutions were very similar and suggested no interpretable patterns of dimensionality.

By examining the correlation matrix of Hofstede's 16 cultural value items, we found the items within Hofstede's original dimensions were almost uncorrelated. Items were as likely to correlate across dimensions as they were within dimensions, suggesting that the responses of participants in this study

Table 1. Ethnic groups.

Ethnicity	Frequency	Percent
Anglo American	444	37.9
Hispanic American		
Hispanic American	183	15.6
Mexican American	111	9.5
Central American	18	1.5
Asian American		
Chinese American	123	10.5
Taiwanese American	69	5.9
Filipino American	32	2.7
Korean American	70	6.0
Vietnamese American	14	1.2
Japanese American	11	.9
African American	17	1.5
American Indian	7	.6
Other	49	4.2
Missing	24	2.0
Total	1,172	100.0

did not reflect the pattern found in workplace and consumer studies. Because we found no interpretable dimensions among Hofstede's items, we used One-way ANOVA to test the relationship between the 16 items and ethnic group membership. We found that eight cultural value items differed significantly among ethnic groups and tested their power to represent cultural differences. Reliability analysis revealed that seven of the eight items should be retained and one item dropped, yielding a Cronbach's alpha of 0.779 (Table 3).

Since perceived service quality is related to cultural differences (Donthu & Yoo 1998, Furrer et al. 2000, Iacobucci et al. 2003, Li et al. 2003, Liu et al. 2001, Mattila 1999, Tsikriktsis 2002), we sought further verification of these cultural measures. Use customer service measures (facility, service, information, and experience dimensions) previously developed for outdoor recreation management (Graefe et al. 2000) as dependent variables, respectively, and seven cultural items as independent variables.

The results show that all four multiple regression models are significant at the 0.001 level (Table 4), suggesting these seven cultural items possess the predictive power of perceived service quality[1].

Therefore, our final cultural values measure was comprised of two items from Hofstede's original Power Distance dimension (Inequalities among people are both expected and desired; Less powerful people should be dependent on more powerful), one

Table 2. Goodness of fit statistics for Hofstede's cultural value model.

Model	χ^2	χ^2 /df	GFI[a]	NFI[b]	CFI[c]	RMR[d]
4 items per dimension	1367.164	13.950	0.797	0.695	0.709	0.134

Note: [a] GFI: Goodness of Fit Index.
[b] NFI: Normed Fit Index.
[c] CFI: Comparative Fit Index.
[d] RMR: Root Mean Square Residual.
Acceptable fit: Rule of thumb, when χ^2 /df = 2 to 5; GFI $\geq$ 0.90; NFI > 0.90; CFI > 0.90; RMR = 0.05 to 0.10.

Table 3. One-way ANOVA result of cultural value item by ethnic group[a].

Cultural value dimension and item	F-value	P-value
Power Distance dimension		
1. Inequalities among people are both expected and desired.[b]	***11.433***	***< 0.001***
2. Less powerful people should be dependent on the more powerful.	***28.389***	***< 0.001***
3. Inequalities among people should be minimized.	3.005	0.050
4. There should be, and there is to some extent, interdependencies between less and more powerful people.	1.391	0.249
Individualism dimension		
5. Everyone grows up to look after him/herself and his/her immediate family only.	***21.996***	***< 0.001***
6. People are identified independently of the groups they belong to.	3.912	0.020
7. An extended family member should be protected by other member in exchange for loyalty.[c]	11.748	< 0.001
8. People are identified by their position in the social networks to which they belong.	2.107	0.122
Masculinity dimension		
9. Money and material things are important.	***12.737***	***< 0.001***
10. Men are supposed to be assertive, ambitious, and tough.	***12.905***	***< 0.001***
11. Dominant values in society are the caring for others and preservation.	1.829	0.161
12. Both men and woman are allowed to be tender and to be concerned with relationships.	0.296	0.744
Uncertainty Avoidance dimension		
13. High stress and subjective feeling of anxiety are frequent among people.	2.471	0.085
14. Fear of ambiguous situations and of unfamiliar risks is normal.	0.952	0.386
15. Uncertainty is a normal feature of life and each day is accepted as it comes.	***6.003***	***0.003***
16. Emotions should not be shown.	***23.961***	***< 0.001***

Note: [a] The ethnic group was represented by a 3-level (Anglo American, Hispanic American, and Asian American) nominal variable.
[b] The Bold and Italic items represented the items used in the final cultural value measure.
[c] Item dropped after the reliability analysis.

item from the Individualism dimension (Everyone grows up to look after him/herself and his/her immediate family only), two items from the Masculinity dimension (Money and material things are important; Men are supposed to be assertive, ambitious, and tough), and two items from Uncertainty Avoidance dimension (Uncertainty is a normal feature of life and each day is accepted as it comes; Emotions should not be shown). The higher scores of the items implied more power distance, more individual, more masculine, and more uncertainty *acceptance*.

Since the final seven items actually covered Hofstede's original four dimensions, we intended to use these items to find conceptually interpretable dimensions. With the final seven cultural items selected, we were able to create only two dimensions

Table 4. Multiple regression of service quality dimensions on the final seven cultural value items.

Seven cultural value items[b]	Service quality dimension[a]			
	Facility[a]			
	Beta	P-value	R-square	P-value
1. Inequalities among people are both expected and desired.	0.048	0.231		
2. Less powerful people should be dependent on the more powerful.	-0.056	0.209		
5. Everyone grows up to look after him/herself and his/her immediate family only.	0.015	0.709		
9. Money and material things are important.	0.040	0.325	0.068	< .001
10. Men are supposed to be assertive, ambitious, and tough.	0.121	0.007		
15. Uncertainty is a normal feature of life and each day is accepted as it comes.	0.166	< .001		
16. Emotions should not be shown.	0.043	0.280		
Seven cultural value items[b]	Service[a]			
	Beta	P-value	R-square	P-value
1. Inequalities among people are both expected and desired.	0.098	0.015		
2. Less powerful people should be dependent on the more powerful.	-0.065	0.145		
5. Everyone grows up to look after him/herself and his/her immediate family only.	0.034	0.409		
9. Money and material things are important.	0.009	0.830	0.065	< .001
10. Men are supposed to be assertive, ambitious, and tough.	0.057	0.201		
15. Uncertainty is a normal feature of life and each day is accepted as it comes.	0.175	< .001		
16. Emotions should not be shown.	0.067	0.096		
Seven cultural value items[b]	Information[a]			
	Beta	P-value	R-square	P-value
1. Inequalities among people are both expected and desired.	0.064	0.108		
2. Less powerful people should be dependent on the more powerful.	0.003	0.954		
5. Everyone grows up to look after him/herself and his/her immediate family only.	0.052	0.193		
9. Money and material things are important.	0.031	0.449	0.087	< .001
10. Men are supposed to be assertive, ambitious, and tough.	0.069	0.120		
15. Uncertainty is a normal feature of life and each day is accepted as it comes.	0.136	< .001		
16. Emotions should not be shown.	0.117	0.003		
Seven cultural value items[b]	Experience[a]			
	Beta	P-value	R-square	P-value
1. Inequalities among people are both expected and desired.	0.101	0.011		
2. Less powerful people should be dependent on the more powerful.	-0.056	0.208		
5. Everyone grows up to look after him/herself and his/her immediate family only.	0.036	0.370		
9. Money and material things are important.	0.013	0.752	0.080	< .001
10. Men are supposed to be assertive, ambitious, and tough.	0.094	0.035		
15. Uncertainty is a normal feature of life and each day is accepted as it comes.	0.196	< .001		
16. Emotions should not be shown.	0.026	0.516		

Note: [a] Service dimensions: Facility, service, information, and experience served as dependent variable, respectively.
[b] Seven cultural items served as independent variables.

of cultural values with good internal consistency. For the two cultural items from the power distance dimension, Cronbach's alpha equals 0.678 (marginally acceptable). For two items from masculinity dimension, alpha equals 0.704.

We examine the convergent validity and discriminant validity of the power distance and masculinity dimensions derived above. The concept of convergent validity and discriminant validity refers to the evaluation of measures against one another instead of against an external criterion. Convergent validity refers to the extent to which different items measure the same trait or dimension. Discriminant validity refers to the distinctiveness of the dimensions (indices) measured by different sets of items (Trochim 2004). By examining the correlations among these four items, we found the items were likely to correlate more strongly with their individual dimensions (indices) than to correlate with the 7-item index (mean of the final seven cultural items). On the other hand, we also found dimensions were likely to correlate more strongly with the 7-item index than to correlate between dimensions. Therefore, we may conclude that the power distance and masculinity dimensions possess convergent and discriminant validity (Zinn & Pierce 2002).

Discussion

Originally, Hofstede's cultural dimensions (1980, 1984, 1991, 2001) were used to measure work-related values and were based on national cultural differences. Since Hofstede's dimensions have been adopted across various contexts and societies, they are, to some degree, generalizable. However, in this study, responses to Hofstede's four cultural dimensions did not follow the same patterns found in other studies. One reason may lie in the limitations of Hofstede's study; he only sampled IBM employees. The relatively homogenous sampling of his study was challenged by the heterogeneity of the National Forest visitor sample (Appendix A: Table 5 shows socio-demographic differences among ethnic groups). Moreover, this study measured the multi-ethnic rather than multi-national cultural differences. Socio-demographic differences among forest visitors, as well as intra-cultural and inter-cultural differences, might account for the internal inconsistency of dimensions (indices) in this study.

Another reason that responses did not follow the same patterns found in other studies might be because societal norms were not clear regarding cultural differences in the sample (Hofstede 1984). Cultural values are regarded as the most abstract type of social cognition that helps to understand the interpersonal world (Kahle 1983). In this study, we found the goodness of fit statistics for the four-dimension model showed a poor fit according to several indicators, such as Goodness of Fit Index (GFI) = 0.797, Normed Fit Index (NFI) = 0.695, via confirmatory factor analysis. Norms are activated when certain conditions are met (Hofstede 2001, Schwartz 1975). However, when our respondents were asked cultural questions, many objected, saying that those cultural questions were too abstract and unrelated to their forest trip.

Furthermore, Hofstede originally identified four cultural dimensions that were supposed to be largely independent of each other. However, our results often were more highly interrelated across dimensions than within dimensions. This implies that our sample of multi-ethnic National Forest visitors understood the underlying cultural concepts in Hofstede's items (e.g., inequity, interdependency) differently from respondents in other studies. Although they came from different ethnic groups, the National Forest recreation visitors seemed to engage cultural issues in quite different ways. Therefore, these four dimensions need further analyses to determine their validity and reliability in a park and recreation context. Our findings are consistent with Hofstede's suggestion that

> *"… the concepts of four dimensions of national culture should be further underpinned, criticized, and complemented by reference to additional literature, in particular to literature of non-Anglo-Saxon origins. And by exposure to the comments of scholars and practitioners from a variety of backgrounds…" (Hofstede 2001, p. 462).*

The failure of exploratory factor analysis to identify interpretable cultural dimensions in this study also suggest that additional studies are needed. Rather than simply adopt Hofstede's cultural items to measure forest visitors' cultural differences, further studies should include more multiethnic and multidisciplinary approaches (e.g., use Rokeach Value Survey [RVS]), to avoid ethnocentrism and bias, or include focus groups to develop a common pool of useful items (Hofstede & Bond 1984). When factor analyzed, these items might provide more meaningful measures that better fit the specific context.

The results of our test of Hofstede's cultural measure suggest that measuring cultural values in the forest recreation context differs substantially from those in workplace and consumer contexts. Developing a more complete understanding of the structure of cultural values as they apply to forest recreation will require additional research with multiple forest recreation populations.

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[1] Note that Table 4 reflects weak relationship between culture and perceived service quality despite all four multiple regression models being significant at the 0.001 level. The cultural item, "Uncertainty is a normal feature of life and each day is accepted as it comes," continues to be significant across four multiple regression models. This implies "expectation" might play an important role to predict perceived service quality.

Living in the Forest: Meanings and Use of Recreational Residences

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Abstract: The Forest Service Recreation Residence Program has been operational since the passage of the Occupancy permits Act in 1915. In the initial years the Forest Service actively encouraged summer home occupancy with the view that such occupancy encouraged recreational use and assisted in proper forest management and fire control as well as providing a source of income. Approval of further recreation residence development on public land was discontinued in 1968 as program costs exceeded revenues and the perception that such occupation of public land was elitist and potentially restricted public access to desirable recreation sites. More recently, both the appraisal process and the pursuance of permit violations have become a focus of some political controversy.

Recreational residences have often been built by and remain in the same family across generations leading to a strong attachment and identification with a particular forest tract. The study discussed in this paper examines the use of these residences and the meanings of such use to a sample of cottage owners in the Arapahoe-Roosevelt and Pike National Forests in Colorado, USA. A multi-methods approach was used to collect data on cottage use including project analysis, surveys, experiential sampling and in-depth interviews. The rationale underlying the multi-method approach and some preliminary results of this study will be presented in this paper.

Introduction

Various commentators have recognized the increased influence of modernity on people's lives today. Such influences include globalization, 'time-space compression' (e.g., Williams & Kaltenborn 1999), and 'separation from nature and experience' (e.g., Giddens 1991). The combination of these influences creates an environment characterized by dynamism, stress, a sense of constant rush, and lack of control. While it has been argued that such conditions can lead to disorientation and personal meaninglessness, the possibility of temporary 'escape' (Cohen & Taylor 1992) and 'resistance' (Ritzer 1998) provide a variety of mechanisms through which people cope with these increasingly pervasive influences.

One such theorized mechanism that is increasingly a characteristic of modern life in industrialised societies is the ownership of a second home in a natural setting.

Second Homes and Modern Life

A second home for most N. Americans is the vacation cabin or weekend cottage situated in natural or semi-natural areas, particularly on the coastlines, rivers and lakesides and in forested and mountainous areas. In recent years in the USA, there has been an increase in the purchase of second homes, rising from 8.4% of total homes purchased in 1996 to 13.1% in 1999 (USA Today, Feb. 2000). Although there is an increasing trend towards the purchase of modern-style second homes in N. America, there still remains a significant proportion of what might be termed 'rustic cabins.' According to a study in Wisconsin, many of these are quite primitive (Williams and Kaltenborn 1999) and a significant outcome for users is an experience of getting 'back to nature.' The purchase and use of second homes is not limited to N. America but is also a growing phenomenon in other developed societies, including Norway (Kaltenborn 1997), France (Chaplin 1999), and New Zealand (McIntyre 2000).

Most research and thinking in the study of second homes tends to focus on the experiences in that context. However, in the majority of cases this experience is a relatively small component of the total life of individuals. Life at home and at work and its influence on the second-home experience is largely neglected. This more inclusive contextualisation is essential because increasingly, modern lifestyles that integrate home, work and play involve circulating through a geographically extended network of social relations and across a multiplicity of dispersed places and regions (McHugh & Mings,1996, Urry 2000).

The thrust of the argument is that to understand second homes within the context of mobility and new forms of place making we need to understand how people weave together the lifestyle sectors of leisure, work, and multiple homes. We need to uncover what people actually do, how they feel about what they are doing and finally, we need to access their deeper thoughts and feelings about these lifestyle sectors (Williams & McIntyre 2002).

The Recreation Residence Program

A unique program in second-home development is the Recreation Residence Program in the US National Forests. This program has a long history, having been part of the National Forests for over 80 years. An estimated 15,200 of these Recreational Residences exist throughout the length and breadth of the country. Many of these residences are situated in areas of high recreation use along the shorelines of lakes and on the banks of rivers and streams and are concentrated in the Western USA, particularly in Pacific South West region of California (Gildor 2002).

Despite the long history of use and importance of these residences, very little is known about their owners, types and frequency of use and the benefits that they provide. This paper reports one part of a larger study, which addresses these broad research issues.

History of the Recreation Residence Program

Recreation was not initially a part of the US Forest Service mandate but rather its policies emphasised extraction of forest resources and 'wise use'. However, the growing demand for recreation opportunities influenced, in part, by the 'back to nature' movement encouraged the Forest Service to promote "simple, low-keyed, rustic, recreational experiences" within the public forests (Lux et al. 2001, p.18). In the early days, recreation was controlled by means of a permit system, which included the establishment of recreation residences leases.

Recreation leases granted under the 'organic statute' had to be reviewed annually and were 'terminable at the discretion of the Forester' (Gildor 2002, p. 997). This approach provided little long term security considering the investment in infrastructure required of permit owners. So, in 1915 the Occupancy Permits Act was passed to provide for leases of no more than 5 acres of land for a period of 30 years.

The Forest Service viewed the Recreation Residence Program as a way of protecting forest resources. A prevalent view was that permit owners became 'conservationists', assisted in managing fire risk, and in addition, the leases were a welcome source of income. Thus, in the early years, the Forest Service actively promoted the program. Articles extolling the virtues of recreational residences and forest living even appeared in the mainstream press (e.g., *Good Housekeeping* and *The Saturday Evening Post*) and outdoor living books:

> [m]any a business man has gained a healthful and keen enjoyment in clearing a small area and erecting thereon a cabin in accordance with his purse and ability (Bryant 1929, p. 347–348, quoted in Gildor 2002, p. 998).

Waugh was appointed by the early Forest Service to examine recreation facilities in the National Forests and to develop guidelines for their development and management (Lux et al. 2001). His report favoured scenic sites (e.g. tree covered, in canyons, beside mountain streams and on lake fronts) for recreational residences. These guidelines influenced the choices of sites for which rangers issued permits. As a result, despite Forest Service policies and instructions to site recreation residences in less desirable location, many cabins were built on sites of high scenic and recreational value (e.g., shores of L. Tahoe). Therefore, right from the start conflict between 'higher uses' (the most benefit to the most people) and the apparent 'exclusive use' of recreation residence tracts was built into the system.

In the 1930's, there was a dramatic shift in Forest Service recreation policy, which moved from an emphasis on permits as a way of managing public recreation to a more broadly based public recreation strategy. This strategy directed energies into conservation and development projects such as the provision of public campgrounds, and picnic areas within the National Forests. The combination of this change in Forest Service policy in regards to recreation provision and the fact that by the 1950's the costs of the Recreation Residence Program to the Forest Service exceeded revenue from the leases contributed to a negative shift in the Forest Service administration's attitude to the program (Lux et al. 2001).

The Public Land Review Commission report published in 1970 recommended that 'public lands should not be made available for private vacation home construction and that such existing use should be eliminated' (Gildor 2002, p. 1001). Although this recommendation was largely ignored, conflicts between general recreation use and recreation residences combined with the growing negative attitude to the program mentioned above likely caused the Forest Service to pre-empt this recommendation and initiate a phase-out of the program. In 1968, they introduced a moratorium on the development of further tracts and in 1976 they prohibited further development within tracts, essentially bringing further extension of the program to a halt. Permit expiration and non-renewal, in the ensuing years, has reduced the number of recreation residences from a peak of 20,000 to 15,200 today (Gildor 2002).

Managing Recreation Residences

Over the years Forest Service policies governing recreation residences have become more detailed and comprehensive. Recreation residence use is authorized on the basis that: (a) it is consistent with the management plan; b) the residence is located where an alternative public use has not been established c) the residence does not constitute a removable hazard d) the residence does not endanger the health and safety of the holder or the public.

Permits may be issued for 20 years and the Forest Service must give 10 years notice of termination. They are non-transferable but can be re-issued to heirs and purchasers of lot improvements for the remainder of the term. The residence must be occupied at least 15 days in any one year but owners cannot live there full-time. Only one building is permitted on each lease and buildings are subject to restrictions on architectural design, size, height, decks, building materials, paint colours and outbuildings.

Permit violations are rampant. Examples cited by Gildor (2002) include: full-time residency, unauthorized construction and rentals. Size creep is a significant problem. For example, cabins originally 40–110 metres square now are commonly over 300 metres square.

A recent review (Lux et al. 2001) has shown permit violations to have a ‘substantial impact’ on the recreating public, cultural and historic sites and on endangered species. This same study noted that roughly half the lots in California have unauthorized improvements and have impacted archaeological or environmental resources. It is argued that this situation arises because of Forest Service ‘inability’ to administer the program due to lack of staffing, and appropriate levels of expertise and training amongst those staff charged with administering the program (Gildor 2002).

Politics and Recreation Residences

More rigorous administration of recreation residence permits and recent reviews of leases generally involving increases in lease costs have resulted in recreation residence owners evolving into a significant political force. The development of ‘client politics’ is not surprising given that the recreation residence program benefits a small number of people and that the costs are diffusely spread across the public domain (Gildor 2002).

Recreation residence owners have also developed the ability to mobilize easily. For example, of the 3,200 comments to the Forest Service on its 1987 proposed rulemaking 96 per cent were from permit holders.

Self-selection of congressmen into committees tends to favour the western states, where most of the RR are developed. One western congressman in a hearing on recreation residences is quoted as saying:

> “The eco-marxists seem to dominate our policy in the area of public lands and environmental policy these days. Obviously the Forest Service has decide it does not like permittees and is doing everything it can to eradicate them… I don’t think congress feels that way. Once again, we have a large bureaucracy careening pretty much out of control and doing whatever it likes”

Public sympathy is also garnered through the portrayal of recreation residence owners as ’part of the West’s rich cultural heritage… often retired folks on fixed incomes who have loyally served our Nation in peacetime and war’ and ’primary users of these cabins are the retired, the elderly, the disabled, teachers’ (Gildor 2002, p. 1013). As a result of these various influences, change in the recreation residence program is slow and difficult to implement.

The Recreation Residence Program is part of the Forest Service System and is unlikely to be able to be phased out despite philosophical and implementation difficulties. This paper, rather than address the issues inherent in the existence of this instance of an ‘exclusive use’ within public lands, focuses on the perceptions of a sample of recreation residence owners as to the role that the ‘cabin’[1] in the forest plays in their lives.

Cabins in the Forest: A Case Study

The approach used in this study involved four methods of data collection: personal project analysis, a survey, in-depth interviews and experiential sampling. Three of these will be discussed in this paper: Personal Project Analysis, the survey and the in-depth interviews.

Personal Project Analysis

Goal directed behavior is characteristic of humans and the way they manage their lives whether it involves going to the summer cottage, learning to be more sociable or getting the car fixed (Little 1989). In the late 1980’s and early 90’s there was a resurgence of interest in goal directed behavior in the form of “personal projects” (Little 1989). Personal Projects Analysis links closely with the notion of “distributed self” as discussed by Bruner (1990), in that, aspects of self are theorised as being represented in the variety of goal-directed behaviors of the individual. According to Little (1989) Personal Projects represent:

> extended sets of personally relevant actions, which can range from the trivial pursuits of a typical Tuesday (e.g. ‘cleaning up my room’) to the magnificent obsessions of a lifetime (‘liberate my people’)... personal projects are natural units. . .that deal with the serious business of how people muddle through their complex lives. (p. 15).

Little (1989) has developed a Personal Project elicitation survey in which participants are requested to list ten current personal projects each of which are then related by the individual on a ten point scale using a series of dimensions which reflect potentially important characteristics of personal projects. Some of these dimensions are derived directly from the sequencing of the stages in a project (e.g., initiation, control, outcome likelihood, time adequacy). Other dimensions such as self-identity, self-worth, challenge, stress, enjoyment and importance may be included because of their potential relevance to leisure projects. Two important contextual variables are also included namely, “where” and “with whom.” Project analysis has a number of advantages:

it focuses on “natural acts” that are of relevance to the individual rather than projects that arise from the researcher’s interest;

it provides a comparative profile of each personal project which indicates both the nature and degree of involvement in each project on dimensions that are relevant to the recreation residence and home experiences; and

it provides data that can be analyzed at the individual level and group level.

In this study, project elicitation was focused on the cabin and home[2] projects to provide an understanding of the different and complementary roles of each in a person’s life.

The Survey

The survey sought characteristics of the use of the recreation residence, facilities, details of annual expenditure and personal information about the owners. The survey and the Personal Project Elicitation package were mailed out to a sample of recreation residence owners in Eastern Colorado.

In-depth Interviews

Interviews were conducted with recreation residence owners either at their homes or at the residence. Typically interviews lasted from 1.50 to 2.00 hrs and often included both husband and wife owners of the cabins. Interviews were structured around open questions, which explored the history of the cabin, their lifetime association with it, memories and stories about incidents that took place at the cabin, life at the cabin, special places in the forest, and what they did when they visited. Broadly similar topics were discussed in the context of the home focusing particularly on similarities and differences in lifestyles and feelings about the two contexts. Perceptions of Forest Service management were also discussed, as were changes in the forests and Colorado over the time that they had owned the cabin.

The Sample

The survey was mailed to a sample of 37 cabin owners who volunteered to take part in the study. All these owners had leases in the Arapahoe-Roosevelt and Pike National Forests and lived in Front Range cities (Denver, Boulder, Fort Collins and Colorado Springs) in Colorado USA. Twenty-nine surveys were returned providing a 78 per cent response rate. Seventeen completed Personal Project Analysis were returned and 11 in-depth interviews were conducted.

Thirty-nine per cent of the owners were female and the average age was 67 years. Almost two-thirds (62%) were retired, 11 per cent semi-retired and 27 per cent were still in the workforce. The owners were generally well educated with 96 per cent having either a college degree or some college education. Fifty-eight per cent were in teaching or other professional occupations, 26% in administration or medical, and the remainder were self-employed. Almost half (47%) had a household income of $US60000 or more.

In summary, the owners were a relatively affluent, mostly retired, well-educated, professional group. The demographics of the this sample are broadly similar to those described by Berg (1975) in a more general survey of original cabin owners.

Life in the Forest

The first part of the study explored the characteristics of the cabins and their use.

Characteristics and Use of the Cabins

All of the cabins are in a forest setting with less than half (44%) sited on river/stream frontage. Only forty-four per cent are winterised and about two-thirds (77%) have gravel, graded road access both of which likely limits winter use in the rather frigid, snowy mountains of Colorado. Grid electricity is connected to about half (48%) of the cabins but wood-burning stoves are the most prevalent form of heating, as is bottled gas for cooking. Just over half (52%) use creek water, about a quarter (24%) carry water in and the remainder use springs or are connected to a community water supply. Seventy per cent have an outhouse, 15 per cent have flush toilets and composting or chemical toilets make up the rest. It is evident that, even in this small sample, the cabins have a wide range of facilities. However, the general level of facilities suggests that they are probably best described as ‘rustic’ rather than ‘primitive’ (Figure 1).

Figure 1 Cabin in the Forest: Arapahoe-Roosevelt NF.

Table 1 indicates that ‘occasional’ and frequent short stays’ are the most common types of use of the cabins. The former took place throughout the year but mostly in the Spring and Winter. Summer and

Fall were characterised more by 'frequent short stays'. Some owners spent vacations at the residence in the summer. Three of the owners surveyed visited every day during Summer and Fall and six of the 29 owners did not visit at all in the Fall and Winter.

Table 1. Patterns of Use of the Cabins by Season (2002–2003).

Season	Not Used	Occasional Use	Frequent Short Stays	Vacation > 6 days	Every Day
Spring	0	7	6	1	0
Summer	0	3	7	3	2
Fall	1	5	9	0	1
Winter	5	8	1	0	0

The cabins were used mainly in the Summer with an average of 24 days of use out of a possible 90 days (Table 2). Summer also showed the widest variation (23.8 days). Fall use, although considerably less than Summer use was the second most popular season. Spring and Winter were the times of least use with zero days being the most common response. Overall use in the year averaged about 47 days, varying from a minimum of 4 days to a maximum of 190. The total use is probably much higher when use by other family members is taken into account.

Table 2. Number of Days Used By Season (2002–2003).

Season	Average No Days	Modal No Days	Maximum No Days	Standard Deviation
Spring	6	0	40	8.2
Summer	24	20	90	23.8
Fall	13	10	80	17.9
Winter	3	0	15	3.9
Total Days	47	34	190	46

In summary, cabin use is concentrated in the Summer and Fall when weather conditions are relatively mild and access is easiest. Most owners tend to use the cabins frequently for short visits throughout these two seasons.

Comparisons with cabin owners in Wisconsin (Stynes et al. 1995) indicate that owner use of these privately owned homes was higher averaging 70 days per year. However, patterns of use are broadly similar, with summer being the most popular time for extended stays and short visits are the norm in Winter.

A key issue for many owners at the present time is the costs associated with owning a cabin, especially as there is a move by the Forest Service to charge lease fees equivalent to that levied on adjacent private lands. This has meant increases in rates for many owners in excess of what are felt to be justifiable on the basis of the restrictive leasehold conditions and the fixed income status of many of the retiree owners. Figure 2 shows that, at an average of $US800, the Permit Fee is the most costly part of owning the cabin. All the other costs (insurance, utilities, repairs, furnishings and county taxes) are very similar, averaging between $US150 - $US200 per annum. The average cost of owning a cabin is just over $US1600 a year.

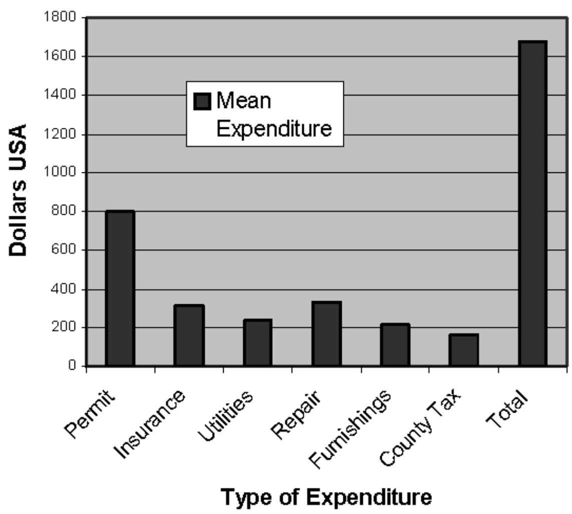

Figure 2 Types of Expenditure on Cabins.

Overall, the cabins in this part of Colorado appear to have remained relatively primitive with few of the modern conveniences that are common in cabins on private land in the same area. Use is generally spasmodic, short frequent summer-time stays being most prevalent type of use. Arguably, given the average income of $US60,000 a year, costs of owning the residence seem reasonable but this view is not shared universally by all owners.

Home and Cabin

The second part of the study examined the sorts of things that owners did when they stayed at the cabin and explored how the various projects were similar and different at home and at the cabin.

Personal Projects were elicited by asking contributors to list:

> *as many personal projects as you can that you are engaged in or thinking about at the present time. Don't just list formal projects, or important ones, but rather I would appreciate you developing a list of everyday activities or concerns that characterize your life (a) in the home and (b) at the recreational residence.*

This process elicited a total of 94 cabin projects and 171 home-based projects. These included: 'put varnish on the cabin'; 'explore the Colorado Trail'; 'weed out closets and basement'; 'losing a few pounds'; 'manage transition when my wife retires';

'become a better listener'; 'learn Spanish' (Figure 3). The individual projects were classified into twelve broad categories (Figure 4) to facilitate comparisons across contexts (home/cabin) and between different studies.

Figure 3. Cabin Project: Footbridge on a Small Creek.

Cabin projects are dominated by maintenance, leisure, and building projects. On the other hand, leisure and to a lesser extent maintenance, volunteer work, family support, and personal development projects characterised the home (Figure 4). The range of projects in the latter context is also broader. Notable among the project types missing from the cabin context are fitness, family support, and volunteer projects.

Examination of the specific leisure type projects conducted at the cabin and the home demonstrated an emphasis on nature-based leisure activities (hiking and wildlife watching) in the former. These are also likely to contribute to fitness goals, a prominent project focus in the home context. In the home, artistic projects (painting, music and writing) prevail.

The number and variety of projects demonstrate that this group of mainly retired people lead quite active lives both at home and at the cabin. Overall, the cabin is a place where owners involve themselves in 'fixing up the residence' or enjoying nature through low-key activities. In the home, various leisure projects particularly of an artistic nature are the main focus, with volunteer work and caring for children, siblings, spouses and grandchildren also being important.

Perceptions of Life in the Forest

In-depth interviews with selected owners provided insights into the meanings associated with living at the cabins. This discussion will examine selected aspects only, in particular those that are linked to understanding key aspects of the Personal Project Analysis and survey responses discussed earlier in this paper.

Maintenance was the most often mentioned type of project at the cabin. One 70 year-old man who had spent most of his life as a stock-broker reminisced about working on the cabin some 40 years earlier:

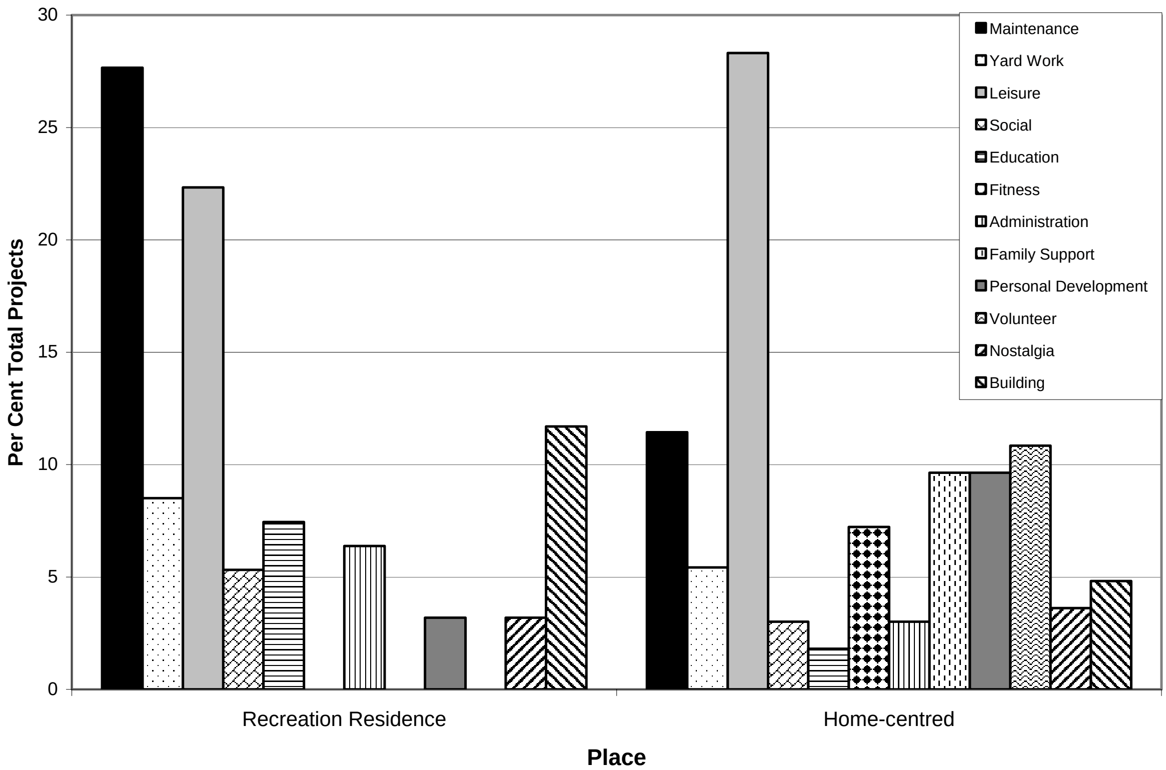

Figure 4. Personal Projects at the Cabins and at Home.

> **SB**: I was a helper… her father was the worker… in fact the worst job I ever had in my life . . . that window on the east side. That was a little bitty window. Those logs are like steel. You know they're a hundred years old… we had a handsaw. And it took me two or three days to do that… was the hardest work I've ever done in my life. You couldn't saw those logs. (S, Fort Collins).

This particular maintenance/building task is very special and recounted with obvious pride at overcoming the challenge and successfully completing the window.

Such personal stories about work down on the cabins that create a binding relationship and sense of ownership with the particular structure are evident in most of the transcripts. One Denver couple talk about renovating their 'cabin' that they acquired about 13 years ago:

> **JP**: put in a little bigger windows. I put in these nice windows and...
>
> **JP:** put log cabin siding inside. It's so cute. It looks like a log cabin inside now.
>
> **PP:** Yeah. 'Cause it's not actually log, it's like a siding stuff. . . . It was kinda just slapped up pretty much that cabin was. But . . . we painted it. I mean we've done a lot to it… but we sorta like to do that.

A female owner from Colorado Springs expressed how working on the 'cabin' made it her own:

> **RB**: I got really attached to the cabin by doin' all the work to it… on the inside. That kinda became a part of me. I made curtains for every room in the cabin and . . . I don't know, I feel like my . . . my heart is there because of the things that I've put into it.

Owners also made a distinction between working on the home and at the 'cabin'.

> **PP**: one thing nice is that… [at the] cabin you can do as much as you want and then leave. It's not like your house where you have to remodel your kitchen and live in it… We have to like wait for money for to do it. So it sort of… it gets done when the money's there and the time.

There is a sense of freedom to undertake tasks at the 'cabin' and a sense of accomplishment in doing something that he/she would find rather daunting at home. RB's husband expressed it this way:

> **MB**: I mean, I can't saw . . . two sticks together and get 'em to fit right… but I can go up there [cabin] and do things and feel like I really accomplished some things, working with my hands. And 'cause I'm not a highly skilled person in that area but… I put in the… linoleum floor. I… you know, I put in the stove.

Working on and at the 'cabin' is a way of bonding with the place, of meeting and overcoming challenges, of practising skills and above all it is enjoyable and fun. This perception seems to be created, in part, through the less stringent requirements for quality and freedom from time constraints when working on the residence than on the home.

Chaplin (1999) in her study of British second-home owners in France considers this type of work at the second home as 'consuming work/productive leisure' interpreting it as a form of escape to a ludic space characterised by a seamless integration of work and leisure.

Home and the Cabin

Despite the relatively sparse use of the cabins amounting to between 10 and 20 days a year (Table 2), these cabins play a very important part in the life-styles of the people involved. A major motive for the acquisition of second-homes has been theorized as 'escape' principally from the 'controlled, predictable, alienating world of their normal working lives' (Chaplin 1999, p. 54) to an 'idealized rural way of life' (Butler & Hoggart 1994, p. 128).

Contributors in this study expressed similar themes, for example:

> **RB**: The city gets to ya and then after a while it's nice to get a break [at the cabin]… and then come back [to the city] and you're refreshed again.

However, a contrary view was expressed by others who viewed life at the 'cabin' as more of a complement to their life at home and who expressed appreciation of the contribution of each to their total lifestyle.

> **PP**: we appreciate living here [home in Denver] after having a cabin. It's… I just can't see that other lifestyle. I can't see living in the mountains and driving to Denver everyday… I like the contrast of the two…
>
> **JP**: on the other hand, there's a lot of really interesting things to do here [Denver] that we don't do up there [cabin]… Go to art galleries or go downtown…

Aspects of 'cabin' life such as:

the contact with nature and wildlife:

> **MB**: [the family] fish with flies and lures; so we return all the fish back. But they're, like the deer, kinda part of our family. We kinda look at the fish as part of our family and the hummingbirds… it's a very large extended family.

getting in touch with a more simple lifestyle:

> **PP**: you know, the thing that's great about our cabin is… is the simplicity of it;

being part of a different, more rural community:

> **JP**: as you exit the highway and turn to the cabin... There's a lumberyard right there... It's a funky little lumberyard. And it's really fun to buy stuff and then work on the cabin. Support the little community up there, you know. It's kinda neat;

the lack of the accoutrements of modern technology

> **PR**: I guess to me, part of the neat thing about it [cabin] is it is primitive. 'N when you go up there… you don't listen to radios, and you don't watch TV, you don't have any telephone.

All provide a contrast to and complement the full lifestyle (Figure 4) experienced at home. There is little sense of the time at the cabin as an escape. Rather, return to the city and its assets are equally appreciated. As JP expresses it:

> I like it up there [cabin] because it's like... going back in time a little bit. But really it's more than that... it's a bridge between living in this urban environment that is... unnatural... [and] nature that, you know, primitive man came out of. This is a lot closer to it.

Attachment to Place

Many of the owners have either built the residence themselves or inherited it from parents or grandparents. A strong feeling of attachment is evident in owners' comments:

> **RB**: our dream wasn't just that we would like a place to relax, but it'd be a place where our children and our children's children could… build family relationships as well.

One couple sold the residence that had been handed down from the wife's family. Recently, they managed to re-lease it and commented thus:

> **JB**: we just quit going up… and so we thought, well, we'll just sell it… and then we've always regretted it… I just never *ever* thought we'd get it back. It was just like it was meant to be.

Another couple talked of special family times:

> **JP**: the aspens had turned. All of us, kids and everybody, we're just layin' in . . . layin' in a big bed of aspen leaves and just looking up and watching them come down on us… It's just unbelievable, through the yellow leaves and then how blue the skies are in Colorado.

This study suggests that attachment to place can be developed in four ways:

it arises through a desire to fulfil a 'dream' of having such a place in the forest,

as a result of a long association through family ties and childhood experiences,

as a site memorialized through family 'traditions' and stories.

by maintaining and building the residence.

Conclusions

This paper has addressed a unique type of second home; a cabin set in the forest on public land. Although this type of lease brings with it certain restrictions on the freedom of owners, at least for the Colorado owners involved in this study, the 'woodsy' nature of the residence is both appreciated and viewed as appropriate. Life in these cabins demonstrates broad similarities to that reported in other second-home studies (e.g., Chaplin 1999, Williams & Kaltenborn 1999) in that maintenance of the residence and its surrounds, contact with nature and wildlife, strong attachment to place and cross-generational continuity, a merging of work and leisure and celebration of a 'rustic minimalist' way of life are key aspects of this lifestyle.

Persistent themes in the literature on second homes are those of 'resistance' and 'escape'. However, neither of these themes is strongly represented in the narratives of cabin owners. They appear to construct life in the second home as complementary to their primary home lives which are equally rich and diverse, though different in ways that are important to the full realisation of their lifestyle. This may be due to the fact that the majority of these owners are retired and life at home is a mix of artistic leisure pursuits, voluntary community work and family. Further analysis of a broader range of narratives will be required to resolve this particular issue.

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[1] Although the strict terminology for these dwellings is 'recreation residence', contributors to this study consistently referred to them as 'cabins' For this reason, that terminology will be adopted in the remainder of this paper.

[2] 'Home' in this context refers to the dwelling which is occupied for most of the time by the contributors to this study.

Recreation Experience Preferences and Activity Profiles in a Crown Forest Landscape in Ontario, Canada

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Abstract: The use of public forested areas in Ontario, Canada is governed by the *Crown Forest Sustainability Act* that directs the management authority, the Ontario Ministry of Natural Resources (OMNR), to ensure that forest operations co-exist with other uses of the forest, especially recreation and tourism. Implementing these legislative requirements has been difficult for the OMNR: it lacks data on recreation and tourism; it lacks readily available social scientific expertise; and it lacks the necessary integrative model. The larger project of which this work is a part, focussing on the Dog River-Matawin Forest, west of Thunder Bay, Ontario and immediately east of Quetico Provincial Park, is designed to address several of these gaps.

This paper seeks to answer two of the many questions concerning how people use the forest for recreation and tourism purposes: what motivates different users and how do those motivations relate to activity profiles.

Our findings indicate that four distinct *experience preference groups* exist among the 1,556 people who used the forest for recreation and tourism purposes. When these groups are compared with four distinct activity profiles, we make connections that, when mapped (a future phase of the work), begin to indicate areas where potential conflicts might occur with forest operations or with other recreation activities.

We conclude by noting that, while knowledge about how people use the forest is interesting in itself, both an integrative framework and a scientifically-capable Ministry of Natural Resources are needed if that knowledge is to find its way into management actions to implement the requirements of Ontario's *Crown Forest Sustainability Act*.

Introduction

Recreation and tourism activities, while common and legitimate uses of public (Crown[1]) forest areas in Canada, are generally poorly understood, poorly documented and not well integrated with other uses of the forest, especially the production of forest products, in forest management plans[2]. This state of affairs has been addressed somewhat in the province of Ontario by the passage of the *Crown Forest Sustainability Act* (Statutes of Ontario 1994), legislation that was intended to see that non-timber values of all sorts were to be included when plans for forest management were developed. Details of this legislation are discussed elsewhere (see Yuan et al. 2004). In the subsequent ten years since the Ontario legislation was passed, little progress has occurred in achieving the integration of timber and non-timber values in forest management. The reasons for this failure are many, but chief among them would be the absence of social science expertise in the Ministry of Natural Resources.

The research reported here is part of a larger project that focuses on developing a framework to integrate recreation and tourism values and activities in forest management planning. Other aspects of that work, with its focus on the Dog River-Matawin forest, west of Thunder Bay, Ontario and east of Quetico Provincial Park (see Figure 1), are reported elsewhere (see McIntyre et al. 2004, Yuan et al. 2004).

This paper analyses data collected about people's activities and recreation experience preferences in the Dog River-Matawin forest. It is concerned first with identifying "activity profiles" that link related recreation and tourism activities with socio-demographic variables. Such profiles provide a useful starting point in understanding people's non-timber uses of the forest and represent a dramatic improvement on the current state of information concerning recreation and tourism in public forests. Determining the relationships between activity profiles and experience preferences comprises the second step. When data on people's experience preferences are associated with these activity profiles, one can begin to develop an

Figure 1. Dog River-Matawin Forest and Quetico Provincial Park.

understanding of how important modifications in the natural environment and the presence of other people are to people's satisfactions with their recreation and tourism engagements. Finally, and most importantly, the paper offers suggestions concerning a framework in which this kind of human dimensions information may be integrated into existing forest management planning practices in Canadian provinces.

Background

Experience Preferences

Research into people's recreation (or tourism) experience preferences has attempted to explain people's participation in activities and their pre-dispositions for engaging in them in specific settings. Virden and Knopf (1989), in testing these hypothetical relationships in real-world settings, found that the posited relationships were not as straightforward as hoped. While relationships among activities, experience preference and settings were found, they were not confident interpreting them and called for more research.

Harshaw and Shepherd (2003) have recently utilized experience preferences and activities in a forest management context, investigating the effects of changes in natural settings on recreational activities in a temporal context.

Manfredo, Driver and Brown (1983) have illustrated that certain experience preferences may be combined in "domains" representing more general experience assemblies. Both the specific recreation experience preference items and the more general domains have been tested by researchers and used in a variety of resource management applications.

Activity Profiles

Examining people's recreation or tourism activities offers a number of opportunities for researchers. Since people are participating in an activity, it is possible to collect data about the participants without having to postulate a relationship between participation and socio-demographic factors or psychological factors (Payne & Nilsen 2002). While activity profiles have been employed in the past, most notably in Canadian national parks (Parks Canada 1984, Westwind Resource Group 1987), the focus on a single activity has undermined effectiveness. Recreation or tourism activities are usually multi-dimensional, in that they change, sometimes radically. Take cross-country skiing, for example. It has fragmented into two distinct forms: classical, the original form; and, skating, with a different stride and equipment. Moreover, recreation and tourism activities are related to settings and experiences. A single activity, done in different settings, may well yield different experiences. What point, then, in maintaining an activity focus?

The approach employed here recognizes that people connect their activities to specific settings and expect certain experiences. Furthermore, people may be expected to engage in more than one activity, often a repertoire of related activities. In north western Ontario, a traditional repertoire has comprised fishing, hunting and camping. There is evidence however, that the traditional repertoire is being challenged by activities that are less consumptive of elements of the natural environment (see, for example, the National Round Table of the Environment and The Economy (n.d.) case study on Ontario's *Lands for Life* process).

The Search for an Integrative Framework

Ontario's *Crown Forest Sustainability Act* requires that non-timber values be included in decision making about forest use. The legislation does not specify how this integration should be effected, nor for that matter, what might constitute such integration. Integrative tools such as the Recreation Opportunity Spectrum have not been applied in the Ontario context: data on people's non-timber uses of forested areas is limited; and, the province's forest management agency, the Ontario Ministry of Natural Resources, does not possess the necessary expertise.

Two potentially useful approaches contained in the Ontario legislation, Resource Stewardship Agreements (Antler 2002, Hyer 2002) and Local Citizens Committees (Saunders 2003), offer particular advantages. Both turn on the notion that determining appropriate forests uses is a negotiation, where stakeholders present positions and information in support of their particular interests. Neither approach negates the utility of data on recreation and tourism uses: rather they provide contexts within which the data may be used in a more integrated form of forest management planning.

Data and Analysis

Data were collected through surveys of people who might be using the Dog River – Matawin Forest Management Unit and Quetico Provincial Park for recreation and tourism activities over the period

November, 2002 to October, 2003. This data includes information about the types of recreation activities in which people are participating, along with the timing and location of the activities. This data was collected using mail-in surveys that also included questions about trip planning, expenditures, motivations, and socio-demographic information of respondents.

The survey instruments employed used a modular approach in which a series of questionnaire modules were developed. Surveys for different seasons, populations, and distribution methods were developed by selecting the appropriate modules for each particular version of the survey. The primary focus of all versions of the survey was on a particular trip taken by the respondent. For mailed-out versions of the survey, respondents were asked to describe the last trip they had taken in the previous six months. For surveys that were distributed in person, respondents were asked to answer the questions about the trip in which they were currently participating.

The population sampled was divided into two segments: residents and non-residents. Residents were defined as those people residing in the study region, an area extending from the City of Thunder Bay west along Highways 11 and 17 to the towns of Ignace and Atikokan, and south to the Canada – U.S. border. Non-residents include everyone living outside of this region that visited or passed through the region. The sampling methodology was also split into winter (approx. November – April) and non-winter (May – October) recreation demand. A more extensive strategy of data collection was employed during the non-winter period due to the increased tourism, the nature of non-winter recreation activities, and the practical limitations of data collection during the winter months.

A total of 3,852 completed surveys comprise the data set, making it one of the largest currently available on non-timber forest use in Ontario. However, only those who reported engaging in activities in the Dog River-Matawin forest and Quetico Provincial Park, that is, 1556 respondents, were included in the analyses described below.

Data on experience preferences were collected using a modified Recreation Experience Preference (REP) scale with 20 questions representing a diversity of domains (Manfredo et al. 1983).

Results

Experience Preferences

Table 1 represents the five dimensions among the respondents' experience preferences. The five factors together account for 61.9% of the variance in the data.

Factor 1, with high loadings on experiencing risks, independence, developing skills, using equipment, self-confidence and adventure is a risk-adventure dimension. Factor 2 can be labelled as a solitude-getaway dimension, with high loadings on tranquillity, solitude, being in nature and getting away. With high loadings on being with others, meeting new people, bringing the family closer together, being with friends and sharing learning, this dimension is clearly social in nature and may be labelled as friends-family. Factor 4 represents a spirituality dimension, with high loadings on spirituality, self-confidence and First Nations (i.e., aboriginal) culture. Finally, experiencing new and different things and learning about nature load highly to form Factor 5, learning.

Table 1. Experience Preference Dimensions[1].

	1	2	3	4	5
with others	–	–	.715	–	
new people	–	–	.501	–	–
experience new	–	–	–	–	.784
learn nature	–	–	–	–	.619
solitude	–	.749	–	–	
spiritually	–	–	–	.729	
self–confidence	.603	–	–	.585	
develop skill	.655	–	–	–	
independence	.729	–	–	–	
experience risks	.754	–	–	–	
use equipment	.607	–	–	–	
family closer	–	–	.622	–	
friends	–	–	.807	–	
keep fit	–	.–	–	–	
adventure	.596	–	–	–	
FN culture	–	–	–	.703	
get away	–	.707	–	–	
share learning	–	–	.549	–	
be in nature	–	.754	–	–	
tranquility	–	.825	–	–	
Eigenvalue	3.2	3.0	2.5	2.1	1.5
Explained Variance (%)	16.1	15.1	12.6	10.6	7.5
Cumulative Variance (%)	16.1	31.2	43.8	54.4	61.9
Mean Scores	3.6	4.2	3.7	2.9	3.9

[1] Extraction Method: Principal Components.
Rotation Method: Varimax with Kaiser Normalization.
Rotation converged in 7 iterations.

Activity Profiles

Efforts focused on developing activity profiles eschewed the obvious, activity by activity, approach, opting instead to search for groupings that reflected the range of activities reported by respondents.

Hierarchical cluster analysis was employed to identify activity groups. Table 2 shows the resulting four activity groups and the proportion of respondents who participated in each activity in each of the groups.

Group 1, the largest of the four, exhibits a relatively high diversity of recreation or tourism activities in the forest but lacks a truly dominant activity. It is however a winter-oriented activity group. Group 2 is equally diverse, but with a high proportion of group members engaged in summer-time fishing and motor boating. A smaller group, Group 3, is highly diverse in activities and is dominated by canoeing, summer fishing, swimming and wildlife viewing. A final group is much less diverse in terms of activities but is dominated by canoeing.

Further information on the nature of the activity groups is provided when (Table 3) they are analyzed by respondent origin. The proportion of Thunder Bay residents in each activity group except group 4 and the proportion of Americans in activity groups 3 and 4 are quite evident.

Table 4 presents socio-demographic information about the activity groups, with significant differences recorded among the activity groups according to gender, age, education and income.

Table2. Activity Groups (%).

Activity[1]	Group 1 (n=581)	Group 2 (n=413)	Group 3 (n=281)	Group 4 (n=281)
Sights	17.7	17.7	21.0	2.5
SnoMo	15.8	2.4	0.4	–
DayHike	10.3	8.0	19.2	2.8
IceFish	21.0	3.6	0.4	–
Photo	9.3	6.5	29.5	–
Wildlife	7.6	2.7	45.6	0.7
MoBoat	0.3	28.6	13.2	0.7
Swim	0.3	28.6	49.8	–
FireWood	3.4	14.5	15.3	–
X-C Ski	7.1	0.5	0.7	–
Canoe	0.5	3.4	72.6	100.0
SumFish	1.2	89.3	66.2	–
Bike	0.3	4.4	6.0	1.8
Hunt	8.8	7.5	4.3	–
OffRoad	3.3	12.8	5.3	–

[1] "Sights" is sightseeing; "SnoMo" is snowmobiling; "Photo" is nature photography; "Wildlife" is wildlife viewing; "MoBoat" is power boating; "FireWood" is collecting firewood; "SumFish" is summer fishing; and, "OffRoad" is other motorized recreation (e.g., ATVs).

Table 3. Activity Groups and Respondent Origin (%).

Origin**	Gr1	Gr2	Gr3	Gr4
Thunder Bay	72.0	54.2	40.1	10.2
NW Ontario	19.7	14.7	11.6	3.3
Rest of Canada	4.8	4.1	10.1	3.3
USA	3.5	27.0	38.2	83.2

** chi square significant at .001 level

Table 4. Activity Groups and Socio-Demographic Variables (%).

Variables		Gr 1	Gr 2	Gr 3	Gr 4
Gender	Male	67.4	66.7	63.9	70.7
	Female	32.6	33.3	36.1	29.3
Age*	18–44	36.3	36.7	37.5	30.1
	45–64	48.3	47.6	54.2	60.3
	65+	15.5	15.8	8.3	9.6
Educat**	High school	40.5	55.2	25.9	19.2
	college	22.7	21.4	20.5	13.7
	univer	36.8	23.4	53.6	67.1
Income**	<40K	24.0	22.8	21.4	13.8
	40001–80000	46.3	54.6	41.7	42.6
	>80K	29.7	22.6	36.9	44.1

* chi square significant at .05 level
** chi square significant at .001 level

Gender does not differ significantly among the four groups: a ratio of 2:1 males to females is to be observed in all four.

Age is significantly different across the four activity groups, with activity groups 3 and 4 having a higher proportion of people between the ages of 45 and 64 and a lower proportion over the age of 65.

Educational attainment, too, differs significantly across the activity groups. Activity group 2 has a relatively high proportion of people who have attained the high school level. Activity groups 3 and 4 have over half of their members with university degrees, with group 3 at just over two-thirds.

With proportionally more people in the top income category in activity groups 3 and 4, income differs significantly across the activity groups.

A revealing element is the location where people in the activity groups engaged in their activities. Table 5 shows that Activity groups 1 and 2 were active only in the Dog River-Matawin forest, that Activity group 2 used the forest for two-thirds of its activities and that Activity group 4 primarily used Quetico Provincial Park.

Table 5. Activity Locations by Activity Group (%).

Location	Gr1	Gr2	Gr3	Gr4
DogMat	100.0	100.0	66.5	9.6
Quetico	0.0	0.0	33.5	90.4

To summarize, when analyzed the data reveals four activity groups that may be profiled in the following ways:

- Activity group 1, with a moderate diversity of activities and an orientation to winter activities lead by ice fishing and snowmobiling; overwhelmingly from Thunder Bay; a ratio of 2:1 males to females, representing all age groups, income levels and levels of educational attainment; active wholly within the Dog River-Matawin forest;
- Activity group 2, with a diverse range of activities, engaged in mainly in the summer, with fishing, motor boating and swimming dominant activities; mainly from Thunder Bay and the USA; a ratio of 2:1 males to females, with relatively low educational attainment, representing all classes of age and income; active wholly within the Dog River-Matawin forest;
- Activity group 3, highly diverse in terms of activities, with a summer orientation; drawn equally from Thunder Bay and the USA; a ratio of 2:1 males to females, with just over half the members in the 45-64 age category, relatively high educational attainment and relatively high incomes; active primarily within the Dog River-Matawin forest; and,
- Activity group 4, with the least diverse group of activities, dominated by canoeing; primarily an American group, a ratio of 2:1 males to females, with 60% between the ages of 18 and 64, with high educational attainment and higher incomes; active primarily within Quetico Provincial Park.

Exploring Experience Preference Dimensions and Activity Profiles

The following figures illustrate the differences and similarities among the means of the activity groups discussed above in relation to the four experience preference dimensions discussed earlier in the paper.

Discriminant analysis was used to identify the most important experience preference dimensions across the four activity groups. Table 6 shows the three discriminant functions generated in the analysis, two of which are significant.

Table 7 illustrates the strength of the four activity groups on the three discriminant functions.

Function 1 exhibits the importance of canoeing in differentiating the activity groups: groups 1 and 2 are not canoeing groups, while groups 3 and 4 definitely are. Function 2 depicts the role of summer fishing among the four groups. Activity groups 2 and 3 are summer fishing groups. Function 3 shows this relatively limited impact of wildlife viewing and nature photography.

Table 8 presents the highest correlations of the experience preference dimensions on the three discriminant functions. Function 1, explaining 87.1% of the variance, depicts an inverse relationship between solitude-getaway and friends-family. A less important discrimination occurs in function 2, in which solitude-getaway and friends-family are inversely related to spirituality and learning. The risk-adventure dimension is not important in differentiating the activity groups.

Figure 2 presents a graphical representation of the relationships of the four activity groups to the experience preference dimensions. The strength of the solitude and friends and family dimensions is noteworthy. So, too, is the limited role of the spirituality and learning dimensions.

Table 6. Discriminant Analysis of Experience Preference Dimensions by Activity Groups.

Function	Chi-square	df	% Variance	Sig.
1	130.53	15	87.1	.000
2	17.73	8	11.3	.023
3	2.18	3	1.6	.536

Table 7. Discriminant Function Centroids by Activity Group.

Group	1	2	3
1	–1.00	–1.90	.34
2	–2.40	1.60	–.07
3	1.70	2.20	1.00
4	3.80	–.63	–.85

Table 8. Experience Preference Dimensions Responsible for Differentiating the Activity Groups.

Dimension	Function 1	Function 2
Solitude	.790	–.541
Friends	–.501	–.518
Learning	–	.392
Spirituality	–	.543
Risk	–	–

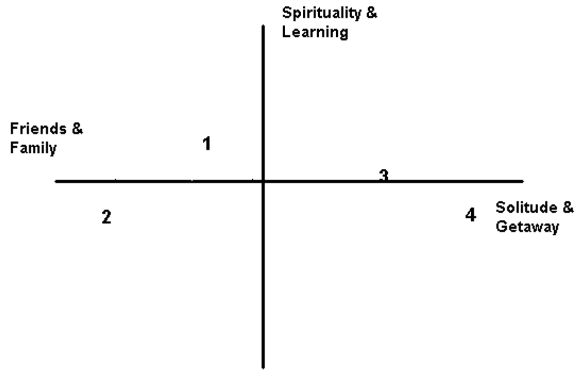

Figure 2. Graphical Representation of Activity Groups on Experience Preference Dimensions.

To summarize, the activity groups differ somewhat from each other on the experience preference dimensions in the following ways:

- Activity group 1 is oriented somewhat to the spirituality and learning dimensions and slightly to the friends and family dimension;
- Activity group 2 is highly oriented to the friends and family dimension;
- Activity group 3 is moderately oriented to the solitude and getaway dimension; and,
- Activity group 4 is highly oriented to the solitude and getaway dimension.

Discussion

At the outset, the intentions of this paper were the following:

- To determine the dimensions of experience preferences among recreationists and tourists in the Dog River-Matawin forest and Quetico Provincial Park;
- To use an activity profile approach to understand recreation and tourism activities in the study area;
- To examine the possible associations between experience preferences and activity profiles; and,
- To make recommendations for integrating information of recreation and tourism use of the forest in forest management planning.

Five experience preference dimensions were determined: getaway and solitude; risk and adventure; friends and family; learning; and, spirituality. With the possible exception of the spirituality dimension, these are commonplace expressions of experience preference in natural settings. The fact that this diversity of experience preference exists in a forest environment that is being logged is a useful finding, given the intentions of the *Crown Forest Sustainability Act*. Two of the dimensions – risk and adventure and friends and family – are not inconsistent with forest harvesting activities. However, the other two dimensions – getaway and solitude and spirituality – may well be more sensitive to the kind of changes in the forest landscape wrought by forest harvesting. They may also be the sort of experience preferences that may be met by Quetico Provincial Park.

The identification of four recreation and tourism activity profiles shifts the focus away from an activity by activity approach to integrating non-timber uses into forest management planning. The activity profiles discussed in this paper are different from each other in several ways.

– Activity group 1 is characterized by a winter-orientation in which ice fishing and snowmobiling are important activities. Most members of this group are from Thunder Bay and two-thirds of them are males.
– Activity group 2 is a motorized summer fishing group, whose members come mainly from Thunder Bay but, to a lesser degree, from the USA. Like the first group, it is two-thirds males, but with the lowest educational attainment among the four.
– Activity group 3 is also a summer fishing group, but one that canoes, swims and views wildlife. Members are equally from Thunder Bay and the USA. Although members are two-thirds male, the group is somewhat younger, better educated and slightly more wealthy than the previous two groups.
– Activity group 4 is a canoeing group that is composed mainly of Americans. This group might also be labelled the “Quetico” group because that is where they are canoeing in the study area.

The activity groups also point to the utility of a modified activity focus for managers. The activities of canoeing, summer fishing and ice fishing/snowmobiling provide useful indicators of recreation and tourism groups in the forest and in Quetico Provincial Park that might be the focus of monitoring and programming.

The activity groups are differentiated by several of the experience preference dimensions. The risk and adventure dimension is the most important in the data, but its influence is spread over all four activity groups. The other four dimensions are connected to the activity groups in a number of ways. The winter group, activity group 1, is characterized by its friends and family and spirituality and learning dimensions. The social element inherent in ice fishing and snowmobiling is clearly visible. Activity group 2, the motorized summer fishing group, is even more a social group for whom friends and family are as important as the activities themselves. Activity group 3 eschews the motorized aspects of summer fishing, preferring a non-motorized orientation and activities of a less consumptive type. Activity group 3, the canoeists, highly prefer solitude and getaway, experience dimensions in relatively short supply in the Dog River-Matawin forest, but much more available in Quetico Provincial Park.

Recommendations concerning the integration of recreation and tourism use in forest management planning remain to be worked out. One lesson from the research reported here is clear: the subtle nuances of people’s use of the forest for recreation and tourism use requires more than mere representation from activity=based user groups. What is needed is a forum where users of the forest may express the relationships between their activities and experience preference dimensions. At this time, Local Citizens Committees and Resource Stewardship Agreements are attractive in their potentials to involve users in negotiating forest uses. However, there is not currently a participant who can bring the sort of social science data and information discussed here into the decision making process. In Ontario, this more analytical role might be played by the Ministry of Natural Resources, had it the scientific capability.

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[1] Forested areas not privately owned in Canada are vested in the Crown (i.e., the Canadian head of state), but administered by provincial governments, under Section 92A of the Canadian *Constitution Act* (1867). In the province of Ontario, the Ministry of Natural Resources, wielding the *Crown Forest Sustainability Act*, is the agency responsible for forest management.

[2] The more integrated form of forest management practised in the province of British Columbia would stand as the exception to this generalization.

Outdoor recreation activities in nature protection areas – situation in Germany

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Abstract: Within a research project of the Federal Nature Conservation Agency, the Institute of Outdoor Sports and Environment points out new developments in outdoor activities in several German landscapes significantly used for sports activities. Therefore two different types of landscape analysis were chosen: First the monitoring of selected sports activities in landscapes with special equipment respectively high frequented by sportsmen (top-spot method) and second the recording of the real utilisation of near-natural landscapes (area method). The results of the scientific analytics were combined with sociological knowledge to describe the development of outdoor recreation in different sport activities (e.g.: canoeing, climbing, paragliding or canyoning). Considering these results the possibilities and the limits of modern concepts of guidance are discussed. Convenience offers, the use of police law or the establishment of a new outdoor culture (depending on Scandinavian standards) will attach great importance to minimize stress and interference in natural landscapes. It is shown that the changes in outdoor activities offer the possibility for a sustainable use of the German countryside for recreation as well as for environment.

The Significance of Outdoor Sporting Activities

Fun, self-realisation, independence, spontaneity, and individuality combined with nature experience are the key characteristics of modern sports. Most of the outdoor activities satisfy these current demands of society. The growing popularity is reflected by the number of members in sport clubs which offer outdoor sporting activities.

In Germany sports such as climbing, horseback riding and scuba diving are increasing and golf is even booming. Other sports, like skiing for example, continue to be popular. Apart from the sportsmen and women, who are traditionally organised in clubs, there is a significant number of people who pursue the new outdoor trend sports.

It is very difficult to estimate the number of people who pursue these sports though, as their popularity is often short-lived. It is easier to make assumptions with respect to the development capacity (Table 1).

Table 1. extension, stage and prospect of development of new outdoor activities.

Sport	Extension (in relation to other activities)	Stage of development (Lamprecht & Stamm 1998)	Prospect of development
canyoning	low, only commercial	saturation	continuity, no further increase
carving	very high	diffusion/saturation	no public relevance
ice climbing	very low	innovation	no public relevance,
kitesurfing	medium	innovation/diffusion	well, replace surfing
mountainbiking	extremly high	saturation	no further increase, small decline
nordic-walking	low	innovation	booming, well increase
snowshoeing	low	diffusion	slow increase
snowboarding	very high	saturation	consistent high
wakeboarding	medium	diffusion	limited by sport facilities
Whitewater-rodeo	low	diffusion	Small public relevance

Methodology

Spatial Requirements

Outdoor activities and all the new trends have spatial requirements and affect nature and the landscape as much as the constantly changing behaviour of the user groups. Possible consequences are:

– the development of new areas,
– different intensity of utilisation in areas already used for sporting activities
– longer duration of activities
– added up effects of multiple use, which exceed the overall effects of single utilisation
– leaving traditional sport areas
– making other or less use of previously utilised areas
– shorter duration of activities

To evaluate the possible effects of selected sporting activities, which depend on certain landscape structures, areas all over Germany were analysed. Detailed spatial analyses are based on case studies, adopting two different approaches:

The first approach looked at the land use of different selected sports in areas that are particularly suitable and therefore frequently used (the so-called 'top spot' approach). 'Top spots' are those areas, which offer good or excellent conditions for one or several related outdoor activities. In Germany there are top spots for almost all of the outdoor sporting activities.

The second approach examines the utilisation of nature and the landscape in selected outdoor sporting areas and regions (the so-called 'model area approach').

This double approach made it possible to describe the complex land use patterns, especially regarding multiple use, in a relatively easy way. The model areas and top spots were selected according to the following criteria:

– quantity and extent of different outdoor activities
– which sports were pursued
– availability of geographic data, as well as information on nature protection and the sporting activities
– familiarity with the area of the people collecting the data

In the regions Obere Rur and Siegaue, both in the federal state North Rhine–Westphalia, canoeing was examined, to analyse climbing the red sand stone rocks of the Rureifel, North Rhine-Westphalia were looked at (Stumpf 2002). Studies on paragliding were undertaken in Oberallgäu, Bavaria (Olbrich 2002). Water bodies in the Cologne area are top spots for scuba diving (Hoffmann 2001) and the island Norderney, Lower Saxony is most suited for surfing (Lutz 2002). Hiking, mountain biking and snow sports were analysed in the low mountain ranges Black Forest, Baden-Württemberg and Sauerland, North Rhine-Westphalia (Roth & Krämer 2000, Roth et al. 2001).

Land Use Analysis

The land use analysis of outdoor sporting activities was done in four steps:

1. Analysis of the activity areas and opportunities by using existing data and collecting new data.
   Among other reasons outdoor activities distinguish themselves from other sporting activities because they do not depend on special facilities. The natural landscape serve as a sporting facility. As a result, the utilised river, rock or the ground itself, as well as the provided infrastructure (paths or clearings) represent opportunities for sporting activities. Increasingly, such opportunities are created for the purpose of outdoor sporting activities.
2. Analysis of existing spatial data relevant to nature protection and landscape management.
   Protected areas, biotopes, habitats and the overall scenery are important to nature protection and landscape management. Conservation targets regulate which forms of utilisation are permitted or prohibited.
3. Analysis of the actual land use through sporting activities.
   Land use can generally be described with the help of information about place and time. This is also true for the use of nature and the landscape, although the essential information is the kind of utilisation. The spatial analysis is based on surveys and mapping. The following factors are included:
   – used area
   – spatial extent of utilisation
   – time and duration
   – intensity of utilisation
   – peak times
4. Combining all geometric and factual data by employing Geographic Information Systems (GIS).
   To illustrate, link up and evaluate all the collected spatial data GIS ArcView 3.2 and ArcMap 8.1 by ESRI are applied. Official topographic maps with the scales of 1:50.000 and 1:25.000, as well as digital orthophotos und digital terrain models form the basis. The data is available from the respective State Surveying Offices or the Federal Office of Nature Protection.

Results

The research project analysed the outdoor activities canoeing, climbing, paragliding, scuba diving and surfing, as well as hiking, mountain biking and snow sports. For each sporting activity some of the results, which are relevant to future land use development, are presented in the following.

A detailed presentation of all the results found for each sport, as well as an in depth description of the specific demands placed on the landscape would go beyond the scope of this article. The complete results are published in the research report (Roth et al. 2004).

Kayaking and Canoeing

Observations indicate an increase of canoeing, especially on weekends, and a big demand for high quality services and attractive offers. Canoeing is easy to learn and canoes can be rented even without prior experience. Furthermore canoeing is supported by politics (cf. Ministerium für Wirtschaft des Landes Brandenburg 2001).

Nevertheless, the targets of the tourist sector do not comply with the efforts of nature protection to reduce the number of people using inland waters. As canoeing makes use of valuable ecosystems, planning, management and environmental education must ensure a sustainable development of the canoeing sector. An example of this is the LEADER II project 'ecologically friendly canoeing', funded by the European Union.

Continuously growing interest in canoeing will lead to a more intensive utilisation of designated waters (cf. Strojec 2002). Depending on the season, there will be intense concentrations of visitors along these waters. Simultaneously, individualists will try to avoid crowded areas and make use of waters in East Germany or neighbouring countries (France, Scandinavia).

Canoe rodeo has developed as a new type of activity. Mostly young paddlers spend a lot of their leisure time practising this sport along designated stretches of water. If this reduces the amount of water stretches available to common canoeing is unknown. Altogether, it can be assumed that more time will be spent on canoeing.

Climbing

Indoor climbing is booming in Germany. There is a new type of climber who solely does indoor climbing and does not consider climbing as an outdoor activity. The number of rock climbers also increases, but only moderately when compared with indoor climbers.

Due to the better training conditions indoors the performance has improved significantly. Moreover, climbers achieve better performance levels within shorter periods of time. At the same time, performance becomes more important. As a result climbers make use of designated climbing areas or difficult climbing routes more frequently. The development of new routes is desired, but in most northern and central German climbing areas it is prohibited to develop new climbing routes.

The majority of climbers prefer secure climbing routes. Secure climbing facilities attract more people than other climbing areas. Simultaneously, bouldering developed as a sport in its own right. Therefore, it is very likely that smaller rocks are increasingly used for climbing activities as well.

Many climbers spend the larger part of their vacations climbing and are very mobile. Often, they visit climbing areas abroad. Southern France, north Italy, Switzerland and Sardinia are especially popular. Even journeys to far away places are fairly common (Thailand, USA).

Paragliding

The development of new materials (e.g. improved canopies) enable more paragliders to stay in the air for longer and use the thermals more efficiently. Even if the conditions are not optimal, altitudes above launch levels are easily gained. At the same time, the number of trips to launching points per day and therefore the number of take-offs and landings is decreasing.

Based on intensive exchange of information with numerous experienced paragliders and own observations it can be concluded that there is a tendency towards growing utilisation of sites in low mountain ranges. The excellent performance of modern canopies makes it possible to start on less steep slopes. In low mountain ranges the thermal conditions are partially good, in some regions (e.g. Mosel valley) even excellent. Nowadays, under the right conditions the use of an efficient canopy makes it possible to launch from almost any hill. This may lessen the impacts on the Alps since long flights are also possible outside of alpine areas. It remains to bee seen if the increased choice of paragliding areas leads to higher numbers of paragliders. So far, there are no indicators for such a development.

Scuba Diving

In proportion to the total number of scuba divers, only a small number of the German divers also go diving within Germany. Nevertheless, there is great interest in scuba diving and every year many people take up diving, especially during vacations.

Potential impacts on the environment, particularly caused by beginners, are therefore exported to other regions of the world. In Germany scuba diving is pursued all year around. Only very few people dive under ice though. Diving at night is common and enables divers to observe nocturnal fish. An impact assessment is needed to determine what effects the increased diving activities have. Different cases may have to be looked at individually.

Surfing

In Germany the wind surfing boom is over and the number of wind surfers is currently declining. In contrast, kite surfing is becoming more popular. As kite surfing does not require strong winds it may prove to be an attractive alternative to windsurfing in the future. But, kite surfing will hardly become as popular as wind surfing used to be, because it involves bigger risks (cf. Kirsch 2002).

Another obstacle to a wider spread of kite surfing is that it requires a lot of space due to the difficult steering and the long flying lines. For these reasons this sport is prohibited on many small or medium sized inland waters. Best conditions for this sport are found along the north German Baltic sea coast. It is very likely that kite surfers will look for new suitable beaches that they can make use of.

Depending on the length of the flying lines, a kite can be up to 50m high in the sky. Therefore, kites are much higher than the dunes or dykes. It has not been analysed yet what impacts this may have on e.g. the beach bird populations.

Hiking

Traditionally, enjoying nature and a feeling of well-being are of importance to hikers. Diverse paths along ridges and at high altitudes are preferred, whereas hiking through dense forests is not very popular. German hikers generally expect perfect signposting and path networks, guiding them through the landscape. Moreover, hikers prefer natural paths and oppose paved roads (Naturpark Südschwarzwald 2003a).

As a result of the recent health and fitness boom, nature based endurance sports such as hiking are rediscovered. The feeling of well-being achieved through the relaxing and health supporting aspects of hiking, as well as nature experience play a crucial role. Apart from traditional hiking, new variations, like Nordic walking for instance, are developed and marketed. Furthermore, there are attempts to market hiking as a year around sporting activity as winter-time hiking, Nordic wintertime walking or snowshoe walking (Naturpark Südschwarzwald 2003b, c).

Consequently, the aim is to develop well organised services of high quality that are offered throughout the year. Due to the landscape dynamics, hiking path network must be modernised continuously. In the coming years the amount of hiking paths will rather be reduced and only in a few cases new paths will be constructed. A hiking path system which complies with the needs of nature protection is an important tool of visitor flow management, especially in ecologically sensitive areas.

Mountain Biking

Mountain biking offers good possibilities to extend services and address a new target group, particularly in low mountain ranges. Individual regions increasingly advertise their mountain bike path networks. Guided tours are offered as part of a package, including accommodation and other services. Land use planning, which considers the requirements of sporting activities as much as the demands of nature protection, may help to avoid conflicts. At the same, management measures may make the area more attractive as more services are offered (cf. Naturpark Südschwarzwald 2003d).

For those mountain bikers who are interested in modern technologies, the Global Positioning System (GPS) opens up new possibilities of orientating themselves without using a map. At the moment, the failure of the system inside forests and in narrow valleys still hinders the wider use of this technology. Once GPS can be successfully applied though, digitised routes could provide additional information to maps and route descriptions and contribute to visitor flow management. Mountain bikers are a suitable target group for this as they are open to new technology.

Traditional events organised for mountain bikers (marathon, down hill or cross country races) will rather decrease in Germany. Many of the larger events will concentrate less on competitions, but offer more opportunities for everybody to participate (cf. Jakob et al. 2001).

So called bike parks, also known as fun parks or bike courses, represent a relatively new development in Germany. Generally, various disciplines are offered on several tracks in designated areas (e.g. ski slopes with lifts). Additional services such as equipment rental, courses and special events complete the offered services.

In many German forests hunters are particularly opposed to permanent mountain bike path networks similar to the hiking path system, because they fear restrictions on hunting, especially with regard to hoofed game in the forest. In this context the German hunting rights and the custom of leasing hunting grounds must be pointed out. Contracts issuing permissions or the reduction of the lease value are chiefly discussed in the red deer preserves of the low mountain ranges.

Snow Sports

The guarantee of snow in skiing resorts is not only a key issue of discussions about the future of snow sports in Germany, but also in other countries. In order to compensate for the lack of snow, many areas have invested in snow machines. But it must be kept in mind that these machines are only profitable and ecologically acceptable under specific conditions. According to legal regulations, impact assessment must ensure that certain requirements are met, before a snow machine can be utilised. The decrease of the number of winter sport areas will lead to a concentration of snow sports in areas which can guarantee snow with the aid of snow machines and offer other services of high quality (cf. Scheiber & Klenkhart 2000).

The visitor demands placed upon alpine skiing areas have changed with overall societal change. So called mountain worlds, which extend over vast skiing areas, are popular. Therefore, suitable areas offer extensive services aimed at the various target groups. Visitors can choose from the variety of services according to their own preferences, without having to organise anything themselves. Nowadays, events, fun parks and service centres are part of the basic facilities skiing resorts offer (cf. Roth 2002).

Another recent development as a result of the lack of snow is indoor skiing and snowboarding. In Germany altogether three indoor skiing facilities are already in use and more facilities are planned. The market economy promotes snow sports in order to attract more people. Nearby skiing areas in low mountain ranges, which can guarantee snow, are supposed to serve as training areas, waking the skiers' interest, so that they will then proceed to spend their winter holidays in the Alps (cf. Türk 2004).

Outdoor Activities and Land Use

Sports and nature protection look at land use from clearly distinct perspectives. Whereas environmentalists rather look at the potential and actual protection categories of an area, outdoor sporting activities evaluate that same area according to its suitability for the various activities and recreation. Different subjective perceptions of the same area could not be more distinct.

But from a neutral point of view, there is one major commonality: often the same parameters are used to analyse the qualities of a biotope and a sport area. For example, in Germany the biotype or geotype 'inland rock formation' is a habitat of indicator species such as the eagle owl (*Bubo bubo*). At the same time, these rocks are important vertical climbing routes. Consequently, the overlapping interests continuously cause conflicts

Land Use

Outdoor activities is only one of many land uses. Therefore, impact assessment of outdoor sports must take into consideration other utilisations and the general conditions of nature and the landscape. Outdoor activities concentrate on water (2% of the total national area), forests (29%) and extensively used agricultural area (cf. Bundesamt für Naturschutz 2002). The larger part of German territory is not suitable for these activities.

Increasing sealed surface because of settlements, industrial constructions and traffic infrastructure have an impact on almost all types of biotopes. This habitat loss is one of the major causes for endangering many animal and plant species. According to the Federal Office for Nature Protection (Bundesamt für Naturschutz 2002), 33% of all biotope types are highly endangered, another 15% are in danger of extinction. The effects of the different causes, which do not lead to complete destruction of an area, depend on how sensitive each biotope is.

Outdoor Activities

To evaluate the land use of outdoor sporting activities different categories must be formed, according to the used area, the preferred time of the year or equipment. As a result, different terms will be used, e.g. snow sport, summer sport, mountain sport, water sport, flying sport and so on. For each utilised area a systematic categorisation of the outdoor sporting activities should be developed, taking into account the joint requirements of various sports.

It can be useful in many ways to subdivide activities according to the type of utilisation of nature and the landscape. Table 2 presents a possible subdivision with examples.

Table 2. Outdoor activities according to the type of land use.

sport	type of utilisation
activitites, using directly the natural resources	
hunting	removal of game, wildlife management
fishing	removal of fish, stocking up
gathering	removal of berries or mushrooms
activities interfere natural landscape by constructions	
skiing	pists, lifts or artificial snowmakers
golf	golf course
activities using the existing infrastructure in landscape	
canoeing	utilisation of existing watercourse
hiking	utilisation of existing paths and trails
mountainbiking	utilisation of existing paths and streets

This subdivision does not provide very much information about the environmental impacts of each activity. To do an impact assessment it is necessary to look at each case individually and analyse the removal of animals or plants with respect to sustainability, the extent of interference, as well as the degree of disturbance.

Additionally, it must be borne in mind that the intensity of utilisation greatly depends on the type of activity and the environmental behaviour of the visitors.

Development through outdoor activities

Many outdoor activities require specific landscape structures. Frequently, alterations of certain landscape elements are necessary. Typical examples are boathouses, landing stages, lifts, as well as car parks and access roads. Generally, such developments are only possible if those sports are of economic importance. Often they induce further development.

In Germany the cultural landscape usually offers sufficient infrastructure, which was originally developed for other purposes, but can also be used for outdoor activities. This form of development grants sportsmen and women access to close to nature landscapes, which they would not have otherwise. An example for this is the utilisation of forest roads and paths for hiking or mountain biking. In theory both activities could do without these roads, but in practice they depend on such an infrastructure. On top of that, even in well developed cultural landscapes there is room for further development, if it suits the interests of sport tourism (construction of special paths, widening of paths etc.).

A categorisation of outdoor activities according to their degree of influence on further development seems to be difficult. Sporting activities undergo changes. Moreover, for one and the same activity the existing structures may be sufficient or require further development, depending on the demands of the people. The current situation is illustrated graphically in Figure 1. In this context it is to be noted that not every development for sporting purposes leads to the

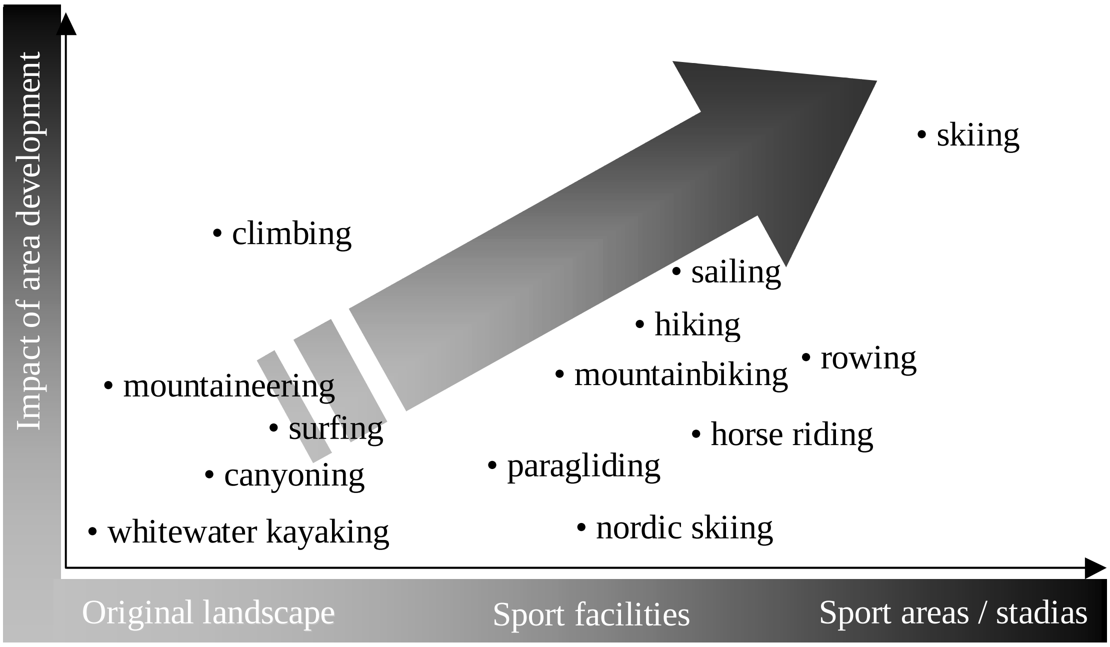

Figure 1. Correlation between the impact of area development and the use of sport facilities by outdoor activities.

construction of extensive facilities. Many developments proceed very slowly, e.g. through repeated use of a certain path, a place for swimming or a slope. Changes can only be noticed after observations over a long time.

Only very few sporting activities do not require any development of the landscape. These sports do not alter the used landscape. Therefore, they could be considered to be the ‘true’ nature sports. Originally, white water rafting, for instance, was a sport that made us of undeveloped landscapes. In Germany, suitable areas for these types of sport are almost impossible to find though. The few areas that would be adequate are mostly rare areas of very high ecological value. This leads to an almost schizophrenic situation, as outdoor activities which require the least space are criticised most.

Provisions for and through Sports

Areas suitable for outdoor activities are often areas of high ecological value. They serve as habitats for specialised animal species and are sites of diverse plant associations. Factors that promote human health, such as clean air or relaxing nature experience, are also evident. Exercise in these surroundings contributes to healthiness for different physiological and psychological reasons.

There is a demand for enjoying nature and active as well as restful recreation. Also, the duties of the legislature regarding provisions for recreation, also in terms of outdoor sporting activities, are clearly defined (cf. Federal Law of Nature Protection). But, in Germany there are not enough areas to meet the demands of sporting activities in natural landscape and to ban sports from protected areas at the same time. Consequently, outdoor activities will largely continue to be pursued in protected areas.

Nature protection laws require that sports make use of the landscape in a sustainable manner and respect the intrinsic value of nature. Especially in priority nature protection areas sporting activities must not interfere with the conservation targets, requiring very strict regulations. Spatial and temporal restriction of use must be accepted and the maximum capacity must not be exceeded. In exceptional cases a total prohibition of sports must be accepted, if sporting activities are absolutely not compatible with conservation targets (cf. DAV 2003). Furthermore, nature protection and sports must cooperate to ensure that voluntary agreements are kept.

The incorporation of sports into the nature protection legislation and the associated duty of providing for recreation require that the management of protected areas takes into account the needs of outdoor sporting activities and recreation. In Germany new management approaches must be developed to avoid future conflicts and to solve existing problems.

Integrative models for the combination of nature protection interests and recreation provisions, as we know them from the USA for example, do not exist yet. The development of a *Sport Area Management System* (Krämer et al. 2004, Krämer in prep.) as part of the sport tourism concept for the Southern Black Forest Nature Park is a promising step forward, however.

If instead of modern management repeated calls for the banning of outdoor sporting activities in order to provide sites for nature conservation purposes (e.g. national parks, biosphere reserves, nature protection areas or FFH areas) were to be acted upon, it would mean the end of numerous outdoor activities in Germany, or a catastrophe for the remaining sites, which would not be able to withstand the resulting over utilisation without being subject to grave damage. The concentration of activities on a small remainder of sites would result in a loss of the quality of recreation. The great demand for suitable facilities also means increases in the numbers travelling abroad, as is already happening in the case of certain sporting activities (climbing, whitewater kayaking, alpine snow sports). Many of the consequences are already known. Ultimately the problems described are not solved, merely shifted.

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Characteristics and Use Patterns of Visitors to Dispersed Areas of Urban National Forests

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Abstract: Public recreation areas near large urban centers are experiencing increasing pressure from visitation, especially in undeveloped and wildland areas that are close to expanding population centers. Understanding the use patterns, characteristics, and perceptions of recreation visitors is critical to managing these areas for maximum sustainable benefits. Of the over 120 National Forests in the United States, eighteen have been officially designated as 'Urban', because of their proximity to large metropolitan areas. Sixteen of these forests have designated Wilderness areas within them. This paper examines the recreation visitors to the undeveloped portions of those National Forests. Key market segments of visitors are identified with respect to demographics, residence, annual use frequency, and visit duration. In addition, visitor perceptions of crowding and safety and their relationship with visitation levels are examined.

Key Words: Urban forests, use patterns, visitor perceptions, crowding, visitor characteristics, demographics, wilderness.

Introduction

In the United States, eighteen of the approximately 120 National Forests have been identified as 'Urban Forests'. The designation indicates that these forests are within 50 mile of one or more large (over 1 million people) urban concentrations. Sixteen of these urban forests contain designated Wilderness. Eight of the urban forests are located close to cities that have warm weather almost year round. These include: Los Angeles (CA), San Diego (CA), Phoenix (AZ), Albuquerque (NM), Atlanta (GA), Jacksonville (FL), Orlando (FL), and Talahassee (FL). The other eight are near cities with cooler climate and noticeable winter use season: Portland (OR), Seattle (WA), Salt Lake City (UT), Denver (CO), Boston (MA), and Providence (RI). Together, these forests cover about 22.6 million acres of land, including almost 4.7 million acres of designated Wilderness. Urban Forests are a very important recreation and open space resource for their proximate urban populations. Consequently, a number of management issues center around the volume and timing of visitation, and certain characteristics of the visitors and their behavior. A list of the challenges for Urban National Forests can be seen at the website: www.fs.fed.us/recreation/permits/urban/urban02.htm.

The lack of information about visitor volume and characteristics, particularly to the undeveloped portions of those forests, can significantly hamper management effectiveness. Identifying key market segments of visitors can help in effective dissemination of information, building coalitions of stakeholders, and designing programs to mitigate conflicts among users. This paper focuses on an empirical examination of users and use patterns of visitors to dispersed areas in these national forests.

Data

The Forest Service's National Visitor Use Monitoring (NVUM) program is the data source for this analysis. From January 2000 through September 2003, the NVUM program has sampled visitors on every National Forest to estimate visitation volume and describe visit characteristics (English, et al., 2002). The approach involved estimating visitation and surveying visitors on a sample of days at developed recreation sites, access points to the general undeveloped forest area, and access points to designated Wilderness. Across the 16 forests, an average of 73 days of sampling occurred in General Forest Areas and 39 in Wilderness. The average number of individuals sampled in those categories was 426 and 188, respectively.

Interviewed visitors were asked about visit duration, activity participation during their visit, demographic information of gender, race, age class, and home ZIPCODE, as well how many times per year they visited the forest for recreation. A subset of visitors was asked questions that enable recreation economic analysis, including annual use of the forest for their primary activity, and how much they spent on this visit to the forest in the local area. A different subset was asked questions regarding satisfaction and importance ratings for a number of access, service, and environmental quality items, and their perception of crowding at the site visited.

General Results

Visitation

Urban forests accommodate a larger than average share of visitation. Total national forest recreation visits to the 16 urban National Forests that contain Wilderness number nearly 50 million, or almost one-fourth of all visits estimated for the entire National Forest System. However, these forests account for only about eleven percent of the approximately 192 million acres of land in the National Forest System. In dispersed areas, these sixteen forests absorb about one-fifth of the visits to general forest area land (29 million out of a national total of about 135 million). The Urban forests contain about 13.5 percent of the total Wilderness acreage managed by the Forest Service. The 3.2 million Wilderness visits that occur on these 16 forests represents nearly one third of the total visits to all Wilderness managed by the agency.

The monthly distribution of visitation to these forests differs markedly between warm-climate and cool-climate forests (Figure 1). There is a greater concentration of visitation during the summer months in the cool-climate urban forests, because many parts of the forests are inaccessible due to snow from November through April. Wilderness use is especially concentrated – over 60 percent of all Wilderness visitation to these cool-climate forests occurs in July, August, and September, and only about 10 percent from November through April combined. In contrast, visitation to Wilderness in the warm-climate urban forests is very evenly distributed throughout the year, with about 7% of visitation in each month from November through April. During summer months the proportion rises to only a little less than 10 percent per month.

Visitor Origin

Local visits were those taken by people who lived within 50 miles of the forest. Slightly less than sixty percent of visits to the dispersed area of these forests were made by local residents. The proportion of visits made by local residents was different between the warm and cool weather forests. For urban forests in warm-weather climates, about 70% of visitation was from people who lived in the local area, versus only 52 percent for urban forests in cool climates. The proportion of visits made by locals was not different for Wilderness versus general dispersed forest areas.

Frequency of use

A large portion of visitors reported making only one visit to the forest in the previous 12 months. However, a fair number indicated that they visited several times per month, and a few visited daily. Three frequency of use categories defined were:

– Frequent users: visited at least 35 times per year.
– Regular users: visited at least 5 but fewer than 35 times per year.
– Infrequent users: visited fewer than 5 times per year.

Frequent visitors accounted for about 22 percent of all visits to the dispersed portions of the urban national forests, regular users for just over 40 percent, and infrequent users slightly less than 38 percent. These percentages were essentially the same for both warm and cool climate forests. As well, the percentage of visits for each of the frequency categories was the same for Wilderness as for the general forest area.

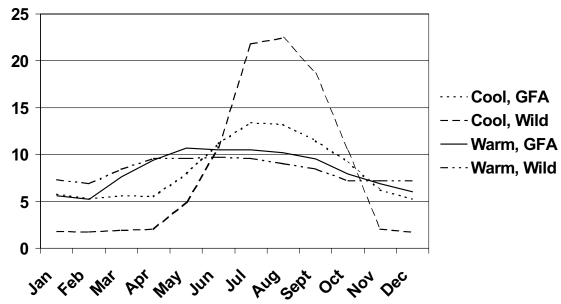

Figure 1. Monthly distribution of visitation for urban national forests, by climate type and dispersed area type.

Frequent users are a relatively small group of individuals. Despite accounting for 22 percent of the visits to the dispersed area of these forests, the frequent users make up only about one percent of all the individuals who visit the forest. Regular users make up slightly more than 12 percent of all visiting individuals. The remaining 87 percent of the people who visit these forests fall into the infrequent user group.

Defining Visitor Segments

Visitor segments were defined by cross-classifying visits by frequency of visit category, and local/non-local residence. Analysis was performed to see if the size of these segments were different for either climate type. The first segment was defined by frequent visitors (Table 1). Nearly all of the frequent visitors were local residents. Within that frequency category, locals outnumbered nonlocals by about nine to one in both visits and visitors. We assumed that the few frequent users who were not local residents were likely to behave similarly to the local frequent users, and in any case were too small a group to merit a separate segment.

Table 1. Defining visitor segments for urban national forests.

	Visit frequency		
	Frequent	Regular	Infrequent
For All Forests	(>34/yr)	(6 – 34/yr)	(<6 / yr)
Visit distribution (%):			
Local Residents	19.5	29.8	18.9
Non-Local Residents	2.5	10.7	18.7
Visitor distribution (%):			
Local Residents	0.9	8.7	39.5
Non-Local Residents	0.1	3.5	47.3
Warm Climate Forests:			
Visit distribution (%):			
Local Residents	20.4	33.5	12.8
Non-Local Residents	1.9	7.6	23.9
Visitor distribution (%):			
Local Residents	1.0	10.2	32.8
Non-Local Residents	0.1	2.7	53.1
Cool Climate Forests:			
Visit distribution (%):			
Local Residents	18.8	27.1	15.2
Non-Local Residents	3.0	13.0	22.9
Visitor distribution (%):			
Local Residents	0.7	7.8	30.3
Non-Local Residents	0.2	4.1	56.9

Regular users were divided into two segments based on residence. Local, regular users accounted for almost thirty percent of the visits but less than nine percent of the visiting individuals. Non-local, regular users comprised slightly less than 4 percent of visiting individuals, and accounted for 10.7 percent of visits. The final segment was made up of infrequent users.

There was very little difference in the size of the segments with respect to either visits or visitors when the forests were divided into warm and cool climate forests. For both climate types, about twenty percent of visits were made by local, frequent users, and just under one-fourth by non-local, infrequent users. The most noticeable difference was that for regular users, the proportion of visits made by locals versus nonlocals was about 6 percent different across climate types. Examining the proportion of visits and visitors by type of area in the forest (Wilderness versus general forest area), showed almost no differences from the overall percentages shown in Table 1.

Describing Visits Made by the Segments

Characteristics of the visits made by people in each of the segments were compared to explore how the people who made up the segments used the forest (Table 2). The segments are arrayed from those who have the most contact with the forest (frequent visitors) to those with the least (infrequent users). Of the regular users, we would expect locals to have more contact than the regular non-local segment. Note that the comparisons in Table 2 are of the visits made by the persons in each segment, not of the individuals themselves.

Demographics

Seventy-six percent of the visits made by people in the frequent use segment were made by males in that segment. For the local regular users, the percentage was about the same (75.6 %), and only slightly less (74.1) for the non-local regular users. However, for the infrequent users, the percent of visits made by males was only 67.6 percent.

Across all segments, the vast majority of visits were made by whites. Between 93 and 94 percent of visits made by both the frequent users, and the regular, local users were by whites. For the other two segments, the percent of visits made by whites was about 90 percent. There was very little difference and no strong patterns in the proportion of visits made by people in various age classes across the segments.

Visit duration

Visits by frequent users had the shortest duration, whether measured by the average (4.5 hours) or median (2.75 hours) visit length. The measures of visit duration for visits made by the regular local users were about the same as for the frequent users. Visits by the regular, non-local visitors averaged slightly more than 12 hours in duration, and about half of the visits by these individuals lasted more than four hours. The infrequent users had the longest average visit duration, slightly more than 25 hours. However, their median visit duration was about the same (4.25 hours) as for the regular non-local segment.

Activity Participation

Across all segments, over 45 percent of visits include participation in one or more of four activities: Hiking/walking, viewing natural features, viewing wildlife, and a general relaxing/hanging out activity. Among the other activities, two showed distinct patterns across the array of segments. The percent of visits that involved developed camping was only 3.3 percent for frequent users. The percentage increased to 5.2 percent for regular, local users, 8.2 percent of regular, non-local visitors, and 11.0 percent for infrequent users. Off Highway Vehicle (OHV) use was most common for local users, including the local-dominated frequent visitor segment (12.6 percent of visits included OHV use), and the regular local segment (14.4 percent of visits). In contrast, less than five percent of visits by the infrequent user segment involved OHV use.

Primary activity

Over one-third of the visits (37.0 percent) taken by individuals in the frequent user segment had a primary activity of hiking/walking. For each of the other three segments, the percent of visits with hiking as a primary activity was between about 25 and 30 percent. The percent of visits with a biking (including mountain biking) activity was also highest in the frequent user segment (7.3 percent), and declined steadily across the other segments, to less than 2 percent for the infrequent users. As a primary activity, developed camping was almost non-existent for visits by individuals in the frequent user segment (0.1 percent of visits). However, fully seven percent of visits made by the infrequent use segment had developed camping as a primary activity. Viewing natural features as a main activity was also greatest among the infrequent user segment (10.1 percent of visits), and

Table 2. Visit characteristics by user segment to urban national forests.

	Segment			
	Frequent Users	Regular, Local	Regular, Non-local	Infrequent Users
Percent visits by males:	76.0	75.6	74.1	67.6
Race:				
– White	93.1	93.8	88.9	90.4
– Hispanic	5.1	2.8	3.3	5.8
– Other	1.8	3.4	7.8	3.8
Length of NF Visit (hrs)				
– Average	4.52	7.81	12.3	25.35
– Median	2.75	3.25	4.0	4.25
– 3rd Quartile	5.25	5.50	8.75	23.25
% Visits with Primary Activity:				
– Hiking	37.0	25.9	29.4	24.6
– Hunting	8.4	9.4	2.6	8.0
– Biking	7.3	5.9	4.1	1.7
– Fishing	7.0	5.4	9.9	4.8
– OHV use	4.5	8.7	5.4	3.7
– Viewing Natural Features	5.4	6.7	9.0	10.1
– Developed Camping	0.1	3.4	1.5	7.0
% Visits with Participation in:				
– Hiking	56.9	49.7	52.8	57.0
– Viewing natural features	58.1	63.8	58.7	71.4
– Viewing Wildlife	45.5	52.4	45.2	57.5
– Relaxing	52.5	53.0	58.1	59.3
– Developed Camping	3.3	5.2	8.2	11.0
– OHV use	12.6	14.4	8.6	4.8
Importance ratings:				
Parking Availability	3.7	3.6	3.5	3.8
Parking Lot Condition	3.4	3.4	3.5	3.6
Road Condition	3.6	3.9	4.1	4.1
Trail Condition	4.2	4.1	4.2	4.2
Signage Adequacy	3.6	3.9	4.0	4.3
Rec Info Availability	3.4	3.7	3.9	4.1
Employee Helpfulness	3.9	3.9	4.2	4.3
Perception of Safety	4.0	4.1	4.2	4.4
Crowding:				
% rating Low	55.8	52.7	59.5	65.8
% rating Moderate	36.4	41.0	34.3	30.2
% rating High	7.8	6.3	6.2	4.0

least common among visits by the frequent user segment (5.4 percent).

Experiences

Insight into how to serve the different segments can be gleaned by examining what elements of the visit are most important. The survey asked importance ratings for several items related to the quality and condition of the environment, the condition of access facilities, and services provided by the agency. A five-point scale was used to evaluate importance, where 1 is not important and 5 is very important. The average rating for the items was compared across segments. There was no difference across segments with respect to three environmental quality items – condition of the natural environment, quality of the landscape, and quality of scenery. For each of these items and segment the average rating was between 4.5 and 4.7. The average ratings for the other items are displayed in Table 2.

The two items that showed the greatest variation in average importance rating across the segments were for the availability of recreation information and the adequacy of signage. For both of these items, frequent users had the lowest average importance rating (3.4 and 3.6 respectively). Successively higher importance ratings were given by regular local users, regular non-local users, and visitors in the infrequent user segment. The same pattern, that the segment that most often visited the forest had the lowest rating and the segment visiting least often had the highest rating, was repeated on several other items as well. Other items with this pattern included the importance of a perception of safety, helpfulness of employees, and condition of parking lots. The importance of trail condition was approximately equal across all segments.

For all segments, the importance of parking lot condition was at or tied for lowest rating. For all segments except frequent users, perception of safety and trail condition had an average importance rating as high as or higher than any other item. For the frequent users, trail condition had a higher importance rating than a perception of safety.

For crowding, a 10-point scale, where1 = not at all crowded and 10 = very crowded was used.

Frequent users had a higher proportion of visits with a High crowding rating than did any other segment. Conversely, infrequent users had the fewest visits with that level of crowding (4.0 percent). As well, infrequent users had the higher percentage of visits with a Low crowding level.

Segment Differences by Climate Type

An issue of interest was whether the visit or visitor characteristics of the segments were the same for warm climate and cool climate urban forests. The proportion of visits made by the different segments was fairly close across the climate types. However, the proportion of visits made by both frequent and regular local visitors was slightly higher for the warm climate forests (Table 3).

With respect to the demographics of the visits segments, there was no clear pattern of difference in the proportion of visits by age class, or by gender. The proportion of visits by Hispanics was higher in every segment for the warm climate forests than for the cool climate forests. There were no clear patterns of differences for the other racial groups.

There were some patterns of differences in the activity mixes for segments between the climate types. In the cool climate forests, a higher proportion of visits by all segments had primary purposes for dispersed winter activities (snowmobiling and cross-country skiing), hiking, and viewing natural features. Biking was a more common primary activity for all segments for warm climate urban forests. For frequent and regular local users, hunting and OHV use were more common primary activities on warm climate urban forests.

There were no distinct patterns of differences across climate type for the importance ratings given by members of the segments. However, for three of the four segments there were differences in the ratings of how crowded the area was. Frequent users rated crowding about the same for both the cool climate and warm climate forests. However, for the other three segments, fewer visitors to cool climate forests gave low crowding ratings, and a higher proportion gave high crowding ratings. A likely explanation is the seasonal concentration of most of the dispersed area visitation for the cool climate forests.

For each segment, females were a slightly higher proportion of the visitor population for the cool climate urban forests than for the warm climate urban forests. There were no distinct patterns of differences for the other demographic characteristics, except for the proportion of Hispanics. That group was a greater proportion of visitors for all segments for the warm climate forests.

For three of the segments, the average number of annual visits to the forest for any recreation activity was about the same. Frequent users of the cool climate forests took on average about 10% more visits per year than did members of the same user segment on warm climate urban forests. For every segment, the average number of visits for the indicated primary activity was very slightly higher for visitors to the warm climate forests. Frequent users of the warm climate forests had a much higher average annual total time on the forest (576 hours per year) than did members of the same segment on the cool climate forests (405 hours per year). For the other three segments, the differences in annual time spent for warm versus cool climate forests were quite small.

Table 3. Visit Differences between warm and cool climate urban forests.

		Segment		
	Frequent Users	Regular, Local	Regular, Non-local	Infrequent Users
% Visits by segment				
Warm	20.1	30.2	6.9	42.8
Cool	18.9	23.0	11.0	47.4
% visits by Hispanics				
Warm	7.9	3.6	8.3	8.3
Cool	2.2	1.9	1.0	2.7
% Visits for Primary Activity				
– X-C ski or Snowmobile				
Warm	0.0	0.0	0.0	0.0
Cool	10.7	8.1	12.2	1.1
– Hiking				
Warm	35.0	22.8	24.9	14.2
Cool	38.6	28.7	31.4	20.8
Viewing Natural Features				
Warm	3.8	4.5	6.9	8.6
Cool	6.7	8.8	9.9	11.0
– Biking				
Warm	9.3	6.4	7.6	1.5
Cool	5.8	3.6	2.5	1.1
– OHV use				
Warm	6.5	11.1	3.2	3.5
Cool	3.1	6.4	6.3	2.2
– Hunting				
Warm	14.5	13.5	1.0	10.4
Cool	3.9	5.7	3.4	2.9
Crowding rating				
Low (1–3)				
Warm	57.1	56.9	81.0	73.0
Cool	55.1	51.3	36.5	58.8
Moderate (4–7)				
Warm	33.2	41.1	13.3	24.8
Cool	38.0	38.5	44.9	35.4
High (8–10)				
Warm	9.7	1.9	4.7	2.2
Cool	6.9	10.1	18.7	5.8

Conclusions

Segmenting visitation by the geographic origin of visitors and frequency of visit can be helpful in identifying key visitor subgroups. For the users of dispersed areas in urban national forests, local frequent users make up a sizeable segment. Visits made by these individuals are of relatively short duration, and their activities often center on regular exercise (hiking, biking), or relaxation (including viewing nature or wildlife). Very few of these users come primarily for camping or viewing natural features, indicating that many of the visitors doing those activities are infrequent users.

Frequent users care less about the availability of recreation information, signage, and the helpfulness of employees, – they already know where they are going and what to do, so these are less needed. Their lower perception of the importance of feeling safe may come from familiarity as well. They aren't worried about feeling safe because they are comfortable and know where to go or where to avoid. On average, these frequent users spend about 500 hours per year recreating on the forest, compared to about 100 hours per year for regular users.

There are differences between the same segments of users according to climate. Hunting is a much more prominent use for warm climate urban forests, and associated with that, so is use of Off Highway Vehicles.

Regular and infrequent users in cool climate forests were more likely to perceive high levels of crowding than for the same segment in warm climate forests. This difference is likely related to the seasonal concentration of use in cool climate forests.

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User attitude towards traffic control in Shiretoko and Daisetsuzan National Parks in Japan

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Abstract: Vehicle traffic control has been introduced as a countermeasure to over-use in various natural parks of Japan. Users' understanding is indispensable for enforcing vehicle traffic control. Thus, the present traffic control system must be examined based on an evaluation from the viewpoint of visitors. Kohgen area of Daisetsuzan National Park and Kamuiwakka area of Shiretoko National Park in Hokkaido (northern island of Japan) were chosen for case studies. Data were collected by a mail-back questionnaire survey for visitors of these areas in 1999–2001. The results showed that most visitors approved or supported the traffic control systems. Approval ratings of vehicular traffic control were closely related to the visitors' acceptability of inconvenience by the control. The visitors' acceptability of the inconvenience was closely related to the length of period under the vehicular traffic control, and interval between shuttle buses. The parameters of the investigation included the timing of the survey. Approval ratings were higher within the restriction period than outside. The study confirmed that there were some elements to which the relationship to the traffic control approval were steady or unstable according to the investigation year. This finding strikes a note of warning about discussing significance levels from data acquired over a single year.

Preface

Over-use affects not only the natural environment but also the quality of the visitor experience. As the number of user increases, vegetation becomes destroyed; the numbers of naturalized plants increase, overcrowding leads to frustrated and dissatisfied users, and wild animals that travel during the night are negatively influenced. Moreover, the following phenomena influence the quality of the visitor experience (Katoh 1997, The Oze Preservation Foundation 1998, Environment Agency 1997, Kobayashi 2000). The appearance of bustle and long traffic jams causes frustration manifested as increased annoying behavior, increased unpleasantness, and obstruction of the achievement of objectives.

Problems associated with increasing use have been repeatedly discussed including capacity from the viewpoint of capping the number of users (Seta 1974, Katoh 1997, Nakajima 1998). These problems are associated with access improvement and increased car usage.

Plans for park use should be implemented when it is necessary to control visitors' behavior (Environment Agency 1997). The objective of such plans is to harmonize the increase in recreational use with the conservation of natural landscape and ecosystem.

The Environment Agency provided the "Outline of measures for correcting car use in Natural Parks" to deal with problems associated with the increasing number of private cars in natural parks (1974). The total number of visitors to 28 Japanese national parks increased from 380 million to 410 million after 1990. By 2000, traffic control had been introduced into 17 areas of 13 parks, with considerably positive effects.

Restrictions are required because too many parked cars on the roadside cause traffic jams in popular districts during high season (Yui & Furuya 2001). Therefore, vehicular traffic has been controlled at times of concentrated use. A substituted mode of transportation has been established in 14 of 17 areas.

Factors affecting approval of vehicle traffic control could be identified based on users' attitude toward the control. The present study examined factors affecting users' support for and understanding of the need for traffic control. Kamuiwakka area of Shiretoko National Park and Kohgen area of Daisetsuzan National Park were chosen for this case study where traffic has been controlled since 1999 and 1997, respectively. The factors included in the investigation were selected based on data gained from a three-year survey that was started in 1999.

Outline of the investigated areas

Kohgen area of Daisetsuzan National Park

The area surrounding the Kohgen hot springs is considered a showplace of autumn colors where visitors can walk around varied ponds. Most users visit with private cars because no regular bus presently operates. Because walking the trails takes about 4 hours to complete, cars remain parked for long time. The capacity of the parking lot at the entrance to the hiking routes is only near 50 cars. Therefore, the lot becomes full at about 6.30 a.m. when the autumn leaves are in full color. Visitors who arrive thereafter park on the shoulder of the approach road that considerably narrows access, leading to traffic jams. These become remarkable on weekends and national holidays from the middle to the end of September. Traffic control was introduced to solve these problems in 1997. Private cars have been diverted to a temporary parking lot on the Daisetsu Lake site, and shuttle buses have been provided. The controlled region comprises an 8 km section that extends from the junction of National Road 278 (Figure 1). About 90 percent of the annual visitors to the park arrive during September. The bus transfer costs 300 yen (about $3 US) and it takes about 15 minutes. Shuttle buses for Kohgen Hot Springs operate from a temporary parking lot from 06:30 to 12:30 every 30 minutes. When the number of visitors is too high to be transported, extra shuttle buses can be organized at short notice according to the situation. A tape in the bus explains details about the natural environment and the manners of recreational use during transportation to Kohgen Hot Spring. Vehicles excluded from the control included sightseeing buses, cars driven by guests staying at Kohgen Hot Springs Hotel, and cars driven by climbers except those on day trips. Vehicular traffic control has been enforced by the coalition for the five days every year that comprise national holidays, a Saturday and a Sunday since 1997 from the middle of September to the beginning of October. The maximal and minimal numbers of users per day were 1550 during the investigation period and 179, respectively.

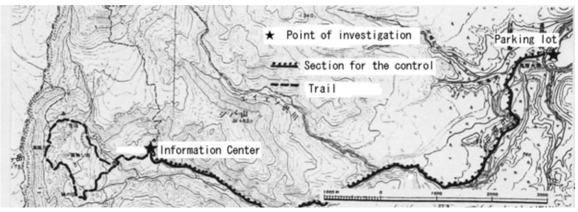

Figure 1. Case study of Kohgen area in Daisetsuzan National Park.

Kamuiwakka area in Shiretoko National Park

The number of visitors to Shiretoko National Park was about 400,000 in 1980 before the Shiretoko Crossing Road over Shiretoko-Pass was opened. The number of visitors increased during the 1980s as a base for tour sightseeing, and it has stabilized at about 2.3 million since 1990. Buses and private vehicles afford the main types of access to this National Park. About 70% of all annual visitors arrive between April–September of (as of 2000), and thus are most concentrated during the summer. When traffic control was originally considered in 1991, a "Liaison council" was established that consisted of representatives of the Environmental Agency, Hokkaido Prefecture, the town of Shari, the local police, the Tourist Association, and a fishery co-operative. The road network is limited by the geographic nature of Shiretoko peninsula. The flow of visitors can be easily controlled due to cul-de-sacs and the simplicity of the road network.

Vehicular traffic control was originally started for 16 days from July 26th – August 10th in 1999. The controlled 12 km section stretches from the junction of Shiretoko-Goko (five lakes) to the Kamuiwakka River (Figure 2). Bicycles and public vehicles were exempt from controls. The period of traffic control was extended to 23 days between July 29th – August 20th in 2000 and from July 28th – August 19th in 2001. Visitors to the Kamuiwakka area have to transfer to a pay shuttle bus at Shiretoko Nature Center. The Nature Center is located about 20 km from Kamuiwakka, so the shuttle bus takes about 50 minutes to arrive. The single fare is 590 yen (about 5 dollars) and the bus operates every 20 minutes from 07:00 to 17:40. While on the bus, visitors are given a taped explanation of the natural environment and how to behave in the park. As they alight from the bus, an instructor gives them and explains some simple notes concerning the Kamuiwakka River.

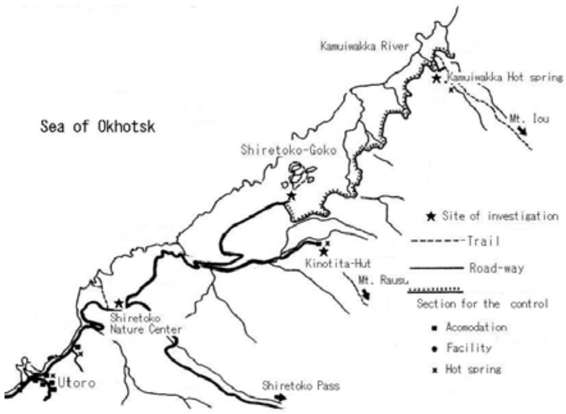

Figure 2. Study area of Kamuiwakka in Shiretoko National Park.

Data and method

Method of attitude survey

Visitor attitudes to the vehicle controls were examined from mail-back questionnaires that were given to the visitors at the sites.

In Kohgen area, visitors were given questionnaires at the Brown Bear Information Center of the entrance to the hiking route, or at the transfer point to the shuttle bus. The day of the survey was selected considering the period of the traffic control. Visitors were asked to complete this questionnaire while boarding the shuttle bus during its hours of operation between 06:30–12:00. In total, 2426 were distributed and 692 were completed (recovery ratio, 28.5%; proportion of total visitors, 8.9%).

In Kamuiwakka area, considering the behavior of visitors and the section under traffic control, the main sites of the attitude survey were Shiretoko Goko and Kamuiwakka. Shiretoko Nature Center and the Kinoshita hut were added considering visitors behavior in alternate years. The first shuttle bus arrives at Kamuiwakka at 07:54, and the last departs at 18:33. Therefore, the investigation proceeded between 08:30–15:00. While visitors were boarding the return shuttle bus, they were asked to cooperate with the survey. In total, 8224 surveys were distributed, 2267 were completed for a recovery ratio of 27.6%. Because the content of the questionnaire differed somewhat according to the investigation year, the relationship to traffic control was limited to questions that addressed issues that were identical common over three years.

Investigation parameters

In the Kohgen investigation, questions addressed the time of the investigation (n=2 questions), individual attributes (n=6), traffic controls (n=10), motivation for visiting (12), parameters access to traffic control information (n=14), parameters for content valued in the Kohgen-Numa round trail (n=10), problems regarding facilities (n=7), and excessive use (n=3). The chi-square test analyzed relationships between these parameters and traffic control. In the Kamuiwakka investigation, questions addressed the time of the investigation (n=3 questions), individual attributes (n=5), traffic controls (n=3), access to traffic control information (n=14). The chi-square test analyzed relationships between these parameters and traffic control.

Result

Visitor profile

Kohgen area in Daisetsuzan National Park

The age distribution was twenties, 5.0%, thirties 14.7%, forties, 21.3% and 50 years and above, 59.0%. Males accounted for 57.3%. Visitors were composed of groups of 3–4 persons (20.0%), pairs (49.5%) groups of five or more, 17.8% and individuals, 12.7 %. First time visitor to the Kohgen-Numa trail accounted for 16.8%, second time visitor did for 21.0%, and third or more did for 62.1%. The proportion of the total number of visitors to the area during the period under traffic control was 95.4%.

Kamuiwakka area in Shiretoko National Park

The age distribution was twenties, 21.4%, thirties, 25.9%, forties, 23.9% and 50 years and above, 28.9%. Males accounted for 60.1%.Groups were composed of 3–4 persons, 30.7%, pairs, 45.1%, five or more, 13.0%, and individuals, 11.1 %. First time visitor was accounted for 55.6%, second time visitor, 28.1%, and third time or more, 16.4%. The proportion of the total number of visitors to the park during the period under traffic control was 80.9%.

Elements and content that affect visitor attitudes towards support for vehicular traffic control

Table 1 shows relationships between these parameters and visitor approval of traffic control in Kohgen area. The significance level of 5% was found in these parameters regarding the investigation year, age of visitors, frequency of visit, prior access to information about traffic control, perception of guide board, and evaluation of countermeasures against over-use. The significance level of 1% was found in shuttle bus interval. The significance level of 0.1% was in these parameters regarding motives for viewing autumn colors, timing of the visit (presence of traffic control), visitor acceptance of inconvenience imposed by the control and opinion of the restriction period.

Table 2 shows relationships between these parameters and visitor approval of traffic control in Kamuiwakka area. The significance level of 5% was found in these parameters regarding group size, and frequency of visit. The significance level of 1% was found in both the investigation year and the point of the investigation. The significance level of 0.1% was found in, timing of visit (presence of traffic control), shuttle bus interval, opinion of the restriction period, and perception of crowding.

Table 1. Relation between each parameters and the approval of the traffic control in Kohgen area (chi-square test).

Investigation Year	Timing of visit	Age of visitors	Sex	Address	Size of group	Frequency of visit	Property of group	Motive for view of the autumn color	Perception of guide board	Evaluation of countermeasures against over-use
0.086*	0.148***	0.101*				0.089*		0.136***	0.121*	0.112*

Acceptance of inconvenience	Comprehensibily of explanation	Perception of crowding	Content of explanation	Time length of explanation	Timing of explanation	Shuttle bus intervals	Opinion of the restriction period	Type of vehicles under the control	Prior access to information about traffic control
0.315***						0.116**	0.235***		0.100*

***=Significant at p<.001 **=Significant at p<.01 *=Significant at p<.05
Figure in each cell is Crame r 'V

Table 2. Relation between each parameters and the approval of the traffic control in Kamuiwakka area (chi-square test).

Investigation Year	Timing of the visit	Age of visitors	Sex	Address	Size of group	Frequency of visit	Shuttle bus interval	Opinion of the restriction period	Perception of Crowding	Point of distribution
0.057**	0.098***	0.081***			0.061*	0.051*	0.148***	0.384 ***	0.089***	0.067**

***=Significant at p<.001 **=Significant at p<.01 *=Significant at p<.05
Figure in each cell is Crame r 'V

The approval rating for traffic control increased from 87.8% to 96.7% in the Kohgen area (Figure 3) and slightly decreased from 87.6% to 83.0% in Kamuiwakka (Figure 4) between 1999 and 2001. The secular distortion of the approval rating tended to differ in both areas.

The approval rating of the traffic control was extremely low among users who thought that the current restriction period was too long. This was common to users of both districts (Figures 5, 6).

Users who wanted more frequent shuttle service were strongly negative towards controls in both areas. In Kohgen area, the approval rating was a little low among users who requested more frequent shuttle service. With respect to shuttle frequency, the approval rating for traffic control was 93.3% among users who felt that "even 30 minute intervals would be acceptable", and 75.9% among those who might accept 10-minute intervals. In Kamuiwakka, the approval rating was low among users who wanted a higher shuttle frequency. The approval rating for the control was 88.6% among users of "even 30 minute intervals would be acceptable", and 74.9% among those who might accept 10-minute intervals.

Users who avoided the control period to visit these areas had negative attitudes towards traffic control. The approval rating for control in Kohgen and Kamuiwakka areas was 71.9% and 79.8%, respectively, among visitors outside the controlled period and 89.6% and 87.7%, respectively, among those within the period. Users who did not approve of traffic controls tended to visit during periods without traffic control.

This analysis was limited to the Kohgen area. The approval rating for vehicular traffic control was high among user who tolerated the inconvenience it imposed (Figure 7).

With regard to visitors' attitude toward countermeasure of addressing over use, the approval rating for traffic control was 93.8% among users who selected "Restricted traffic control", 89.9 % among those who selected "Enlightenment and environmental education", and 70.6% among those who thought that traffic controls failed to positively impact over use.

This analysis was limited to the Kohgen area. The approval rating for the traffic control was a little higher among users who positively evaluated current advance access to information about controls.

This analysis was limited to the Kohgen area. The approval rating for traffic control was 91.2% of users who visited to "view the autumn colors" as the primary reason for the visit and 82.3% of those who chose this as their secondary purpose reason, and 80.0% of those for whom this motivation was not an issue.

This analysis was limited to the Kamuiwakka area. The approval rating for vehicular traffic control was high among users who did not perceive crowding in Kamuiwakka.

The approval ratings for traffic control were a little low in both areas among users in their twenties. The approval rating for traffic control in Kohgen was 95.2% among users in their forties, 93.0% in their thirties, 89.0% in those over 50 and 82.4% in the twenties. In Kamuiwakka, the approval rating for traffic control was 89.2% in those aged over 50, 87.4% in the 40s, 86.3% in the 30s and 78.5% in those aged 20 and below.

This parameter tended to differ between the two areas. The approval rating for vehicular traffic control in Kohgen tended to increase with visiting frequency. The approval rating of the vehicular traffic control was 83.9% among first time users, 90.0% and 93.0% among 2nd and 3rd (or more) time users, respectively. The approval rating for vehicular traffic control in Kamuiwakka tended to vary with visiting frequency. The approval ratings for vehicular traffic control were 86.5%, 87.1% and 81.8% among first, second and 3rd (or more) time users.

Attitudes toward restricting vehicles differed in Kamuiwakka among points where visitors were asked to cooperate with the investigation. The approval ratings for vehicular control were 89.6%, 84.0%, 79.1% and 84.0% among users at Shiretoko Gobo, Kamuiwakka, Kinoshita hut and at Shiretoko Nature center.

Relationships between parameters that affect attitudes toward vehicular traffic control

Mutual relationships between parameters that significantly affect attitudes toward traffic control in Kohgen were analyzed by the chi-square test. Judging from the frequency of the significant level of 0.1%, the following parameters strongly affected the approval rating of traffic control: acceptance of inconvenience by traffic control, opinion of the restriction period, investigation year, and timing of the visit.

The chi-square test revealed a significant relationship among most parameters in Kamuiwakka, with many being at the levels of 0.1%.

In Kohgen area, the relationship between the investigation year and parameters with a significant relationship to the approval rating of traffic control according to unified data collected over three years was examined. Frequency of visit, acceptance of inconvenience by traffic control, and timing of the visit were significantly related ($p = 0.1\%$) to the approval rating of traffic control. The relationship of the shuttle bus interval to approval of traffic control was significant ($p = 5\%$).

Non-restriction day of the investigation was included only in 1999. The ratios of users who had visited three times or more were 40.9%, 76.3% and 85.3% in 1999, 2000, and 2001, respectively. The ratios of users who accepted inconvenience imposed by the control were 71.9%, 81.4% and 88.0% in 1999, 2000 and 2001, respectively (Figure 8). The ratios of users who recognized the current shuttle bus interval as acceptable were 46.2%, 55.3% and 63.9% in 1999, 2000 and 2001.

To exclude the influence of the investigation year, the relationship to the approval rating of the traffic control was analyzed by the chi-square test separately for each year. Two patterns were recognized in statistically significant relations to the approval rating. One was detected on some year of the investigation and in others, not detected at all. The approval rating and frequency of visit in each investigation year were not correlated significantly. The following parameters significantly affected approval ratings in any investigation year: countermeasures against over-use, timing of visit, shuttle bus interval, age of visitors, prior access to information about traffic control, acceptance of inconvenience imposed by traffic control and opinion of the restriction period.

In Kamuiwakka area, data from three years were unified and analyzed with respect to parameters that were significantly related to approval of traffic control during each year. The following parameters significantly differed at each year: group size, opinion about the restriction period, perception of crowding at Kamuiwakka and frequency of visit.

The approval ratios of the current period of traffic controls were 29.1%, 51.3% and 56.1% in 1999, 2000 and 2001 respectively. From a social viewpoint, the period of vehicular traffic control that includes the Obon Festival was extended from 16 to 23 days from the year 2000. The ratios of being perceived the current shuttle bus frequency as acceptable was 63.6%, 69.9% and 79.9% in 1999, 2000 and 2001 respectively. The ratios of visitors being over 50 were 25.1%, 25.3% and 35.9% in 1999, 2000 and 2001, respectively. The ratios of those who visited at least three times were 27.6%, 21.7% and 19.3% in 1999, 2000 and 2001 respectively. The ratios of the

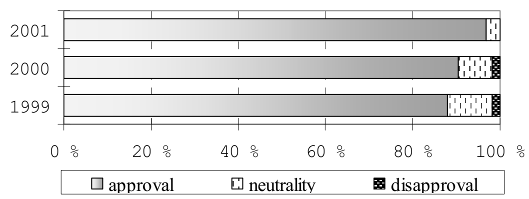

Figure 3. Approval rating of traffic control according to the year in Kohegen area.

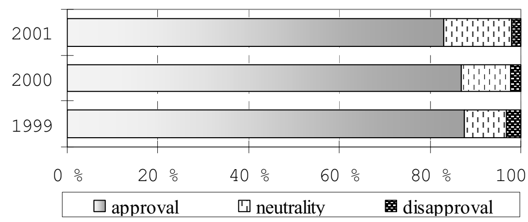

Figure 4. Approval rating of traffic control according to the year in Kamuiwakka are.

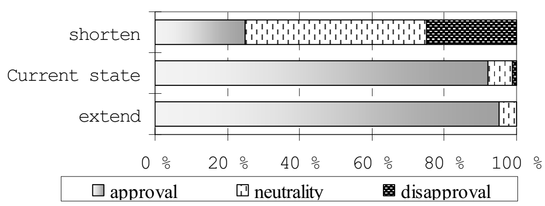

Figure 5. Approval rating according to the opinion of the restriction period in Kohgen area.

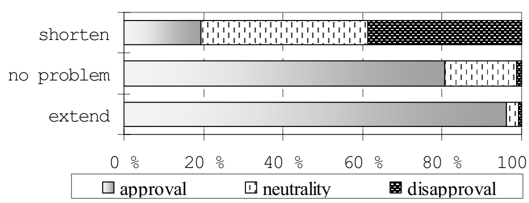

Figure 6. Approval rating according to theopinion of the restriction period in Kamuiwakka area.

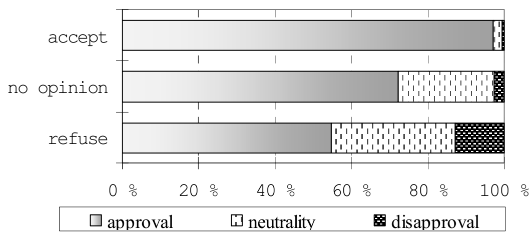

Figure 7. Approval rating according to the acceptance of inconvenience in Kohgen area.

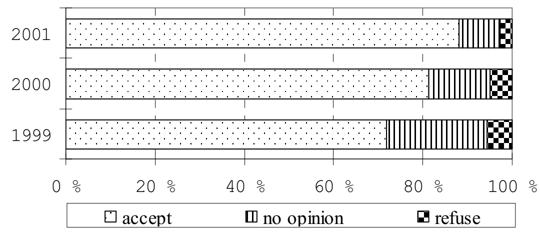

Figure 8. Acceptance of inconvenience according to the year in Kohgen area.

total user proportion within the restriction period were 84.7%, 90.9% and 67.0% in 1999, 2000 and 2001 respectively. The approval ratings were 88.6%, 87.9% and 85.9% in 1999, 2000 and 2001, respectively within and 81.8%, 77.4%, and 79.3%, respectively outside the control period.

To exclude the influence of the investigation year, the relationship between these parameter and support of vehicular traffic control was analyzed by chi-square test separately each investigation year. Three patterns were recognized: undetectable, occasionally detected and detected regardless of the investigation year. Frequency of visit was not significantly related to approval rating. Only group size, perception of crowding at Kamuiwakka, point of investigation, and shuttle bus interval were significantly related to control approval during any year. The relationship between the following parameters and approval rating of the vehicular traffic control was significant during each year of the investigation: age of visitor, opinion of restriction period and timing of visit.

Elements that affected approval rating of vehicular traffic control

In the Kohgen area, the acceptance of inconvenience imposed by vehicular traffic control and opinion of the restriction period were significantly related to the approval rating. The relationship between these and other parameters was examined. Acceptance of inconvenience imposed by vehicular traffic control was significantly related (p = 0.1%) to the shuttle bus interval, timing of visit and opinion of the restriction period.

With respect to acceptance of inconvenience imposed by vehicular traffic control, the ratio of acceptance was 83.3% among those who would accept an even by 30 minute shuttle bus and 79.9% of those with no opinion ("It cannot be said either") and 46.2% of those who would like 15 minute intervals. The ratios of those who accept the current shuttle bus frequency was 46.4% and 80.0% of visitors outside and within the control period, respectively. Significant relationships to opinion of the restriction period were identified among prior access to information about traffic control and acceptance of inconvenience imposed by vehicular traffic control (p=0.1%) and evaluation of countermeasures against over-use (p = 5%).

In Kamuiwakka area, age of visitors, timing of visit, and opinion of the restriction period were significantly related to the approval rating of vehicular traffic control. The relationship between these and other parameters was examined. The results of the chi-square test showed that "opinion of the restriction period", was significantly related to age of visitor and timing of visit (p = 0.1%), and frequency of visit (p = 5%). The ratio of those who hoped an extended restriction period was 46.3% of visitors under 20 years of age, 57.9%, 53.7% and 47.7% of those in their 30s, 40s and 50s, respectively. The desire for an extended restriction period was very low among those aged over 50 or under 20. The ratios of those who hoped an extended restriction period was 40.6% and 55.2% of those outside and within the restricted period.

Analysis of variance of approval rating of traffic control

The relationship between "approval rating of vehicular traffic control" and factors in Kohgen was examined by analysis of variance of one-way layout. Table 3 shows that acceptance of inconvenience, opinion of the restriction period, timing of the visit and shuttle bus intervals were related at a significance level of 0.1%. Viewing autumn colors and the investigation year were related at a significance level of 1%. Prior access to information about traffic control and evaluation of countermeasures against over-use, frequency of visit, and age of visitors were related at a significance level of 5%.

The following factors were combined in the two-way analysis of variance, and analyzed based on acceptance of inconvenience and opinion of the restriction period. These factors were the most significantly related according to the one-way analysis of variance (Table 4). Acceptance of inconvenience was the most closely related to the approval rating of vehicular traffic control, followed prior access to information about the traffic control, opinion of the restriction period, investigation year, viewing autumn colors, and timing of visit.

The relationship between "approval rating of vehicular traffic control" and other factors in Kamuiwakka were examined by the one-way analysis of variance. Table 5 shows that opinion of restriction period, shuttle bus interval, timing of visit, perception of crowding and age of visitor were related at a significance level of 0.1%. Frequency of visit and point of investigation were related at a significance level of 1%. Investigation year and size of group were not significantly related to the approval rating.

Table 3. Relation between the approval of the traffic control and related factors in Kohgen area (One-way layout analysis of variance).

①Investigation year	②Timing of the visit	④Age	⑥Frequency of visit	⑦Acceptance of inconvenience	⑧Shuttle bus interval	⑨Opinion of the restriction period	⑩Prior access to information about traffic control	⑫Evaluation of measures against over-use	⑬Viewing autumn colors	⑭Perception of guide board
4.8**	15.1***	3.0*	3.3*	68.6***	8.2***	36.7***	5.1*	3.2*	5.0**	
1.4	2.2	1.3	1.0	17.0	2.5	10.4	0.8	2.0	1.5	

Upper row: F value
Lower row: contribution(%)

***=Significant at p<.001 **=Significant at p<.01 *=Significant at p<.05

Table 4. Relation between the approval of the traffic control and related factors in Kohgen area (Two-way layout analysis of variance).

whole	⑦Acceptance of inconvenience	⑨Opinion of the restriction period	Effect of interaction
22.2***	15.7***	10.2***	2.7*
		⑩Prior access to information about traffic control	
25.5***	47.0***	19.4***	8.8***
	⑦	①Investigation year	
21.7***	28.6***	13.8***	6.4**
	⑦	⑬Viewing autumn colors	
23.0***	63.4***	16.6***	7.9***
	⑦	②Timing of the visit	
30.0***	32.0***	7.7**	3.6*
	⑦	⑧Shuttle bus interval	
19.7***	55.8***	5.9**	4.6**
	⑦	⑫ Evaluation of measures against over-use	
12.0***	19.4***	4.3**	
	⑦	⑥Frequency of visit	
16.9 ***	59.8***	4.6*	
	⑦	Age	
13.8***	25.8***	2.8*	

whole	⑨Opinion of the restriction period	⑩Prior access to information about traffic control	Effect of interaction
17.8***	5.8**	12.9***	6.2**
	⑨	①Investigation year	
12.2***	13.4***	7.8**	3.1*
	⑨	⑬Viewing autumn colors	
10.6***	29.9***	3.4*	
	⑨	②Timing of the visit	
18.6***	31.5***	15.8***	5.0**
	⑨	⑧Shuttle bus interval	
10.8***	37.6***	5.0**	
	⑨	⑫Evaluation of measures against over-use	
9.5***	7.4***	8.1***	7.8***
	⑨	⑥Frequency of visit	
11.7***	40.0***	7.1***	4.8***
	⑨	④Age	
10.2***	19.7***	4.1**	

F value
***=Significant at p<.001 **=Significant at p<.01 *=Significant at p<.05

Table 5. Relation between the approval of the traffic control and related factors in Kamuiwakka area (one-way layout analysis of variance).

①Investigation year	②Timing of the visit	③Point of distribution	④Age	⑤Size of group	⑥Frequency of visit	⑧Shuttle bus interval	⑨Opinion of the restriction period	⑪Perception of crowding
	11.28***	3.93**	7.03***		4.77**	31.37***	312***	9.15***
	5.2	0.5	9.4		4.3	3.9	22.9	1.3

Upper row: F value ***=Significant at p<.001 **=Significant at p<.01 *=Significant at p<.05

Table 6 shows the results of the two-way analysis of variance that analyzed the following factors based on opinion of the restriction period, shuttle bus interval, and timing of visit. Opinion of the period was the most closely related to the approval rating of vehicular traffic control, followed by shuttle bus interval and perception of crowding.

Factors affecting secular distortion of the approval rating of traffic control

Based on the results shown, factors affecting secular distortion of the approval rating of traffic control were examined. The rating in Kohgen increased in 2001 compared with 1999 from 87.8% to 96.7%. Two or more factors affected this result. The number of annual users who can tolerate the shuttle bus interval or inconvenience imposed by the traffic control has increased. This means that the ratio of users who can accept the current conditions will increase.

When the numbers of users who tolerated inconvenience increased, the approval rating was high. Thus, an increase in the numbers of such users leads to an increase in those who approve the vehicular control. Therefore, the approval rating of the traffic control has increased each year in this area.

The approval ratings in Kamuiwakka were 87.6%, 87.0% and 83.0% in 1999, 2000 and 2001, respectively. The approval rating of traffic control was closely related to the amount of accepted inconvenience. Evaluation of inconvenience involved "length of vehicular traffic control period" and" shuttle bus intervals". The ratio of visitors that would accept the current shuttle bus interval and period of traffic control increased every year.

The approval rating of the vehicular traffic control differed according to timing of visit, age of visitor and point of investigation. The ratios of those over 50 years of age were 25.1%, 25.3% and 35.9% in 1999, 2000 and 2001, respectively. The proportion of users within the period was 84.7%, 90.9% and 67.0% in 1999, 2000 and 2001 respectively.

Because of an increase of the ratio of visitors that accept the current state, the approval rating of vehicular traffic control should increase. However, both the proportion of users who visited within the restricted period and the approval rating of vehicular

Table 6. Relation between the approval of the traffic control and related factors in Kamuiwakka area (Two-way layout analysis of variance).

whole	⑨Opinion of the restriction period	⑧Shuttle bus interval	Effect of interaction
52.8***	113.1***	14.8***	3.0*
	⑨	⑪Perception of crowding	
45.5***	130.4***	10.8***	4.1**
	⑨	④Age	
64.1***	317.4***	14.7***	6.6***
	⑨	③Point of distribution	
61.9***	95.7***	7.1***	4.2***
	⑨	②Timing of the visit	
120.9***	191.3***		
	⑨	⑥Frequency of visit	
78.4***	258.2***	6.4**	2.6*
	⑨	①Investiga-tion year	
78.4***	296.8***		

whole	⑧Shuttle bus interval	⑪Perception of crowding	Effect of interaction
9.9***	25.2***	6.8**	
	⑧	④Age	
7.5***	28.3***	4.0**	
	⑧	③Point of distribution	
7.9***	23.7***	4.6**	2.8**
	⑧	②Timing of the visit	
15.9***	11.6***	4.2*	
	⑧	⑥Frequency of visit	
8.6***	25.9***		
	⑧	①Investiga-tion year	
11.4***	16.6***	8.2***	5.2***

whole	②Timing of the visit	⑪Perception of crowding	Effect of interaction
11.7***	26.2***		2.9*
	②	④Age	
5.2***	13.4***	4.9**	
	②	③Point of distribution	
4.3**	11.8***	2.9*	
	②		
	②	⑥Frequency of visit	
4.1**	9.2**	3.4*	
	②	①Investiga-tion year	
2.8*	11.3***		

F value
***=Significant at p<.001 **=Significant at p<.01 *=Significant at p<.05

control decreased in 2001. With respect to the small decrease in 2001, the effects of both increasing and decreasing factors seemed to be counterbalanced. The approval rating was not secularly distorted if the data were limited to within the period. Therefore, the approval rating changed very little during the three years after vehicular control was introduced.

Conclusion

Visitor attitudes towards traffic control were examined in Kamuiwakka and in Kohgen where such controls have been in place since 1999 and 1997, respectively. The results showed that over 80% of users approved the control. In the Oze area of Nikko National Park, 85.4% of visitors approved and 1.2% disapproved of traffic control (Yui & Furuya 2001).

Most users approved of traffic control even though the surveys were implemented soon after the introduction of vehicular traffic control or several years thereafter. The period under the traffic control was different among the areas, being at least 90 days in Oze, 16 or 23 in Kamuiwakka, and five in Kohgen. Moreover, the management of the vehicular traffic control also differs. Regardless, the approval ratios did not significantly vary, suggesting that vehicular control has obtained the social cognition.

When vehicular traffic control is considered to force some inconvenience upon the user, I think that not only a person who agrees unavoidably but also a person who agrees positively is included in this group who approve the traffic control. Subdividing groups according to the degree of approval might more precisely identify the mental structure of users who feel forced to accept the restrictions as opposed to those who wholeheartedly approve them.

Approval of traffic control differed in both areas according to the age of the visitors or the frequency of visiting. Approval was a little low among visitors in their twenties to both areas. This tendency can also be confirmed in Oze. Few younger people expressed a desire for an extended restriction period, indicating that this group tends not to want to tolerate inconvenience.

The approval rating of higher frequency user was high in Kohgen, but somewhat low in Kamuiwakka. A revisit attends to reflect attachment to a place, and it relates to an affirmative evaluation of the current status. The high frequency of those revisiting Kohgen is reflected in the high approval rating of traffic control. However, approval decreases when users visit Kamuiwakka three times or more. This study could not clarify the cause of this phenomenon.

The secular distortion of the approval rating was examined including related factors. The approval rating increased in the fifth year from 3rd year after traffic control had been enforced in Kohgen area. The approval rating hardly seemed to have changed since traffic control had been enforced in Kamuiwakka.

Closely related parameters to the approval rating in both areas were opinion of the restriction period, timing of visit, and shuttle bus interval. The approval rating was low among users who visited outside the restriction period, who thought that the shuttle bus interval was too long, and who wanted to shorten the restriction period. Users who tended to resist inconvenience imposed by the controls showed tended to have an attitude that would avoid inconvenience.

The proportion of the approval was high among those who accepted the inconvenience in Kohgen though there was no question in Kamuiwakka. An investigation executed in 1992 before vehicular traffic control was enforced on Shiretoko confirmed that user attitudes to the inconvenience are related to the approval of enforced traffic control (Kobayashi 1993). These findings indicate that evaluation and response to inconvenience imposed by vehicular traffic control affect the attitude towards the approval rating. The report from Oze found that approval of the restriction correlated with "evaluation of the effect of nature conservation", "evaluation of the effect of easing congestion ", and "evaluation of substitution and traffic charges", and that users who opposed the executed controls evaluated each effect as low (The Oze Preservation Foundation 1998).

Although users agreed that regulating private cars is effective, many felt an economic load from the fee, and a stress from the inconvenience (Yui & Furuya 2001). To increase visitor approval, overcoming a strong sense of resistance against inconvenience will become critical. As the Kita-Kanto District National Park and Wildlife Office (1999) pointed it out, the necessary condition it is never to add an excessive load to the user. However, higher approval ratings cannot be achieved if users do not recognize and understand the value that can be obtained at the expense of convenience. The advantages gained from the restrictions are not clearly compared with those obtained in the absence of controls so users cannot clearly recognize the need for such controls. The 1992 investigation in Shiretoko showed that users who thought that the negative influence on the environment was reduced by traffic control highly approved of traffic controls whereas the opposite was true of those who assumed that the restrictions did not affect the environment (Kobayashi 1993).

In Oze, users pointed out that information about vehicular traffic control is not widely available. Problems include the outline and content of the control, service to users, and the imposition of a fee (Yui & Furuya 2001).

The 2001 investigation at Kamuiwakka revealed that the visitors who wanted “The results of the investigation to be made public" accounted for 86.0% of respondents (Kobayashi 2001). However, not enough information is being disclosed. The purpose of the fee should be revealed, a technique for evaluating the effect brought by the control should be established, and the results should be publicized. Moreover, to extend the approval, a logical context that reflects user evaluation and demand for the system of traffic control must be established.

The subjects in the investigation technique must include the timing of the survey. Approval ratings were higher within the period under the control than outside. When approval of traffic control is investigated, respondent groups should be evaluated with respect to biases towards such approval in the area of traffic control execution during the period under control rather than the opinions of all users. Moreover, attitudes to vehicular control differ among local populations (Watanabe 1992). Therefore, when evaluating the effects of traffic control, of the viewpoints of users during the restriction period, all visitors to the park, the local population and the manager should be categorized to understand the structure of the approval.

The present study confirmed that there were elements to which the relations to the approval of traffic control were stable or unstable according to the investigation year.Thus, the significance level of approval should not be based on results taken from an investigation of a single year.

That is, the reproducibility of the relationship is in doubt. For instance, a previous investigation (Kobayashi 2000), detected a statistically significant relationship between approval of vehicular traffic control and acceptance of inconvenience, unpleasantness of congestion and shuttle bus interval. However, such significance of was not necessarily reproduced over three years. Therefore, factors affecting stability must be identified and included in future investigations. In that sense, the problem about the technique of monitoring the user attitude survey should be instituted.

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Evaluation of the success of visitor flow management projects in the Southern Black Forest Nature Park

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Abstract: Nature sports place a number of demands upon the landscape structures being utilised. In order to assess the effects of sporting activities on nature and the landscape, it is insufficient to simply analyse the impacts of certain sports. Therefore, new assessment and planning methods for sporting areas are necessary in order to identify potential ecological conflicts and draw conclusions with respect to the desired aims and the measures to be implemented. The extent of the reference level plays a key role in the planning procedure. Tools, which include spatial as much as factual information, are necessary for implementation at all levels. The application of modern information technology, such as Geographic Information Systems (GIS), is required. The term 'Sport Area Management System' (SAMS) is used to describe management possibilities in the context of the development of a sustainable sporting area. The SAMS includes various components of sport orientated land use planning and the management of sporting activities. It is subdivided into regional and local sport area management. The approaches to visitor flow management and communications are of particular significance at both levels.

The SAMS concept is illustrated on the basis of the example of the sports tourism concepts developed for the Southern Black Forest Nature Park. The park offers many different opportunities for sporting activities and tourism. At the same time, a substantial part of the area is of a high ecological value. Therefore, the nature park association is seeking a sport tourism concept, which identifies and analyses potential conflicts and possibilities for further development. Following a detailed assessment of the current situation an analysis of the possibilities and potential conflicts was carried out. Further emphasis was placed on the development of an overall concept and possibilities for further development. The implementation of the project findings in parts of the nature park, and subsequent monitoring, are also important parts of the concept. Visitor flow management model projects are shown with the examples of hiking, mountainbiking and Nordic Walking.

The methodology behind the SAMS proved to be useful when the projects were put into practice. The initial model projects had the desired positive effect and the concept is to be applied to the whole nature park. Visitor flow management revealed that the large majority of sport tourists made use of the facilities. The co-existence and the cooperation between nature protection and all stakeholders in the region are an important basis for successful future development.

Introduction

The Southern Black Forest Nature Park was established in 1999 and is the biggest nature park in Germany, extending over 3300 square kilometres.

The area can be subdivided into a fragmented western part with great differences in elevations within short distances and a rather flat eastern part. The average altitude within the nature park is 780 m above sea level, varying from 222 m up to 1496 m.

The nature park is by far the most important sport tourism region within the federal state Baden-Württemberg. Over 11 million people live in the area surrounding the nature park (within a radius of 100 km), which is relevant for day trips. Moreover, there is a large number of visitors from other parts of Germany and abroad. The tourism sector generates returns of over 3 billion euros per annum and secures about 100,000 jobs. Quite a substantial part of the local population depend on this sector.

The Southern Black Forest Nature Park provides extensive infrastructure for a whole range of sporting activities – both during summer and winter. At the same time, from the viewpoint of nature protection large parts of the nature park are of very high ecological value. This is emphasised by the high number of nature and landscape protection areas, as well as Natura 2000 areas. Protected areas account for 40% of the total nature park area. Therefore, the development towards sport tourism all year around leads to a considerable amount of negative impacts. As a consequence the Institute of Outdoor Sports and Environment of the German Sport University in Cologne was asked to develop an all-embracing sport tourism concept for the Southern Black Forest Nature Park. The aim of the research project was to develop sustainable strategies and suggest management measures, which serve as a basis for a positive sport tourism development in the area (Roth & Krämer 2000). The concepts are to ensure the long-term preservation of sport and recreation areas in an intact landscape. Furthermore, the development of sport tourism is to be adapted to the needs of the local population and the visitors as much as possible. The approach adopted followed the principles of the 'Sport Area Management System', which is introduced in the following section.

Sport Area Management System

Nature sports place a number of demands upon the landscape structures being utilised and the resulting impacts are manifold. In order to assess the effects of sporting activities on nature and the landscape generally, it is insufficient to simply analyse the impacts of certain sports. Approaches which take into consideration the potential multiple use functions of the land available are required. In addition to that, the capacity limit in some core zones has already been reached – independent of the time of year and the associated sporting activities.

New assessment and planning methods for sporting areas are necessary in order to identify potential ecological conflicts and draw conclusions with respect to the desired aims and the measures to be implemented. Land use planning, which takes into consideration environmental needs as much as the demands of sporting activities is a potential tool for the resolution of any conflicts. Sport Area Management System – SAMS (Krämer, in prep.) represents an innovative approach, which contributes to the optimisation of land use, meeting the demands of sports and nature protection.

The extent of the reference level plays a key role in the planning procedure. In the course of various research projects a subdivision into two benchmark levels has been found to be useful. The regional level consists of nature sport areas with a range extending over several thousand square kilometres (e.g. the Southern Black Forest Nature Park). These areas may also include several different landscape types. They form the superordinate spatial reference level, within which a specific methodology is necessary in order to achieve a predefined aim (e.g. sport tourism concepts).

At the other end of the scale is the local reference level. At the local level certain nature sport areas and individual management measures can be looked at. In between are nature sport areas, described as connected landscape units extending over several square kilometres, which can be treated separately. This level is necessary, for example in the planning of a nature park, since the research area can be subdivided into several parts, which must be looked at separately due to their natural differences (e.g. the Feldberg region within the Southern Black Forest Nature Park). It should also be pointed out that the borders between the two levels can not always be strictly delineated and may merge. Additionally, measures at one level must always comply with planning at the superordinate level.

The fundamental principle of the SAMS is illustrated in Figure 1. The segment described as regional sport area management applies to large nature sport expanses, as well as more discrete areas (regional benchmark level). It includes visitor flow management measures and communication methods. Most important feature of the management measures is a regional development conception (e.g. nature park planning). The following aspects require consideration:

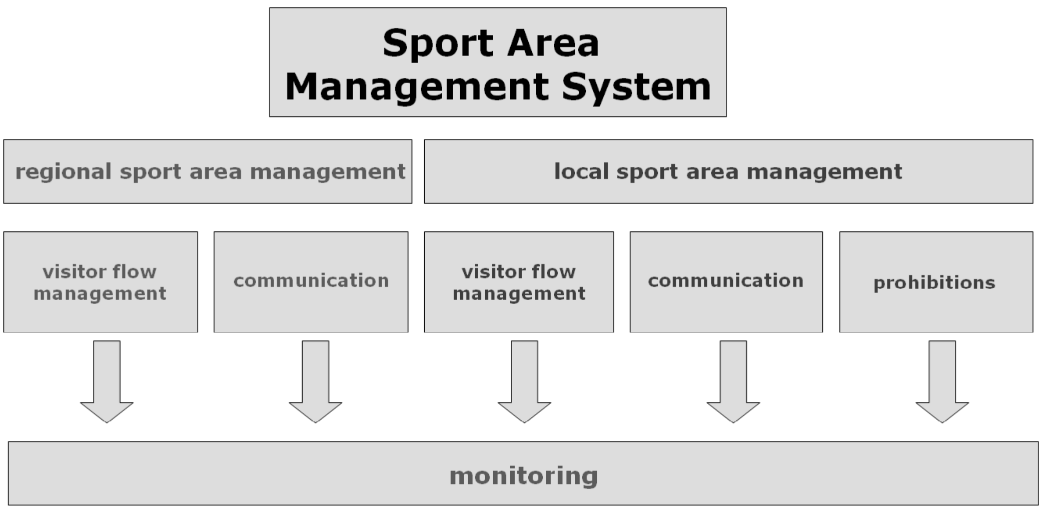

Figure. Components of the Sport Area Management System.

– integral spatial approaches,
– spatial separation by function,
– intercommunal approaches,
– site adapted development and
– provisions for recreation and sports.

Cooperation during each phase of the planning procedure and the participation of all stakeholders leads to a higher degree of acceptance of land use planning. At the regional level communication is based on discussion fora and events, publications, seminars and further education of multipliers. Although the planning is centrally managed on a regional scale, at the local level the implementation is the task of the individual communities or stakeholders. So-called model projects are carried out in order to support implementation. This means that different issues will be dealt with at individual sites, serving as examples which encourage further implementation across the region.

At the local level sport area management includes visitor flow management, communication and prohibitions. Visitor flow management measures are of major importance. The measures include direct interference like routing, as well as facilities targeting visitor convenience and interests. This includes high quality sporting facilities and services, as well as an appealing path network. Furthermore, management measures include planting schemes, barriers and the removal of paths. It is important that the applied measures are conveyed to the public appropriately. Brochures providing background information, signposting and updated maps which include the new paths, as well as guided tours and public presentations are essential tools. The implementation of prohibitions is a final measure. But this is only to be applied if absolutely necessary. It is vital that all sporting activities in the managed areas are analysed and planned with the support of land use planning strategies. This is particularly true for the planning and the building of the infrastructure. The planning does not only include social and economic impact assessment but also environmental impact assessment. The cooperation between executers, legal representatives, communities, sport associations, forestry and nature protection are the basis for successful implementation of visitor flow management. In the interest of a holistic approach sectoral ways of thinking must be avoided.

The final step of the sport area management system also includes monitoring, as all projects, measures and treatments impact upon the future development. Continuous impact assessment of the management makes it possible to draw conclusions regarding the success of the implemented projects and provides crucial information for future planning.

Tools, which include spatial as much as factual information, are necessary for implementation at all levels. Today, it is hard to imagine that the collection and analysis of geographic data, the evaluation and the linking-up of data, as well as the implementation in the planning phase could be done without the help of information technology. Therefore, the application of modern programmes, such as Geographic Information Systems (GIS), is absolutely necessary. In a first step all the relevant landscape information must be collected. Landscape structures are analysed by means of a digital elevation model, satellite photographs, topographical maps, functional maps (e.g. hiking maps, climate maps) and field data (mapping). Analogous data are digitised and saved in the GIS database. Furthermore, the existing spatial data are linked up with additional factual information, for example the results of surveys. The landscape analysis and evaluation from the viewpoint of sport tourism are based on the data collected.

Visitor Flow Management Model Projects

Model projects will implement the predefined aims and the overall concept. A key element of visitor flow management for sports that affect the whole area, such as hiking and mountain biking, is the path network. Consequently, the criteria applied for adjusting old paths or constructing new ones take into account the ecological aspects as much as the demands of the sporting activities. As a result, handbooks are available for different sporting activities and distributed among the communities, sport organisations and the tourist services (Roth et al. 2002a, 2002b, Roth et al. 2003a). The handbooks provide information about the principles of the development of path networks that serve the needs of the sporting activities and are environmentally friendly at the same time. Furthermore, signposting rules necessary for the intended visitor flow management are introduced. This is accompanied by other measures of communications in order to ensure a successful implementation of the path network strategies.

In model projects, as well as in an accompanying project dealing with habitat management (Suchant & Schäfer 2002), the concepts were put to practice for hiking, mountain biking and Nordic Walking. The results of these projects will be presented in the following. In the central part of the nature park (Feldberg area) research about the development of the grouse population is conducted in cooperation with the State Forest Research Institute Freiburg and a local team. The monitoring, which is to provide information on the number of capercaillie and hazel grouse, their distribution and the tendencies of future development is accompanied by analyses of the habitat conditions. In selected areas certain habitat management measures are applied and the interrelation between habitat conditions and the presence of the two species is examined.

The visitor flow management and the signposting concepts for the various sporting activities in the model regions are based on a target group analysis. After an evaluation of the management measures the concept may be modified, if necessary, and will be implemented throughout the area of the nature park. At the same time, it is important to analyse the existing path network and to estimate how frequently these paths are used.

Target Group Analysis

Target group analyses must be based on extensive knowledge about the various user groups and the requirements of each sporting activity. To gain this knowledge visitors were surveyed and the visitor numbers were counted (Table 1). Own results were compared with findings of other analyses and complemented the research (AGL 1996, Wöhrstein 1998, Brämer 1998, Vollmer 1999).

Data collection was repeated after four years for hiking, and two years for mountain biking. As Nordic Walking is a relatively new sport, data was only collected recently and the presented results are preliminary.

Table1. Visitor survey and the number of returned questionnaires.

Year	Hiking	Mountain Biking	Nordic Walking
1999	415 (Polenz 2000)		
2000		355 (Nöll 2001)	
2002		305 (Weißen-berger 2003)	
2003	254 (Roth et al. 2004b)		
2004			73* (Krämer 2004)
Total	669	660	73

* preliminary results, evaluation has not been completed yet

Research results show that each sport has a quite distinct target group. The most important results are presented in Table 2.

The average age distribution shows clearly that mountain biking is more popular among younger people. Of all the questioned mountain bikers, 75% percent are men. Among hikers the proportion of both genders is fairly balanced, but women clearly dominate Nordic Walking.

The reasons for doing the respective sport vary greatly. Hiking mostly serves nature experience, whereas mountain bikers and Nordic walkers also put emphasis on the sporting activity itself (exercise, health, sport performance, losing weight).

Hiking is mostly done on weekends and during the holidays. In contrast, mountain biking is frequently and Nordic Walking even mainly done during the week.

Within the nature park almost 90% of all mountain bikers are locals. Among the surveyed hikers only 32% lived within the area of the nature park and 38% in the surrounding area. Due to this 75% of the mountain bikers are able to travel to the sport area on bike, whereas the majority of hikers makes use of a car. Evidently, public transport is of greater importance to hikers than to mountain bikers. It has been found that the average range of hikers is 12 km and mountain bikers cover a range of 45 km. The local population also dominates the group of Nordic walkers, but in this group tourists also play an important role.

Path Networks to Manage the Visitor Flow

In the Southern Black Forest Nature Park the path network has been found to be the most efficient tool in the management of hiking, mountain biking and Nordic Walking. The utilised signposting systems vary because of the different target groups.

Hiking

In the Black Forest the signposting of hiking paths has a long tradition. Signs for the first long distance hiking path in Germany leading from Basel to Pforzheim, for example, were already put up in 1900. But, due to this long tradition of signposting many different signposting systems have been used over time. Varying path signs, the combination of circular routes with those leading to certain destinations and the lack of general path networks on a larger scale often led to confusion. The Black Forest Association decided to develop a completely new path network in close cooperation with communities and the nature park representatives. The new path system guides hikers through the landscape to specific destinations. At crossings signs list one or more hiking destinations and their distances.

The major focus lies on the main hiking paths beyond the community level, which have traditionally been used and connect to a whole selection of local paths to form a uniform network. The emphasis is on quality rather than quantity, favouring an appealing and ecologically friendly path network. The existing dense community based path network has been scaled back. The criteria for the new path network are specified in the Southern Black Forest Nature Park hiking handbook (Roth et al. 2002a). The Black Forest Association are in charge of the implementation, in close cooperation with the communities. By now the implementation has been completed for large parts of the nature park.

With the help of the new signs, hikers are now able to choose their routes according to their preferences without any difficulties. Additional information guides hikers to specific sights and vantage points or other places of interest, such as inns or train stations and bus stops. Signs showing all the hiking routes have been placed at the important entry points and up-to-date maps are available. The regional path

Table 2. Target group analysis for hiking, mountain biking and Nordic Walking.

	Hiking*1	Mountain Biking*1	Nordic Walking*2
average age (years)	50	37	55
gender	55% male / 45% female	75% male / 25% female	26% male / 74% female
group size	2 people (52%) 3–5 people (30%)	2 people (43%) single (34%)	3–5 people (52%)
motivation (in order of priority)	nature experience, landscape, the view	sporting activity, nature experience, exercise	health, lose weight, nature experience, exercise
Time of activity	mostly weekends / vacation; rarely during the week	weekends / vacation, but also frequently to very frequently during the week	mostly during the week
average range	12 km	43 km	6 km
average duration of activity	mostly for a day or half a day	mostly for a day or half a day on weekends, shorter during the week	mostly shorter tours during the week (2 hours)
origin	local population (32%) surrounding area (38%) tourist (25%)	local population (80%) surrounding area (10%) tourist (5%)	local population (65%) surrounding area (10%) tourist (25%)
means of transport	car (76%), public transport (19%)	mountain bike (75%), car (21%), public transport (4%)	car (80%)
orientation	signs, partly maps	maps and signs	signs

*1 summary of results of two surveys
*2 preliminary results, evaluation has not been completed yet

network of the nature park covers 2400 km. The implementation of the new concept and the linking-up of the regional and local paths will lead to a network of about 7000 km of hiking paths which are signposted in a uniform manner.

Mountain Biking

The signposting of a mountain bike path network in the Southern Black Forest Nature Park was initiated by the Forstdirektion Freiburg (the local forest directorate) during the 1990s. On top of that, some communities offered circular bicycle routes, using different signs. As in the case of hiking, a handbook (Roth et al. 2002b) now defines the criteria for the uniform signposting of mountain bike paths. This has already been implemented in large parts of the nature park.

The emphasis is also on path networks which are beyond the community level and guide mountain bikers to specific destinations. In some places these paths are connected to circular routes, which are either numbered or indicated by a colour. There is a distinction between easy (blue), moderately difficult (red) and difficult (black) routes, as known from the categorisation of cross-country skiing trails. This information is also included in maps.

This combination of different signposting systems is due to the varying demands of mountain bikers as they have a larger activity range. Whereas some mountain bikers prefer to go on more individual routes by combining paths to various destinations, others appreciate the circular routes with information on distances, altitudes and the degree of difficulty. Tourists, in particular, appreciate the existence of circular routes as they lack local knowledge. It is important that the uniform signposting is applied although the two systems are combined. Information on the circular routes is to be supplementary and should not require additional signs. Altogether, the signposted mountain bike paths extend over roughly 1000 km in the Southern Black Forest Nature Park.

Nordic Walking

Those who do Nordic Walking have their own requirements with respect to the path network. For this sporting activity the emphasis is on circular routes. The routes begin at the same starting point and are also subdivided according to their degree of difficulty (blue, red, black). Signs along the routes are only put up in one direction. Signs at the start, as well as at other stops along the way include additional information about the route (general maps, height profiles, altitudes, distances, degrees of difficulty). Moreover, the signs provide information relating to techniques, heart rate measurement, equipment rental, courses, as well as stretching and strengthening exercises. An innovative, high quality service is offered to tourists, which is also useful for marketing purposes. The signposting criteria for the nature park are defined in the Nordic Walking handbook (Roth et al. 2003a). Currently, over 20 communities offer more than 400 km of reliably signposted Nordic Walking routes.

These services offer many possibilities to learn and practise this new endurance sport. Almost all of the communities make use of the path network to offer organised Nordic Walking tours and training. Naturally, Nordic walkers may also use the existing hiking paths, if they do not want to make use of the additional services and wish to follow individual routes.

Independent of the applied signposting system, the putting up of signs must be done thoroughly in order to ensure good orientation. Regular checks of the signs and the substitution of damaged or missing signs is mandatory. To manage the routes and the signposting it is helpful to use Geographic Information Systems.

Furthermore, it is absolutely necessary to make the new path network concepts and measures known. Updated and standardised maps, as well as brochures or information in the internet must be made available to (sport) tourists. The application of new media for this purpose, e.g. routing planners in the internet and automatic height profile generation, plays an important role. A vital interest of all new conceptions is that ecological aspects are taken into consideration. In order to avoid conflicts and to come up with solutions, all of the local stakeholders (community, forestry, nature protection, hunting, sports) participate in the planning from the very beginning. The utilisation of Geographic Information Systems is crucial.

Evaluation of Visitor Flow Management Measures

The end result with respect to hiking is very positive. The vast majority of hikers is very satisfied with the new signposting system. The identical design of signs makes it easer for hikers to orient themselves. The additional information on the signs is appreciated. Only a very small percentage of the hikers uses unmarked paths. For hikers it is important that the route is attractive and that signs do not only guide their way, but also indicate vantage points and guide them through changing landscapes, as well as to inns. Signs combined with a hiking map enable locals and visitors alike to plan individual routes. The provided information material for hikers also received very good feedback.

The results are equally positive in those areas, where management measures were applied as part of the habitat management project (Suchant & Schäfer 2002). In the central Feldberg area existing paths were relocated, removed or closed. If possible, new routes were moved to less sensitive areas and at the same time, attractive paths and good signposting led to improvements. So far habitat management measures were implemented on altogether 300 ha. Simultaneously, 33 km of new hiking paths were constructed and additional path construction measures were undertaken on a combined distance of roughly 15 km in order to improve the quality of the hiking paths. Surveys among visitors confirm that there are less activities in sensitive areas now.

Nordic Walking also seems to develop in a positive direction. Since the data collection has not been completed yet, the results are only preliminary. Nevertheless, it already becomes clear that this target group is comparable with the hikers and that visitor flow management measures are successful. This target group is very interested in making use of the signposted paths and the additional services as people mostly take up Nordic Walking for health reasons (e.g. exercises, heart rate). It is striking that many joggers and hikers also use these paths for the same reasons. Apart from that, many Nordic walkers still feel uncertain about the right way of doing this new sport. Due to this many people do Nordic Walking as a member of a group or prefer routes where they meet like-minded people. Signposted routes are also frequently used by guided groups. Those who do Nordic Walking in other areas, almost exclusively use the signposted hiking paths.

The majority of surveyed mountain bikers have positive opinions about the paths. It is mostly individual parts of the path network that are used. Only rarely, the additional circular routes are utilised. Mountain bikers also use many paths which are not signposted, partly even in sensitive areas. Most of the mountain bikers are locals. The existing path network is appreciated and made use of in many parts, but the local knowledge enables the mountain bikers to go on individual routes, take short cuts and include other stretches. Information aimed at visitor flow management is not adequately designed for the local population, as brochures and other information material are mostly addressing tourists. The main target group is not reached. Furthermore, there is clearly a lack of marketing mountain biking. Despite ideal natural conditions, there is still great potential for further development. Additionally, the distribution of existing maps must be improved. Only a very small proportion of the surveyed mountain bikers use the existing mountain biking maps.

From the viewpoint of nature protection, due to its large activity range, mountain biking also has negative impacts on many animal species at dusk and dawn. Whereas hikers and Nordic walkers have already returned to the car parks or villages by the time it gets dark, mountain bikers may still be active in remote areas. This requires better communication to highlight the problems and to stress the importance of staying on the signposted paths. Of the surveyed people 62% stated they would be in favour of the relocation or removal of mountain bike paths, if it is beneficial to nature protection. This high percentage is to be looked at critically though, because of the high proportion of locals. Among the hikers 66% agreed.

Better development and integration of single paths may also lead to an improvement of the situation. Many of the questioned people would prefer more of those demanding stretches. This requires special regulations approved by the forestry commission, but a compromise would be possible. The availability of attractive single paths in less sensitive areas would improve the effects of managing the visitor flow by means of the path network. As a result, this may lead to a reduction of disturbances in ecologically valuable areas.

'Social' conflicts that mostly arise between hikers and mountain bikers are manageable. Information campaigns have already achieved that the different user groups are more considerate towards each other. The surveyed hikers feel mostly disturbed by motorcycles and cars (Polenz & Roth 2000).

To analyse the population development of various animal species and to observe the effects of the visitor flow and habitat management measures, the state Forest Research Institute has set up a monitoring programme throughout the Black Forest. Data are collected at different levels (foresters, ornithologists, volunteers) and saved in a central GIS database. The different effects of the habitat management and the relocation of paths can only be evaluated after a longer period of time, but the monitoring serves as an important basis for an extensive long-term analysis of the effects.

Conclusions / Discussion

Four years after its foundation the Southern Black Forest Nature Park has managed to firmly establish itself. Many of the overall concepts could be implemented. An extensive programme of events, the implementation of several model projects and the identification of the local population with the nature park reflect the successful development. At the same time, the nature park has become an important label, which makes the region a strong competitor. The coexistence and cooperation between nature protection, agriculture, forestry, settlement development and (sport) tourism in the region are an important basis for successful future development. In the sport tourism sector, especially in core zones, existing conflicts could be neutralised by applying visitor flow and habitat management measures. Apart from resolving conflicts and increasing the value of nature protection issues, an overall improvement or optimisation of the sporting facilities is achieved. It shows that visitor flow management through offering service is accepted by the majority of people. This way rules and prohibitions, as proposed by Scherzinger (1992) and Köhn (1997), can be reduced to a minimum. High quality infrastructure and an extensive information campaign, which must convey knowledge and gain public approval for the implemented measures, form the basis for this. Visitors are provided with the necessary information and are able to make their own decisions, which gives them the impression that there are less restrictions (Riekens 1996). This combined with the exchange of expert knowledge (guided tours, presentations, etc.) encourages visitors to act environmentally friendly (Janssen 1989). The results found by Suchant (2001), Suchant & Schäfer (2002) and Krämer (2003) also illustrate that (sport) tourism and nature protection can harmonise, even in valuable protected areas, if they are spatially separate. Both can in fact gain from this.

Even so, it is absolutely necessary to develop further in this direction. It will remain a challenge to recognise new trends and developments and implement innovative ideas at an early stage. The initial model projects had the desired positive effect and the concept is to be applied to the whole area. The example of mountain biking underlines how important it is to do an in depth analysis of the target group if the management measures are to be successful.

Current conditions must be analysed continuously and need to be compared with the predefined overall concepts. The methodology behind the Sport Area Management System proved to be useful in this respect. The pillars of success are the planning procedures at the two different levels, the participation of all stakeholders and continuous monitoring. In the meantime the Sport Area Management System methodology has also been applied successfully in further projects, e.g. for the conception of the Central/ Northern Black Forest Nature Park (Roth et al. 2003b) or to develop a concept which promotes winter sport tourism in Baden-Württemberg (Roth et al. 2004a).

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Regulation of Visitor Activities in the DINP

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Abstract: Thanks to its varied natural and artificial values the Duna-Ipoly National Park (DINP), established as the ninth national park in Hungary is suitable for numerous tourist activities (touring, cycling, horse riding, winter sports, water sports, caving tours, cliff-climbing, flying, fishing, hunting, etc.). Resulting from this, the employees of the national park must reckon with numerous unfavourable environmental effects produced by the tourism and increased by the closeness to Budapest. All of this is intensified on one hand by part of the territory being identical with the outstanding recreation district of the Danube Bend, on the other hand by its coming within the capital city's recreation zone, due to which establishing the section of visitors is also problematic. Although attempts are made to demonstrate the values in the national park in the interest of avoiding the hazards and developing environmental awareness and ethics, regulation of the visitors' activities, for the main part, does not take place in a planned manner. In our article, besides disclosing the causes of the disorganisation, we also stipulated the most important principles for solving these problems.

Introduction

Although the primary task of the national parks is protection and rehabilitation of natural and artificial values found in the areas under their administration, the presentation of these values, together with developing an attitude intending to preserve these, also come within their objectives. This role, however, can only be fulfilled if they provide the opportunity for gaining experience, relaxation and studying for as many people as possible. Tourism can offer extremely important assistance in developing an attitude capable of recognising, appreciating and wishing to protect these environmental values. However, only activities carried out by the visitors may be established or developed in the national parks, which do not harm the protected values significantly. Therefore direction and checking of visitor activity is indispensable.

Within the framework of the article we present the main items of attraction of the DINP, together with the national park as a target area for tourism. We survey the tourist activities characteristic of the area, disclose those effects endangering the values, and examine what the national park has done, and with what success, in the interest of protecting and presenting the attractions, and for shaping the attitude of visitors. Finally we call attention to the problems obstructing the development of friendly tourism and outline the main principles for their solution.

Value of the DINP

The DINP, which is positioned to the North in close proximity of the Capital city, was established in 1997 as one of Hungary's newest national parks. It covers 60314 hectares, of which 21410 ha (35.5%) is a highly protected area. Besides the fact that it contains as a unit, the Danube Bend, the valley of the Danube breaking through between the Börzsöny and the Visegrád Mountains, the area being designated as a meeting point of river valleys, mountain chains and plains, provides other individual landscape values. The richness of geomorphological, hydrological, botanical, zoological and cultural history values justify its being declared as a protected area.

The region is dominated by medium mountain ranges of varying petrography and relief construction (Figure 1). The ***Pilis*** originating in the Triassic period is characterised by barren limestone and dolomite slopes. Due to the carst development it hides almost 200 caves, of which 12 are strictly protected. The plateau of Pilis-tető (757 m) carries the highest point of the entire Transdanubian Mountain Range. The andesite and pyroclasts of the Visegrád Mountains double caldera, rising on the right hand bank of the Danube, were developed during the volcanic activity taking place in the Miocene. Deep valleys and ravines make its area variable. The mountain range's andesite agglomerate „pyramids and towers" are of captivating beauty, which was formed jointly by the wind, frost and water. The Pilis, Visegrád Mountains is a biosphere reservation, also registered internationally from 1981. The andesite, andesite-dacite volcanic complex of the ***Börzsöny***, reckoned as one of the county's most close-ordered mountain ranges is similarly a reminder of the Miocene volcanic activity. From the edge of the central caldera,

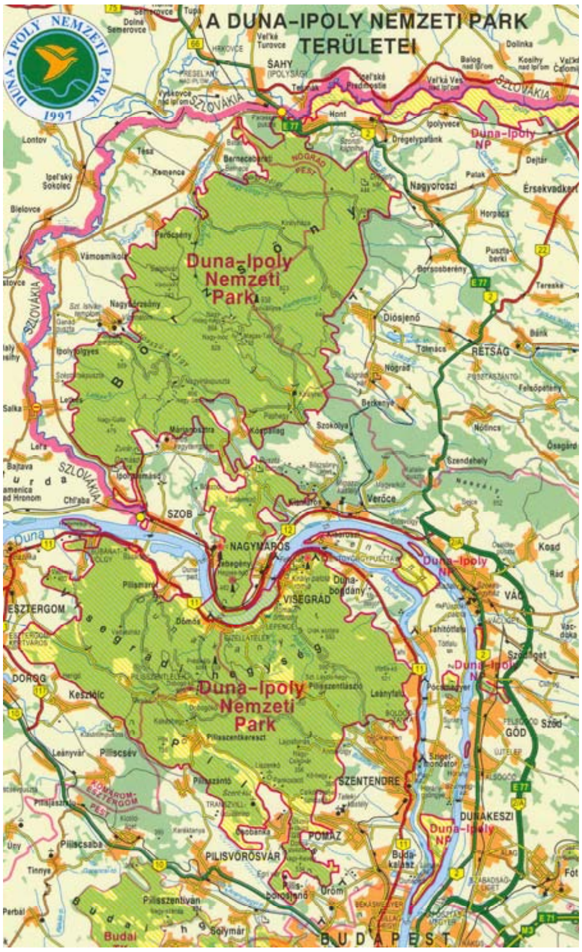

Figure 1. The area of the DINP. Source: The Pilis and the Visegrád Mountains, Tourist atlas & guidebook (2001).

protruding up from its surroundings, a wonderful panorama is opened up onto the mountain range, divided up by valleys and covered by forests.

The Danube bordering on Slovakian territory and its tributary the Ipoly, are dominant from both the hydrologic and landscape points of view. Leaving the Visegrád-strait the Danube widens out and then dividing in two encloses the ***Szentendrei-Island***. The about 31 km long and 2–3 km wide island is a flat area scattered with sand mounds. In the ***Ipoly-valley*** the improvement work initiated by Slovakia was made difficult by legal border questions, due to which the DINP was able to put an "almost untouched" flood area of about 2000 ha haunted by marshes and mort lakes, under protection. This river-stretch accounted as a significant route for migrating birds in early spring, was registered as Ramsari Territory in 2001. The clear, abundant water streams of the Börzsöny, together with the 300–350 springs feeding them, represent important hydrologic values. Among them more than forty have sources more than 600 m above sea level.

The national park's vegetation is extremely varied. The proportion of forestation is 80–85%. Besides the large extension of shrubs and hornbeam-oak groves, the extra-zonal associations display greater variation. The mixed carst forest characteristic of the Transdanubian Mountain Range reaches the limit of extension to the east in the Pilis, but at the same time the hare's tail grassy beech groves starting at the Visegrád Mountains extend this far. The black-cherry carst-shrub woodland association is spread over the southern rocky slopes; the soft-stem Hungarian Thistle is characteristic, but the Pannon ferula, surviving since the ice age also exists here. All of this is supplemented by the vegetation communities, characteristic in the Ipoly-valley's watery habitats. The meadow clematis is the decorative plant in the Ipoly's catchment meadows, but botanic rarities are also hidden in the alder fen woods. The Börzsöny is the limit area for extension of a series of species. In its flora, the protected orchis, iris and gentian species are present in greater numbers, while other rarities (alpine rose, ophioglossum, rock-fern, etc.) are only known to occur over a few square metres.

The area's fauna is also variegated. The steppe meadows are the habitat for unique orthoptera. Numerous amphibious and reptiles (e.g. speckled salamander, pannon lizard), together with several shrew and dormouse species obtain protection in the DINP. Occasionally the lynx shows up in the undisturbed forest, while the otter can be found beside the waters. The fast flowing, gravel-bedded water in the Danube Bend is the habitat of endemic snail species (e.g. shelled-snail). The most valuable member of the fish fauna is the petényi barbell. Among the bird species, the strictly protected fallow eagle, lanner, water ouzel, bee-eater, secretary bird and white-backed woodpecker are worth mentioning. The caves and deserted mine shafts are habitats for rare bat species.

The DINP is extremely rich in cultural historic values. Among these are the bridge and watchtower remains from the Roman period, the Visegrád palace and castle of the middle ages, the Börzsöny fortresses (e.g. Drégely, Nógrád's fortress), together with the village museum at Szentendre, preserving the traditional architecture values.

The national park as a target area for tourism

Due to its positioning the DINP is not sought out by tourists mainly as a preservation area. This is reinforced by the questionnaire survey carried out among tourists in 2001, according to which only 4% of the visitors came to the area because it is a national park (Marton-Erdős et al. 2003). It is also an important circumstance that the majority of visitors (~60%) only came for a one-day trip.

The DINP territory is partly identical with the outstanding holiday district of Danube bend; on the other hand by it's coming within the recreation zone of Budapest with a population of two million. This is also reflected – the Danube Bend is "overrun" by people in their second homes – by the survey data, according to which the proportion of those from the

Capital City was 67%. Besides this, naturally the free time activity of the local inhabitants in the holiday area is also directed towards the protected areas. Resulting from all this it is very difficult to identify the type of visitors to the national park. Assessing the amount of tourist traffic can be done in various ways. One form of basis is offered by data of the commercial accommodation in the holiday district. According to this, the 161268 persons accommodated in the commercial units with space for 9555 persons, spent a total of 345002 nights as guests (Tourist Statistics Journal 2001). In regard to the owners of second homes coming within the recreation district, unfortunately we can only refer to estimations, according to which their numbers at summer weekends is three times that of those living in the area (resident population: ~ 100000). At the same time, the number of visitors to the DINP territory can only be estimated from the questionnaire survey carried out among the visitors. The data of visitor traffic from the park's main Börzsöny reception centre (Királyrét) are much more reliable, because the tourists staying there all visit the national park as well, without exception. According to the statistics 957 persons spent 2158 nights as guests at Királyrét in 2003. The numbers taking part in "paid" programmes can similarly be followed up precisely. 2901 persons took part in the guided tours organised by the Börzsöny reception centre in 2003, while about 400 people went to see the exhibition held in the Pilis centre (Esztergom). As opposed to the foregoing, it is more difficult to establish the numbers visiting the study-paths, various tour routes or skiing centres. For example, according to the nature protection wardens about 2000 visitors a year walk along the Kis-Strázsa-mountain study-path in the Pilis.

The lack of knowledge of the numbers and types of visitors makes it extremely difficult to regulate the activities of the visitors.

The effect of DINP tourism on the environment

Tourism can influence the environmental condition of a given target area in many ways. The ***traffic*** is an extremely significant environment contamination factor, therefore the knowledge and regulation of the means of transport used by visitors in the protected areas is particularly important. The development of a public transport network around the national park can be assessed a positive due to the close proximity to the capital city, thanks to which, according to the surveys, about 48% of the visitors travel to the area by public transport. Similarly it can be said to be favourable that the three overhauled lines of the traditional Börzsöny mountain small-gauge rail network, are promoting environment friendly tourism within the national park area. Besides substituting for car traffic, the small-gauge railway lines also represent an attraction.

Development and operation of the ***tourist infrastructure*** similarly places a heavy load on the environment. The most conspicuous effect can be put down to the building of second homes. Since the second half of the 19th century, the Danube Bend has progressively become a favourite holiday district for residents of Budapest. The landscape devastating expansion of family holiday homes became a serious problem from the 1960s. Besides the increase in built-up area, the insufficient infrastructure of the houses also represents a big problem. Due to all this, the total value of protected areas adjacent to the holiday home district can today be regarded as endangered.

The tourist infrastructure development incompatible with nature preservation, is sometimes successfully prevented (e.g. construction of the Dömös-Dobogókő chair-lift), sometimes is obliged to be accepted by the national park (e.g. the therapeutic complex being built beside the Danube close to Visegrád).

Resulting from its endowments, the DINP offer numerous opportunities to its visitors for relaxation, sport and study. The various ***tourist activities*** represent many dangers to the environment. In the following we review in tabular form the characteristic tourist activities relating to the area, the negative effects produced by these and the methods applied up to now for their elimination (Table 1.).

Although, it was not indicated in the table those omitting against the rules formed by the national park may be punished by spot-fine, offence measures or natural protection fine.

Let's consider the most important problems highlighting certain activities. Questionnaire investigations revealed that visitors aim is nature trailing when visiting the DINP. The Börözsny, Pilis and Visegrád Mountains are the most exposed parts of the country regarding nature trails. Even in some places (e.g. Nagy-Hideg hill in the Börzsöny) rangers consider the system of nature trails to be denser than the optimum. The greatest problem is caused by the disturbance of crowdedness associated with nature trailing along the most popular routes. To avoid this for example certain fortresses have to be missed during the fortress trails in the Börzsöny as these are found near the nesting places of imperial eagle.

In theory considering sporting activities in nature, the technical sports (pleasure flying, hang gliding, cycling, motor sports) are subject to permission but nature rangers consider these activities as inconsistent with protection tasks. The most problematic site in Hungary in this respect is the strict nature reserve of the Pilis-tető that on the one hand is the habitat of the Pannon ferula while on the other hand it is one of the best starting points for hang gliding in the country. The endangeredness of the species is indicated by the highest value, 100000 forints, of intangible value. Hang gliders and gilders occupy the area since the 1960's. Their activity resulted in that the

Table 1. Tourist activities in the DINP, the dangers produced by these and the methods directed towards their prevention.

Tourist activity	Dangers	Methods of prevention
Touring, hiking	Too congested touring path network, pedestrian path erosion, disturbance, littering, crowdedness, collection of natural values, straying from designated route	Construction of paths, path repositioning, terminating paths, positioning litter containers
Cross-country races/competition tours	More and more competitors, littering, trampling, disturbance	Subjection to permission (inspection of routes, taking account of frequency of competitions)
GPS navigation competition	Increase in passenger car traffic	Forbidding the activity
Cycling	Crushing, breaking vegetation, soil erosion	Subjection to permission, designating cycle tracks
Car and motorcycle sport	Crushing, breaking vegetation, soil erosion, noise, air pollution, disturbance	Subjection to permission
Hang-gliding, sail-planing	Trampling	Forbidding the activity
Rock climbing	Damaging rock faces, crushing valuable plants, disturbing nesting places	Subjection to permission
Skiing	Landscape dissection, division of habitats, overloaded capacity, trampling, soil erosion	Forbidding snowballing, forbidding vehicle traffic, permission for sites at the development
Horse riding	Trampling, lack of routes	Keeping the traffic on designated routes
Caving	Damage to formations, excess growth of algae, disturbance	Visits subject to permission with guides, restricting group numbers
Water sports	Trampling vegetation, communal pollution, damage to water life	Subjection to permission, designated camp sites, restriction of group numbers
Fishing	Trampling vegetation, communal pollution, damage to water life	Subjecting the activity to permission, dismantling of non-permitted stages
Hunting	Too large stock of game, prevention of rejuvenation development, shooting of protected animals	Conciliation of interests

bush-wood retreated to the edges so the system of licensing was substituted by prohibiting.

Several problems are associated with water sports and fishing. One of the problems is associated with the weirs of valley reservoirs for flood protection and recreation. As these close the way of the fish that can not reach the mountain streams that present their spawning place. The lack of instruction that would rule the infrastructure construction along the coasts is also a problem.

The “view-forming” activity of the National Park

To avoid the above mentioned problems and to form environmental awareness and ethics the national park staff is keen on presenting the values of the area by different exhibitions by teaching and amusement programs and by trails.

When establishing exhibition centres, study paths and cultural values the main goal was to expose characteristic values so that visitors are driven to the marginal areas unloading the inner strict nature reserves.

Among exhibition centres the Királyrét Exhibition Centre provides both accommodation and programme. Visitors can spend one hour or one week with field programmes (studying wetlands and plants, studying animal traces, animal watching day and night, visiting local historical memorials), craftsmanship lessons (felting, origami, stringing of beads, weaving), slide and quiz shows and guided tours.

The exhibition of the Esztergom Exhibition Centre shows the natural characteristics and protected values of the Pilis. Walking on its study path visitors may see these values at their natural occurrence: sand martins nesting in loess walls, colourful bee-eaters, spring pheasant's eye meadows and the view from the lookout on the top of the hill. 1–3 hours long tours may be asked depending on the interest of the visitors.

In the Visegrád Hiking Centre maintained by the Pilis Parkerdő Company forest culture house, game preserve, and playing ground can be found. In the forest culture house children can take part in nature protection programmes or they may join the nature protection camp operating on the hill for a week.

The other study path in the national park represents a flood-plain area and it is maintained by a fund. The botanical-zoological study path represents a remnant of the flood-plane forests following the Danube near Vác. The most valuable parts of the forest are frequently covered by water therefore a board path is laid down. Bird watching is also a possibility at the site. Visitors may ask for a guided tour. Groups are recommended not to exceed 20 people.

Further exhibition sites are also planned to be established at the margins of the national park. To implement this, a 13th century monastery was restored and an ancient glassworks was exposed and Drégely fortress is also planned to be reconstructed.

At the DINP future is planned as to invisibly drive the visitors. Experience proved that prohibiting is often useless and it triggers offence from the visitors. Undisciplined visitors force the staff of the national park to exclude endangered values from exhibition and to provide access to the displayable values.

Outlining the factors impeding the control of visitor activity

Before we outline the directives to be applied in the future for controlling visitor activity we present the specific problems that make the provision of the conditions of friendly tourism harder.

1. The position of the national park makes implementing the tasks harder

As the DINP involves a densely populated well infrastructured and heavily industrialised area of Hungary the environmental harms affecting the territory are multiplied. Therefore the protecting of this conflict loaded environment requires great effort (Bodnár 2000).

2. Controlling visitor activity triggers problems in the traditional tourist areas

The area is situated close to Budapest. Furthermore, there is a great overlap with the important recreation district of the Danube Bend that is regarded as the 3rd most visited tourist resorts in the country. Thus recreation activity within the park started way before it received protection. According to the experiences controlling such activities that were allowed before is much harder.

3. The National Park Directorate is not permitted to carry out profit oriented activity

As a non-profit institution the primary task of the national park is to act as an authority and it should not carry out profit oriented activity. Therefore the park provides certain services (tour guiding, accommodation, exhibition) but other tourist agents compile the programme packages. This has two main disadvantages: first, the Directorate can not influence what should be covered by the programmes. Second, a major income is released. Therefore, the national park is not fully interested in the development of tourism however, the conditions could enable further tourist activities (village tourism, vine tourism, birdwatching).

4. Profit-oriented forestry and hunting activity is carried out in the area of the national park

The self-owned area is only 8 % in the DINP! The majority of its area is maintained by profit-oriented forest and hunting companies. The harms coming from silviculture and game management affect the wildlife of the forests. The talks between the representatives are not successful in every issue yet.

5. Zoning of the DINP is not completed yet

Development of eco-tourism should be based on the zoning of the national park. Acceptation of the zoning is delayed due to the interest of the forestry. However, it is nonsense to start the development without this zoning.

6. No study investigating the effects of visitors is available for the DINP

The lack of knowing the number and structure of visitors makes harder not only the control of visitor activity but planning as well. Further problem is the lack of report on the environmental effects of visitor activity. It is not possible to determine the loading capacity of the area without these.

7. Lack of manpower

Lack of staff also reduces the effectiveness of the Danube-Ipoly National Park Directorate. Therefore in both eco-tourism and education only the most important tasks are carried out. No energy is available for detailed planning and major development.

Tasks

The control of visitor activity and the application of the measures for this is not planned and occasional in the DINP. Without solving the already mentioned problems no improvement is expected towards a higher level of control. Further, the national park is still ahead of several tasks: e.g. the operation conditions of certain activities should be completed and the behaviour codex of the visitors should be compiled. There are tasks in the field of education as well. This is proved by a questionnaire study revealing that 41 % of the asked tourists know nothing about the park and only 56 % of the hikers know that they are within a national park (Benkhard 2001)!

Co-ordinating nature protection and friendly tourism is not imaginable without co-operation of national parks, visitors and local residents. Realising well operating co-operation is beneficial for all participants. This is proved by a farm operated by a local entrepreneur. This interactively exhibits traditional occupations and local production forms that are nearly forgotten. Visitors are attracted by leaflets produced together with the national park.

For the DINP it would be possible to join the PAN park system. The PAN Parks programme would give the possibilities for constructing study paths and birdwatching towers and for reinforce exhibition centres, etc.

Regarding the above mentioned facts there are two ways for the DINP: preventive protection and control of visitor activity or no control but more cost consuming restore of the environment.

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Trip motivations among water-based recreationists

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Abstract: Empirical research has consistently demonstrated that motivations differ based on participation in various activities, as well as due to the significant effect of other variables. Perpetuating this line of research, the purpose of this paper was to examine the effect of select non-motivational variables on motivations among recreationists on the Gallatin River, Montana, USA. A 15-mile stretch of the river was earmarked for data collection (n=321) in June and July 2000 via river exit interviews. Based on the literature, motivation was operationalized into 9-items using a 5-point Likert scale. Some of the findings highlight that rafters emphasized the status motive, while anglers noted relaxation and solitude. Residents were motivated to participate for social and physical aspects, while tourists noted setting and prestige motives. Repeat visitors were more likely to mention solitude, while first time visitors indicated to watch wildlife, and to tell others about it as key motives. Males were more likely to participate for solitude while females noted that they could tell others about it at home. Recreationists have wide sets of motives, and understanding what individuals seek through recreation can provide useful guidance to a variety of planning and management decisions.

Introduction

As participation in outdoor recreation activities has increased dramatically over the past few decades in the US, researchers have attempted to study the underlying motivations for participation. Empirical research has largely employed Recreation Experience Preference (REP) Scales conceptualized and empirically tested by Driver and associates. Due to the length of the REP Scales, researchers have typically employed smaller sets of items or certain domains pertinent to their respective research (Graefe et al. 2000).

However, motives differ among recreationists and are largely dependent on their goals (Mannell & Kleiber 1997) and their respective activity. Some of the participants that have been examined in the literature are, rock climbers (Iso-Ahola et al. 1988, Levenson 1990, McIntyre 1992), mountaineers (Ewert 1985, 1993, 1994), mountain bikers (Vilter et al. 1995), river users (Graefe et al. 1981, Knopf & Lime 1984, Schreyer et al. 1984, Schuett 1994, 1995), campers and horse and wilderness users (Graefe et al. 2000), and SCUBA divers (Meyer et al. 2003, Todd et al. 2002).

Based on river users, peace and calm, and viewing scenery were noted as key motives (Knopf & Lime 1984). Among rock climbers, McIntyre (1992) identified recognition, creativity, physical setting, challenge, escape, and control as motives to participate. Similarly, exhilaration/excitement, social aspects, image, aspects of climbing, and catharsis/escape were found for climbers (Ewert 1994). For SCUBA divers, Todd et al. (2002) noted adventure, learning, escape, social interaction, status and personal challenge. Among visitors to the Delaware State Parks system, Confer and colleagues (1996) identified escape/solitude, nature/harmony, nature/learning, fun/recreation and social/interaction as major motive domains. Furthermore, based upon various user groups within a wilderness area setting, Graefe et al. (2000) found that scenic area users (mostly day visitors) were motivated to visit so that they could be surrounded by nature and learn about it. Conversely, escape was the strongest motive factor for campground and wilderness users.

In addition to understanding motives for participation, researchers have further examined non-motivational factors that may influence participation in a certain activity. Such variables relate to past experience and skill level (Ewert 1985, 1993, 1994, Knopf & Lime 1984, Graefe et al. 2000, Schreyer et al. 1984, Schuett 1995, Todd et al. 2002, Williams et al. 1990), first/repeat visit and type of trip (Graefe et al. 2000), group composition (Ewert 1993, Ewert & Hollenhorst 1989, Heywood 1987, Schuett 1994), enduring involvement (Ewert & Hollenhorst 1989, McIntyre 1992, Robinson 1992, Schuett 1993), and select demographic variables (Meyer et al. 2003).

Some of the findings highlight that first-time wilderness visitors were more motivated to learn, while repeat visitors noted escape reasons. Additionally, learning was also mentioned as a major motive to visit by day users, and overnight users identified more with escape, fun and challenge (Graefe et al. 2000). Among SCUBA divers, those with higher levels of development (i.e., beginners through experts) were highly motivated to participate for adventure, learn, status, and escape (Todd et al. 2002). Similarly, Meyer et al. (2003) found that females SCUBA divers were more likely to participate for intrinsic purposes, while males noted for extrinsic reasons.

Overall, based on empirical research, there has been some consistency in findings as recreationists have noted the following but not limited to these motivations/domains such as, exploration, escape, general natural experience, introspection, exercise, to be with similar people, to seek exhilaration, and to escape physical stressors. In addition, empirical research has consistently demonstrated that motivations differ based on participation in various activities, as well as due to the significant effect of other non-motivational variables. With the current growth in participation and projected increases in the future, natural resource managers must be able to learn about the needs and trip motives of their visitors, and to act accordingly to optimize the quality of their experiences. The purpose of this paper was to examine the effect of selected non-motivational variables on motivations among recreationists on the Gallatin River, Montana, USA.

Methods

Big Sky is one of the gateway communities to Yellowstone National Park and is a destination frequented by tourists largely during the summer months. Gallatin River is a naturally free flowing river with headwaters that originates in the Park, and is popular recreation site for local recreationists (rafters, kayakers, anglers) and tourists. A 15-mile stretch of the river was earmarked for data collection due to its popularity and accessibility to private recreationists (self-guided) and commercial operators who charge for services such as a guide and/or outfitted raft/fishing trips.

Data were collected in June and July 2000 via river exit interviews (approximately 12 minutes) with a systematic stratified sample of users throughout the day. Collectively, 321 recreationists (residents and tourists) who were 18 years and above were sampled. Motivation was operationalized into 9-items using a 5 point Likert scale ranging from 1=not at all important to 5=extremely important. The items were based from the literature. Similarly, non-motivational variables included activity style, first/repeat visit, frequency of participation, and select demographic variables such as gender and residence. The motivational items were employed as dependent variables, and a series of one-way analysis of variance were conducted against the non-motivational variables (independent variables). Significance was measured at the .05 level.

Results

Males comprised about 71% of the respondents, while 29% were females. About 36% were between 21–30 years of age, and 22% were between 41–50. Respondents were fairly affluent with 34% noted family incomes to be over $90,000. The sample was almost evenly split between tourists and residents (someone who has traveled 50 miles or less to the site). About 52% of the respondents noted to live within 50 miles of the recreation site. Based on the primary activity of the day, 32% were identified as kayakers; 35% were rafters, and 33% were anglers. Majority of the tourists (72%) noted to have participated in rafting, while a similar percentage of residents (77%) noted to have kayaked. Anglers were fairly evenly spilt between being a tourist and a resident. About 37% were first time visitors; 23% participated between 2–9 days in the past 12 months, while 40% visited 10 days or more. Likewise, 94% were overnight visitors while 6% were day visitors.

Based on the comparison of motivational items and activity style, six out of eight items were significant at the .05 level. Findings highlight that anglers were more likely to participate for solitude; kayakers were more likely to participate as it offers a challenge, keeps them in shape, and to do things with other people, whereas rafters were more likely to participate to see wildlife, and to tell others about it at home (see Table 1).

On comparison of motivational items and first/repeat visit, four items were significant. Regardless of activity, repeat visitors were more likely than first time visitors to mention solitude and relaxation as their key motives to visit the river. However, first time visitors were more likely to indicate to watch wildlife as well as to tell others about it as key motives (see Table 2). Similarly, recreationists that participated for more than 8 days in the past 12 months were more likely to indicate participation to help keep them in shape, and also as an opportunity for challenge (see Table 3).

With respect to gender differences, regardless of activity, males were more likely to participate for solitude while females indicated participation so that they could tell others about it at home (see Table 4). Finally, on comparison with residency status, regardless of activity, tourists were more likely motivated to participate to get away from everyday routine of life, to see wildlife, and to tell others about it. Local residents were more likely to participate as it helps them to keep in shape (see Table 5).

Table 1. Comparison of Motivation Items and Activity Style.

Motive	Rafters		Kayakers		Anglers		
	Mean (n)	Std. Dev[1].	Mean (n)	Std. Dev[1].	Mean (n)	Std. Dev[1].	F value
For relaxation	4.06 (109)	.95	4.09 (100)	1.07	4.36 (101)	.84	2.94
To do things with other people	3.66 (109)	1.25	3.84 (100)	1.20	3.33 (101)	1.41	4.11*
To get away from the everyday routine of life	4.31 (109)	.96	4.17 (100)	1.21	4.44 (101)	.96	1.62
Opportunities for solitude	3.17 (109)	1.31	3.39 (100)	1.41	3.92 (101)	1.22	9.01***
To tell others about it at home	2.67 (109)	1.35	1.67 (100)	.97	2.16 (101)	1.19	18.56***
Help keep me in shape	2.60 (109)	1.26	3.36 (100)	1.20	2.27 (101)	1.23	20.79***
Be in a natural setting	4.35 (109)	.87	4.33 (100)	.83	4.22 (101)	1.02	.63
Opportunities to challenge myself	3.57 (109)	1.27	4.32 (100)	.92	3.18 (101)	1.40	22.94***
To see wildlife	3.62 (109)	1.25	2.89 (100)	1.29	3.42 (101)	1.33	8.84***

* significant at .05 level (2-tail significance)
*** significant at .001 level (2-tail significance)
[1]Standard Deviation

Table 2. Comparison of Motivation and Visitation (First/Repeat Visit).

Motive	First Visit		Repeat Visit		
	Mean (n)	Std. Dev[1].	Mean (n)	Std. Dev[1].	F value
For relaxation	3.89 (72)	1.07	4.23 (248)	.91	7.40**
To do things with other people	3.60 (72)	1.30	3.60 (248)	1.31	.12
To get away from the everyday routine of life	4.38 (72)	.88	4.29 (248)	1.09	.40
Opportunities for solitude	3.13 (72)	1.30	3.57 (248)	1.35	6.16*
To tell others about it at home	2.93 (72)	1.26	1.92 (248)	1.15	41.33***
Help keep me in shape	2.57 (72)	1.27	2.76 (248)	1.32	1.21
Be in a natural setting	4.35 (72)	.84	4.27 (248)	.93	.40
Opportunities to challenge myself	3.74 (72)	1.19	3.66 (248)	1.33	.18
To see wildlife	3.81 (72)	1.08	3.15 (248)	1.35	14.30***

* significant at .05 level (2-tail significance)
** significant at .01 level (2-tail significance)
*** significant at .001 level (2-tail significance)
[1]Standard Deviation

Table 3. Comparison of Motivation Items and Frequency of Participation.

Motive	1 Day		2-7 Days		More than 8 Days		
	Mean (n)	Std. Dev[1].	Mean (n)	Std. Dev[1].	Mean (n)	Std. Dev[1].	F value
For relaxation	4.08 (120)	1.01	4.35 (69)	.86	4.13 (131)	.95	1.88
To do things with other people	3.66 (120)	1.28	3.65 (69)	1.29	3.49 (131)	1.33	.64
To get away from the everyday routine of life	4.45 (120)	.79	4.39 (69)	.88	4.13 (131)	1.29	3.26*
Opportunities for solitude	3.21 (120)	1.33	3.74 (69)	1.30	3.56 (131)	1.35	4.05*
To tell others about it at home	2.65 (120)	1.29	2.22 (69)	1.25	1.65 (131)	1.00	23.14***
Help keep me in shape	2.56 (120)	1.20	2.32 (69)	1.23	3.08 (131)	1.36	9.49***
Be in a natural setting	4.35 (120)	.87	4.20 (69)	.95	4.27 (131)	.93	.59
Opportunities to challenge myself	3.62 (120)	1.25	3.19 (69)	1.49	3.99 (131)	1.16	9.31***
To see wildlife	3.68 (120)	1.22	3.09 (69)	1.28	3.06 (131)	1.36	8.20***

* significant at .05 level (2-tail significance)
*** significant at .001 level (2-tail significance)
[1]Standard Deviation

Table 4. Comparison of Motivation Items and Gender.

Motive	Male		Female		
	Mean (n)	Std. Dev[1].	Mean (n)	Std. Dev[1].	F value
For relaxation	4.22 (228)	.96	4.00 (92)	.94	3.47
To do things with other people	3.57 (228)	1.34	3.63 (92)	1.21	.14
To get away from the everyday routine of life	4.34 (228)	1.04	4.23 (92)	1.08	.72
Opportunities for solitude	3.58 (228)	1.31	3.20 (92)	1.39	5.39*
To tell others about it at home	2.04 (228)	1.19	2.41 (92)	1.34	5.97*
Help keep me in shape	2.74 (228)	1.35	2.67 (92)	1.21	.15
Be in a natural setting	4.26 (228)	.93	4.35 (92)	.84	.57
Opportunities to challenge myself	3.63 (228)	1.33	3.80 (92)	1.23	1.22
To see wildlife	3.25 (228)	1.34	3.41 (92)	1.29	.10

* significant at .05 level (2-tail significance)
[1]Standard Deviation

Table 5. Comparison of Motivation Items and Residency Status.

Motive	Residents		Tourists		
	Mean (n)	Std. Dev[1].	Mean (n)	Std. Dev[1].	F value
For relaxation	4.19 (160)	.95	4.12 (160)	.97	.49
To do things with other people	3.61 (160)	1.33	3.57 (160)	1.28	.07
To get away from the everyday routine of life	4.13 (160)	1.25	4.49 (160)	.76	9.85**
Opportunities for solitude	3.58 (160)	1.38	3.36 (160)	1.31	2.00
To tell others about it at home	1.68 (160)	1.04	2.61 (160)	1.26	51.70***
Help keep me in shape	2.96 (160)	1.35	2.48 (160)	1.22	10.86***
Be in a natural setting	4.29 (160)	.91	4.29 (160)	.91	.00
Opportunities to challenge myself	3.73 (160)	1.35	3.63 (160)	1.25	.53
To see wildlife	2.99 (160)	1.37	3.60 (160)	1.21	17.66***

** significant at .01 level (2-tail significance)
*** significant at .001 level (2-tail significance)
[1]Standard Deviation

Discussion and Conclusion

Empirical research has demonstrated that recreationists have wide range of motives and the importance of key motives varies across individuals and activities. In addition, motivations are influenced due to the significant effect of other non-motivational variables. Based on the results of this study, the importance of motives varied based on activity style, first/repeat visit, frequency of participation, gender and residence. Rafters placed emphasizes on the status motive while anglers noted solitude. Such findings were expected as anglers generally prefer isolation and are susceptible to conflict situations due to presence or behavior of other activities. Anglers were equally representative of both tourists and locals. However, kayaking is a strenuous activity and as noted, participation was largely based for the purpose of physical conditioning. Also, it was more representative of local residents. Conversely, rafting was predominantly participated by tourists who sought to learn about the wildlife in the area, and wanted to let others at home know about their experience on the river. Similarly, first time visitors were mostly tourists who were more interested in learning about the wildlife in the area and sharing the experiences upon their return to their respective homes. As expected, repeat visitors were largely local residents who recreated for solitude. Concomitantly, recreationists that participated for more than 8 days in the past 12 months were predominantly local residents that participated for physical aspects.

Females' motive for participation was largely based on the fact that they could tell others about it at home. Also, more females were representative of being a tourist and chose rafting than kayaking or angling. Rafting on rivers along gateway communities is very popular among tourists as local residents work as guides. It can be noted that rafting among tourists is largely based for extrinsic reasons. Finally, as expected, local residents placed greater importance with physical aspects of their recreation experience, while for tourists, the setting and prestige motives were important.

This study sought to examine trip motivations and the effect of select non-motivational variables among water-based recreationists. The findings derived from this study was largely expected and confirmed. Future research should expand on the motivational items and also offer an alternative method of analysis, using factor-based or cluster-based segmentation to further understand water-based recreations. Understanding what people seek through recreation can provide useful guidance to a variety of planning and management tasks, such as measuring supply and demand for recreation, developing management objectives, and preventing and managing conflicts between users as well as local residents and tourists.

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Visitors of Parque Florestal Quedas do Rio Bonito, Lavras (Mg), Brazil: A Management Planning Based on Profile, Perceptions, Needs and Motivations

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Abstract: The research was carried out in the Parque Florestal Quedas do Rio Bonito, located in Lavras city (Minas Gerais – Brazil) and participatory research methods were used in an integrated and iterative way. Results of the specific visitors study has shown that most of people visit the area with a special interest on leisure opportunities. Enjoyment of natural environment, peace and quiet are also important motivations. In a variety of activities, the visitors appreciate relaxing and enjoying the nature, swimming in the waterfall and walking on the trails. Most of visitors exhibited a high level of interest in conservation. In conclusion, this study represents one of the first efforts for providing the local foundation for a comprehensive framework for outdoor recreation management from the perspective of visitors. More generally, the visitor approach taken in this study contributes to a greater understanding of the visitor experience for tourism management in the natural environments.

Introduction

Traditionally, tourism has been described as a complex phenomenon, involving the integration of many actors and multiple functions. These actors are engaged in a symbiotic relationship revolving around of the idea of the tourism as a means of economic development and promoting conservation of natural resources. Brohman (1996) emphasize that it has been the subject of much debate about environmental credentials and its management seeking to integrate and balance several potentially conflicting objectives: protection of natural and cultural resources, provision of recreation opportunities and generation of economic benefits. Socially, residents perceive that if developed appropriately, the tourism improves the quality of life in host communities through the provision of a variety of recreational facilities, cultural activities, commercial facilities and services (Buttler 1991). Nevertheless, places that allow tourism development without the benefit of planning often suffer from environmental and social problems, increased costs of conflict resolution, and from declining competitiveness as destinations.

Therefore, this situation leads us to an important question: how to promote tourism and recreation in natural areas providing experiences and pleasure for the tourists and at the same time finding everyday conservation? Destination managers may adopt certain principles and strategies to assist the visitors in providing appropriate environmental protection (Kelly & Nankervis 2001). A general rule is that zones designated for recreation and tourism development require management plans. Planning can offer methods for alleviating past mistakes, for preventing present mistakes, and for reducing future errors to some probabilistic minimum. More specifically, Dowling (1993) affirm that visitor and community participation in the development of these plans is essential. For Getz (1987), this procedure is widely viewed as a way of maximizing the benefits of tourism to an area and mitigating problems that might occur as result of development.

The planning of new developments strategically in national parks requires a wide variety of information about the area and the visitor (Arnberger & Brandenburg 2002). Explicitly, accurate information requirements include: the local resources that are available for recreation; the constraining factors that may limit the use of areas for recreation; the profiles of visitors, the number of visitors, the distribution of visitors, the size of group, length of stay, the activities carried out by visitors, the resources that attract the visitors and the attitudes of visitors (Keirle 2002, Henderson 1999, Morin et al. 1997, Obua & Harding 1996, Buckley & Pannel 1990). In this way, visitors are the centre of tourism management and represent a valuable resource for gaining information about the presence of impacts, the acceptability of environmental change, and the consequences of management actions for their experience (Chin et al. 2000).

The research was carried out in the Parque Florestal Quedas do Rio Bonito (PFQRB), located in

Lavras city (Minas Gerais – Brazil) with emphasis in its visitors. The study has the main intention of gather information that will contribute for to provide data to future planning of the area's activities and potential management actions in a way to conciliate the educational and recreational needs of the visitors with the conservation of the natural resources. Specifically, the aims of this study were to identify geographic and sociodemographic characteristics, to analyse psychographic characteristics and to clarify the behavioural attributes of the visitors.

Study Area

The PFQRB is situated in a gradient from 13 km south of the city of Lavras (Minas Gerais, Brazil). It covers a total area of approximately 210 hectares and there is only one access point by road to the Park. The area is characterized by high rates of biodiversity, comprises several levels of vegetation and shows some degrees of human interference for to open spaces for wood extraction, etc. The mountains topography hosts ecosystems ranging from humid in the river valleys to dry at higher elevations. The woodland covering the Park has large habitat diversity on a variety of soil.

The many natural features of the area (waterfall, bush, landscape) provide the resources for visitation and are suitable for walking, research, environmental activities, etc. The area offers opportunities to day visitors and those wishing to take short breaks. Infrastructure within the Park is consisting of only essential visitor facilities, including walking trails, artificial lake, and scenic overlook.

Methods and Data Collection

This research concentrated especially on the important information for planning and management of recreation development at the PFQRB. The research methodology adopted a strategy constituted of three main phases:

First phase: it consisted in surveys in the place with emphasis on subjects related to the natural resources, infrastructure and visitation systems in way to get clearer picture of site, the actual position in the management structure and other analyses and interpretations providing the basis for planning and management of the recreation. Therefore, important information to the development of tourist activities was gotten, such as aspects of the physical environment (climate, geology, geomorphology, relief, soils and hydrology); aspects of the biological environment (vegetation and wildlife); carrying capacity and zoning. Secondary sources of information were extracted from previous publications, project reports, official records, management plan and other literature about the research site.

Second phase: condition at leisure or recreation sites vary enormously, depending on the season, the day of the week and the time of day (Veal 1997). Thus, the sampling strategy was stratified random sample, in the period from January to December 1999 and the questionnaire surveys was be used as an ideal mean of providing the information. Users of the area were interviewed in selected places of high recreational frequentation, and no more than one person per group was chosen, in order to avoid duplications (Atauri et al. 2000). Responses were obtained from a total of 9549 individuals.

Third phase: during the research period with visitors in the area, was be used to collect data other technique in addition to questionnaires survey such as participant observation, which involve gathering information about people's behaviour without their knowledge. Details of visitors characteristics obtained from observation were used in this research as a way of check visitor's behaviour, activities developed and attitudes. For this, was be chosen sites which provide suitable conditions for observation of behaviour of the visitors. Such detail was used also as a way of check the accuracy of the questionnaire and to 'weight' the results of questionnaire survey.

Results and Discussion

Geographic characteristics

The survey found that 87.4% of the visitors come from Minas Gerais State and the rest are from São Paulo, Rio de Janeiro and another States. A total of 63.6% of the visitors from Minas Gerais originate from town of Lavras, indicating a more intense visitor frequency among the inhabitants. Probably, the main reason is the relative position of the Park to the agglomeration of Lavras (70.000 inhabitants). Visitors studies conducted by Arnberger and Brandenburg (2002), detected that the visitors are also from the nearby to The Danube Foodplain National Park (Austria). Also, Wagar (1963) found that the respondents living closet to the Monongabela National Forest (Virginia) and Allegheny National Forest (Pennsylvania) visited the areas most frequently. Local residents can be harshest critics of local attractions and can act as tour to friend and relatives who visit the area (Moscardo 1999). Nevertheless, the benefits of tourism should be diffused through many communities, not concentrated on a narrow coastal strip or scenic valley (Lane 1991).

Sociodemographic characteristics

Some researchers have examined sociodemographic characteristics to increase understanding of ecotourists and to improve marketing and management efforts. Thus, in an effort to provide more detail to the profile of the visitors, the survey sought information on age, educational level, gender, occupation and income from respondents (Table 1). The largest group of visitors are predominantly aged between 21 and 30 years old (25.9%), followed by less than 10 years old (25.3%) and fewer visitors aged 50 years old or over. Based on the results, suppose that the PFQRB is visited by young people (maybe couples) in company of their children, who are people having create their family and come to the area for enjoying the outdoor recreation. Nevertheless, this finding does not agree with Seeley's observation (1990) that more single people tend to participate in outdoor recreation than married ones. According to Chin et al. (2000) in studies conducted in Bako National Park (Borneo), wilderness visitors also tended to be young. Nevertheless, these results contrast with surveys conducted by Hvenegaard and Dearden (1998) and Roovers et al. (2002). Their results showed that the average age from ecotouristis was around of 40 years.

More than half (59.4%) of the visitors are male. It is recognized from the other research in natural areas that males are slightly more representative of the group (Fennell 1999).

As far as the educational status is concerned, most of them (39.2%) has secondary education level and 38.6% has a high level of formal education possessing university undergraduate degree. It shows that the respondents who visit the site have high educational level (also suggested by Roovers et al. 2002). Probably, this result is due to the city of Lavras to possess a large number of schools and universities. Also, these kind of people need more relation in quite surroundings and make larger demand for recreation in natural places (Roovers et al. 2002). Research carried out by Fenneell (1990) published by Page and Dowling (2002) also found that Canadian ecotourists who had visited destinations as Kenya and Costa Rica showed that they have high levels of education.

Concerning the occupation, the respondents are professionals in different areas. For instance, 20.9% are in administrative or business positions and 21.3% in service work. 16.9% are student, 7.7,% are teachers, 3.7% are in industrial areas, 2.9% are in armed forces. 2.9% are housewife and 1.9% are retired. In a smaller proportion (0.1%) are in clerical work. In the present case, the survey found that 35.5% of visitors have monthly earnings between 1 to 3 minimal salary (1 minimal salary – s.m.– is equivalent to R$ 243.00 and the coin is Brazilian Real), 24.5% have a income from 3 to 6 s.m., 18.3% have a income from 7 to 10 s.m. and, finally, 21.7% have a income more than 10 s.m.

Table 1. Sociodemographic characteristics of visitors surveyed at PFQRB.

Sociodemographic characteristics	% Visitors
Age	
Less than 10 years	25.9
11 to 20 years	14.8
21 to 30 years	25.3
31 to 40 years	20.2
41 to 50 years	9.7
More than 51 years	4.0
Educational level	
Illiterate	1.6
Primary school	20.6
Secondary school	39.2
University	38.6
Gender	
Male	59.4
Female	40.6
Occupation	
Administrative/business/management	20.9
Service	21.3
Student	16.9
Teacher	7.7
Industrial area	3.7
Armed forces	2.9
Housewife	2.9
Retired	1.9
Clerical work	0.1
Income: Minimal salary (m.s.): R$ 243.00	
1 to 3 m.s.	35.5
3 to 6 m.s.	24.5
7 to 10 m.s.	18.3
Over 10 m.s.	21.7

Pyschographic characteristics

Activities participation and preferences

All recreation visitors were asked to answer multiple choice questions about preferred activities. Roovers et al. (2002) consider that in modern society there is a tendency to more active recreation. Nevertheless, in a variety of activities, is remarkable that 46.7% of all visitors explicitly appreciate relaxing and enjoying the nature. They consider that outdoor activity associated with the natural environment is considered very important for their health. This kind of activity is highly dependent on the quality of the natural environment providing visitors a rewarding and enjoyable time (Kuo 2002). According to Murphy and Pearce (1995), several activities developed by backpackers in Australia are also based on the natural environment. Results supported by studies conducted by Jackson et al. (2002) in Chilkoot Trail National Historic Site (British Columbia) have found that appreciation and learning was the most important activities. As implied by Dwyer and Edwards (2000), it has relevance because people who enjoy an experience associated with the natural environment will be more willing to pay fees or to make donations which can be used to manage and protected that environment.

The second most attractive in the area is the opportunity to swim in fresh water, which has a strong preference for 46.1% of the visitors. According to Fennell (1999), the water is the substance which play a critical rule in determining the type and level of outdoor recreational participation. The third activity is walking on the trails developed by 43.5% of the visitors, followed by walking on the area by 37.3%. Research reported by Barros (2003) also found walking to be the most common activity undertaken by visitors to Parque Nacional do Itatia, Brazil. These results also correspond to the findings of Roovers et al. (2002) on forest use in central Belgium. The other main pastimes can be observed in the Figure 1, which gives an idea of activities developed by respondents during their visit to the area. These results show that the activities developed in the area by the visitors are similar in others recent surveys in natural places (Obua and Harding 1996, Teixeira and Santos 1992).

The duration of visit in the area influence the kind of activities, or vice versa (see Figures 2, 3 and 4). Visitors who stay in the area for a short periods (1 to 2 hours), spend the time relaxing (41.2%), walking on the area (40.2%) or walking on the trails (33.6%). Nevertheless, activities as swimming tend to be more developed by visitors who stay in the area for larger periods (3 hours or more). Hence, the findings confirm that the management of visitor activities is equally important to the management of resources (Kuo 2002).

Attractions in the area

Natural tourist attractions offer visitors a range of desirable experiences. Nevertheless, sometimes it is difficult to distinguish between activities and attractions (Morgan & Lok 2000, Kelly & Nankervis 2001). The Table 2 demonstrates that the main activities is often the main attraction for visiting the area. Importantly, Swarbrooke (2002) recognizes that it is due to attractions to be a resource that provides the raw material on which the activity depends.

Over 35.0% of respondents indicated that swim in the waterfall is the main attraction in the area. Research reported by Ryan and Sterling (2001) also found that swimming is one of the factors that attract people to Litchfield National Park (Australia). Relaxing and enjoy nature together are also common attractive undertaken by visitors (15.9%) in the PFQRB. About 11.0% of the visitors have the walking on the trails as a pleasurable attraction, providing satisfaction to them. Finally, people who visit the

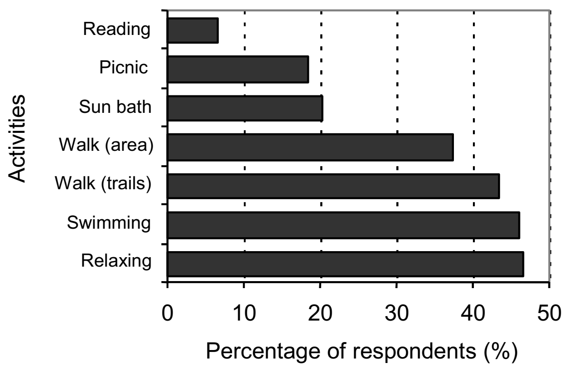

Figure 1. Distribution of the activities developed by visitors surveyed at the PFQRB.

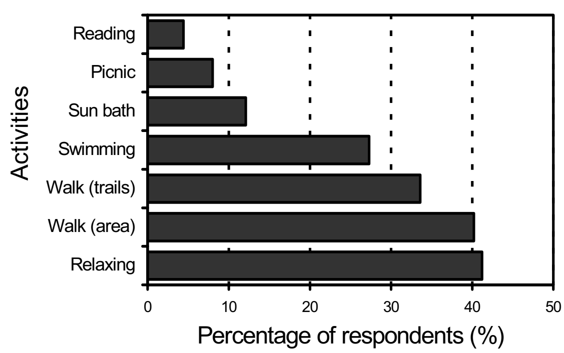

Figure 2. Distribution of the activities developed by visitors who stay at the PFQRB for 1 to 2 hours.

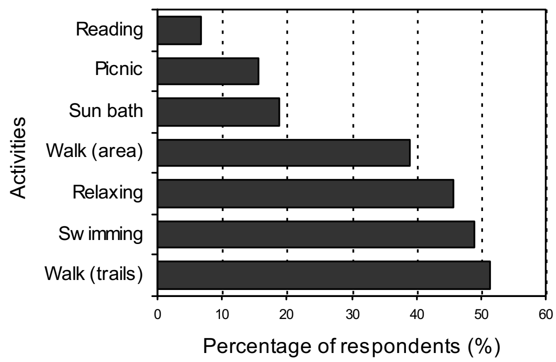

Figure 3. Distribution of the activities developed by visitors who stay at the PFQRB for 2 to 3 hours.

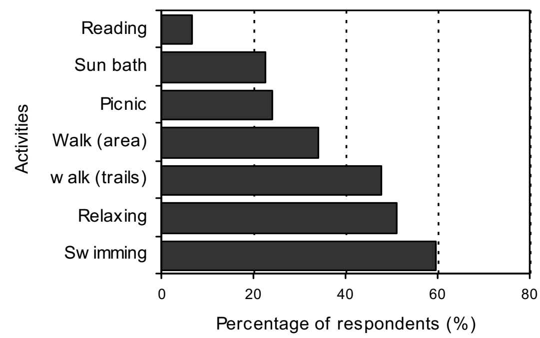

Figure 4. Distribution of the activities developed by visitors who stay at the PFQRB for 3 to 4 hours.

Table 2. Comparative analysis of activities and attractions at the PFQRB.

Activities	Attraction
Swimming in fresh water	Relaxing and enjoy nature
Relaxing and enjoy nature	Swimming in fresh water
Walking on the trails	Walking on the trails

area are attracted by the chance to enjoy the scenery (8.7%), the peace and quiet (6.6%) and the cleaning of the area (4.2%). According to Kelly and Nankervis (2001), in Australia many tourists are attracted to by the opportunity to experience rainforest vegetation and observe animal inhabitants. Hvenegaard and Dearden (1998) working with wilderness use in Thai National Park (Thailand), found that the area has many natural and cultural attractions, including the summit, birds and other wildlife, waterfalls, walking trails, scenic overlooks, caves and cool climate. Therefore, attractions can be arranged according to their general environment characteristics and specific features (Shaw & Williams 1998).

Visit motivations

Tourists are not always all the same (Elands & Lengkeek 2000). Every tourist is different and there are the factors they are motivated by. Thus, motivation has been fundamental to tourism researchers interested in the "why" of tourist travel (Fennell 1999).

Examining the motivating factors, several factors emerged (Figure 5). Visitors gave various reasons for choosing to visit the area. Nevertheless, most of people (29.2%) visit the area with a special interest on leisure opportunities and the second major reason is enjoyment of natural environment (26.1%). The peace and quiet (12.4%) are of less significance in choosing to visit the PFQRB. The existing studies of Arnberger and Brandenburg (2002), also indicated that approximately one-third of the visitors to The

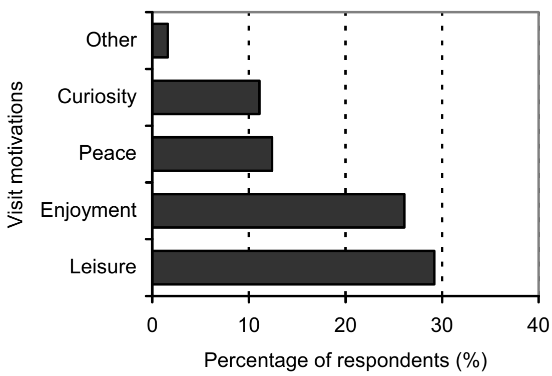

Figure 5. Visit motivations towards to visit at the PFQRB.

Danube Foodplain National Park (Austria) is really interested in the environment. Research quoted by Jackson et al. (2002), noted that specific motivations of skiers and snowmobilers in Chilkoot Trail National Historic Site (British Columbia) are natural environment, escapism and socialization. Parks and protected areas, according to Fennell (1999), have a certain mystique to travelers interested in some of the best representative natural regions or countries.

On an idea of protected area as an important reason for deciding to visit, about 38% said it was important. Besides, most of visitors (82.7%) exhibited a high level of interest in participating of environmental education and conservation program. Educational levels, income or age did not influence the interest of the visitors in participating of nature programs. The importance of education in general

has been recognized by many authors and organizations concerned with encouraging sustainable practices. According to Chin et al. (2000) and Moscardo (1999) this interest of visitors can signals an opportunity for the use of education as potential management tool achieving sustainability.

Provision of support facilities and infrastructure

Ecotourists' needs on infrastructure differ significantly from those of mass tourism (Saleh and Karwacki 1996). Nevertheless, there is growing community expectation of high quality facilities and interpretation at natural attractions (Dwyer & Edwards 2000). Therefore, within the scope of the research, visitors were also asked to give their opinions on the improvements to the area. According to Chin et al. (2000), these parameters can be examined to identify possible indicators for monitoring the area. When respondents were asked what they would like to see in the area about facilities and infrastructure, basic day facilities are demanded as snack bar and toilets replied by 77.6% and 72.0%, respectively.

Support facilities required by the visitors include yet, sport centre (46.4%), medical assistance (45.9%), camp grounds (36.0%), picnic sites (21.3%), interpretation facilities (15.4%) and walking tracks (13.8%). In contrast to these facilities required, only 13.4% of the visitors appreciate an interpretative/information centre. The satisfaction with facilities plays a large role in the ecotourist's intention to return. Nevertheless, there is no need to construct elaborate accommodation and facilities in the area. It is true especially when the visitors enjoy the wilderness environment, relax, swim and walk as favourite leisure activities (Saleh & Karwacki 1996).

Improvements and additional services

One of the main of the survey was to obtain suggestions about possible improvements and additional services in the area. When asked to indicate what they think about the possible developments in the area, respondents emphasized the desire by basic services.

The most respondents (49.1%) explicitly are demanding in regard to provision of information about nature and conservation. In fact, ecotourists place a high emphasis on learning about nature (Saleh & Karwacki 1996). This fact dictates the need of the visitors in gain an understanding of the area on its landscapes, and local people and culture (Lane 1991). Users (35.5%) also claim the provision of maps and signs in the area, a strategy which is also supported by Müller (1995) and Schneider (1996).

As expected, approximately 41.0% of the interviews suggest that information about the area as a tourist destination should be circulated more widely. In the present case, 40.2% of the visitors concern about safety issues which indicate that visitors see the possibility of some actions reducing the quality of their experience. Furthermore, about 33.8% are really interested in a regular transport, while a minimum of 19.1% of the other suggest guided walks as a additional services in the area. It is interesting to note that such perceptions are not based on previous experiences in natural sites, because 56.1% of the visitors have no past experience with recreational facilities in other natural places. This shows that the visitors are not expert travelers. Nevertheless, these results found are supported by surveys of visitors to natural areas as Bako National Park, Corneo (Chin et al. 2000) and Grasslands National Park, Canada (Saleh & Karwacki 1996).

Behavioural characteristics

It was asked to the visitors how they arrive at the PFQRB. About the transport, the car is the most popular and almost 90% said use private car for arriving to the Park. The rest said they come by bicycle (5.4%), motorcycle (3.6%), walking (1.3%) and a minor group by bus (0.6%). Findings from Arnberger and Brandenburg (2002) in The Danube Foodplain National Park (Austria), demonstrated that the visitors arrive on foot, by bicycle or by car. About the peak visit frequency, visitor arrivals is maximal in two periods. One peak occurs from 9:00 till 11:00 h and the other from 14:00 till 15:00h.

Information on visitor numbers is essential for a variety of strategic and operation planning tasks in park management (Cessford et al. 2002). Such broad support provides managers with a choice of direct and indirect strategies to address management concerns. Thus, analysis of information from the visitors' register indicates that it have been significant variations in the last years (see Figure 6).

The most intensely visited months are January, February and March. Generally, these months are hoter in the region and there are periods of holiday and Carnival. It is interesting to note that due to high precipitation in January (1997), October (1998) and in November (1998) the visit frequency was lower.

Ryan (1998), arguments that poor weather can be sources of dissatisfaction on holidays. The results on

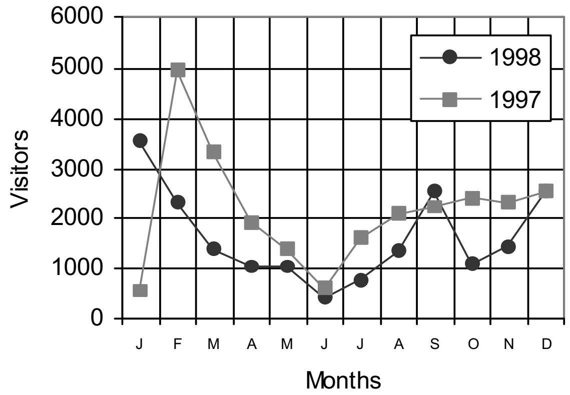

Figure 6. Visit frequency at the PFQRB.

frequency indicate that the recreation is most intensive in weekends (89.1%). High visitor flows can cause multiple negative effects on the ecosystems (Shapochkin and Kiseleva 2002, Netherlands development organization 2001). Thus, fundamentally, the carrying capacity of the tourism in the research area should not be exceeded at the weekends.

44.7% of the visitors said visit the site around 1 to 3 times in the last year and almost 32.0% never visited the site before. About the visit duration, 37.0% of all visitors spend around 1 to 2 hours with the visit. To enhance rural development, tourist might be encouraged to stay longer in the Park, purchase local products, and hire local guiding and transportation services. Nearly 8% of the visitors groups visit the area alone and most respondents (92%) come in the company of one to 5 persons, generally friends and relatives. As expected, similar patterns can be observed in Swarbrooke and Horner (2001) and Dias and Rocha (1996).

A significant proportion (79.3%) said they learn about the Park simply by word of mouth and 5.1% of the visitors learn about the area from advertisements. A similar finding was reported by Bontempo (1994) in a study of ecotourists in Brazil. He noted that the majority of people who visited natural parks heard about them casually from friends and relatives.

Conclusions and Recommendations

The main motive for this study was to provide information for the Park service about the geographic, sociodemographic and behavioural characteristics of the visitors and also to identify recreation preferences, desires, interests, motivations, perceptions and needs from the perspective of visitors on the area. Additionally, to provide data that can contribute the planning of the Park's visitor amenities without problems between tourism activity and resource protection. The existence of the recreation activities in the area enabled the collection of the detailed information and several conclusions can be made from the results presented in the article.

With regarding to demographic attributes the data indicated a more intense visitor frequency among the inhabitants from Lavras. Effective local community involvement could be actively developed at the tourism site providing quality experience for visitors, conservation and regional development (Inskeep, 1991). Nevertheless, it is important to select people who have the ability to socialize with all kinds of tourists and they must be able to communicate appropriately (Netherlands development organization 2001).

Page and Dowling's study (2002) with ecotourists from several parts of the world indicates that the ecotourists tend to be older than other tourists, with higher education and income levels. Nevertheless, the PFQRB is visited mainly by young people in company of their children. They have high educational level and are male.

Sometimes it is difficult to distinguish between activities and attractions (Morgan and Lok 2000, Kelly and Nankervis 2001). Given the findings of this paper, the main preferred activities (relaxing and enjoying the nature, swimming and walking) are also the main attraction in the area Support facilities required by the visitors include basic day facilities as snack bar and toilets. Yet, sport centre, medical assistance, camp grounds, picnic sites, interpretation facilities and walking tracks are also demanded. However, the planning of infrastructure and facilities must support tourist activity and in this case there is no need to construct elaborated accommodation and leisure facilities (Saleh and Karwachi 1996).

Suggestions for improvements and additional services is related to safety. They explicitly demand information about nature and conservation and claim the provision of maps and signs in the area. An interpretative/information centre can be build to information and interpretation services. The circulation of information about the area as a tourist destination is paramount to the visitors.

Results of the specific visitors study has shown that many people visit the area because of the need for direct contact with nature indicating the importance of learning about nature as part of their experience. 82.7% of visitors are highly receptive to educational strategies and involvement in conservation. This study provides additional indicators of the importance of experiences in natural places to the tourists. Local educational institutions could be encouraged to participate of education programs in the area using interpretation and education to help visitors to gain a better understanding of the natural environment, thereby enhancing experience and protection of the area (Chin et al. 2000). As Lucas (1990) notes such approaches are ideal for conservation reserves because they do not directly alter the natural environment.

The car is the most popular transport used for arriving to the Park. The visitor arrivals is maximal in two periods (from 9:00 till 11:00 h and the other from 14:00 till 15:00h). The recreation is most intensive in weekends and January, February and March are the months most intensely visited. The most of the visitors spend around 1 to 2 hours with the visit and come in the company of one to 5 persons, generally friends and relatives. A significant proportion learn about the Park simply by word of mouth.

The PFQRB represents a small Park within an urban context and this study provided some insights able to provide the Park service for a comprehensive framework for planning improvements in the area and managing the visitors. The suggestions given are based on the visitor profile, their behavior and perceptions in the present survey developed. Thus, possible weakness must be pointed out and finally the ameninties planning can be elaborated on. Additionally, this kind of research must to be repeated over time in a way that changes could be monitored and visitor statistical database maintained.

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PAN Parks implementation process: cross cultural comparison – Bieszczady & Slovenski Raij National Parks

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Introduction

Tourism is noted as the fastest growing industry with many environmental and socioeconomic impacts, which significantly effect *Natura 2000* locations. *Natura 2000* is an ecological network of protected areas in the European Union, which serve as the centre of the EU's policy on nature conservation. The purpose of this network is to maintain and restore habitats and species at a favourable conservation status in their natural range. *Natura 2000* will happen in 20–25 European countries and it is important to know how tourism will impact or affect these sites. The PAN (Protected Areas Network) Parks project, initiated by the World Wide Fund for Nature (WWF) and a Dutch leisure company in 1997, was named as one of two most relevant management initiatives for *Natura 2000* sites (DG Environment, Lisbon conference, 1999 in Kun, 2001). PAN Parks is based on the concept of active involvement of the tourism industry in conserving Europe's wilderness areas within a network of effectively managed and verified protected areas. To receive PAN Park's verification, a park must meet five principles each with specific criteria (i.e., 1. nature values, 2. habitat management, 3. visitor management, 4. sustainable tourism development strategy, and 5. business partnerships) adopted in 2001 (Anon 2002). Principle four focuses on criteria to develop and implement a Sustainable Tourism Development Strategy (STDS), the primary focus of this study. Sustainable tourism development in protected areas may mean 'no development' and any tourism in protected areas should be carefully evaluated and, where permitted, carefully regulated and monitored (Brasser & Font 2002).

Nature Protected Areas (PA) in Europe are special to people (PAN Parks 2003), yet many sites must deal with an uncontrolled amount of tourists, while others would like to have more visitors. PA management parts from the idea that a PA has a relationship of mutual dependency with its environment. Change is a characteristic of modern society creating both opportunities and threats. Good management means dealing in an effective way with changes in this environment and it is important to consider a PA as an open system, because new challenges like tourism development ask for a pro-active approach (Beunders 2002). "A re-active approach is usually not very efficient: once negative impacts of a 'spontaneous' tourism development become visible, it is already too late to restore the balance" (p. 10). Tourism has become a vested economic and social interest in Europe and much environmental damage has already occurred in European protected areas that deal with a large number of visitors a year.

To monitor the influence of visitor numbers and the sustainability of tourism, standards can be set. A standard is a document or set of criteria approved by a recognized body that provides for common and repeated use of a prescribed set of rules, conditions or requirements (Toth 2000). Setting standards is one of the most difficult elements of a project that wants to establish a sustainable way of tourism in natural areas, since varying geographical and other site specific conditions mean what is appropriate for one site may not be acceptable elsewhere (Wood & Halpenny 2001). Another major difficulty arises from differences in national legislation. Ideally, standards should not be below any national legislative requirements, but if a standard reflects the highest level of current law and practice this might be too demanding for some countries. The PAN Parks initiative aims to promote a synergy between nature conservation and local development through sustainable tourism in European protected areas based on standards of quality (Brasser & Font 2002).

As an ecolabel, PAN Park's is classified as a performance based certification program based on clear-cut criteria (Brasser & Font 2002). It is argued, however, that while criteria about natural and habitat values are clear and relatively straightforward, those belonging to the STDS (Principle 4) and Business Partners (Principle 5) very much depend on the specific social and institutional context of each park, therefore cannot be called straightforward (Cutumisu 2003). Indicators measure the criteria and Valentine and Spangenberg (2000) argue that these indicators cannot be applied to every site. Managers of each park must develop site-specific indicators within the common structure. The common structure in this case is the structure of the PAN Parks Principles. This approach (common structure, different indicators) provides a means to compare sites without ignoring their specific situation. This paper examines the difficulties of implementing the PAN Park Principles and Criteria, and the Sustainable Tourism Development Strategy (STDS) in particular.

Therefore, the ***purpose*** of this study was to determine if PAN Park's principles and criteria are feasible and applicable cross-culturally for candidate parks in different countries. The main objective was to assess if the criteria must be adapted or compromised within the context of the five principles for each country or region. To gain insight into the process of implementation of STDS in the case study areas, a *sustainability framework*, developed by the Wuppertal Institute in Germany was used as the theoretical lens to guide this analysis. Referred to as the prism of sustainability (Figure 1), the framework distinguishes four dimensions of sustainability: social, economic, environmental and institutional (Eden et al. 2000).

Theoretical Context

Sustainable development means different things to different people, but the most frequently quoted definition is from the report Our Common Future (World Commission on Environment 1987): "*Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*" The German Wuppertal Institute (commissioned by Friends of the Earth to develop a methodology for the Sustainable Europe project) devised a four-dimensional model of sustainability (Figure 1) including the social, economic, environmental and institutional dimensions (institutional includes not only organisations, but also mechanisms and orientations) with clearly defined links between the dimensions (Spangenberg and Valentine 1999). Although the Prism of sustainability focuses on sustainability overall, for this research the prism was applied to sustainable tourism. Whereas the environmental dimension is quite clearly defined to be the sum of all bio-geological processes and their elements (referred to as "environmental capital" by economists), the social dimension ("human capital") is not as easy to define. Individual human beings, their skills, dedication, experiences and the resulting behaviour are its focus, with the boundaries to the institutional dimension (institutions as an achievement of human interactions, confusingly called "social capital") not always easy to draw. Institutions are understood here as described above, i.e. not only including organisations, but the system of rules governing the interaction of members of a society as well. This kind of societal interaction and the social norms behind each are a necessary precondition for economic activities. Nonetheless, the economic dimension ("man-made capital") is singled out as one specific subsystem of society, although this should not be understood as denoting the permanent interactions of the economic, social, institutional and the environmental subsystems (Spangenberg 2002).

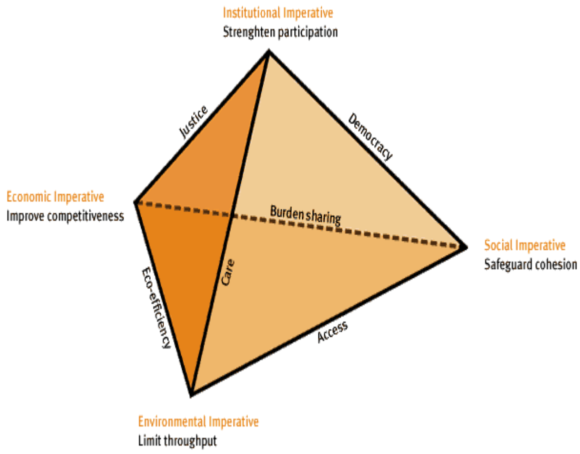

Figure 1. Prism of Sustainability (Spangenberg & Valentine 1999),

Spangenberg and Valentine (1999) describe the above-mentioned dimensions as follows: The environmental dimension describes the need to reduce the pressure on the physical environment to within ecological system limits. The environmental dimension of sustainability aims at keeping intact, indefinitely, the stability of the processes of the ecosphere, as a dynamic and self-organised structure. An economic system is environmentally sustainable only as long as the amount of resources utilised to generate welfare is permanently restricted to a size and quality that does not overexploit the sources or overburden the sinks provided by the ecosphere. This dimension is defined from an anthropocentric point of view. The institutional dimension calls for strengthening people's participation in political governance. The mechanisms of decision-making have to integrate people's wishes and activities. This way, the acceptance of and identification with political decisions both become broader, and democracy is strengthened. The social dimension demands that all individuals have access to the resources and facilities they need to live a healthy and dignified life. This implies a non-discriminatory social fabric, supported by measures to reduce social exclusion and guarantee social minimum standards and human rights. The economic dimension is to satisfy human needs for material welfare. This implies an economy that supports employment and livelihoods, in a framework, which is competitive and stable at the macro-economic scale.

According to Valentine and Spangenberg (2000) the four dimensions can be linked to imperatives (*targets and indicators*) for local communities to *arrange* sustainable development. It is however not enough to define targets and indicators for the four dimensions of sustainability (von Weizsäcker 1989). They only express some of the necessary preconditions to maintain the self-reproduction cycles of the four interlinked subsystems, without giving any information on the character and effect of the linkages. Therefore, and also because the interlinkages often turn out to be closely linked to the most important fields of policy making, Valentine and Spangenberg (2000) pay due attention to the proper definition of targets and indicators for the interlinkages as well otherwise any system of indicators would lack operational qualities (Spangenberg & Valentine 1999).

To address the core question of the research, we formulated theoretical variables for the concepts in our research: dimensions of sustainability for Bieszczady National park (hereafter NP) (and surroundings) located in Poland and Slovenský Raj NP (and surroundings) located in Slovakia; PAN Park's implementation process of STDS in Bieszczady NP and in Slovenský Raj NP.

We compared the constitution of the four dimensions of sustainability in Bieszczady NP (and surroundings) with that of Slovenský Raj NP (and surroundings) and to see if this constitution influenced the STDS implementation process. To make this comparison we first drew an inventory of the constitution of the four dimensions in Bieszczady NP. Because the Bieszczady NP is situated in the Podkarpacie province, this inventory included the province as well. The same process was applied to Slovenský Raj NP and the Košice region.

To operationalise the Prism of sustainability we integrated the PAN Parks Principles with the Prism of sustainability (Figure 2). This integration is partly based on a system of ordering thematic areas into indicators used by Coccossis et al. (2001). The thematic areas they use match up nicely with the PAN Park Principles while the indicators match well with the dimensions of sustainability used in this research. The conceptual framework developed for this study is based on the Prism of sustainability within the context of the PAN Parks Principles and shows the relationships between the theoretical concepts we examined (Figure 2).

The dotted line in figure 2 shows the comparison between the implementation processes in both parks (Bieszczady NP and Slovenský Raj NP) and also the comparison between the four dimensions in both areas. For this comparison we used the Podkarpacie province in Poland and the Košice region in Slovakia. The solid line in figure 2 shows the relation between the constitution of the four dimensions of sustainability and the implementation process of the PAN Parks Principles, especially the implementation process of the STDS.

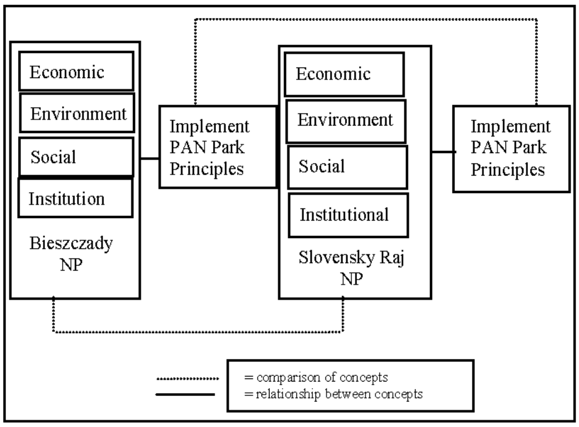

Figure 2. Conceptual Framework.

Problem statement

The paper alludes to problems that can occur during the implementation process of the PAN Park Principles and Criteria. Practically, the study gives results as tips to use by management of PAN Parks and park managers of verified or candidate PAN Parks. If PAN Park Principles depend on site-specific indicators of sustainability, it is recommendable to let park managers define indicators within a framework of more rigid principles set by PAN Parks.

From a theoretical perspective this study shows the importance of the institutional dimension versus the usual focus on the economic, ecological and social dimensions. Using the Prism of sustainability as a lens to examine the PAN Parks Principles, it clearly shows that Principles 4 and 5 depend on the institutional dimension. In future projects it is advisable to consider the institutional dimension along with the economic, ecological and social dimensions. In this context (the importance of the institutional dimension), this study builds on Cutumisu's (2003) where she argues that STDS and Business partners (PAN Parks Principles 4 and 5) very much depend on the specific social and institutional context of each park. Thus, core questions examined were: *Do the three verified parks differ in the process and quality of implementation of principles one to three to obtain PAN Park's verification? What influence does implementation of principles one to three have on the STDS process? And do elements of the dimensions of sustainability play a role in the STDS process*? This presentation will describe how to use the sustainability framework to analysis PAN Park principles and STDS implementation processes at the park level.

Methodology

A ***qualitative methodology*** involving a comparative case study approach as part of a Master's thesis at Wageningen University was used (Berg and Bree, 2003). At the time of this study, there were three verified parks as of September 2002. The study was conducted in two phases. In *phase one* a comparison of three certified PAN parks, namely Bieszczady NP (Poland), Fulufjället NP (Sweden) and Oulanka NP (Finland), focused on the first three PAN Park principles. Content analysis of verification documents and expert interviews (n = 7) among park managers supplemented with participant observation at a PAN Park workshop in Poland (April 2003) was used to gain insight into differences in implementation of PAN Parks principles in these parks.

For *phase two*, we chose two sites in different countries (Bieszczady National Park in Poland and Slovenský Raj National Park in Slovakia), which we expected to differ in the content of and relations between the four dimensions of sustainability since the first one was a certified and the other a candidate PAN Park. This phase focused on PAN Parks principal four (STDS) with in-depth interviews during May to July of stakeholders at Bieszczady NP (n=8; verified park) in Poland and Slovensky Raj NP in Slovakia (n=11; candidate park) for comparison. Interviews collected data on the economic, ecological, social and institutional dimensions in both parks and their surroundings and were assisted by local interpreters, taped, and transcribed for textual analysis with NUD*ist, qualitative software for the social sciences. PAN Park's principles and criteria were integrated within the four dimensions of sustainability as an approach to data analysis and ordering of results into thematic categories (e.g., institutional divided into policy, management, status of protection, legislation, etc.). It has been argued that principle four depends on the specific social and institutional dimensions of each park. We believe that these dimensions and relations between them vary between countries and even between regions within the same country. These differences can influence the way and extent to which a park can meet – or not – the criteria defined by PAN Parks. Therefore, we sought to determine if it is realistic to use the same criteria for each site.

Study settings

The sites chosen as case study areas were situated in two countries: Bieszczady National Park in Poland and Slovensky Raj in Slovakia. We expected these parks to differ in the content of and relation between the four dimensions of sustainability. Bieszczady National Park (BNP) is situated in the far south east of Poland and Slovensky Raj National Park (SRNP) in the north-east of Slovakia. Both parks are located in mountain ranges of moderate heights. BNP is famous for its unique fauna of rare and threatened animals. A special feature of nature in SRNP is the special character of the surface forms. The surface consists of karst plateaus with deep gorges or canyons in between. The majority of the forests in Poland are of a natural kind. The most widespread forest association is of Carpathian beech forest. The biggest part of the SRNP is covered with fir and beech as dominant wood species. The two parks have a totally different historic background. BNP was densely populated until the 1st World War. After the war, all inhabitants were deported and the area became deserted. There were no settlements left, former fields, pastures and even roads became overgrown. The areas of the Bieszczady stayed uninhabited for many years and became a kingdom of nature (Winnicki & Zemanek 2001). In 1957 the first people returned to their homeland. Due to the climate and soil conditions of the area Bieszczady was unattractive for farmers; some of the new settlers abandoned their farms. In the 70s and 80s the government experimented with state owned collective farms. To prepare the pastures for these farms, troops devastated large areas with explosives and bulldozers. The transition to a market economy caused the collapse of the state-owned farms.

SRNP is embedded in a rich historical and cultural context. Archaeological records document the existence of humans in Slovensky Raj since 5000 B.C. In the very heart of SRNP, there are localities that were settled during the middle Ages. These localities played an important role in the history of the region. It is Klastorisko where people from the region took refuge from the Tart Arian invasions. Volunteers have rebuilt Klastorisko (Leskovjanská & Hájek 1999). The first tourists came to BNP in the sixties. They were pioneers and looking for wilderness. These days tourism started to grow. Nowadays the park is much bigger, mass tourism has been replaced by mountain tourism, group tourism has been replaced by individual tourism. The first tourists in SRNP arrived a lot earlier. They came to see the Dobsina Ice cave near the end of the 19th century. The incessant increase of visitors became the most serious negative factor for nature conservation in SRNP (PAN Parks 2003).

Results and discussion

Phase one

The first question examined was: Is it realistic to use the same criteria for every PAN Park, or is it necessary to develop or adapt the criteria, due to differences in the economic, social, environmental and institutional context of each site, within the context of the five principles for each country or region?

First a comparison of the three certified PAN Parks on their progress on the implementation of the principles is made (Table 1). Column cells with an X mark those issues the various parks still deal with at the moment; if blank it is no longer an issue.

Some of the issues concerning Principle 1–3, like the training of the staff and the number of employees in the NP, are still difficult for all the parks. All three parks are situated at the border with one or more other countries, and they all co-operate with adjacent areas. This is necessary, because this way a good buffer zone for the park can be assured. The management of visitors and the gathering of information about them (visitor's survey) are also issues in all the parks. It should be noted that Oulanka NP (ONP) is very progressive on this point and can serve as an example for the other two parks. The most similarities are between Fullufjallet NP (FNP) and ONP. The reason for this can be that both are Scandinavian countries with similar kinds of laws and regulations. Another reason can be that they have a similar culture, at least more similar than to the Polish culture. This was also very clear at the PAN Parks Meeting. Poland was in a very different situation, whereas Finland and Sweden could relate to each other very easily.

Table 1 Summary of the comparison of the parks,

Issues	BNP	ONP	FNP
Principle 1&2			
Management Plan/ Strategy	X		X
Ecology of Fire	X		
Berry picking	X		
Critical Financial situation	X		
Hunting		X	X
Reindeer herding		X	X
National Park Zoning/ Park boundaries		X	X
Trans border Cooperation	X	X	X
Fishing		X	
Forestry		X	
Research data			X
Snowmobiles			X
Principle 3			
Staff (Training, number of employees)	X	X	X
Visitor Centre	X	X *	
Visitor Management (Plan)	X	X *	X
Visibility & Availability of information	X		
Presentation Primeval forest	X		
Development tourist products	X		
The carrying capacity		X *	
Visitor activities		X	
Visitor impacts			X
Visitors survey	X	X *	X
Principle 4 & 5			
Sustainable Tourism Development strategy	X	X *	X
EPPO Stakeholder group	X	X	X
Partnerships	X	X *	X
PAN Parks Accommodation	X	X	X *

* Issues related to positive distinction of the park compared to the other parks.

All three parks are still working on all issues concerning Principle 4 & 5. This is not a surprise, because at the time of the research, none of the parks were certified for these principles. ONP will be the first park to apply for verification of these principles. This can be seen in the matrix: two of the four issues are better developed in ONP than in the other two parks. This is also a benefit of the PAN Parks Meetings: parks can learn from the experiences and successes of other parks. Mainly the implementation of principle three, visitor management is important for successful implementation of an STDS. To develop a successful visitor management plan, data about visitors (amount, profile, activities, motives, etc.) must be available. ONP is further along on this issue than the other two parks. From this perspective, implementation of the first three PAN Park principles, especially principle 3, clearly influences STDS implementation.

Valentine and Spangenberg (2000) argue that indicators (the PAN Parks criteria in this case) are not applicable on every site: *Each community has to develop its individual set of indicators within a common structure*. This approach (common structure, different indicators) provides a possibility to compare communities without ignoring their specific needs and situations. Our conclusion is that it is not necessary to develop or adapt the criteria of the PAN Parks principles; yet setting the same conditions to meet the criteria for each park is not realistic. There are indeed differences in the economic, social, environmental and institutional context of each site. Particularly differences in the institutional dimension influence the implementation process of the principles, especially implementation of the STDS. In her research, Cutumisu (2003) came up with the same issue. She found that relationships between park administrations and PAN Park's promoters, and all factors involved which represent a basis for STDS implementation, are insufficiently developed. This layer of relations represents the decisional and political forum. The tuning of the relationships among institutions (top-level) is a pre-requisite for attaining sustainable tourism. She also states: "Historically, authorities have dealt mainly with conservation, not promoting the resource use and now there is a new situation generating new issues as visitor management, visitor behaviour forecast, the need to actually stimulate the flow of visitors in a balanced way, as well as marketing the resource itself as a part of the whole tourism development for the region (p. 65)." Finally she adds that more co-operation between the different levels of authorities is needed.

Phase 2

In both Poland and Slovakia, respondents agreed that the development of sustainable tourism in the area, implementing an STDS, has an essential role in increasing dedication and action of both authorities and local people. This will contribute to increasing the tourism potential of the region in respect to the environment.

> Interviewee in Poland: "*Sustainable tourism gives opportunities to local people by giving them a job, so it improves the local economic situation. It also respects the nature.*"
>
> Mayor of Hrabusice, Slovakia: "*The inhabitants of the villages here are owners of the National Park. They have to use the area in a clever way and take care of their own property.*"

In our study, authorities in both regions still focus on the level of not destroying the environment by tourism development. They do not have a pro-active attitude (yet) towards integrating conservation and tourism. But a re-active approach to tourism is usually not very effective. Good management means dealing in an effective way with changes in this environment. New challenges like tourism development need a post pro-active approach. Once negative impacts of *spontaneous* tourism development become visible, it is already too late to restore the balance: tourism has become a vested economic and social interest and the damage is already done (Beunders 2002). A pre pro-active approach to new challenges should therefore be stimulated.

According to the PAN Parks Principles, the parks certified on P1-3 should be financially self sufficient after 1 year, because of the annual fee paid by local business partners for the use of the panda logo. None of the parks have met this term of reference. According to Beunders (2002) local stakeholder involvement is a time consuming and complicated process, especially in regions where social competitiveness is low and the motivation to work together has yet to be created. Training and professional facilitators can play an important role here since people can learn how to co-operate (Beunders 2002). But PAN Parks must play a more directing role in this process. In parks like BNP, a participatory approach and local stakeholder involvement are totally new concepts. They do indeed have to learn how to co-operate and there is a big need for training and education. In STD, stakeholder and stakeholder analysis are key issues. A stakeholder analysis is useful to analsize strategically the environment of the project to know which people and institutions you must deal with (Beunders 2002).

The tourism manual is a good guideline for developing a STDS, but for parks like BNP and SRNP not a practical guideline. A BNP Park authority in Poland says:

> *"I think this manual is very much focused on the way sustainable tourism is supposed to be from the EU country's prospective. Some parts of the manual are much more relevant and some parts are less relevant. These less relevant parts need some more study in eastern European countries. The tourist manual is very much ambitious."*

PPF should therefore not imply that these techniques are known in all parks. There is too little time and money available to start an EPPO (local stakeholder committee), develop a STDS and contract local partners as the tourism manual might suggest.

A pre-project appraisal provides the proponent with the important baseline data needed for the project. Without this pre-project appraisal, the proponent will not have the basic information needed to make important decisions for the project (Urquico, 1998). The PAN Parks project also has a self-assessment questionnaire for candidate PAN Parks by means of a pre-project appraisal. The goal of self-assessment is to evaluate a protected area against the established PAN Parks Principles, Criteria and Indicators. Although a park is supposed to be verified on 5 principles (first 1-3, then 4&5), the self-assessment only evaluates Principle 1-3. Therefore lacking in the PAN Parks self-assessment questionnaire is an inventory of the structures involved in tourism and the social problems in the area. The project's self-assessment, and its principles, criteria and indicators too, are totally focussed on the Protected Area (PA) and skills of the PA management, although what they are trying to achieve by implementing the five principles is Sustainable Tourism based on local stakeholder's involvement. Politically, it is important to have an understanding and involvement of community in decision-making, planning and implementation. The influence of the government must be clear, as well as the level of networking with NGOs, private groups, and agencies of government (Urquico, 1998). It cannot be assumed that the PA researched these factors, thus, there is a lack of knowledge about an important part of the region the project is supposed to be implemented in. Before a project like PAN Parks can be implemented, there should be clarity about these subjects. The ability to fulfil Principle 4 & 5 is just as important as the ability to fulfil Principle 1-3 and should be included in the self-assessment questionnaire. Without governmental and community support the project has no chance of succeeding. When a project like PAN Parks is implemented into a park in a region where there is no governmental and community support, sustainability of tourism cannot be guaranteed. This falls back on the concept of empowerment of communities. Sofield (2003) argues that virtually all models of tourism planning incorporate public and community participation, but most of them are market driven. They could be described as "reactive and containment public participation" (see Macbeth, 1996 in Sofield, 2003), because they tend to be placed in the context of how to achieve tourism development plans, rather than permitting communities real choice. Empowerment of communities for tourism development requires a political framework that is either supportive (pro-active) or at least neutral, not obstructionist. There must be a shared willingness of community, individuals and external entities (authorities) to initiate and undertake processes leading to empowerment. A fundamental tenet is that it must be able to counter dependency. If it cannot/does not, then genuine empowerment doesn't happen. Positive support emerging from the public sector, working in partnership with people's organisations, is necessary to ensure that a project is sustainable (Sofield, 2003).

The second question of the problem statement is: *Does the constitution of the four dimensions of sustainability, according to the Prism of sustainability, have influence on the implementation process of the STDS?*

An overview the four dimensions of sustainability and their (negative/positive) relation with the implementation of a STDS is given (Table 2). According to Brasser and Font (2002) parks can benefit from the support of WWF in training and resources to meet the criteria and once they are qualified parks, they can use the PAN Parks logo for marketing purposes. The anticipated benefits for each park include opportunities for increased, mainly international, tourism businesses, networking and research opportunities and closer co-operation with local population and stakeholders (Brasser & Font 2002). Table 2 shows that the implementation of STDS can have many advantages. A STDS can create more jobs on different levels from marketing the area, not done previously, to selling agricultural products directly from the farm, especially in a time where the status of agriculture is decreasing. STDS can also decrease the influence of tourism on the natural environment; it can provide concrete plans for National Parks and its implementation can be a good tool to achieve general objectives of both Podkarpackie province and the Košice region. Meanwhile, the lack of an overall vision and a tourism vision in both areas makes implementation of STDS more difficult. Networking and co-operation, as part of the social capital is not yet sufficient in both countries. Scattered ownership of SRNP does not provide good conditions for this. Above all it is not clear to everyone what sustainability means. People want to earn money right now, which makes sustainable thinking almost impossible. Tourism will never be successful or sustainable if only based on good intentions, accidental commitment and individual initiatives. Uncontrolled, poorly planned and managed tourism development will in the long run be far from sustainable while negative impacts could jeopardise both natural and cultural resources we seek to protect (Beunders 2002).

A problem in SRNP for instance is that tourism is not included in its budget making it difficult to account for tourism when conducting new plans. In some cases we see aspects of the dimensions of sustainability coming out in the implementation of the STDS, while in other cases as STDS seems to influence the dimensions of sustainability. Therefore it can be said that there is a certain relation between constitution of the four dimensions of sustainability and the implementation of a STDS.

Conclusions

Findings show that there are indeed differences between the social-cultural, economic, environmental and institutional contexts in Poland and Slovakia with more extreme differences when compared to Sweden and Finland (i.e., laws, governmental structure, economic and political stability, etc.). From a general perspective, PAN Park's principles and criteria are broad enough to be used for each cultural context and standards and integrity of the criteria should be maintained cross-culturally. Yet, the conditions on which the criteria should be met for each park location should vary for each country (i.e., time frame for verification, funding available, help and technical assistance, etc.). The degree of readiness for an STDS in Poland remains in the beginning stages

Table 2. Difficulties and advantages of STDS implementation in relation to sustainability dimensions.

	Difficulties of STDS implementation	**Advantages of STDS implementation**
Social dimension	If target groups are not clear, no Product Market Combinations for Unique Selling Points can be made; no awareness campaigns for the residents; no highly skilled and informed employees.	STDS can create more employment and keep young people in the areas; STDS can give a positive impulse to both regions
Economic dimension	Without useful strategies with action points, the overall vision for the future is not clear; lack of integration of tourism in other sectors, can make the areas less competitive than other areas; goals for economic investments and employment need to be set; bad condition of the infrastructure in both countries.	Both regions are working on tourism development.
Environmental dimension	Goals for conservation and restoration of the protected areas and cultural settings need to be set.	Natural and cultural settings can be used as USP in the STDS; The required zonation for the STDS can decrease the influence of tourism on the natural environment; Relatively unpolluted areas increase their competitiveness with other areas.
Institutional dimension	No overall visions of both areas; tools for attracting tourists (marketing) are criticised by deputy director or are not allowed to apply on the NP; tourism strategies of parts of the area are not integrated; Scattered ownership of the SRNP; No research for implementing the STDS has been conducted; Financial problems to make new plans in Poland; Mayors of communities think on local scale in stead of regional scale; It is not clear for everybody what sustainable means, let alone what STDS means.	A STDS can provide innovations that are embedded in the legislation of the NP's; STDS can provide concrete plans for the NP's; Both NP's already have a buffer zone; In both countries there is some form of co-operate between stakeholders in the area; BNP management and local partners have a common interest: keep visitors in the buffer zone of the area; Implementation of STDS is a good tool to achieve general objectives of both regions.

since the park was recently verified on principles 1 to 3 and they are presently developing the structure of an STDS. In Slovakia, the park is not yet verified and may not be due to limitations not related to ability to establish an STDS; therefore, direct comparisons among the parks was not possible. Many of the ideals of PAN Parks and an STDS are based on western European situations, which should be considered in the verification of parks in former eastern block countries. In ***conclusion***, the sustainability framework was useful for examining issues of sustainability in implementation of PAN Park principles and will be helpful in developing indicators to monitor the balance between sustainable tourism and nature conservation. PAN Parks is an innovative initiative and still in its infancy, yet the task of networking Europe's finest parks is apparently succeeding.

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Tourism monitoring system based on the concept of carrying capacity – The case of the regional natural park Pfyn-Finges (Switzerland)

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Abstract: The creation of regional natural parks offers the possibility of improving the economic situation of peripheral regions. However, the use of ecologically sensitive zones for tourism purposes also presents economic, environmental and social problems. The concept of carrying capacity is often presented as a useful approach for determining the intensity of tourism development that can be supported by a region. Our objective thus consisted in the operationalisation of this concept by defining a certain number of indicators to measure the different types of carrying capacity. However, the confrontation with the practical realities of the regional natural park Pfyn-Finges in Switzerland made us realise that what we intended to do was more a stylistic exercise than a setup of a management tool adapted to the needs of the park managers. We thus conclude that even though the concept of carrying capacity may have a high heuristic value, its practical value is rather limited.

Introduction

Unlike other European countries such as France or Italy, Switzerland has not encouraged the creation of regional natural parks in order to develop tourism activities in partly underdeveloped rural or mountain regions. The number of projects aiming at using such territories for tourism purposes by creating regional natural parks has only started to increase in the mid 90s. As Margot and Wespi (2001, p. 24) point out, "tourism is the economic sector which best allows to enhance the value of the rich heritage of decentralised regions. […] The improvement of relaxation possibilities in a preserved landscape constitutes a concrete contribution of the parks to the increasing demand of the urban agglomeration population." The study by Siegrist et al. (2002) on the potential of nature tourism shows indeed that Swiss tourists who stay in their country demand protected areas in their holiday region. The intention to enhance the value of regions with high quality natural or cultural heritage for tourism is also due to the fact that on an international level, ecotourism is a constantly growing market (Eagles 1999, UNEP 2001, Arnberger et al. 2002, Revermann & Petermann 2002).

The initiatives to create regional natural parks offer the possibility of improving the economic situation of peripheral regions (WCPA 1998, Küpfer & Elsasser 2001). However, the use of ecologically sensitive zones, which have not been subjects to intensive tourism until now, for tourism purposes, presents economic, environmental and social problems (Epler Wood 2002). In this context, the concept of carrying capacity is often presented as a particularly useful approach for determining the intensity of tourism development that can be supported by a region, considering its economic, ecological and social characteristics. Until now, only few attempts have been made to operationalise this concept and to transform it into a management tool for the persons in charge of parks and protected areas. This article presents the results of a study[1] aiming at operationalising this concept by defining indicators to measure the different types of carrying capacity.[2] The ulterior objective will be the construction of a monitoring system based on these indicators to promote a sustainable management of tourism activities in Swiss regional natural parks. The research was carried out in the Pfyn-Finges Park in Valais (Switzerland). The central question of this article is to find out whether the concept of carrying capacity can be useful for the setup of a tourism monitoring system in regional natural parks.

Regional natural parks in Switzerland

The creation of regional natural parks in Switzerland – difficult beginnings

Switzerland was one of the first European countries to have a national park (the Swiss National Park was founded in 1914). However, not one single park has been created since. Following the emergence of several park projects at the end of the 90s and several procedural forms of requests for action, the Swiss Government has assigned the Swiss Agency for the Environment, Forests and Landscape (SAEFL) to prepare a revision of the Federal nature and landscape protection law to enable the creation of different types of parks (national park, regional natural park, periurban natural park) and to define the recognition criteria for these parks. According to the results of the consultation procedure, which was held between September 2002 and January 2003, the purposes of the new system for Swiss parks are as follows: "Enhance the biological diversity, realise the current objectives of the Federal nature and landscape protection law in a particularly intense way, promote sustainable development in a balanced way […] and implement it in an exemplary way, achieve the objectives regarding the regional development and planning policy. The ecological dimension of sustainable development requires that the objective of the protection defined in the current Federal nature and landscape protection law be entirely achieved, even if social and economic development aspects are taken into account." (DETEC/OFEFP 2003, p. 4)

The consultation of the cantons and the stakeholders has, on the whole, been favourable to the revision of the Federal nature and landscape protection law. In his meeting of 25 February 2004, the Federal Council nevertheless decided to remove this revision from the programme of the legislative period 2004–2007, because of the precarious situation of public finances. Several procedural forms of requests for action, a petition signed by the municipal presidents and the lobbying of different non-governmental organisations will hopefully prevent this question from being definitely ignored during the current legislative period.

The Swiss conception of a regional natural park

The revision of the Federal nature and landscape protection law is largely inspired by French experiences. A regional natural park is considered "an instrument of regional policies used for revitalising certain territories or for assisting them in their adaptation to economic and technological mutations, without losing their specific characters, which are an evidence of their know-how, their cultures and their diverse cultural landscapes" (Margot & Wespi 2001, p. 5). The following definition of regional natural parks has been retained:

"A regional natural park is a territory of high natural, cultural and landscape value, whose culture, nature, social structure and local economy are part of a sustainable development project, in harmony with the aspirations of the population. (…)

– It will be a territory of high natural, cultural and landscape value, which importance is demonstrated by regional, cantonal, federal and international inventories;
– A regional natural park project stems from a regional initiative;
– The regional natural park is a development tool for regions, and especially for rural areas;
– The "Swiss Landscape Concept" (1997) and the "Sustainable Development Strategy 2002" of the Federal Council establish the framework of regional natural parks" (Oppizzi 2003, p. 5)

In its project, the SAEFL underlines that "only natural and landscape parks stemming from regional initiatives and supported by the local population and the Canton" (Oppizzi 2003, p. 4) can be recognized by the Confederation. The minimum size for the construction of a regional natural park is 100 km^2. The Confederation plans to subsidize the creation and the management of such parks up to 60%.

The designation "Regional Natural Park" gives the park managers the right to award "a label with the park emblem to the producers, firms, societies or associations that are active within the park and offer products and services that are typical of the park" (Oppizzi 2003, p. 22). This regional quality label must be renewed every three years and is only awarded to products, services or social and associative activities that correspond to the protection requirements for natural, landscape and cultural heritage and to the requirements of sustainable development.

To ensure that the Federal requirements are respected and to decide on the renewal of the convention, an evaluation system is planned. However, "this evaluation must not be conducted at the end of the procedure, but be prepared while setting up the park project. A progressive and continual approach is needed, which can be summarized in three big stages:

1. Setup of the monitoring devices
2. Management of the park project
3. Assessment of the concept and impact analysis." (Oppizzi 2003, p. 24)

Our attempt to develop a monitoring system of tourism activities can be situated on the level of this evaluation procedure, and particularly within the first stage described above.

The concept of carrying capacity

Definition

We will refrain from giving an overview of the many different definitions of the concept of carrying capacity that can be found in literature. Yet, it is necessary to clarify our comprehension of this concept.

The World Tourism Organisation (WTO) defines the concept of carrying capacity as follows: "The maximum number of people that may visit a tourist destination at the same time, without causing destruction of the physical, economic and socio-cultural environment and an unacceptable decrease in the quality of the visitors' satisfaction" (cited in PAP/RAC 1997, p. 5).

Hunter (1995, p. 67) gives a more precise definition by distinguishing four different types of carrying capacity:

"*Physical carrying capacity* – the limit of a site beyond which wear and tear will start taking place or environmental problems will arise.

Psychological (or perceptual) carrying capacity – the lowest degree of enjoyment tourists are prepared to accept before they start seeking alternative destinations.

Social carrying capacity – the level of tolerance of the host population for the presence and behaviour of tourists in the destination area, and/or the degree of crowding users (tourists) are prepared to accept by others (other tourists).

Economic carrying capacity – the ability to absorb tourism activities without displacing or disrupting desirable local activities."

Papageorgiou and Brotherton (1999, p. 272) underline what they think the central point of the concept of carrying capacity is: "In a recreational context, central to all definitions of carrying capacity is the idea of maintenance of the integrity of the resource-base and the provision of a high-quality recreation experience to users."

At this stage, we will retain the two following main elements from these definitions:

– The notion of a quantitative frequentation limit related to a given surface area and to a degree of satisfaction.
– The notion of maintaining the natural resources on which the tourism activity is founded.

A concept difficult to operationalise

The concept of carrying capacity has been the object of numerous publications and discussions in the last 30 years. Many studies were focused on the quantitative operationalisation of the concept, thereby neglecting the qualitative aspects. In addition, even though the concept has sometimes been related to the concept of sustainable development (Coccossis & Parpairis 1992, Hunter 1995), only few attempts have been made to operationalise the concept by taking into account the economic, ecological and social aspects. Too often, the carrying capacity is determined by only one of these three dimensions (Williams 1994), generally the ecological aspect. Furthermore, as every territory has its own specific characteristics, these must be taken into account when operationalising the concept of carrying capacity. For this reason, different methods will be used to determine the carrying capacity of a winter holiday resort, a seaside resort or a regional natural park.

The concept of carrying capacity has been used for parks and protected zones for several decades, but only recently attempts have been made to operationalise this concept by using indicators and quality standards (Manning 2002, Martin et al. 2002). These experiences mainly concern national parks, and thus cannot be transposed to other types of parks as such, especially not to regional natural parks, which are characterised by the many socio-economic activities on their territory. In this context, our initial approach was to start from Hunter's definition (1995, p. 67) to establish indicators enabling the measurement of the four types of carrying capacity identified by this author. Our approach has greatly evolved, though, as we felt it necessary to rely more on the concrete entities of regional natural parks in Switzerland than on the theoretical concept of carrying capacity.

The monitoring of tourism in regional natural parks

The common aspect of the whole literature on monitoring the sustainability of tourism development is the absence of a satisfactory method, which is accepted by everybody: "Monitoring of tourism in the context of sustainable development is necessary if we are to understand and plan for tourism more effectively. But the problem is what and how to monitor in an efficient and effective way with only general concepts and criteria such as economic health, diversity, productivity, maintenance of essential processes and equity in mind?" (Nelson 1999, p. 339).

One of the solutions is to start from the objectives defined for regional natural parks, and then to define the indicators linked to these objectives. According to the Swiss concept, a regional natural park pursues several objectives in the following areas:

– socio-cultural vitality;
– economic vitality;
– nature & landscape;
– information & education;
– administration & policy.

The management of the territory of a regional natural park is a dynamic process. All five areas must more or less simultaneously be taken into account by defining specific objectives for every area. On the basis of the revision of the Federal nature and landscape protection law, we were able to extract five to six objectives for each of the areas mentioned above (Clivaz et al. 2004). For instance, the objectives for the area "socio-cultural vitality" are:

– Maintain and develop attractive living spaces;
– Enhance the value of heritage and of traditions;
– Promote the quality of life;
– Maintain a sane and stable demography;
– Allow the local population to appropriate the regional natural park project;
– Create value added and innovating jobs.

In practice, these broadly defined national objectives must be specified according to the characteristics of each park, and a certain number of indicators have to be chosen for every objective. Afterwards, a diagnostic of the current situation in relation to the five areas (T1) can be established with the help of the indicators, and the state to be achieved can be defined (T2). This state must ideally result from a consensus based on the common vision of the actors concerned by the regional natural park project. The middle- and long-term objective of a park is the progression on every axis (area) to achieve the "ideal" pentagon (cf. Figure 1). This ideal pentagon represents a sustainable development situation, which combines the objectives of development and of resources conservation.

The project of the regional natural park of Pfyn-Finges

Pfyn-Finges is crossed by the wild Rhone River and comprises pine groves, ponds, hills and an alluvial zone. Its entry into different inventories of national importance and its protection by the Canton limit the possibilities of economic use of this site and impose severe conditions on the different projects in relation to the area. The combination of natural and cultural values and the Mediterranean climatic conditions of the Pfyn-Finges region constitute the ideal basis for the development of green tourism, which aims at conserving the landscapes and the richness of fauna and flora.

In March 2000, the "Pfyn-Finges Association" was founded. Its members are the administrative bodies concerned (municipalities, socio-economic regions, canton), tourist offices, environmental associations, various private persons and public institutions. The first objective of this association is to lodge an application addressed to the Canton to create a "natural park" according to the 21st article of the Cantonal nature, landscape and site protection law. Their second objective is to obtain the Federal recognition of Pfyn-Finges as a regional natural park.

The tourism concept 2010

In order to define the spatial planning of the Finges site, a tourism concept was established under the aegis of the Pfyn-Finges Association (Verein Lebens- und Erlebnisraum Pfyn-Finges 2003), which will be realised by 2010. This planning tool enables the development of a soft tourism according to the principles of sustainable development defined in the Federal Constitution. It consists of 11 action sheets, which specify the suggested measures, such as the creation of a nature and landscape centre, the construction of recreational facilities at the park entrances, direct sales of regional products or an access concept for motor vehicles, bicycles, hikers and riders.[3] At the present time, it is not planned to evaluate the success of these actions by using indicators. Such an evaluation could be made within a larger monitoring system of tourism activities.

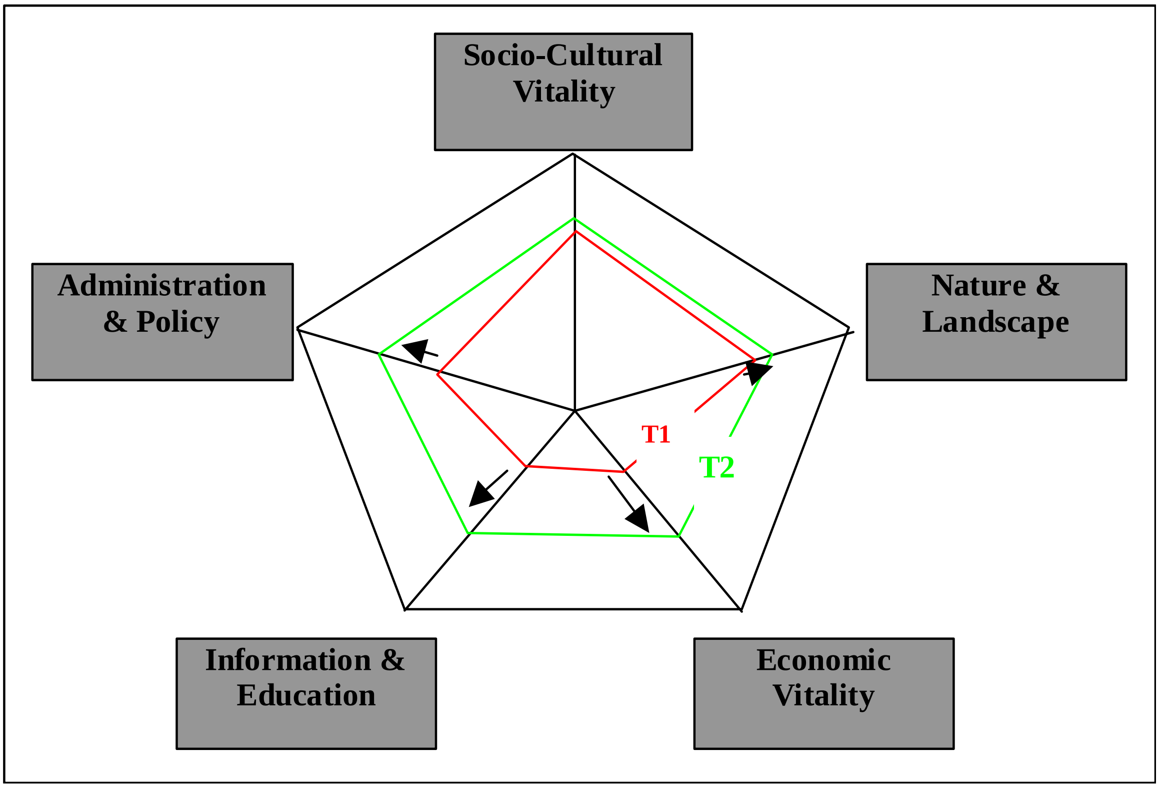

Figure 1. The five key areas of a regional natural park in Switzerland (T1 = diagnostic of the current situation; T2 = state to be achieved in the future).

The obstacles to the setup of a tourism monitoring system

The development of tourism activities is a priority for the Pfyn-Finges Association. This is why it is crucial to prevent the degradation of the site by a massive and uncontrolled influx of visitors. This risk of over-frequentation must not be underestimated, as Pfyn-Finges is close to big tourist resorts (Crans-Montana, Loèche-les-Bains, Val d'Anniviers). The "traditional" clientele of these resorts could be very interested in the additional offer of this regional natural park. It is thus particularly important for the park managers to have an operational monitoring system for the tourism activities in order to be able to take the necessary measures in due time. Nonetheless, the development of such a system will take time, mainly for the following three reasons:

– The persons in charge of Pfyn-Finges recognise the importance of such instruments for the observation of the economic, ecological and social consequences of the tourism for the park. However, in the present situation, where the survival of the park is still not ensured, they have other priorities.
– The global objectives for regional natural parks are clear. However, they must be refined according to the economic, ecological, social and institutional particularities of Pfyn-Finges before an indicator set can be elaborated. From a sustainable development perspective, this requires the participation of all concerned actors, which implies a relatively long and complex process.
– If the evolution of the different areas and objectives mentioned above are to be monitored, a huge amount of data is needed. A rapid overview of the data currently existing in Switzerland shows that the situation is not very favourable, either because this data has simply not been collected or because it exists on another level (national, cantonal) and is therefore not always applicable to a regional natural park.

Conclusion: Heuristic and practical value of the concept of carrying capacity

Whichever definition is chosen, the concept of carrying capacity is far from being unanimously approved by researchers and is still widely discussed. According to Sun and Walsh (1998, p. 326), "although the carrying capacity concept has been generally accepted in outdoor recreation management (…) some scientists consider it a useful theoretical concept, but limited in practical application". For Hughes (2002, p. 465–466), citing Butler (1993), "there are no satisfactory indicators of carrying capacity or the ability of the environment to sustain tourism". Even the authors who do use the concept recognize its limitations. According to Papageorgiou and Brotherton (1999, p. 271), "carrying capacity remains a highly elusive concept, and its implementation is linked with the practical problems involved in measuring it". On the same page, these authors also point out Manning et al.'s (1996) acknowledgement, that "efforts to determine and apply the concept of perceptual carrying capacity to areas such as the National Parks have remained problematic".

In this article, we have presented an attempt to operationalise the concept of tourism carrying capacity for a regional natural park by defining a certain number of indicators to measure the four types of capacity defined by Hunter (1995, p. 67). As we have already pointed out before, a more thorough analysis of the literature and of existing experiences and the confrontation with the practical realities of the park convinced us to adopt a different approach. In accordance with the authors cited above (Hughes 2002, Papageorgiou & Brotherton 1999, Sun & Walsh 1998), we consider that the concept of carrying capacity has a certain heuristic value in its ability to account theoretically for the relations between human activities and their impact on the territory, especially regarding the environmental factor. However, we are more doubtful regarding the practical value of this concept, as we had to adopt a different approach to be able to propose a tourism monitoring system for regional natural parks. The definition of the indicators to measure the different types of carrying capacity was thus more a stylistic exercise than a setup of a management tool adapted to the needs of the park managers. This is why our study was oriented towards the development of an approach that allows each park to define its objectives and indicators according to its own characteristics and needs (Clivaz et al. 2004). This modification of the direction of our study corresponds to a more general tendency, which has been observed in other projects concerning the development of sustainable development indicators (Clivaz & Babey 2003, Pastille Consortium 2002). This tendency consists in switching from top-down approaches, where indicators are defined by experts, to bottom-up approaches, where indicators are defined by means of participative processes including local actors.

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[2] See below for the presentation of the different types of carrying capacity.

[3] The tourism concept Pfyn-Finges 2010 (in German and in French) can be downloaded from the website http://www.pfyn-finges.ch

Measures for Developing Sustainability of Nature Tourism in Protected Areas

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Abstract: Nature protection areas are often significant and attractive recreation areas and tourist destinations. In Finland, Metsähallitus manages most of state owned protected areas. Thus, Metsähallitus also has a significant responsibility for tourism development in these areas. As a part of a larger Metsähallitus project to promote sustainable nature tourism in protected areas, the organization has developed measures for estimating the environmental impacts of nature tourism in protected areas. The measures are derived from Metsähallitus' nine principles of for sustainable nature tourism, including the aspects of ecological, socio-cultural, and economic sustainability. The indicators have been tested in six pilot areas across Finland.

This article describes the process of developing indicators, and the ways in which the indicators are being and will be used through incorporating them into the overall planning process. Sustainability is approached by setting standards, i.e. defining the limits of acceptable change, for each indicator. While some of the indicators are ready to be used, further development and testing is still required.

Introduction

The majority of protected areas are at the same time scenic and interesting recreation and tourism destinations that attracted tourists even before they were established as protected areas. Although the main purpose of protection is nature conservation, legislation in Finland usually allows for a certain amount of recreation and research as well. Moreover, a protection decision, especially the status of a national park, tends to increase public awareness of the area, thus attracting even more visitors. This is the case more or less everywhere in the world, although this article focuses on the case of Finland.

In Finland, most of the state owned protected areas are managed by Metsähallitus. Thus Metsähallitus has a particularly significant responsibility as regards tourism development in protected areas. In order to further develop the possibilities for quality nature tourism in conservation areas, Metsähallitus has developed measures for sustainable nature tourism in protected areas, wilderness areas, and areas that are included in nature protection programmes still to be implemented.

The development process is part of a larger project with which Metsähallitus is promoting sustainable nature tourism in protected areas. Other parts of the project include developing principles for sustainable nature tourism, agreements with nature tourism entrepreneurs, and creating a process for enhancing sustainability in the protected areas.

This article describes the process by which the indicators for sustainable nature tourism were selected. Furthermore, it classifies the indicators according to how useful they appeared to be on the basis of field testing and also when judged by general criteria for good indicators. Finally, it describes the ways in which the indicators are currently being used in Metsähallitus, and how they will be used and further developed in the future.

Material and methods

There are numerous definitions of nature tourism and sustainable nature tourism (e.g. Blamey 1995, Valkama 1997, Patterson 2001). In this article the concept of nature tourism is understood to include all tourism that is at least partly based on nature. It is used in the same way as in the recent Finnish Government action plan for developing outdoor recreation and nature tourism (Programme for Developing… 2002, p. 3):

"*Nature tourism refers to all tourism that is based on nature. In a slightly narrower definition, nature tourism is tourism that involves recreation in natural surroundings. Nature tourism combines recreational use of nature and tourism. In nature tourism nature is a significant attraction or environment for activities.*

In recreational use of nature nearly everything that is not part of daily outdoor recreation in the immediate surroundings is regarded as nature tourism. Thus, for example, the use of holiday homes and recreation in this context is regarded as nature tourism."

In order to keep the terminology simple, it was decided in the project that the term nature tourism will be used. However, in reality the indicators developed in this project, measure the impacts of outdoor recreation more broadly in a particular area, thus including e.g. outdoor recreation by local people (Figure 1).

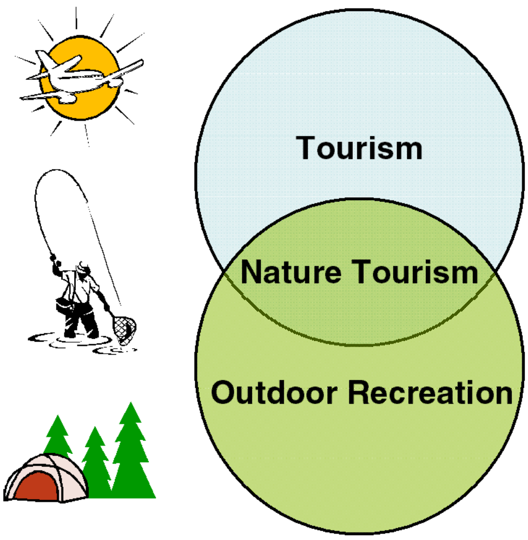

Figure 1. Nature tourism is both outdoor recreation and tourism.

Limits of Acceptable Change (LAC)

Limits of Acceptable Change (Frissell & Stankey 1972, Stankey et al. 1985, Cole & McCool 1997) was chosen as the planning framework for the process for several reasons. The LAC planning process provides a way of monitoring changes in the state of the area and helps to determine appropriate management actions in order to manage changes. It helps managers to systematically set explicit standards of acceptable and appropriate resource and social conditions in recreation settings. Furthermore, it encourages managers to set appropriate management strategies for maintaining and/or achieving these conditions.

LAC was found to be a particularly useful approach to sustainability of nature tourism because it draws attention to human-induced changes and emphasizes that all the limits are set by managerial decisions; they are not "the objective truth" in themselves (Hendee & Dawson 2002). Moreover, considering the limits of acceptable change during the planning process helps to draw attention to development trends that are threatening the area, and to find ways of stopping this development. Thus, LAC is one way of putting the term sustainability into practice in a concrete manner.

The Limits of Acceptable Change process was modified to fit the purposes of the nationwide Metsähallitus project. It turned out to be a nine-step process as follows (Numbers refer to Figure 2.):

1. The goals for nature tourism were set in Finland's publicly owned protected areas managed by Metsähallitus. This was implemented as part of the broader project; by establishing the general nine principles of sustainable nature tourism (Högmander & Leivo 2004, in these proceedings).

2. More specific desired future conditions were defined for nature tourism and its impacts.

3–4. A comprehensive list of indicators and ways of measuring them was developed.

5–6. Previous and current values of the indicators were inventoried.

7–8. Standards and desired future values were set for the indicators.

9. The management actions available to achieve or to maintain desired conditions were considered.

Steps 1–4 were common to all areas, while steps 5–9 were implemented in each area separately. During the year 2003, the measures were tested in six pilot areas: five National Parks representing both southern and northern Finland (Nuuksio, Repovesi, Oulanka, Pallas-Ounas and Pyhä-Luosto), and Kaldoaivi Wilderness Area. The pilot areas are continuing their work in the year 2004.

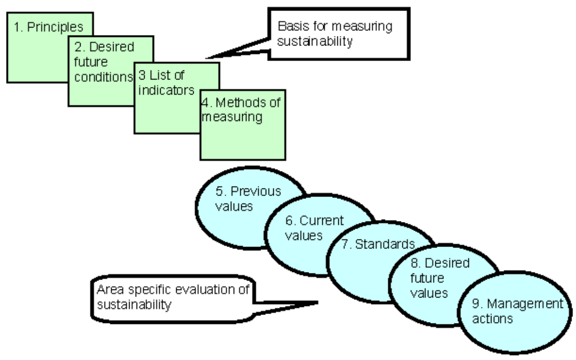

Figure 2. An application of the Limits of Acceptable Change planning framework used in the project.

Development process in practice

Based on former experience, the literature and field testing in pilot areas, employees of Metsähallitus selected and further developed several indicators for estimating the environmental impacts of nature tourism in protected areas. As the indicators are derived from the nine principles proposed by Metsähallitus for sustainable nature tourism, they inherently include the aspects of ecological, socio-cultural, and economic sustainability.

At first, the list was as comprehensive as possible. Pilot areas tested the indicators during the summer season of the year 2003. They were not required for testing all the possible indicators, but only those that were significant and promising in their particular area.

During the testing period, pilot areas also created new indicators and ways of measuring them. This information was shared throughout the testing season. Indicators that are already collected by Metsähallitus for some other reason were favored. These include e.g. the amount of waste accumulated in protected areas and indicators obtained from standardized visitor surveys implemented by Metsähallitus.

In addition to inventorying the current value of the indicator, existing information such as previous visitor surveys was also gathered. Information for evaluating the usefulness of the indicators was also to be gathered in the pilot areas, e.g. the number of working hours required for each indicator.

In fall 2003 the results were compiled and analyzed in a workshop of pilot areas. Indicators were classified on the basis of criteria for good indicators. Ideally, indicators have an early-warning ability, they are significant, indicative, discriminative, sensitive, responsive, quantitative, reliable and feasible (Hendee & Dawson 2002, VERP 1997).

Selected indicators

As a result of the development process described in material and methods, a group of indicators that were judged as useful was created. They were classified into four categories:

- Common indicators that are ready to be put into practice and that are common to all protected areas with a significant amount of nature tourism
- Optional indicators that are ready to be put into practice, but that will be used only in certain protected areas with a significant amount of nature tourism
- Indicators that were found to be useful but require further development in the year 2004
- Indicators that were found to be useful but require further development later

Altogether, the process yielded almost 30 indicators that were estimated to be useful for all nature protection areas with a significant amount of nature tourism (Appendix 1). More than 20 indicators were evaluated as relevant for at least some of the areas. From these, each planning area will estimate which ones should and could be used. Some of the indicators in this category require further elaboration.

While some of the indicators are ready or fairly ready to be used, some require a significant amount of further development and testing. From these, the ones that are most likely to be good indicators were selected. These indicators will be developed and taken into practice later.

Towards managing the impacts of nature tourism

The indicators will be incorporated into the overall planning process of Metsähallitus as a tool for planning, managing and monitoring the impacts of nature tourism in protected areas. In the process of planning any particular nature protection area, the sustainability of nature tourism is approached by going through the entire updated LAC process (e.g. Hendee & Dawson 2002, p. 238). If nature tourism plays a significant role in the area, a nature tourism plan will be made, in addition to the general management plan. As public participation is an integrated part of Metsähallitus' planning processes, it will also be used in setting the limits of acceptable change for sustainable nature tourism.

During the year 2004, the six pilot areas are continuing their work. Now that the work of developing indicators is well under way, the pilot areas will be able to focus more on formulating standards, comparing the existing conditions with the standards, and considering appropriate management actions.

Other protected areas managed by Metsähallitus have not yet been requested to apply the measures, but if any of the areas are starting new management planning processes, they are likely to consider the method available. The goal of Metsähallitus is that the guidelines and measures should be finalized and applicable by the end of the year 2004. Thus, the areas can start applying them in practice fully by the year 2005. In the nature conservation areas where nature tourism is a significant form of use, at minimum all the common measures (Appendix 1) will be applied from 2005 on.

Conclusions

The task of the Metsähallitus project was to develop indicators for sustainable nature tourism in order to allow better monitoring and management of the environmental impacts of nature tourism. One direct way in which Metsähallitus will apply the indicators is in the management plans for the protected areas.

Of the indicators relating to the monitoring of impacts of nature tourism, visitor surveys are well represented among the common indicators. The intention is to develop visitor surveys further in order to better meet the needs of tourism monitoring.

Visitor counting is of great significance in developing indicators, as reliable data on number of visits is a prerequisite for many other indicators. The key figures for most of the impacts of nature tourism are calculated in proportion to the number of visits to the area: e.g. amount of waste, consumption of firewood, wear on the terrain, trash, various costs, impacts of nature tourism and nature conservation on the regional economy.

There should be some flexibility, depending on the protected area type. Moreover, it is possible that the relative importance of indicators may change as time passes. This requires follow-up and potentially updates on the indicators from time to time (Hendee & Dawson 2002, VERP 1997).

When considering appropriate management action, the minimum tool rule is a good guideline, in Finnish conditions, too. As Cole and Stankey (1997, p. 9) state: "Recreation opportunities should not be restricted to any substantial degree unless restrictions are necessary to keep conditions within standards."

Although a lot of work remains to be done, this project was a necessary and significant step towards monitoring and managing the impacts of nature tourism in state-owned protected areas of Finland.

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Appendix 1. Indicators that were selected for measuring the impacts of nature tourism in protected areas with significant amounts of nature tourism (common to all areas).

GENERAL PRINCIPLE	DESIRED FUTURE CONDITION	INDICATOR	METHOD OF MEASURING THE INDICATOR
1. Nature values are preserved and the activity promotes nature protection	Tourism and recreational use should not threaten occurrences of endangered species	Number of occurrences on which tourism has had an adverse impact (e.g. Saimaa ringed seal, red-throated diver and golden eagle)	Monitoring - guidelines concerning species to be monitored nationally will be developed further
		Visitor survey, questions 7 and 9 related to the attractiveness and quality of nature in the area	Visitor survey - Visitor survey to be developed further from the perspective of monitoring sustainable nature tourism
2. Minimum loading of the environment is assured	Wear on the terrain should be within acceptable limits	Width and depth of trail tracks	Monitoring of wear on the terrain with the help of the study on trail and campsite conditions. Measurements every 5 years. Wear is an indicator consisting of some 30 parameters.
		Uncovered roots	See the study on trail and campsite conditions
		Amount of vegetation in selected areas	See the study on trail and campsite conditions
		Number of campfires in selected areas	See the study on trail and campsite conditions: Inventory of campfire sites and campsites
		Visitor survey, question 15A, asking whether trampled ground has disturbed visitors.	Visitor survey
		Area of barren mineral soil/total area of barren soil	See the study on trail and campsite conditions
		Damage to trees, bushes and stumps; total number of cases of damage	See the study on trail and campsite conditions
	Sign-posted routes and maintained infrastructure should be used where provided	Number of unauthorized campfire sites and campsites in selected areas	See the study on trail and campsite conditions: Inventory of campfire sites and campsites
	Minimum loading of the environment should be taken into account in recreation: - Trips should be well planned and prepared - Sign-posted routes and maintained infrastructure should be used where provided - Waste should be treated according to instructions	Amount of landfill waste generated in the area	Information on waste accumulation is collected in accordance with the environmental management system
		Study on the amount of trash in a selected area	Trash monitoring
		Visitor survey, question 15B, asking whether littering has disturbed visitors	Visitor survey
3. Local culture and heritage are respected			

GENERAL PRINCIPLE	DESIRED FUTURE CONDITION	INDICATOR	METHOD OF MEASURING THE INDICATOR
4. Customers' appreciation and knowledge of nature and culture are promoted	The customers should know the special characteristics of the local culture	Feedback from local residents and stakeholders Visitor survey	
	The customers should show interest in nature, ask questions and seek further information	Number of visits to the areas	Visitor counting
	Nature should be a major motive for trips	Visitor survey, question 7, related to the attractiveness of nature in the area	Visitor survey
5. Customers' opportunities to find recreation in nature are enhanced	A high standard of recreational environment should be maintained	Visitor survey, question 9 (quality of services, quality of the environment) Question 10 (expectations vs. actual experiences during the visit)	Visitor survey Customer feedback
		Customer satisfaction index	Visitor survey Customer feedback
	The customers should take other customers visiting the area into consideration (group sizes, conduct)	Visitor survey, questions 5, 15D, 15E: size of the party, excessive number of visitors and behaviour of other visitors	Visitor survey Customer feedback
6. Customers' mental and physical wellbeing are reinforced	The visitors should feel refreshed and relaxed in the natural environment	Visitor survey, question 7 and open feedback	Visitor survey
	Visitors should have personal experiences of nature	Visitor survey, questions 8 and 10: respondents´ activities in the area, expectations vs. experiences	Visitor survey Feedback
	The safety of service infrastructure should be guaranteed	Condition inventory of infrastructure, age of the structures and scope of the inventory	Condition inventories of infrastructure (with the completion of the GIS project on trails, buildings and structures) Visitor survey, question 21
7. Positive impacts are made on local economy and employment		Number of agreements with nature tourism entrepreneurs	Information on agreements of different types included in Metsähallitus' information system
8. Communication and marketing are of high standard and carried out with a sense of responsibility	Open and comprehensive information should be given on what is permitted and suitable in the protected areas	Visitor survey, question 20, asking what is allowed and what is prohibited in the area	Visitor survey
9. Activities are planned and implemented in co-operation	Customer feedback should be collected regularly and processed	Number of events organized for stakeholders and number of participants	
		Number of partnership agreements in proportion to the total number of agreements with entrepreneurs	Information on agreements of different types included in Metsähallitus' information system
	Co-operation with stakeholders should be smooth and regular	Number of events organized for stakeholders and number of participants	

Improving the environmental conditions in intensively used rural areas

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Abstract: The rural area of Brotas in the southeast of Brazil was national pioneer in the development of intensive adventure tourism, based on enjoying nature. The exploitation of the bounder-areas of the rural properties offered a new income base for the town and improved the working opportunities for the local youth. But there is a setback. There are signs that the fast growing flux of tourists in the town is provoking lesser satisfaction for the visitors and causes damage to the natural environment. This is of great concern for all parties, especially for the local government, as most of the trails and natural attractions lie within Permanent Protected Areas. These areas are often the only pristine settings with potential for recreational use. They are seen as very sensitive areas, protected by the Forest Code of Law, but in reality are managed by private landowners. The Local Government Policy Plan for The Development of Sustainable Tourism (2002), using the input of underlying research project, confronts this dilemma. It was the focus of this research to combine governmental restrictions with new regulations, defined by private landowners, tourism agencies, non-governmental organizations and the municipality. Brotas has introduced measures to maintain or improve the environmental conditions of the rural properties. One of the measures is monitoring the existing conditions in order to control the visitors' impacts to a maximum. In this research project, we used indicators on the trails and waterfalls of Brotas in order to discover and evaluate if the set of goals for the preservation of vegetation, soil and visitor-satisfaction were reached. The selection of the indicators and the standards for desirable conditions were based on the objectives established by Brotas Municipality Council for Tourism – COMTUR.

Introduction

The development of tourism activities based on the natural environment of the municipality of Brotas (Brasil)has increased enormously in the last few years, following the worldwide tendency. The owners of rural properties that possess natural attractions like waterfalls, springs and rivers with rapids, are profiting from this. Amongst others, the crises in the agricultural sector led these agriculturists to open up their properties to the development of tourist adventure activities.

We have followed the process of implementing tourism activities in new destinies where the natural environment is the main attraction for visitors. Nature tourism classified as an important incentive for environmental protection and has been implemented in places with a great conservation potential. This whole new business has actually been able to contribute to the development of some municipalities.

Our concern is focused on the implementation and guidance of the tourism process in sensitive areas, those areas that have fortunately resisted or were spared from other land uses, but could be damaged by this new purpose.

Following this process means evaluating and monitoring the effects on the environment in order to propose suitable forms of control. This should lead to reasonable results for the environmental quality and help to maintain an economically sustainable tourism flux.

In addition, monitoring rural properties with an intensive use is important because once the quality of the resources has been reduced a great deal of the local economy will be harmed.

In most cases, the existence of a diverse range of activities implemented in the natural environment of rural properties is the result of pressure from the adventure tourism agencies. This occurs due to the few natural areas available for adventure sports and the necessity of variety in the visited attractions. Another reason is the fact that Brazilian Federal and State Conservation Areas have clear standards for the development of activities. If potential impacts are expected the activity will not be implemented. In this way, the tourism agencies and operators aim for the potential brought forward by private properties. Due to the characteristics of these areas, there are fewer restrictions for use (Magro 2001).

It is interesting to note, that in the discussion about the implementation of sustainable tourism in Brazilian rural properties, there seems to be a change in thoughts. The environmental quality is becoming one of the most important objectives, when one wants to provide a quality experience for the tourist and maintain the earning-capacity of the business.

The tools to reach the conservation goals and the goals related to the public use are available in different publications. These tools can be very useful for planning purposes, but were developed for public protected areas. The owners of private properties do not always accept management suggestions, which involve restrictions for use and changes in the relationship between the tourist and the visited area, as a feasible solution.

The focus of this research project is to insert the monitoring of the public use, with acceptance of governmental restrictions, into a new set of regulations, defined by private landowners, tourism agencies, non-governmental organizations and the municipality.

Study area

The City of Brotas lies 240 kilometres from the City of São Paulo (the capital of the State of São Paulo) in Brazil. The population is 20,000 habitants.

The municipality of Brotas received most of its inhabitants at the beginning of the 20th century. The majority of these inhabitants were Italian and Portuguese descendents. With their efforts during the Coffee Cycle, an important economic period for Brazil, they brought prosperity to Brotas (Mata´Adentro 2003). The cultivation of coffee caused the expansion of Brotas but unfortunately also her decline, when the coffee price dropped as a reaction to the economic crisis on Wall Street, New York, in 1929.

The landscape of Brotas is intersected by valleys and mountains ranges with forest vegetation. Agriculture, livestock and especially sugarcane plantations are predominant in this landscape.

Neither the cattle breeding nor the agriculture were sufficient to sustain the local economy. Due to the low labour expectations many younger inhabitants moved to larger urban centres. This situation changed in 1992 when the NGO “Movimento Rio Vivo” impeded the construction of a tannery and helped creating a municipal law that prevents the establishment of any kind of polluting industry.

On the other hand (as compensation) a development proposal was presented based on adventure tourism. Tourism expanded and gave Brotas the national status of “adventure tourism capital”. Brotas was the first Brazilian municipality to have a specific legislation for sustainable tourism.

Table 1 indicates the economic and touristic growth of the municipality in a 10-year period.

Table 1. The evolution of eco-tourism in Brotas (Brotas 2004).

	Before 1993	In 2004
Tourist attractions	2 to 3	> 40
Variety of sports	1 [1]	16
Touristic ranches	2	23
Eco-tourism Agencies	None	17
Guides	None	> 300
Hotels/pensions/B&B's	3	27
Restaurants	3	21
Tourism businesses	Few	> 80
Tourists per year	Small	150.000/year
Tourism jobs	Hardly any	+/- 1.000
Media exposure	Regional	National
Financial transactions per year	-------	U$34 millions

[1] floating down the river on an inflated tire

Research methods

Visitors' questionnaire

With the results of the questionnaire, we gained knowledge about the type of tourists visiting Brotas, their behaviour and the satisfaction about their visit. The knowledge provided by the questionnaire makes it easier to implement education strategies, infrastructure improvements and spatial planning.

The survey had four types of questions: 1) facts about the visitor; 2) a question for monitoring purposes; 3) questions about the time/space behaviour of the visitors; and 4) statements about the natural resources, activities, attractions and facilities.

The survey was held in 2002 during three different periods: 1) three days during the Carnival (404 surveys); 2) two days during the Easter (416 surveys); 3) two days during a regular weekend (209 surveys). Carnival and Easter represents the crowding period in the municipality. In 2002 the estimate number of visitors during Carnival was 13,000 and 6,000 during Easter. The third survey represents normal weekends and the municipality receives around 2,000 visitors.

In total 1029 surveys were done in 16 different rural properties with tourist attractions.

Trail evaluation

In order to evaluate the environmental conditions, the planning method VIM – Visitor Impact Management (Graefe et al. 1990, Kuss et al. 1990) was used. Indicators were used for the trails and waterfalls that could evaluate if the desired conditions for the vegetation, soil and quality of the tourism experience were met. The selection of indicators and respective standards for acceptable change were based on the objectives for implementing sustainable tourism, established by COMTUR, the Brotas Municipality Council for Tourism. The final selection was based on Passold (2002), taking into consideration that the municipality itself could train people for future survey activities.

In work meetings with representatives of tourism agencies and local guides, the parameters of the environmental valuation were confirmed by the participants indicating their perception of the potential impacts to vegetation and soil caused by tourism activity.

Thirty-four trails on sixteen properties were evaluated. Each trail was divided into a certain amount of survey spots were mapping and monitoring activities were done. The number of spots is determined by the total trail length with a minimum of 10 spots. The longest trail was 6,200 meters and the shortest 88 meters.

The indicators that were used refer mainly to 1) presence of trash/debris/waste; 2) vegetation with damage; 3) trees with anchor cable; 4) trees with inscriptions; 5) trail tread way width > 1 m; 6) organic litter; 7) exposed tree roots; and 8) social trails.

The establishment of the standards of measurement to eliminate or decrease the identified problems was also based on available literature on this subject (Cole et al. 1997, Hammitt & Cole 1998).

Selected Results and Discussion

Visitor's judgement

The survey contained some questions for monitoring purposes. These questions deal with the effect of other tourists on their own visit, and the condition of the places they visited.

The respondents were asked to mark on a scale of 1 to 10 how the presence of other tourists affected their own visit, where: 1 = negative effect; 5 = indifferent and 10 = positive effect.

Figure 1 shows that 42% is indifferent and 40% is positively affected by the presence of other tourists. In these cases the positive influence was related to: friendship (3%); more lively (2.5%); know new people (2%); information exchange (1.5%); interaction (1%); other reasons (15.5%); not filled in (73.7%).

The cases in which the visit was negatively affected, 83 % of the respondents didn't fill in a reason.

The others choose from four options: bawling/noise (1%); crowding (7%); trash (5%); other reasons (4%).

During the survey, we notice that when we did not give possible options, visitors had to think about their own answers and they didn't like it. The easiest way was not to fill in. Then they could quickly go back to their activities. This can be the main reason for a high percentage of not filled in answers in some questions.

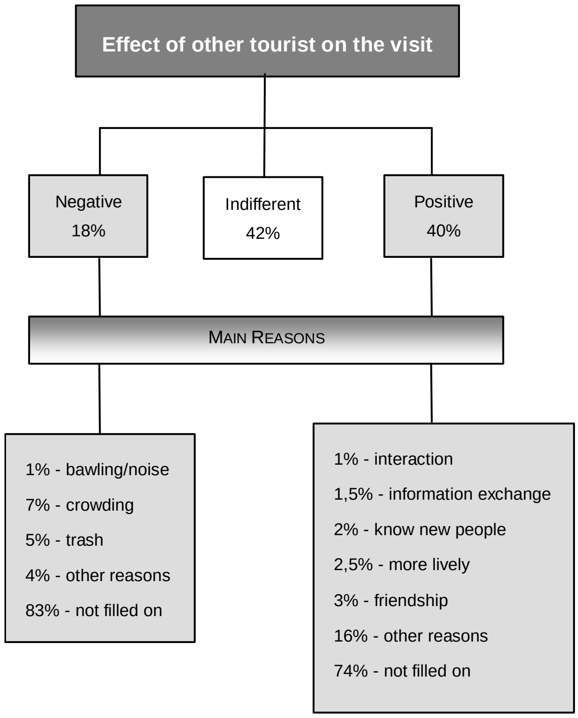

Figure 1. The effect of other tourists on the visit (n = 1029).

Then the respondents were asked to describe the trails conditions and places visited, using the following options: empty (24%); normal (43%); a bit crowded (27%); extremely crowed (3%). A three percent of the respondents didn't answer this question.

The scores for repeat visits to Brotas are quite high. Forty-five percent of the respondents had visited Brotas before, nearly 30% even in the last year. The number of participants (96%) that plan to visit the area again shows a high satisfaction rate.

Nature is a very important item for visiting Brotas. In 91% of the cases this is the main reason for the visit. However, 60% of the participants state that they could visit any other place for nature purposes. So how do they valuate the quality of Brotas' nature? Eighty-three percent of the respondents disagreed with the statement that Brotas does not have specific natural resources. However for 61% of the participants the nature of Brotas is not the most primitive they have seen up to now (Figure 2). Twenty-seven percent of the participants can compare the quality of the natural resources of Brotas to other natural areas in different countries.

There is a desire for more tourism information. This is supported by the results of the survey. Eighty-five percent agrees with the statement that they would like more information about the activities and attractions of Brotas. One could assume that if this information were offered, the repeat-visit-rate to Brotas could be even higher.

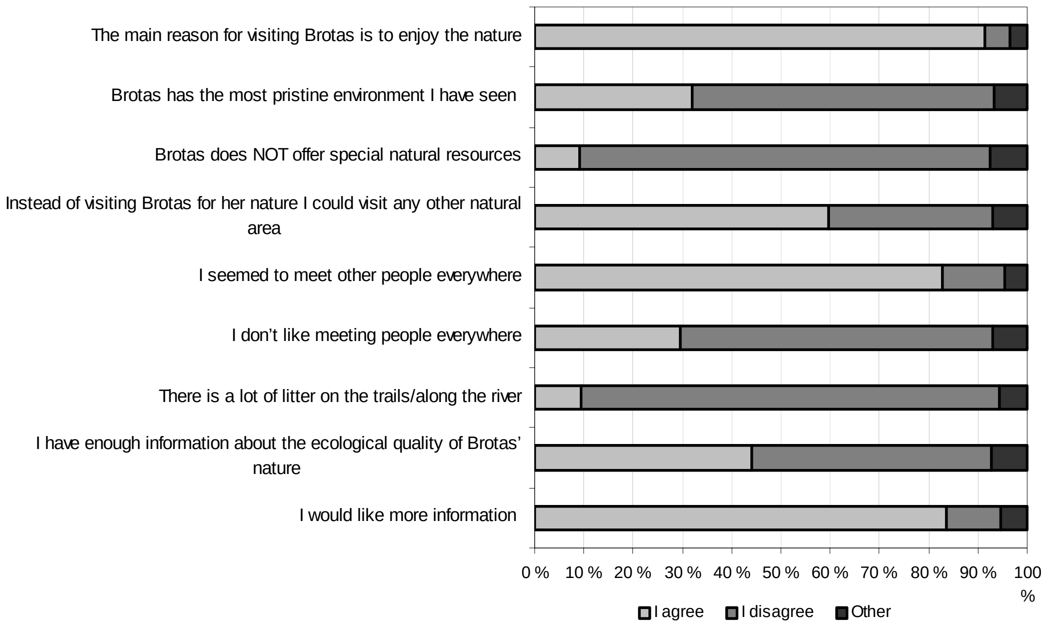

Figure 2. Visitor´s judgement about the visit and the environment in Brotas (n = 1029).

Concerning the allocation of the visitors, 83% of the respondents state that during their visit in Brotas they meet people everywhere and 30% agrees with the statement that they do not like meeting other visitors everywhere. Luckily, 64% disagrees with this statement (which can be supported by the results of the monitoring questions in the survey).

Trail's conditions

The lack of trail-management was indicated more often, compared to the indicators that reflect an improper behaviour of the tourists (Figure 3).

The indicator for trees with exposed roots occurred for 100% of 34 the trails.

The use of tree trunks as a support for a banister or handrail for steps was valuated in 41% of the observations. The placing of poles or other structures compared to using the trees alongside, is more expensive and only some landowners opted for this application. This is why we found seriously damaged trees in 91% of the observations. The damage caused to the trees is hardly seen as a problem, but this practice is affecting the strength of the trees and sometimes, the loss of a circular strip of bark around the circumference, causes their death.

Other damages to the vegetation are a result of extensive cutting of leaves and branches in order to keep the trails neat and the breaking of branches by tourists, using them as a support in areas with declivity. In 30% of the observations the lack of organic litter was caused by this extensive cleaning of the stratum (top layer) of the trail, together with erosion. Some landowners sweep the trails and remove moss from stones and rocks nearby waterfalls so that the tourists have the sensation of being in a clean and tidy place. The proposed management strategies to address these problems should, however, take cultural aspects that are involved into consideration; the inadequate management is due to the practises applied in agricultural cultivation.

Indicators like trees with inscriptions and trash hardly occurred, respectively in 9% and 15% of the observations. The inscriptions occur on the flat sections of the trails, especially on the trails that have been open for public for a longer time.

The existence of social trails was in all accounts a result of drainage problems, forming puddles and mud in the original trail.

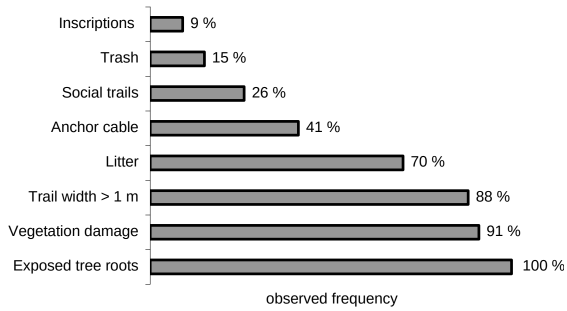

Figure 3. Indicators frequency for 34 trails.

The effectiveness of the emerged recommendations

Management strategies can be directed to *working on the causes* of the impacts or *treating the symptoms* through the recovering of the impacted areas. According to Hammitt and Colle (1998) the option of treating the symptoms is the most expensive option and will be an everlasting effort. Ideally, both strategies should be used together, giving priority to the actual cause of the problem.

The expectation for the completion of this research project was to gradually implant the indicated recommendations and strategies on the rural properties. The project brought forth tools so that the landowners could make environmental adjustments and monitor the areas used by tourists.

The monitoring activity is essential for the natural resources in the region, in order to attain the desired conditions in the future. This is why the survey and mapping activities were done according to criteria specifically defined for each property. The activities were presented in detail to the experts assigned by the municipality.

As proposed, the monitoring of the conditions of the attractions will be undertaken annually, by experts indicated by the municipality and COMTUR. The monitoring will take place under supervision of an environmental specialist.

The survey concerning the implementation of the proposed actions (for the improvement of the environmental conditions), will be carried out in 2004 on the 16 rural properties that were evaluated in 2002.

Improvements were already observed when a preliminary (non-systematic) survey was completed in 2003. The improvements related to the environmental conditions of the trails and the partial implementation of the recommended strategies. To substitute living trees by proper structures in order to fasten handrails, was apparently the most effective recommendation. On the other hand, the excessive cleaning of the trails, removing the organic litter as a top layer, with soil erosion as a consequence, remained to be one of the regular practices in all of the properties. The cleaning is done in order to avoid accidents with snakes.

The recovery of the Permanent Protection Areas became one of the most urgent actions on the local-government level.

Some rural landowners have already initiated the re-vegetation of the riparian forest. For the results to be effective it is necessary to carry out the actions in the entire region, involving the sugarcane plantations and the cattle breeding farms. These farmers however are not involved in tourism related economic activities and therefore not motivated to improve their form of land use and change their agricultural practices.

Local government laws

The greatest challenges of this research project were the implementation of the management strategies and the monitoring of the visits to the touristic ranches. The natural areas that should be managed, lay within the rural properties, with distinct characteristics from the public protected areas. This is an important item as once the area is private the landowners could refuse to implement the management proposals that emerged. The same accounts for the local tour-operators. Involving the landowners and tour-operators in the data collection and discussions about the objectives for the implementation of sustainable tourism in the municipality gave more perspective for this challenge.

To standardize the tourism activities the local government created a set of laws and implemented the monitoring of the public use of the rural properties. Before the execution of this research project the intention of COMTUR was to use the Recreational Carrying Capacity Method (Cifuentes 1992) in order to establish a limited visitor's number for each trail of the rural properties. Even though it is the easiest method and directly regulates tourism use, it will not be the most effective method. This regulating action, along with the guidance of the landowners are aspects that contribute to the improvement of the environmental quality of intensively used areas. As such the implementation of the Local Government Policy for the Development of Sustainable Tourism - PMTS (Brotas, 2002), has amongst its objectives:

- Establish an ideal amount of users for the attractions and activities, monitoring the impact, controlling the tourism growth, avoiding environmental degradation and guaranteeing the quality of products and services.
- Promote, stimulate and encourage the forth bringing and improvement of the infrastructure for tourism activities, respecting the ideal amount of visitors for each ecosystem.

The project developed for the rural properties and touristic ranches as presented in this article, granted the credibility (public trust) that was necessary for the implementation of a monitoring system and motivated one of the priority actions of the PMTS:

- Monitoring the visitors, implanting a system in which the trails and paths are used in rotation, allocating the visitors, and controlling the improper use of the resources or services.

Conclusions

The results of the questionnaire show that there is no negative effect on the visit of the respondents caused by the presence of other tourists. The effect was either neutral or positive. Even though the interviews were held during two occasions with visitor's congestion, the majority of the respondents considered the situation as normal. We can't affirm if these results reflect the true perception of the tourists in relationship to the situation met. A manifestation of dissatisfaction may require the implementation of controlling systems with utilization restrictions.

The tourists showed a high level of satisfaction, which can be observed by the intention to make a return visit after a short time.

Yet they also show a great concern for nature conservation in Brotas. Some studies demonstrate that experiments done in natural environments, involve visitors that are generally more concerned with nature conservation and visit natural areas with a higher frequency. Therefore they are able to compare natural areas with each other. Here's a snag; visiting more primitive environments than those of Brotas, could imply a lesser satisfaction of the natural resources of Brotas. If this tendency confirms then the investments done by the municipality will be in vain.

The paths leading to the attractions are mostly situated within the Permanent Preservation Areas, because of the declivity of the terrain or the nearness of rivers and springs. Due to the fragility of these ecosystems they are seen as environmental protected areas (protected by the Forest Code of Law) but are managed as part of a touristic ranch by the rural landowners. The monitoring of the environmental conditions on the touristic ranches, established by the Local Government Policy for the Development of Sustainable Tourism, could guarantee the quality of these ecosystems.

As in all other regions where the development of tourism has been encouraged, the increase in visits to the natural attractions in the region of Brotas caused an augmentation in the impacts. These impacts previously occurred within acceptable levels and were often absorbed by the carrying capacity of nature. The actions brought forth for the improvement of the environmental conditions will control these impacts. In this matter, these actions should be succeeded by maintaining the economic sustainability of the tourism activity in the region.

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Visitor Monitoring as a prerequisite of assessments in Natura 2000 sites

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Abstract: Biodiversity is increasingly recognized as an invaluable element of the European heritage. Across Europe, the NATURA 2000 ecological network has been established under the European Community's `habitats` directive and the `bird` directive. The goal of this network is to provide a strong protection for Europe's most valuable wildlife areas. If development plans or projects threaten to deteriorate this network or its favourable conservation status, a special assessment is required (see Art.6 of the Fauna-Flora-Habitat directive, called FFH-assessment).

When planning a new foot-bridge in a NATURA 2000 site, it became obvious that an evaluation of the possible ecological deterioration is only possible when detailed information about the current and the potential future recreational use is included in the assessment. It will be suggested that visitor monitoring and visitor surveys collect essential background information for the FFH-assessment process evaluating the possible impacts on NATURA 2000 sites. Without such data it would be impossible to determine the potential effects of changes to the recreational infrastructure and its associated uses on protected areas. Therefore, a curriculum for protected area planning that strives to accommodate the legal requirements of the European Community should also include recreation research techniques.

Introduction

In the European Community, the various types of protected areas currently in existence (e.g. national parks, nature conservations areas, nature parks, landscape protection areas) have been enriched with one further concept, the NATURA 2000 sites. The legal foundations for this concept are the directive for the conservation of natural habitats and of wild fauna and flora (European Council Directive 92/43 EEC from 1992, "Habitat-Directive") and the directive on the conservation of wild birds (European Council directive 79/409 EEC from 1979, "Bird-directive").

The European Community has designed these directives for the purpose of conserving, and even improving, biodiversity and habitats of endangered species. The directives should lead to the establishment of an European-wide network for nature-conservation, called NATURA 2000. The crucial elements of the network are composed of

– the habitats of endangered species (animals and plants),
– special biotopes, and
– the habitats of endangered birds.

This design is based on the insights that the long-term survival of many species does not only depend on intact habitats, but more importantly requires an interconnected network of adequate habitats.

According to Article 6 of the Habitat-directive, member states must prevent any further deterioration of various biotopes, as well as of the habitats of the endangered species conditions. This principle of no deterioration pertains exclusively to NATURA 2000 sites, i.e. biotopes as listed in Appendix I, the habitats of flora and fauna according to Appendix II, and the protected bird species and their habitats as listed in the Bird-directive. Any evaluation or assessment needs to consider all species and habitats listed in the various appendices, and must be based on the conservation goal, i.e. the maintenance or restoration of a favourable conservation status. The conservation goals are to be established separately for each site by the respective jurisdiction.

The law of no deterioration means that in any NATURA 2000 area all projects, measures, changes or disruptions, which may lead to significant changes or deteriorations of the natural components relating to any conservation goals of the protected area are not allowed. So far, minimal knowledge exists about the potential effects associated with improving access to an area for recreation opportunities (Pröbstl 2001).

The case study to be presented below focuses on the construction of a pedestrian bridge, which will improve access to a NATURA 2000 site located in the floodplain along a river. The issue was if, and to what extent, the bridge would cause direct habitat disturbances, or lead to some indirect deterioration of sensitive habitats. I will start my discussion below with a presentation of the legal and administrative context, and from that basis I will then argue about the importance of recreation data for the planning process.

The FFH-assessment

Purpose of the assessment

Despite the overall goal to maintain the protected habitats without any deterioration, the EU understood from the beginning that in specific circumstances changes may be inevitable. Such changes may be associated with the construction of roads, railway tracks, or any other infrastructures. Such developments are not necessarily excluded by the directives, but if significant effects are to be expected, then the respective plans and projects need to be subjected to an special assessment. (see Art.6 of the Fauna-Flora-Habitat directive). This assessment is called FFH-assessment. This assessment pertains only to those effects which relate to the specific conservation goals. Furthermore, the evaluation needs to examine if the negative effects are significant, or if mitigating the effects would make the development goals and measures of optimisiation impossible. Therefore, plans and projects that are not associated with significant effects are to be permitted (Europäische Kommission 2000).

Protection of adjacent areas

A FFH-assessment is also required if changes are planned in the adjacent area, and there is potential that the proposed project could have significant impacts on the protected area and its conservation goals. The FFH-assessment also needs to consider these “exogenous effects”.

Cumulative effects

The FFH-assessment must also consider cumulative effects, that is, the joint effects generated by a project or any strategic plans. This evaluative component needs to consider both currently existing projects and planned projects, as long as they have advanced to a sufficiently detailed state.

Legal consequences

If the responsible jurisdiction determines that an assessment is required, then the project proponent usually hires a consultant for the FFH-assessment study. The purpose of this study is to describe the project, as well as its potential affects and to provide relevant information in text, tables and maps.

Following the framework of the FFH-evaluation process, the actual evaluation is sole responsibility of the respective jurisdiction. If the study determines that significant deteriorations are to be expected, then the project is inadmissible until further notice. The project may only be granted permission and implementation if

- there are no reasonable alternatives with lower overall deteriorations in a different location, and
- at the same time the proposal is absolutely essential to satisfy public, including social and/or economic interests.

In these situations special compensatory measures are required, which would ensure the overall conservation goals of the NATURA 2000 program, and equally contribute to the establishment of the pan-European conservation network. Under certain circumstances, at sites with especially endangered habitats or species one needs to consult the European Commission before a project may gain approval (European Commission 2000).

The project and the problem

Many citizens of the town of Fürstenfeldbruck in southern Germany requested the construction of a pedestrian bridge across a river. Since the bridge will be located in a NATURA 2000 area, the question of appropriateness of the project arises immediately. The construction requires changes to the shrubs along the river for locating the foundations. Furthermore, construction activities and deliveries require access for large vehicles.

A preliminary investigation determined that the construction constituted an interference, but that given the overall extent of the area, the remaining extent of shrubs and the short term disturbances associated with construction activities, did not constitute a significant impairment, and consequently no deterioration.

However, the administration responsible for nature conservation argued that this footbridge could lead to some deterioration in the adjacent NATURA 2000 sites, because this sensible habitat would now be accessible to many citizens in a very convenient manner. Despite this realization, at the time of the assessment nobody had any information about the current number of visitors, nor their temporal distribution or motivation of visit.

Method

In order to determine if a FFH-assessment is required, we proposed a 2-step process (Figure 1). First, a pre-study should primarily assemble the relevant recreation information and collect the existing ecological data. To that effect, visitor user counts and interviews were undertaken on select days. The purpose of the questionnaire was to obtain a representative description of the current spatial and temporal use patterns, as well as to ask current users about their opinions of the future effects of the planned footbridge.

At the same time, we also undertook an analysis of the spatial use patterns of the larger area, including the current supply of trails, their main characteristics, and their frequency of use.

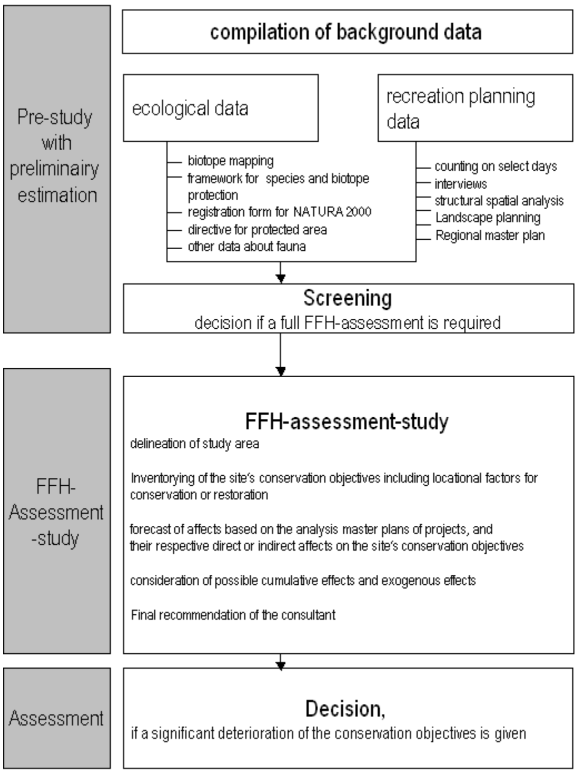

Figure 1. Missing data lead to the suggestion of a 2-step assessment process that included a screening stage.

The goal of this pre-study was to establish the pre-conditions for the "screening" stage, during which the administration responsible for conservation and the municipality could decide jointly if a deterioration is a possible outcome, and consequently a complete FFH-assessment would be required.

The visitor monitoring and interviewing was conducted during the fall of 2002 on several weekdays, representing various weather conditions. The tasks were performed by municipal employees. On every sampling day, visitors were counted during the morning and afternoon. Monitoring was performed separately for the east and the west bank of the river, and a total of 1,336 visitors were observed. They were recorded by activities (pedestrians, bicyclists, bicyclist or walkers with dogs, horseback riders, etc.). These monitoring data represent a lower level of activity, because sampling occurred during the fall only, and one can only suspect that during the nicer time of the year the proportion of regular visitors would be even higher; also these counts missed out on early morning users.

A total of 247 interviews were collected, asking questions about the spatial extent of current activities, the importance of the area, their overall evaluation of the study sites and the area in general. Some questions were asked about the demand for the future footbridge and the likely characteristics of future user groups, as well as their socio-demographic characteristics, and place of residence.

Finally, the pre-study also contained a mapping of current disturbances of the habitats, which was based on selected indicator plants. The potential habitat characteristics could be mapped at the same time.

Results of the pre-study

Counting / Monitoring

The monitoring data documented significant differences between the west bank of the river, adjacent to the community, and the east bank of the floodplain, which so far had only limited access. Even on the most heavily used days, the east bank recorded only about half as many visitors. The visitor structure also differed in the sense that the west side recorded about six to seven times more visitors with dogs (Table 1). Along the east bank, on the other hand, the proportion of bicyclists is almost triple the amount compared to the west bank (35% on the east, vs. 12% on the west side). Especially on nice days, every second visitor is on a bicycle. The reason for this discrepancy is the long distance that needs to be covered to reach the east bank; also, the eastern trail is part of a regional bicycle trail network (Table 2).

Table 1. Proportion of dog walkers (n = 247).

Dog walkers	West Bank	East Bank
Peak value	11%	3%
Average	10%	5%

Table 2. Proportion of cyclists (n = 247).

Visitors with bicycles	West Bank	East Bank
Peak value	21%	50%
Average	12%	35%

Results of the interviews

The interviews (n = 247) revealed that the area is visited predominantly by repeat visitors, who constitute more than 80% of the users. About 60% visit the floodplain at least once a week. More than half of the users stay longer than 90 minutes and visit several times a week (54%). Two thirds of all visitors are urban, mainly from the surrounding communities. These numbers emphasize the importance of the floodplain for routine recreation purposes.

The visitors value the natural resources and the setting of the area. The recreationists listed nature (26%), quietness (24%), landscape (18%), and riparian landscape (15%) as the main attractions of the area. When asked about possible improvements, most respondents mentioned the pedestrian bridge which has already been under public discussion, and additional information about the trail network and aspects of the natural habitat. They listed the conflict between walkers and bicyclists and walkers and dog owners as the main concerns.

When they were asked directly about the proposed bridge, a clear majority (66%) were in favour. This support is even higher with the local population. Most of the opponents mentioned ecological reasons. They also had concerns that more of the distant visitors would be attracted by the bridge, that the overall number of visitors would increase, and that conflicts between walkers and bicyclists would increase further.

Structural Mapping

Another component of the analysis was a structural mapping process of relevant landscape features, to synthesize information relevant to the decision. During the structural landscape mapping in spring and summer one further visitor monitoring was undertaken. Its purpose was to verify the previous results, and to add information about visitors during another season. For that purpose the trail network and the affected area of the floodplain were divided into homogenous landscape units (for example A1, A2, W1, W2, W3, E1-4, E5-6, E7 as documented in Figure 2). In these units visitor counts were undertaken in 15 - 20 minute intervals (n = 398). The structural mapping provided additional information about visitor behavior and patterns of temporal uses in the various sections.

Most users (45 persons per hectare; n = 398) were observed during the late afternoons, starting at 4pm, and peaking at about 8pm. Similar peaks occurred at around lunch time (39 persons per hectare), while during the early (prior to 8am) and late mornings visitation was rather low with 16 and seven visitors per hectare respectively. Most joggers (from 4 to 7 persons per hectare; n = 398) are active during the mornings (5-9am), and again around lunch time (11am-1pm) and evenings (5-8pm). Most of the bicyclists were observed only after 5pm (31 persons per hectare), while walkers are most prominent during the early afternoons (noon to 3pm, with 9 persons per hectare). The phenomenon of free running dogs occurs over the entire day, with an additional peak during the early morning hours. The spatial distribution and differentiation of the more intensively used areas are documented in Figure 2.

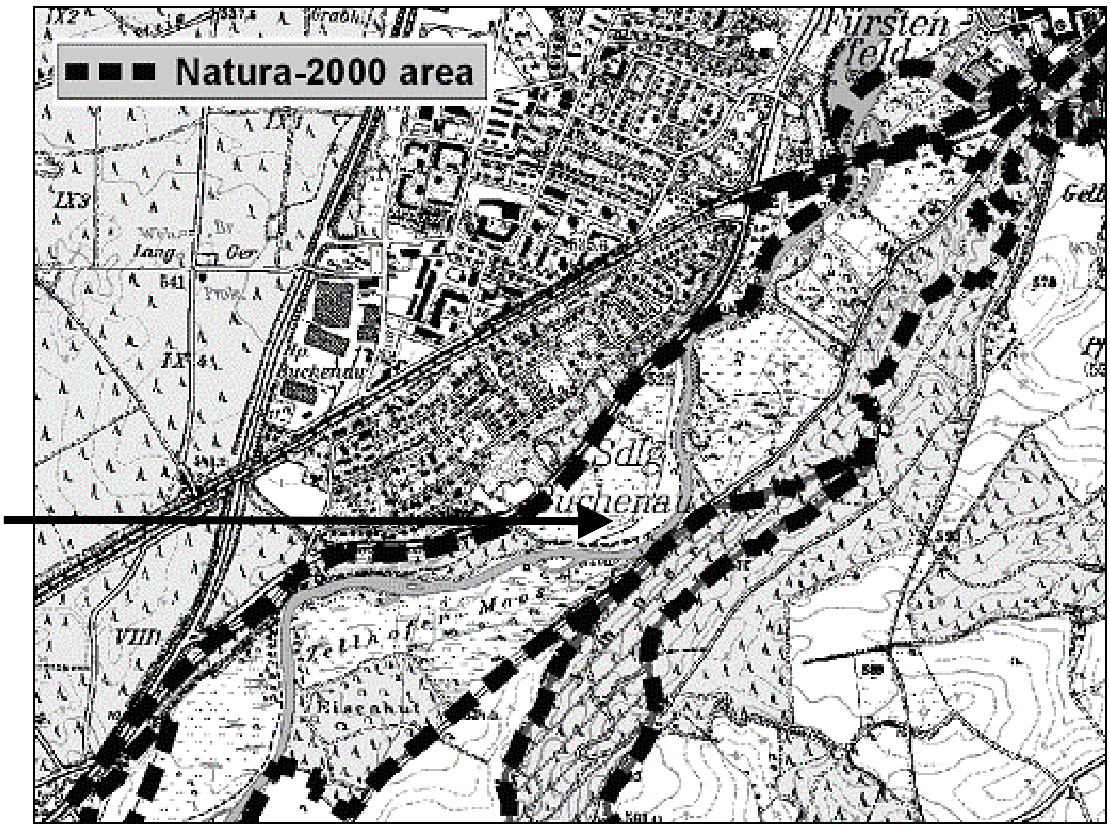

Figure 2. Location of the NATURA 2000 sites close to the city of Fürstenfeldbruck following the river Amper. The arrow points to the location of the planned pedestrian bridge (Pröbstl 2002).

Figure 3. Representative sample of the structural mapping process. Homogenous areas were identified by their natural characteristics (Pröbstl 2003).

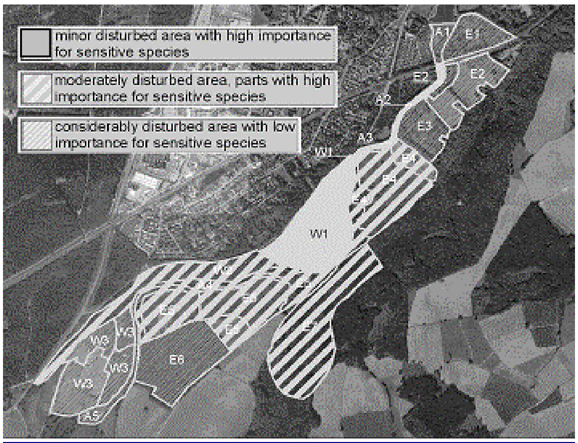

Figure 4. During the structural mapping process in a second step the identified homogenous areas were evaluated by their sensitivity and the current intensity of disturbance (Pröbstl 2003).

Predicting future recreational use levels

In order to assess the intensity of use we also needed to predict the expected changes in use patterns caused by the project. Based on the information generated during the structural mapping process and additional user counting, we concluded that the construction of the foot-bridge would lead to the following changes of recreational behavior:

– The proportion of bicyclists will increase, because access from the western sections of town will be improved significantly.
– Walkers will increase especially in the more remote eastern part of the NATURA 2000 sites. As soon as the residential areas in the western parts of the city will have convenient access to these sites, the eastern areas will experience increased uses, especially during the evenings and weekends.
– With the increasing number of bicyclists and walkers, one can expect a proportional increase in the number of dogs. However, one should keep in mind that if the increasing number of dogs is associated with bicyclists, then this will affect the ecology of the area less, because these dogs need to keep up with the higher speed of their owners on bicycles, and do not have many opportunities to stray from the trails extensively. The opposite is true for increases of dog walkers. When more dogs accompany walkers, then more disturbance of adjacent meadows can also be expected.

In order to estimate the spatial context of these changes, we inferred likely affects based on assumptions of the distances that dogs would remove themselves from their owners.

One major factor contributing to the attractivity of this near-urban recreation site for dog walkers is the short driving distance from home (ideally with plenty of parking opportunities), and a trail – ideally a circular route – with changing environment and plenty of open spaces (ideally shortgrass meadows).

Based on these main determinants, we developed likely scenarios for the various components of the NATURA 2000 areas. Table 3 summarizes the kind of changes that can be expected in the main components.

Results of the FFH-Assessment

Detailed results

The compatibility of the project was assessed on the basis of this forecast, as well as the results of previous studies documenting the effects of disturbances on potentially affected species and their habitat requirements (vgl. Schwab 1994, Assmann 1997, DVWK 1997, Hußmann 1997, BfN 1998, Utschick 2001). The analyses and forecasts regarding the species that are likely to be affected are also based on a comparison between the species' current distribution in the study area and the likely future situation. This analysis is based on a detailed bird nesting mapping exercise, which encompassed three rounds of inventorying, identifying a total of 75 bird species and 1934 single birds. Furthermore, the presence of amphibians, reptiles, mammals and invertebrates was also documented. The entire study area included 148,3 ha. Among the affected species and habitats under consideration, and given the above described forecast, the following affects are to be expected:

The disturbances caused by the construction itself will be minimal to the extent that one cannot anticipate any affects or deteriorations on the habitats under consideration.

Based on the above described predictions one can derive several conclusions regarding the affects on the species and habitats listed in the directives. The changes associated with the construction of the

Table 3. Forecasts and evaluation of changes to specific landscape units.

Land-scape unit	Description	Distance to main residential areas		Proportion of residential areas within 10 ha in %		Trails in km for walking		Attractivity for users; potential for letting dogs run free	Forecast: Condition after the construction of the foot-bridge
		before	after	before	after	before	after		
Watercourse and immediately adjacent areas									
A 1, 2, 4, 5	Watercourse, reservoir with riparian area, oxbows	0,5	0,5	50	50	2	2	Mostly closed, Inaccessible	None, or minor disturbances; no changes
A 3	Riparian area	1,5	1,5	30	30	1	1	Circular routes, riparian area accessible to dogs	Major disturbances; no changes
Riparian area along West Bank									
W 1	Intensive grassland; narrow shore	1,5	1,5	50	50	2	2	Circular route with grassland	Major disturbances; no changes
W 2	Riparian forest and valley slope	2,5	2,5	5	5	2	2	Circular route with forest	Minor disturbances, no changes
W 3	Swampy fallow, diches, cane brake, dispersed meadows	2,5	2,5	5	5	2	2	Circular route with grassland	Moderate disturbances; no changes
Riparian area along East Bank									
E 1-3	Riparian forest, fish ponds, dispersed meadows, oxbows, grassland	1,5	0,5	0	50	3	3	Pre-dominantly grassland, partially closed	Increasing number of dogs; minor impacts, see W2
E 4	Dispersed meadows, ditches	1,5	1,5	0	50	4	3	No circular route, grassland	Increasing number of dogs; moderate impacts, see W3
E 5	Dispersed meadows, ditches	1,5	1,5	0	50	6	3	No circular route, grassland	Increasing number of dogs; moderate impacts, see W3
E 6	Forest	1,5	1,5	0	50	6	5	Circular route, forest	Increasing number of dogs; minor impacts, see W2
E 7	Forest	1,5	1,5	0	50	4	3	partially steep slopes	Increasing number of dogs; minor impacts, see W2

pedestrian bridge are so minor, that one does not need to be concerned about affects or deteriorations on any the special habitats. Among these are:

– Alluvial forest
– Waldmeister-Beech forest
– Central European Orchid-Limestone-Beech Forest (Cephalanthero-Fagion)
– Moist tall brush areas of the planar, montane and alpine eco-regions

Significant affects can also be excluded for amphibia, reptilia, invertebrates, and fish.

Considering the potential affects on the conservation goals, i.e. the conservation of the typical species mixes of the Alder-Ash-Elm-alluvial forests as well as the typical types of wet meadows, moist tall brush areas, and other habitats devoid of trees, the analysis of the various bird species, the following conclusion can be drawn:

For fish-eating birds the entire study area is already too stressed. Rail (Fulica atra, Gallinula chloropus) breed predominantly on the east side of the river in the stagnant waters of oxbows and fish ponds. Since these areas will continue to be closed to visitors, and walkers will continue to use the opposing shore, occasional disturbances will be tolerated.

The forests along the valley slopes, and the eastern alluvial areas are feeding- and breeding habitats for the large woodpeckers. Because of the overall extent of this habitat, and the fact that plenty of alternatives are available, one can assume that even an increase in visitor numbers will not cause any deterioration. However, in the marshy areas the birds are already negatively affected by the high number of visitors to the effect that these birds can establish themselves temporarily only (during migration, and at the beginning of breeding season).

Birds in the cane brake are concentrated on both sides of the planned bridge on easily accessible areas. Since dogs avoid thicker cane brake or dense brush, and even may be called back from those areas by their owners, these areas should not be affected significantly by the proposed project.

With regards to the birds and mammals protected by the Bird-directive and the Habitat-directive, one further differentiation of potential affects is required in the assessment. It is the concern about the following species which have been documented to exist in the study area:

– Beaver (Castor fiber)
– Kingfisher (Alcedo atthis)
– Grey woodpecker (Picus canus)
– Black woodpecker (Dryocopus martius)
– Goosander (Mergus merganser).

The FFH-assessment produced the following results:

The protection of the beaver depends mainly on large habitats in which the species can maintain its idiosyncratic behavioral dynamic. The project does not affect the areas currently available for the beaver. They are active predominantly during twilight and at night, and therefore their behavior will not be affected significantly by the project. The management goal of permitting dynamic changes to the habitat, as well as to the behavior of the beaver do not suggest any negative affects according to Art. 6 of the FFH-directives.

The kingfisher requires stagnant water especially during winter. At the moment, this area contains a small remnant oxbow between the reservoir and the railway line. The quality of this rather sensitive habitat will remain after project implementation.

For water dependent birds, and several species of ducks there will remain sufficient habitat along the east bank which are closed already.

The areas located along the eastern shore as well as the sloped forests are important feeding habitat for large woodpeckers (Black, Grey, and Green woodpeckers, Dryocopus martius, Picus canus, Picus viridis). The sensitivity of these species of woodpeckers differs with regards to feeding and breeding habitat requirements. These cavity breeders are not very sensitive to the passing of pedestrians and bicyclists, even when accompanied by dogs, as long as these user groups are staying on trails.

However, Black and Grey woodpeckers are much more sensitive to changing locations during feeding, because they require further safety distances.

In the more remote south-eastern area of the alluvial one must anticipate an increase of the proportion of dog walkers, but due to the steeper terrain, as well as the limited accessibility of these walking trails and bicycle paths one cannot anticipate any significant increases in the disturbances for the grey and black woodpeckers. Furthermore, the larger adjacent forested areas provide sufficient alternatives and development spaces.

One also needs to differentiate between feeding and breeding habitat for the Goosander?, a species using stretches of the river for their prey behaviour. They can continue to do so undisturbed during early morning hours. When visitor numbers increase, then the Goosander withdraws to more remote areas. Since their breeding locations are well hidden, there should not be any negative effects expected, as these habitat structures remain inaccessible after the construction.

Concluding evaluation

As long as one can ensure that the already established limited access rules for the east bank continue to be enforced with sufficient rigour (providing information, physical barriers, occasional controls), then one can rule out any significant deterioration of habitat types and protected species in the NATURA 2000 area associated with the construction of the bridge. Under these conditions the proposed project does not represent any deterioration according to the Directives. No cumulative effects, or exogenous affects needed to be considered.

Conclusions

The main purpose of this paper was not to present the findings of the case study in all its details of potentially affected species and habitats and the specific results of the FFH-assessment. The goal was to emphasize the importance of recreation planning and its contribution to biodiversity conservation in Europe. The above example documents the frequently encountered problem of the lack of recreation data for a complete FFH-assessment. The combination of methods applied in this study, i.e. interviews, visitor monitoring, and structural landscape mapping proved to be a suitable approach for this assessment.

This planning process shows that it was essential that the assessment of the proposed construction of the bridge went beyond the mandatory requirements of the assessment by including the following questions:

– to determine the current visitor / user volume;
– to estimate the volume of future users after project completion; and
– to determine the effects of the future user volume and patterns on the potentially affected flora and fauna.

Only after the current volume of visitors was established with a sound monitoring method, and likely changes of the user volume after project completion was estimated based on interviews with users, it became possible to answer the crucial question of ecological affects associated with the new project.

Our experience shows that visitor monitoring and visitor surveys collect essential background information for assessments concerning possible impacts on NATURA 2000 sites. In the absence of such data it would be impossible to determine the potential effects of changes to the recreational infrastructure and its associated uses on protected areas. Therefore, any curriculum for protected areas planning that strives to accommodate the legal context of the European Community also needs to include recreation research techniques.

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Social Carrying Capacity of Canoeists in Austria´s Danube Floodplains National Park

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Abstract: Increasing recreational activities in National Parks affect natural resources as well as the recreational quality. In the Danube Floodplains National Park, stagnant waters, such as the Stopfenreuter and Spittelauer Arm, are a crucial component for ecological integrity, and at the same time constitute a main visitor attraction. In the summers of 2002 and 2003 a visitor survey investigated the perceived crowding of canoeists and whether the social carrying capacity is exceeded. Results of this study are that the social carrying capacity of this area has obviously been reached at certain times.

Introduction

According to the International Union for Conservation of Nature and Natural Resources, a National Park has to satisfy the demands for nature protection as well as the needs of a quality recreation (IUCN 1994). A circumspect and well-considered management is necessary to meet the requirements of both. In Austria, use levels in National Parks increase consistently, and therefore, research concerning the social effects in heavily used National Parks is necessary.

The concept of carrying capacity in leisure sciences was first mentioned in 1964, when Wagar (1964) developed the hypothesis that the relationship between nature and visitors can exceed certain ecological capacities. This hypothesis was broadened by the integration of social and managerial aspects, comprising, carrying capacity bases on three dimensions (Manning 1999): environmental, social and managerial. High visitor use can impact nature, can influence the experiences of the other visitors and can require management measures. Wagar (1964) defined carrying capacity as „the level of recreational use an area (could) withstand while providing a sustained quality of recreation, a quality environment and a quality recreational experience".

Factors influencing crowding

Factors that influence the sense of crowding can be classified into three groups (Manning 1999): characteristics of the visitors themselves; characteristics of the encountered visitors and characteristics related to the area visited. Examples of visitors' characteristics include motivation, preferences, expectations or attitudes (Manning 1999, Stankey & Manning 1986). The feeling of crowding can be influenced by group size, activity and kind of use (Jensen 1981, Stankey & Manning 1986). Ditton et al. (1983) describe the relevance of earlier experiences. Demographic factors (Arnberger 2003) can have an effect on crowding in urban recreational areas as well. Characteristics of the encountered, like size of the encountered group, their behaviour and their alikeness, are other factors that can have an effect on crowding (Manning 1999). Area-specific characteristics, such as the type of the recreational area, the location within the area (Manning 1999), accessibility, vandalism and waste (Budruk et al. 2001) are factors contributing to crowding as well.

Lucas (1964) was one of the first to carry out crowding studies with canoeists. Canoeists and users of motorboats experienced different levels of crowding, as the perception of crowding was related to the kind of use and the kind of encounter. Tarrant et al. (1997) found that encounters with kayaks and canoes seem to be less of a concern for many boaters than encounters with rafters. Use levels, time, day and water release explained perceived crowding of whitewater boaters quite well (Tarrant & English 1996). Expectations, preferences and former experiences of canoeists can influence the perception of crowding stronger than perceived encounters and use levels (Ditton et al. 1983).

Coping behaviour

Visitors can cope with crowding by rationalizing, shifting or displacing (Shelby et al. 1988). As recreational and leisure activities are based on self-selection, users tend to be quite content with their activities, as they choose actions they like. If users experience negative factors, like crowding, they try to cope with this situation by e.g. displacing themselves to another area. Manning (1999) distinguishes interspatial, intraspatial and temporal relocation. Becker et al. (1981) mention a displacement of activities as well.

Spatial displacement was carried out by users of two rivers (Becker et al. 1981), justifying this coping behaviour with high use levels. Robertson and Regula (1994) describe various occurences of displacement; some boaters used the lake less, others changed the way of using it, and others carried out temporal displacement such as coming in the early morning hours or on days other than usual. More than one third of interviewed boaters (Shelby et al. 1988). stated that high use levels would lead to a redefinition of the way they thought about the river About 20% of them would displace spatially.

Crowding measurement approach

To define standards of quality related to crowding, visitors are usually asked to state the hypothetical acceptance of different numbers of encounters or to assess the maximum number of encounters that seems acceptable to them (Manning et al. 1996). In the last years, image-based methods came into operation. Freimund et al. (2002) describe that one of the advantages of image-based surveys is that images are more conducive to visual presentation as compared to verbal descriptions; also, interviewees and managers are truly confronted with the same conditions, as opposed to inferring from mere verbal descriptions. Images are more realistic representations of an area or a situation than a verbal description; nevertheless, not even pictures can represent a situation really realistically (Manning 1999).

Study area

One of the five Austrian National Parks, which are accredited by the IUCN, is the Danube Floodplains National Park (see Figure 1). It was founded in 1996 and is situated between the two conurbations of Vienna and Bratislava, extending over a length of 38 kilometres with an area of 9,300 hectares. The National Park protects one of the largest natural riparian wetlands in Central Europe, which to a high degree remain ecologically intact (www.donauauen.at).

There are one million visits per year counted in the National Park and the main users are hikers and bikers (Arnberger & Brandenburg 2002).

The National Park consists of nature zones, nature zones with management measures and external zones. The nature zones are not used commercially at all, and there are no attempts of influencing the nature, the ecological system, or the landscape. Temporary management measures are carried out in order to support natural development. In the nature zones with management measures, no interventions except for measures which serve to protect the ecological system and biodiversity (e.g. mowing of grass) take place. The external zone includes special areas, like the Danube waterway or flood protection dikes.

In the eastern section of the National Park an old-arm region is situated, the Stopfenreuther and Spittelauer Arm, which stretches for a length of approximately 4.5 kilometres along the Danube river and has a width of about ten metres. In the National Park boating with non-motorized boats is permitted on four old branches; the study area represents the most attractive and longest stretch of water. The entry point is easily accessible over an asphalt road. Due to the proximity of the old arm system to a

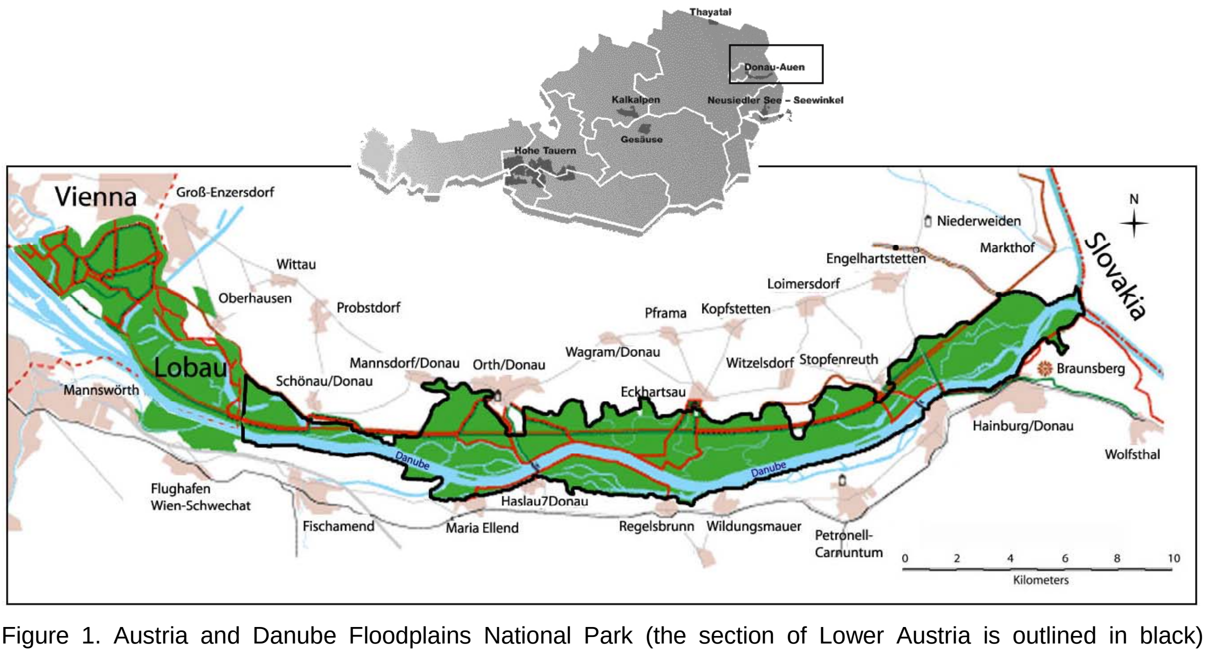

Figure 1. Austria and Danube Floodplains National Park (the section of Lower Austria is outlined in black), Source: Nationalpark Donau-Auen.

canoe rental and to a kayak club, this old arm system experiences the highest boater frequencies in the National Park region. In the last decade, canoeists' use levels have highly increased, caused by promotional activities of the National Park as well as the installation of the canoe rental. These are the reasons for conducting investigations about the social carrying capacity of this old-arm system.

Methods

Different methods, like on-site interviews, visitor observation and long-term visitor monitoring were carried out within the reach of this study (Sterl and Wagner 2003):

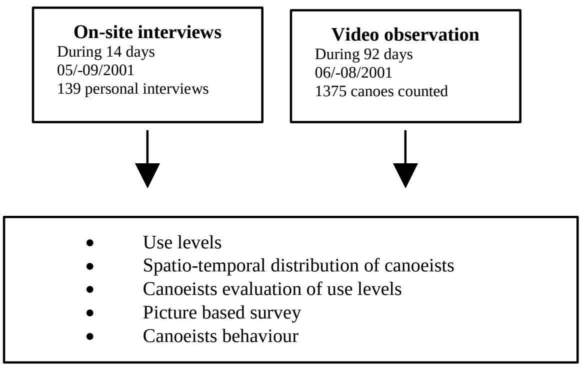

Figure 2. Methods of data collection.

On-site interviews
The visitors' survey was carried out in the summers of 2002 and 2003. Over fourteen days, canoeists leaving the old arms were interviewed by the authors using a standardized questionnaire. General demographic data was collected as well as the motivation for boating and the canoeists' earlier experiences with boating in this area. Visitors were also asked about their perceived crowding (ranging from "very few visitors" to "very many visitors") during the actual trip, the numbers of encounters, and if they react to crowding with coping behaviour. In addition, a multivariate image-based survey was developed, containing visual stimuli representing different levels of crowding, presence of wildlife, direction of travel, group size and placement of the canoes within the image (see Table 1).

Five sets each containing four pictures were chosen to analyse the influence of the displayed factors by asking the interviewees to choose the most pleasant and the least pleasant scenario in each set (see Figure 3). All pictures show the same background: an open part of the old-arm near the access point. Therefore, it can be assumed that the interviewees knew the scene. Also, the factor levels were kept constant and always shown at the same placement, e.g. the animals shown are always at the same location and in the same position. Sunshine or shade-effects were kept constant and therefore did not have any influence on the decision. The images were arranged using Adobe Photoshop 5.5 and the sets were systematically chosen from 96 possible combinations. This data was analysed using a logistic regression. The total sample size was 115 canoeists, interviewed on-site. In addition, 24 kayakers who are members of a kayak club located close to Stopfenreuth participated in a postal questionnaire survey.

Video observation
A day-long permanent video monitoring was carried out over a period of three months in the year 2001 in order to acquire counting data of the canoeists. All visitors entering the National Park with canoes were registered. The evaluation of these recordings provided information about use levels and the visitors´ temporal distribution. The data was proved to apply to the years 2002 and 2003 as well, through comparison with actual count-data. It was not possible to identify individuals in the video images, therefore anonymity of those observed is guaranteed.

Results

Intensity of leisure time usage

Based on the results of the video-monitoring (n=1375), it can be seen that use levels are at 3-7 canoes per weekday, rising to about 13 canoes on Saturdays and Sundays, and increasing even more on holidays (up to 18 canoes per day) (see Table 2). On the peak day, 32 canoes were observed in the old branch-system in the National Park. All in all, 1,375 canoes were counted during the three months of video monitoring.

Table 1. Attributes and attribute levels of image-based survey.

Attributes	Attribute levels			
Presence of wildlife	yes	no		
Use level	no canoe	one canoe	two canoes	three canoes
Direction of travel	facing the viewer	not facing the viewer		
Allocation of canoes within the image	foreground	background		
Group size	1 canoe per group	3 canoes per group		

Figure 3. Example of a choice- set.

Table 2. Mean of daily use level (n=1375).

Time unit	Mean of daily use level (canoes)
June 2001	9.0
July 2001	5.3
August 2001	8.2
per day	7.5
per weekday	4.7
on weekends	13.0

Visitor structure

The following results base on the survey (n=139). As many men as women used the area for boating within the range of this study; about 50% of the visitors were aged between 31 and 45 years and 20% were younger than 15 years. Interviewed visitors showed a comparable higher educational level than Austrian inhabitants in general. About 60% of the visitors are inhabitants of Vienna, which is situated only one hour by car from Stopfenreuth. The remaining visitors come from the surrounding areas.

About 70% of the visitors go boating with canoes, usually used by two persons. The others use kayaks or other boats. About 7% of the visitors are joining a field trip organized by the National Park. About 80% of the visitors go boating for up to four hours. Only one third of the respondents go boating more often than three times a year.

A special user group are the members of the kayak club who go boating almost the entire year. They use the old branches throughout the week, and are very experienced in boating.

Nature, pristine landscape and silence are the most frequently mentioned (each more than 90%) expectations of visitors of the National Park. Motivations for boating are the experience of an unspoiled nature and landscape as well as recreation. More than 50% mentioned the “pristine nature experience” as the highlight of the day, and 30% of the visitors enjoyed the silence and solitude.

Canoeists were also asked to evaluate different statements: more than 80% stated that they would accept bans on use if justified with nature protection. Likewise, about 70% think that low use levels are necessary to be able to experience nature and stated that they would react to high use levels with displacement. In contrast to this, 30% are happy if they would meet other canoeists on their trip.

Perceived crowding

A 5-point-crowding-scale was used to determine visitors’ feelings of perceived crowding ranging from "very few visitors" to "very many visitors": 40% of the interviewees indicated that the number of canoeists seen during their trip was neither very many nor very few. Interviewed canoeists stated as well that the number of canoeists encountered agreed mainly with their expectations on use levels. There exists a negative correlation between perceived crowding and the expectation of solitude (1=solitude is expected very strong, 5=solitude is not expected at all) in the National Park (Linear regression: dependent variable: perceived crowding; R=0.195, p=0.041). No relationship could be detected between the experiences of crowding and day or use levels. Cross-tabs revealed that perceived encounters with up to six groups are seen as agreeable by 60% of the interviewees. 80% of those, who feel crowded ("many or very many visitors"), encountered at least 10 groups of canoeists.

A prediction model for the feeling of crowding was developed by integrating diverse variables (see Table 3). Two of these variables could significantly explain perceived crowding: expected use level and perceived encounters. The more canoeists are met, and the less canoeists were expected, the more crowded interviewees feel. By combining these two variables, 35% of perceived crowding can be explained, whereas expected use level has a stronger influence.

Preferences for use levels

The picture-based survey (n=139)was conducted by asking the visitors to choose one picture out of a set of four pictures which described for them the most and least pleasant scenario. Preliminary analysis only includes the evaluation of use levels, not considering other attributes, shown on the images:

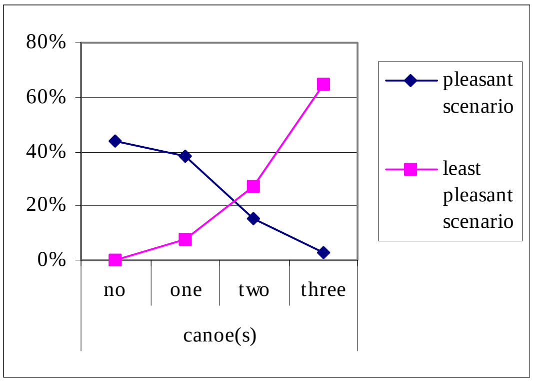

Figure 4. Relationship between use levels and share of preference for the scenarios.

On average, up to one canoe was evaluated as pleasant scenario, and three canoes as crowded scenario (see Figure 4). Scarcely half of the interviewed evaluated the scenario displaying no use level (no canoes) as pleasant scenario, and about 80% rated up to one canoe within sight as pleasant. Contrary to this, about 70% of the interviewed canoeists evaluated the highest use level (three canoes displayed) as least pleasant and therefore as a crowded scenario. But, already 9% feel crowded if one canoe is displayed. In contrast, 5% of the interviewed visitors evaluated the scenario with three canoes as not crowded. Scenarios displaying up to two canoes are evaluated as still being pleasant, whereas scenarios showing three canoes in any case represent a crowded situation.

The point of interception between the two curves of pleasant and crowded scenarios is situated at about 1.8 canoes depicted on the image, which signifies that two canoes are the critical point, where the perception of use level changes from pleasant to crowded. Visitors, whose main interest is either sports or nature, show a lower interception point at about 1.5 canoes; whereas, recreation-interested visitors display an interception point situated at about 2 canoes. The highest tolerance level have the family-orientated visitors, who would accept up to 2.4 boats. It can be seen that those who are interested in sports and nature evaluated use levels quite differently than visitors, who go boating with family and friends.

Data was additionally analysed with a logistic regression analysis, using this multivariate approach, for being able to determine the probability for each picture to be chosen, based on the attributes depicted. All significant coefficients ($p<0.05$) are marked in bold except the coefficient for "direction", which is significant at the 10%-level (italics) (see Table 4). The influences of the variables use level, presence of wildlife, direction of travel, position of boats within the picture and group size were analysed: the decision for the most pleasant situation was significantly influenced by use level, presence of wildlife and direction of travel.

Table 5 presents the probability of the four images shown in the methods chapter, to be chosen as a pleasant scenario: i.e. pleasant canoeing situations were described by low use levels, presence of wildlife and boats not facing the viewer: more than 60% of the interviewees would chose the image, repre-

Table 3. Regression model: dependant variable: perceived use level (1=very few visitors, 5=very many visitors).

Variable	Coefficient	SE	Beta	P
Constant	3.921	0.328		0.000
Expected use level	-0.456	0.085	-0.447	0.000
Perceived use level	0.061	0.018	0.084	0.001
r^2 / $r^2_{adjusted}$	0.382/0.371			
F/P	32.799/0.000			

senting the lowest use level as most pleasant, whereas only 4% would evaluate the scenario indicating the highest use level as pleasant. The logistic regression predicted 75% of the observed cases correctly.

Pictures representing a crowded situation were chosen if high use levels were shown (see Table 6). In this case, all variables depicted did not significantly influence the decision except use levels. Nevertheless, it can be observed that high use levels, boats displayed in the foreground of the picture and a big group size negatively influence the decision. 80% of the observed cases were predicted correctly.

In general, high use levels diminish the canoeing experience, the presence of animals is favoured in both cases (preferred or not preferred), small groups are seen as more agreeable than bigger groups and boats in the background of the picture (i.e. boats that are more distant) tend to reduce crowding perceptions based on the sign of coefficients. It can be assumed that a bigger sample size would lead to a significant confirmation of the tendencies shown in Tables 4 and 6.

Discussion

Within the reach of this study, several factors influencing perceived crowding could be assessed: perceived and expected use levels did significantly exert influence on crowding. In addition to that, crowding was related to expectations like solitude. Use level, presence of wildlife and direction of travel did influence the choice of recreational scenarios.

As perceived encounters with up to six groups of canoeists were evaluated as “neither too much, nor too few encounters” (with a scale ranging from “very few” to “very many”), standards of quality could be acquired. Six encounters corresponded to three boats that were encountered two times each during the trip.

Consequently, up to four boats could be in the old-branch-system at the same time. As the duration of stay averaged three hours, and if different times of arrival were assumed, 12 boats per day could stay in the old branches without violating standards of quality. This use level was exceeded on 22 days during the months of June to August registered via the video monitoring.

Table 4. Coefficients of the pleasant scenario of the logistic regression model.

Variable	Coefficient	Standard Error	Wald Chi-Square	P-Value
Wildlife	0.557	0.262	4.534	0.033
Use level	-1.480	0.415	12.692	0.000
Position	0.273	0.288	0.903	0.342
Direction	0.728	0.402	3.273	0.070
Group size	-0.672	0.932	0.520	0.471
Constant	-0.435	0.229	3.627	0.057

Table 5. Probability of images to represent a pleasant scenario.

Attribute	Image 1	Image 2	Image 3	Image 4
Use level	no canoe	one canoe	two canoes	three canoes
Wildlife	yes	no	no	yes
Direction	/	same	against	same
Share	64%	24%	11%	4%

Table 6. Coefficients of the crowded scenario of the logistic regression model.

Variable	Coefficient	Standard Error	Wald Chi-Square	P-Value
Wildlife	0.047	0.294	0.026	0.873
Use level	1.105	0.355	9.699	0.002
Position	0.599	0.398	2.263	0.133
Direction	0.265	0.385	0.474	0.491
Group size	0.921	0.603	2.335	0.127
Constant	-6.269	1.416	19.606	0.000

The pictures presented show 0.5 kilometres of the old-branch. One canoe per 0.5 kilometres was rated as an acceptable use level (see Figure 4); therefore, a use level of two boats per kilometre seems to be an acceptable standard. Considering the length of this old-branch, with 4.5 kilometres, nine boats at one time could use the old branch, which means 4 to 5 boats going in both directions, not assuming a clustered appearance as well. Boats stayed in the system on average for three hours, therefore 15 boats per day could use the old branch system, staying for about three hours, without feeling crowded. This use level was exceeded on 13 days in the summer months.

As canoeists boated on the average for one kilometre per hour, and as they stayed in the old branch for three hours, up to six encounters per trip seem to be an acceptable use level.

With the use of visual and narrative methods similar standards could be developed:

– 2 perceived encounters per kilometre (visual method)
– 6 perceived encounters per trip (same results with narrative and visual method)
– 12/15 boats as maximal use level per day (narrative/ visual)

Big group size of the encountered seems to intensify perceived crowding, as a small group size was generally evaluated as more pleasant.

Conclusions

About 60% of the interviewees (n=139) stated that they would displace because of high use levels: less than one third react to high use levels with temporal relocation and another 30% of the visitors react with spatial relocation (see Table 7).

Table 7. Coping behaviour (n =139).

Reactions due to crowding	Share
"I do not react at all."	44%
Temporal displacement	26%
Intraspatial displacement	22%
Interspatial displacement	9%
"I would not visit this place any more."	3%
"I would go home."	1%

Alternating routes and visiting times are the most common adaptive behaviours to crowding. About 10% of the visitors even displace to other boating areas, maybe giving place to less sensitive canoeists.

The analysis of the picture-based survey lead to the identification of standards of quality: six perceived encounters per trip were deemed acceptable by the canoeists. Another result of the image-based survey is that the variables canoeists' use level, group size and presence of wildlife do significantly influence the choice of a picture.

Within the reach of this study, the ecological carrying capacity, related to Grey Herons´ (*Ardea cinerea*) ability to cope with high canoeists´ use levels was assessed as well. As Grey Herons´ flight distances have not changed within the last ten years, even though use levels have risen significantly, it can be assumed that Grey Herons were able to habituate up to a certain extent to these high use levels (Wagner et al. 2003).

Experiencing nature is an important motivation for visiting the National Park and 80 % of the canoeists want to observe animals. As high use levels lead to disturbances to the fauna, animal observations become rare situations and therefore can diminish the recreational quality of the canoeists.

As the Danube Floodplains National Park is predominantly used as a local recreation area, management, therefore, needs to decide whether the National Park should provide local recreation opportunities for users, or should focus on providing a quality recreation for those who want to visit the National Park and desire to experience nature.

It seems problematic to implement management measures targeting use limits, as in Austria, since such measures do not have a tradition like e.g. in American National Parks. In addition, it would be very difficult to put such measures into operation, as the National Park area is used as an everyday recreational area by the local inhabitants. Another aspect is the limited resources of the National Park, limiting the possibility of executing bans on use.

Nevertheless, management measures are necessary, since about 60% of the interviewees indicated that they would react with temporal or spatial displacement to high use levels and 30% stated that this area of the National Park is crowded. Therefore, it is necessary to provide possibilities for a quality recreation.

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Research on ecological and social sustainability of nature tourism in northern Finland

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Abstract: We present preliminary results obtained from a project concentrating on sustainable nature tourism in Northern Finland. Our aims have been to provide information on the ecological and social sustainability of nature tourism by investigating the tolerance of vegetation to recreation and by surveying the attitudes of local people towards nature conservation and nature tourism. According to our results, even low levels of recreational activities have obvious effects on vegetation cover and species diversity. Attitudes towards nature conservation are positive as long as the opportunities of local people to continue the use of natural resources are not restricted, while opinions towards nature tourism are in general positive in the survey areas. To keep nature tourism at both ecologically and socially sustainable level, close cooperation between stakeholders, such as administrators, planners, researchers, and local people is required.

Introduction

The right of public access has largely shaped the development of recreation and nature tourism throughout Fennoscandia. Known popularly as 'everyone's rights', this allows for free access to and use of both public and private land, provided no harm is caused to people, animals or vegetation. To maintain the increasing tourism activities at ecologically and socially sustainable level, effective methods and indicators based on scientific results are needed. Sustainability requires understanding and the consideration of the motives, interests and values of all users and stakeholders. Management planning should be targeted simultaneously at ensuring biodiversity and healthy environment, at providing nature resources in an economically sustainable way, and at ensuring the social acceptability of management actions. To achieve this multifaceted aim, close cooperation between researchers, administrators, planners, and local people is crucial.

Research on the ecological impacts of recreation and nature tourism started in Fennoscandia during the 1970's (e.g. Wielgolaski 1978), which is considerably later than e.g. in North America and Great Britain, where vegetation studies were carried out already in the 1930's (Bates 1935). By today, there is a remarkable amount of research on recreation impacts in Finland, but most of the studies are still unpublished or available only in Finnish. The studies published for international researchers have been principally carried out in southern or central parts of the country (e.g. Kellomäki & Saastamoinen 1975, Kellomäki 1977, Nylund et al. 1979, Malmivaara et al. 2002), while the number of such studies concentrating on northern Finland is smaller (Hoogesteger 1984, Tolvanen et al. 2001).

A strong interaction exists between nature conservation and nature tourism, since both concern the use of natural resources, and an essential part of nature tourism concentrates on protected areas with pristine environments. Even though several theoretical models and predictions have been made considering the relationship between nature conservation and tourism (e.g., Budowski 1976), only a few empirical studies have been conducted to investigate this relationship (see e.g., Fiallo & Jacobson 1995, Macleod 2001). Also in Finland, empirical studies have surveyed attitudes of local people towards either nature conservation or nature tourism (Järviluoma 1993, Rauhala 1994, Mäkinen 1998, Autto 1999, Malinen 1999, Vanhamäki 2003, Rämet et al. 2004 unpubl.), but the relatioship between these actions has not been much discussed.

This paper reviews preliminary results obtained from a project concentrating on sustainable nature tourism in Northern Finland. This is a joint project by researchers from the University of Oulu, Finnish Forest Research Institute and Finnish Forest and Park Service. Firstly, we aimed at providing information on the ecological sustainability of nature tourism in order to develop ecological principles for the management of protected areas, for trail network planning, and for the restoration of severely damaged habitats in northern Finland. Further, we focused on investigating social sustainability of nature conservation and nature tourism from the perspective of local residents in order to estimate how well planning has fulfilled the needs of the residents and to detect problematic issues arising from conservation and tourism. These aims have been approached by ecological field studies investigating the tolerance of vegetation to recreation, and by surveying the attitudes of local people, respectively.

Ecological sustainability

Field study regions

Our studies concentrate in the Pallas-Ounastunturi National Park and Oulanka National Park since the late 1990's. The number of tourists has increased considerably in these national parks during recent decades: annual visitor numbers are approximately 100,000 at Pallas-Ounastunturi, which is 2.5 – 4 – fold compared with the situation 20 years ago (Penttilä et al. 1998). The Oulanka National Park had 162,000 visitors in 2002, which is 2.7 times as many as ten years previously. At Pallas-Ounastunturi National Park it is estimated that 40% of tourists come during the summer season and 60% in winter (Tervo 2003), while at Oulanka the emphasis is on summer recreation. Recreation has an impact on the environment throughout the year, but in the form of different activities, which are often concentrated within different areas.

Pallas-Ounastunturi is the first Finnish national park where large-scale surveys have been repeatedly carried out to investigate the condition of hiking trails (Y. Norokorpi, unpublished material). Additional experiments were carried out in order to estimate the tolerance of vegetation and soil to various factors of trampling, such as the intensity and timing of trampling (Pesonen 2003, Törn et al. unpublished). Impacts of hiking and skiing have also been compared (Tervo 2003). An underlying issue in all surveys and experiments has been the identification of the most sensitive and the most tolerant vegetation types.

Impacts of trampling on vegetation

The major effect of recreation is mechanical trampling of vegetation, which leads to changes as well in microclimate, as in the physical, chemical and hydrological properties of the soil (e.g. Chapin & Shaver 1981, Kevan et al. 1995, Forbes et al. 2001). Ecological changes are inevitable even after slight and short-term trampling. The overall tolerance of vegetation to trampling depends on the combined resistance and resilience of each species and the rate of regeneration after disturbance (Cole 1995a, b). The negative impacts of hiking on vegetation show usually non-linear patterns and at some threshold the loss of vegetation is total (e.g., Hammit & Cole 1998). Reductions in density and cover of vascular plants occur quickly at relatively low trampling intensities, but as either the intensity or the frequency of trampling rises the rate of deterioration becomes much slower (Pesonen 2003). Recreational impacts vary also between vertical layers within vegetation types, i.e. ground cover, shrubs and saplings and mature trees (Hammit & Cole 1998) from which we focus here on ground cover and shrubs. Depending on the vegetation type, visible trails form as soon as 10 – 25 persons using a same route, and a threshold level of a significant disturbance to vegetation cover seems to occur after between 75 and 200 passes (Tolvanen et al. 2001).

Plant responses to trampling varies in terms of both life form and morphology. Many graminoids and deciduous dwarf shrubs have high rates of photosynthesis and growth, and large belowground organs for carbon/nutrient storage (Chapin 1980, Bryant et al. 1983, Karlsson 1985). These characteristics help such plants to regenerate after disturbance and gain competitive advantatage over less resilient species, such as evergreen dwarf shrubs. Plant morphology, considering the amount of belowground meristems protected from trampling, may override the importance of life form in the regeneration. In a short-term trampling experiment three species groups relative to their regeneration rate could be identified: graminoids and forbs recovered most rapidly, rhizomatous deciduous and evergreen dwarf shrubs of *Vaccinium* spp. were intermediate, while the non-rhizomatous shrubs, such as the evergreen *Empetrum nigrum* and deciduous *Betula nana* recovered most slowly (Tolvanen et al. 2001). In a longer-term trampling experiment, where repeated trampling was applied, similar results were obtained, except that the forbs were almost entirely destroyed during the course of the experiment (Pesonen 2003). This indicates that the tolerance of forbs was lowered by their weak resistance to trampling.

'Delayed action' responses are common in studies considering trampling impacts on vegetation (Forbes et al. 2004). For example at subarctic Kilpisjärvi, Finnish Lapland, plants of *Empetrum nigrum* continued to die one year, and *Betula nana* well into the second year, after one-time experimental trampling treatments (Forbes et al. unpubl). Our observations from northern boreal Oulanka National Park support the delayed responses of mosses, while vascular plants seem to react more rapidly to trampling: after 100 passes applied once on the experimental trails, the relative cover of vascular plants decreased to less that 50% of the original cover. Similar reductions in the relative moss cover required approximately three to four trampling occasions of 300 or 100 passes, respectively (Figure 1, Pesonen 2003). The delayed response of the mosses to trampling was apparently caused by the buffering impact of the field layer, which is reduced by the death of the vascular plants.

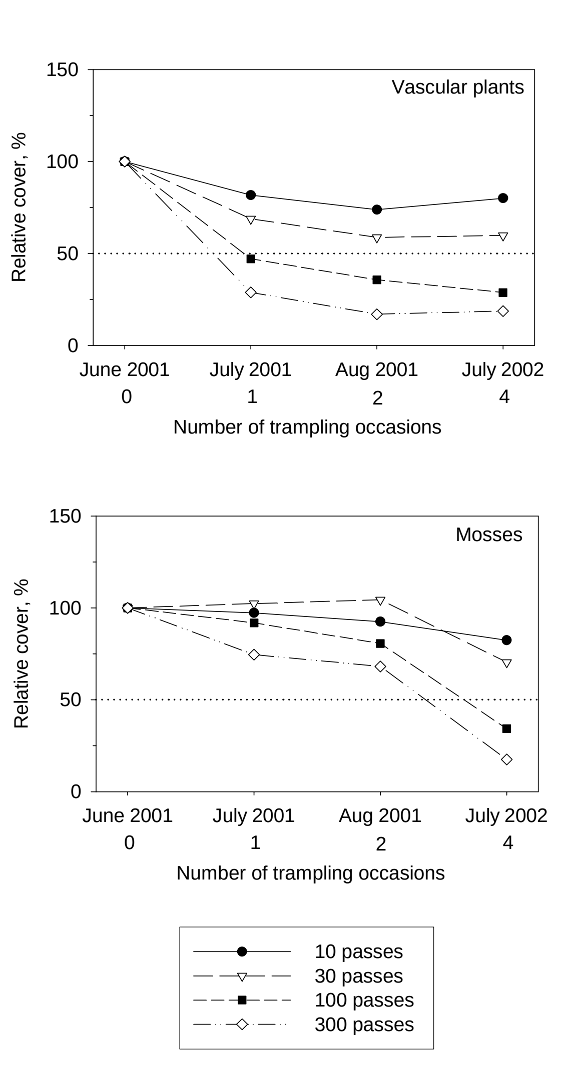

Figure 1. Relative cover change of vascular plants and mosses under repeated trampling, which has been carried out three times during each summer at four intensities. Summary results combined from three contrasting boreal forest site types are presented.

Topography and elevation greatly influence the vulnerability of a habitat to disturbance. Slopes are most sensitive to wear due to the combined influence of trampling and water erosion, the latter occurring especially during snowmelt period. In our experiments, 150 passes on flat terrain caused approximately the same decrease in plant cover as did 25 passes on steep slopes, i.e. the impact of trampling on slopes was six-fold relative to flat terrain (Törn et al. in prep.). Moreover, downward trampling had a slightly greater impact on vegetation than had upward trampling, which is due to the heavier pressure of the steps when hiking downward. When controlled tramping treatments were applied either in June, July or August, there were no differences in the regeneration of plant cover between treatments (Törn et al. in prep.). Early season disturbance could be assumed to be more deleterious for vegetation due to the mobilization of storage reserves from below-ground organs, but this was not observed in our work apparently since the trampling treatments were only applied once.

The influence of contrasting recreation activities may differ considerably due to e.g. the differences in the mechanical impacts on soil and vegetation, and due to different timing and intensity of the activities. Our comparisons on the impacts of hiking and skiing reveal that the direct influence of skiing on soil and vegetation is not as great as that of hiking (Tervo 2003). On the other hand, the influence of skiing is spread over a wider area, since skiing trails are broader and, especially near tourist resorts, maintained by machines, which press and compact the snow and delay the timing of snowmelt. The tolerance of vegetation to hiking and skiing is opposite between the dry and mesic vegetation types: hiking reduces plant cover most in dry vegetation, whereas skiing has a negative impact on mesic vegetation types. Relatively dry forests seem to be most tolerant to both recreation forms (Tervo 2003). The negative impact of skiing is based on a decreased cover of the dominant deciduous dwarf shrubs, which are found to be replaced by evergreen species (Tervo 2003). The great width of the modified area and the time to recover during summer may create opportunities for light-favouring species, such as lichens and evergreen plants to increase on skiing trails (Tervo 2003).

In practise, the numbers of hikers on nature trails are considerably greater than in our experiments, where the maximum number of passes has been 500 (Tolvanen et al. 2001) or 1800 (Törn et al. unpubl.). To be realistic, we have to talk about hundreds or thousands of users during a single summer period. The long-term physical influence of hiking is to compact the soil and reduce the thickness of the soil humus layer. On such trails no vegetation can grow, and the main issue is to keep their physical dimensions under control. Earlier studies have shown that changes in the condition of hiking trails may be rapid: at Pallas-Ounastunturi, during a three-month summer period with fewer than a thousand hikers it was observed that hiking trails can expand by up to 70 cm in width and be worn down by as much as 1.5 cm in depth, with average figures for these types of erosion being 3.1 cm and 0.15 cm, respectively (Koivula 2000). In areas of high wear, complete closure of the trail or artificial structures, e.g. stairs, duckboards, or cover by gravel or pavement, are probably the only methods to protect the environment from further wear.

Introduction of alien species

An essential risk for the biodiversity of protected areas is caused by invasive species, which, once introduced, may spread along roads and trail network and occupy space from local species. In Finland, horse riding belongs to 'everyone's rights'. Besides considerable trampling influence, horse riding poses a risk for protected areas through manure which may spread seeds of alien and invasive species.

We have investigated the impacts or horse riding at Oulanka National Park by trail surveys and controlled experiments since 2001. Our preliminary results show considerable influence by horses on the species composition: seedlings of fast-growing grasses and forbs emerge along trails and horse resting areas. Also in controlled experiments, the impact of horse manure on the emergence of seedlings is remarkable (Figure 2, Törn et al. unpubl.). We do not know yet whether the new species can establish in the area or whether the changes are reversible and can be negated by e.g. the reduction or cessation of horse riding in the area. Our further studies will bring light to the long-term impacts of the horse in the research area.

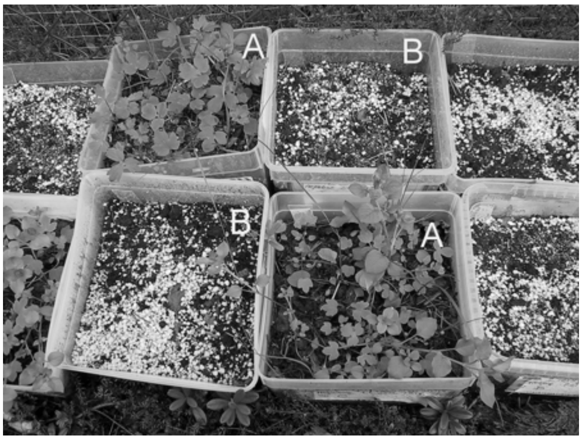

Figure 2. Emergence of seedlings from forest soil added with perlite and horse manure (A) relative to soil added with perlite only (B).

Long-term ecological impacts of nature tourism

According to our results, recreational activities have obvious effects on the vegetation, even when low levels of pressure are concerned. Long-term disturbance may change the species composition, as vulnerable species disappear from their original habitats while more tolerant species are established in the area. The extreme consequence of trampling on vegetation is complete removal of vegetation, which initiates erosion.

Because the restoration of vegetation to severely damaged habitats is difficult and expensive, the vegetation response of different vegetation types should be taken into account already during the planning of recreational use. Effective methods and indicators based on scientific results are needed to measure and predict the effects of nature-based tourism on different types of environment, and to plan and control the use of natural habitats for tourism.

Attitudes of local people towards nature conservation and nature tourism

Nature tourism always relies on environmental resources and is strongly interlinked with nature conservation especially in protected areas. Budowski (1976) has classified the relationship between nature conservation and tourism into three categories. (1) Conflicts emerge when tourism has detrimental effects on the environment and when there is little contact between tourism and conservation. Conflicts may also arise from a situation where tourism is a victim of an already deteriorated environment. (2) Coexistence indicates that under certain circumstances, nature conservation and nature tourism may coexist to each other's benefit. For example, coexistence may be attained by dividing areas to different use in time and space. (3) In symbiosis, the protection of environment can be enhanced by tourism, when appreciation towards nature and conservation increases as a consequence of tourism.

In order to estimate how well planning has fulfilled the needs of local residents and to detect specific problems arising from conservation and nature tourism we carried out a survey of the attitudes of local residents towards nature conservation and the development of tourism in Kuusamo and in Pudasjärvi (Rämet et al. in prep., Törn et al. unpublished). Kuusamo area is a suitable focus for this type of study, since it has many protected areas of different sizes and types, each with their own conservation history. In Kuusamo the oldest and the most important protected area is the Oulanka National park. New protected old-growth forest areas were recently designated just south of Kuusamo, after a long and controversial process. Additionally, Ruka, one of the most popular ski resorts in Finland, is located in Kuusamo. In Pudasjärvi, Syöte National Park was established in 2000. Iso-Syöte, a popular tourist resort in Finland, is located in the vicinity of the national park. We included four areas in Kuusamo (North Kuusamo, Ruka area, the town centre and South Kuusamo) and two areas in Pudasjärvi (Syöte and Sarajärvi) for the survey, which was carried out in 2002 and 2003, respectively.

In general, local residents showed a positive attitude towards nature conservation, as long as their own opportunities to continue the use of natural resources, such as picking berries, fishing and hunting, were not restricted. In Kuusamo, most respondents living in the vicinity of protected areas (North and South Kuusamo) regarded that there are too many protected areas in Kuusamo, while respondents living at town center or close to Ruka tourist resort had a more positive attitude towards conservation (Figure 3). In Pudasjärvi, no great differences occurred in the opinions towards nature conservation between respondents of the two survey areas (Figure 3, Rämet et al. in prep.).

Opinions on the consequences of nature conservation varied considerably among the survey areas. In general, the most positive impacts were seen in the appreciation of the local area within and outside the country, in the attractiveness of nature and in the positive influence of conservation on tourism. Many people living at Ruka and Syöte regions get incomes from tourism, which apparently increased their positive opinions towards nature conservation (Rämet et al. in prep.). Nature protection was seen to affect negatively to the employment and economic life of the area.

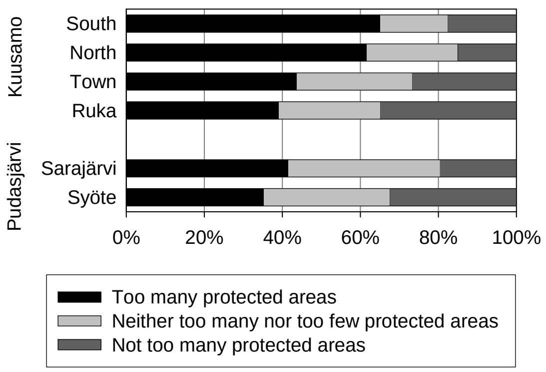

Figure 3. Opinions on the amount of protected areas in the municipality among respondents from Kuusamo and Pudasjärvi.

Attitudes to nature tourism were generally positive. Most respondents were willing to accept an increase in the number of tourists in their municipality (Figure 4). Although they usually accepted the increase in tourism also in their immediate area, the willingness of the increase was always somewhat smaller than at the level of the whole municipality (Rämet et al. in prep.).

The most positive impacts of tourism were seen in the improved employment, local services and incomes of people. Besides economic benefits, social benefits were seen in the increased activity of villages and new influences brought by tourists. Respondents with direct incomes from tourism had more positive attitudes towards tourism than those with no incomes from tourism. Opinions on the negative impacts of nature tourism varied considerably among the survey areas. In Kuusamo, the most negative consequences were seen in environmental problems, such as the wear of nature and waste problems. In Pudasjärvi, restrictions in land use were seen as the most ‘negative’ effects. Contrasting interests or even conflicts between local residents and tourists, and to a lesser extent increased jams were felt as the main social problems of tourism. The investments allocated to the development of tourism at the expense of other livelihood were seen as the main economical disadvantege of tourism among the local inhabitats in Pudasjärvi area. The higher price levels and seasonal changes in employment were considered as minor economic disadvantages.

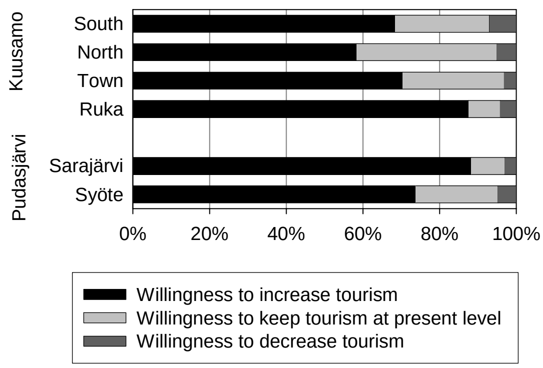

Figure 4. Opinions on the amount of tourism in the municipality among respondents from Kuusamo and Pudasjärvi.

There were clearly conflicting interests among stakeholders within the survey areas, depending on the personal values of the respondents. Most respondents thought that their opinions had not been sufficiently considered during the planning process of tourism in their region. However, the respondents would not be willing to increase their participation in the planning, even if they were given a chance. Hence, even though the results of our survey emphasise the importance of management planning and the participation of stakeholders in rural areas, there seems to be little interest among local people to participate in planning.

Towards sustainable nature tourism

Definitions of sustainable tourism typically emphasise ecological, social and economic elements of tourism in order to achieve a ‘wise’ use of natural resources. However, defining what exactly constitutes a wise use of resources may depend greatly on the values held by the stakeholders concerned. From an economic viewpoint, tourism brings incomes to local communities, but from an ecological standpoint, tourism poses a threat to sensitive environments. Conflicts can easily arise due to the different values of stakeholders. Co-management is a promising option for the resolution of resource-based conflicts related to the development of tourism (Rämet et al. 2004 in review). A certain degree of conflict may even be required before stakeholders initiate negotiations towards co-management agreements, hence conflicts should be appreciated as opportunities for change. The fundamental assumption is that resource management will be enhanced by the sharing of authority and decision-making, making it more responsive to a wider range of needs. Advantage of the complementary knowledge of different stakeholders is taken; residents and tourists may have experiential 'views' about the area concerned, while officials and decision-makers rely more on scientific 'facts' (Rämet et al. 2004 in review).

If sustainability is not clearly defined and monitored through the use of quantitative and/or qualitative indicators, communities may easily remain unconcerned about long-term ecological and social sustainability in their decisions. In principle, the starting point for any activity that uses natural resources is ecological sustainability. However, nature tourism does not directly use natural resources in the same sense as for example forestry and mining. Nature tourism can benefit nature conservation by increased appreciation of nature, which may increase ecological sustainability of tourism. Similarly, nature conservation benefits nature tourism and, consequently, the economical sustainability of tourism. Hence all dimensions of sustainability are assumed to have their specific roles, which altogether support the sustainability of nature tourism.

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Visitor management and revegetation efforts on a degraded Lake Superior cliff edge

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Abstract: Rock climbing has grown to be a major recreational sport in the United States. Yet, resource degradation caused by recreational rock climbing has become a controversial issue throughout the United States (Access Fund 1999). Some resource agencies such as the U.S. Forest Service, National Park Service, and Bureau of Land Management are struggling to establish functional management policies that allow appropriate rock climbing practices while protecting the natural resource (Devine 2001). Resource managers tend to favor restriction of climbing activities to protect the resource. Yet, without adequate understanding of rock climbing, this approach can become controversial. A less controversial approach toward rock climbing influences on natural resources can be to include the rock climbing community in management planning. The result can be increased protection of the resource while allowing recreational climbing to continue (Hynek 1999).

In an effort to address both public recreational needs and to protect the natural resource of Shovel Point, a popular rock climbing site in Tettegouche State Park on the edge of Lake Superior in northeastern Minnesota, USA, a study was conducted during the summer of 1998 to identify types of recreational users, impacts from their use behaviors, and to survey climber attitudes toward a proposed management plan that would influence climbing on the site.

The results of this study were implemented into a long range management plan that has resulted in modified climber impact on the environment and allows a rehabilitation of the site that is hoped to preserve the unique natural resource. Innovative vegetative rehabilitation of the climbing site has been successfully implemented. This is an excellent example of positive conflict resolution through research, management through public participation, and resource rehabilitation and protection.

Introduction

Rock climbing has grown to be a major recreational sport in the United States. Minnesota has become one of the leading states in the nation for rock climbing because of its well known and excellent climbing sites. Situated along the North Shore of Lake Superior, in Northeastern Minnesota, lies a spectacular cliff called Shovel Point. Shovel Point has become one of the premier climbing sites in Minnesota (Thompson 1996). Shovel Point also lies within the boundaries of the Tettegouche State Park in northeastern Minnesota.

In addition to being a sought after rock climbing site, Shovel Point has been discovered as a popular short hike for tourists traveling along the North Shore of Lake Superior. The pressure on the land from recreational users has caused vegetation to die along the cliff edge. This die back, or kill zone, has occurred because of severe soil compaction and resultant erosional problems. Shovel Point is considered a unique micro-habitat because of the combination of poor, shallow depth, soils and a short growing season from the cold climate created by Lake Superior. The result is a situation where there is a significant negative environmental impact from human recreational use on a particularly sensitive landscape (Hargrave 1994).

The Minnesota Department of Natural Resources began to establish a management plan that would manage rock climbers' and recreational hikers impacts while striving to protect and even restore the natural landscape along the cliff edge of Shovel Point (Thompson 1996).

In 1995, the park manager of Tettegouche State Park began an innovative program to encourage a pro-active means of self regulation among rock climbers. The manager established a citizens' advisory committee for rock climbing combined with consultation from natural resource and recreation professionals to develop a plan to minimize user impacts while stopping the kill zone from moving further inland and restoring native vegetation.

A primary goal was to avoid closure of the climbing sites or implementing some other type of imposed regulatory control without loss of habitat. The park manager has been striving to establish an effective management scheme to preserve the fragile natural environment along the cliff edge while minimizing restrictions on rock climbers and hikers. The Tettegouche State Park Management Plan has recommended that techniques be developed to manage the "cliff edge for safety, recreational enjoyment, and resource preservation..." (Thompson 1996, p. 59).

The purpose of this project was to establish baseline data on hiker and climber attitudes and behavior toward the management plan. It has been shown that climber participation is critical for compliance for resource managers worldwide (Access Fund 2004). In addition, the kill zone needs to be accurately measured to assess the extent of it and to help determine if it is recovering from the new management practices.

This study gathered baseline data on rock climber and recreational hiker attitudes and behaviors to help determine if natural resource degradation will be stopped and the extent that restoration is possible. These baseline data were used to help refine the recommendations made toward management of the site. They also serve to monitor the effects of the management plan.

A vegetation analysis along the cliff edge was conducted to monitor the recovery and/or expansion of the kill zone. Finally, a review of management practices by resource agencies was conducted to determine what other agencies were doing to provide rock climbing opportunities while protecting the natural resource.

Methods

This study is a long-range design with annual assessments made to guide changes in management of the site. The purpose of this study was to establish baseline information on the effects of the existing management plan on user behavior and toward resource protection. In addition, the impact zone (kill zone) was measured to determine its severity. This research began June 8, 1998. There were five distinct parts to this study. They are identified below.

1) *A geo-referenced map* of human-made and natural features of Shovel Point was designed. This map is used to guide physical management features such as trail developments as well as to physically monitor the cliff edge kill zone.
2) *Rock climbers were surveyed* on their attitudes toward the proposed changes made along Shovel Point. An opinion survey was designed to interview climbers about their attitudes regarding the new management procedures. Included was their commitment to adhere to the plans. All climbers were interviewed on alternating Saturday's, Wednesdays, and Fridays at two distinct time periods (morning and afternoon). In addition, user types (hiker/climber) and frequency of use was assessed. The survey was field tested to ensure appropriate validity.
3) *A vegetation analysis* was conducted to measure the kill zone. The cliff edge was used as the constant. The depth of the kill zone was measured. Second, the extent of soil and vegetation destruction was assessed using photographs and vegetation analysis (measuring species types and numbers). This will serve as the basis from which to determine whether or not the kill zone is recovering.
4) *A review of management practices* in state parks, national parks, and national forests concerning rock climber behaviors and their impacts on natural resources was conducted to determine if a similar situation may be able to be applied to Shovel Point. Since most management practices are not published in professional journals, it was necessary to determine where climbing sites are located around the nation. This was conducted with help from the *Access Fund*, a national organization that promotes responsible climbing and fosters positive working relationships between climbers and resource agencies. Park managers were interviewed for their insights into similar issues relevant to Shovel Point. A literature review was conducted to examine research concerning climbing and natural resource protection.
5) Revegetation of site using origin species: We chose a trampled, eroding hillside for plant trials to see if we could grow vegetation on a harsh, actively used site. We chose to plant a grass, *Danthonia spicata*, and the creeping, woody *Potentilla tridentata* because they are common on site and appear to be able to colonize disturbed areas. We collected seed from shoreline habitats within 2 km of Shovel Point and grew seedlings in a greenhouse over the winter. Plants were robust and had large root mass by the time we planted in June 2001. We chose soil amendment treatments with potential to ameliorate the harsh conditions on site.

We established three blocks of six .25 m^2 treatment plots for each species, for a total of 36 plots. We dug these plots to 10 cm, or bedrock, and filled them with plants and a soil amendment. Plants were randomly assigned to plots and were placed 10 cm apart, 5 cm from edges, and 10 cm deep. Twenty-five plants were placed in each plot for a total of 450 plants of each species. In addition, two plots in each block were established but not planted – one was tilled and one was left untilled – to assess the ability of vegetation to colonize without assistance.

To assess survival rates we counted all live plants at 13 weeks and one year. To assess plant growth we tallied the number of live stems at ground level. We counted only *P. tridentata* stems with fully expanded leaves, and *D. spicata* stems longer than two cm. We counted stems in all plots at 13 weeks. At one year we counted stems in one of the treatment blocks.

Defining and "hardening" trails

We had earlier experience with visitors trampling revegetation efforts on Shovel Point so we were unwilling to leave these plantings unprotected. We used several techniques to guide hikers and climbers around the planting site: roping off areas; placing signs at critical points; adding wooden curbs to help define designated trails; placing gravel to improve some walking surfaces; and constructing low board-walks to identify paths to climbing areas.

Results

The results of this study will present the changes in visitor behavior and the site rehabilitation.

Visitor behavior

The positive support provided by climbers is very evident, even when asked if other climbers would abide to management plans to determine truthfulness of response. All questions indicated at least 80% favorable responses toward all recommendations. It is interesting to note that over 52% of climbers indicated they did not have a current permit to climb. However, many respondents were members of an organized group and were unaware if the group leader possessed a permit.

While most comments were strongly supportive of the efforts to protect the land from negative user impacts, the negative comments revealed a strong attitude of wanting a nature-based experience with minimal to no contrivances. Thus, manipulating the land was considered unacceptable, even if the manipulation was intended to preserve the native character of the land. Finally, a few respondents indicated a distrust for human made support. The concern expressed was unreliability due to malicious tampering. Primary results are identified as:

- Surveyed climbers showed a strong willingness to comply with proposed park management actions that focus and in some cases restrict how they use Shovel Point. Willingness to comply was achieved through understanding that rehabilitation and development efforts were to protect the land. Otherwise there was strong initial resistance to the plan.
- Climbers believed that other climbers would be willing to comply with proposed actions.
- Follow-up comments provided by some climbers indicated that, even if they disagreed with the proposed action, they would support it if they believed it would help maintain their climbing access to Shovel Point.
- Tallies of trail use showed heavy use of some trail segments and very light or no observed use on others. These results suggest where trails might be easily closed and revegetated, where "hardening" with gravel or boardwalks might be appropriate, and where visitor patterns may be difficult to change.

Site Rehabilitation

A vegetation analysis was conducted. The analysis entailed establishing a specific zone to be measured, establishing specific procedures to follow to ensure accuracy in monitoring vegetation change. Vegetation type was catalogued. Finally, origin species were collected and propagated. Seedlings were planted on site using various methods of treatment to determine greatest success of survival. Detailed results are as follows:

Plantings

- Overall survival rates were high at 13 weeks: 98.7% for *D. spicata* and 86.9% for *P. tridentata*. Overall survival rates remained high after 1 year: 96.7% for *D. spicata* and 79.1% for *P. tridentata*.
- 1 year survival rates varied little among treatments for *D. spicata* but did show variation for *P. tridentata*
- After 13 weeks *D. spicata* treated with hydrogel and fertilizer had significant growth compared to other treatments (mean change in stem number $P \leq 0.0001$). *P. tridentata* treated with hydrogel, sterile soil, or sterile + forest soil had significant growth compared to other treatments (mean change in stem number $P \leq 0.0195$).
- After 1 year *D. spicata* growth appears poorest with fertilizer or woodchips. After 1 year *P. tridentata* growth appears best with sterile + forest soil.
- After 1 year the 3 tilled, but unplanted plots recruited a total of 9 *D. spicata* seedlings, each with 1 or 2 stems. The 3 untilled, unplanted plots had no recruitment.

Trail Rehabilitation

To date, trail rehabilitation efforts have succeeded. Trails have been marked in an manner that is unobtrusive to the scenic value of the site, yet visitors are guided more effectively through the use of wooden curbs. In addition roped off areas with accompanying signs indicating "revegetation site" have succeeded in eliminating spur trails. The addition of signs have been key toward gaining compliance by the climbers.

Finally, wooden platforms have been erected at key "staging" areas where groups of climbers place their gear and plan climbs. These platforms have reduced soil compaction and erosion resulting in protection of root systems. Thus, the expansion of the kill zone has been stopped.

Discussion and Conclusion

Review of management practices of established climbing sites

A literature review revealed no specific information to resource agency management practices toward natural resource protection and rock climbing impacts. However, with increasing popularity of rock climbing and the subsequent impact on natural resources is increasingly controversial between the resource manager and the rock climbing community (Access Fund 1999, 2004).

There were a few sites around the United States that have implemented similar management practices and/or made recommendations that lend support to the Tettegouche plan. A few agencies have taken an abrupt approach of simply banning climbing. For example, the Ohio Department of Natural Resources manages a park near Yellow Springs, Ohio called "Clifton Gorge". This area is approximately 1.5 miles wide by five miles long and runs in an east-west direction. A small stream bisects the gorge which is comprised of limestone cliffs 20'–30' high. The southern half of the park has restricted access to protect sensitive, with some endangered, plant life. The northern half of the park was designated for hiking and rock climbing. Because of intense climbing pressure and hard to control practices, the impact on the gorge became so negative that the park managers simply closed the park to climbing.

A less controversial approach has been followed in Acadia National Park (ANP) in Maine. ANP has a similar situation to Shovel Point at one of their climbing sites called Otter Cliff (Gregory 1998). Because Acadia does not have written documentation of their restoration project, the following information was gathered by a phone interview with the park botanist. The park has installed fixed anchors for climbers to use and has placed signs telling climbers to use the fixed anchors instead of trees. The fixed anchors have helped in the recovery process. The park has also roped off protected areas and has placed signs asking people to please stay off those areas. By just keeping people off those areas for one year, small amounts of vegetation re-growth have occurred.

Also interviewed was Sam Davidson, the senior policy analyst for The Access Fund. The Access Fund is a non-profit organization dedicated toward climbing access, conservation of natural resources, and promotion of the sport of rock climbing. Davidson (1998) said that fixed anchors have helped in some areas to reduce the impact of climbers. Mississippi Palisades and New River Gorge are two examples he gave. At these locations the anchors were placed over the rim of the cliff edges to be less obtrusive. However, the climbers start from the bottom of the cliff unlike Shovel Point where climbers belay from the top of the cliff edge.

Davidson (1998) also stated that decks have been built to protect staging areas. He suggested that a deck should be tested at one location to see how it works. When asked about the use of curbing and its effectiveness, he said that it usually works getting climbers to the climbing areas, but not at the staging areas. For the staging areas he suggested low-key benches or a deck, if that much development was acceptable to the park management. Davidson also recommended that signs such as, "please stay on trails", and "do not walk on vegetation", help.

The result is that while the need for more clear site planning and implementation is necessary, the success of the popularity of rock climbing is creating adversarial relationships with resource managers who view the natural resource as the higher priority to protect. The scant information that was available revealed that the Tettegouche State Park plans are sound and correct.

Consequently, our findings are identified as:

- Climber surveys gave the Minnesota Department of Natural Resources confidence to spend the time, money and effort required to redirect hiker and climber activity and to attempt revegetation of degraded areas.
- The techniques we used to guide visitors away from revegetated areas seem to work. We observed no obvious trampling damage to the plantings. Visitors we talked to on site or at the park office were generally appreciative of attempts to halt and reverse degradation.
- We were surprised by plant survival rates given the harsh, bare nature of the site and the lack of measurable rainfall for five weeks after planting.
- Both *D. spicata* and *P. tridentata* are good choices for future plantings in similar settings. *D. spicata's* better survival and more aggressive growth may make it a better choice for trying to stop erosion.
- Hydrogel treatment is worth considering in future plantings. The gel crystals are relatively easy to apply and treated plants showed improved growth at 13 weeks and were still showing good survival and growth at one year.
- Fertilizer treatment, while giving an initial boost to *D. spicata*, does not seem to provide benefits after one year.
- Results from sterile + forest soil treatments suggest that *P. tridentata* may be benefiting from associations with mycorrhizal fungi. A next step would be to test if commercially available fungi also improve survival and growth and thus be a more practical amendment than locally harvested soil.

We were encouraged enough by the results of this work to plant an additional 4000 local seed-source seedlings in 2002. We also learned that educating the visitor on the value of natural resource rehabilitation and management lends toward acceptance and compliance of managed recreational use. This is a significant issue between natural resource managers and rock climbers nation wide.

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Canoes versus birds or canoeists versus canoeists? Combining interview survey and visitor monitoring to inform visitor management in the Mueritz National Park

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Abstract: Intensive use of canoeing trails in national parks can impact both wildlife and the satisfaction of paddlers. This paper focuses on paddlers' perception of congestion in the National Park Mueritz (Germany) and the effectiveness of different management options. Our theoretical discussion is based on the economics of congestion and the social science literature on carrying capacity of recreational resources. For the empirical application, we use interview survey and monitoring data. While our results suggest a high relevance of congestion on canoeists' satisfaction, the acceptance of a quota system does not exceed 30 percent. We employ a statistical analysis to describe the effect of different use levels on the quality of the paddling experience. We further use the travel cost method for a rough prediction of the effect of pricing strategies (entrance fee) on use levels.

Introduction[1]

This paper focuses on canoeists' perception of congestion in the Mueritz National Park (Germany) and the assessment and acceptance of management interventions to reduce numbers of paddlers. The management authority of the National Park is perceiving a growing conflict between the goals of the Park's management and the increasing number of paddlers on the lakes and waterways (cf. Nationalparkamt Mueritz, 2004). As a consequence, park managers are discussing strategies to reduce use levels in order to minimise negative effects on wildlife and habitats.

In economic terms, a reduction of the number of visitors in frequented protected areas can be justified if substantial congestion costs are to be expected. Usually, economists distinguish between two dimensions of congestion costs: reduction of the recreational benefit and negative environmental effects (cf. Hanley et al. 2003). While the latter relate to impacts of visitors on wildlife and habitats (canoes vs. birds dimension), costs of congestion of recreational resources costs refer to the visitors perception of crowding and resulting reductions of recreational benefit (canoeists vs. canoeists dimension). Even though both problem dimensions are highly relevant for the management of the canoeing routes in the National Park Mueritz, we concentrate on the recreational aspect in this paper.

The central focus of our project was therefore to establish, whether paddlers in the study area feel disturbed in consequence of the high number of other paddlers at all and to what extent this may prove to be an additional justification for a management intervention. The second purpose of our project was to support the design of management instruments by attempting an ex-ante assessment of their possible effects and acceptance. For the empirical analysis we use data from an on-site interview survey amongst paddlers and long term visitor monitoring of visitor flows.

Conceptualising and measuring costs of congestion of recreational resources

Evidence of the potential impacts of congestion on the demand for recreational resources and visitor satisfaction is of obvious importance to management. Because users differ in their preferences for resource use and aversion to congestion, evidence of how such congestion effects are borne differently by different user groups is crucial to help resource mangers to more efficiently manage their resources. Unfortunately, the empirical evidence on the potential impacts of congestion on visitor demand and satisfaction is mixed. This may be a sign of the difficulties associated with defining and measuring congestion. The most widespread approach is to derive encounter measures that either (a) describe the probability of encounters by using monitoring data of the number of visitors per location, date and time or (b) describe the number of encounters an individual remembers seeing during a trip. Crowding or congestion is then defined as a negative evaluation of these encounter rates, and is therefore essentially an indicator of use levels.

Most researchers subscribe to an approach that predicts that disutility associated with crowding will increase until a visitors tolerance limit is reached. This disutility is termed cost of congestion to recreationists. However preferences for quiet and undisturbed enjoyment of nature are heterogeneous. In general crowding has different relevance for different activities and its effects are perceived with different intensity by different persons (McConnell 1988). Concerning canoeing, Boxall et al. (2003) show that canoeists experience of congestion not only varies amongst individuals but also varies for different parts of a trip. Whilst increasing encounters during paddling and camping were found to have a negative effect on satisfaction, encounters at the start and end point were found to have positive effects.

Principally two different approaches to measuring the disutility or costs associated with crowding are found in the recreation literature. The more widespread are social-psychological measures, which measure individual preferences in terms of stated satisfaction or acceptability. The economic approach attempts to assess disutility in terms of revealed or stated willingness to pay measures. This approach is based on a utility theoretical framework, which assumes that an individual will be willing to pay higher access costs (travel further, pay higher entry fee) in exchange for reduced numbers of encounters if the change in congestion level is greater or equal to the lost income. Otherwise the individual will choose to keep the income and live with the actual congestion levels. This relationship can be used to estimate utility levels of recreation associated with different levels of congestion. Consumer surplus measures, which can be derived from this type of analysis can then be used to estimate welfare implications.

A central issue in the measurement of the disutility associated with crowding is that the congestion measurements that are relevant for the recreationist may not be equivalent to those that are developed by the outside observer for monitoring or analytical purposes. Jakus and Shaw (1997) suggest to differentiate between measures based on actually observed crowding and measures based on the expectation and on-site perception of congestion by respondents. They further differentiate between ex ante and ex post measures of congestion. For our purposes it is important to note, that ex-post assessment of congestion costs are conditional on ex ante expectations, because self selecting decisions such as choice of site or date of trip are made on basis of ex-ante expectations.

Building on these ideas, Eugenio-Martin and Thiene (2003) develop a rather simple concept of expected congestion to predict probability of visitation in a multi – site choice model. They use a dichotomous variable (1–0), which denotes whether an individual states that congestion reduces significantly the enjoyability of any site or not. They define expected congestion of an individual for a site as the estimated absolute use intensity multiplied by the dichotomous variable. As a result expected congestion is set to zero for those visitors who do not care about the level of congestion.

We adapt this concept for our own single-site study of the Upper Havel Trail. We assume heterogeneity of visitors sensitivity to congestion (Figure 1). Because of the increasing popularity and high use levels we assume that ex-ante expectations of high levels of congestion are relevant and a self selection of visitors is to be expected. Congestion sensitive visitors may substitute potential visits during expected high visitation periods, for example weekends or public holidays for less crowded areas or less crowded periods. As a result we conceptualise on-site rate of total visitors who perceive a congestion problem to be:

$$\frac{IPC}{N_{sd}} = \frac{(N_{sd} * IS_{isd} * PC_{sN}) + (N_{sd} * INS_{isd} * PC_{sN})}{N_{sd}}$$

where *IPC* is the number of individuals who perceive congestion at total visitation level *N* on site s and day d. IS is the proportion of visitors who are principally sensitive to congestion, *INS* is the proportion of visitors who principally do not care very much about the level of congestion. *PC* is the rate of individuals who perceive congestion costs at visitation level *N* of site *s*. For *INS* the perceived congestion *(PC)* is zero. If we assume that the proportion of *IS* and *INS* is constant over the year, the maximum rate of persons who perceive congestion can rise to *N* * *IS*, which should be less than 100%. Therefore we expect that the percentage of visitors who perceive congestion as a problem to increase with higher use levels, but not linear (Figure 1). The specific intercept and maximum percentages in relation to the observed use levels are an empirical issue, which we intended to investigate for the Mueritz National Park.

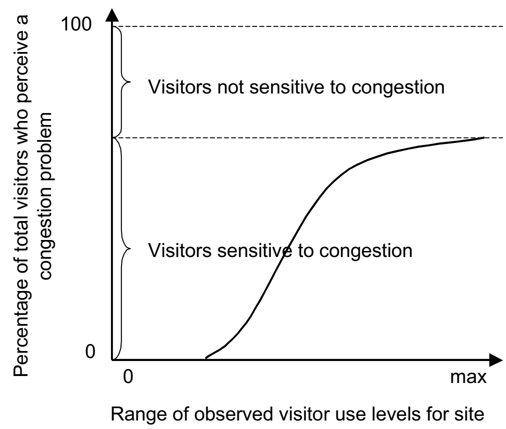

Figure 1. Conceptual model for on-site perceived congestion in relation to use levels.

Even though the relevance of costs associated with the congestion of recreational resources is largely uncontested there is an ongoing debate in economics and park planning on how to conceptualise and define acceptable levels of crowding. For practical purposes, these acceptable levels of crowding are most often framed in terms of carrying capacity. From a perspective of economic theory, the concept of carrying capacity is closely related to the concept of optimal congestion levels. From a welfare economic point of view and for a start not taking environmental costs into account, recreation site management should attempt to chose strategies which maximise recreation benefits for a given regional, national or other population, subject to both an income constraint of the population and the availability and accessibility of sites.

Although it is generally extremely difficult to deduct optimal levels of congestion empirically, these theoretical concepts have important ramifications for assessing recreation and park management options in practice.

Because users differ in their preferences for resource use and aversion to congestion, it is important to have empirical indications of use levels from where on congestion costs become relevant and how these congestion effects are borne differently by different user groups. Both theoretical and empirical findings indicate that ignoring heterogeneous preferences is likely to lead to incorrect conclusions about optimal use levels. Michael and Reiling (1997) show that failure to account for heterogeneous preferences would overestimate congestion costs. Freemann and Havemann (1977) were the first to show that an explicit accounting of how these congestion costs are distributed across users is necessary for an optimal rationing and pricing policy. McConnell (1988) shows that, if the demand for a recreational good is income elastic, rationing via price among heterogeneous users will increase the demand for some groups, even if overall demand may be decreased. The effect is to make the users more homogenous, favouring higher income groups. These theoretical result supports mangers reluctance to use price rationing in favour of setting quotas due to equity considerations. If on the other hand managers accord a high priority to development of the regional tourism economy, possible price effects which in tendency deter low budget tourism may be acceptable. McConnell (1998) contrast this result with the effects of increasing the efficiency with which a site can provide recreational benefits by increasing capacity or optimising design of the trail, which results in reductions in congestion while not decreasing demand by any one group. Knowledge of the specific points in a paddling experience, where congestion is most costly can be crucial to the design of the trip routes, resting places and portaging sites.

Study Area: Mueritz National Park

The Mueritz National Park is part of the Mecklenburg Lakes Region, which is characterised by a multitude of lakes and waterways. The Lakes Region is only some 130 km from Berlin, which makes it a popular destination for weekend and holiday trips. For German standards the forest and lakes landscape – although not a pristine wilderness – offers a certain degree of solitude.

Two paddling trails, which are both part of the larger waterways system originate within the National Park territory. The more important one of these is the Upper Havel paddling trail, which is approximately 23 km long. Paddlers may begin paddling at both ends and halfway, where there are camping sites and boat rentals. Boat rentals along the paddling route have a total capacity of around 300 canoes. Additional boat rentals in the vicinity have an additional capacity of some hundred canoes. Most paddlers require two days for the trail within the national park, even though they may continue on south for many further days. Likewise paddlers arriving from south may end their paddling trip here. There are two portaging sites within the national park. The southern entry and exit point is a lock with a portaging site.

There is a long tradition of watersports, especially canoeing, in this region, which has become increasingly popular in the years following German reunification. The long term trend of boat movements through the lock at the southern entry show that activity levels on the paddling route have more than doubled in the last ten years (Nationalparkamt Mueritz 2004).

The paddling trail passes through several lakes and lowland fens which are important breeding bird habitats. The management authority of the national park has already implemented several management measures to reduce negative effects of water-based recreation on local wildlife and habitats. While non-

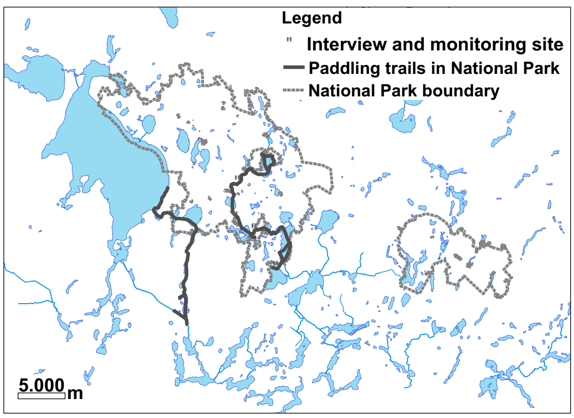

Figure 2. Map of the Mueritz National Park and the Upper Havel Paddling Trail.

commercial paddling is principally allowed (up to groups of 8 boats), motor boating and surfing are not. Resting and camping sites have been deliberately limited by the National Park Authority for conservation reasons. Resting and camping outside the official resting, portaging or camping sites is strictly forbidden. Wild resting places are barricaded with dead wood. Some sensitive stretches of the Havel and individual lakes have already been totally closed to paddling. Apart from two shorter portaging sites, paddlers can however still experience a non-stop paddling route between the most northern Kaebelick Lake and the southern exit point.

Visitor survey and monitoring data

Interview survey

Face to face interviews with paddlers passing four portaging / resting[2] sites were carried out on six weekends between May and August 2003. Interview dates were chosen to sample a range of expected visitation levels. The sample of a total of 285 interviews was drawn by randomly selecting interview partners at their arrival at the portaging site. We used a rather short questionnaire, each interview lasted on average between 8–10 minutes, because paddlers hardly accept interviews of substantially longer duration during their trip. The survey contained questions about the paddlers' current paddling trip (group size, starting and endpoint, starting time, length of paddling trip in days, nights camping during the trip, advanced planning for trip in weeks), general paddling experience (boat ownership, number of paddling trips per year, number of paddling trips in Mueritz National Park per year, membership in paddling association etc.), socio-economic variables (household size, household income, employment, age, sex, home district) and a set of questions related to perceived congestion (see below for details), the general acceptance (yes – no) of a quota system with booking on a "first come, first served"- basis and the willingness to pay a user fee in this context for the administration of this system and the maintenance of the facilities along the paddling trail at current levels (principal willingness and amount in €).

In the following, some important characteristics of paddlers and their trail use patterns are summarized. Median group size is four persons in two boats, who take a three day paddling trip with two nights spent at a camping site on the way. 58% of the visitors rent their boat on site. 39% of the visitors are day trippers who travel back and forth on one day. It is apparent that the paddling route attracts visitors from all of Germany. The average distance from the home district is 273 km. However canoeists from Berlin (30.5%), which is 130 km away, predominate. 40% of respondents decide to take the trip rather spontaneously, that is less than 2 weeks in advance, whilst 60% make their decision well in advance. Only 7% of the paddlers are a member of a canoe association. Median number of canoe trips taken per year is two, one of which is in the Mueritz Lakes Region. Two-thirds of the respondents have visited the paddling trail before. 44% of the respondents take only one canoe trip per year.

Measure of physical and perceived congestion

We attempted to assess perception of congestion levels during paddling and resting / portaging as a function of boat activity levels on the interview date by eliciting responses to following statements:

A. In my opinion, there are too many boats/people on the paddling trail today.
B. In my opinion, there are too many boats/people at resting / portaging sites today.

A four point Likert scale (fully agree=4 ; agree=3; do not agree=2; do not agree at all=1) was used. The two items (A. and B.) were evaluated both independently and as combined scale with a range from 0-6, with 6 denoting the most negative perception of crowding. The formation of this combined perception of congestion scale was found to be statistically valid.[3]

Because we are interested in explaining perception of congestion, the proper specification of measures of physical congestion is important. Boat counts were carried out for each of the interview days. Three physical measures of congestion were calculated from the data: boat activity level (number of boats passing count station on interview data), absolute number of boat encounters preceding interview (averages number of boats per hour on interview date cumulated for the hours between starting and interview time) and average boat activity levels during portaging preceding interview (averages number of boats per hour on interview date multiplied by the number of portaging points passed preceding the interview). In order to account for the fact that respondents were interviewed during and not at the end of their trip, we included the hours a respondent was paddling preceding the interview and the total length of the trip in days as additional variables in our statistical analysis.

Boat counts and correction coefficient

Regular counts of the number of boats passing the portaging site at Granzin are carried out by the National Park administration beginning from the year 2000. These boat counts describe relative activity levels at the counting points. Whilst these may be adequate for characterising relative congestion levels, for assessing management options related to regulating boat numbers it is necessary to estimate absolute numbers of boats. The interview survey was used to elucidate use patterns of boaters passing the interview stations. This data was used to calculate a simple correction coefficient for estimating the number of boats associated with observed activity levels at the monitoring point[4].

Data analysis and results

Utilisation levels

Figure 3 illustrates the results of long term monitoring of activity levels at Granzin and our corrected estimate of total number of boats on the paddling trail for the years 2000 to 2003. Peak activity levels are during public holidays in early summer. Generally high, but not peak levels are found throughout the summer holiday month. Absolute numbers of boats on the 23 km paddling trail are estimated to be 550 boats at a maximum. This is equivalent to an average density of 24 canoes per km paddling trail per day. Since approximately 40% of the canoeists paddle both up and downstream on the same day, absolute activity levels along the trail are ca. 20% higher.

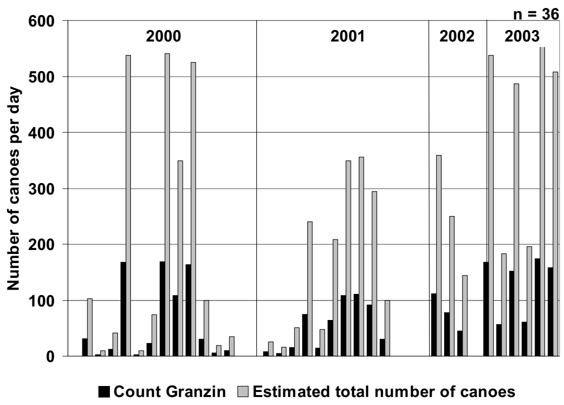

Figure 3. Range of observed activity levels and estimated total number of canoes on the Upper Havel Trail.

Levels and determinants of perceived congestion

We find that negative perception of congestion by visitors at current use levels on the paddling trail is not negligible. The percentage of respondents per interview date, who agreed and strongly agreed to the statement, that there are too many boats on the trail ranges from 30–70%. We tested various possible explanatory variables in a linear regression model to predict perceived congestion as measured with the combined perceived congestion scale. Explanatory variables were excluded stepwise if not significant at the 95% level. In particular, we tested three measures of physical congestion. These were included both as linear and quadratic terms in order to account for possible non-linear effects. Of the three measures, the general boat activity level showed to have the best explanatory effect. We find that the linear term is positive and significant whilst the quadratic term is negative and also significant. This suggests that the probability that a person perceives effects of congestion negatively, rises with higher boat activity levels but not proportionally. Implications of this finding are discussed in more detail below. We further find that variables included to correct for the fact that some respondents were interviewed at the beginning of their trip while others towards the end, have a positive and significant coefficient. These are the duration of paddling preceding the interview and total length of paddling trip in days. This suggests that the longer a person has been on the trail both in terms of time paddling on the interview day and in terms of total days spent on the trail and has thus been able to experience activity levels in tendency increase negative perception of congestion. Another explanatory aspect might be that the more paddling days respondents spend in the Lakes Region, the more likely is that they ascribe importance to quite paddling during their holidays. Negative perception of congestion also increases with size of travelling group. A possible explanation is that larger groups have to wait longer at portaging sites for all boats to pass. Somewhat surprising, negative and significant coefficients were found for membership in a canoe association. A possible explanation could be strategic bias, because restrictions due to crowding are a hotly debated issue in canoe associations. Furthermore, a self-selection of congestion insensitive members might be relevant because the canoe associations advises members not to paddle the trail on extended weekends in spring. Finally, respondents with their own canoe were found to be more congestion sensitive than paddlers who rented their canoe. This is in accordance with our expectation of a higher preference for an undisturbed nature experiences by people who are willing to buy their own canoe.

In a second step, we use our sample of 285 visitors to calculate the predicted level of negative perception associated with congestion on the combined scale over a range of boat activity levels for every respondent. The results, reported as percentage of total sample for which a strong negative perception of congestion is predicted (upper third of the combined scale) are shown in Figure 4[5]. It can be seen that substantial negative perception of congestion commences at activity levels of ca. 50 canoes and continues to rises up to a level of 100 canoes a day, where after negative perceived congestion levels remain constant. We interpret these results to show the empirical distribution of heterogeneous aversion to congestion of visitors to the trail. Our results could possibly be improved if more detailed questions as to the principal sensitivity to congestion, expected congestion and its relevance for choice of trip date would have been included. If a larger sample for maximum use levels were available, differences self selection between dates could be better accommodated for. A larger sample would also enable a separate analysis for different user groups.

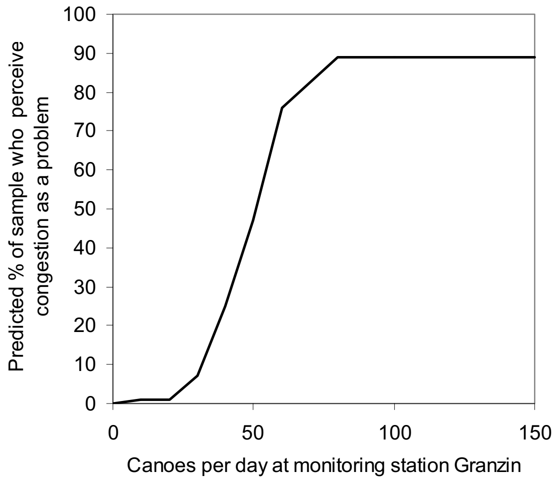

Figure 4. Percentage of sample who perceive congestion as a problem for the different levels of canoe activity at the monitoring point in Granzin as predicted with statistical model.

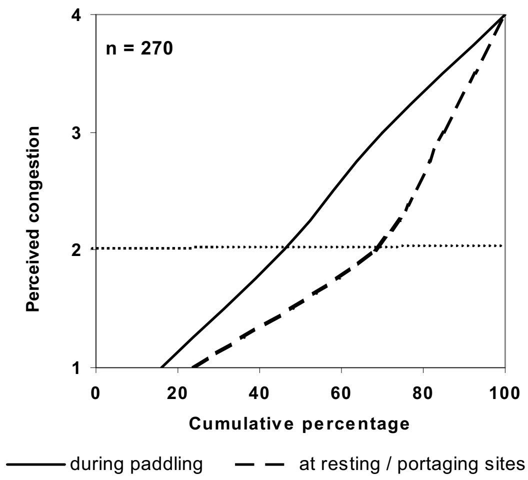

Figure 5. Comparison of perceived congestion during paddling and resting / portaging: fully agree (4) – do not agree at all (1) that there are too many boats.

Improving the efficiency of trail use

Possible management option to deal with congestion problems is to increase the efficiency with which a site can provide recreational benefits by increasing capacity or optimising design of the trail, which results in reductions in congestion while not decreasing demand by any one group. Knowledge of the specific points in a paddling experience, where congestion is most costly can be crucial to the design of the trip routes, resting places and portaging sites.

We tested whether the negative perception of crowding can be traced back to crowding at the resting sites or portaging sites. Resting sites have been deliberately limited by the National Park Authority for conservation reasons. Figure 5 shows the cumulative percentage of responses to the statements on the perception of crowding at the resting/portaging sites and during paddling. Whilst only 45% of the total sample did not perceive a problem with number of canoes encountered during paddling, 70% did not perceive a problem with overcrowded resting/portaging sites. This suggests that limitation of resting sites is not the main issue, and that consequently increasing the capacity by reopening some of the sites would not substantially reduce perceived congestion. Likewise we can not infer that congestion at the portaging sites, which constitute a bottleneck, is the main determinant for perceived congestion. These specific results have to be treated with caution, because we did not specifically ask respondents how often and long they had been resting or how many portaging sites they had passed prior to the interview.

As an further result of our survey, we find that a potentially effective, easy to control management option to reduce activity levels which is not as restrictive as the introduction of a quota would be the restriction of the paddling direction. We found that 40% of the visitors are day trippers who start and stop at the same point. By restricting travel direction to downstream, activity levels could be reduced by 20% without reducing numbers of visitors.

Acceptance of a quota system and willingness-to-pay for user fee

An effective strategy to reduce peak activity levels is the introduction of a quota system. We asked respondents for general acceptance of such an instrument for the Mueritz National Park. We proposed a reduction of peak levels by 30 percent with a pre-booking system and allocation of quotas according on a “first come, first serve” basis. Its was explained that the implementation of the system would reduce the probability of being able to go on popular weekends. However, provided that canoeists book early enough, they could enjoy a less congested paddling trial. Herewith, we attempted to make clear the trade-off between the reduced probability of obtaining a quota and the increased enjoyment of the paddling route. In total 29 % of the respondents were willing to accept the introduction of a quota system. We use a logistic regression to determine factors influencing acceptance. As expected, we find that negative perception of congestion has a positive effect on acceptance. In other words, congestion sensitive paddlers are more likely to accept the implementation of a quota system. We also find that first time visitors, who constitute 33% of the visitors are more likely to accept a quota system. This is interesting, as it suggests that a quota system would not deter the recruitment of new visitors for the tourism destination. Large groups and frequent paddlers are more likely not to accept a quota system, which can be attributed to the stronger expected impact on their use patterns. Interestingly, we also find that a dummy for the public holiday extended weekend days in our sample has a negative effect on acceptance. This is where crowding is most relevant. We interpret this to be the result of a self selection effect. We assume that visitors on this date expect high use levels, may also find these too high, but prefer to continue to have a free choice of when to go.

Respondents were further asked how high their willingness to pay for a user fee to be collected in association with the pre-booking system would be. This fee was explained to be used both for the maintenance of the facilities at current levels and the administration of the pre-booking system. Average willingness to pay was found to be 2.30 € per person, including those reluctant to pay with a WTP of 0 €6.

Setting user fee levels and compensating losses to boat rentals via increased rental prices

The travel cost method was employed to assess the effects of different user fee levels in the context of the introduction of a quota system. We analysed two possible mechanisms for setting user fee prices levels. In the first case, we where interested in assessing potential demand effects of setting differential user fees for peak season weekends and off season/weekdays. In the second case, we were interested in a quota system, in which a certain proportion or all of the quota is allocated to boat rentals, who may thus be put into a position to compensate for a reduction in boat capacity through charging higher rental prices.

We did not ask respondents directly for effects of changes entry prices on visitation rate. Therefore, we used the travel cost model to estimate relative changes in visitation rates that would result from increases in user or boat rental fees. This is based on an interpretation of the travel cost function as a proxy for estimating price elasticity of demand. For this purpose we employ a zonal travel cost model. The zonal TCM demand equation specifies trips per capita from a given zone of origin to a particular site as the dependant variable. Observed visitation rates are assumed to reflect the desired level of consumption given the travel cost facing the recreationist. Annual visitation rates per 1000 population in our sample were predicted by travel costs for the mean distance from home (14 zones ranging from 8 to 760 km) to the paddling trail. Travel costs were calculated on the plausible assumption that respondents travel to the area by car. Travel costs were assumed to be 0.10 € per km with an average of two persons per car. We employ a linear regression to estimate a zonal travel cost model following Beal (1995). A double log specification was chosen because model validity and predicted visitors showed best results[7]. All of the estimated coefficients are significant at the 0.05 level and the coefficient on travel cost is of the expected sign.

In a second stage we determine relative changes in visitation levels, by stepwise adding increased entry fess to the travel costs and calculating new visitation rates with the travel cost model. Relative changes of visitation for an increases in entry or user fee from 0 to 50 € per person and trip are presented in Figure 6[8]. It can be inferred, that price elasticity of demand is highest in the range of fee levels from 0–10 € and that a user fee in the range of 20 € per person and trip would lead to an expected reduction of visitation levels by 50 %.

What does this imply for management? When setting user fees an incentive to redistribute visitor flows between peak season weekends and low season weekends may be useful. We estimate that demand may be sensitive already at low levels of user fees between 0 and 10 € per person and day. Whilst relative high user fees at peak times may be useful for a higher cost recovery level, these may lead to additional reduction in low periods, where use levels may be very low. Differential pricing for high and low periods could provide a way to increase acceptance and effect a temporal redistribution of visitor demand.

If the second option, to allocate quota to boat rentals, is realised, we find that the potential to increase boat prices is generally not very high, because demand is relatively price elastic. If a quota is allocated which for example requires a reduction of maximum boats put up for rental from 300 to 150 and assuming a rental price of 25 € per day, an additional ca. 25 € on the remaining canoes per day would have to be charged in order to compensate the loss. We find that demand is sensitive to this level of price change, but that total demand would still be high enough for it to seem realistic to assume such prices could be taken, provided that the predominant share of the quota is allocated to boat rentals and chances to substitute for a private boat is thus low.

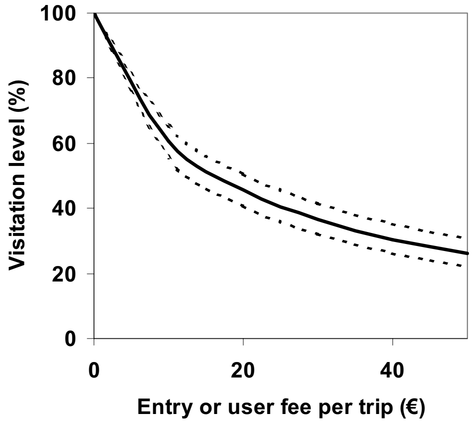

Figure 6. Changes in estimated visitation levels (mean and +/- standard error) for increases in per trip entry prices using the travel cost function (mean trip length of three days).

Summary

Our key result is that a majority of the canoeists in the Mueritz National Park do perceive congestion as a problem. The negative perception of crowding seems to be attributable to the frequency of boat encounters on the lakes and waterways and not to congestion at the resting and queuing at portaging sites. A more detailed analysis of the determinants of perceived congestion (is it the number of boats encountered during paddling, their direction, boats at the portaging sites, at the rest places, during camping?) could allow for more finely tuned management and generate greater net recreational benefits.

We calibrate the resulting statistical model of perception of congestion to the activity levels at the long term visitor monitoring point, so that it can be used to evaluate long term trend data. For visitor management purposes, the interpretation of visitor flow monitoring data can be substantially improved through a systematic combination with interview survey data to elucitate actual visitor use patterns that are the basis for observed activity levels. This is especially the case if monitoring of activity levels is to be used to discuss quotas in terms of absolute visitor numbers.

The simple fact that the majority of canoeists has proven to be congestion sensitive can be interpreted as an argument to reduce the allowed number of boats but an unambiguous and clear standard for the determination of acceptable use levels is still lacking. It is hardly possible to draw concrete conclusions regarding an optimal level of paddlers within the National Park, for which a rigorous economic welfare assessment would be necessary. Here, we clearly see much room for improvement and future research.

Secondly, we analysed several aspects relating to the implementation of a quota system. The implementation of quotas as a visitor management instrument is not very common in Germany because most National Parks are pursuing a "free access" policy since the exclusion of citizens from "their landscape" is a hot political issue. Never the less, quota systems for canoeists have already been implemented (e.g. Ems, Rur, Upper Donau) or are under consideration in several canoe areas in Germany. We find that canoeists' acceptance of a quota system is rather low. In contrast to the low acceptance of quotas, respondents have turned out to be more willing to pay for a user fee and the maintenance of the facilities on the current level.

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[1] We would like to thank the Mueritz National Park Administration for the good cooperation and provision of monitoring data. We further thank the students of Landscape Planning from the Technical University Berlin for carrying out the interviews as part of their course work.

[2] Granzin, Babke, Blankenfoerde, Zwenzow

[3] Cronbach's Alpha is 0,7021.

[4] CANOES = COUNT * $C_{\text{NOT COUNTED}}$ * $C_{\text{DOUBLE COUNTED}}$, where CANOES = total number of boats on the trail on a day, COUNT = number of boats counted at Granzin from 9.00 AM to 18.00 PM, $C_{\text{NOT COUNTED}}$ is a coefficient to correct for canoes not observable at the counting station (estimated value = 3,2) $C_{\text{DOUBLE COUNTED}}$ is a coefficient to correct for double counting due to bi-directional day trips (estimated value = 0,8)

[5] The activity levels are those observed at the monitoring station Granzin.

[6] For comparison: user fees for the Ruhr in the context of a quota system is ca. 3 € per person and day.

[7] Log (Per Capita Visitation Rate) = a + b *Log (Travel Cost) + c* (City)

[8] Taking average trip duration into account the per person and day prices would be ca. 50 % lower then per trip prices.

Development of a Values-based Approach to Managing Recreation on Canadian Crown Lands

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Abstract: A key issue in sustainability is understanding the values of a particular place that are to be conserved. While many of the natural resource values of protected areas are mandated, values associated with public use and recreation are frequently less clearly defined and often hotly contested. Public involvement processes are often used to elicit these values and a number of mostly survey-based approaches have been developed to achieve this. However, theoretical considerations concerning the nature of values and the processes of value formation have brought into question whether survey approaches on their own are the most appropriate way of understanding values.

Consideration of public use and recreation values brings into play many of the issues surrounding place attachment and place identification. People value places because they symbolize something, because they have histories and memories associated with them, because they are interwoven in the stories we tell our self and others about who we are, and because they are rhetorical methods of making arguments for managing a place in one way or another. These ideas center on 'meaning-based" rather than "information processing" models of value formation. In this context, values are seen as discursive constructions, which are continuously being contested and reconstructed through political dialogue.

It is argued that a 'meaning-based' approach to value formation is better suited to the developing models of collaborative planning than are the expert-driven, rational decision-making models that have dominated natural area planning. This paper describes a planning approach, which seeks to combine both interpretive approaches to data collection (narratives and value mapping) and survey methods in the elicitation of values attached to a working forest. A process will be detailed that links the characteristics of an area with the spatial distribution of values ascribed to the same area utilizing GIS and photo-mosaic representations. The case study area discussed in this paper is the Dog River/Matawin area of North Western Ontario. Application of this approach to forest planning will be discussed.

Introduction

Forests covering almost 50 per cent of the land surface of Canada have played an important role in the development of Canada as a nation, and in the development of its traditions, culture, and history (Myre 1998). Although almost all of the forests in Canada are publicly owned, the majority of harvesting is done under lease agreements with private forestry companies. These agreements allow companies to cut timber but provide no rights to other forest resources (e.g. wildlife, land and water). Moreover, these companies are increasingly required to adhere to conditions relating to protection of the forest environment, wildlife, and Aboriginal heritage.

Prior to the 1970's, timber harvesting was focussed on mature stands without much attention being paid to regeneration or silviculture. However, in the 1980's and 90's a change in policy and legislation evolved culminating in the 1992 National Forest Strategy, which recognized the need to manage forests on the principles of sustainable forest management. This Strategy was endorsed by provincial and territory governments and paved the way for forest companies to develop codes of forest practices based on these principles (Myre 1998). During this same period, in response to increasing public use of forests and demands for involvement in forest planning, there was an increasing realization that forests provided a broader range of values than the purely economic. For example, the Crown Forest Sustainability Act 1994 for Ontario states that Crown Forests are to be managed "to meet social, economic and environmental needs of present and future generations." Consequently, a major challenge in Canada and elsewhere in the world is how to take into account a broad range of social values in the management and planning of 'working' forests (Tindall 2003, Tarrant et al. 2003, Rantala & Primer 2003).

Public Involvement in Resource Planning

In many parts of the world, collaboration with local communities is a requirement of the planning process in natural resource areas and more broadly within a region. Positive advantages of such involvement include the opportunity to capitalize on local knowledge, encourage support for management decisions and improve the quality of decision-making (Shindler & Neburka 1997). Despite the obvious advantages and indeed, the necessity in this modern world, to involve stakeholders in planning situations, such involvement is a complex and often contentious process.

Professional planners trained to rely on science and technical expertise as a basis for decision-making (Lachapelle et al. 2003), are frustrated by the decreased acceptance in the public arena of the resultant management decisions and distrustful of the outcomes of the collaborative process. One major outcome of public involvement has been that it has demonstrated that professionals and lay persons, more often than not, express quite different views as to the values of those places, which are important to the public's work and leisure lives (e.g. Wagner et al. 1998). Hence the challenge for the professionals is to develop more effective and theoretically sound methods for incorporating public value positions into the planning process.

Values

In an environmental context, values have been defined as 'direct and indirect qualities of natural systems that are important to the evaluator' (Satterfield 2001, p. 332). The importance of values lies in the realisation that, many natural resource conflicts are more about values than they are about facts (Yankelovich 1991). For this reason, the call to include a broad range of social values in environmental and natural resource planning has intensified over recent years (e.g. Borrie et al. 2002, McFarlane & Boxall 1999, Brown & Reed 1999, Satterfield 2001).

Philosophical and theoretical differences about how the valuation process occurs are at the root of the problem of incorporating values into the public participation process. Three dominant and divergent perspectives have been recognized: social utility; social cohesiveness; and social discourse (Keuntzel et al. 1997).

The social utility perspective has been used extensively in natural resource management and is based on the view of valuation as rational, goal-directed behaviour. This perspective underlies widely used recreation planning frameworks such as the Recreation Opportunity Spectrum (ROS) that links motivations for participation in recreation experiences to the achievement of desired and valued benefits for the individual and society (Driver et al. 1991). Neo-classical economic approaches including 'cost-benefit analysis', 'contingent valuation', and 'willingness to pay' that attempt to reduce all values to single monetary unit are further examples of the social utility perspective. Despite widespread criticism (e.g. Milbrath 1984, Bengston 1993, Keuntzal 2000), the social utility perspective persists as a dominant force in decision-making in the development of forestry policy (O'Brien 2003).

Social cohesiveness, on the other hand, views values as objects that exist within society as shared entities and individuals ascribe to various values based on their membership of certain groups (Parsons 1951). In effect, values act as a constraining force in societies and serve to maintain order and cohesiveness in an increasingly complex and confusing world.

Both of these perspectives have emphasized the empirical identification of values either as benefits, recreation preferences, or monetary units as in the case of the social utility perspective or as normative systems (e.g. Rokeach 1973) as perceived through the lens of social cohesiveness.

The third and more recent view, following Giddens (1984), is the social discourse perspective, which is somewhat similar to that of social cohesiveness, in that, values are seen as an integral part of the structures and institutions of societies. However, the former argues that values are more contextual, and much less stable and universally accepted than envisaged in the social cohesiveness perspective. Instead, social discourse emphasizes that, while people embrace the values of society, they are also instrumental in constructing and reconstructing them through everyday social interactions (Keuntzal 2000). Hence, the values expressed by people may depend on who is asked, when and under what circumstances.

We would suggest that this perspective implies that in any discussion on the preferred management options for a particular forest, all three of these value perspectives are in operation (Figure 1).

The legislative imperatives (e.g. the Crown Forest Sustainability Act 1994) would form a socially agreed framework nonetheless open to multiple interpretations. It has also been suggested (Keuntzel 1996) that natural resource professionals are not neutral mediators in natural resource planning but are, instead, active participants who use their disciplinary frameworks and personal biases to influence

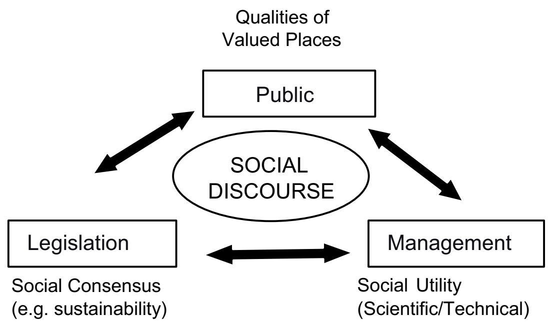

Figure 1. Social Discourse in Resource Management.

the agenda and direct the process of public debate. Hence, managers are viewed as perceiving the planning process through the lens of a scientific, technical value system (Cortner & Moote 1999) using supply-driven models such as the Recreation Opportunity Spectrum (ROS). Finally, the various publics would express preferences based on the direct or indirect qualities of valued places.

This suggests that natural resource planning is at its center "an intrinsically political process involving community deliberation and struggle" (Lachapelle et al. 2003, p. 475) over differing value positions about specific places.

Forest Values

Many studies both in North America and overseas have focused on exploring the values that the public attach to forests. Traditionally, these values have been studied by requesting participants to respond to survey items developed through literature reviews (e.g. Manning et al. 1999), expert panels (e.g. Bright et al. 2000) and focus groups (e.g. Shields et al. 2002). This research has resulted in the recognition of various value positions.

Xu and Bengston (1997) from a content analysis of news media reports on forest management, planning and policy identified four distinct forest value orientations related to the US National Forests (i.e. economic/utilitarian, life support, aesthetic and moral spiritual). Manning et al. (1998) applied a survey instrument based on 11 value positions comprising historical/cultural, aesthetic, ecological, recreation, education, moral/ethical, therapeutic, scientific, intellectual, spiritual, and economic. In Australia, the Social Assessment Report (Commonwealth of Australia, 1998 in Ananda & Herath 2003) recognised economic, social and cultural, historic, aesthetic, environmental, recreation and education values.

It has been demonstrated that forest value orientations are influenced by a variety of factors (Steel et al. 1994) including socio-demographics (e.g. age, gender, education and place of residence), self or group interest (e.g. membership of environmental organisations) and political affiliation. Significant differences in value orientations have also been noted between the public and government and industry foresters (Wagner et al. 1998) and gradual change in both public values and those of forest professionals with time have been proposed (Bengston et al. forthcoming).

In general, the research suggests that we know a lot about broadly defined forest values, and about the societal factors that influence them. We know that these values have shifted from a utilitarian to a more biocentric orientation over the last 10 years and that this change is evident both in forest professionals and the general public. There is evidence also to suggest that, at least in the USA, management is leading this trend (Steel et al. 1994). Although this research is useful in informing large-scale policy development in forest management, it is essentially too general and de-contextualised to be applicable in the specific place-based conflicts that characterise much of forest planning.

Place Meanings and Forest Values

Place-based approaches to natural resource planning are attracting increased attention in many parts of the world, especially in the context of ecosystem management (Galliano & Loeffler 1999, Williams & Stewart 1998, Williams & Patterson 1996, Mitchellet al. 1993) and in the adoption of community-based collaborative partnerships in forest management (Oglethorpe 2002). This renewed interest in place and increased emphasis on collaborative processes indicate a move away from 'one-suit-fit-all' planning models that have dominated natural resource planning in recent times. It recognizes the strong bonds that people develop with natural places and the need that they have to be involved in influencing the future direction of change in places they value.

Central to the understanding of a place-based approach to planning is the realisation that:

> natural resource politics is as much about contest over place meanings as it is competition over the allocation and distribution of scarce resources among interest groups (Cheng, Kruger & Daniels 2002, p. 98).

'Place meanings' encompass values attached to natural places (e.g. utilitarian, belonging, beauty, spirituality etc.). Forests or specific sites within them are seen as socially constructed 'landscapes that are multi-faceted, complex and saturated with meaning' (Cheng et al. 2002, p. 90). Planning therefore becomes a social process of negotiating consensus among the variety of place-meanings that are assigned by resource professionals, individuals and groups to particular places.

Place-meanings are bound up with individual and group identity. The values expressed by individuals with regard to specific places may represent strongly held individual attachments or reflect shifting group allegiances. Thus stereotypical labelling of people conventionally applied in resource planning situations (e.g. 'environmentalist' or 'logger') may not necessarily be reliable indicators of the value positions adopted by them. For example, Brandenburg and Carroll (1995, p. 391) found that in the public planning of a watershed 'it was the experience of place instead of common group values that appeared to shape their environmental values'.

The contingent, negotiated and shifting nature of place meanings makes elicitation of values difficult and suggests the need to employ interpretive, rather than, or as well as, survey approaches in data collection. For example, Satterfield (2002), in the context of environmental values, has suggested that personal, place-based narratives may be a particularly useful data source:

> values may be more commonly embedded, in… our everyday impassioned and storied talk about nature and meaning. Perhaps… it is only through such talk that we can elicit values that belong to this philosophic-spiritual-affective realm (p. 335).

Following Satterfield (2002) and Cheng et al. (2002) the study reported in this paper uses a number of interpretive approaches including, narratives, mapping, photography and diaries to uncover the values that are attached to specific places within a working forest in Canada. Value statements derived from the analyses of the interpretive data were included in a survey instrument that was used for a broader community-based assessment of value positions.

Study Area

The Dog River-Matawin is a working forest in North Western Ontario that forms an important outdoor recreation resource for the adjacent communities of Thunder Bay, Atikokan and Ignace. Refer to Yuan et al. (2004) for details of the study area. This paper discusses the values elicitation process used in the development of the Spatial Recreation Planning Model. The essence of this model is the integration of supply (roads, topography including water bodies and a Recreation Opportunity Spectrum plan), and demand (valued places derived from users) with the Forest Management Plan using GIS technology to develop a decision-making framework that embodies recreation as a key component in the overall forest planning process. A central feature of this approach is the production of a three-dimensional, interactive, system that can visually represent the forest at different times and under the influence of differing silvicultural regimes (Yuan et al. 1994). This particular paper provides some insights into the strategies for values elicitation and discusses preliminary results of this process and the values survey developed from it.

Values Elicitation

Three phases of data collection were used to elicit values from users of the study area: Focus groups and mapping exercise; in-trip photography and photo-logs; and daily diaries.

Focus Groups

A series of 11 focus groups were used to elicit special places and the values (qualities) associated with these places within the Dog River-Matawin. Participants were encouraged to reminisce and recount stories about trips to the Dog River-Matawin and to identify and name the places associated with these memories. A group rather than an individual interview format was used because it was thought that the former arrangement would be more stimulating and individuals would 'feed off' the stories of others. All focus groups were recorded and videotaped with the permission of the participants. The recordings were transcribed and analysed for information on special places and the values attached to them. As part of the focus group sessions, participants were asked to mark 'special places' and associated values directly onto 1:50,000 maps of the study area.

Focus groups comprised both special interest groups (hunters, fishers, environmental and tourism NGO's, motorised and non-motorised recreationists, and cottagers) and groups made up of interested community members recruited through a telephone survey. Sessions were conducted in Thunder Bay and also in the communities of Atikokan and Ignace.

Photo-logs

A second phase of data collection involved the use of cameras and photo-logs (Taylor & Schuster 2002) in the Dog River-Matawin in the summer of 2003. Visitors to the area were asked to take photographs during their trips, to record the subject, location, importance and positive or negative effect on her/his experience. Photographs and photo-logs were analysed for expression of values.

Daily Diaries

Participants were asked to record the most memorable event of the day for each day of their trip, the location and the reason why the event was memorable. Statements were entered into a spread- sheet and analysed for value expressions.

All data points derived both from the focus group transcriptions and the mapping exercises, the photo-logs, and diaries were entered into a GIS data-base for subsequent spatial analysis.

Twenty-one value statements derived from analysis of the focus group transcripts were used to develop the questionnaire that was distributed to users of the Dog River-Matawin, residents of Thunder Bay and North Western Ontario, and USA and Canadian tourists passing through the region (Payne et al. 2004).

Focus Group Analysis and Results

The focus group transcripts were open-coded and axial coded (Neumann, 2003) for expression of 'qualities or values that made the Dog River-Matawin a good place to visit'. Seventeen value/quality themes were identified from the focus group transcripts:

- Access[1] (e.g. "go out for a quick fishing trip or quick and easy camping… easy to get to");
- Recreation Experiences (e.g. "I like the variety of (*recreational*) experiences you can get throughout this area");
- Solitude[1] (e.g. "you can have nobody else on a lake if you wanna go that far out to get there")
- Wildlife[1] (e.g. "we came across a group of... loons… like they were playing… that was very special");

– Aesthetics/beauty (e.g. "that's one of the things, the aesthetics that actually brings me back");
– Intergenerational (e.g. "I can take my kids out there and share the same experiences with them that I had with my father");
– Social: friends, family[1] (e.g. "we have our tradition with just, uh, family members that we always go out… we look forward to this every year")
– Exploration/adventure (e.g. "getting to those lakes and seeing those pictographs is so special because their hard to get to");
– History (e.g. "a spearhead... found one… dated back somewhere between 5,00 and 7,000 years… that's something interesting");
– Economic (e.g. "the outfitters opened up some of these areas… because there (*is*) great economic [*value*] to it as well");
– Belonging (e.g. "when we go *back* to places like that [*fishing and hunting spots*], that's like going home");
– Fishing and Hunting (e.g. "when you do hunt… the seriousness and the whole commitment is there then, that you just can't get with... sightseeing or something");
– Education/research (e.g. "Greenwood Lake (*conservation area*) has an educational as well as research value to it. Your first impression is these big trees… then as you study more, you see all kinds of subtle differences");
– Wilderness (e.g. "I think part of the uniqueness of this (*area*) is the pristine wilderness").
– Therapeutic (e.g. " I spend every day with 300 students… go home to my dinky little apartment… here I rejuvenate myself");
– Spiritual (e.g. "such a diverse experience and it (*nature*) changes every time… its familiar but it really isn't");
– Lakes and water (e.g. "drink the water in the lake. That really impresses people from... outside the area because they don't").

The catalogue of values derived in this study, allowing for variation in classification, essentially duplicate those in many other studies (e.g. Manning et al. 1998, Brown & Reed 1999). A key difference in this study, however, is that users have linked these values to specific places on the map of the study area. In this way, particular concentrations of values can delineate specific value clusters. Figure 2 shows a detail from the GIS values map of the Dog River-Matawin in which the density of value points has been mapped. It is evident from this example that, in general, valued places tend to cluster along the margins of the main roads and in and around easily accessible lakes attesting to the strong influence of access in influencing use of the area.

These value clusters can be related to landscape features (roads, lakes), forest treatment sites, ROS designations etc. all of which are inter-linked spatially in a GIS data-base. The value layer is an essential part of the development of the interactive three-dimensional Recreation Planning Model for the Dog River-Matawin (Yuan et al. 2004).

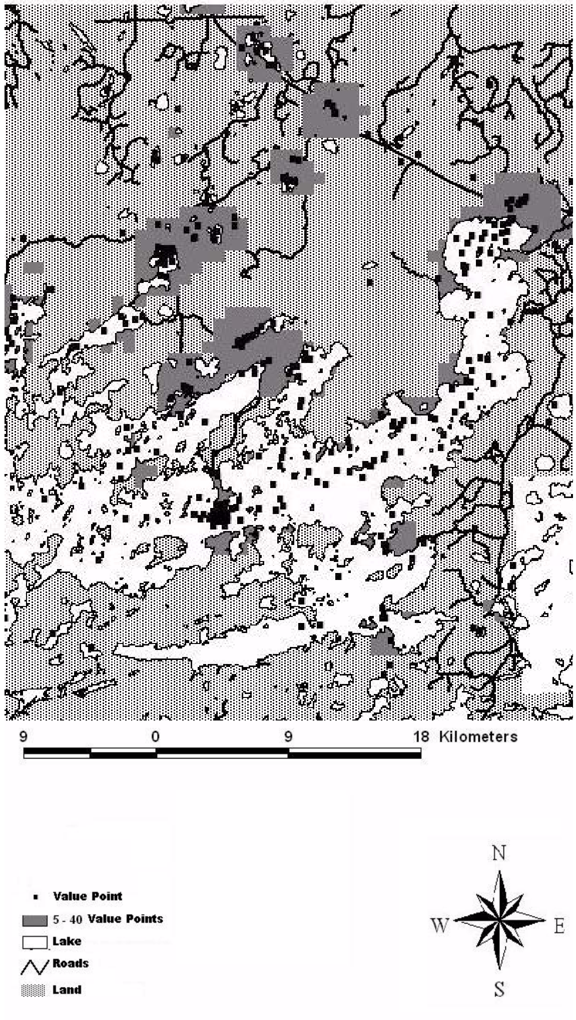

Figure 2. Distribution of Forest Values.

Data from the photo-logs and diaries essentially fitted the classification of values derived from the focus groups and were used mainly to increase the density of specific value sites identified by users.

Survey Analysis and Results

Two measures of value importance were used to assess community forest values of the Dog River-Matawin. The first was a General Forest Values scale that consisted of six general value statements derived from a study of forest values in Northern Ontario. (Hunt & McFarlane 2003). These statements were included in all surveys. Refer Payne et al. (2004) in for details of the survey administration.

A second Forest Values Scale was compiled from verbatim statements addressing the main themes derived from the analysis of the focus group transcripts that aimed at examining the importance of these value expressions to a broader constituency

(N= 487) including a more diverse local community sample, USA residents and visitors from elsewhere in Canada.

General Forest Values

On the General Forest Values Scale the mean scores of the various items (Table 1) on a five-point scale of importance indicate that the bequest value is highest with a mean score of 4.56 and has the lowest standard deviation (0.65) indicating a high level of agreement among respondents. Economic and Recreation values are rated as very important with mean scores of 4.05 and 4.03 respectively and standard deviations of approximately 0.9. The statement "forests have a right to exist for their own sake" was rated at 3.86 just below very important but there was a greater spread in opinion, as indicated by the standard deviation of 1.11. Meeting human needs and the spiritual values of forests were rated lowest but again demonstrated wider ranges of opinion among respondents. In general, it appears that the overall evaluation of the Dog River-Matawin is anthropocentric with intrinsic and spiritual values being rated as relatively less important.

Forest Values Scale

The Forest Values Scale comprised 21 verbatim quotes derived from the focus group transcripts and the six items from the Ontario wide survey of forest values (Hunt & McFarlane 2003). A five-point scale of importance was used varying from 1= Not Important to 5= Extremely Important.

A Principal Components Factor Analysis (SPSS 10) with Varimax Rotation produced six factors with eigenvalues greater than 1.00 (Table 2) that explained almost 60 per cent of the variance. All items with factor loadings in excess of 0.5 were included in the solution. As a result of this, four items were dropped from the final solution (intrinsic, meeting human needs, social others, and valuable and uncommon wildlife). The 'access' item (good road access for quick camping and fishing) loaded almost equally on Factors 3 and 5.

Factor 1 attests to the wide range of values provided by the Dog River-Matawin including: spiritual, learning, historical and belonging as well as economic values. A sense of wilderness, low visitor density and solitude are the key characteristics of Factor 2. Motorised consumptive recreation notably hunting and fishing characterise the third factor along with a sense of camaraderie and access. Factor 4 focuses on the waters and lakes of the region and the importance of family recreation and the bequest value of the forest. The linkage between 'bequest' and 'family' is notable given the importance expressed in the focus groups about intergenerational sharing of recreational experiences. Factor 5 focuses on recreation diversity including motorised access and an appreciation of forestry activities. The final factor links tourism with adventure and the diversity of wildlife.

Table 1. Mean Scores of General Forest Values (N= 3,197).

General Forest Value Statements	Mean	Stdev
Forests are maintained for future generations to enjoy	4.56	0.65
Forests contribute to economic stability in local communities	4.05	0.91
Forests provide a diversity of recreation opportunities	4.03	0.90
Forests have a right to exist for their own sake	3.86	1.11
Forests meet human needs	3.79	1.00
Forests are sacred	3.47	1.27

Table 2. Factor Analysis of Value Items.

Item	1	2	3	4	5	6
sacred*	.73					
learning	.68					
history	.65					
economic*	.65					
belonging	.57					
variety values	.57					
wilderness		.78				
uncrowded		.75				
solitude		.68				
exploration		.62				
fishing/hunting			.77			
social friends			.65			
logging roads			.61			
clean water				.62		
beautiful lakes				.58		
bequest*				.55		
social family				.54		
forestry					.67	
recreation*					.64	
access			.53		.55	
adventure						.67
eco-tourism						.57
wildlife						.52
Eigenvalues	8.3	2.6	1.8	1.2	1.1	1.0
% Variance	30.9	9.6	6.5	4.6	4.1	3.8
Cumulative %	30.9	41	47	51	55	60

* (Hunt & McFarlane 2003)

Analysis of the relative importance of the various factors indicates that all the value groupings are important (Table 3). However, three main groups are

Table 3. Mean Forest Values (N= 558).

Forest Values	Mean	Stdev
Lakes/Family Recreation/Bequest	4.38	0.58
Wilderness/Solitude	4.02	0.74
Adventure/**Ecotourism**/Wildlife	3.69	0.82
Fishing/Hunting/Friends social/Access	3.59	0.88
Multiple Values (spirituality, learning, culture, belonging and management goals)	3.43	0.79
Recreation Diversity and access	3.36	0.85

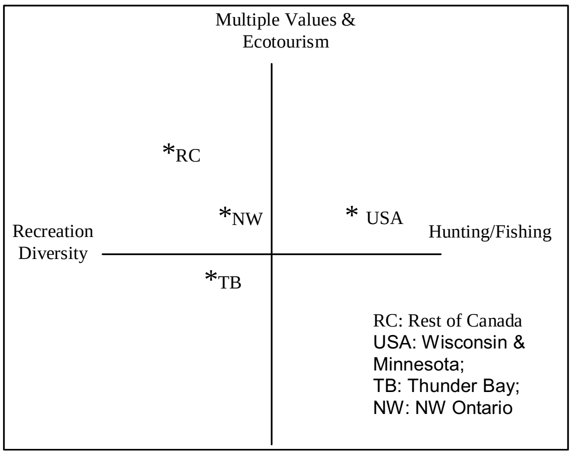

Figure 3. Schematic of Forest Values by Region.

evident. The most important values are those associated with lakes, family recreation and bequest with wilderness/solitude values being of slightly less importance. Ecotourism, and fishing and hunting form the second group in importance and multiple values and recreation diversity is the third group.

At the more specific level, lakes as a focus for family recreation and wilderness/solitude are the main values of the Dog River-Matawin combined with the desire that these assets be sustained for future generations to enjoy. Consumptive recreation and tourism opportunities are of relatively less importance. Diversity in both values and recreation opportunities while still important are the lowest rated of all.

Regional Variation in Forest Values

The Discriminant Analysis procedure (SPSS 10) with region (USA, North Western Ontario, Thunder Bay and the Rest of Canada) as the group and Forest Values (Table 3) as the discriminant variables respectively was used to explore the regional variation in importance of the Forest Values.

Three significant discriminant functions resulted from this analysis (Table 4). Function 1 rated 'Fishing/Hunting etc.' as important and 'Recreation Diversity' as relatively less important. 'Ecotourism etc.' and 'Multiple Values' were rated as important in Function 2. However, Function 3, which focused on 'Lakes etc.' barely reached significance attesting to the generally high rating of this particular Forest Value.

Residents of the USA rated consumptive recreation (fishing and hunting) higher than Canadians (Figure 3). Among Canadians, residents of North Western Ontario and Thunder Bay place greater importance on this type of recreation than do residents of the "Rest of Canada" who rate 'Recreation Diversity' higher than any of the other regions. Overall, this pattern exemplifies differences in local versus more distant valuations evident in many forest value studies (e.g. Robson et al. 2000), with locals being more focused on consumptive recreational pursuits. It is also evident that, in this regard, at least, residents of the USA can be considered as 'locals'.

Table 4. Discriminant Analysis Region by Forest Values.

Discriminant Functions	Chi-square	df	% Variance	Sig
Function 1	86.8	18	72.9	.001
Function 2	24.5	10	16.6	.006
Function 3	9.5	4	10.5	.049

Significantly, the most immediate users (Thunder Bay residents) appear to rate 'Ecotourism etc.' and 'Multiple Values' as least important. Perhaps reflecting their emphasis, as local stakeholders resident in a forest industry dependent city, on consumptive uses of forests (Steel et al. 1993). North Western Ontario and USA residents occupy an intermediate position and the Rest of Canada view these particular values of Forests highest of all the regions.

Discussion and Conclusions

Research cited in this paper indicates that citizens believe increasingly that public lands, including working forests, should provide a broad range of benefits and that management of these forests needs to reflect this belief. Although this has been recognised for some considerable time, public land planning agencies are struggling to respond to this expectation. We have argued that there are a number of reasons for this

First, public land planning is fundamentally a discourse centring on differing value positions regarding the best use of public lands or specific sites within those lands. Second, current planning processes in working forests, which purport to be scientific, objective, and expert-driven, attempt reluctantly, if at all, to incorporate public values in decision-making. Third, such systems require significant expertise on the part of lay-persons if they are to be appropriately involved in influencing the effect of forest operations in places they value. The sum total of these effects is to disempower significant numbers of stakeholders and to create alienation from and cynicism about the products of such plans.

Hence, if managers are to respond realistically to public expectations, they must:

– recognise that the nature of public planning is such that scientific, objective, expertise is only one of the data sources that inform the planning process
– explore methods that incorporate a broader range of data inputs including place, place meanings, and values
– experiment with technologies that make the outcomes of forest practices more transparent and accessible to affected publics.

Specifically, this paper has demonstrated that interpretive procedures including focus groups, narratives, user-generated maps, photography, and diaries can provide user-defined, site-specific values. These data, utilising GIS technology, can be rendered as a spatial representation of the meanings assigned to specific places in a working forest, which can then be integrated visually with resource characteristics and forest practices to identify those places where conflicts of values are most likely to occur.

Data from the focus groups were used to develop a survey instrument that was distributed to a broad range of visitors to North Western Ontario and throughout communities adjacent to the Dog River Matawin Forest. Analyses of these data revealed significant differences between various stakeholder groups including US citizens, North Western Ontario communities, and visitors from elsewhere in Canada.

This paper has detailed a process for eliciting the location and character of valued places within a working forest. In common with others in many parts of the world, we have demonstrated that working forests have the potential to provide a broad spectrum of recreational opportunities that are highly valued by both neighbouring and more distant communities. However, while these data are well documented in the literature, few studies have explored ways in which valued places can be located and incorporated realistically into the forest planning process. This paper and others in these proceedings (Yuan et al. 2004, Payne et al. 2004) provide a significant step towards this ultimate goal.

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[1] Two items in Values Scale to represent different facets of the theme.

The Public Functions of Parks and Protected Areas

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Abstract: Establishing and managing protected areas throughout the world usually have been considered a governmental function. However, recent conservative political thinking in many developed countries has challenged the role of the public sector on all fronts. In Australia, Britain, Canada, and the United States, government has been seen as a problem, while private enterprise is presented as the solution. Advocates of privatization argue that park services can be provided more efficiently under private management, and that the areas themselves will be better protected for future generations. Unfortunately, such a policy can foster elitism by preserving the benefits of parks and protected areas for the wealthy while ignoring the growing social inequality in many of these countries. In this paper, I examine the concepts that underlie privatization efforts, particularly economic efficiency. I suggest that there is a need to examine the different functions that parks and protected areas serve, and to ask if each function helps to differentiate between public and private. I argue that, in the final analysis, equality of access is the primary function of public-sector management of parks and that we need to examine our policies and practices to ensure that park benefits are distributed fairly throughout society.

Introduction

The United States established its first national parks In the late 19th century. It was an idea that spread quickly, eventually leading to the development of a worldwide network of parks and protected areas. In western nations, the growth of this network was fostered by a progressive era ideology that dominated political thinking from the late 19th century to the middle of the 20th century. A primary characteristic of progressive ideology was a belief in the power and efficacy of government in all realms of life; an activist government was considered a positive force in molding the welfare of its citizenry. Parks in particular were considered to be a public function; their provision was one way in which governments could act to improve the lives and lots of ordinary citizens. As Robert Moses, New York's commissioner of Parks from 1934 to 1960, put it: “To argue for parks is to be on the side of the angels.” (Caro 1975). Although private parks have always existed, and some wealthy individuals and private corporations have always had large landholdings, the reservation, protection and management of the vast majority of the world’s wild lands and unique sites generally was considered to be a governmental (i.e., public) function lying well beyond the power of most individuals.

In the late 20th century, however, progressive era faith in the ability of governments to solve problems eroded. Globalization, immigration, and increasing levels of social inequality led to the development of a new neo-conservative ideology (Cassidy 1995), while the collapse of Communism bolstered the case for market-driven economies. The public sector was seen as an inhibition on individual development, stifling initiative and creating needless bureaucracy. This new ideology, perhaps best symbolized by Margaret Thatcher in Britain and Ronald Reagan in the United States, emphasized the sanctity of the individual and his/her place in the market. Both business and governments began shifting responsibility to individuals, and the doctrine of market-based efficiency became paramount. Governments, it was argued, were inefficient and taxation was iniquitous, while business was efficient because it had to respond to market forces.

This shift in thinking had a profound impact throughout the public sector, including parks and protected areas. Parks and park agencies were easy targets for budget cutters (Morton 1997). Maintenance declined even as demand increased, and agencies' abilities to protect and manage additional lands were stretched. To adapt, many public agencies tried to become more business-like. Downsizing, outsourcing of functions, and even full privatization became common. Public agencies adopted marketing techniques, wrote business plans, and sought to generate revenues through fee collection, partnerships with private business, and philanthropic contributions. Some state/provincial governments even contemplated park closure.

These trends are ongoing and, at present, conservative thinking in many western developed nations reflects the belief that public lands in general, and parks in particular, can be most effectively administered and maintained by market-driven private enterprise rather than the public sector (e.g., Leal & Fretwell 1997). To understand the changes that such thinking implies, we need to understand the assumptions that underlie it and the probable consequences that attend such a shift. We also need to enquire about the basis for the public sector and how public sector management differs from private sector management. Finally, if we are to retain a public sector role in the provision of park and protected area services, then we need to articulate a philosophy of the value of the public sector and public sector management. It is to these questions that this paper is devoted.

Efficiency vs. Equality

The concept of economic efficiency is a central tenet in the debate over public vs. private. As the term is used by economists, efficiency is concerned with achieving an optimal allocation of scarce resources. With most goods and services, this is accomplished through markets where supply and demand are balanced in a complex system of pricing that sends signals to both producers and consumers. In fact, the market is said to be efficient because it balances supply and demand. For example, if a particular good or service costs $20, you, as a consumer, will either buy it or not, based upon its value to you. Your decision, along with those of many others, signals the producer to make more, to raise or lower the price, and so forth. In this way, supply and demand are effectively balanced in the long run to achieve an optimum (efficient) allocation of resources.

Economic value is at the core of efficiency. Goods and services have value because they help people fulfill various goals and desires; for example, a shirt provides its wearer with warmth and style, while parks enable people to fulfill less tangible goals. To an economist, value is captured by a person's willingness to pay; presumably, the more important the goal, the more someone will be willing to pay to obtain the good or service. With limited resources, people must make choices, allocating their resources to the goods and services most important to them. In this way, the consumer is sovereign and the market ensures that scarce goods and services are allocated efficiently to those who value them most – who are most willing to pay. But, when government (the public sector) subsidize goods and services, the pricing system cannot operate and the resulting resource allocation becomes inefficient.

To illustrate, suppose two families want to visit a day-use park. To the first family, the visit is important, so they're willing to pay $25 for it – the value they place upon it. To the second family, the experience is worth only $10. If the price is set at $15, then the first family will participate, while the second family will choose an alternative activity. This ensures the park would be used only by families like the first – those who value it significantly. But if the government subsidizes the park, providing it at little or no cost, then both families will participate often, leading to overcrowding, site deterioration, and other undesirable consequences (Rosenthal et al. 1984). In this way, efficiency theorists argue that government interference in private markets creates inefficiencies that make everyone worse off. Privatization, they argue, is the solution and will make both the people and the lands better off. In the absence of immediate privatization, they encourage agencies to adopt the techniques and strategies of the private sector.

Unfortunately, in emphasizing people's willingness to pay, economic efficiency fails to consider differences in their *ability* to pay. Of necessity, a person's willingness to pay for something must be a function of their ability to pay for it, and in the past half-century, many western nations have experienced rapidly growing social inequality (Hurst 1998). In the United States, for example, the year of greatest income equality was 1968 (Jones & Weinberg 2000). From 1973 to 1993, income levels for the bottom 40% of American families declined in real terms so that today 85% of America's wealth is controlled by the top 10% of the population (Cassidy 1999). Consequently, it makes little sense to speak of the American middle class. Rather, as Cassidy (1995) puts it, the United States now comprises four economic groups that are suspicious of each other and of the future:

> "At the top is an immensely wealthy elite which has never had it so good. At the bottom is an underclass, which is increasingly divorced from the rest of society. And in between these extremes there are, instead of a unified middle class, two distinct groups: an upper echelon of highly skilled, highly educated professionals who are doing pretty well, and a vast swath of unskilled and semi-skilled workers who are experiencing falling wages, stagnant or declining living standards, and increased economic uncertainty." (Cassidy 1995, p. 18).

While the discontent sowed by these divisions provided fertile ground for the growth of the neo-conservative movement, there is also a growing recognition of the importance of equality. In 1975, Arthur Okun, a Nobel Laureate economist, pointed out that efficiency exists as a tradeoff with equality (Okun 1975): You can treat people efficiently or you can treat them equally, but you cannot do both at once. Okun suggests that efficiency emphasizes the differences between people while equality emphasizes their similarity. In the U. S., recent history has emphasized efficiency and individuality. However, equality also has a long-standing history, both generally in the area of human rights, and specifically in public land policy. In the 19th century, for example, Frederick Law Olmstead resisted the apologists of the aristocracy who believed that working people were incapable of appreciating or being improved by natural scenery. Rather, Olmstead believed that parks were important to democracy itself and that all people should have access (Sax 1981). This theme continued in the 20th century as romantic preservationism gave way to a concern for more active recreation. To many, public lands and public parks still represent Olmstead's ideal of equality; they are the great Commons where all people are equal, where you and I both have comparable shares and comparable rights. Unfortunately, this ideal is vitiated by the growing emphasis on economic efficiency in public land allocation (More & Stevens 2000). To understand the balance between efficiency and equality, we need to look more closely at the public and its origins and interests.

The Public and Its Interest

Why do we have "public" parks and protected areas? What does it mean for something to be a "public" resource? The American pragmatist philosopher John Dewey traced the origins of the public to the consequences of acts (Dewey 1927). In Dewey's view, all acts have consequences. When an act's consequences affect only those individuals who perform it, then the act is inherently private. So, if two people have a discussion or make an exchange, their action is private if nobody else is affected. However, most actions and transactions have external consequences that affect others, often in non-obvious ways. For example, as Adam Smith originally pointed out in *The Wealth of Nations*, we all have a better breakfast because of the principally private transactions of farmers, grocers, and butchers all acting in their own self-interest. Dewey recognizes that such private transactions have a social component because they do influence others beyond the immediate participants; many private acts are social in that their consequences contribute to the welfare of the community. According to Dewey:

> "The line between public and private is to be drawn on the basis of extent and scope of the consequences of acts which are so important as to need control, whether by inhibition or promotion. The public consists of all those who are affected by the indirect consequences of transactions to such an extent that it is necessary to have their interests systematically cared for. Officials are those who take care of the interests thus affected." (Dewey 1927, p. 15).

In sum, the public sector intervenes only when there are negative impacts that are sufficiently important to require control, or when the market fails to produce enough of a positive good so that government action is required to enhance production. Parks and protected areas obviously fall into the latter category. The key point is that government's task is to do what the private sector either cannot or will not. And in societies with substantial social inequality, the social distribution of benefits is central to the public interest. For example, we have public schools, public libraries, and public health clinics because we believe that all children should receive at least some education, that it is desirable to encourage the distribution of books and other educational material, and that low-income people should have access to at least minimal healthcare. Almost certainly these goals would not be accomplished if we relied solely on private markets. In the past, public parks and recreation have been cast in the same mold (More 2002). For example, public playgrounds were created because the mothers of the playground movement wanted safe, stimulating, educational spaces that would keep children off the streets and they recognized that government action was required to achieve these goals (Cranz 1982, Taylor 1999). Similarly, the U.S. established public campgrounds to encourage citizens to explore America and its natural and cultural history.

The view of parks as public goods has been attacked by those who challenge the idea that recreation is socially necessary and who argue that the private sector could do a better, more efficient job of fulfilling public recreation demand if it did not face public-sector "competition" (see, for example, Beckwith 1981). For example, cities now have many private play spaces, reducing the need for public playgrounds, and the private campground industry is now a very effective supplier of camping experiences. Consequently, we must ask what today's public parks do that is different from what the private sector does. Are there things that a public agency can do that a private business cannot? Are there goals that a public university can accomplish that a private university cannot? Clearly, if the private sector can perform a task well then there is no need to have the public sector take action. What we must do, therefore, is to identify the public functions of parks and protected areas – those benefits that are not, and cannot be, provided by private companies. In other words, we must identify why and for who markets fail to understand when the public sector needs to step in to provide systematic enhancement.

Perhaps the most obvious example of market failure is with unique resources – there is only one Grand Canyon, Uluru, Machu Picchu, or Mt. Kenya. If these were operated privately (or quasi-privately according to market principles), their rarity would drive up the price, excluding low-income people. In standard economics, if the supply of something is limited and the demand is high, the market signals producers to expand production, and demand and supply eventually reach equilibrium. But the Grand Canyon, Uluru, Machu Picchu, and Mt. Kenya are not ordinary manufactured goods – their supply is fixed at one and is impossible to expand in any meaningful sense. The only reasonable alternative is to expand access, which can, in turn, raise a host of capacity questions. The economically efficient solution would be to ration access by pricing. Pricing ensures that access would be allocated to the highest bidders – those most willing to pay. But, unfortunately, even small fees have a significant impact on accessibility (More & Stevens 2000), and to allocate by price is to allocate by social class. Pricing is particularly problematic in countries like Britain, Canada, and the United States, where social inequality is growing rapidly. If the preservation of parks and protected areas has a social objective related to public use, then allocating by price defeats it. If we believe, as did Olmstead and others in the early Progressive Movement, that sites of great natural beauty or cultural significance should be visited by all and not just by the wealthy, then efficiency is not a good criterion to use for allocation. Instead, fairness becomes the appropriate criterion and, following Okun (1975), we can argue that the major reason for public ownership is to allocate our scarce park resources equitably.

In the final analysis, then, we face a value judgment: Are the recreational benefits of parks sufficiently important to warrant their public provision, or should they be provided by the private sector? One major attempt to identify the benefits (functions) of parks and protected areas has come through the benefits research of B. L. Driver and his colleagues (see review by Driver & Bruns 1999). At present, they identify 104 specific types of benefits that research has attributed to leisure. These include 61 personal benefits (wellness, mood change, etc.), 24 social benefits (community satisfaction, social support, etc.) 8 economic benefits, and 12 environmental benefits. Most of these could be claimed as benefits of parks and protected areas as well. The problem is that many of them, if not all, could be created by the private sector with greater economic efficiency than could be achieved by the public sector. Put differently, the various benefits, though legitimate, do not differentiate between public and private. The core of the public/private problem lies not in the production of benefits, but in their distribution. The private sector can produce parks and their benefits, but not in sufficient quantities to meet the needs of a large proportion of the population. This is especially true of unique areas like the Grand Canyon.

The benefits of parks and protected areas extend well beyond recreation and leisure, of course. Robert Manning and his colleagues have identified ten different values served by parks and protected areas (Manning et al. 1999). These include recreation, aesthetics, ecological, therapeutic, economic, scientific/educational, historical/cultural, moral/ethical, spiritual, and intellectual values. Of these, people tend to place primary emphasis on the recreational, aesthetic, and ecological value of parks (Manning & More 2002). Yet other values (e.g., scientific), though not as salient to the public at large, may be equally valid. Again, the key question is whether or not these values could be provided as effectively by the private sector as well as the public.

A third alternative set of functions can potentially be derived from the work on John Rawls (1971). In his monumental *Theory of Justice*, Rawls proposes (but does not develop) a theory of "primary goods." Primary goods are defined as those things that every rational person is presumed to want in order to further his/her rational plan of life. These are of two kinds: natural primary goods are biologically endowed and include health and vigor, intelligence, and imagination, while social primary goods include rights and liberties, powers and opportunities, income and wealth, and self-respect. Parks and protected areas derive their importance from their relationship to the provision of these goods. Parks, for example, may play an important role in the provision of both individuals and public health. As before, however, the question remains if these primary goods could not be provided more efficiently by private firms rather than the public sector.

Conclusion

In addressing the question of public versus private, it is not the benefits of parks and protected areas *per se* that matters, but rather their distribution throughout society. There is mounting evidence that the emphasis on economic efficiency and concomitant privatization supported by the New Right is exclusionary and has already shifted the benefits of public parks and protected areas away from the middle and lower classes toward the elite. While this may create some short-term economic gains, in the longer run such strategies can only be bad for lands and the agencies that manage them, and to love them they must access them. Preservation itself depends on the parks being relevant and important in the everyday lives of people from a broad spectrum of society. Over 20 years ago, Joseph Sax (1981) argued that national parks should be managed to entice people away from their comfortable homes and cars and into the natural world. Policies and programs designed to achieve economic efficiency militate against this goal. When access must be limited to ensure preservation, the appropriate role of the public sector is to guarantee that it is allocated fairly (equitably). If the benefits of parks and protected areas are shifted to the comfortably well off, it is doubtful that they will remain publicly necessary.

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Value based decision making process for strategic visitor management in the Natura 2000 area Lech River Valley, Tyrol

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Abstract: The Lech valley with the river Lech and its tributaries is an alpine river valley in Austria with a considerable amount of naturally free flowing stretches. The ecological and scientific significance of the Natura 2000 area lies in its high biodiversity and the occurrence of numerous internationally endangered species within the dynamic braided river stretches. Apart from that the area contains a high number of recreational and educational values as well. The area, which is situated within day travel distance of the cities Innsbruck and Munich, is renowned for its biking and hiking trails and its unique water sport opportunities. Nevertheless, most intense impact occurs from the daily use of the local population in the densely populated Lech valley area nearby.

Due to its long and narrow shape the protected area is very vulnerable to impacts and therefore, to avoid negative impacts on natural values from recreational use, not only a management plan, but also a visitor strategy has been developed as part of an extensive European Union LIFE funded project. The decision making process for the establishment of the visitor management concept was based on a GIS supported risk analysis: First current ecological and recreational values have been located and assessed. Subsequently hotspots have been defined in areas, where those contrasting values overlay. These hotspots were defined in areas of high ecological vulnerability and high visitor impact from intense recreational use.

This hotspot analysis served as a basis for discussion and co-operation with the local population and stakeholders to agree on management solutions. As a result specific management actions were defined and the allocation of visitor infrastructure was planned accordingly. As a response to the need for more detailed information about recreational uses and users a visitor monitoring concept was included in the visitor strategy as well. This paper describes practical planning policies to highlight the need for strategic planning of recreational use in protected area management based on the comprehensible evaluation of the hazard potential from uses and the vulnerability of ecological values.

Introduction

Area description and project outline

The Natura 2000 area Lech valley of Tyrol (within the political district of Reutte), covers 41 km^2, and contains parts of the river Tiroler Lech including the floodplain areas and its forests, the most significant tributary streams and parts of the bordering montane forest stands (Figure 1). The Natura 2000 area represents an impressive ecosystem with enormous scientific significance and contains important recreational and educational values. The ecological significance of the Tiroler Lech lies in the dynamic power of its water and the occurrence of numerous native plant and animal species including those especially adapted to riverine ecosystems.

In 2001 an extensive European Union LIFE funded project was launched at the Lech River, which includes a total of 53 individual projects. The project aims at conserving and restoring the fairly natural, dynamic fluvial habitats by revitalising both the Lech and its tributary streams. A total of 7.82 million Euros are available in order to carry out the project, which is also to have positive economic impacts on the region.

As part of the LIFE funded project a visitor management concept has been developed in close co-operation with the local population, which builds the basis for this paper about applied visitor management issues and tasks.

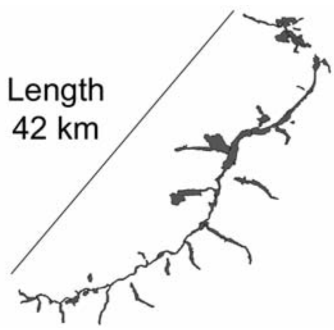

Figure 1. Due to limited space the protected area along the Lech river and its tributaries does not contain buffer zones. Its long and narrow shape makes it more vulnerable to impacts.

Nature conservation tasks

The river Lech represents an important nesting habitat for riparian species. Nowhere can comparable populations of Goosander *Mergus merganser* (which has its most significant occurrence in Austria in Lechtal), the Common Sandpiper *Actitis hypoleucos*, Little Ringed Plover *Charadrius dubius*, Dipper *Cinclus cinclus*, be found. The extensive riparian forests serve as a habitat for numerous bird species of extraordinary diversity compared to other alpine areas.

The Little Ringed Plover's preferred breeding ground is on gravel banks devoid of vegetation. The Common Sandpiper, on the other hand, finds more protection for its nest in the sparse vegetation of pioneer plants. For both species, the Lech is one of the less outstanding remaining breeding grounds in Austria.

The habitat of the grasshopper *Bryodema tuberculata* is to be found at slightly raised places of alpine river gravel banks. Owing to the fact that such places have almost disappeared, this big and beautiful species is today threatened with extinction.

The lady's slipper is one of the rarest and most spectacular orchids. This orchid, classified in Austria as an endangered species, feels most comfortable in the half shaded surroundings of floodplain forests, developing a one to two-flowered inflorescence with large blooms. The distinctive plant with its large, yellow blooms in the shape of a slipper, flowers from May to July. In this time thousands of visitors arrive in the area to see the blooms.

Problem statement

Regional context and recreational use

At the Lech river, as at other rivers in Central Europe, for a long time protection from the water and creation of land were the main focus of the structural water measures that were undertaken. Since having satisfied these needs, different aims have become more and more important today, namely to conserve and re-create a fluvial landscape with a character as close to nature as possible, which offers place for leisure time activities, recreation and the experience of nature.

Due to its long and narrow shape, settlements and business sites are directly bordering the significant protected area. The floodplains and the river bed areas have traditionally been used for recreation by the local people due to easy access from the nearby settlements. Their activities are ranging from sun bathing and children playing on the gravel banks to picnicking and camping in the nearby floodplain forests. Apart from these unofficial uses by local people from adjacent residential areas, there is a very popular officially marked biking and hiking trail that runs along the river bed. Finally, there are kayakers and rafters travelling down the stream and landing on gravel banks.

Therefore, the pressure on the protected area from this variety of uses is generally very high, although there are local differences in the activities and frequencies of visitors (e.g. intensive use of the area around the flooded gravel pit, partly high frequencies on biking trails). Visitor management is difficult to implement due to the shape of the area. Furthermore, the possibilities for providing visitor facilities, which do not cause a disturbance, are restricted because of the many contact points to the river areas.

More or less all floodplains are easily accessible, as there are numerous entrances and foot paths leading in. This also makes effective visitor monitoring difficult to implement. Specific data about the numbers, activities and impact of visitors as a basis for the visitor strategy are lacking.

Taking this into account a visitor monitoring concept has been developed as part of the preparation of the visitor management concept by the Bodenkultur University, Institute for Landscape Architecture and Landscape management (Arnberger 2002).

Due to the increasing popularity of the area, a large potential for the development of tourism is predicted. The Lech river lies within day travel distance of the cities Munich and Innsbruck, which is part of the reason for the variation of visitor frequencies and user groups during a week.

Whereas the use by local people from adjacent residential areas is more evenly spread on weekdays, high user densities occur on weekends from city – dwellers arriving by car. Those getaway visits are often day trips or 2–3 day visits that tend to focus on a specific activity (e.g. biking along the river) or area (e.g. visiting the blooming "Lady's Slipper orchids").

Goals and objectives

The region is interested in triggering regional development and stimulating sustainable tourism and marketing. Nevertheless, there is an increasing pressure on an area that has to be safeguarded as much as possible. So, sustainable and environmentally sound development of tourism and recreational use/infrastructure should be guided by a visitor strategy.

The development of this regional visitor strategy including direct and indirect management actions was the first step to co-ordinate and link management measures in order to maximise their positive effects. The visitor strategy should include:

– Offering improved educational facilities and hiking trails in order to promote a gentle sustainable recreational use
– Areas for experiencing nature and opportunities for locals to use certain areas of the riverbed
– Information strategy (media, folder, panels) and corporate design
– Facilities (educational trails, visitor centre, view points)
– Identification of spatially, temporally flexible especially protected low impact zones within the ecological core zones, on the basis of a conflict analysis and continual observation (max. 10% of the Natura 2000 area)

– Rangers in the field (information, control) and excursions (environmental education)
– Monitoring of the number of visitors, activities and their impact as a basis for effective future visitor management would be highly desirable.

In order to ensure acceptance of the visitor strategy among the local communities close co-operation with regional stakeholders and tourist organisations was a prerequisite for establishing the concept and particularly for defining management measures.

Methods

Value based decision making process

As a basis for the spatial planning of management measures, a GIS supported decision making process has been applied. The methodical approach was based on spatially and technically defining ecological and recreational values within the area in order to be able to analyse current conflicts and to avoid future conflicts that could occur from planning new visitor infrastructure.

First, all available ecological data to represent the current condition of the protected area had been gathered and evaluated. The most significant studies about habitat structure (Cerny 2001) and wildlife (Landmann 2002) were used to build a geographical information map that contains information about the current sensitivity of the protected area. For this purpose the entire area had been covered by a field inventory and subsequently the data were integrated in the map and database.

On the one hand, the database "ecological values" contained information about the value of a biotope type and its structure (Figure 2). On the other hand, information about habitat potential for various bird and mammal species was included. Therefore, the assessment of the sensitivity of a biotope was not exclusively linked to the estimation of its vulnerability to disturbance, but rather on its own ecological value *and* its value as a habitat. Obviously, this sensitivity of a habitat type can differ considerably from the vulnerability of wildlife species living there (e.g. gravel banks severing as nesting sites for sensitive bird species). Hence, first the value of each biotope type was estimated and categorised generally for the entire project area, then the value of each habitat was defined individually by the occurrence of valuable wildlife species within. It was assumed that the occurrence of several endangered wildlife species made an area more sensitive to impact than none or one. Furthermore, it was considered that open areas without buffers are more susceptible to impact.

Subsequently, the recreational infrastructure (hiking, biking, mountain-biking trails, cross-country skiing, parking lots) and unofficial uses (picnic, barbecue, rafting and kayak, foot paths leading to the river banks) have been mapped in detail (Figure 3), assessed and categorised according to their impact. In accordance to relevant literature the impact for the uses had been defined as follows (Schneider-Jacoby 2001, Reichholf 2001, Walls 1999, Yalden 1990):

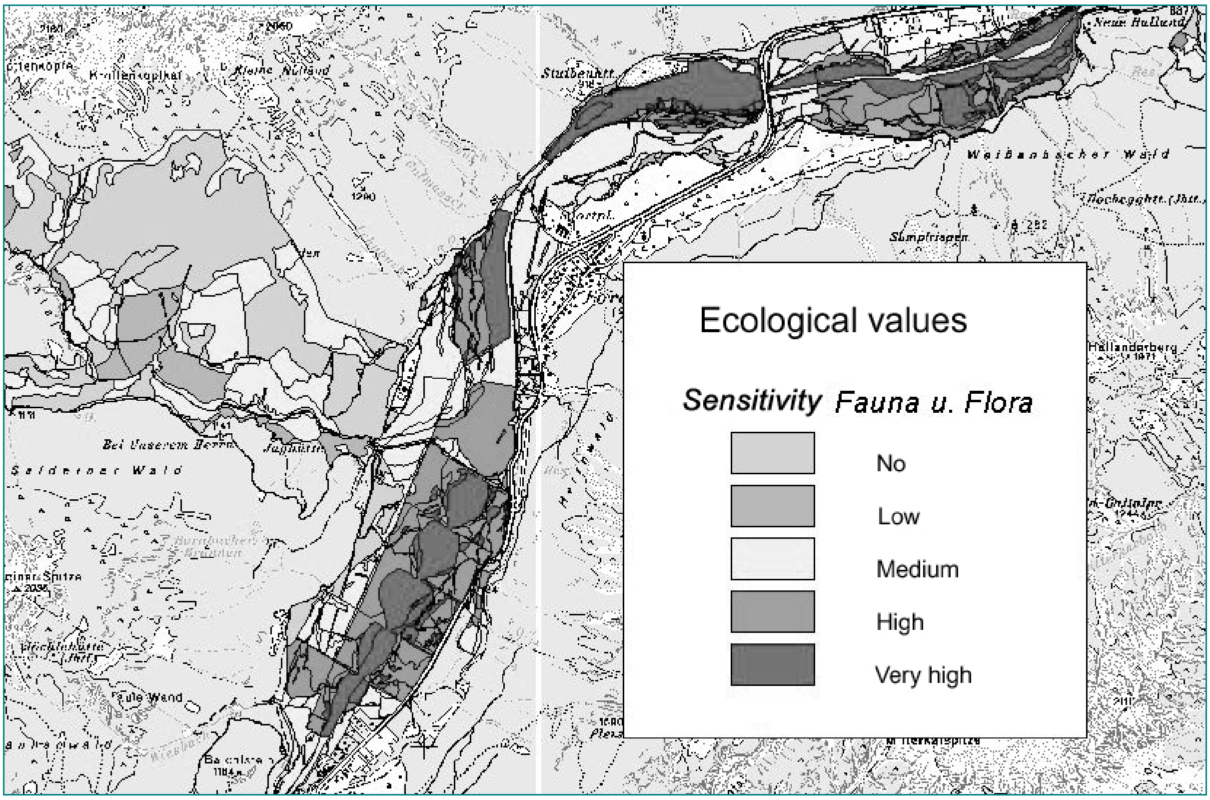

Figure 2. The map shows the high ecological value of the free flowing stretch of the river Lech with its sinuous water channels and highly variable flows.

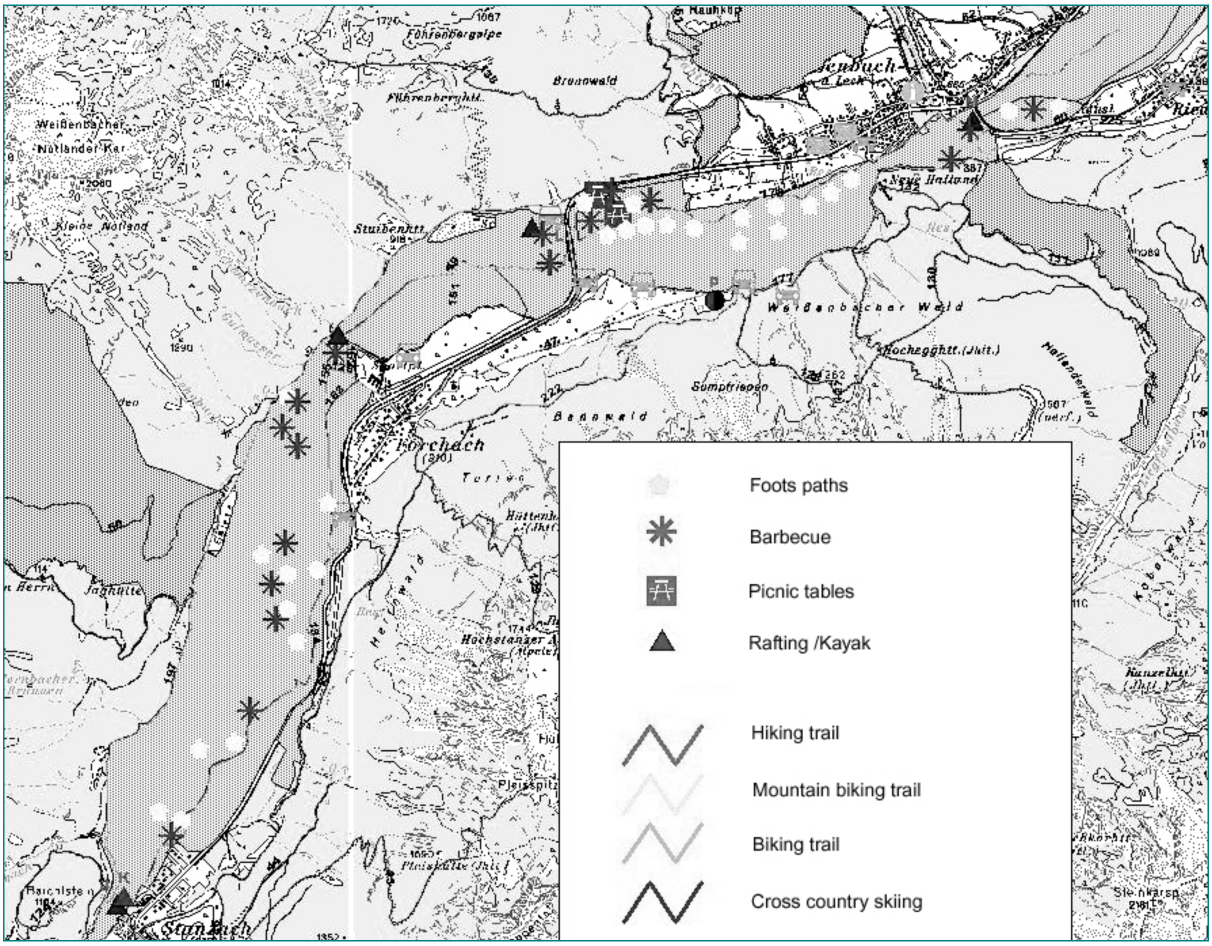

Figure 3. At the Middle Lech (see Figure 2) high user densities and various recreational uses are concentrated on the attractive gravel banks of the river stretch.

– Visitor frequency: Due to the lack of current visitor data, such as user frequencies, user densities had to be estimated based on interviews with locals and specialists familiar to the area.
– Visitor use: Visitor uses were categorised according to their intensity and impact on wildlife.

Biking and cross country skiing along the marked bike trail were considered as less intense than mountain biking and hiking. The highest impact occurs from uses that actually intrude into the habitat such as barbecuing on gravel banks or walking on foot paths leading into the floodplain forests.

Risk analysis model

The decision making process for the establishment of the visitor management concept was based on a GIS supported risk analysis (Figure 4 and 5). As in other risk analysis models (Egli 1996) the following process was applied: First the current ecological values had been located and assessed (sensitivity to damage). Then the impacts from the visitor infrastructure and use (danger defined through the frequency and intensity of recreational use) had been overlaid in a 100 m buffer (Margraf 2001).

Consequently the risk was defined in areas, where those contrasting ecological and recreational values conflicted. Hence, hotspots were defined in areas of high ecological value (vulnerability) and high visitor impact from intense recreational use.

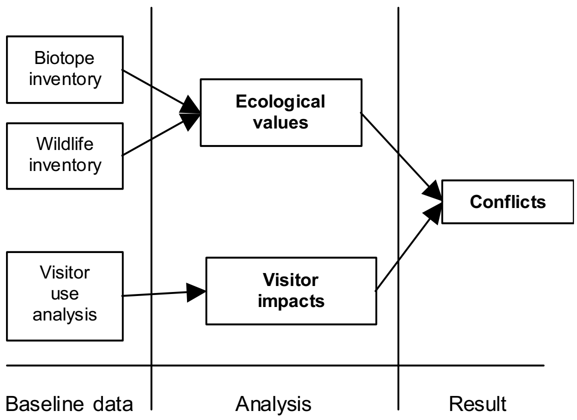

Figure 4. The methodology is based on overlaying ecological values and visitor impacts to define hotspots and areas of intense conflict.

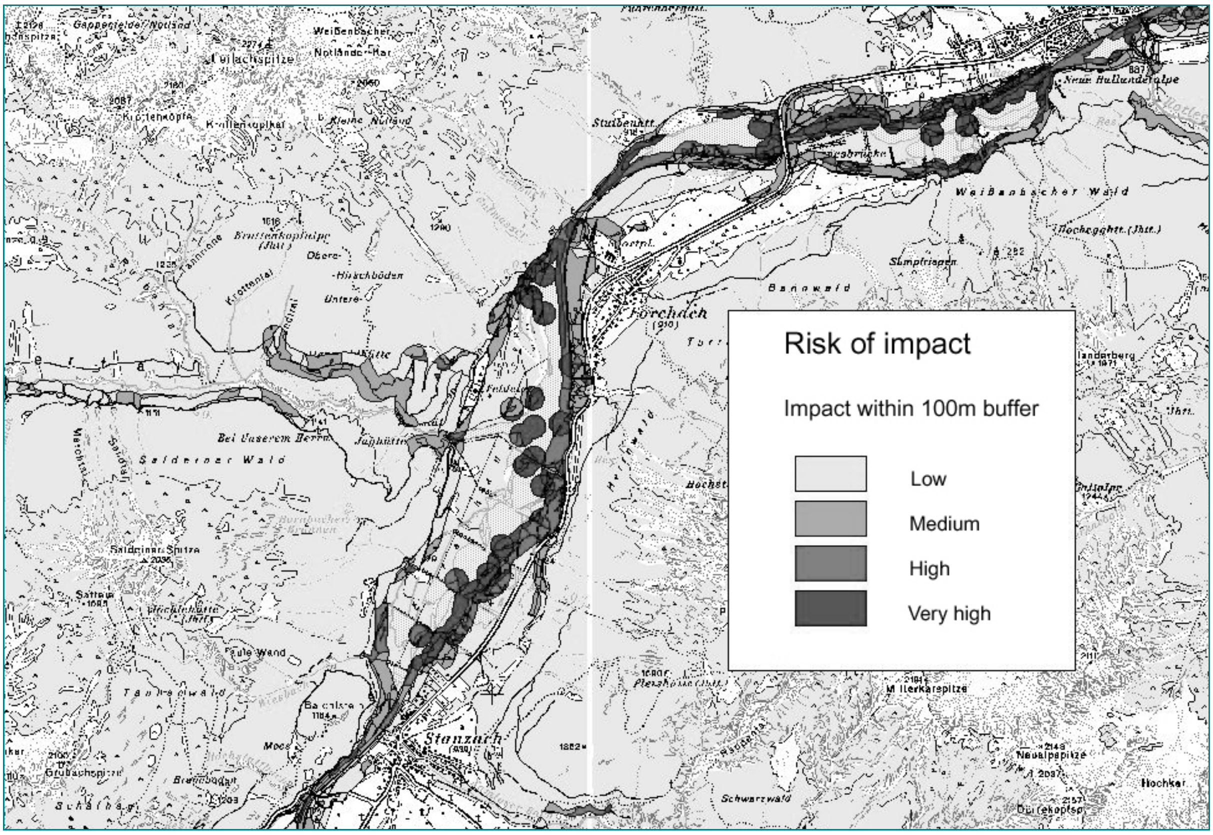

Figure 5. The map that has been developed as part of the risk analysis shows the areas of intense conflict. The application of a GIS based planning process allowed to cover the entire Natura 2000 area in the spatial analysis.

This hotspot analysis served as a basis for discussion and co-operation with the local population and stakeholders to agree on management solutions.

GIS application

The results of the field inventories were digitised and processed into digital theme maps by using a Geographical Information System (GIS; Programme: Arc View). The work with GIS does not only provide a graphical representation of very high quality, but also allows to carry out spatial analyses and the overlay of the different content maps (e.g. ecological values and recreational uses) as described above.

Management goals and objectives

Proposed management plan

As mentioned above, the definition of current hotspots (where ecological and recreational needs are conflicting) served as a basis for spatially defining measures for visitor management in order to protect intrinsic ecological values and to fulfil the visitors' need for recreation and environmental education.

First, the biking trail that runs along the Lech river was allocated on one side of the river according to the results of the risk analysis. At the moment the trail frequently splits up and is partly marked on both sides, which leads to impact on both river banks and makes orientation difficult. After the definition of *one* axis, that changes river banks where necessary, all planned visitor infrastructure was concentrated in 21 visitor management zones along this axis in order to channel use on specific sites through facility design and to reduce impacts in the areas in between.

In contrast, the areas of highest ecological value were defined as low impact zones.

The management zones are generally located close to areas of current high user densities, as locals will probably continue to use those places that they are accustomed to. The detailed planning of attractive visitor management zones should help to provide alternatives to currently used sites and thus subconsciously influence visitor behaviour and use.

Various types of infrastructure will be integrated in the management zones:

– Interpretative paths
– Viewing platforms
– River access & recreation zones (located at sites of current river revitalisation projects)
– Rafting and kayak exit points
– Information points and visitor centre
– Outside of the visitor management zones the following measures will be applied:
– Low impact zones, where uses and access can temporarily be regulated
– Rangers operating in the field

All funds will be invested in the maintenance of the infrastructure along the axis, while other paths will eventually become less attractive and could partly be screened (especially foot paths in the floodplains). Psychological barriers (such as handrails along educational trails) and sufficient information about impacts will be used to avoid signs.

Implementation and perspective

One of the main tasks in the development of the conceptual visitor management strategy was the public involvement in the planning process in order to gain acceptance in the region. Therefore the proposed visitor concept has been presented to the communities and tourist organisations and discussed in detail. Consequently, adaptations according to local needs have been made.

The management measures will be implemented over the next ten years. The installation of two educational trails and three viewing platforms has been integrated in the LIFE funded project and will thus be carried out as pilot projects.

Discussion

The fact that the development of a visitor strategy was integrated in this extensive LIFE project highlights the increasing importance of recreational use and its strategic planning in protected area management. The LIFE project aims at triggering a development, though afterwards the funds for the implementation of the entire set of management measures depend on the protection status that the Natura 2000 area will be transferred to in national legislation. The national protection status “nature conservation area “or “national park” are currently being discussed for the Natura 2000 area at Lech river, which will make a difference in funding on a Bundeslaender and state level.

It proved to be important to involve local communities in the planning process and to convey understandable (technical and graphic) information about conflicts between current recreational uses and the need to safeguard conservation interests.

Finally, a conceptual visitor strategy appeared to be essential to co-ordinate the sustainable development of recreational infrastructure in the region and to protect the intrinsic ecological values outdoor recreation actually depends on.

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Visitor Perceptions of the Inscription on the World Heritage List: The Use of Stated Choice Methods

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Abstract: This study examines how visitors to Daisetsuzan National Park in Japan perceive its inscription on the World Heritage List by applying stated choice methods. Most visitors regarded the inscription as favourable although their willingness to pay indicated that better visitor control and further conservation of natural resources would be necessary by taking opportunity of the inscription. However, the current situation of World Heritage sites in Japan indicates that the domestic management system of natural resources is inadequate to realize these visitor visions. We conclude that the nomination of Daisetsuzan National Park for the World Heritage List should be reconsidered, but only after the Japanese management system for natural resources has been improved.

Introduction

The World Heritage mission is to encourage the identification, protection, and preservation of cultural and natural heritage around the world, which is considered to be of outstanding value to humanity. The mission is embodied in an international treaty called the Protection of the World Cultural and Natural Heritage, adopted by the United Nations Educational, Scientific and Cultural Organization (UNESCO) in 1972 (UNESCO 2000).

As of November 2003, 177 states had signed the treaty, and 754 properties had been added to the World Heritage List. One hundred and forty-nine properties of 754 are natural or natural/cultural mixed properties (UNESCO 2000). These World Natural Heritages globally have remarkable value from aesthetic, ecological and scientific perspectives, furthermore, it also plays an important role in the management of domestic natural resources. In Japan, Yakushima and Shirakami-Sanchi were inscribed on the World Heritage List in December 1993.

This study examines how visitors to Daisetsuzan National Park perceive its inscription on the World Heritage List. Daisetsuzan National Park has been a candidate for World Heritage site in Japan; some local communities and NPOs have been in favour of its inscription. From the standpoint of the current situation of other World Heritage sites in Japan, we also discuss whether the inscription of Daisetsuzan National Park on the World Heritage List will contribute to the realization of visitor visitons of what Daisetsuzan National Park ought to be.

The Status of Yakushima, Japan, a World Heritage Site

First, we discuss the current situation of the Yakushima in Japan, a World Heritage site and examine issues concerning the Japanese management system of natural resources (e.g. national park system), which is in charge of managing World Heritage sites in Japan.

Yakushima is a circular and conical island that is almost 130 km in circumference (Figure 1).

Figure 1. Yakushima in Japan.

Mt. Miyanoura-dake (1,936 m), the highest mountain in southern Japan, and some 40 other peaks over 1,000 m constitute the center of the island (Kagoshima Prefecture 2004). Yakushima has been on the World Heritage List since 1993. It has a diverse ecosystem with many endemic or endangered plants and animals, including Yaku Cedars, which can be thousands of years old, and a continuum of climate from sub-tropical on the coastlines to sub-alpine in the mountain peaks. Yakushima has also been designated as a national park; it was included as a part of Kirishima-Yaku National Park in 1964.

Inscription on the World Heritage List provides both protection of the ecosystem and landscape in Yakushima as well as economic benefits. However, the growing number of visitors resulting from the fame of the location has brought about various problems. For example, congestion has resulted in visitors' bivouacs around some mountain huts (camping is only permitted in designated areas). There are an insufficient number of toilets to serve the visitors at the huts; as a result, visitor's toilet demand have exceeded the capacity of available facilities and temporary pit toilets have been constructed around the huts. These have invited intensive crowding for visitors and damages on ecosystem.

These huts are located not only in the heritage site but also in Special Protection Zone: core areas of national park under Ministry of the Environment, Forest Biosphere Reserve under Forest Agency and Special Natural Monument under Agency for Cultural Affairs. Nevertheless, there are no controls on number of visitors because of complicated land ownerships and sectionalism of ministries and government offices (see Ito 1996 for details). This situation is not exclusive to Yakushima but, on the contrary, common to every nature conservation area, including national parks, in Japan. After all no practical measures against overuse (e.g. use limits, first-come first-served, reservation and lottery) have been taken in management system of natural resources.

These overuse situations cannot be improved under rules of the treaty as the management system of concerned countries will be largely adopted for management of heritage sites. Therefore, these current issues pose a question: whether the nomination and potential inscription of Daisetsuzan National Park on a World Heritage List will lead to the realization of visitors visions of what Daisetsuzan National Park ought to be.

Study Area

Daisetsuzan National Park (Figure 2) is the largest terrestrial park in Japan, with vast wilderness. This study is focused on the northern part of Daisetsuzan National Park, the Omote Daisetsu area, which includes Mt. Asahi-dake (2,290 m), the highest peak on Hokkaido Island. In this area, large snow patches last into midsummer, and alpine plant communities are widely distributed. Coniferous forests are widely distributed on the mountainside, and they offer habitats for various species of wildlife, including brown bears. In addition, trails have been established to offer recreation opportunities to visitors. Some trails have easy access, whose trailheads start from terminals of the ropeways at Asahidake Spa or Sounkyo Spa whereas others are located in remote and primitive areas around Mt. Tomuraushi-yama in a southern part of the Omote Daisetsu area. Every year, people visit the Omote Daisetsu area to experience its natural environment. Records show that, in the summer of 2000, about 50,000 people visited the area.

Figure 2. Daisetsuzan National Park in Japan.

However, the popularity of the area as a trekking destination has resulted in congestion at mountain huts and designated camping areas, crowding on trails and peaks, tramping damages to alpine plants, and disturbing wildlife habitats (Aikoh et al. 1992, Park and Asakawa 1993, Aikoh et al. 1995, Kobayashi 1995).

Method

Choice Experiment

Choice Experiment (CE) has its origin in conjoint analysis, which has been employed in marketing, transportation, and other fields (Hensher 1994, Louviere 1994). Conjoint analysis is a method used to represent individual judgements of multi-attribute stimuli (Batsell & Louviere 1991). CE differs from typical conjoint analysis in that individuals are asked to choose from choice sets (alternative bundles described in attributes) instead of ranking or rating ('alternative' is also termed as 'profile' in terminology). Once one understands how changes in the attributes affect satisfaction levels by CE analysis, one can predict how possible alternatives will impact satisfaction (Louviere & Timmermans 1990).

Since the late 1990s, the method has been frequently used in environmental valuation (Mackenzie 1993, Adamowicz et al. 1994, Boxall et al. 1996, Adamowicz et al. 1998, Hanley et al. 1998). For application to the valuation of recreational management, Schroeder and Louviere (1999) used the method to valuate campsite facilities, and Lawson and Manning (2002) used it to formulate indicators and standards of quality for wilderness experiences.

Selection of Scenario, Attributes, and Levels

First, we identified a decision problem to formulate a questionnaire scenario. We hypothesized requiring a one-time payment from visitors into a fund that would be established to promote the site's inscription into the World Heritage List. Once the inscription had been obtained, the fund would be used to realize the visitors visions for the park. We anticipated that quite a few respondents were aware of the problem of Yakushima and, hence, would refuse to pay for the World Heritage Fund by the UNESCO. Therefore, we intentionally explained the issues of overuse at Yakushima in the questionnaire and designed a scenario so that respondents could participate in determining how the fund would eventually be used. Respondents were requested to choose a preferable alternative constituted of attributes in CE task.

Four attributes and levels considered highly important to all visitors were chosen: the establishment of roads and trails, the number of visitors, the conservation of brown bear's habitats, and the conservation of alpine plants (Table 1). A nominal scale was used to set the attributes. A coding method, called "effect code," was used to estimate the coefficients of the attributes (see Louviere 1988, Holmes & Adamowicz 2003, for details).

Design of Choice Set

Profiles and choice sets can be designed once attributes and levels are set. In this case, $5^3 \times 2^2$ combinations of profiles can be assumed, since there are three attributes with five levels and two attributes with two levels. To reduce the number of profiles for handling and avoid multicollinearity, we used orthogonal main effect design, in which profiles are designed to maintain the orthogonality of each attribute (see Louviere et al. 2000, Holmes & Adamowicz 2003, for details). Orthogonal main effect design created 25 profiles.

We created choice sets that consist of the *status quo* profile: all attributes set *current situation* in Table 1, and three profiles selected randomly from the 25 profiles. Eight groups with seven choice sets were created, and each respondent was provided with one of them selected randomly. One of the choice sets that was presented to the respondents is shown in Figure 3.

Table 1. Attributes and their levels used in Choice Experiment.

Attributes and Levels
Establishment of roads[a] and trails
· Trails should be developed for easier trekking throughout the Omote Daisetsu, and roadways and car parks should be built.
· Although trails should be developed for easier trekking throughout the Omote Daisetsu, roadways and car parks should be maintained at the current level.
· Keep current level of roads and trails (*current situation*).
· Trails should be maintained at the current level, and roadways and car parks should be reduced in the areas where environmental conservation is important.
· Trails, roadways, and car parks should be reduced in the areas where environmental conservation is important.
Number of visitors
· Active efforts should be made to attract more visitors.
· No action (*current situation*).
· Number of visitors should be maintained at the year 2000 level.
· Number of visitors should be reduced to 80% of the year 2000 level.
· Number of visitors should be reduced to half of the year 2000 level.
Conservation of brown bears' habitats
· Trails are occasionally closed due to the high possibility of encountering a bear/bears (*current situation*).
· The Kogen Spa area should be closed through the season for conserving the habitat of the bears.
Conservation of alpine plants
· Building fences to keep visitors off alpine plans (*current situation*).
· Boardwalks should be built accordingly to prevent further destruction of alpine plants in the Omote Daisetsu area.
Fund[b]
· 1,000 yen, 3,000 yen, 5,000 yen, 10,000 yen, 15,000 yen

[a] Roads are primarily used to refer to access roads.
[b] A hundred yen was about 0.9 US dollar or 0.7 euro in February, 2004.

Choice Set	Alternative 1	Alternative 2	Alternative 3	Current Situation
Establishment of Roads and Trails	**More Roads and Trails**	Current Situation	**Less Roads and Trails**	Current Situation
Number of Visitors	**Half of the Year 2000 Level**	**More Visitors**	**80% of the Year 2000 Level**	Current Situation
Conservation of Brown Bear's Habitats	Current Situation	**Close Kogen Spa Area**	Current Situation	Current Situation
Conservation of Alpine Plants	Current Situation	**Building Boardwalks**	Current Situation	Current Situation
Payment for Fund	**5,000 Yen**	**3,000 Yen**	**5,000 Yen**	0 Yen
Circle Prefereble **ONE** Number	1	2	3	4

Figure 3. A example of choice set presented to respondents.

An on-site return-mail survey was conducted at each trailhead and on trails in the Omote Daisetsu area in August 2000. In total 1,872 questionnaires were distributed, and 814 (43.5%) were returned. After removing respondents who always chose the *status quo* profile in the CE task, we were left with 520 completed respondents.

Estimation Procedures

The random utility model quantifies responses for CE task. Each profile *i* in the choice set is represented with a utility function that is composed by a deterministic component. The unobservable, overall utility *U* of profile *i* is represented by:

$$U_i = V_i + \varepsilon_i$$

V_i is the deterministic component, and ε_i is random error component. The probability that an individual will choose profile *i* over other profiles *j* is given by:

$$\begin{aligned}\Pr(i \mid C) &= \Pr\left[U_i > U_j\right] \\ &= \Pr\left[V_i - V_j \geq \varepsilon_j - \varepsilon_i\right]; \forall j \in C\end{aligned}$$

where *C* is the choice set of all possible profiles. With no loss of generality, the deterministic component can be expressed as linear-in-parameters, such as:

$$V_i = \boldsymbol{\beta}' \mathbf{x}_i$$

where $\mathbf{x}_i$ is a vector of observable attributes, and $\boldsymbol{\beta}$ is a vector of utility coefficients to be estimated. Assuming that type I extreme value distribution (Gumbel distribution) for the error term, the probability of choosing profile *i* produce conditional logit model (McFadden 1974):

$$\Pr(i \mid C) = \frac{\exp\left(\mu \boldsymbol{\beta}' \mathbf{x}_i\right)}{\sum_{j \in C} \exp\left(\mu \boldsymbol{\beta}' \mathbf{x}_j\right)}$$

where μ is the scale parameter, which is typically asumued to equal 1 in any single sample (Ben-Akiva and Lerman 1985). The vector of utility coefficients can be estimated by the maximum likelihood method (Greene 2000).

Result

Descriptive Statistic for the Sample

Almost all of the respondents (94.6%) had knowledge of the World Heritage mission, and 700 respondents (86.0%) agreed with or would possibly agree with payment for a hypothetical fund, if the proposed payment to the fund was reasonable for them. Ninety-nine respondents (12.2%) refused to pay for the hypothetical fund. Sixty (7.4%) of 99 respondents rejected the idea because they believed that Daisetsuzan National Park should not be added to the World Heritage List.

Choice Experiment

Table 2 shows the results of conditional logit model. All coefficients were estimated based on the *current situation*. The three alternative-specific constants (ASCs) correspond to constant terms for each deterministic component for profile *i*.

Log-likelihood ($\boldsymbol{\beta}$=0) is the log-likelihood in which all coefficients are 0, and log-likelihood (Max) is the log-likelihood in which coefficients are the results shown in Table 2. Rho-bar-square is the

Table 2. Coefficients in the choice experiment and willigess to pay.

Attributes and Levels	Coef.	(S.E.)	WTP[d]
Establishment of roads[a] and trails			
More roads and trails	-0.49	(0.07)**	-3,493
More trails	-0.04	(0.06)	-304
Keep current level[b]	0.32	(0.12)**	2,258
Less roads	0.12	(0.06)*	858
Less roads and trails	0.10	(0.05)	681
Number of visitors[a]			
More visitors	-0.98	(0.07)**	-6,927
No Action[b]	0.24	(0.12)**	1,698
The year 2000 level	0.53	(0.05)**	3,732
80% of the level in 2000	0.41	(0.05)**	2,906
50% of the level in 2000	-0.20	(0.06)**	-1,409
Conservation of brown bears[a]			
Close trails occasionally[b]	-0.10	(0.03)**	-715
Close Kogen Spa Area	0.10	(0.03)**	715
Conservation of alpine plants[a]			
Building fences[b]	-0.36	(0.03)**	-2,546
Building boardwalks	0.36	(0.03)**	2,546
Fund·10^{-3} [c]	-0.14	(0.01)**	
ASC_1	0.69	(0.12)**	
ASC_2	0.77	(0.11)**	
ASC_3	0.69	(0.12)**	
Number of Choice Sets		3031	
Log-likelihood (Max)		-3607.3	
Log-likelihood (β=0)		-4185.9	
$\bar{\rho}^2$		0.14	

[a] Effect coded variable. [b] Current situation.
[c] Ratio scaled variable. [d] Japanese yen.
$^{*}p < .05$. $^{**}p < .01$.

adjusted log-likelihood ratio index, which is an indicator of the goodness of fit of the model (Ben-Akiva & Lerman 1985).

Based on the estimations of how changes in the attributes or levels affect utility levels through the same functional form, we calculated willingness to pay (WTP) for each attribute and level (Table 2). For example, the effect on ‘building boardwalk for the conservation of alpine plants’ is 0.36 for utility levels; the effect on ‘payment 1 yen for the fund’ is $-0.14 \cdot 10^{-3}$ for utility levels. Therefore, the effect of coefficient building boardwalk in a monetary unit can be calculated through dividing the boardwalk coefficient by the fund coefficient $-(0.36/-0.14*10^{-3})$.

Discussion

Most visitors regarded the inscription of Daisetsuzan National Park on the World Heritage List as favourable, since they knew the World Heritage mission well, and more or less agreed with payment for a hypothetical fund that would forward the inscription.

Our results of CE showed that visitor visions of the inscription of Daisetsuzan National Park in Japan on the World Heritage List, helping us to find out what kind of action plans could realize their favourable management. They generally indicated a desire for visitor control and further conservation of natural resources. This tendency is supported by the highest WTP: 3,732 yen for ‘Number of visitors should be maintained at the year 2000 level’; the lowest WTP: -6,927 yen for ‘Active efforts should be made to attract more visitors’; and a quite high WTP: 2,546 yen for ‘Boardwalks should be built to prevent further damage to alpine plants in the Omote Daisetsu area’. The WTP: 695 yen (2,258+1,698–715–2,546=695) for the *status quo* profile did not indicate that visitors regarded current management as a negative alternative. Compared with the WTP: 9,251 yen (2,258+3,732+715+2,546=9,251) for the most desirable profile, however, choosing current management appeared to be far less preferable.

In view of the current issues of heritage sites and conventional management system of natural resources in Japan, it is difficult to foresee the implementations of strong controls for crowding and damage on the ecosystem. Therefore, it may not be realistic to choose the most desirable or preferable combination of attributes with high WTP, although it is possible to choose the *status quo* alternative. These findings demonstrated the inscription is unlikely to lead to realize visitor visions of what Daisetsuzan National Park ought to be.

We conclude that the nomination of Daisetsuzan National Park for the World Heritage List should be reconsidered, but only after the Japanese management system for natural resources has been improved. Further discussion on how Japanese management system for natural resources ought to be is of a first priority.

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Sustainable tourism and large protected areas – analysis models and success criteria of a sustainable tourism management using the example of the Alps

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Abstract: Within the framework of a sustainable regional development, protected area tourism acquires increasing significance. This applies particularly to peripheral regions, that posess no outlook for economic development. With this background, the question of success criteria for a sustainable tourist management in protected regions was investigated. The example of Austrian nature parks demonstrates, that inadequate cooperation at local level can be an important source of failure. At the same time, a suitable financial framework for successful protected area tourism is especially important.
Key words: Recreational management of large protected areas, management of ecotourism, analysis of best practice, sustainable regional development, Alpine convention

Introduction

Protected area tourism has long been a tradition in the Alpine countries. The founding of the first alpine national parks (1914 Engadine/Switzerland, 1922 Gran Paradiso/Italy, 1935 Stelvio/Italy), goes back to the beginning of the last century. At the moment (February 2004), in the Alps there is a total of 14 national parks with an area of 811’238 hectars with almost 10 million of visitors annually (Job et al. 2003, p. 24). Alongside these, further large area protected regions exist, including numerous nature parks and regional nature parks, as well as an increasing number of UNESCO biosphere reservations and World Heritage Sites. In some alpine countries, the creation of new large area protected regions is planned for the coming years (Siegrist 2002).

The ideals of classical nature protection were foremost at the start of protected area development in the alpine regions. Recently though, protected area tourism has gained increasing importance. With the further development of some protected area categories, for example nature parks, the economic effects due to tourism are attracting considerable attention. In protected area regions, a sustainable tourism matched to the special conditions, is regarded today as a necessary part of a matching regional development. This applies particularly to alpine peripheral regions, that often have no other perspective for economic development. (Mose & Weixlbaumer 2003). Thus the question arises as to the extent of trading-activity and -chances, but also about the limits to the ecotouristic use of protected area regions in the alps. In this connection, the sustainable tourist management in protected area regions will form a central challenge. Thus, beyond those responsible for parks, others – locally involved – are addressed here, especially tourism. (Hammer 2003).

Objects and methods

The aim of our investigation was primarly to impart the main success- and failure-criteria of sustainable tourist mananagement in the Alps. Local participants from tourism and the parks as well as others responsible at a higher level, would thus be supported in their striving for a sustainable management of the protected areas and their regions.

The following methods are used, among others, during the empirical investigation:

– Expert interviews with representatives from alpine park- and tourism-management.
– Written questioning from those responsible for tourism and protected areas.
– Delphi-analysis with representatives from selected protected area regions.

Monitoring of the practical effects resulting from sustainable development strategies is a complex problem. Without specific knowledge concerning the results of applying the success criteria, it is hardly possible, from a scientific and practical point of view, to obtain a final decision. At the practical level, the problem of measuring the ecological, social and economic effects of a sustainable tourist management has not been solved so far (Baumgartner in press, Arnberger et al. 2004).

Two particular questions arise on the evaluation of touristic sustainability:

1. How should general standards for sustainability in tourism - acceptable to politics and society – be established and the appropriate criteria and threshold values developed?
2. With which indicators should processes and results in the framework of as sustainable tourist development be measured and/or evaluated? Which qualitative or quantitative data-bases are needed here and how can they be made available?

Research has, over the years, made a series of suggestions for the monitoring of tourist sustainability. Those suggestions range from classical top-down methods right through to a joint judgment of sustainability by involving local participants. Where the Alps are concerned, these questions are presently under discussion in the framework of the Alpine convention. It is however open, if and how suitable monitoring method for alpine tourist sustainability can be realized.[1]

Results

Nature park tourism in Austria

The existing lack of cooperation between different local participants can be regarded as fundamental factor in the failure of tourism and regional management. (Baumgartner & Röhrer 1998). This is confirmed through failure-source ranking by those locally responsible for nature parks and tourism in Austria (Figure 1).

Figure 2 will show in detail some chosen aspects of the cooperation between tourism and nature parks, based on the example of Austrian nature parks. The base is related to expert interviews carried out in summer 2003, as well as written questionnaires of key personnel from Austrian nature parks. 14 people representing tourism and 17 people from 17 nature parks in 7 counties were questioned. A number of smaller nature parks, less relevant as regards tourism, took no part in the questioning.

Cooperation between tourism and nature parks

When ranking local tourism and nature park protagonists, cooperation was best with communities and regional management, but worst with train- and bus-services. The reciprocal cooperation with the other partner (nature park or tourism) follows in second place after communities/regional management. In third place follows cooperation with Innkeepers, Hotel directors and excursion centres as well as that with farmers. Notable differences occur, between those responsible for tourism and nature parks, regarding quality assessment of reciprocal cooperation with the other partner. This cooperation gained higher estimation from tourism than from the nature parks. Also the cooperation with Innkeepers, Hotel directors and excursion centres was esteemed higher from those in tourism compared with those in nature parks. Just the opposite was the case concerning farmers and with train- and bus-services, where the cooperation with nature park protagonists was regarded as better.

We requested those involved with tourism and nature parks to enter their current and future preferences in a matrix. Accordingly, nature park protagonists showed, in their own estimation of the future development of nature park tourism, a definite

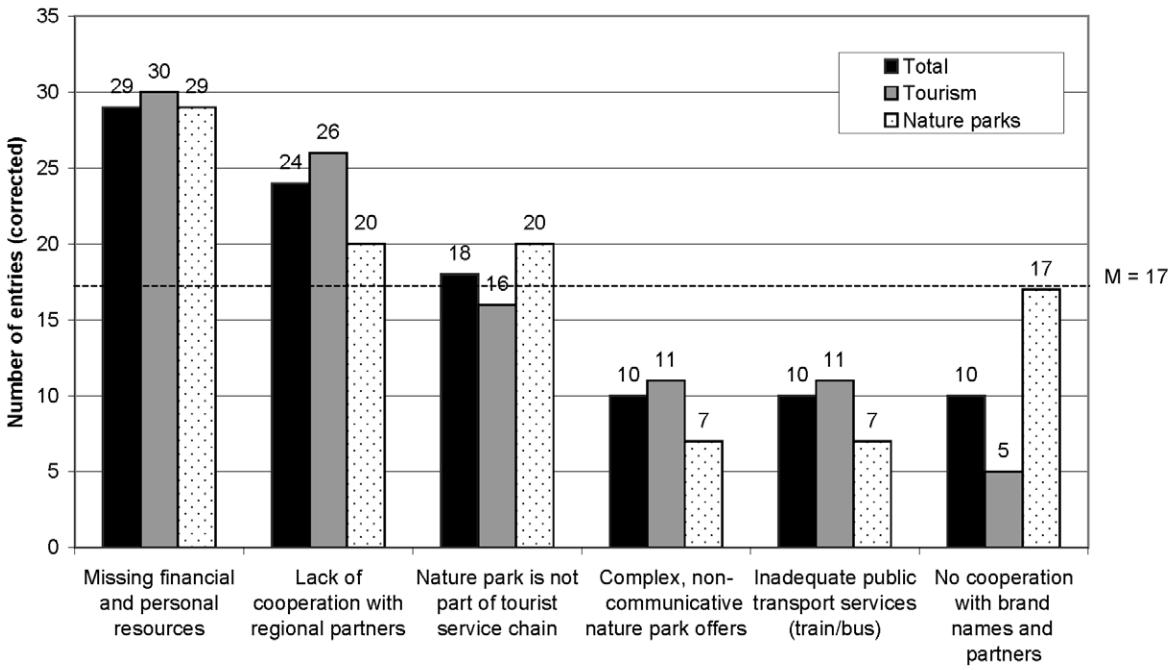

Figure 1. Sources of failure in nature park tourism.

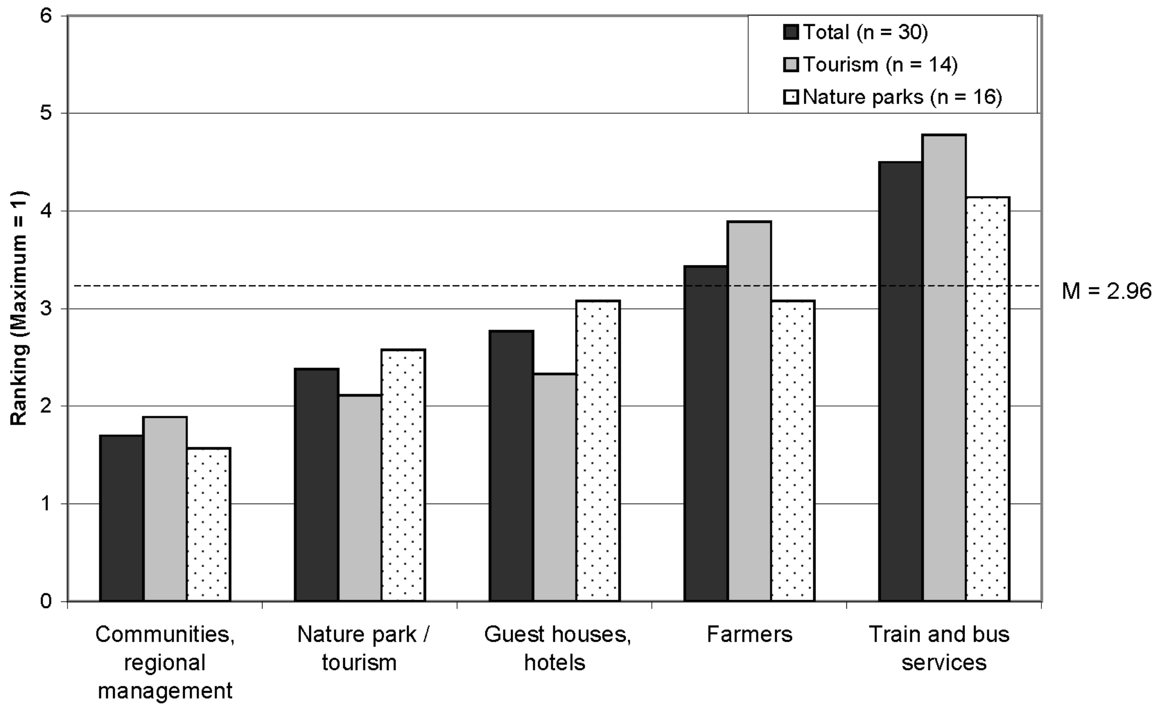

Figure 2. Participants and cooperation in nature park tourism: with which participants does does cooperation work best?

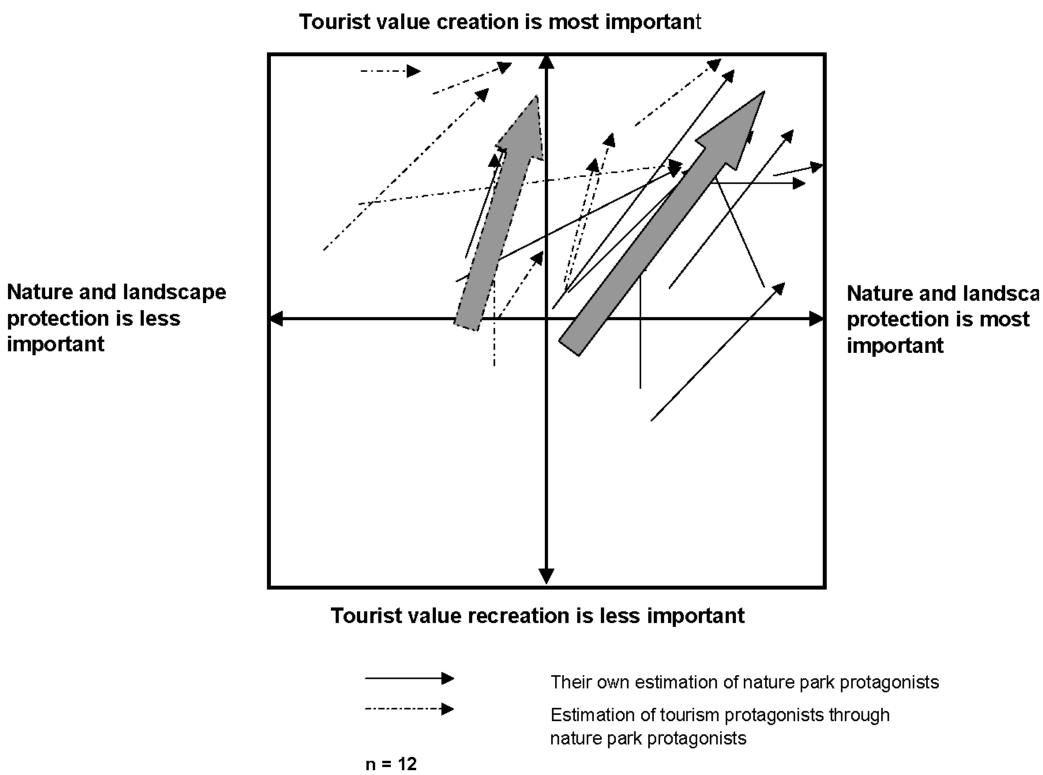

Figure 3. Current state and future development of nature park tourism.

tendency towards an interplay of more nature and landscape protection and enhanced touristic value creation. Nature park protagonists assume misguidedly, that tourist protagonists on the contrary, show a strong tendency to strive after more touristic value creation. Preferences toward more nature and landscape protection are assumed to be lower with tourism supporters (Figure 3).

Tourism protagonists also showed, in their own estimation of the future development of nature park tourism, a clear preference towards an interplay of more nature and landscape protection with more touristic value creation. They suppose, misguidedly, that those involved with nature parks on the contrary, show a strong tendancy to more nature- and landscape-protection, with a reduced preference for further touristic value creation.

The biggest differences in these reciprocal estimations, lay in the fact that the nature park protagonists weigh the touristic value creation as such, as a definitely stronger objective than tourist supporters themselves assume. Conversely, tourist protagonists prefer nature and landscape protection considerably more than nature park supporters credit them with.

Points of commonality and areas of cooperation

Those involved with tourism regard the most important link between nature parks and tourism as the collective involvement in financial advancement programs. Conversely, the nature park protagonists put the collective marketing for nature park tourism in the foreground. Those responsible for tourism also place collective marketing, for the future, in the foreground (Figure 4). The office community between nature parks and tourism, forming an important link today will however, loose significance in future for those involved with tourism, in favour of a collective business management. Conversely, nature park protagonists will tend to side more in future with the office community.

Those involved in tourism regard the most important field of cooperation with the nature parks as that of guestcare/information (Figure 5). In contrast, for nature park protagonists, the area of cooperation of greater significance is developing offers/advertising. Other fields of cooperation like tourism concept development, footpath upkeep/visitor management or the development of touristic quality were rated as much less important. Considerable differences in the interpretation between the two factions exist regarding tourism concept development and footpath upkeep/visitor management. Those involved with tourism regard this field of cooperation highly. Nature park protagonists however, prefer the field of environmental awareness/sensibility.

Success criteria and framework conditions

The protagonists of tourism note that by far the most important success criteria of nature park tourism are a consistently marketing strategy plus the recreation-guide to the nature park offerings. For those responsable involved with nature parks is the consideration of regional strengths the most significant success factor of nature park tourism in contrast, followed by the adventure guided offerings of nature parks (Figure 6).

Further notable success criteria were a child/family-friendly ambient as well as current information on nature, culture and the region. Reduced rates for nature park attractions and limited recreation zones were not seen as important success factors. Both tourism and and nature park protagonists noted

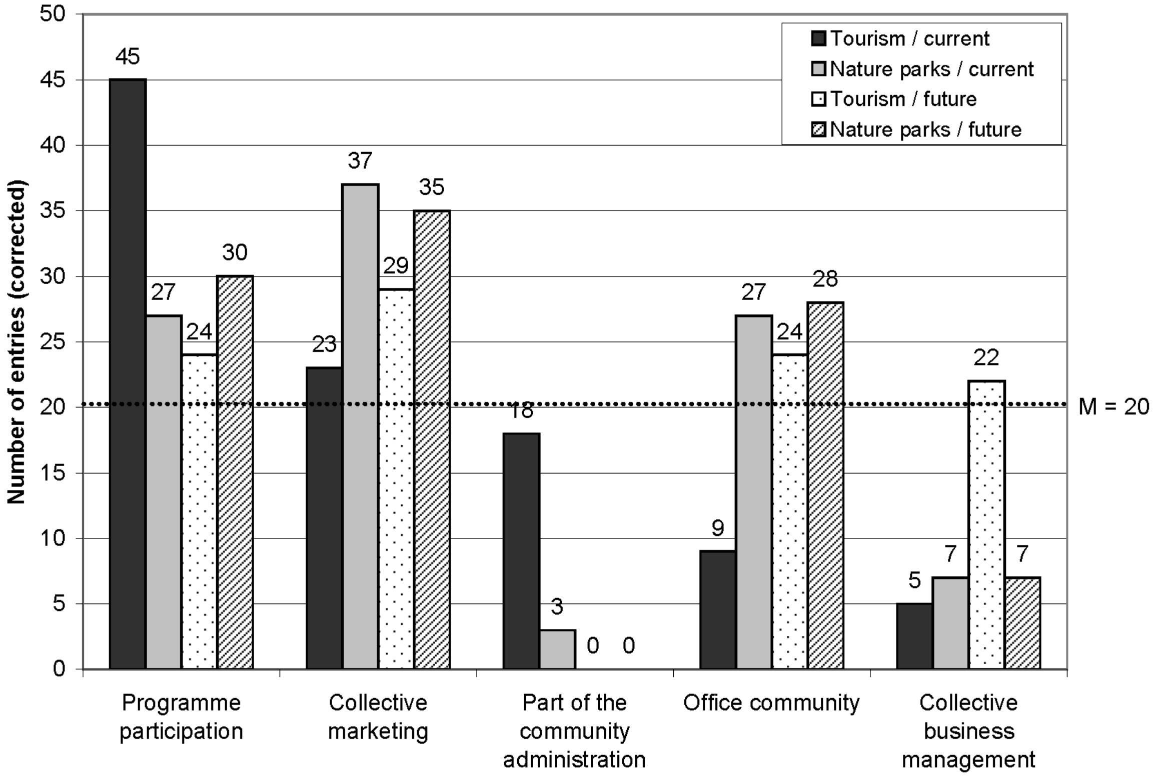

Figure 4. Important links between nature parks and tourism.

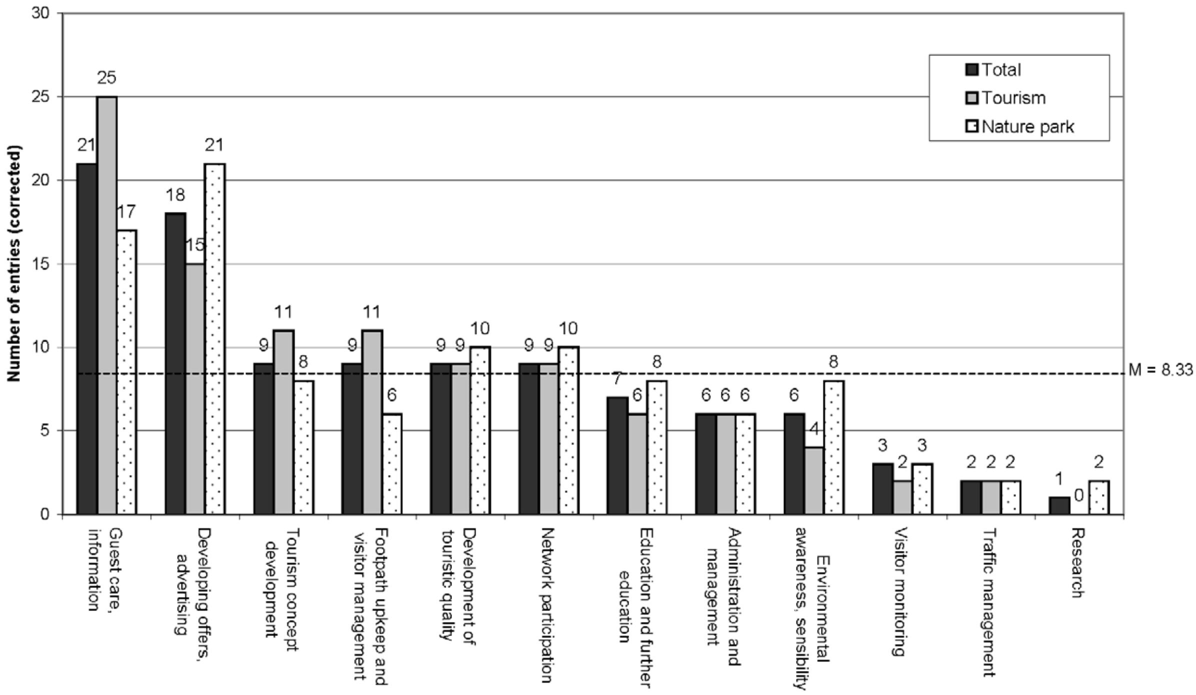

Figure 5. Main fields of cooperation between tourism and nature parks.

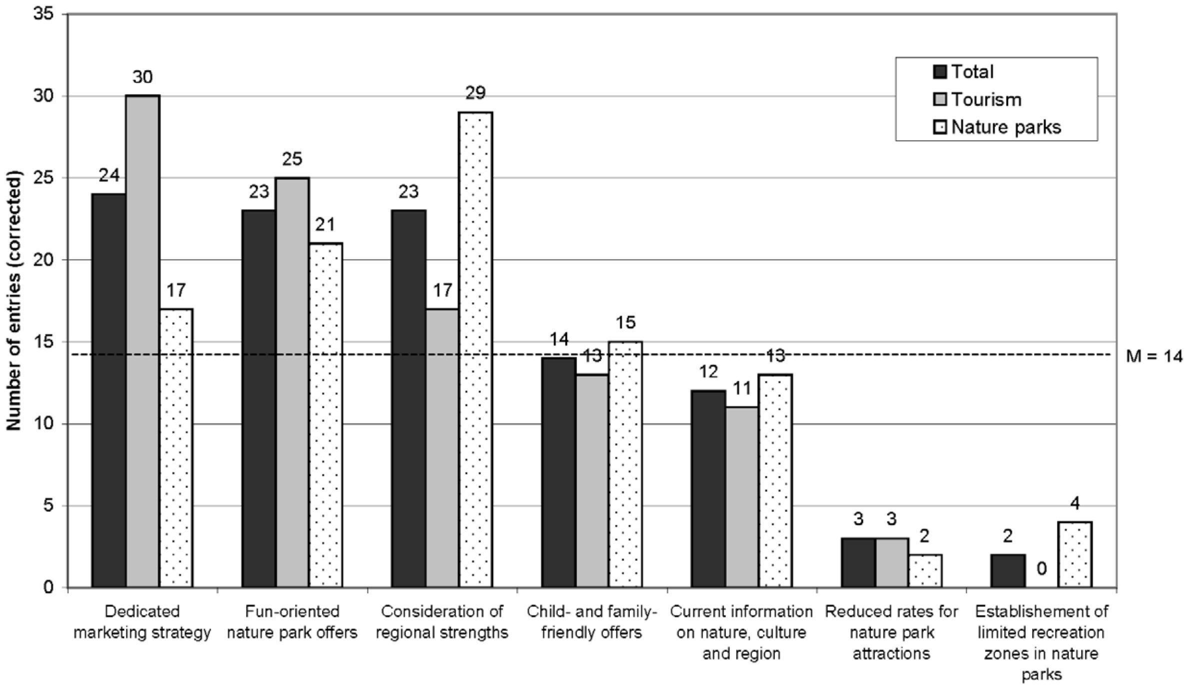

Figure 6. Succes factors of nature park tourism.

the major failure criterion of nature park tourism – apart from the lack of local cooperation already mentioned, lay overwhelmingly in missing financial and personal resources.

The possibilities and chances, realizeable in the framework of increased cooperation between tourism and nature parks, depend strongly on institutional framework conditions. Most nature park protagonists and the majority of those involved with tourism would favour better financial framework conditions for nature park tourism (Figure 7). However this does not imply a lack of interest in the ecotourism market, but a clear interest in financial advancement through public authorities. In addition, particularly protagonists of tourism would wish for an increased acceptance for innovation by residents in nature park regions.

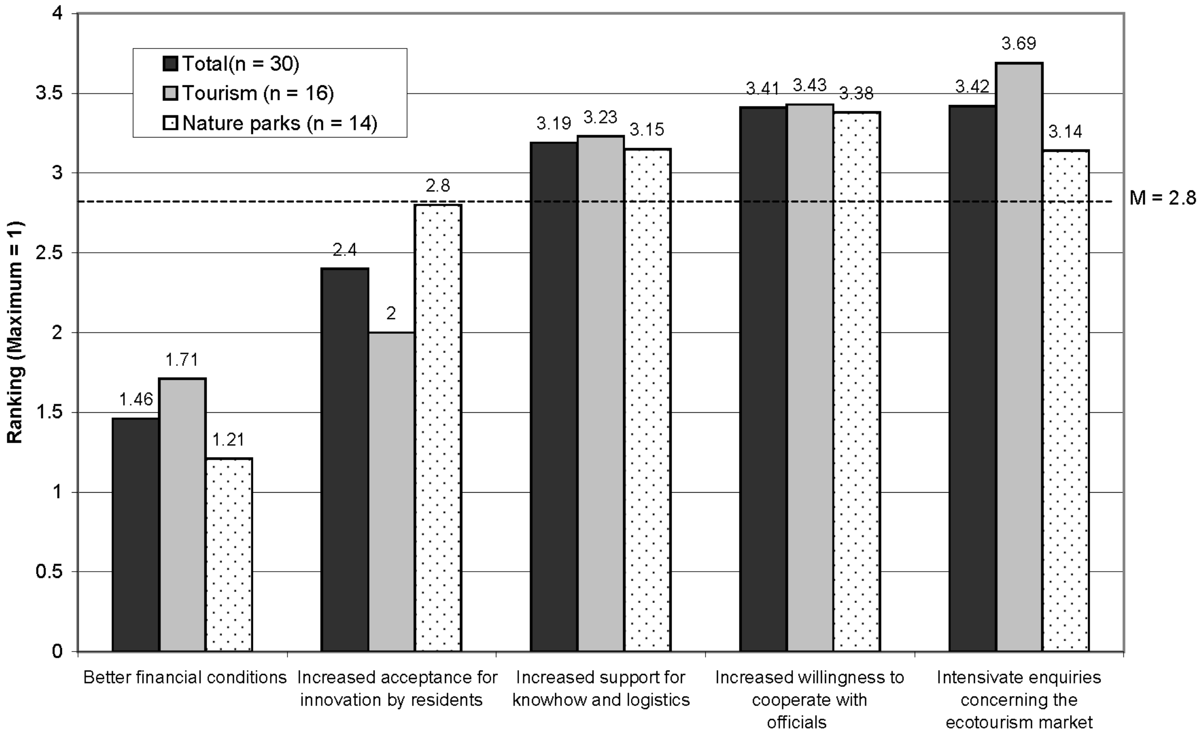

Figure 7. Desired framework for nature park tourism.

Discussion

Ecotourism acquires, through its specific regional features, a differing importance depending on the class of protected area. Nature park tourism acquires a central function for regional development in the Austrian nature parks; from the viewpoint of local participants it clearly ranks above the demands of nature and landscape protection. This points, on the one hand, to the importance of large protected regions as instrumental in regional development. On the other hand, this also points directly to the problem complex of nature and landscape protection in relation to nature parks. (Verband... 2003).

The aims of nature park tourism are caught in the strained matrix between touristic value creation and nature and landscape protection. In their self-esteem, nature park protagonists and those engaged in tourism, lie quite near each other. In contrast, they lie in their mutual misguidedness wide apart. This discrepancy underlines the need for better communications, a requirement still necessary to correct the mutually wrong impressions between the parties. From these results, a collective working potential from nature parks and tourism can be derived for a sustainable regional development.

Important links between nature parks and tourism lie, from the viewpoint of local participants, in collective marketing. More precisely in coordinated forms of offer-development, distribution and information about nature park tourist offers. This could be supported through institutionalised forms of cooperation (office communities, collective business management) and secured financially through the common participation in programs.

The agreement between local protagonists of tourism and nature parks, concerning the success criteria of nature park tourism, would appear to be strongest where a collective contribution to regional value creation is expected. This agreement lies particularly in collective marketing strategies when developing experience-oriented nature park offers, but allowing for the particular regional strengths. In order that the extent of trading-activity and -chances outlined can be fully utilized, suitable institutional frameworks are needed. Precisely that need for better financial framework conditions – expressed by those localy responsible for tourism and nature parks – points to an existing deficit.

Conclusion

Should important success criteria be taken into account, broad protected area regions could represent a considerable tourist factor. In this function they can fullfill a notable contribution to a sustainable development in fringe areas with poor infrastructure. However, one must not expect an economic wonder from ecotourism, as the capacity of senitive regions is limited. If one does not accept the reckless destruction of nature and landscapes, this special form of tourism must always exist in certain quantitative limits. (Leuthold 2001).

The professional tourist and protected area management in park regions constitutes an important success factor. An important failure criteria occurs through insufficient cooperation, especially between tourism and nature parks. Often a sizeable potential exists, as with the improvement of regional operations, as shown by the example of the Austrian nature parks. The coordinated interplay of various planning and touristic management methods also belongs there.

Together with the local success and failure criteria, it should not be forgotten that appropriate institutional and financial framework conditions form important factors for a sustainable protected area tourism. Last but not least, a sustainable regional management needs a suitable form of sustainability monitoring. Only so can the results of the various development strategies with respect to sustainability be obtained – and from these the conclusions for future strategies can be derived.

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Classification of trail settings in an alpine national park using the Recreation Opportunity Spectrum approach

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Abstract: Considering trail settings in alpine national parks is important for both conserving nature and maximizing the quality of the experience for visitors. This study examines classifying trails in Daisetsuzan National Park, Japan, using the Recreation Opportunity Spectrum approach. A questionnaire was used to obtain data from park visitors concerning their preferences for the facility developments, accessibility, and visitor encounters. The responses were classified into four groups according to the preferences expressed for the types of trail settings. The trails were classified according to their characteristics as described by park visitors. The northern part of the park, with easier access and moderate development, was preferred by all groups, and the southern part of the park was preferred only by the those who favored more primitive surroundings.

Introduction

The purpose of Japan's natural parks is to provide people with recreation opportunities in natural settings in addition to conserving natural landscapes. Park plans are developed to achieve these objects, and park management is based on the objectives. The plans are divided into two categories in accordance with the purpose of the park: conservation plan and utilization plan. Each park is managed using such a system.

One difficult and consistent challenge of park planning is to design recreational activities that are compatible with conservation. As access to the mountainous areas of the national parks has been improved, the number of visitors has increased. The absence of park management with systematic planning have resulted in lack of control, overuse, and degradation of natural settings. It is expected that planning would ameliorate these problems. On the other hand, a utilization plan in conjunction with recreational management only defines how trails, roads, and facilities are to be allocated in the future. The utilization plan does not cover management issues. Without clearly defined policies for managing park visitors, conflicts occur involving recreational use and park conservation. The guidelines in the utilization plan were insufficient for maintaining high-quality and diverse recreational experiences that a park should provide to its visitors.

The intrinsic nature of mountainous settings should be maintained, and the impact of recreational pursuits should be held to a miminum. Therefore, it is important to develop systematic plans that will help park managers. Toward this end, the utilization plan should be revised to clearly define the areas and suitable recreational activities (Environmental Agency 1989).

The Recreation Opportunity Spectrum (ROS) that considers the diversity of recreation experience (Brown 1978, Buist 1982, Clark 1979, Driver 1978) will improve the utilization plan in this respect. This study is a report of clarifying the present situation of a national park using the ROS approach as an attempt to apply guidelines for the utilization plan.

Problems associated with planning in natural parks

National parks are under the jurisdiction of the Natural Parks Law. This law prescribes three types of natural parks: national parks, quasi-national parks, and prefectural natural parks. National parks are designated for nationally significant areas of outstanding natural beauty. Quasi-national parks are designated as areas of great natural beauty second to those of national parks. Prefectural natural parks are designated by prefectural governments to conserve areas of scenic beauty. National parks are generally the most outstanding of the three categories. There are 28 national parks in Japan. National, prefectural, municipal, and private lands are included within the park boundaries. Natural parks are managed for conservation and recreation and are also used for agriculture, forestry, mining, residences, and other uses.

The policy for the conservation and recreational use of national parks is established by a Park Plan (Ito 1990). As mentioned above, this plan is divided into two plans. The conservation plan details the zoning of the natural parks. Because land ownership and land use are diverse, a zoning system is used for conservation. Forestry is the major land use in natural parks, and, therefore, it has the greatest influence on the zoning system (Ito 1996). The park area is classified into five zones, each distinct by the degree of regulation. The special protection area is the most strictly regulated, followed by special areas 1, 2, 3, and one classified as an ordinary area. Activities inconsistent with nature conservation, such as building, timber cutting, land development, and extracting natural resources, are controled according to how strictly regulated each zone is.

The utilization plan defines the allocation of park facilities. They include recreational facilities, such as roads, trails, campsites, visitor centers, and overnight accommodations. The development of park facilities is carried out on the basis of the utilization plan. The facilities are developed by national and local governments as well as by non-governmental organizations providing that the developments are consistent with park policy. Park plans are to be reviewed and updated every five years so that they remain compatible with the changing situations around the parks.

Daisetsuzan National Park is located in the center of Hokkaido, and the area includes 226,764 ha. It was established in 1934 and is the largest and one of the oldest national parks in Japan. It is categorized as a type II park on the United Nations' list of protected areas. The elevation reaches approximately two-thousand meters above sea level, and sub-frigid and alpine forest vegetation is dominant in the park. The park is busiest from July to September, as the winters are severe with heavy snowfall, and there are alpine flowers in summer and colorful foliage in the fall. The most popular recreation is hiking. Since some of the areas are accessible by aerial tram, people can easily enjoy alpine vegetation and mountain landscape. In addition, there are volcanoes and many hot springs. Several spa resort complexes have been developed.

The special protection area, which is the most strictly regulated, makes up 16.2% of the park. The average of all national parks is 12.0%. Stricter than average conservation guidelines are in place at Daisetsuzan National Park. The areas for classes 1, 2, 3, and ordinary are 13.0%, 9.8%, 41.8%, and 19.1% of the total park area, respectively.

Because there is no systematic management policy, recreational use of the parks produces environmental destruction. Visitors concentrate in certain areas, and there are no policies for control, which results in overuse of these areas. The lack of management results in erosion and destruction of vegetation along the trails. In addition, the excessive number of visitors places a strain on the sanitary systems within the parks, which degrades the water quality and has a negative impact on the ecosystem. Furthermore, the level of the development of the trails and facilities is not always consistent with the preferences of the visitors, which reduces the quality of the visitors' experience. These problems are caused by the lack of systematic visitor management policy. Improvements with the ROS approach are expected to lead to better planning and the ability to overcome the current problems.

Application of the ROS in Daisetsuzan National Park

ROS is a framework for recreation planning. The objective is to provide diverse recreational experiences and manage them simultaneously in conjunction with other needs for land use. The ROS concept is briefly outlined in the following. There is a desire to obtain satisfactory recreation experiences by choosing specific settings for recreational activities. Recreation opportunity settings include a combination of physical, social, and managerial conditions. Examples of physical conditions are topography, vegetation, and landscape. Social conditions include crowding, user density, and type of activities, and managerial conditions include management regulations and orders. Recreation opportunities vary with the combination of these conditions.

Desirable recreation settings depend on both recreation experiences and the type of activities visitors desire. Those who prefer a wild environment prefer few facilities and the least contact with other park visitors. On the other hand, users who want to experience a natural environment with the least effort desire acccessibility by automobile and comfortable facilities and services. Suitable recreational facilities should be provided to meet the desires of users.

Managers are required to supply and manage appropriate recreational opportunities based on a specific set of policies. ROS was designed for use in recreation management offering diverse recreation opportunitiy settings. A practical procedure for providing diverse recreation opportunities is as follows: diverse recreation opportunity settings are classified according to the users' preferences, and then it is decided where the categories should be allocated in a particular area. Clark et al. (1979) state that the ROS can indicate a distributional change of recreation opportunities caused by management activities such as timber cutting and the development of roads and recreational facilities. Therefore, ROS is useful to allocate recreational opportunities while keeping other land uses in mind. In this sense, ROS is desirable for the Japanese park system, in which multiple land use is the rule.

Daisetsuzan National Park was assessed using the ROS in this study. The northern part of the park was studied since it is the most popular among visiting hikers. Most of the park visitors come in the summer, which crowds the access roads and aerial trams. The vegetation along the trails becomes damaged because of the heavy traffic. To control the damage, it is necesary to zone areas and to gain control of the visitors with the use of planning with ROS. For this study, the focus was on the summer use of the park. Because of the growth of a particular type of dense bamboo, called *sasa* in Japanese, leaving the trails is difficult. In addition, because trespassing on alpine vegetation is prohibited in natural parks, off-trail recreation is rare. As a result, off-trail analysis was not conducted. Access roads were also excluded from the analysis because this study focuses on the alpine area, in which conflicts are most likely to occur between conservation and recreational use.

Method

The process of analysis is shown in Figure 1 (Sangaku Recreation Kanri Kenkyukai 1998, 2002, Yamaki et al. 2003). We used a return-mail questionnaire to examine visitor preferences. The data obtained from the survey was used to classify the areas (Kliskey 1994). Because recreation opportunity settings are consisted of physical, social and managerial conditions as described in the early section, appropriate variables that represent recreation opportunity settings were selected and used for the survey. The variables selected for the study are shown in Table 1. The questionnaires were distributed to visitors at trailheads. The visitors were asked to answer the questionnaire and return it later. Respondents indicated their preferences to recreation opportunity settings by ranking the variables from one to five. The survey was conducted in August in 1997. A total of 1,443 questionnaires were distributed, and 658 (45.6%) were returned.

Respondents were classified by the data obtained from the questionnaire. Categorial principal component analysis (CATPCA) in a statistical software package (SPSS) was used with the data. CATPCA is applicable to principal component analysis using data with categorical scales. CATPCA was carried out to sum up the variables into a smaller number of components and extract important components for visitor preferences. Cluster analysis was performed next. The respondents were classified using object scores obtained from the CATPCA.

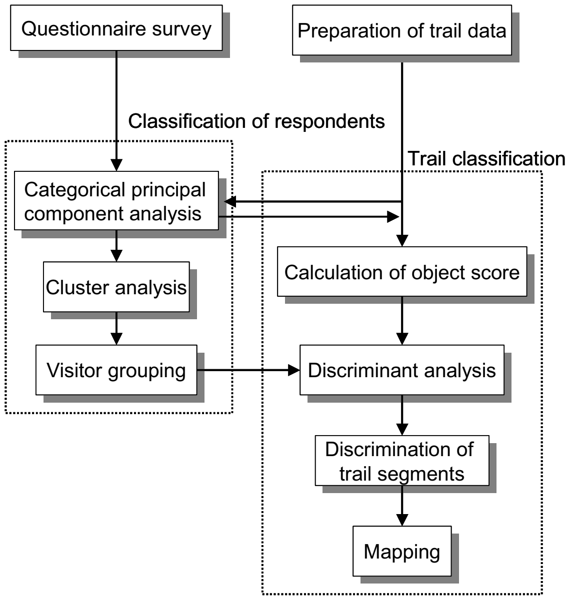


Figure 1. Process of analysis.

Trail settings were evaluated using the result of the visitor classification in order to reflect the preferences of the respondents. The information from the

Table 1. Variables used in the questionnaire.

	Variables	Score 1	2	3	4	5
1.	Trail condition	Town shoes or heels are usable	—	Ahletic shoes are usable	—	Trekking boots are necessary
2.	Bench and table	Both bench and table	—	Only bench	—	No bench and table
3.	Guide sign	Every regular distance	—	Only junction	—	No signpost
4.	Interpretation Board	As many as possible	—	As few as possible	—	No interpretation Board
5.	Warning Sign	As many as possible	—	As few as possible	—	No warning Sign
6.	Rope for no trespassing	Everywhere	—	Only important places	—	No rope
7.	Ranger	Always patroling	—	Sometimes patroling	—	No watchman or ranger
8.	Frequency of meeting others	Continuouslly meet	Several times in 10 minutes	Several times in 10 minutes	Several times in a day	Less than once in a day
9.	Possibility of encountering bear	No possibility	—	Low possibility	—	There is possibility
10.	Walking hours from trailhead to destination	In 1 hour	In 3 hours	In a half day	In a day	Overngiht stay in mountain is needed

respondents and that regarding the trails was combined to implement the procedure. The trail settings were evaluated based on the visitor classification by calculating the distance between the trail settings and the gravity of each visitor group.

The trails were divided into segments depending on the physical, social, and managerial conditions of the environment, and then data sets were made for each segment. Second, we substituted the data of the trail segments into the formula that was made for calculating the object scores of the respondents in the CATPCA procedure, and then obtained object scores of the trail segments. Next, we performed a discriminant analysis to discriminate the trail segments according to the visitor classification. For this analysis, distants between the trail segments and the gravities of the visitor groups were calculated using Maharanobis distant. The distants to the gravities of the visitor groups were compared for each trail segment, and each trail segment was classified as the group that has the closest distant.

To carry out the procedure, we assumed the homogeneity of the visitor data and trail data. However, it is difficult to ensure that both data are homogeneous, as they were obtained using different means. Nevertheless, we treated them as if they were homogeneous because the scales used for both data were the same.

Results

A total of 514 bits of data from the returned questionnaires were used for the CATPCA. The results are shown in Table 2. Eigenvalues from the first to third dimensions were larger than 1, and the accumulative proportion of the three dimensions totaled 54.6%. Because the first dimension indicated large component loadings to most of the variables, it is provable that this dimension represents the general characteristic of preferences to the recreation opportunity settings. The second dimension showed large component loadings to ”1. Trail condition” and ”10. Walking hours from trailhead to destination”, which is likely to indicate preference to the trail setting itelf. Because the third dimension had a large positive component loading on ”3. Guide sign” and a large negative component loading on ”8. Frequency of meeting others”, it presumably means the trade-off of the two variables. That is to say, guide signs are preferefed by users who desire the low possibility of encounter for route finding, but are not prefered by users who desire the possibility of encounter because they obstruct the view.

Cluster analysis was performed to classify the respondents using the object scores of the three dimensions. They were classified into four groups with the Ward method. The numbers of respondents of groups 1 to 4 were 84, 145, 119, and 166, respectively.

Table 3 shows the average of the object scores by each group. Considering the result, the following classifications were used: 1. Primitive, 2. Semi-primitive, 3. Semi-urban, and 4. Urban. The primitive group preferred wild and natural settings, and the urban one, developed and artificial environments. The semi-primitive and semi-urban groups were closer in their preferences to the primitive and urban ones, respectively. Here it should be noted that, since the classification was produced using several

Table 2. Result of CATPCA.

	Variables	Component loading Dimension		
		1	2	3
1.	Trail condition	0.539	0.583	-0.134
2.	Bench and table	0.588	0.214	0.320
3.	Signpost	0.517	-0.244	0.503
4.	Interpretation Board	0.691	-0.080	0.260
5.	Warning Sign	0.609	-0.469	-0.191
6.	Rope for no entrance	0.544	-0.462	-0.251
7.	Watchman or ranger	0.438	-0.400	-0.107
8.	Frequency of meeting others	0.552	0.130	-0.558
9.	Possibility of encountering bear	-0.371	-0.203	-0.407
10.	Walking hours from trailhead to destination	0.539	0.570	-0.184
	Eigenvalue	2.974	1.427	1.063
	Contribution (%)	29.738	14.273	10.625
	Accumulative contribution (%)	29.738	44.011	54.636

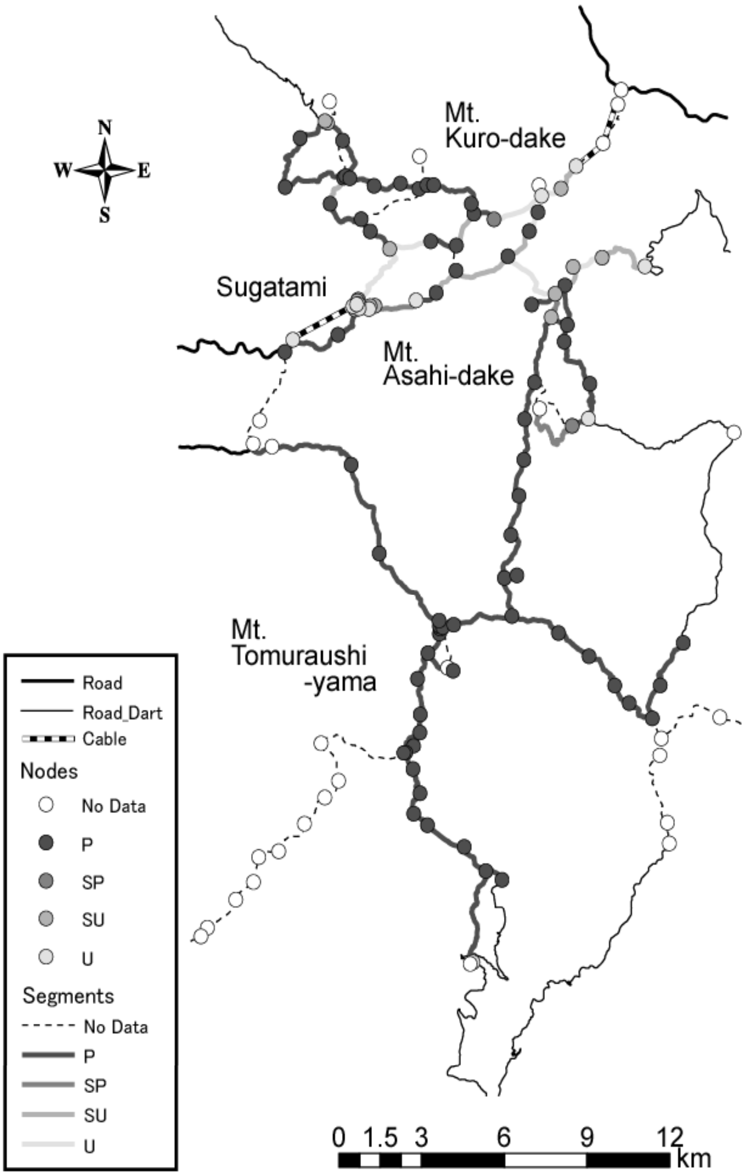
Table 3. Average of the object scores.

Group	Variables										
	1	2	3	4	5	6	7	8	9	10	n
1. Primitive	0.531	0.732	0.700	0.958	1.127	1.091	0.856	0.928	0.579	0.648	84
2. Semi-primitive	0.621	0.481	0.317	0.385	0.118	0.080	-0.013	0.184	0.227	0.438	145
3. Semi-urban	-0.014	-0.061	-0.054	-0.050	-0.147	-0.183	-0.109	-0.029	-0.076	-0.156	119
4. Urban	-0.801	-0.747	-0.592	-0.785	-0.568	-0.490	-0.343	-0.609	-0.437	-0.599	166

dimensions, there is no linear relationship among the groups, as shown by the basic concept of ROS.

The trails were classified according to the classification of the respondents. As mentioned earlier, trails were divided into several segments. The data for each segment were obtained from a field survey with the same scores that were used in the questionnaire. The segments consist of 104 sections and 107 nodes, with a total of 211 segments. Only segments that were surveyed were analyzed. The sections and nodes analyzed were 87 and 95, respectively, for a total of 182 segments.

The result of the analysis are mapped in Figure 2. All the segments in the southern area were classified as primitive. This indicates that the southern part is the most preferable for those who prefer a primitive environment. Because this area is far from the trail-heads, less developed, and less visited, it is likely that visitors who prefer a primitive environment can obtain the recreational experiences they desire. On the other hand, developed and artificial settings, such as those in the urban and semi-urban areas, are located in the northern part of the park. Users who indicated a preference for urban and semi-urban areas will have the recreation experiences that they prefer in this area. It is easily accessible and developed with several facilities, thus, attracting many visitors. On the contrary, segments classified as semi-primitive are rare. This does not mean, however, that there are few choices for those who prefer semi-primitive areas. It should be noted that most segments are more preferable to other groups.



P: Primitive, SP: Semi-primitive, SU: Semi-urban, U: Urban

Figure 2. Map of the trail classification.

Management implications

Visitors to Dassetsuzan National Park were classified into four groups according to the preferences to the recreation opportunity settings of the survey respondents. The park trails were classified according to visitor preferences. From the results, the recreational opportunitiy settings were classfied within the ROS framework. The next step will be to use ROS to improve the utilization plan. As prescribed in the Natural Parks Law, one of the main goals of natural parks is to increase the number of visitors. However, by present-day standards, it is not reasonable to simply increase the number of visitors to a national park; what is needed is to improve the quality of the experience for park users. Every visitor seeks a different recreational experience, and, therefore, diversity of opportunities is necessary.

In addition, there has not been a well-organized planning framework from the recreational point of view. The utilization plan has, thus, become merely a plan for roads, accommodations, and recreational facilities for mass tourism. Consequently, it has been criticized as only “an allocation plan with points and lines. Since overuse is one of the most critical problems facing national park managers, it would be wise to allocate recreational opportuniy settings more accurately by considering visitors’ preferences. As shown in this study, different types of classifications mingle in the northern part of the study area; as a result, it is difficult to have a consistent management policy, and visitors’ experiences are, on the whole, worse. The utilization plan should be improved so that desirable recreational opportunities would be avilable to all visitors to national parks. This is one reason that ROS should be integrated into a utilization plan.

Moreover, the overlapping of the ROS-based utilization plan and the zoning plan included in the protection plan allows for both recreation use and nature conservation to be considered. Levels of use vary among different ROS classifications and, therefore, use management policiy should also be different for each individual ROS classification. However, no previous management guidelines have ever taken into acount the diversity of recreation opportunity settings. For example, though ”Urban” and ”Primitive” zones in the special protection area should be managed in different ways, clear management policy has not been specified in the park plans. This worsens the quality of environment in both ecological and perceptual aspects. Because the utilization plan and the protection plan have not been well integrated so far, the conflict between recreational use and nature conservation has not been evaluated during the development of park plans. ROS will reinforce the utilization plan and combine it with the protection plan; in this way, the park plan will become a comprehensive park management plan.

In addition, since land ownership and land use in Japan’s natural parks are diverse, natural parks are managed on the basis of multiple use. Changes in land use allocations are common and result in changes in the settings for recreational opportunity settings. If the distributuion of recreation opportunity settings is clarified by the ROS, we can assess how land use change will affect the recreation opportunities. In conclusion, the ROS will lead to improvements of Japan’s natural park planning in terms of visitor management.

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A modern net of paths for every type of hiking: new possibilities in order to discover and to promote a protected area

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Abstract: The recreational and protected areas are increasingly undertaking a social function toward becoming a real destination for holidays and travel equal to famous tourist locations. In Italy this type of "green ecotourism" is spreading as an alternative type of tourism enabling it to repopulate the countryside and to exploit the history and culture of rural territories. To demonstrate how hiking in general can be a way to discover and to promote a protected rural area from the perspective of a tourist point of view, one of the most beautiful Italian areas has been examined, the Casentino Valley in Tuscany.

Introduction

The main aim of the research is the demonstration of how a functional and modern excursion-net can constitute the basis for the creation of a plan of tourist development of an area. Due to the incentive of various types of excursions (horse, trekking and mountain-bike) and to the efficient connection of the several tourist and accommodation places on the territory, it is able to elevate and stimulate the rural and mountain economy.

When planning excursion-paths able to satisfy every type of hiking, it is important to take into account the concept of "Ippovia" (horse-path), because these paths, for their characteristic of slope, difficulties and dimension, may be used also by foot and mountain bike.

This concept can appear simple and banal but much too often we see many plans of modern excursion-nets that are located on old paths, that are realized only for hiking on foot, and not suitable for bicycles and horses.

The utilization as excursion paths of these tracks along ancient ways of communication, like pavements and old tracks completely in disuse, allow the recovery of a historical and cultural patrimony of high value.

It's also important to recover the agricultural annexes that are in a state of utter neglect, like barns, refuge huts, shelters, ancient places for horses etc, to make them suitable for hiking, in particular for hiking by horse.

In order to demonstrate how hiking in general and especially horse trekking can be a method of promoting a rural mountain territory, from the tourist point of view, one of the most beautiful Italian areas, the Casentino Valley in Tuscany has been examined.

In the Casentino area a remarkable enviromental patrimony has been conserved, constituted not only from important natural property but also from the testimonies of its own history, traditions and rural culture typical of the mountain areas. There is also a National Park, the Casentino National Park.

Materials and Methods

For the planning of the excursion-net the G.I.S. software (Arcview), the cartography of the IGMI (Italian Military Geographic Institute) at 1:25.000 scale (Regione Toscana Giunta Regionale 1996) and aerial photos of the zone have been used. The program AutoCAD 2002 has been used for the planning of the constructions in wood for the shelter of the horses and the signalling of the paths like showcases, markings of the paths etc.

The plan is made with various phases of elaboration and afterwards summarized.

The first phase consists in the localization on a 1:25.000 map (digitized and georeferenced – Falcidieno & Spagnuolo 1991) of the places both of major and of less interest from the touristic point of view, like small churches, stone villages, castles, etc., that are located in the area studied. These places have been then digitized in one cartography of reference (Burrough 1986) introduced in the GIS. (Figure1).

In the second phase, the different model of receptive structures, that can give hospitality to the horses and to the hikers, are digitized on the reference map (Figure 2) as in phase one. These structures are agritourism, hotels, camping, shelter, riding-schools, bed and breakfast etc.

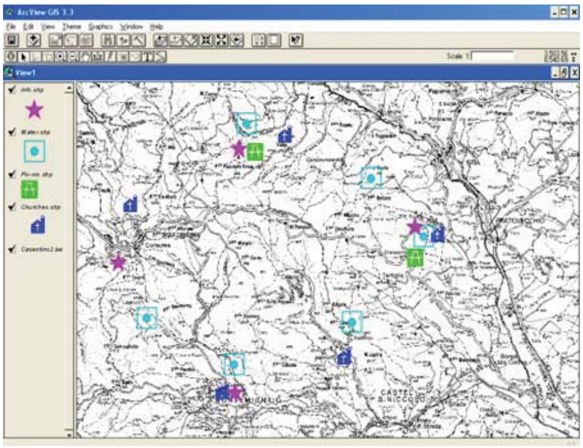

Figure 1. Buffering to identify the places of interest from the tourist point of view.

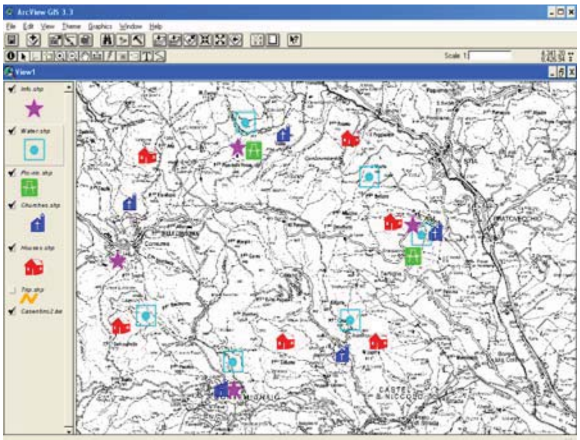

Figure 2. Buffering to identify the receptive structures for the hikers and horses.

The third phase consists to individualize on the reference map the better path to connect the tourist places and accommodation structures found in the previous phases. It's also possible to make this operation with photo interpretation of the digital ortophotos with the methods of the survey and the cartographic restitution (Figure 3).

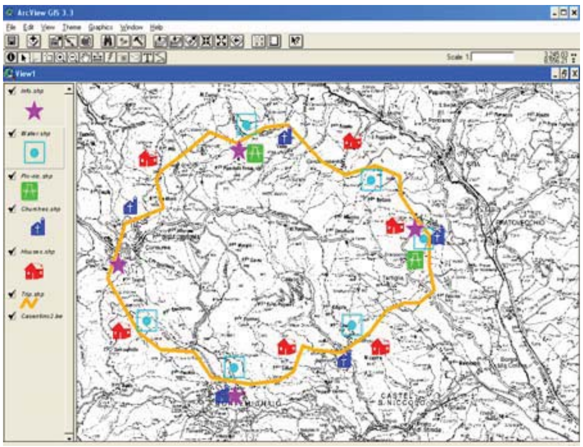

Figure 3. Buffering to identify the better connection paths.

During the path planning it's always important to take into account that the path must be easily covered by horses, which have their own needs in terms of the characteristics of the paths. The path for horses can also easily be used by foot or by mountain-bike.

Attempts should be made in trying to discover and re-use the ancient ways of communication (often present for example in the Casentino valley) like the transhumant-ways, the ancient paths used by charcoal burners, the ways of pilgrimage etc.

The greater part of the excursion-paths has been localized on tracks that guarantee a good compromise between the horses and hikers safety and limitation on damages to the ground and to the growth, trying to avoid the phenomena of soil erosion.

Therefore during the localization of the most suitable path it should be taken into consideration:

– limitation on soil erosion and on the growth
– the path must be easy and safe for the horses and the hikers
– the path must be also beautiful and functional for the hikers

The forest roads, or however roads in battered or white earth, often guarantee the possibility to have satisfied the above mentioned points, because they have a natural surface (Jaarsma 1997), consolidated and generally with modest slopes (factors that positively influences the health of the horse and limits soil erosion). Moreover these type of paths, very often in a natural context, are so appreciated from the hikers who always feel themselves close to nature and far away from the sealed road with motorized vehicles (Figure 4).

With regard to the length, it's necessary to keep in mind that a day horseriding, is not longer than 6–7 hours in the saddle and moving at a speed, that in average is at 6–7 km/h for flat lands and at 4–5 km/h on slope, the paths will not be longer than 30–35 km.

Moreover during the path localization for horses it's also important to think about their well-being, therefore it's necessary to avoid the paths that are too pebbly, hard or soft and that are not suitable to horse-feet. It's necessary also to individualize along the

Figure 4. Typical forest road.

paths places with water for the horses, like founts, sources, pits etc, and eventually predispose drinking troughs in masonry, undoubtedly useful also to the hikers on foot and in bicycle.

The fourth phase consists of the verification on the field, of the places and the existence of the paths located before on the map and, at the same time, individualizing and recording through GPS. the places and the paths, of particular interest, that have not been located before and put them in the GIS.

The last phase is the GIS elaboration of all data that can be found on commercial maps and on the field, and the planning of a final and functional excursion-net that would be able to satisfy both the requirements of the hiker maintainin a good balance between nature and tourism.

When the location of the excursion-net phase is over, it's necessary to preview shelters for the horses and hikers along the paths that are situated far from the villages, taking into consideration that they will need to rest for the night (for example along the mountain ridges).

For this purpose, it is possible to restore disused rural buildings present on the paths, as shelters, refuges, barns, etc., and it's necessary to plan new types of shelter that may integrate in the rural and mountain landscape.

Particular attention should be focused on the restoration of rural annexes that are often located along the paths representing the culture and the history of local populations. One of the most important, for the architectonical structure, is the "seccatoi" (drying-buildings for chestnuts). This rural building, completely in stone and wood, was utilized for drying the chestnuts in the forest and today they can be employed as optimal places for the temporary shelter of the hikers and the riders (Figure 5).

For some of these, a small structure in wood with a shed have been planned to be put adjoining the side of the same one, with the function of shelter being used for 3–4 horses. The first floor to be used for storing food and hay, and the one below for the hikers.

Another type of structure is represented by old shelters completely in stone and wood that were used by people working in the forest and that can be found in mountain areas along the way. These buildings, even if of small dimensions, give valid shelter from the unexpected climatic changes whilst at the same time display the culture of mountain people.

Figure 5. Rural annexe for chestsunts drying.

Some new structures, totally in wood or in stone and wood, have been planned to host horses and hikers during the night. They are devised to remain isolated from the villages as a real shelter.

These buildings are structures in round wood consisting of a place to receive the horses (with 6–8 places), one for the saddles, food and hay and another one furnished with tables, benches and beds for the hikers (Figures 6 and 7).

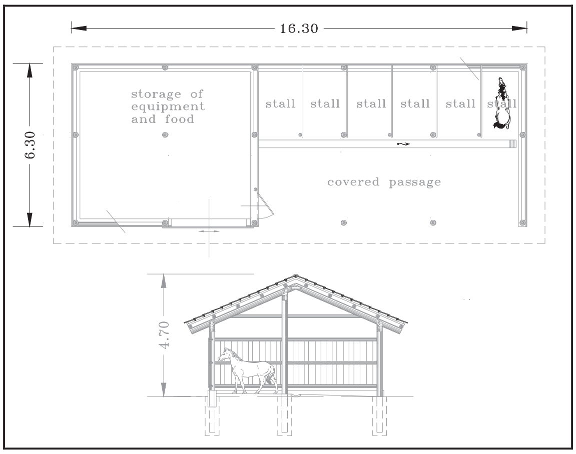

Figure 6. The planimetry of a wood shelter for horses.

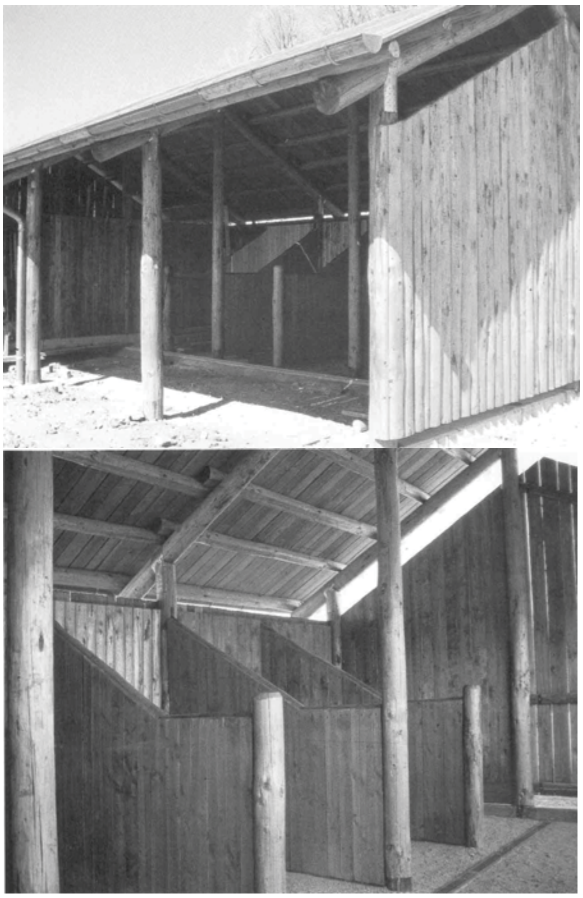

Figure 7. Wood shelter for horses.

These support structures, constructed with traditional materials, must be planned according to the roles of correct insertion in the landscape and reduction of the environmental impact.

Results and Discussion

Through the above methodology it is possible to plan a modern excursion-net able to satisfy the various requirements of the different types of hiker, maintaining a good integration with the surroundings and at the same time guarantee the tourist accommodation and also re-launching of the territory.

The final results of the described methodology can be seen in planning of the new and modern excursion-net in the Casentino Valley, under the name “Casentinese Escursion-Net” (C.E.N.).

In order to guarantee a good net of paths that comprises all the interesting tourist places present in the Casentino valley, satisfying the requirements of the hikers for feeding and lodging, an excursion-net has been planned with two concentric rings (one along the mountain ridges and the other one across a mountain-side). Several connections between these two rings, forming other small rings (Figure 8).

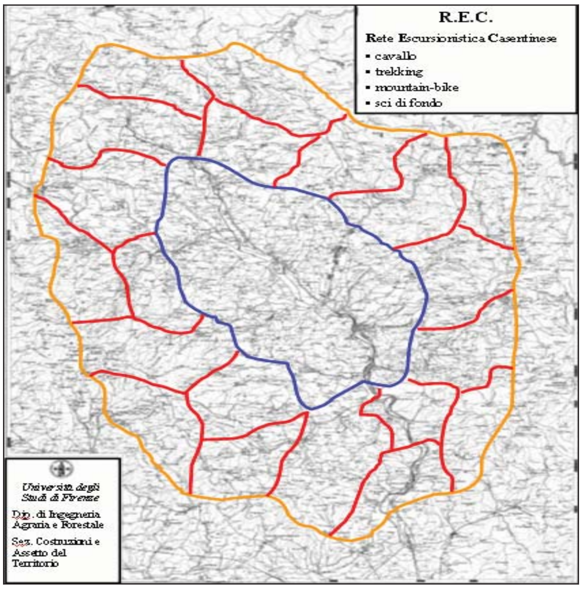

Figure 8. Parts of the two concentric rings and the connections.

These small-rings can be covered by horse, foot and mountain-bike and they have the peculiarity of being interlinked allowing to the hikers the possibility of choosing among itineraries, passing from a small-ring to another one.

These small-rings can be covered in only one day returning to the main lodging structure, they will be a useful incentive to the hiker to stay in the lodging structure for more days having the possibility to choose among other excursions the next morning, making a typical excursion called “daisy-path”, where it’s possible to return to the place where you have started.

The most part of the paths of the C.E.N. have been located along the natural roads , trying to exclude the asphalted roads, because they can be dangerous for the hikers and horses. The ring across the mountain-side has been planned also for bicycles (“Bikecross”, is a ring purposely planned and prepared for the bicycles all-terrain or hybrid, along flat and little rough lands).

The described solution is the most appropriate for the territory of the Casentino and it will guarantee the satisfaction of the tastes and the requirements of the hikers, giving the possibility of choosing among many itineraries.

In conclusion, more than 500 km of modern and rational paths for horses have individualized, suitable also for hikers on foot and in mountain-bike, often located along ancient ways of communication and comprising beyond 90% of the tourist and accommodation places of the Casentino Valley.

The remarkable presence of some accommodation structures, in particular farm holidays, induced the planning of only three shelters for horses, located along the big ridge-ring, with annexed structures in order to accommodate the riders and the hikers. However, attention has been focused on the planning of boxes, stables, paddocks, etc., in order to conform those accommodation structures that are situated in the excursion-net.

Conclusions

Horse tourism in Italy, and in countries where there is a strong horse culture, increasingly growing as an alternative tourism that can guarantee long distances always remaining in contact with nature.

The paths for horses, for their characteristic to be functional to other modalities of excursion, represent the ideal solution when it’s necessary to plan an excursion-net that values and increases the economic development of mountain and rural areas.

Today, in some rural areas this tourism could be a valid alternative to the traditional economy, rising up from the crisis that took place with the depopulation of the countryside towards the big cities.

The involvement of accommodation structures and all those economic activities like restaurants etc., especially those situated in the small mountain villages, guarantee the development of these small mountain economies.

The creation of a rational excursion-net gives the opportunity to have and offer a large variety of excursions, keeping the tourist in the territory for a longer time. It’s possible to have the tourist presences in each season, especially in spring and in autumn, that represent the best periods for excursions by horse.

This kind of excursion-net can solve one of the main problems of tourism in Casentino related to the short time of tourist visits and the maximum tourist flux only in the summer period. The plan of the Tourism Excursion Development is therefore necessary for a better and greater tourist presence of the Valley.

The project also included the restoration of several annexed buildings located in the Valley, for the shelter of the hikers and the reopening of ancient ways of communication, contributing therefore to the valorisation of the ancient local cultures that would undergo the risk of otherwise completely disappearing.

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Double strategy towards sustainable tourism: Offers for visitors and opportunities for people employed in tourism in the Wadden Sea National Park in Schleswig-Holstein

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Abstract: Schleswig-Holstein's part of the Wadden Sea is a traditional holiday destination. Tourism and leisure activities are the most important regional economic activity. Two million overnight guests and four million day trippers travel to this part of the North Sea coast each year. An area of 4,400 km² has been protected as a National Park "Schleswig- Holstein Wadden Sea" since 1985 and the area was established as a UNESCO biosphere reserve in 1990. A proper strategy for communication, information and visitor guidance is essential to achieve nature conservation goals, and to make them understandable and acceptable to the general public. LIFE Nature has helped to finance information panels, maps, information kiosks, nature trails and observation platforms all of which aim to inform and guide visitors. A number of attractive indoor and outdoor nature experience and nature-compatible offers exist. However external and internal marketing has to be intensified to make these offers better known to both, visitors and locals. A LEADER+ project has been set up to take better advantage of the National Park status as a unique selling proposition and for tourism advertising. A monitoring system evaluates the success of measures and offers.

The Wadden Sea National Park

With an area of 4,400 km² the Schleswig-Holstein Wadden Sea is the largest National Park in Europe, located at the North Sea Coast in the very North of Germany (Figure 1). The unique coastal landscapes of tidal flats, salt marshes, dunes and beaches are inhabited by specialised plant species and populated by large numbers of migratory and breeding birds. Besides these avian visitors, permanent residents like seals and harbour porpoises must not be overlooked. Humans do not live within the area of the National Park, but the imbedded islands and the bordering mainland region have about 300,000 inhabitants.

The objectives of the National Park are

- Protection of the Wadden Sea for future generations
- Undisturbed development – leave nature to its own devices
- Monitoring and research
- Recreation and nature experience

With regard to the latter objective, visitors are explicitly invited to enjoy and experience nature in the Wadden Sea. However, the National Park law, which has been amended in 1999, also refers to the improvement of living and working conditions of the regional population. Protection of nature by means of the National Park ought to have positive effects on tourism, enhance the prestige of the region and foster sustainable development.

Tourism in the National Park region

Tourism is by far the most important economic sector in this coastal region, it contributes almost 20% of the added value (Figure 2).

About 15 million overnight stays were recorded in 2002. The numbers have been slightly but continuously decreasing in recent years, showing that the traditional holiday resorts at the German North Sea coast are having to compete with other attractive destinations.

People who spend their holidays in the federal state of Schleswig-Holstein show a high affinity to environmental and nature-related features of their holiday destination (Table 1). Their appreciation of opportunities to enjoy and experience nature is higher than average in comparison to all German inland vacationists.

Information and guidance for visitors

Until recently, information for visitors and local inhabitants on protection goals, protection regulations and measures was insufficient, casually leading to unintentional disturbance of the National Park's habitats and species.

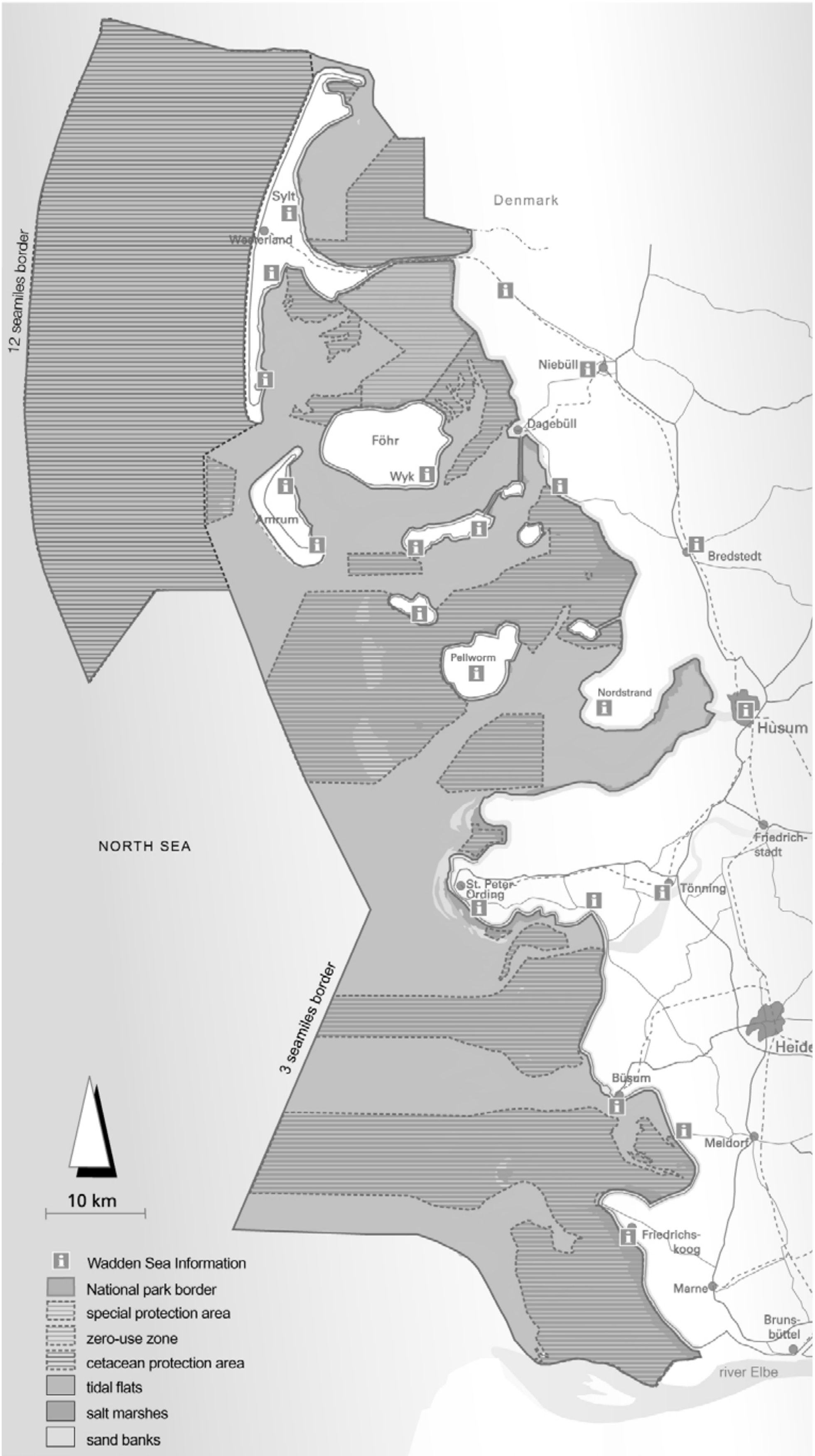

Figure 1. Map of the Schleswig-Holstein Wadden Sea National Park.

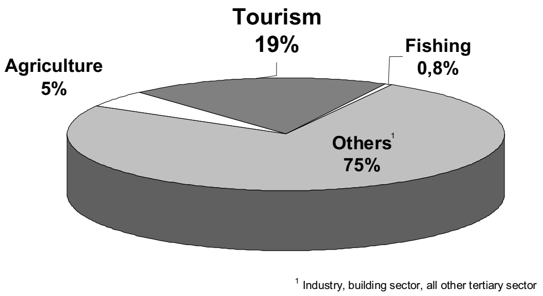

Figure 2. Added value of economic branches in the National Park region (1st and 2nd level of turnover) (Stock et al. 1996).

Table 1. Opinions concerning holidays and environment of vacationists in Schleswig-Holstein (Günther & Münninkhoff 2003).

Opinions concerning holidays and environment (Vacationists in Schleswig-Holstein in 1996, n=240)	"I agree decidedly" / I tend to agree"
Intact environment is very important with respect to contentedness with my holidays	90.7 %
Opportunities to directly experience nature are important for the choice of my holiday destination	65.2 %
Opportunities to observe animals in their natural environment are important for the choice of my holiday destination	39.0 %
Opportunities to visit a Nature/ National Park are important for the choice of my holiday destination	39.0 %

In the period 1998–2001, the EU programme LIFE Nature has helped to finance information panels, maps, information kiosks, nature trails and observation platforms which are to inform and guide visitors (Table 2, Figure 3 and 4). Instead of being restricted in their freedom of movement, people will actually gain extra opportunities in terms of leisure activity. With few exceptions, visitors have free access to the National Park for hiking-tours on tidal flats all along the coastline.

Table 2. Numbers of information elements bordering entrances to the National Park.

Element	Number
Information panels	115
Information maps	57
Information kiosks	17
Nature trails	7
Observation platforms	2
Total	**198**

Figure 3. Information elements.

Figure 4. Information panel (example).

Planning this visitor imformation and guidance – concerning the site as well as the matters – was debated, hammered out and implemented through open dialogue with all regional interest groups, in particular the local inhabitants and the representatives of the respective communities.

The measures regarding guidance and information now minimise conflicts, reduce disturbance of birds and seals and damage to habitats, therefore improving nature protection within the National Park. The participatory approach might even have contributed to an increase in the acceptance and appreciation of the National Park.

Nature experience offers for visitors

There are a lot of opportunities to experience nature within the National Park.

– Tidal-flat walks with certified National Park guides: local people with special knowledge of the Wadden Sea, of weather and tidal conditions provide excursions and walking tours. They are well trained in nature interpretation, adhere to high safety standards and keep up with the latest information on the Wadden Sea region during regular

courses organised by the National Park Office. In 2002, about 116,000 guests participated in nearly 5,000 guided tours throughout the Schleswig-Holstein Wadden Sea (Gätje 2004).
- A boat trip in the National Park – a wonderful opportunity to observe nature: Birds, seals and – with a little bit of luck – Harbour Porpoises can be seen during boat trips in the Wadden Sea. On trips that are certified by the National Park Office, the passengers are provided with interesting information and in some cases with fascinating stories and anecdotes from the captain or a member of the crew.
- Information centres – tourists and day trippers are interested in the Wadden Sea and want to experience nature and be informed about the area. The information centres of the National Park, with their exhibitions, lectures, slide-shows and souvenir sales, aim to satisfy this need. The most successful facility is 'Multimar Wattforum' which presents the whole diversity of the Wadden Sea. A special attraction are the hands-on experiences of the fauna and fauna in touch-pools and the complete skeleton of a 17 meter sperm whale (*Physeter macrocephalus*). 240,000 visitors per annum make exciting discoveries in the centre and deepen their knowledge on nature in the Wadden Sea.
- The Rangers from the National Park Service and the nature conservation societies make every effort to personally inform visitors about the Wadden Sea. Tourists and day-trippers can chose between a large variety of guided tours on foot, by bike or by boat to discover Wadden Sea nature.

Regional National Park partner

The National Park Office has established a partnership program with a regional brand – 'National Park Partner'[1]. Under specific conditions, tourism enterprises, organisations and individuals can become a partner of the National Park by a voluntary agreement. They have to fulfil basic environmental standards, supplied by Viabono[2] – the new brand for everyone offering tourist services in Germany that are combined with natural enjoyment.

Furthermore, the partners commit themselves to support and communicate the aims and philosophy of the National Park. The attendance at further education courses once a year is obligatory for employees, to update information and to impart competent knowledge of the National Park. Partners are allowed to use the logo and are supplied with free information material. Cross-marketing via print media and Internet homepages is stipulated in the contract.

National Park partner can be
- Communities (Figure 5)
- Hotels, guest houses, vacation rentals
- Restaurants, cafés
- Shipping companies
- Youth hostels
- Campgrounds
- Tour guides

Also tour operators and a private railway enterprise are interested in concluding this National Park partner agreement.

Figure 5. Mayor of the first National Park community with the project manager on the island of Nordstrand.

Wadden Sea nature in tourism marketing

National parks can be trademarks for pristine landscape and authentic nature experience, a quality which is one of the most important competition factors in tourism (Hannemann & Job 2003). This conclusion is corroborated by representative surveys on expectations, opinions, motives, interests and activities of vacationers (Günther & Münnekhoff 2003). However, up to now regional tourism organisations, tour operators and facilities operators (accommodation, gastronomy, communities etc.) merely use the attraction value of the Wadden Sea National Park for marketing, although it is even suited to serve as unique selling proposition.

In order to improve this situation, the National Park Office has – in co-operation with the regional tourist information office – installed a LEADER+[3] project called 'Wadden Sea nature experience and tourism'. During the period 2003-2006, it aims to improve the integration of the numerous existing offers to experience the Wadden Sea nature into the choice of tourism products and services. Internal and external marketing is to be enhanced and intensified.

Within the project, we organise
- marketing-seminars tailored for enterprises offering nature experience,
- specific excursions for those engaged professionally in tourism where they can experience the attractions of the National Park themselves, so that they can give first-hand recommendations to guests with respect to indoor and outdoor nature experience and nature-compatible activities,
- conferences and workshops for people employed in tourism and nature interpretation as well as suppliers of nature-tourism packages, to exchange information, to stimulate discussion and co-operation and to enhance the generation of new ideas, products and services.

Evaluation by socio-economic monitoring

The Schleswig-Holstein Wadden Sea National Park implemented socio-economic monitoring (SEM) in 1999. A rising need to know more about National Park visitors, their expectations and opinions in order to better target information and public relations work has been recognised. This led to a monitoring concept which also supplies information for communication strategy and advanced visitor marketing (Gätje 2000a, Gätje et al. 2002).

SEM identifies visitor figures and structures as a measure of the use of the protected area as a site for recreation, leisure activities and environmental education. Furthermore, it also records how satisfied local inhabitants and visitors are with the National Park and the activities it offers.

When looking at the results of the opinion surveys at the Schleswig-Holstein Wadden Sea, the high level of acceptance for protection measures, such as access regulations and restrictions (Gätje 2000b) as well as for its protection status as a National Park are immediately noticeable.

In 2002, a representative survey using computer-aided telephone interviews with people living within the region was commissioned. The results revealed a positive attitude: More than a third of the respondents were proud of the National Park on their doorstep, another 49% classified it as ‘important’ (Figure 6). Only 5% gave a negative judgement.

Visitors to the Wadden Sea are positive, even very positive, about the National Park, as a facility to protect their holiday region: Of 859 holidaymakers at the North Sea, as many as 81% stated that statutory protection of the Wadden Sea was “very important” to them and for further 16% it was “important”. The other categories in this survey were “less important/unimportant” and “don’t know”.

These survey results are a sort of mood barometer for nature conservation and protected area management in the Schleswig-Holstein Wadden Sea region. They show that the National Park meets with great acceptance not only among visitors, but also among the majority of the regional population.

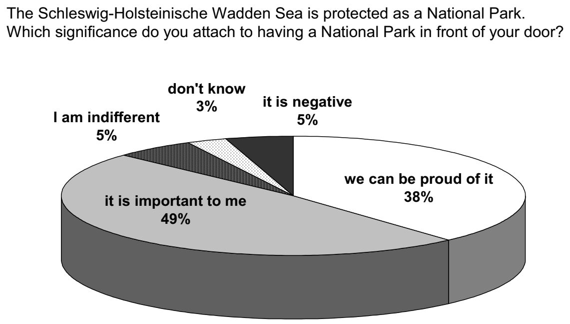

Figure 6. Result of a representative SEM survey in the National Park region (residents in the counties of Dithmarschen and Nordfriesland, n=606, September /October 2002, inspektour GmbH).

Conclusions

In 2005 the National Park will celebrate its 20th anniversary. The National Park authority has gained experience and has undergone a change to become a partner in sustainable regional development. This means that in the future it has to play an active role within the network of regional actors and to integrate nature protection needs and interests especially in the tourism industry. The aim to protect nature and concurrently support regional economy and meet social needs may then be achieved (Gätje 2003a).

Preconditions for sustainable tourism in the Wadden Sea region are:
- zonation (temporal and/or spatial) to avoid or at least minimise disturbance of species and negative impact on habitats,
- an efficient system for visitor information and guidance,
- qualified face-to-face information and support of visitors by competent, regularly trained staff (rangers, tour guides, employees of the tourism industry),
- intensive communication, co-operation and partnership between nature conservation and tourism,
- attractive nature experience, interpretation and edutainment opportunities,
- creation of (more) environment-friendly travel offers,
- professional marketing for nature experience and eco-tourism offers
- a good monitoring database for evaluation of ecological, social and economic development and sustainability (Gätje 2003b)

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[1] www.nationalpark-partner.de
[2] www.viabono.de
[3] EU community initiative "Liaison Entre Actions de Developpement de l'Economie Rurale"

General Principles for Sustainable Nature Tourism in Protected Areas Administrated by Metsähallitus, Finland

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Abstract: Metsähallitus is a state owned enterprise which has the responsibility for about 27 % of the Finnish land areas. The Natural Heritage Services of Metsähallitus is the administrator of 34 national parks, 17 strict nature reserves, 12 wilderness areas and over 400 nature reserves. Totally, the area of the protected areas, wilderness areas and other areas with high values for nature conservation and recreation, administrated by the Metsähallitus, covers almost four million hectares. As a part of the work to contribute to sustainable tourism in protected areas, wilderness areas and the areas yet to be protected, administrated by Metsähallitus in Finland, nine principles have been developed.

Nine principles of sustainable nature tourism are to be implemented in 2004 and they have been prepared paying attention to the character of these areas and the roles of the various actors, i.e. Metsähallitus, private entrepreneurs having their business there and all the stakeholders which are active within or close to these areas. The nine principles for sustainable nature tourism are as follows: 1) Nature values are preserved and the activities promote nature protection, 2) Minimum loading of the environment is assured, 3) Local culture and heritage are respected, 4) Customers' appreciation and knowledge of nature are promoted, 5) Customers' opportunities to find recreation in nature are enhanced, 6) Customers' mental and physical wellbeing are reinforced, 7) Positive impacts are made on local economy and employment, 8) Communication and marketing are of high standard and carried out with a sense of responsibility and 9) Activities are planned and implemented in co-operation.

What is Metsähallitus?

Metsähallitus is a state enterprise with two main divisions: Natural Heritage Services and Forestry. The former one has the responsibility for 34 national parks, 17 strict nature reserves, 12 wilderness areas and over 400 nature reserves. Totally, the area of the protected areas, wilderness areas and other areas with high values for nature conservation and recreation, administrated by the Metsähallitus, covers almost four million hectares. There are annually over 1 million visitors in the national parks, 342 000 in the hiking areas and 673 000 in the visitor centres and other customer service points of Metsähallitus.

Responsible management and use of natural resources is one of the main values of the Metsähallitus. Guidelines for the good management of protected areas are defined and implemented in the whole organisation of Metsähallitus (Metsähallitus 2000). But how to implement these when developing tourism in the protected areas, which – at the same time – represent the most beautiful natural features of Finland? And what is sustainability?

During the last ten years, many organisations have made definitions of their own about sustainability, and for different purposes. For example, the WWF drew up the Ten Commandments for ecotourism addressed mainly for western tourists visiting exotic countries (WWF 1995). The World Travel and Tourism Council has listed ten primary areas needing to be developed by the tourism industry in order to achieve sustainable development. The World Trade Organisation has core indicators for sustainable tourism (WTTC, WTO & Earth Council 1995). The European Charter for sustainable tourism in protected areas has been prepared by Europarc, the Federation of Nature and National Parks of Europe. Its purpose is to act as a standard and guideline helping each signatory to develop high quality sustainable tourism (Europarc 2003) A sustainable model for tourism in the arctic areas has also been prepared.

There are also many other examples of definitions aiming at describing guidelines for different activities in different parts of the globe. However, there are certain common features, which can be recognised in most cases (first defined by the WWF in 1995). Consequently, the following guidelines can be considered as a kind of basis for sustainability in tourism:

- Sustainable use of resources
- Reduction of over-consumption and pollution
- Protection of biodiversity

– Co-operation with local populations and stakeholders
– Marketing of tourism in a responsible way

Principles Applied by Metsähallitus

Interpretation and implementation of these depend on who is using them and for which purpose. Our point of view is that of the land administrator, who has the responsibility for protection of biodiversity and is interested in serving the visitors. Thus, the following nine principles and their interpretations have been drawn up for the protected areas administrated by the Metsähallitus.

1. Nature values are preserved and the tourism activities promote nature protection
   – Nature is an important reason for travel
   – Visitors are told about nature and nature conservation
   – Tourism does not disturb nature, all areas are not suitable for tourism
   – Visitor groups are small and trails are used whenever possible
   – Tourism is channelled with the help of information and by placing of facilities
   – Facilities are constructed without harm to the environment and areas of natural beauty are left in their natural state
   – Degradation of nature and other impacts are monitored and, if necessary, measures are undertaken

2. Minimum loading of the environment is assured
   – All forms of loading of the environment is avoided and nature's own terms are followed
   – The objective is rubbish-free hiking with minimum stress on environment
   – Firewood is used frugally
   – Emissions into water and air are minimised and renewable energy sources are favoured
   – Metsähallitus and entrepreneurs provide examples of how to act when in taking care of environment

3. Local culture and heritage are respected
   – Local culture is met open-mindedly
   – Whenever possible, cultural heritage is included in information and experiences are offered
   – Local guides familiar with culture are used

4. Customers' appreciation and knowledge of nature and culture are promoted
   – Information is acquired beforehand
   – Knowledge is easy to find in interesting form and content
   – Opportunities are given for participating in the management of the area
   – Guides are well-trained

5. Customers' opportunities to find recreation in nature are enhanced
   – All nature lovers are taken into account
   – Services are optimal in relation to demand and site
   – Peace of wilderness and guided excursions in nature are offered
   – Tourism products are developed in co-operation with entrepreneurs

6. Customers' mental and physical wellbeing are reinforced
   – Muscle-powered mobility is favoured
   – Appropriate hiking equipment is provided
   – Both easy and demanding hiking routes are available
   – Opportunities for nature experiences are offered
   – All routes, facilities and programmes are safe

7. Positive impacts are made on local economy and employment
   – Products and services of local entrepreneurs are always used when possible
   – Local people are employed when possible, but also people and ideas from outside the region are seen as a potential

8. Communication and marketing are of high standard and are carried out with a sense of responsibility
   – Information is reliable
   – Communication is open and interactive
   – Marketing is not in conflict with nature conservation

9. Activities are planned and implemented in co-operation
   – Opinions of the visitors are appreciated
   – Training is organised in co-operation with entrepreneurs
   – Planning procedure is open for anybody
   – Priority is given to those wanting to commit themselves to these nine principles of sustainable nature tourism

Implementation of the Principles

The nine principles are to be implemented in 2004 and they have been prepared paying attention to the character of these areas and the roles of the various actors, i.e. Metsähallitus, private entrepreneurs having their business there and all the stakeholders which are active within or close to these areas. The principles can be seen as a log term goal. The implementation and application of these principles is an ongoing process.

In the activities of the land administrator, Metsähallitus, better management is one of the goals. Management of the areas is improved by avoiding mass tourism, by taking protection of natural values as a guideline when doing construction work in sensitive areas and by having an efficient system for supervision and interpretation.

The principles also steer the work with tourism. For example, they are clearly showing the need to know more about degradation of the areas, thriving of rare animals and flowers and the quality of waters in wells and waterways. This leads to developing a new system of monitoring the impacts of tourism in our areas. Some forms of recreation do perhaps not meet the demands set in the nine principles. Consistently, these activities will be excluded from the protected areas or from some parts of them.

Metsähallitus is not working alone in the protected areas. Private entrepreneurs are active in many areas. Their customers use the facilities of Metsähallitus and they are our customers, too.

Private entrepreneurs are involved in this through their agreements with Metsähallitus. At the moment, the Natural Heritage Services of Metsähallitus has an agreement with over 200 entrepreneurs working in tourism. A new system of agreements was recently introduced and the principles are applied in the terms written in the agreements. New agreements will concern hundreds of companies and entrepreneurs in the whole country.

There are four kind of agreements made with the entrepreneurs using the protected areas more than what the Finnish everyman's right (public access principle) allows. The four types of agreements are:

– Licence (usually a short-term limited permission)
– Agreement on the right of use (at least one year)
– Agreement on co-operation (mutual interest, different activities included)
– Agreement on partnership (development of products in common)

Experiences Gained

During the development period feedback of the nine principles was gathered from 135 entrepreneurs and stakeholders around the country. According to the feedback our principles of sustainable nature tourism are considered rather acceptable. The average grade of answers was 8,96 (on the scale of 4 to10). They are considered clear and easy to understand (mean 8,24). Our entrepreneurs see the principles even more positive as compared to other groups of stakeholders. At the same time, slight criticism is given owing to the ambiguous character of the principles. It is easy to agree to the principles, if the they are not too binding.

However, thanks to the feedback, we know that we are on a right track, hiking to the right direction.

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Sustainable Tourism in Biosphere Reserves of East Central European Countries – Case Studies from Slovakia, Hungary and the Czech Republic

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Abstract: This paper reviews the perspective of the local actors within the context of a sustainable future. Biosphere reserves as designated model areas for sustainability strive to reconcile existing conflicts between the goals of economic growth, environmental protection and social justice. Tourism development in biosphere reserves provides opportunities as well as challenges for the exploitation of biodiversity. In order to minimise the danger it is important how tourism is managed. Without the involvement of local people, sustainable tourism development is doomed to failure. The case studies presented from Slovakia, Hungary and the Czech Republic provide a view inside the situation of protected areas in East Central Europe and cover areas where tourism has reached differing stages of development. Empirical results in four biosphere reserves will show the view of the actors in the region.

Introduction

During the last decades there have been profound changes in Central Europe, and some of these have also affected the natural environment. Nevertheless, nowadays there is 30% of the total area of East Central Europe with the highest density of biodiversity. (Homeyer 2001, p. 41). A special feature of this region is the strong presence of wild animals that are almost extinct in Western Europe e.g. lynx, wolf, bear and beaver.

Under the former socialist system, industrial development was concentrated in urban areas, which meant that the undisturbed development of ecosystems was possible outside these centres. But this diversity of species and the preservation of some protected areas in East Central Europe are increasingly endangered. The accession to the European Union this year promotes the idea of ease of economic actions and access to markets, but at the same time this increases the danger to biodiversity: the most serious threats include unsustainable exploitation, pollution and land-use changes throughout Central and Eastern Europe.

Tourism, while still at a relatively modest level of development in the region, provides opportunities as well as challenges for the sustainable use of biodiversity. To minimise the threat it is important to know in which way tourism should be managed. The concept of sustainability strives to reconcile conflicts existing between the goals of economic growth, environmental protection and social justice. In biosphere reserves it is an important task to develop tourism in a sustainable way because of its large potential negative impact on biodiversity, in both a quantitative and qualitative sense.

The growing market for nature-oriented tourism is exerting growing pressure on sensitive areas. Many regions now have to take action. Biosphere reserves are designated and managed with the objective of promoting and combining biodiversity conservation with sustainable development based on community participation and science.

The case studies presented from Slovakia, Hungary and the Czech Republic provide a view inside the situation of protected areas in East Central Europe and cover areas where tourism has reached differing stages of development. Empirical results from my survey, which was taken in summer 2003 in four biosphere reserves (Sumava, Czech Republic, Aggtelek, Hungary, and Slovensky Kras and Polana, Slovakia), will show the perspective of the actors in the region. This view is important to evaluate the chance for the implementation of the ideas of sustainable tourism development.

Common Situation of Selected Biosphere Reserves

The situation in all four regions is characterized by the following:

The economic and social transition is accompanied by structural changes and breakdowns, which have substantial consequences in every part of life.

The accession to the EU defines the direction of transition, e.g. in the question of the administrational reform that is followed by a change in political decision-making with benefits for districts and municipalities.

The case studies presented have characteristics of peripheral areas in Central Europe: three out of the four are situated at the border; they are all situated relatively far from the capital city and therefore the centre of economic growth; they are characterized by economic disadvantages, high unemployment rate and low living standards; the population density is respectively low.

Nature conservation is important in the region: they all have international approval as biosphere reserves in the framework of the Man and Biosphere Programme of the UNESCO; three of the regions achieved also the designation 'national park' offering the highest national level of protection (Aggtelek, Hungary, Sumava, Czech Republic and Slovensky Kras, Slovakia).

Tourism plays an important role, because the beautiful landscape provides great opportunities for regional development in each biosphere reserve.

All the biosphere reserves presented are involved in an international project in cooperation with UNESCO and financed by GEF[1] with the title: "Conservation and Sustainable Use of Biodiversity through Sound Tourism Development in Biosphere Reserves in Central Eastern Europe". This could be interpreted as an understanding of the pressure to act and to search for solutions for a sustainable future.

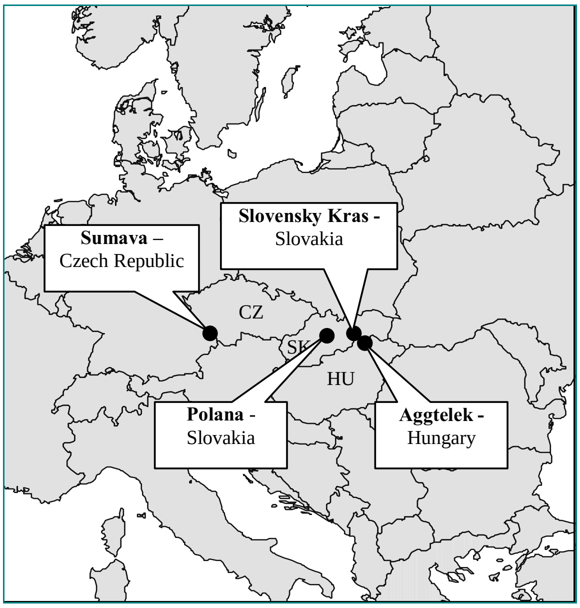

Figure 1. Map of case studies.

Special Situation in Each Biosphere Reserve

Biosphere reserve Sumava – Czech Republic

The area has been protected as protected landscape area (PLA) since 1963 and in 1990 it was included on the list of biosphere reserves with a total area of 160 000 ha. Concerted efforts by nature conservationists led to the most vulnerable areas being declared as a national park in 1991. As shown in the map (Figure 1), Sumava is situated in the south-western part of the Czech Republic with a common border to the German national park Bavarian Forest and in the south to Austria. Thanks to its geographical position, the area remained in its natural condition until the middle of the 20th century. It became well known for wood processing and glass making; related settlements as well as resource exploitation have changed the landscape slowly during the last centuries. After the Second World War the iron curtain was established, so the area was characterized for over 40 years by the military. The geographical situation as borderland between East and West reinforces the economic marginality and its rural character; on the other hand it has helped to sustain natural attractions and to establish protected areas. The Sumava biosphere reserve includes a substantial part of the north-east-facing Bohemian Forest with the largest forest complex in Central Europe. Due to its situation within densely populated Central Europe, its relatively high wild-life conservation, and its rich water resources, the Sumava region is often referred to as "The Green Roof of Europe". Typical for the landscape are spruce forest, peat bogs, meadows and altitudes that vary between 1 378m and 490m above sea level.

Biosphere reserve Aggtelek – Hungary

The nomination to UNESCO biosphere reserve occurred in the year 1979 and covers an area of 19 915 ha. The national park was established in the same border in 1985 with two villages inside its boundaries. The underground natural treasure, the caves of the Aggtelek Karst and the Slovak Karst were inscribed on the UNESCO World Heritage List in 1995. The morphological diversity and typical fauna make this cave system one of the most complex examples of karstic phenomena in Europe. This area with over 800 caves is divided by the state border between Hungary and Slovakia. On the Hungarian side, the landscape is dominated by small scale agriculture with small fields in strips, extensively used karst plateaus with dolines and valleys and a richness of endemic plants and animals. The two villages inside the national park represent the local economic centre on a small scale. Miscolc is the nearest city with more potential for economic growth, but it is too far away (70 km) for this region. The historical centre for Aggtelek region lies on the Slovak side with the town Roznava.

Biosphere reserve Slovensky Kras – Slovakia

Situated adjacent to the Aggtelek biosphere reserve in the south of Slovakia, Slovensky Kras (Figure 1) has a series of plateaus, ranging between 400 and 900m above sea level, that are surrounded by steep slopes descending to adjacent basins, valleys and gorges. In 1973 the area achieved the status of protected landscape area but in 2002 this was replaced by the new establishment of the national park, with almost the same boundaries enclosing about 35 000 ha. The declaration as biosphere reserve occurred in 1977, this was the first biosphere reserve in Slovakia. It covers an area of more than 75 000 ha with the national park in its centre. Inside the biosphere reserve the population density is very low, but in the near vicinity there are towns, including the cultural and administrative centre Roznava (20 000 inhabitants). Roznava and many other towns in the region have a long tradition of mining and iron ore smelting. Today all mining activities have ceased, but a lot of traces can be found in the landscape. The recent settlements and economic activities are concentrated in the basins and river valley outside the national park. In contrast to the neighbouring area of Aggtelek, the region has an industrial-rural character with industries exploiting and processing raw materials, machinery and metal industry.

Biosphere reserve Polana – Slovakia

Since 1981 the area with approx. 20 000 ha has had the legal status of protected landscape area. It lies in the central part of Slovakia in the proximity of the district city Banska Bystrica. In 1990 the entire area was declared a biosphere reserve. The landscape was shaped mainly by volcanic processes more than 10 million years ago. The caldera with a diameter of up to 6 km is well visible, with altitudes of 1 300 m and up to 1 580 m (highest peak *Zadna Polana*). Within the biosphere reserve there are only few settlements with altogether 400 inhabitants. In the south, on the verge of Polana, the town Detva has over 12 000 inhabitants and central functions for the region. However, the largest enterprise (heavy industry) closed down and more than a thousand workers lost their jobs one year ago. Social problems within the biosphere reserve result mainly from the demographic situation: younger people move out of the region and the remaining population has a high proportion of elderly people. The landscape is mainly characterized by agriculture in a traditional way; mainly subsistence and not for the market. Therefore the fields are very small with the particularity of a terrace-like shape. The extensive use of the landscape assures the high biodiversity in the area.

Key aspects of tourism development in case regions

Sumava – Czech Republic

- tourism revival since the opening of the border in 1989
- large local and seasonal differences in tourist arrivals
- heterogeneous structure of accommodations: ski-resorts, big hotels but also private accommodations, little pensions, cheap cottages and big campsites
- lengths of stay: 1-2 weeks, 1.8 mio visitors per year, over 90% domestic tourism
- activities: mountain biking, hiking, downhill and cross-country skiing
- some villages are economically heavily dependant on tourism

Polana – Slovakia

- only one hotel (over 200 beds) situated in the core of the biosphere reserve
- tourism recently very weak
- landscape has high tourism potential
- mainly daily visitors or guests from the hotel (in summer business, in winter skiing)
- activities: skiing (mainly hotel guests), hiking, biking

Slovensky Kras – Slovakia

- mainly private accommodation, no bigger hotels
- tourist information in Roznava is accommodation agency for the region
- local tourism board represents the interests of tourism industry in a broader area
- main attraction: four dripstone caves open to the public in summertime
- lengths of stay: 1-2 days, many daily visitors; main season in summer
- activities: visiting caves and cultural sites (e.g. castles)

Aggtelek – Hungary

- over 100-year old tourist tradition of visits to the biggest cave system
- at the end of the 1980s visitor numbers higher than today; the quality and the structure of tourism changed
- mainly daily visitors, lengths of stay: no more than 2 days
- main attraction: visiting the cave *Baradla* (phenomena of mass tourism)
- Aggtelek national park acts like tour operator: cave management, owns restaurants, hotel and camp sites; the national park is a strong brand mark

Aspects of Sound Tourism Development

In the following part three aspects will be examined more closely by identifying differences and similarities between the chosen regions. The results present a crucial part of the survey I made in the summer 2003. A standardized questionnaire was used to survey all the accommodation enterprises within the borders of the biosphere reserve. The different size and tourism intensity of the areas requires an adapted approach. Thus in Sumava, as the largest biosphere reserve in the Czech Republic, hotels were the main group surveyed (altogether 35 enterprises). In the other areas, the accommodations inside the biosphere reserve were supplemented by bigger hotels at the edge or in vicinity of the protected area (in Aggtelek 21, in Slovensky Kras 13 and in Polana 9 enterprises altogether). Data relating to the total number of accommodations in the biosphere reserves is not available, so it is impossible to tell if the sample is representative or not. However, if the criteria of a visitor looking for accommodation are considered (as information from the tourist information, road signs, discover by coincidence etc.) it is possible to assume that the surveyed enterprises could represent a very high percentage of all enterprises providing accommodation – roughly 90%.

The empirical emphasis is based on qualitative interviews with persons from a various range of tourism and nature protection (e.g. administration of biosphere reserve, tour operator, and regional development agency).

Potential conflicts between nature conservation and tourism development

In all four biosphere reserves the likeliness of potential conflicts between tourism and nature protection is seen as relatively small. Nearly 60 % of all surveyed persons rated the likeliness as less than 5 on a scale from 0 to 10. Approx. 12% said that there is no potential conflict at all between tourism and nature protection. According to statements which were made during the investigation, the threats to nature come from other non-tourism activities. A good example here is the industrial land use in Slovensky Kras, Slovakia: a visible contrast to the national park philosophy.

Already existing tourism activities are causing damages in temporal and spatial concentration. Phenomena known to arise from mass tourism with direct, negative consequences for nature and landscape could be found in places in Aggtelek, Hungary, and also in Sumava, Czech Republic. The main conflicts result from a low public environmental awareness (not only tourists), which could be observed in illegal garbage disposal in the forest.

The different stages of tourism development in the areas are reflected by the different ratings for the potential conflicts of tourism and nature protection. In Aggtelek, Hungary, and Sumava, Czech Republic, we find higher values then in lower developed tourism destinations like biosphere reserve Slovensky Kras and Polana (Figure 2). Differences exist particularly in the kind of conflicts caused by the different stage of tourism development. In Sumava there are up to 1.8 million visitors annually and the main tourist attractions (Schwarzenberg timber floating canal, observation tower in Polednik, Vydra valley) are visited by several hundred tourists daily during the summer months. In Aggtelek, Hungary, the dripstone caves are highly frequented in the summer months July and August. In both areas we can find typical problems of mass tourism and the attempts to solve them through strict visitor management.

The different tourism development situations (see also key aspects of tourism in the biosphere reserves) mean that there are different possibilities and limits for tourism development and, of course, site specific ‘carrying capacities’. Some experts in Sumava already regard the tourism growth as critical and do not think that the continuous growth of visitors would be a desirable goal. According to the expert opinions, the existing and potential problems occur basically in connection with (too high) visitor frequencies. Therefore visitor management, and here especially the channelling of visitor flows, is the instrument that is used most frequently and most effectively. Measures aiming to change visitor behaviour or environmental education are not the main task. Further statements of the experts regarding the reasons for conflicts fit in this picture very well: The general environmental awareness of the public (tourists as well as local inhabitants) is very low and hard measures like restrictions and prohibitions are more likely to assure a solution than soft (educational) tools - at least in the short term.

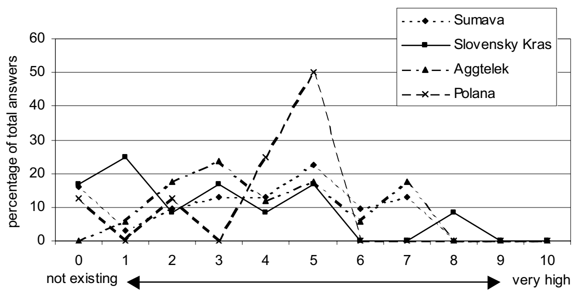

Figure 2. Rating of potential conflicts between nature conservation and tourism development

Local stakeholders in regional development

Local inhabitants are the main factor for regional development in a sustainable sense. The accommodation questionnaire also asked about the willingness to participate in regional decision-making. In summary, it can be stated that the general readiness to participate is high, over 60% answer this question positively. A total refusal of participation is stated only rarely (8%). The interpretation lies in the fact that the stakeholders in the tourism sector have a strong interest in taking part in decision-making. However, many remain uncertain. Thus, there is interest in taking part in regional decision-making, but not without conditions.

In contrast to this, many experts share the opinion that local people show altogether little interest in regional development. According to statements in all four biosphere reserves, it is very difficult to motivate local people to take part in processes which go beyond individual short-term profits.

A strong faith in the capability of the state is illustrated by the futile wait for national control and financial support: a common behaviour amongst the local people which is described by experts as an effect from the past socialist era.

The regional differences as to whether the accommodation providers would participate in regional decision-making processes is shown in Sumava, Czech Republic (see Figure 3). Here, the number of persons who answer with 'don't know' is higher than in the other biosphere reserves. Only a few categorically reject participation. In the biosphere reserve Polana, past experiences with participation procedures were visible, with some of them negative ("the talking didn't bring solutions", an owner of a pension). Nevertheless, a general readiness can also be recognized in Polana. One third of the respondents answer with 'don't know', but during the interviews it became obvious that the reason for that lies in the scepticism of participation itself. A categorical refusal is stated only rarely. The broad agreement to this question is remarkable in the biosphere reserve Slovensky Kras and the adjacent biosphere reserve Aggtelek, with approx. three quarters of the total responses being positive.

In addition, there are differences regarding the regional identity. According to expert statements, Sumava has a relatively high regional identity despite its long period as a border area at the iron curtain. Slovensky Kras and Aggtelek have a common historical past: before the Second World War this area was a Hungarian district. The name from this time is still in common use: *Gömör Torna Karst*. On the Slovak side the strong Hungarian minority identifies itself very much with this region and its Hungarian history.

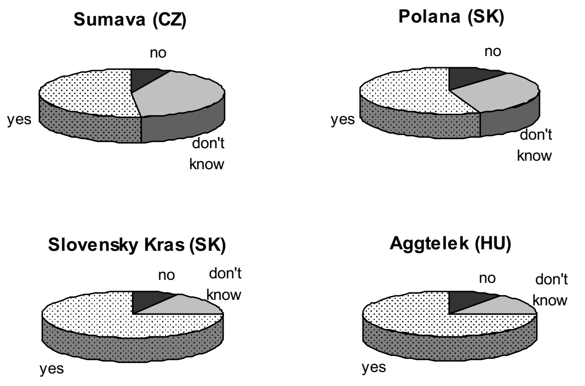

Figure 3. Would you take part in decision-making in your area?

The region around the biosphere reserve Polana is hardly known as a protected area. However, it gives the name for the micro region *Podpolana* which is adjacent in the south.

The degree of networking between regional stakeholders is quite different in the biosphere reserves. In the biosphere reserve Sumava, Czech Republic, the tourism sector lacks a controlling body that can represent the interests of the tourism, like a local tourism board. Likewise, a central service providing information about accommodation for the entire area is missing. In the biosphere reserves Aggtelek, Hungary, and Slovensky Kras, Slovakia, this service is provided by the tourist information, which has a list of accommodation in the area. In the biosphere reserve Polana, tourism has not yet developed sufficiently to make a tourism organisation necessary.

Influence of the protected area on tourism development

The questionnaire asked for the participants' opinion on the influence of the protected area on tourism development in the region. On a scale from -4 (very repressive) to +4 (very stimulating), over 50% of the answers lie in the range between +1 and +3; only 13% of all answers are negative.

There are strong differences in the answers between the examined regions (Figure 4). In the two areas where tourism is more developed, Aggtelek, Hungary, and Sumava, Czech Republic, the answers are more positive than in the other not so well developed areas in Slovakia. Here, the interpretation might be allowed that the tourism stakeholders see that the protected area is partly responsible for the tourism development which has already taken place. The variation of the answers is very high, particularly in Sumava, Czech Republic: 10 of 28 responses have the two highest values and four responses lie in the negative range.

This mainly positive evaluation of the influence of the protected area on tourism arises mainly from the benchmark national park, because biosphere reserve as a type of protected area is hardly noticed. It can be stated that for the surveyed people working in the accommodation sector it does not play a great role whether this area is protected as biosphere reserve, protected landscape area or national park. According to the statements of the experts, the inhabitants have only a little knowledge of the concept of biosphere reserves, if they have any idea at all what this is. The main idea of the biosphere reserves, to be model regions of sustainable development[2], is not communicated sufficiently in the area. On some information boards in Sumava, Czech Republic, tourists have the chance to learn that the national park is a part of the broader biosphere reserve through interpreting the map where the borders of the protected areas are shown. If visitors look for deeper information about the conceptual and practical differences, they will have some problems finding it. In Slovensky Kras, Slovakia, the term biosphere reserve appears only in the logo of the national park; any general information beyond that is missing.

In all four protected areas the term biosphere reserve is not communicated sufficiently. As a logical consequence, the biosphere reserve is hardly noticed by the population and other protection categories (primarily the national park) dominate the situation.

Even the experts do not value the economic, tourist and multiple opportunities of the international approval by UNESCO as a biosphere reserve. They primarily regard the nature conservation function of the biosphere reserve as very helpful: the differences to the concept of national park are not very clear. Knowledge about biosphere reserves is missing among the tourism experts, or it is also determined by the classical interests of nature conservation.

Large differences exist in the acceptance of the protected area. According to expert statements, the overall acceptance is low in all examined areas. The chance to participate in the decisions during the establishment of the protected area was not granted to the inhabitants of any of the biosphere reserves. On the other hand, it can be stated that the acceptance is higher in areas where the national park acts as a large employer (in Aggtelek, Hungary, and Sumava, Czech Republic). In the biosphere reserves where daily life is not affected by the protected area (Polana and Slovensky Kras, Slovakia), the acceptance is accordingly lower. Problems of acceptance can emerge if the nature conservation rules lead to hard restrictions for development. This is what happened in the case of the municipality Horni Plana in the biosphere reserve Sumava, Czech Republic, where the mayor would like to build a new skiing area in the national park but has been refused permission.

For the administration of protected areas, the existing opportunities to act are very different in the

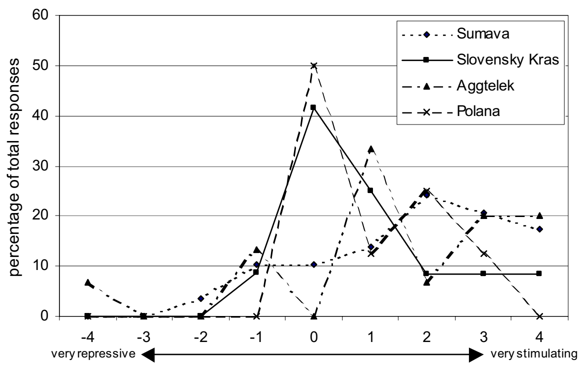

Figure 4. Influence of the protected area on tourism development.

surveyed biosphere reserves. In Aggtelek, Hungary, the national park is at the same time regional authority for nature conservation and acts as a tour operator. They have to earn over 40% of their budget themselves. This is only possible because the main attractions (here: dripstone caves) are in the ownership of the national park itself. On the Slovak side of the karst region, the caves (which are also the main attraction here) are under the administration of the national authority for caves in Slovakia, which has its office outside the region. In addition, the Slovak national park only has the authority to give statements in questions relating to nature conservation. The biosphere reserve Slovensky Kras only became a national park in the year 2002; this was followed by crucial changes in the administration (e.g. change of the director, increase in employees) that are continuing today. The national park Sumava, Czech Republic, is an economically important stakeholder in the region because of its activities in wood processing and forestry. Polana is of lesser importance since it is “only” a protected landscape area. The administration of the biosphere reserve is also responsible for the tasks of nature conservation in a larger district.

The administrations of the four biosphere reserves all have in common the fact that they do not have staff or a department whose tasks exclusively concern the biosphere reserve.

These different positions of the administrations in the region of the biosphere reserves are the starting point for the evaluation of the regional role. In the biosphere reserve, the goal and the task are to manage tourism in such a way that it does not endanger the interests of nature conservation. In Polana and Slovensky Kras, Slovakia, the experts stated that it is not necessary to act because the potential conflicts between tourism and nature protection are too small and not relevant. Also in Sumava, Czech Republic, the national park sees its task as managing, not developing tourism. The idea of being an engine for regional development can be found in the Hungarian biosphere reserve but at the very beginning. The national park Aggtelek is in fact the main stakeholder in the region. The two villages situated inside the national park are a kind of regional centre for regional development and economic growth. The national park is the biggest tour operator with good marketing in the area.

Summary and Outlook

In the four biosphere reserves presented, the main hope for the development of the region lies in tourism. On one hand, there are statements reflecting a critical view of this hope that tourism development will bring quick economic effects for the region. One expert refers to the time 10 years ago when everybody in the region believed that economic growth would come through tourism development: he points out that so far tourism has hardly brought any substantial improvements to the region. On the other hand, most of the experts agree on the fact that there is no alternative to tourism development in the respective regions. Thus tourism remains the economic field that brings hope for an improvement in the economic situation and for a better life.

The fact that the protected areas all have international approval as biosphere reserve is not communicated sufficiently within the areas. The chance that lies with the concept of biosphere reserves has not been recognised. The protection category national park is better known in the public, because everybody can associate something with a national park, while the term biosphere reserve remains mysterious. Good evidence for this is provided by the comparison with the biosphere reserve Polana, Slovakia, which is not approved as national park. The situation here is dominated by the relatively low national status of protected landscape area (*Chranena Krajinna Oblast*) which overlaps the international protection status. According to statements of local tourism experts, few people in the region know that a biosphere reserve is situated here (some do not even know that there is a protected area). The people working in tourist accommodation were asked in the questionnaire about their connotations concerning the term biosphere reserve. The clear result can be characterised by terms which are strongly connected to nature conservation or the natural landscape (“clean air”, “protection of plants and animals” etc.). Terms that express the concept of biosphere reserve can seldom be found; a harmonious way of human utilisation of the landscape and at the same time protection of nature and culture. It is noticeable that in their answers, the respondents often do not make a distinction between the biosphere reserve and the national park (or the protected landscape area).

For regional development the cross-linking between local stakeholders is of great importance. It is particularly important in tourism if the goal is sustainability for the regional development. In all examined biosphere reserves there is a lack of networks, which is expressed in the experts’ demand for the establishment of new networks and the maintenance of existing ones. Three of the four biosphere reserves are border regions. The contacts beyond national borders play an important role here. The opportunities to request financing in the European Union are much more promising if you have transboundary cooperation. Therefore we can find in this context some international projects in the biosphere reserves financed, for example, by the European Union and the United Nation Environmental Programme (UNEP).

Tourism is one of the key factors for sustainable development in the biosphere reserves examined, since this sector can be the economic engine for conservation of cultural and natural values. But tourism can have a positive effect on local people on other fields, too: people are probably more likely to respect their own natural and cultural surroundings if they experience the value of these through being confronted by visitors looking for just that. This might also help to avoid the consumptive tourism developments – those that exceed the carrying capacity of the vulnerable natural and cultural landscape – like large scale ski facilities or extreme sports.

The largest problem within regional development in biosphere reserves is the lack of initiatives from local inhabitants, who should be the main stakeholder for implementing sustainability. The reason for this situation is often identified as the past socialist system: there might be still a strong faith in the capability of the state to regulate and finance at the regional level, as it was usual in the socialist system. In the region there is a divided group of inhabitants. On one hand there are active and enthusiastic people who wish to develop the region through sound tourism development. These people are mainly residents who have not been living in the area for generations but who have moved into the area out of choice. This is not specific only for these regions but can also be found in other rural areas throughout Europe. On the other hand there are the main inhabitants of the villages situated close to the area who are not open minded and who are often suspicious of any changes in their life. In general, they do not see the connection between nature conservation and its value for the economic growth in the region. They often have to struggle with low living standards and do not understand the importance of being able to help oneself. To act on one's own responsibility is not something easily learnt in just a few years. It is a hard task to reach the local inhabitants, but in the long run there is no other chance for a sustainable future than to integrate them.

The scientific challenge is to develop and recommend suitable measures and tools for sustainable tourism development with the active participation of all regional stakeholders. Further should be examined, whether the concept of the biosphere reserves with its opportunities could play a role as the economic engine of regional development and what kind of basic conditions and institutional framework are needed. In this context, the tourism development has to be observed critically, in order to guarantee the satisfaction of the criteria of the overall goal to promote sustainable tourism while maintaining close contact to local people.

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[1] GEF = Global Environment Facility – established in 1991 and helps developing countries fund projects and programs that protect the global environment

[2] As described in the Seville strategy from 1995 (UNESCO 1996, UNESCO 2001)

Profiling recreational users of national parks, national hiking areas and wilderness areas in Finland

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Abstract: Finland's national parks, wilderness areas and national hiking areas play an important role in tourism and recreation, in addition to their primary purpose of nature conservation. Very little attention has been paid by research to the factors that influence the use of these state-owned areas by different segments of the population. The results of logistic and negative binomial regression models based on population-survey data indicate that the users of these state-owned recreation areas have a higher than average level of education and are more likely to be white-collar employees. The users were typically enthusiasts of particular forms of outdoor recreation, above all skiing and camping. The availability of state-owned recreation areas in the home municipality increased the likelihood of using them. The number of user days spent in these areas tended to be larger among those whose permanent residence was in eastern Finland or in a city of more than 100,000 inhabitants. Small-sized household and abundance of leisure time also increased the amount of use.

Introduction

Nature tourism and recreation use of state-owned nature conservation areas in Finland, especially national parks, has typically been studied from the point of view of the reconciliation of apparently incompatible use forms. The general perception has been that nature conservation and tourism and recreation can be done side-by-side in the same areas (Ohjelma luonnon... 2002). However, several studies have brought out the conflictual nature of these uses and have suggested some possible remedies (e.g. in Muhonen & Sulonen 1998, Saarinen et al. 2000). It is generally thought that nature conservation sets restrictions on the development of recreation and tourism on the same location. On the other hand, protection tends to support tourism when the attraction of these areas lies particularly in its special, natural characteristics. The national parks are experienced as a common heritage, the preservation of which can justify restricted access and the payment of a use permit (Naskali 2000). In the planning and management of each individual area, attention is also paid to the goals of recreation and environmental education, as well as to the ability of the area in question to serve different population groups (Natura 2000 -alueiden... 2002). However, no research has yet been conducted to find out how individual population groups use state areas in general.

The use of recreation areas can be approached proactively, focusing on objectives which are set on the areas and the needs of different population groups, or reactively by studying current use (cf. More 2000). Although it is important to identify the present customers and serve them as well as possible, it is also essential to discover for whom the areas are intended and whether the present clientele corresponds to the expected profile of visitors. In order to ensure an adequate supply of state-owned areas and to balance the emphasis on recreation use among them, it is useful to obtain a comprehensive picture of the whole group of users and to be able to compare this profile with that of the whole population and with the potential target users.

Categorising users of the state conservation and recreation areas and analysing the amount of use in the separate population groups is also useful for the sake of ensuring that all Finnish citizen can benefit from them equally. As the management of nature in state-owned areas is financed mainly by public funding, it is important to find out who ultimately benefit from these areas, which are intended to serve "a common interest". Although, all citizens participate in the financing of recreation services equally through taxation, some may have very few possibilities to use them. On the other hand, the mere existence of these state-owned areas can benefit all citizens by virtue of their nature conservation amenities even if some never use the areas themselves.

Equality questions related the fairness of use payments and effect of payments on users of public recreation areas and national parks have been discussed in the international literature (e.g. Walsh et al. 1989, More & Stevens 2000). User fees have been supported for the reasons of equality. When the costs of the management of these areas are covered by user fees, the costs are borne by those who actually use the areas. On the other hand, use payments have been seen as an obstacle to the equality of use when they have excluded low-income population groups from using them. The reduction of opportunities of some ethnic groups and minorities has received a lot of attention, especially in the United States, where nature conservation and recreation areas seem to serve middle-aged, white, male users (Taylor 2000).

Information about the national parks and national hiking areas that is produced on the basis of visitor studies of individual areas gives some idea of who uses these recreation opportunities. In this study, state protected and recreation areas (SPRA) – national parks, national hiking areas and wilderness areas – are treated as a single entity. The concepts of this study will follow this more general focus. According to an established practice, the term ‘visitor’ or ‘customer’ is used to refer to an individual who is visiting a particular nature conservation or recreation area. In this study it is natural to use the word ‘user’ to refer to all those who generally use the state areas, and to measure time spent there in terms of ‘user days’.

About one fifth of adult Finns use state areas for the recreation every year (Pouta & Sievänen 2001). About one fourth of the nature trips lasting overnight take place on state-owned areas. About 4.7% of the outdoor recreation which takes place near the primary residence is on state-owned areas. Recent outdoor recreation statistics (Pouta & Sievänen 2001) give a general picture of the users of state-owned areas. These statistics indicate that high education, male gender and white collar socio-economic status characterize a relatively higher proportion of users. However, there are benefits to be had from presenting a clearer and more detailed picture of these who use state protected and recreation areas.

The objective of this study is to analyse those who use national parks, hiking and wilderness areas and what factors affect how often these areas are visited for recreational purposes. For this purpose we have created participation models using population-based data on outdoor recreation behaviour.

Prior research and current policy objectives concerning the use of state protected and recreation areas

In Finland the recreational use of state protected and recreation areas was actively studied in the 1990's. Most of this research has been done in the terms of visitor studies that describe the recreation users and visitor profile of a certain specific area or location. Nowadays, visitor studies are conducted routinely with standardised research methods in the national parks and national hiking areas (Erkkonen & Sievänen 2001) for planning and management purposes. The published visitor studies justify the picture of the typical users of these areas as educated males aged 25–44 years who are employed as workers or white collar employees (e.g. Peura & Inkinen 1994, Ovaskainen et al. 1999a, b, Erkkonen 2000, Eisto 2003). Because visitor studies always target the visitors of a particular area, they do not produce a comprehensive general view of those who use national hiking areas or national parks as a whole.

According to Koskela et al. (2002) the possibility of participating in such activities as hunting, fishing, skiing and studying nature in special natural conditions of national parks, national hiking areas and wilderness attracts visitors to state areas. Visitor appear to invest more travel and recreation time and money in using the versatile outdoor recreation environment of state owned areas than in the visits to areas owned by municipalities or private parties. More costs were related to the use of state areas than to recreation in other areas. The study of Koskela et al. did not attempt to create a profile of those who visit state-owned areas.

The primary purpose of the 35 national parks (as of 2003) in Finland is conservation of the original biotic and abiotic features of nature, including traditional landscapes (The principles of protected area… 2000). *Metsähallitus* (The Finnish Forest and Park Service) has set management policy targets for the national parks, as well as for the national hiking and wilderness areas. In addition to enhancing nature conservation, the national parks also serve the objectives of recreation, environmental education, and teaching with the aim of increasing the Finnish population’s general knowledge of environmental matters (The principles of protected area… 2000). According to the principles established for managing Finland’s national parks, these areas have an important role in providing all Finns with opportunities to hike and experience nature. The seven national hiking areas have, in turn, been established in accordance with outdoor recreation statutes on state-owned land that is of considerable general importance from the point of view of outdoor recreation. According to a wilderness law that went into effect in 1991, 12 wilderness areas were established in the northernmost portions of Lapland for the purpose of preserving the wilderness in its original state, securing the status of the Sami culture and natural sources of livelihood and diversifying the use of nature. Most Finns traditionally associate wilderness areas with fishing and hunting. More recently, the wilderness has tended to be understood as a place of peace, silence and tranquility, as well as a place where one can experience nature in its original state, largely free of human traces and influence.

Traditional customs in Finland provide that everyone should have equal access to recreational uses of nature. The public right of access to nature, which is called “everyman’s right”, ensures that everyone is allowed to use nature for recreational purposes irrespective of who owns the land in question. When nature is used in accordance with “everyman’s right”, no permission is needed to enter the area, nor can a fee be demanded for using it. This right is enjoyed equally by all Finns and citizens of EU Member States, as well as in practice by citizens of other countries (Valtion alueiden… 1996). Generally speaking, all state-owned areas can be used in accordance with this right. In nature conservation areas there are a few exceptions to this general rule. “Everyman’s right” does not include the right of access to certain nature reserves. This right is also not valid as such in national parks, where certain area-specific regulations govern the recreational use of the area in question. Generally all the citizens are in an equal position as recreation users of state areas. However, there are some statutory exceptions concerning hunting, fishing and the use of motor vehicles in order to guarantee the local population in Lapland certain rights that are broader than those granted under “everyman’s right”. These rights pertain especially to reindeer herders (Valtion alueiden… 1996).

The objectives set for the recreational use of state-owned areas in the statutes and regulations do not take a stand on which population groups should be served by these areas; instead it seems that the objective is to guarantee equal access to all citizens. For example, according to Metsähallitus ordinary Finnish outdoor recreationists constitute the largest client group related to state forests (Metsähallitus suomalaisten… 2002). On the other hand, who uses these areas and how many users there are can be determined or influenced by creating a service profile for state areas and by distributing information to the public about the areas and their use. The awareness of the existence of a certain area and the possibility of using it varies in different segments of the population. In addition, not all Finns can reach these areas as easily on account of the uneven distribution of the population in different parts of the country. Achieving a more balanced user profile with reference to the entire population of Finland might be a very important objective on its own.

Modelling the use of state protected and recreation areas

An attempt is made in this study to find out who uses Finland’s state protected and recreation areas (SPRA) and what factors affect the amount or frequency of use. The share of users can be described on the basis of participation rates. The amount of use of these areas within a certain period of time by an individual person can, in turn, be described in terms of either the number of user days or the number of times a particular site is used.

Models of outdoor recreation demand can be used to create profiles of those who use SPRA. The choice of whether to use a particular area can be described with a model of so-called random utility (e.g. Walker & Ben Akiva 2002). According to the random utility model, the choices an individual makes reveals the utility the person gains. However, one aspect of this utility is random and is thus not directly accessible to the researcher. If a particular person is among those who use SPRA, then the utility that accrues to the person exceeds that which results in the event that the person does not use the area. The situation involving the choice of one destination site is typically described with a random utility model (e.g. Parsons & Kealy 1992, Siderelis et al. 1995, Englin et al. 1996). When the use of SPRA is examined, the demand is not studied from the standpoint of one particular area, but from that of all areas belonging to the category in question, in this case state protected and recreation areas. When the objective is to determine whether a person visits a particular area type or not, the attributes of one area and of possible substitute areas cannot be used as explanatory variables. Here, we do not examine the decision to visit one recreation site, but rather the decisions to visit state areas in general during the 12-month period prior to the survey.

The number of outdoor recreation trips taken to a particular destination has traditionally been described with a travel cost model that is based on household production theory (e.g. Bockstael 1995). In this model, the costs of the outdoor recreation explain the number of recreation visits to a certain area within a certain period of time, however other explaining factors, such as income, available leisure time and factors related to the quality of the site in question can also be used. In the travel cost method, demand is traditionally described on the basis of one recreational area and the model is based on on-site data. Here, we are interested in modelling demand for the entire category of SPRA. Because we are not concerned with any particular area, in which case we could measure distance and travel expenses directly, a variable describing the supply of such areas is used as the indicator of travel costs. It is assumed that the costs of using these areas are lower when they are located near the user’s permanent residence. Among the other factors that can be used to profile those who use SPRA relate to socio-economic background and to data on their outdoor recreation activities.

Statistical methods

SPRA use is described with a variable that indicates visitation of such an area during the past 12 months on at least one occasion. This variable is assigned the value of 1 if the respondent made such a visit, or of 0 if not. Thus in the first model SPRA use /non-use is described with a logistic regression model (e.g. Hosmer & Lemeshow 2000) that allows the dependent variable to be dichotomous.

The second model explains the annual number of days of use for those respondents who used an SPRA at least once during the 12-month period prior to the survey. Use days accumulate during the year when recreationists make decisions concerning individual outdoor recreation target areas. In this way the dependent variable, the number of use days, can receive only non-negative integer values. So-called count data models, such as the negative binomial regression model used in this study, are suitable for this purpose (e.g. Cameron & Trivedi 1998). Because the number of use days receives the value 1, 2, 3, etc., the distribution of the use days is left-truncated, such that the zero observations are not included in the model.

Data

Data for this study were taken from the national inventory of outdoor recreation in Finland. This data contains information on the recreation behaviour of Finns aged 15–74 years (Virtanen et al. 2001). The data collection was performed in two phases. Telephone interviews were conducted over a 24-month period every other month as 12 split samples. Data were obtained from altogether 10,651 interviewees with a response rate of 84%. A mail survey was sent to about 8,500 of the telephone respondents who were willing to answer it. A total of 5,535 respondents answered the mail inquiry, corresponding to a response rate of 65%. In this survey 2,632 mail responses contained information concerning the use of the areas of different owner groups.

Respondents were asked whether they had visited an SPRA during the last 12 months. Such areas include national parks, wilderness areas, hiking areas and other areas on which there are trails or recreation services arranged by the state. In a separate item, respondents were also asked how many days they had spent at such a place during the past 12 months.

In the following analyses several variables are used to explain SPRA use or non-use of areas and the number of user days. The telephone interview produced information about participation in about 90 different outdoor recreation activities. The background variables were obtained in the telephone interviews and the postal questionnaires and were used as explanatory variables. Furthermore, variables which describe the supply of state protected and recreation areas – the total area of the national parks, wilderness areas and the national hiking areas in respondents home municipality and the distance from residential centre of the municipality to the nearest state area – were obtained from the databases of Metsähallitus.

Results

During the 12 months prior to the survey, 22% of the respondents had used a state area for recreation at least once. We assumed that the supply of state conservation and recreation areas had an effect on their use. To analyse SPRA use in more detail we estimated the following logistic regression model.

Table 1 shows the estimates of a multiple logistic regression model explaining SPRA use or non-use. The aim was to include variables that described the socio-economic background of the respondent and the supply of state protected and recreation areas in his or her living environment. Furthermore, some variables that were related to outdoor recreation activities and proved to be significant were also

Table 1. Explaining the use of state protected and recreation areas, logistic regression model.

	Coefficient	p-value	Odds Ratios
Gender (male)	0.186	0.068	1.205
Elementary education	–0.269	0.026	0.764
White collar employee or entrepreneur	0.377	0.001	1.458
Camper	0.899	0.000	2.458
Cross-country skier	0.786	0.000	2.196
Downhill skier	0.332	0.009	1.393
Nature trips abroad	0.668	0.000	1.951
Distance to nearest state area (100 km)	–0.829	0.000	0.437
Constant	–1.826	0.000	0.161
N	2511		
Correctly classified, (%, cutpoint 0.50)	78.7		
Pseudo R^2	0.121		
Log-likelihood (constant only)	–1380		
Log-likelihood (model)	–1213		

included. In estimating the model we paid attention to the significance of the variables, and an attempt was made to avoid multicollinearity between the predicting variables. The measure of goodness of fit of the estimated model (so-called pseudo R^2) was 0.12, and in 78.7% of the cases the model predicted correctly whether the respondent had visited the state areas or not.

Socio-economic status and education explained SPRA use. Respondents who had completed only elementary school education used these areas less than those with higher education. Respondents who worked as white collar employees or as entrepreneurs were more likely to use these areas than were respondents in other socio-economic categories (workers, agricultural entrepreneurs and those who were not employed). The effect of the gender was less significant. Enthusiasm for camping, cross-country skiing and downhill skiing increased the likelihood of SPRA use. Participation in hunting was also significant in the model, but was removed from the final model because it was correlated with gender. Those respondents who had made a nature trip abroad during the past 12 months were also more likely to use an SPRA.

We used the distance to the nearest SPRA from the home municipality centre as a variable to describe the supply, accessibility and the costs of use of these areas. This variable was statistically significant and its sign was in accordance with expectations: when distance to the nearest SPRA increased, likelihood of use decreased. The distance to the nearest area was 34 km on average for those respondents who had used an SPRA, for those who had not used them, the distance to the areas averaged 38 km. The variables that described the geographical region of the respondent's home municipality, did not prove to be significant in the model.

It was possible to use the model to predict the likelihood of SPRA use by different population groups. For example, among respondents who had only an elementary education, who did not work as white collar employees or as entrepreneurs and who were not downhill skiers, the probability of using an SPRA was 0.15. For white collar employees or entrepreneurs who had more than an elementary education and were active in downhill skiing the probability of using an SPRA was 0.32. On the basis of the average of the total sample in the model, probability of using these areas was 0.19.

The average number of days of SPRA use was 1.3 days per year (standard deviation 5.1) when zero observations – respondents whom had not used state areas during the latest 12 months – were included. Of those who had visited an SPRA at least once, the median number of the use days was 4, the mean was 6.8 times and the standard deviation 9.9. About 15% of the users had spent more than 10 days at such areas.

We included the variable in the model to explain usage (user days) (Table 2) that showed the most statistically significant correlations with user days and did not correlate very strongly among each other. Respondents who lived in a city with more than 100,000 inhabitants were more likely to spend more days during a year at an SPRA. Another factor that was connected to the respondents' place of residence and increased the use of the state areas was location of respondent's permanent residence in eastern Finland (Kunnat ja kuntapohjaiset... 1999). The number of use days did not seem to be strongly affected by respondent's age, education or socio-economic background, and we found only a few socio-economic background variables, that explained the number of use days. As the size of the household increased, the number of days of SPRA use decreased. As the size of the household correlated with the interviewee's stage of family life, including a variable in our model that described a family with small children could have operated just as well. Number of the respondent's

Table 2. Variables that explain the number of use days, negative binomial regression model.

	Coefficient	Stand. dev.	p-value
Number of residents in home municipality >100 000	0.641	0.150	0.000
Eastern Finn	0.505	0.185	0.006
Household size	–0.111	0.041	0.007
Vacation days	0.001	0.001	0.064
Total area of SPRA in home municipality (1000 ha)	0.074	0.027	0.006
Constant	1.308	0.190	0.000
Alfa	2.260	0.467	0.000
N	458		
Pseudo R^2	0.461		
Log-likelihood (constant only)	–2323		
Log-likelihood (model)	–1251		

vacation days also tended to add use days in the state areas. Of the factors that described the supply of state protected and recreation areas, number of such areas in the respondent's home municipality was the best predictor in the model. When the respondent lived in a municipality that had a higher number of such areas than average, he or she tended to visit those areas more often than a resident living in a municipality with a lower number of such areas. However, the distribution of the number of such areas per municipality was quite skewed, and the majority of those who had used them did not have any in their home municipality at all.

Discussion

Our results suggest that the profile of Finns who use national parks, national hiking areas and wilderness areas for recreation deviates from that of Finns who does not use them at all. Both the supply of such areas and the socio-economic background seem to affect whether they are used or not.

Of the supply factors, proximity of the nearest state protected and recreation areas influenced the probability of their use. The abundance of such areas in the home municipality has a particularly strong effect on the frequency of use. We conclude that if the objective is to make special nature experiences on state protected and recreation areas available to as many as possible, these areas should be located as near as possible to large potential user groups. However, the amount of land area per site need not be large. An abundant supply of state areas near the primary residence makes it more attractive for people to visit them repeatedly. On the other hand, however, the abundance of such areas may reduce the relative share of other alternatives available.

The proportions of users versus non-users of state protected and recreation areas are similar in all five regions of Finland (Kunnat ja kuntapohjaiset... 1999). Even though the state protected and recreation areas in northern Finland are much larger in area, the distance to them for an average visitor in most parts of southern Finland is shorter than in other parts of the country. In southern Finland, such areas are small and fairly close to major populations centres, and thus the need of people living in towns and cities to enjoy natural outdoor settings is met rather well.

The profile of SPRA users is compatible with that which emerges from visitor studies. Those studies showed that level of education and socioeconomic status affected the use of such areas. It was especially apparent that of those who had only a basic education, fewer used state areas, more white collar employees and entrepreneurs tended to use them, than other socioeconomic groups did. The differences in recreational use can be partly attributed to differences in economic resources. Even reaching these areas already entails transport and accommodation expenses, and these are often high enough to keep some from participating at all. In addition, obtaining information about the recreation opportunities on offer in these areas and acquiring the skills needed to get information about them via the internet are probably related to educational level.

In this study, the use of SPRA was associated with participation in certain types of outdoor recreation activity. More of those who avidly participated in a variety of outdoor recreation activities visited these areas than those who were not active recreationists. The use of these areas was especially linked to camping, cross-country skiing and downhill skiing activities. The national parks of northern Finland are typical and logical destinations for downhill and cross-country skiing enthusiasts. The use of the national parks in connection with ski resorts obviously also influences the profile of the users of these areas in other ways as well. The fact that downhill skiing tends to be an activity that is particularly popular among individuals who have higher education and social status (Pouta & Sievänen 2001) tends to mean that these population groups are also important users of the state protected and recreation areas.

The model that was presented here in order to explain the number of use days revealed the importance of factors that are related to the respondents' residential environment. The fact that a respondent lived in a city with more than 100 000 inhabitants increased the frequency of his or her visits to state protected and recreation areas. This finding may be connected to the popularity of skiing tourism in Finland's five largest cities all of which are located in southern Finland. Skiing trips to the national parks in northern Finland typically last several days, and this accounts for much of the increase in the average number of days visitors from urban areas spend in them. Another factor that increased the amount of use among urban populations is the smaller supply of local opportunities to experience nature compared to similar opportunities available to people living in the countryside or in smaller towns.

The tendency for the use of state protected and recreation areas to decrease with increasing household size relates to the impact of growing family obligations and the increased costs of traveling. Another more general factor that tended to increase the number of days spent in state areas was the number of vacation days. When breadwinners had more days off, more time was available for outdoor recreation activities, and this added to the number of days spent enjoying state recreation facilities.

Offering high-quality nature experiences to as wide a group of Finns as possible could be seen as one good reason for increasing their possibilities to participate in outdoor activities and nature tourism on state-owned land (Ohjelma luonnon virkistyskäytön… 2002). The fact that the user profile of the state areas does not correspond to that of the general population in all respects may also be due to the fact that not all Finns are interested in using the current state recreation services and areas. On this basis, one might well ask if the services offered by the state areas could be developed without endangering their intrinsic natural value while still meeting the needs of different population groups as impartially as possible. The needs of those who visit such areas only occasionally or not at all should be studied more carefully so as to reveal any hidden demand. However, it is almost inevitable that some will not need or want the recreation opportunities offered by the state, particularly at their own expense as taxpayers, if there are plenty of other opportunities to enjoy nature closer to home.

The differences between the user profile and the profile of the general population may also be accounted for by the fact that many of the state protected and recreation areas are relatively difficult to access. An examination of the obstacles to the use of these areas might produce information that would be useful in improving their supply and accessibility. Even though those who provide other similar facilities and services, particularly municipalities and private entrepreneurs, are also able to fill the gap, their contributions may not be able to replace those experiences of nature that are based on conservation values, rather than on profit motives.

A third factor that might account for the difference between these two profiles may be the fact that some population groups have less information about the facilities and services available in state protected and recreation areas. Even though it may be difficult to increase the awareness of Finland's nature reserves in all segments of the population, it is especially important to make this information available to groups that are older or have less education. This will do much to ensure that Finland's basic policy objective will be met: namely that the welfare effects to be obtained from recreation and tourism in state protected and recreation areas will benefit as many citizens as possible across all social spectrums.

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Image as an Important Factor of Destination Management

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Abstract: For successful development of tourism in a region is a necessary condition to learn planning and using management principals. General characteristics of successful planning can be derived from experiences of their application in advanced countries but must be adapted to specific local regional conditions. Since 1989 (after the “Velvet Revolution”), the Czech Republic has become an attractive destination for many tourists from all over the world – it was a new, unknown and not financially demanding area. In the meantime, this trend has changed and Czech Republic has become a common tourist destination, which cannot exploit this competitive advantage any longer. Nowadays, when the differences between individual countries and regions are diminishing, and the main competitive forces are factors, such as image, which create the power of the “brand” of a particular destination. We can find that “the present tourism industry is formed by battle for destination, where the good brand sells”.

Introduction

After political and economic changes in 1989, the tourism in the Czech Republic went through progressive transformation process and became an important part of the Czech economy. Opening of the borders, freedom of enterprise and changes in financial markets multiplied the speed of changes on a thus far strictly regulated market of tourism. The most significant changes were visible in rapid increase of demand of Czechs for outgoing tourism and increase of demand after the attractiveness of the iron curtain with very low prices and relatively acceptable services.

The Czech Republic has conditions for tourism development mostly in the wealth of natural and historical sites, cultural heritage and a well developed spa industry. To keep a position on the market of tourism in times of growing competition of European and overseas destinations is, however, very difficult. One of the inevitable necessities for staying competitive is strategic planning in tourism. While doing that, it is also necessary to apply a system of destination management in individual regions as a strategic method for strengthening of the position on a market of tourism.

Image as an important factor of destination management

The destination management can be defined as “a system of managerial skills and activities used for coordinated planning and organizing of tourism for a particular destination” (Janečková & Vaštíková 1999). In other words, in the process of strategic planning for regional development representatives should be involved not only from the public sphere, but also businessmen, non-profit sector and civic initiatives. Primarily in tourism the cooperation of public and private sectors is especially important, because the satisfaction of a client in tourism influences the entire complex of services and if one of the services doesn’t function properly or doesn’t function at all, then it projects negative impressions on other service providers, even if their services are of high quality. That concludes, that a well functioning cooperation of a public and private sector contributes to forming of positive image of a region, which then significantly influences the decision-making of potential customer in destination selection. In relation to this we can often see a term “marketing of local government”, which might be for many people somewhat unusual term. Nevertheless, it’s nothing else but “attracting investors to a region, attracting tourists, communicating with public and promotion of a region” (Bernátová & Vanova 2000). These are the main objectives of the local government representatives. Marketing of a region (place or area) is thus marketing of local authorities.

A destination can be considered as a product of tourism, which is a combination of many partial products (services), components. Under a product destination, we understand everything, that a town offers its residents, visitors, businesses and potential investors, and what contributes to satisfying their individual or common needs. Some entities are then both parts of the product and its consumers. Janečková and Vaštíková (1999) define destination as a symbiosis of impact of material resources (such as recreation area, infrastructure) and non-material resources (climate, personalities – such as guides etc.). The level of the product interrelates directly with its image, its quality, and quantity. The image of local authorities and the image of individual services provided in the destination put the finishing touches to summary image of a destination. The image of a place, a region or a town is not only an important part of the product, but first of all it can play an important role in destination promotion.

Each tourist destination should strive for creation of a specific image. An image of a place or a destination is rather a complex variable. It is influenced both by internal and external environment that is formed by a number of factors. It stems from the history of a town or a region, as much as from its present.

According to Janečková and Vaštíková (1999), an image of a place is also interconnected with its positioning in individual market segments, because for each of these segments the destination presents its different image. Very clearly define positioning Ries and Trout (1996), who say that "positioning is not what you do with a product, but what you do with perception or the mind of the potential customers."

The image of a country may, but doesn't necessarily need to conform to its reality. Often an image comes across the same way as a cliché. It underlines certain characteristics of a country while it leaves out different ones. Despite the fact, or maybe because of that has an image such importance and many times it influences people's behavior and attitudes.

Philip Kotler (2001) defines image as a set of ideas and impressions that a person has about an object. The attitudes and people's actions are highly dependent on object's image.

Nakomah et al. (1996) summarize that a majority of researches of place's image from the point of view of tourism take account of the acquired image, most of all the characteristics of how the people perceive the particular places and how they react to these perceptions, and whether this acquired image influences their present, existing concepts and their behavior as customer of tourism products.

When creating an image of a place, according to Bramwell and Rawding (1996), the municipalities or organizations involved must start with their own ideas and expectations about the place, town, destination, from its history and local conditions. The important factors are:

- Size of the location
- Natural and tourism conditions
- Economic activities
- Regional and international importance of the location
- Relations among the communities
- Marketing activities of the town and municipalities
- Relations among local municipalities and interest groups
- Local politics.

When planning and building image, Ashworth and Goodall (1998, p. 190) use these three basic types of research sources:

1. **Geographic research**: analyzes the natural, cultural and economic specifics of a destination (e.g. cultural traditions, customs). Exploiting the local traditions can intensify the feeling of pride of the locals for their place (area, region), which helps to better acceptance of and life together with tourists.
2. **Marketing research**: the goal is to find a competitive advantage of the analyzed destination. We presume that the individual destinations are substitutes for each other and our effort is to convince the potential clients to select our particular destination as their recreation resort. Marketing theory describes this technique also as branding. The goal is simple and quick identification of a particular destination (which we consider as the product of a certain brand) by introduction of a specific name, logo and other symbols contributing to differentiation from other competing destinations.
3. **Sociological research**: it is based on differences among people in various communities.

The foundation for properly built image is in its authenticity and specification, which provides the place with competitive advantage. People should perceive the destination as something unique. The right image, according to Ashworth and Goodall (1998), is being created over a certain period of time by using various communication tools with the objective to address our target segment(s) and hope that our message will be decoded and lead to satisfactory reaction.

An important term in this subject is also so called as Corporate Identity. It is the summary image of a destination (generally applies also to any organization or institution). It is represented by shared values, opinions, and attitudes of each sector (commercial, public and non-profit) in a destination, which differentiate the destination. On the outside, the destination is represented both by tangible elements (corporate design, name, logo, symbols, etc.), and intangible elements, such as the shared values, that contribute to the corporate culture.

Figure 1 shows the most important factors that play a significant role in the image creation.

The four advantages of using the image of a country:

1. **Building a country's identity**: By analyzing the image of a country, we can reveal the important unique selling proposition of a country. If the country's image proves to have positive influence on the perception of the country and its products, then it is in interest of the export policy to support the image and systematically develop it. This position is described as USP-strategy. This strat-

egy provides numerous advantages – first of all, it promises success with use of just a bit of resources. If people are convinced that the Czech Republic has exceptional position, for example in brewery industry, then it is appropriate to concentrate on this strength and develop it even more.

2. **Cost-saving effect**: In the Czech Republic, the majority of the businesses are small or middle size, and when entering the international market, they are not well known or not known at all. Raising awareness and building a high level of knowledge about them is very costly from the financial point of view. Exploiting the world famous, Czech Republic's typical elements for the support of exports can then bring advantages for many companies to help them establish themselves on these new markets.
3. **Image transfer strategy**: As we have already mentioned, if there are any strengths associated with a country, where it is reasonable to take advantage of them and use them as a support also for other services and products of that particular country that are not so well known. In this sense, it is useful to transfer the capital stemming from the image of the Czech Republic not only to tourism, but also to export policies. By using the specific indication of the country of origin, or by using typical Czech elements which can then transfer the image of the Czech Republic also to other products and services. This strategy helped many countries to increase their exports.
4. **Increased efficiency of advertising**: Based on emotionally charged elements of promotion supporting exports, the efficiency of marketing communication can be increased. It leads to higher sensitivity to advertising and positive image transfer.

An important factor of building an image is establishment of the **brand of a destination**. It is clear that a country (a destination) with strong, positive and generally accepted associations lead to trust, quality and integrity, which provide the producers or services provider with a competitive advantage.

Smart country representatives base their brands and their reputation and their attitudes exactly the same way as smart companies do. Globalization and harmonization effects of European integration contribute to the pressure on countries to create, manage and increase the value of their "brand". The countries are aware that most of them provide similar products: area, infrastructure, educated citizens and very often also almost identical government system. To stand out in a crowd, it is necessary to really work on building your own brand. It is a difficult and long-term task, which can, however, significantly influence foreign investment decision-making and a market capitalization of the country. The countries need to search for a market niche and get involved in competitive struggle with marketing of other countries with the goal to satisfy customers and first of all to create a loyalty to their brand. In reality, a brand is ethically neutral term – it is simply a name representing perceived values related to the reputation of a product or a company.

The best example in shift in perception of a Country of origin information is Japan. After the WWII the "Made in Japan" indication used to be associated with rejects and low-end products flooding the markets. Its products were cheap and they were considered as worthless products. In many respects we could compare them to still present perception of Chinese products. Nowadays, though, Japan is perceived as a country with advanced technologies, high production

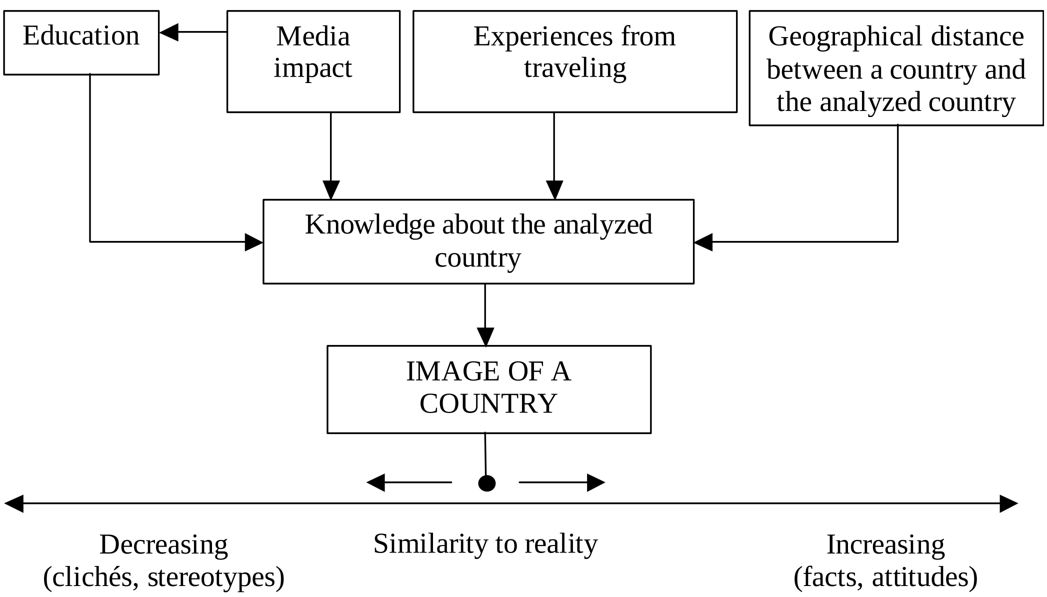

Figure 1. Factors with impact on a country's image.

quality, even of high style and social position. Customers are willing to pay more even for functionally identical product only because of the fact that the product comes from Japan.

The advertising agency Young&Rubicam claims that successful brand have these two following characteristics: brand vitality and brand caliber. Each of these characteristics has two attributes. A brand distinguishes itself with brand vitality, if it is in the awareness of a consumer differentiated from other brands and this differentiation is relevant according to customer's need. A brand has a necessary caliber, if it basks in significant respect and if it is well know on its target market.

Image of the Czech Republic in Austria

A marketing research analyzing the image of the Czech Republic in Austria was conducted during March and April 2002. To obtain necessary information about public opinion about the image of the Czech Republic in Austria, the major part of the research is based upon survey among Austrian citizens. A comparative sample of respondents was selected also in the Czech Republic in order to be able to compare differences between the real image and the expected image by the Czech citizens (a self perception).

The results show that the Czech Republic is a much-frequented tourist destination. The Czech Republic is associated with interesting historical sites, culture, good food and picturesque landscape; however, it is also perceived as a country with low interest for environmental protection. As other problematic characteristics are perceived the political stability and technical development.

Products with indication "Made in Czech Republic" are mainly associated with reasonable prices and good craftwork; characteristics such as high quality were mentioned by less than 50% of respondents.

As factors that connect the Czech Republic with Austria were indicated history, culture, proximity, family relations, economic relations and character traits.

Austrian respondents were able to recall great number of Czech personalities, who they associate with the Czech Republic, such as Václav Havel, Bedřich Smetana, Antonín Dvořák, Masaryk, Emil Zátopek, Eduard Beneš, Franz Kafka, but also Karel Gott, Karel Schwarzenberg, Alexandr Dubček, Milan Kundera, Miloš Zeman, and Martina Navrátilová.

Škoda, bier, glass products and china were named as the most known Czech products. Besides these products, the respondents mentioned also regional products, such as Karlsbad biscuits, Olomouc cheese and Znojmo pickles.

Answers to the question – what factors do the Austrian respondents consider as positively influencing the image of the Czech Republic, were culture, hospitality, friendliness of people, economic development, food, landscape and the care of the historical sites. As negative factors were selected: the activation of the nuclear power plant Temelín and Beneš Edicts. Very sensitively is perceived the "injustice", when the Czech Republic joined the other EU countries with sanctions against Austria, when Haider was elected in the lead of Austrian government.

The familiarity with symbols and logos representing the Czech Republic is rather low. Partly it is due to the fact that the symbols aren't used on a lot of materials, and when compared with Austrian products, the usage of the logos representing Czech Republic on products is just now growing.

The results of the research proved that image of the Czech Republic has many strengths, however, it also has problematic areas that need to be worked on. It is a difficult and very complex task.

When building and maintaining the image these following factors are important:

1. **The research of current attitude and awareness about the country**. An important and basic condition of success is knowledge and availability of information. Knowing, how the country is perceived, is very important information.
2. **Be active**. When creating and sustaining an image, we cannot wait for someone to come to us. It is necessary to take the initiative and let the others know about us. Then you can control the extent and form of provided information. That gives more possibilities to better prepare for various problematic topics.
3. **Clearly define image you aspire to have**. In order to work on image and influence its characteristics, it is necessary to have clear idea of how it should be like, what we aspire to. Otherwise it could happen that media or someone else would define, who we are and where we fit. It is important to realize that an image has certain time stability and, therefore, it requires longer time period to change the image.
4. **Stress benefits and the uniqueness**. Especially nowadays, when the Czech Republic is joining the European Union, the citizens of the current member countries want to know, what kind of benefit the new coming members will bring, why they should be interested in cooperation, support, etc. So it is reasonable to present the country's strengths and benefits with guaranties that can be relied upon.
5. **Define the audience**. Just as in marketing plan of a product, the marketing plan of a country needs to define certain target segments that we want to address. Targeting the message can save costs and increase efficiency.
6. **Create and use marketing plan**. Marketing a country is a very complex thing. It is necessary to create mutual cooperation among individual participating entities in order to reach consistency

and efficiency. Marketing plan should include these basic elements: analysis of current situation, objectives, strategies and methods, how to reach the stated objectives, time schedule and budget.

7. **Create and maintain a steady flow of information**. If we want to create or change perceptions, it is impossible just to wait for something to happen. It is up to our own initiative to provide enough press releases, promotion materials, advertisements, surveys.
8. **Be specific** in your information. If we want to differentiate from other countries, we have to clearly exhibit, why we deserve the support and interest. We should offer the best or at least an original idea.
9. **Don't exaggerate**. The right solution is not boasting and promises you cannot fulfill, the goals can be reached, when the communication and presentation will be direct, confident and honest. The goal is to gain goodwill and respect.
10. **Be patient**. Image can hardly change over a short period of time. Creating and maintaining an image is not a question of few years, but rather decades of a consistent work.
11. **The first rule of effective public relations is to be good**. When creating the marketing plan to support an image of a country, it is necessary to stay realistic. A skilled PR person can tell something good about anything. But you cannot look good unless you are good. Using PR to hide problems is unfruitful, expensive and can lead to embarrassing situations. A guarantee of high quality of production, providing services, respectful treatment, quality of legal system then lead to achievement of the requested results.
12. **Using celebrities as spokespeople can bring both positive and negative effect**. Celebrities usually attract more attention faster, they can help to win, by association, goodwill of their fans. The effect can also be opposite – the celebrity's private life can hurt the image of the country even more. So the choice of such a personality has to be very sensitive, if we want to achieve our objectives.
13. **Image Marketing overlaps practice and budget areas**. The brands, logos and symbols representing the country is necessary to apply to as many different fields as possible (promotion materials, catalogues, web sites, headed papers, etc.), so their knowledge is as high as possible, otherwise they don't fulfill their purpose.
14. **Image is based on emotions**. Promotion and other marketing activities can help to influence, how people will perceive our country. Making a list of benefits and unique features of what we represent can help us to better affect emotions and feelings, which stay after our campaign is over.

Conclusion

The present tourism is a battlefield of destinations, where good brand sells. To create a tourist destination out of "a place" is not easy. It is not enough just to print out promotion material on a coated paper, it is rather complex, long term process, which requires a lot of effort, teamwork, cooperation and coordination. Tourist destination needs to be appropriately managed. The management function should be played to great extent by the local authorities. Not everybody agrees that tourism represents influential contribution to the lives of regions, towns or cities, so in the recent history in many cases tourism was abandoned and left to activities of all kinds of entrepreneurs and services providers with only very low level of control and restrictions.

The art of establishing itself abroad, from the point of view of the Czech Republic, is especially nowadays, soon after accession to the EU, very important. Image plays as significant role in winning foreign investment and in success in exports, as much as for the development of incoming tourism.

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Social Carrying Capacity of an Urban Park in Vienna

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Abstract: The goal of this research was to investigate the social carrying capacity of an urban park in Vienna, Austria. We used a stated choice approach, combined with a referendum style conjoint model. Based on the hypothesis that the perception of crowding is influenced by several factors, digitally calibrated images were generated to depict in a systematic and rigorous manner different visitor numbers, user types, group sizes, the placement of visitors within the scene, numbers of dogs on or off leash, and the direction of visitor movement. The social carrying capacity was measured by asking each respondent whether the presented scenario was acceptable or not. Overall, visitor numbers, the placement of visitors within the image, and dogs being on or off a leash influenced the visitors' decisions the most. The results of the binomial logit model can be used to simulate and calculate the visitor norms for many different situations; in other words, the referendum style conjoint approach delivers recreation norms within a truly multivariate investigative framework.

Introduction

The fact that visitor volume and unwanted visitor behaviour can compromise a recreational experience and even lead to use conflicts has been documented in many recreation studies over the past two decades (Graefe et al. 1984, Manning 1999, Rudell & Gramann 1994, Shelby et al. 1989). We are expanding that work in two ways.

So far, most crowding research focused on recreation in wilderness or natural areas with rather low user densities as opposed to more developed or urban recreation settings. The latter have received much less attention (Westover & Collins 1987), partly because these areas are so different, partly because the research methods developed for low-use areas may not be appropriate in high-use areas. One can only suspect that the phenomenon of social carrying capacity and substitution behaviour is equally relevant in urban and sub-urban settings.

The perception of crowding is a complex phenomenon, which is not only influenced by use levels but also by user conflicts, unwanted visitor behaviour, or resource conditions. Therefore, we propose to pursue our research on social carrying capacity more holistically with a multivariate method and a visual presentation of stimuli.

Social carrying capacity

Social carrying capacity, often referred to as crowding, can be discussed as a normative concept and crowding norms are generally described as visitor-based standards that individuals and groups use for evaluating behaviour and social and environmental conditions (Donnelly et al. 1992). Social standards are considered to be normative if there is a strong consensus agreement about a norm and the relative importance of the norm (Heywood 2002). If visitors have such normative standards, then they can be used for social carrying capacity management of recreation and conservation areas.

Norm measurement approaches

Several approaches to measuring social carrying capacities have been developed. Visitors have been asked directly in a hypothetical manner, about the maximum acceptable numbers of encounters. This numerical approach (Manning et al. 1996) referred to the evaluation of encounters of other visitors during a specific time period, mostly per day. Analyses of such data resulted in encounter norms or preference curves. Such a norm curve traces the average acceptability ratings of a sample of visitors for encountering a range of groups of other visitors along a trail or at a site per time unit.

Occasionally, visual approaches have been applied to measuring crowding in outdoor recreation (Behan et al. 2001, Davis & Lindvall 2000, Manning et al. 1996, Manning et al. 1999). A visual presentation of crowding situations seems particularly appropriate in high-use areas where it may be unrealistic to expect respondents to accurately judge the maximum number of encounters (Manning et al. 1996). The advantage of visual presentation is that certain influences such as use levels are more conducive to visual presentation instead of verbal descriptions, as the former generate a more realistic and accurate normative evaluation of indicators (Hall & Roggenbuck 2002, Manning et al. 1996). Interviewees and managers are truly confronted with the same depictions of a situation, and there is no need to inferring use levels from mere verbal descriptions.

Many authors have used acceptance or preference as the evaluative response scale (Freimund et al. 2002, Manning et al. 1996). Manning et al. (1999) used the absolute tolerance as the evaluative response scale: visitors were asked whether the visually presented condition was so unacceptable that they would shift their use to a different location or time.

Most of these studies applied univariate research methods in the sense that visitors were asked about norms and standards in single item questions (Shelby & Heberlein 1986, Manning et al. 1999). However, many management problems in conservation and recreation area management are of a multi-attribute nature and involve tradeoffs among multiple and often competing values. Only recently have some backcountry studies broadened their scope to multivariate research methods and some researchers included the impact of visitor numbers among other values using choice analysis (Lawson & Manning 2002, McCormick et al. 2003).

Study area

Data were collected in an urban park, called 'Wienerberg', in the south of Vienna, the capital city of Austria. This park of 120 hectares is managed by the municipal forest department, and forested patches dominate the park structure. Several sections of the park are conservation areas. The park provides about 14 km gravel trails and innumerable paths; some trails are open for bicycling. A lake in the middle of the park is used intensively for bathing and angling in summer, and ice-skating in winter; only one main trail section provides appropriate lighting for night use. Dogs are allowed, but have to be kept on a leash.

This forest park is surrounded by residential and business areas, a hospital, and garden allotments. The park was established in the late 1980s, and park management has observed permanently increasing recreational use levels, primarily fuelled by recent housing developments in the vicinity. More residential high-rise buildings are currently under construction nearby, and will increase use pressure on the park further.

Methods

Stated Choice

To analyse the trade-off behaviour in recreation research, stated choice methods have been used in the past, whereby respondents are asked to choose among alternative configurations of a hypothetical multi-attribute good (Louviere & Timmermans 1990). One strength of choice models lies in their ability to predict how the public will respond to various policy and management alternatives, including arrangements of resources, quality of visitor experiences, facilities, and/or services that may not currently exist, and avoid the problem of multicollinearity (Haider 2002). Stated choice analysis has been applied to study public preferences concerning a range of recreation-related issues such as visitor preferences for wilderness management issues (Lawson & Manning 2002; McCormick et al. 2003), tourism destination choice (Haider & Ewing 1990), and beach preferences (Stewart et al. 2003).

In stated preference/choice models, alternatives are defined as combinations of attributes, and each set is evaluated as a whole. The alternative profiles are constructed by statistical design principles, such as fractional factorial designs (Montgomery 2001). If respondents rate or rank each profile separately, the technique is usually referred to as conjoint analysis (Green & Srinavasan 1978). In a discrete choice experiment, however, two or more such hypothetical profiles are combined to choice sets, and respondents choose the most or least preferred alternative (profile) from each set they are asked to evaluate (Louviere et al. 2000). The advantages of stated choice over traditional conjoint analysis are that behaviourally, the analysis of choice – even though it is only hypothetical choice – is closer to actual behaviour than a rating or ranking task, and that the statistical analysis relies on random utility theory.

The theory postulates that choices can be modelled as a function of the attributes of the alternatives (McFadden 1974, Ben-Akiva & Lerman 1985). Individual behaviour is considered as deterministic, but because of the inability of the research process to account for all influencing attributes and the need to aggregate individual choices across individuals, the modelling of behaviour is undertaken stochastically (Train 1986, Ben-Akiva & Lerman 1985). Therefore, it is assumed that the overall utility (U_i) contained in any one alternative is represented by a utility function that contains a deterministic component (V_i) and a stochastic component (ε_i). Selection of one alternative over another implies that the utility (U_i) of that alternative is greater than the utility of any other alternative (U_j). The overall utility of alternative i is represented as (McFadden 1974, Train 1986):

$U_i = V_i + \varepsilon_i$ (1)

Given this stochastic component, the probability of an individual choosing one alternative over another will depend on the relative sizes of the systematic components of their utilities compared with the size and sign of their random components. The larger the difference in systematic components compared with the difference in random components, the more likely is the alternative with the larger systematic component to be chosen (Louviere et al. 2000).

Prob {i chosen} = prob $\{V_i + \varepsilon_i > V_j + \varepsilon_j; \forall_j \in C\}$ (2)

where C is the set of all possible alternatives. If one assumes that, for the entire sample, the stochastic elements of the utilities follow a Gumbel distribution, the multinomial logit (MNL) model can be specified as

Prob {i chosen} = $e^{Vi} / \sum e^{Vj}$ (3)

For binary dependent variables, where “not acceptable” may be coded as 0, and “acceptable” as 1, the choice probability can be estimated as

Prob {i chosen} = $e^{Vi} / e^{Vi} + 1$ (4)

The analysis produces regression estimates, standard error and *t*-values for each attribute level, which are referred to as part-worth utilities. The results of the binomial logit model supports the estimation of parameters that allow the estimation of the probability of choice of a given alternative as a function of the attributes comprising that alternative and those attributes of all other alternatives in the choice set.

Data sampling

Data for this paper were drawn from a larger study designed to develop a baseline understanding of recreational use to the Wienerberg Park in Vienna. Investigations of the recreational use were conducted between 2002 and 2003 using a mix of long-term and short term counting methods, as well as on-site interviews. The data for the study presented here were collected in personal on-site interviews, and included the choice task with visual stimuli.

On six days in late summer and early autumn 2002 on-site interviews were conducted in the park along the main trail section. The interviews took place on three randomly selected work days and their immediately following Sundays. The interviewers were employees of the institute, mostly students, who were carefully trained in the use of the survey forms. The interviewers asked visitors if they were willing to participate in a fifteen-minute interview. Once the interview was completed the next visitor encountered, regardless of user type was asked to participate in the study. Interviewers registered group size, activity type (biking, hiking etc.), if the visitor was accompanied by dogs on or off a leash, and interview time. A total of 291 visitors agreed to the interview, of which only 241 completed all questions. Especially some elderly people did not have their glasses with them to assess the photos. Compared to the results of the visitor counting methods, walkers and dog walkers were over-represented, while bicyclists and joggers were underrepresented in our sample due to their unwillingness to stop for an interview. The survey instrument consisted of two distinct components. The first part contained a conventional questionnaire on socio-demographic aspects and visit-related questions such as motivations and perception of crowding, origin, length of stay, etc.

In the second part of the interview, each respondent was shown four choice sets. Each set contained four digitally calibrated images displaying various recreational scenarios (Figure 1). Eight versions of four choice sets respectively were created, displaying a total of 128 different images. The images were printed on an A4-sheet using a high-quality colour laser printer. To facilitate presentation, each choice-set was laminated. The order of choice-set and choice-version was varied systematically to avoid starting point bias. First, preferences were assessed by asking the visitors to choose the most and the least preferred scenario of each choice set (these results will not be presented here); then the crowding norm was measured by asking the visitors whether each one of the chosen scenarios was so unacceptable that it would shift their use to a different location or time.

Attributes of the visually calibrated images

The 128 computer-generated images contained the following attributes in a systematically varied manner (see Table 1): number of visitors, user type, group size, the placement of visitors within the image, dog numbers and dogs on or not on a leash, and the direction of movement. Four attributes consisted of four levels; the number of visitors was shown in eight levels, and the direction of movement in three levels. The persons depicted in the images originated from photos taken in a two-hour photo session with a digital camera on a sunny summer afternoon from a fixed vantage point of the main trail section, thereby controlling colour and light effects. Adobe Photoshop 6.0 software was used to create the images according to the design plan. In order to respect the privacy of displayed ‘real’ visitors, all persons in the foreground of the image facing the viewer were depicted with sunglasses.

The background of the images was a 200m-section of the main trail system in the north of the park. The presented trail segment is well-known, popular and heavily used, because it offers a panoramic view to the Alps and over the Pannonian plain. Consequently, the topic of crowding was particularly relevant to this trail section.

Table 1. Experimental attributes and levels.

Attribute and Attribute levels			
Number of persons in the image:			
	0, 1, 2, 4, 6, 8, 10, 12		
User type			
1	80% Walkers,	10% Bicyclists,	10% Joggers
2	40% Walkers,	50% Bicyclists,	10% Joggers
3	40% Walkers,	10% Bicyclists,	50% Joggers
4	20% Walkers,	40% Bicyclists,	40% Joggers
Placement of visitors within the image:			
1	30% Foregrd.,	40% Midgrd.,	30% Backgrd.
2	60% Foregrd.,	40% Midgrd.,	0% Backgrd.
3	10% Foregrd.,	60% Midgrd.,	30% Backgrd.
4	0% Foregrd.,	40% Midgrd.,	60% Backgrd.
Number of dogs and dog on or off leash:			
1	10% of walkers have a dog unleashed		
2	10% of walkers have a dog leashed		
3	30% of walkers have a dog unleashed		
4	30% of walkers have a dog leashed		
Group size:			
1	30% Single,	40% Pairs,	30% Triplets
2	60% Single,	40% Pairs,	0% Triplets
3	30% Single,	60% Pairs,	10% Triplets
4	0% Single,	40% Pairs,	60% Triplets
Direction of movement:			
1	50% towards camera,	50% away from camera	
2	75% towards	25% away	
3	25% towards	75% away	

The number of people depicted ranged from no person to twelve persons. In order to stay in our simulations within realistic visitor numbers, the maximum number of people presented in the images was derived from actual counting results. User types were displayed as walkers, bicyclists and joggers. We avoided different subtypes of user types, such as sportive fast moving bicyclists and recreational bicyclists. User types were displayed to assess the potential influence of user conflicts.

The attribute 'placement within the image' described the placement of persons in the fore-, mid- or background. For an accurate position of people, the 200m-trail section was divided into three equal distance zones. To ensure that the scale and size of people was correct, size comparisons of people in actual photos depending on placement within the image were undertaken. By means of that attribute, the influence of proximity effects to other visitors as well as the need for minimum spatial requirements (Baum & Paulus 1991) for the satisfactory pursuit of recreational activities such as cycling could be evaluated.

The influence of visitor behaviour was presented in two ways. Potentially unwanted behaviour was included by displaying unleashed dogs, and groups walking, jogging or cycling side by side thereby narrowing the trail. Due to design limitations, reliable results concerning this attribute were only possible when more than three persons were displayed in the picture. All dogs depicted were of similar size, and only walkers were accompanied by dogs, because our long-term video monitoring showed that only a small minority of joggers and bikers were accompanied by dogs. The maximum number of dogs displayed was three, and the impact of unwanted behaviour varied with the number of leashed or unleashed dogs. The attribute "direction of movement" contained three levels and described the proportion of people walking, cycling or jogging away from vs. facing the vantage point.

The hypothetical scenarios (profiles) and the choice sets were created by following an orthogonal fractional factorial design plan (Montgomery 2001). The binomial logit regression analysis resulted in part-worth utilities for each attribute level with standard error and *t*-value associated with each estimate. All attributes, except the crowding variable, were effects coded (Louviere et al. 2000), where an N-categorical variable needs to be defined by N-1 estimates only. Consequently, for all attributes one level is defined as the negative sum of the other level estimates, and these base levels do not contain any reference to a standard error or *t*-ratio.

The attribute number of persons were transformed into a continuous variable with a linear and quadratic term using orthogonal polynomial coding (Louviere et al. 2000, Montgomery 2001) fitting the eight parameter coefficients best. As the orthogonal fractional factorial design permitted the estimation of all main effects as well as two-way interactions, transformation was necessary to analyse the interaction between user numbers and other attributes. This data analysis was undertaken in LIMDEP 7.0 (Green 1998).

Figure 1. Example of a choice set – each image depicts different levels of six social setting attributes.

Results

Visitor characteristics

The profile of respondents shows an equal mix of women and men, and over 53 % were between 31 and 60 years of age. Only 4 % were bikers and 6 % joggers, while the majority of visitors interviewed were walkers (63 %) and dog walkers (25 %). More than half of the visitors live within a 15-minute walking distance to the park, and nearly all visitors reside in Vienna. One quarter of the respondents visits the park daily in summer, and 52 % at least once a week. About 13 % of the interviewees perceived the park as overcrowded on weekends and on holidays; on working days use levels are too high for only 0,4 % of respondents.

Choice model results

Table 2 presents the binomial parameter coefficients, standard errors, *t*-values and *p*-values for each level of attributes in the tolerance model. The tolerance model is based on a referendum style conjoint approach which requires respondents to evaluate one conjoint profile at a time, and simply judge if the profile is acceptable or not. Our study design contained a slight variation to this simple conjoint approach, because respondents first chose the most preferred and least preferred images from the set of four, and thereafter the second question asked if the best and the worst image respectively were so intolerable that they would shift their use to another location or another time.

After the tolerances were determined for the best and the worst image of a choice set, we then applied the rule of transitivity to infer about the tolerance of the other two images of a set: whenever the most preferred scenario was not tolerable, than all other three scenarios of the choice set were also deemed as not tolerable; on the other extreme, when the least preferred scenario was still acceptable, than the other scenarios were also deemed acceptable. This type of question together with the further inferences permit us to determine visitor norms for the main trail sections of the park, because based on Equation 4 we can predict the proportion of visitors whose standard would be violated.

The rho-square statistic of 0.74 indicates that the model (Table 2) has an excellent fit. The high intercepts indicate that the majority of the depicted recreational scenarios were tolerable for the respondents. The most important attribute was the number of persons depicted in the image. The high *t*-values indicate a strong agreement of respondents' evaluations of use levels, and consequently one should have confidence in using such data to formulate standards of crowding.

Other important attributes were numbers of dogs and whether they were leashed or unleashed, and group size. A low number of dogs leashed resulted in the highest positive part-worth utilities of that attribute, and many dogs not on a leash were evaluated as the worst attribute level. Somewhat surprisingly, respondents preferred bigger group sizes compared to single persons. Initially we had assumed that the behaviour of walking side by side, thereby narrowing the trail, would be intolerable for park users, in particular at high-use times. But apparently bigger groups imply fewer social contacts in total, and probably a more ordered situation for the respondents, which needed less attention. This assumption was confirmed by the significant interactions between user numbers and group size: the more people an image contained, the more bigger groups were preferred. Although all main effects were insignificant for the placement of people within the image, most of the interactions were. People in the background of the image were more acceptable. The more people were depicted in the foreground, the more this condition was refused. Violations of personal space due to the proximity to others led to crowding perceptions.

Table 2. Model estimates.

Attribute and levels	Parameter estimate	Standard error	*t*-Value	*p*-Value
Intercept	3.666	0.129	28.309	0.000
Number of persons depicted				
Linear term	-0.433	0.073	-5.934	0.000
Quadratic term	-0.114	0.028	-4.037	0.000
Placement of visitors				
30% Fore-, 40% Mid-, 30% Background	0.058			
60% Fore-, 40% Mid-, 0% Background	-0.275	0.194	-1.414	0.157
10% Fore-, 60% Mid-, 30% Background	-0.006	0.136	-0.046	0.963
0% Fore-, 40% Mid-, 60% Background	0.223	0.232	0.960	0.337
Dog number and leash rate				
10 % of walkers have a dog unleashed	-0.225			
10 % of walkers have a dog leashed	0.332	0.139	2.389	0.017
30 % of walkers have a dog unleashed	-0.312	0.121	-2.585	0.010
30 % of walkers have a dog leashed	0.205	0.139	1.468	0.142
Group size				
30% Single, 40% Pairs, 30% Triplets	0.333			
60% Single, 40% Pairs, 0% Triplets	-0.248	0.120	-2.077	0.038
30% Single, 60% Pairs, 10% Triplets	-0.356	0.179	-1.987	0.047
0% Single, 40% Pairs, 60% Triplets	0.271	0.139	1.946	0.052
User type				
80% Walkers, 10% Bicyclists, 10% Joggers	0.077			
40% Walkers, 50% Bicyclists, 10% Joggers	0.041	0.129	0.315	0.753
40% Walkers, 10% Bicyclists, 50% Joggers	-0.148	0.209	-0.708	0.479
20% Walkers, 40% Bicyclists, 40% Joggers	0.031	0.197	0.157	0.875
Direction of movement				
50% towards camera, 50% away from camera	-0.392			
75% towards camera, 25% away from camera	0.176	0.140	1.262	0.207
25% towards camera, 75% away from camera	0.216	0.144	1.499	0.134
Interactions number of persons with				
Linear x 40% Walkers, 10% Bicyclists, 50% Joggers	0.271	0.122	2.221	0.026
Linear x 20% Walkers, 40% Bicyclists, 40% Joggers	-0.236	0.120	-1.964	0.049
Quadratic x 40% Walkers, 10% Bicyclists, 50% Joggers	-0.104	0.048	-2.177	0.029
Quadratic x 20% Walkers, 40% Bicyclists, 40% Joggers	0.139	0.046	3.028	0.002
Linear x 0% Single, 40% Pairs, 60%Triplets	0.142	0.075	1.891	0.059
Linear x 60% Fore-, 40% Mid-, 0% Background	-0.207	0.117	-1.777	0.076
Linear x 0% Fore-, 40% Mid-, 60% Background	0.448	0.138	3.255	0.001
Quadratic x 60% Fore-, 40% Mid-, 0% Background	0.085	0.045	1.896	0.058
Quadratic x 0% Fore-, 40% Mid-, 60% Background	-0.181	0.059	-3.084	0.002

$Rho^2 = 0.737$, $Rho^2_{adj.} = 0.667$;
Log Likelihood (0): -3377.01; Parameter model: –888.12

Similarly, the attribute "user type" also did not emerge with any significant main effects, but the interactions revealed that the more people an image contained, the less favourable respondents were about a mix of users and a high share of walkers. At first glance, the negative evaluation of walkers seemed to be surprising, but only walkers were accompanied by a dog according to the design plan. The direction of movement was less important, and no level was significant. Respondents preferred when the majority of users were facing into one direction, as compared to an even distribution of direction.

By substituting the part-worth utilities into Equation (4), the proportion of respondents whose tolerance norms have been violated can be calculated for any possible combination of variables. Results for four scenarios (each represented by a line) are graphed in Figure 2. Each line represents a different combination of two variables, and the line links the changing tolerance levels over the number of persons depicted in the image.

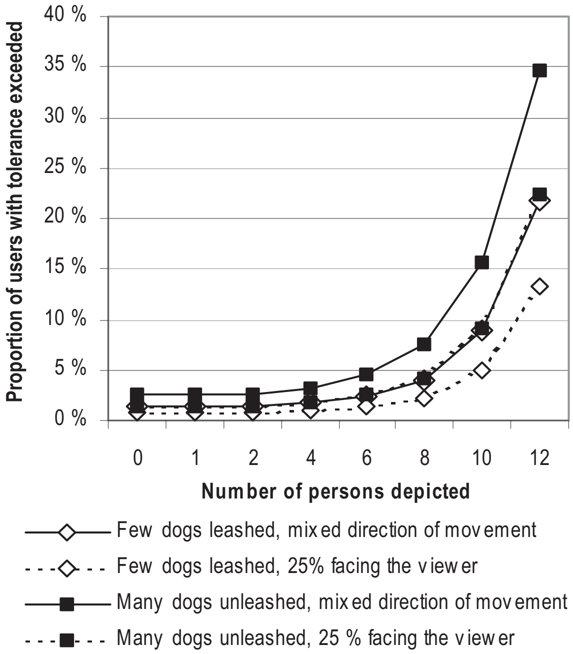

Figure 2. Share of respondents judging a situation as unacceptable

Overall, situations with six users or fewer are acceptable to almost all users (more than 95%), regardless of the accompanying social situation in the image. However, when use density increases to 8 persons or more, then acceptability starts to vary significantly as a function of the accompanying situation. Especially if most dogs remain unleashed and the number of users increases to 12, then the situation is quickly regarded as unacceptable by 23% of users, and by 35% if the direction of movement is equal into both directions.

Discussion

Visitor numbers, proximity to others, unwanted visitor behaviour and the complexity of the situation at high-use situations due to mix of users and movement directions influenced the respondents' decision to shift their use due to intolerable social conditions from the main trail network. When use levels increase to eight people or more per scene, then acceptability of the situation decreases drastically, as documented by the drastic increases in the absolute tolerance curve. More importantly, the tolerance levels are sensitive to accompanying social conditions, especially unleashed dogs, and less organized situations with people walking into both directions equally.

Unwanted visitor behaviour influenced the tolerance of social conditions remarkably. Consequently, park management can increase the social carrying capacity of a park by enforcing the existing regulations such as keeping dogs leashed. Obviously, park management has also other options to increase the social carrying capacity of a recreation area, as variables such as visitor numbers, the placement of visitors within the image, group size and dogs on leash influenced the visitors' decisions significantly.

Such conclusive and statistically significant results could not have been achieved with traditional univariate research techniques. As the tolerance for social conditions is influenced by several factors, controversial management measures such as limiting use, which may be completely unacceptable measures to start with, can be avoided and substituted by other, more acceptable, management actions to ensure the quality of the recreation experience. As such, this method represents a significant advancement to the field of recreation carrying capacity research compared to classical approaches, which are based on one-dimensional Likert scaling.

The factors and theories with regard to crowding perceptions were thought to be useful in defining a crowding norm for urban recreation areas and indicators of standards could also be formulated. This multivariate elicitation of crowding norms has been successful because of a very specific tolerance type question, as formulated in the referendum style conjoint question, combined with the application of digitally calibrated images, which carefully followed a predefined design plan. With this application we have documented that the phenomenon of social carrying capacity is also highly relevant to the planning and management of recreational areas in urban areas, in particular as coping behaviours of park visitors lead to changes in the specific recreation area, as well as in neighbouring recreation areas on the urban and sub-urban level.

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National Park Designation – Visitor Flows and Tourism Impact

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Abstract: National parks around the world are increasingly attracting visitors to experience pristine and unique natural environments. While increases in national park tourism provides business opportunities both in the parks and in adjacent communities, there are several economic, social and ecological aspects that need to be monitored in order to sustain high quality visitor experiences. Increases in visitation may cause negative impacts on the environment, conflicts between different user groups or within groups. At the same time, data on visitor numbers, distribution and attitudes is needed in order to design efficient management strategies and provide appropriate recreation opportunities. This paper reports preliminary findings from two different surveys of visitors to Fulufjället National Park in Sweden – one year before and one year after national park designation respectively. Both surveys used on site counters and self registration boxes to collect visitor data. Follow-up mail questionnaires were sent to a sample of Swedish and German visitors. The survey of 2001 (one year before national park designation) collected data on visitor numbers, nationalities, demographics, trip characteristics, crowding, willingness to pay, attitudes towards management actions and tourism development etc. The purpose of the 2003 survey (one year after national park designation) was to monitor possible short term changes in some of these parameters as a consequence of the national park designation in 2002. In addition, the 2003 survey was designed to estimate the regional economic impact of the park. Data from the two surveys are compared and the results are discussed from both a methodological and an impact perspective.

Introduction

Both the attraction and sustainability of a tourist destination is relative to the standard of maintenance and management. To succeed in adequately manage and develop natural areas with respect to ecological and social values it is crucial to collect relevant and accurate data on visitor numbers, characteristics, behavior and attitudes. Among the questions managers need to ask themselves are what motivations and constraints there exist to make a visit; are there recreation conflicts to solve; and ultimately how should the area be managed to maximize visitor benefits while the natural environment is preserved and costs are minimized (Loomis & Walsh 1997, Manning 1999, Fredman & Emmelin 2001)? The reasons for visiting natural areas are often just as diversified as there are visitors. Some come to participate in specific activities, other to experience a certain place or environment (Heberlein & Fredman 2002). Studies of visitors to protected areas in Sweden have shown that peace and quiet, wilderness experiences and absence of litter are of high importance while geographical location and social interactions are less important (Fredman & Hansson 2003, Hörnsten & Fredman 2002).

The number and extent of protected areas in the world has increased considerably over the last fifty years. Today about 30,000 protected areas cover some eight percent of the global land area, and these are increasingly attracting visitors (Driml & Common 1995, Pigram & Jenkins 1999, Eagles & McCool 2002). For example, in 1996 the US and Canadian park systems produced some 2.5 billion visitor days at an economic value in the range of 240-370 billion, and in Costa Rica park visits have increased from 250,000 in 1985 to 860,000 in 1996 (Eagles & McCool 2002). Protected areas are often located in rural regions and can play an important role in their development (Machlis & Field 2000). Driml & Common (1995) estimated visitor expenditures to 1.4 billion at five world heritage sites in Australia and the national parks of Utah generate about 550 million USD in direct consumption (Voorhees et al. 1996). A common strategy in tourism development is to focus on visitor numbers. In protected areas, such strategies may be less appropriate considering possible negative ecological and social impact from too many visitors. One alternative is then to focus on consumption patterns and willingness to pay among current users, and means to minimize local economic leakage.

National park and world heritage are well known labels to many people. In an international perspective, such labels often represent places where pristine or unique natural environments are accessible, often with some degree of development and infrastructure. This is similar to what is known as markers in tourism research, i.e items that carry information about tourism attractions (MacCannell 1999). There are reasons to believe that parks and protected areas to various degrees represent markers to certain groups of tourists. In a study of national park designation at eight sites in the US, Weiler and Seidl (2004) estimated a six percent increase in visitor numbers as a consequence of the national park designation.

Sweden has 28 national parks and about 2,500 nature reserves. While protected areas in Sweden are established both of ecological and social reasons, there has been no tradition of collecting visitor data, and consequently knowledge about visitor numbers, distributions and visitor impact are generally quite limited. One reason for this could be the relatively low population density in combination with the Right of Common Access – limiting the importance of protected areas for the total supply of land for outdoor recreation opportunities. Recent changes in the Swedish environmental policy does however, indicate an increased focus on social values in protected areas in the future.

This paper reports preliminary findings from two visitor surveys at Fulufjället National Park in Sweden – one year before and one year after the national park designation in 2002. The study presented here is financed by the Swedish Environmental Protection Agency and is an important element in the build-up of knowledge concerning visitor experiences. Fulufjället is the first Swedish national park where the planning strategy explicitly builds on such data. Results from the 2001 study are reported in Hörnsten and Fredman (2002), and the current paper focuses primarily on changes in use. The aim of the research is to provide input to future management of the park based on visitor data and to evaluate short term effects of the national park designation. The study will also provide an important input for tourism development in the park and adjacent gateway communities. For the last twenty years, tourism in the Swedish mountain region has increased – but mostly among mechanized winter activities (snowmobiling and downhill skiing) while more traditional activities like backpacking and cross-country skiing have been stable or decreased (Fredman & Heberlein 2003). Particularly in the southern part of the mountain region there is a strong dominance of winter tourism (Heberlein et al. 2002), and the tourism industry is trying to develop summer tourism. In Fulufjället, local tourism companies and the regional government carried out a tourism development project parallel to the national park designation process, and in 2004 the international PAN-park organization will open a holiday village in the gateway community of Mörkret that currently has ten permanent residents.

Study area and data collection

Fulufjället National Park is located in the county of Dalarna in the southern part of the Swedish mountain region (Figure 1). The park is 380 km^2 large, primarily featuring a low alpine region with large areas just reaching above the tree-line at 700 meters above the sea level. Since Fulufjället is not utilized for reindeer grazing, it has large areas of thick lichen covering the ground which is unique for the Swedish mountain region. The area is also known for its wildlife populations, including bear, moose and nesting birds of prey.

Figure 1. Sweden and Fulufjället National Park.

Fulufjällets National Park features the highest waterfall in Sweden – Njupeskär. This is a major tourist attraction in the region and the access to the 90 meter high fall is by car or bus to the trail head followed by a three kilometer round trip hike. The waterfall, the trails to the fall and the major park entrance with car parking, cafeteria and a visitor center are located in the most developed zone of the park. Part of the process to establish Fulufjället National Park was the implementation of four management zones; 1) a wilderness zone, 2) a low-intensity activity zone, 3) a high-intensity activity zone, and 4) a development zone (Swedish Environmental Protection Agency 2002). These zones are an important instrument to meet the objectives of the park and to supply a spectrum of different recreation opportunities. There is a small fishing camp at Rösjön in zone 3, and a network of small cabins and marked trails throughout the park that provides good opportunities for backpacking. Most visitors will only come to zone 4, which is the most developed part of the park including Njupeskär waterfall.

Data collection

Visitor surveys were undertaken at Fulufjället National Park in the summers of 2001 and 2003. During the period June to September seven self-registration boxes were located at the major entrances of the national park. Each box was placed clearly visible along the hiking trail together with a poster asking the visitors to fill out a registration card containing a few questions concerning the visit and the person's name and address. The completed cards were placed in a locked section of the box. Automatic trail counters were used at four different locations – two at Njupeskär waterfall and two in back-country areas. A sample of the visitors that registered at the self-registration boxes received a mailed questionnaire sent to their home address a few months after the visit to Fulufjället (Table 1). Besides a large number of attitude questions related to outdoor recreation, park policy and management the questionnaire included items concerning travel patterns, crowding, economic and demographic variables etc. Two remainders were sent out including a new questionnaire in the second one.

Table 1. Data collection statistics.

		2001	2003
Completed registration cards	Total	4,107	6,151
Swedish mail survey	Completed	1014	804
	Response rate	80%	82%
German mail survey	Completed	483	441
	Response rate	74%	85%

Non-respondents

On site data collection and mailed surveys involve several possible sources of non-response errors (Mangione 1995). In the current study, on site check-ups were done at the self registration boxes to identify possible biases from non-respondents. In places with many visitors there is a risk of the box being "busy" so that following hikers do not notice it or do not have time to wait for their turn but move on without registering. This was periodically the case along the trail to Njupeskär waterfall. From field observations, an estimated 50–80 % of the visitors at the Njupeskär old trail (the most frequently used trail in the area) did not register. As long as these non-registrations occur randomly it will not affect the results. To ensure that such, or other non-registrations, do not follow a specific pattern the self registration must be supplemented with a drop-out study. In the 2003 survey, a sample of 236 individuals that did not volunterly register at the Njupeskär old trail did fill in a registration card upon request from filed staff. All of these on site non-respondents later received a mailed questionnaire that was answered by 165 individuals (70%). A preliminary look at the data, comparing the answers with the regular respondents, indicates that the answer to about 20 out of 130 questions asked in the mailed questionnaire (15%) significantly differ between the two groups. Assuming the questions in the survey are unrelated, we would expect at the most a five percent difference in the answers to not reject the hypothesis of no difference between the two groups. This will be subject to further analysis, and consequently the results presented in this paper should be interpreted accordingly.

Findings

Visits and visitors

Data from the on site visitor counter at the old trail to Njupeskär waterfall is presented in Figure 2 for the summer of 2001 and 2003 respectively. Because of maintenance work, the trail was closed for about ten days in 2001 and for twenty days in 2003 – reducing the length of comparable time series data. A visual inspection of the two curves indicate a considerably increase in visitors at the trail for most of the season.

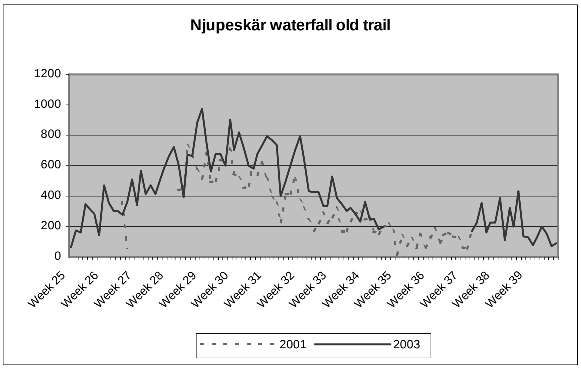

Figure 2. Data from the visitor counter at the Njupeskär trail.

The total number of observations in 2003 is 40 percent higher compared to 2001 for the comparable time period (approx. June 29 – August 24). While the trail to Njupeskär can be considered a front country location, the equivalent figure for Gördalen – a back-country trail in the north-west of the park – is a 12 percent increase in visitor observations. Based on these increases, the estimate of 38 000 visitors to Fulufjället in 2001 and that 93 percent of the visitors come to Njupeskär while 7 percent does visit various back-country locations, the total number of visitors to Fulufjäll National Park in 2003 is estimated at 52,000 – a thirty-seven percent increase compared to 2001.

Looking at some basic visitor and trip characteristics (Table 2) collected both in 2001 and 2003, one will find significant changes in gender, place of residence, trip length and transportation. In 2003, Fulufjället was visited by more females and a higher proportion came from cities with more than 20,000 inhabitants compared to two years earlier. One also finds that the average length of the trip during which Fulufjället was visited has decreased from 10.1 to 8.8 days, and the proportion arriving at Fulufjället in bus has increased – but is still a very small number compared to those arriving in car. No changes were observed for age, education or the proportion that came as participants of an organized trip (commercial or non-commercial).

Table 2. Visitor and trip characteristics.

	2001	2003	
Age	47 years	49 years	n.s.[a]
Gender (% female)	47.0%	52.9%	0.004[b]
Residence in city (>20,000)	47.7%	52.5%	0.014[b]
University degree	39.9%	41.2%	n.s.[b]
Trip length	10.1 days	8.8 days	0.000[a]
Car	93.4%	95.1%	n.s.[b]
Bus	1.4%	2.6%	0.036[b]
Organized trip	4.1%	3.5%	n.s.[b]
Non-Swedish visitors[c]	39.9%	30.6%	--
First time visitors[c]	59.8%	63.6%	--

a – t-test; b – Chi-sq. test; c – based on data from on site registration cards

The questionnaire also included a closed ended question about the major reason to visit Fulufjället (Table 3). A visit to Njupeskär waterfall is the most important reason among two-thirds of all visitors in both years. The most noticeable change can be observed among those that express the nature reserve (2001 survey) and the national park (2003 survey) is the most important reason. In 2001, about three percent of the visitors said the most important reason to visit Fulufjället was because it is a nature reserve, while in 2003, some ten percent of the visitors said the most important reason to visit Fulufjället was because it is a national park. There is also a major decrease in the proportion of the visitors that hunt, fish or pick berries, while studies of nature increase. In general, it looks like more people come to visit Fulufjället because of more symbolic reasons (it is a national park) and to participate in non-extractive activities in 2003 compared to 2001.

Table 3. The major reason to visit Fulufjället.

	2001[a]	2003[a]
Visit to Njupeskär waterfall	68.4%	65.5%
Visit Fulufjället because it is a nature reserve (2001) / national park (2003)	3.5%	10.4%
Hiking	17.6%	15.9%
Nature studies	1.7%	3.3%
Hunting, fishing or berry picking	3.8%	0.9%
Other	5.0%	3.8%

a – *Chi-sq. < 0.000*

National park designation and tourism

In the 2001 survey, most visitors said that there is still not enough protected nature and wished for more nature reserves and national parks in the mountain areas. About 40 percent claimed that Fulufjället would be more attractive to visit once it became a national park. The majority of the visitors believed that a national park will increase Fulufjället's value to both people and nature. The creation of a national park would also bring advantages to the surrounding communities, as agreed by over 70 per cent of the visitors. One visitor in two thought that a national park in Fulufjället would not pose unnecessary restrictions on human use of the area, whereas 25 per cent believed that would be the case. A majority of the local population (the inhabitants in Särna and Sörsjön) claimed that the creation of a national park has little meaning to them.

In the 2003 survey, several of the attitudes toward a national park had changed (Table 4). A significantly larger proportion of the visitors agreed to the statements that a national park increases the value of Fulufjället to the visitors, increases the value of Fulufjället to the local population and contributes to protecting biodiversity. Still about 25 percent of the visitors believed that a national park at Fulufjället limits human development.

Table 4. Attitudes toward a national park (NP) at Fulufjället. Proportion of the visitors that agree to the following statements.

	2001	2003
The NP increases the value of Fulufjället to the visitors	63.8% [a]	80.6% [a]
The NP increases the value of Fulufjället to the local population	72.7% [a]	86.0% [a]
The NP at Fulufjället limits human development	26.3%	23.2%
The NP at Fulufjället contributes to protecting biodiversity	83.4% [a]	94.7% [a]

a – Chi.sq. p<0.000

One effective means of managing visitors to natural areas is to focus on different visitor groups or categories. Different visitor groups are attracted by different natural and social features, and often any single area must be managed to produce a spectrum of recreation opportunities. There are several ways to group visitors into categories. In this study, a question of twenty items was used to categorize the visitors by a factor analysis (principal component analysis with varimax rotation). For each item, respondents were asked to assess its importance to the decision to visit Fulufjället on a five point scale (ranging from 1 – not at all important, to 5 – very important). The analysis of 2001 and 2003 produced five and six categories respectively (Table 5). The first component for both years is the Protected, unspoiled wilderness – i.e. people who come to Fulufjället because they think the area is unique, it is a nature reserve / national park, they want to experience unspoiled nature and wilderness. While in 2001 comfortable fishing is the second component and Family and sunshine the third, while this order is reversed in the 2003 study. Hence, in 2003 the fishing oriented visitors are somewhat replaced by those more family oriented. Peace and quiet and accessibility make up components four and five, while in 2003 people that have friends living close to Fulufjället form a sixth category.

Visitor expenditures and willingness to pay

In both surveys, questions were asked about the willingness to pay for parking at the trailhead to Njupeskär waterfall and total expenditures during the visit to Fulufjället. Willingness to pay for parking did not change between the two studies – in both surveys respondents on average said they were willing to pay about 37.5 SEK excluding those ten percent who gave a zero bid to the open ended question. Zeros included imply a willingness to pay of 33 SEK in 2001 and 34 SEK in 2003, but still not statistically different. The expenditure question asked both in 2001 and 2003 – “About how large expenditures did you have while visiting Fulufjället (lodging, food,

Table 5. Visitor categories in Fulufjället National Park 2001 and 2003.

Component	Items	2001		2003	
		Rank	% of variance	Rank	% of variance
Protected, unspoiled wilderness	- The area is unique - The area in a NR / NP - Experience unspoiled nature - Experience wilderness	1	13.1%	1	12.4%
Comfortable fishing	- Fishing possibilities - Good lodging - Cabins and huts	2	12.4%	3	10.6%
Family and sunshine	- Good weather - Family friendly - Good restaurants	3	10.4%	2	10.8%
Peace and quiet	- No crowding - Peace and quiet	4	10.3%	4	10.2%
Accessibility	- Area is close to residence - Good transportation	5	6.7	5	8.1%
Friends	- Friends close to Fulufjället	--	--	6	5.7%
Total variance explained			52.9%		57.8%

souvenirs etc.)?" – was less specific than the expenditure items for 2003 reported below. This single question did not take different geographical areas into account, but will give some idea about the changes in expenditures between the surveys. In 2001, visitors reported an average expenditure of 294 SEK while in 2003 the equivalent number was 248 SEK (F=3.34, p=.067), indicating that expenditures for an average visitor may have been higher in 2001 compared to 2003, depending on the level of significance we use.

Using the figures above and the estimation of 38,000 visitors to Fulufjället in 2001 and 52,000 visitors in 2003, we are able to determine changes in the total amounts for both willingness to pay for parking at Njupeskär trailhead and in visitor expenditures. The total amount visitors are willing to pay for parking increased by 37%, from 1.42 million SEK in 2001 to 1.95 million SEK in 2003. The total expenditures increased by 15%, from 11.2 million SEK in 2001 to 12.9 million SEK in 2003.

A more detailed question concerning visitor expenditures was included in the 2003 survey. In this case, respondents reported their expenditures on lodging, food, shopping, activities, transportation etc. in four different geographical regions: Fulufjället National Park; the gateway area surrounding the park; the local region outside the gateway area; and in Sweden outside the region. Average expenditures, the proportion of the visitors that reported expenditures and the total expenditures for each region are reported in Table 6. Accordingly, about five million SEK were spent in the park, about 11 million SEK in the gateway area, 41 million SEK in the region and just over 74 million SEK in Sweden outside the region.

Respondents to the 2003 survey were also asked to consider a hypothetical scenario under which Fulufjället was not designated a national park; "Suppose that Fulufjället was not a national park in the summer of 2003. Would this have affected your itinerary or time spent in the region, gateway area or current park area?". Seven percent of the respondents said they would not have undertaken the trip at all, 8.4 percent said their trip would have been different while almost 85 percent of the respondents would not have changed their itinerary or time spent in the different locations. Hence, under a hypothetical scenario of no national park in Fulufjället there will be a decrease in visitors in the range of 7–15 percent. Based on the numbers in Table 6, this change will account for a decrease in expenditures in the range of 0.4-0.8 million SEK in Fulufjället, 0.8-1.8 million SEK in the gateway area, and 2.9–6.4 million SEK in the region outside the gateway area. These figures should however be considered preliminary and will be subject to further research. The relationship between visitor attitudes, real behavior, expenditures and travel patterns may be more complex than the assumptions above are based on.

Table 6. Visitor expenditures by geographical location.

	Average expenditure[a]	**Visitors reporting expenditure**	**Total expenditures[b]**
Fulufjället NP	208 SEK	45.5%	4.98 MSEK
Gateway area (outside FNP)	1022 SEK	31.6%	11.6 MSEK
Region (outside gateway area)	1985 SEK	52.8%	41.3 MSEK
Sweden (outside region)	4275 SEK	50.9%	74.4 MSEK

a – average expenditure among visitors that reported expenditures in each region
b – based on 52,455 estimated visitors to Fulufjällets NP, 35,950 visitors to gateway area, 39,400 visitors to region and 34,200 visitors to Sweden outside the region.

Concluding remarks

The visitors to Fulufjället differ from those of other Swedish mountain regions by a high percentage of first time visitors (about 60 percent). Four out of ten visitors to Fulufjället are foreigners, which is also considerably more than in other parts of the Swedish mountain region (Heberlein et al., 2002; Vuorio, 2003). Njupeskär – the highest waterfall in the country – is a major attraction in Fulufjället with a high concentration of visitors, situated in an area otherwise little known. All this make Fulufjället a special place, and the benefits of using visitor data both in park management and tourism development should be obvious. What also make Fulufjället a special place is the national park designation process that explicitly involved the local population, applied a management zoning system and initiated social science research – some of which is presented in this paper.

Comparing the visitors that came the year before Fulufjället was designated a national park with those that came one year after show some interesting differences. It looks like a national park attract more females, people from larger cities, people that hike, fish and hunt less, families and people who like good weather. This is clearly not the more wilderness purism oriented groups. In general, visitors are more positive toward national parks and it looks like about one in ten visitors came to Fulufjället only because the place is a national park. At least so in the short run. While it looks like a national park as such matters, changes identified here may partly be driven by improvements in infrastructure such as roads, visitor center, signs, trails – all of which took place during the study period.

National parks in Sweden are not as important for the supply of outdoor recreation opportunities as may be the case in other countries where access to private land is restricted. Nevertheless, national parks and other protected areas do play an important role in the tourism production process. More focus is needed on the relationship between park management and tourism development. Measurement of visitor satisfaction shows that people are more satisfied with their visit to Fulufjället in 2003 as compared to 2001. Data on travel patterns and expenditures also indicate that a national park matters in economic terms. Future research will explore these relationships in more detail.

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Relations Between IUCN-Zoning And Tourism In The Hungarian National Parks

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Abstract: Within the 100.000 km^2 area of Hungary, which is located in Central Europe, 10% is protected. The National Park Directorates make an effort to suit the requirements of the IUCN and strive to develop a zoning system. However, the settling of the zones meet had to face many difficulties in this relatively small country, which also has dense regional structure. The extent and the fragmentation of the national parks, the position and threatening of their natural values and the previous utilization and naturalness of their area all influence the classification of the given area. Besides, attractions, tourist destinations and the areas which are used by tourists also have to be taken into consideration during the development of the zones. The aim of this poster is to analyse the role of the position, shape and rates of the zones and their connection with tourism.

Introduction

The IUCN (The World Conservation Union) was founded in 1948 and brings together states, government agencies, NGOs, scientist and experts from 141 countries. IUCN is legally registered as "The International Union for the Conservation of Nature and Natural Resources".

It has over the last 27 years worked to develop international criteria for protected area categories around the world. Guidelines have been developed to assist countries to apply a consistent terminology to protected areas. The six Categories are based on the objectives for managing the area.

A National Park, Category II. is defined as a natural area of land (or sea), designated to:

- protect the ecological integrity of one or more ecosystems for present and future generations
- exclude exploitation or occupation inimical to the purposes of designation of the area and
- provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible (http://www.unep-wcmc.org).

IUCN recognises a protected area as a national park only if it meets several criteria. One of the criteria is the introduction of a zoning system. Meeting all criteria is very difficult, that is why there are only so few "recognised" national parks in the world. National Parks with IUCN Category II listing are for example Yellowstone NP (USA), Ras Mohammed NP (Egypt), Tongariro NP (New Zealand), Waterton NP (Canada), Thayatal NP (Austria) and Hohe Tauern NP (Austria).

National Parks in Hungary

There are already ten national parks in Hungary, the first of which was established in 1973 (Figure 1). According to the Act on Nature Conservation of 1996 "national parks are extended areas of the country whose natural condition has not been significantly altered and whose primary designation is the protection of natural botanical, zoological, geographical, hidrological, landscape and cultural values, the preservation of biodiversity and the undisturbed operation of natural systems, in order to further education, scientific research and recreation."

There are two levels of protection: beside protected areas there are also strictly protected parts of national parks. Strictly protected areas are indicated with boards and tourists need special permits to enter. Usually an extension board relates the concession: "Do not leave marked routes." Wherever the sensitiveness of the territory did not allow for such a concession, tourist routes were diverted from the path developed over decades (e.g. in the Aggtelek NP).

Hungary is a member of IUCN since 1974. The regulations of the organization are observed by Hungary: to this end the Hungarian law on nature conservation requires that park have to comply with international regulations and introduce a zoning system of various categories requiring different principles of treatment. The principles of the development of zones are put down in Ministerial Decree 14 of 1997 which also include general guidelines.

The purpose of zoning is to make sure that the national park can fulfil all its tasks in the areas most appropriate for each task. The following zones are distinguished:

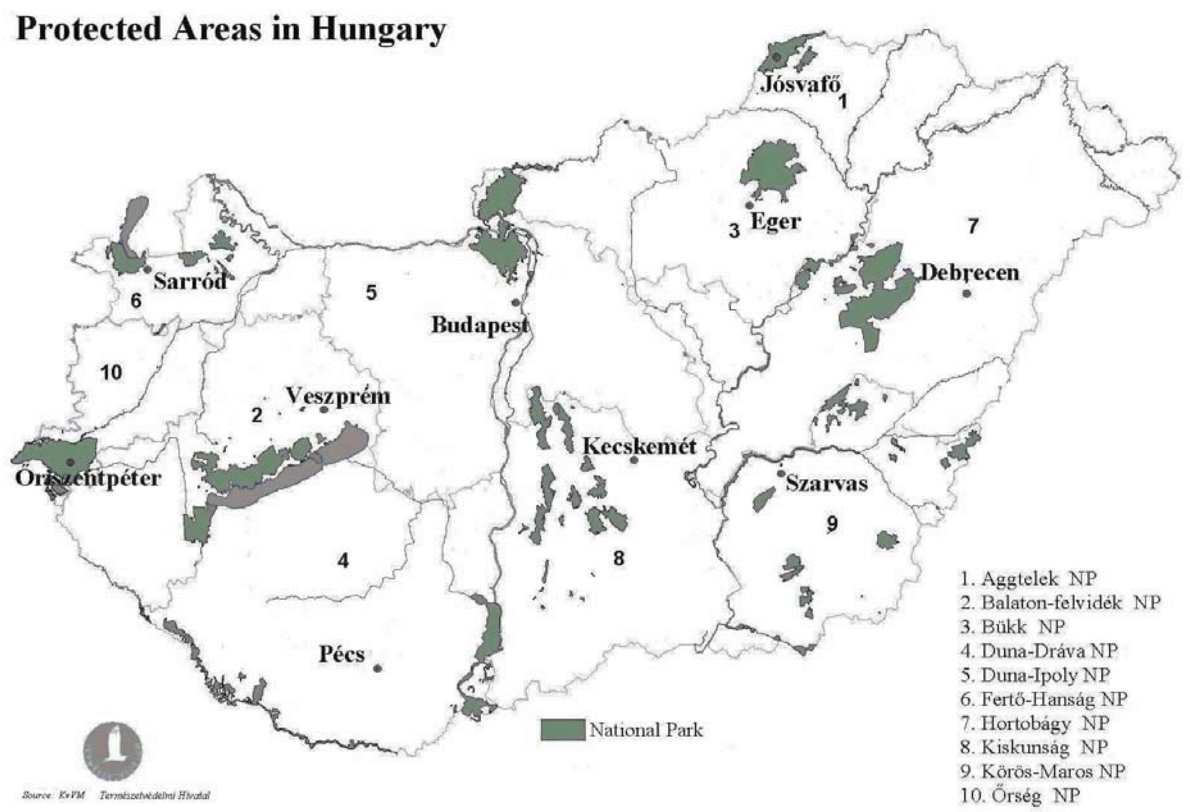

Figure 1. National Parks in Hungary.

– Zone A: nature zone. (It cannot be visited. Its main purpose is the maintenance of natural conditions.)
– Zone B: preserved zone or treated natural zone. (It cannot be visited or only restricted access is allowed with permits.)
– Zone C: tourist zone or exhibit zone. (Open access.)

Beside these three, mention is usually made of Zone D, a puffer zone beyond the borders of the national park, a so called protective zone. National parks are not obliged to designate areas for this zone and in many cases no plans exists to set them up. Such a zone, however, can be useful in the future for the purposes of tourist developments.

The law allows for zones B and C to be designated together in cases when separating the two is not possible or for conservation reasons not expedient. Several of our national parks opted for this possibility, as we shall see in a moment.

It follows from what was said so far that the various forms of tourism are permitted only zone C, so it is important to take a closer look at these permitted territories, especially their position vis-a-vis frequented tourist sights. Although zones have not yet been officially introduced in this country/Hungary, many conflicts arise in the course of visits to strictly protected areas. It is most apparent in the case of mountainous national parks that strictly protected areas, prior to the establishment of national parks, had been beloved tourist destinations. Prohibiting entry into such areas by way of putting up boards is rather difficult especially in cases where pathways continue to be drawn along the original lines.

Zones in Hungarian National Parks

Hungarian National Parks look very different from the point of view of Zone C:

Table 1. Extreme zone rates.

	Zone A	Zone B	**Zone C**
Hortobágy NP	15%	80%	**5%**
Kiskunság NP	24.4%	44.7%	**30.9%**
Bükk NP	25%	70.75%	**4.25%**
Aggtelek NP	19.5%	13.2%	**67.5%**
Fertő-Hanság NP	16%	60%	**24%**
Duna-Dráva NP*	–	–	**–**
Duna-Ipoly NP*	–	–	**–**
Balaton-felvidék NP	19.9%	35.6%	**44.5%**
Körös-Maros NP*	–	–	**–**
Őrségi NP	0,5%	7,1%	**92,4%**

* No zoning system

It was in the oldest national park of the country, in the Hortobágy NP, that the first zoning system was developed. Tourism in the area is a relatively newfangled. Visiting the Puszta and its cultural attractions (such as traditional farming or traditional farm animals) has become a custom only in the twentieth century. These cultural values (Museum of Pastoral Life, Puszta Animal Park, Meggyes Inn Museum) are usually exhibited in establishments located within settlements or near public roads. Since the founding of the national park, those interested in its natural assets (such as the wildlife of waters) are welcomed at visitors' disposals. Experts show them around on trips that go along nature trails. Controlling tourism and keeping visitors (200.000 yearly) within zones C is further assisted by the introduction of an admission card system in this national park.

That is way there is no significant tension between nature conservation and tourism in spite of the fact that zone C represents only 5% of the park. The only exception is Lake Tisza where there is a widespread practice of illicit camping. It should be noted, however, that the maps distributed by the directorate of national park depict in their zoning system areas open to visitors which cover territories beyond the borders of the park belonging to so called zone D.

Tourists are notified about the various zones and the applicable regulations on boards posted at points of entry for tourists.

The Kiskunság NP (established in 1975) is made up of nine separate units. More than one fourth of the total territory is strictly protected. The park preserves some of the features of the landscape from time before water regulations such as sand dunes, alkalic plains and marshes. The NP has developed the zoning system what is taken into consideration during the planning. Strictly protected areas belong to zone A. The way of life in the farms and traditional farming are exhibited in tourist establishments that fall within the territory of zone C. Wherever pathways go through more sensitive water habitat or geological values, time restrictions have been introduced (e.g. birds' brooding). Following the mosaic like composition of the national park, the zones too are designated in a mosaic manner.

The borders of the various zones are not posted for visitors (130 000 peoples yearly) but strictly protected areas are frequently signaled by boards. In these areas are forbidden to leave the pathway. Given that hiking has no particular traditions in this area, environmental authorities have hardly any conflicts of this nature.

Our first mountainous national park, the Bükk NP (1977) is the most frequented hiking place in the country (about 1,35 million peoples yearly). Already at the end of the nineteenth century crowds flocked here to enjoy the mountain climate, the beauty of wooded mountains, the mysteries of karst (caves, sinkholes). Another result of the woods of the mountains has been a profit oriented forest management. Such a practice is in explicite contradiction with the nature conservation regulations of IUCN. Unfortunately, property relations and the interests of farmers have not yet made it possible to realize plans for the zoning of the national park in a manner that would satisfy everyone. Plans for the zones are based on assessments of the vegetation and that explains why our most frequented national park has the lowest planned rate for zone C, 4.25% (Figure 2).

Figure 2. Zone C in the Bükk NP (4.25%; 18 360 ha).

The strange long narrow shape of the zone C is the result of the decision to designate areas open to visitors along roads (in many cases public roads) with the heaviest traffic on them. The geomorphological condition is the other cause of the unusual shape. I wonder to what extent compliance be enforced given that the directorate of the national park has already had many conflicts with tourists. The majority of pathways that were developed in the course of long years, well before the establishment of the national park, lead through what is planned to be zone A, and several of the beloved sights are strictly protected values (caves, canyons). Visitors are informed about the rules on boards posted at the borders of the park, but in many cases they do not observe them.

Probably the most fortunate zoning system was developed in the Aggtelek NP (1985). There is a rather obvious system of blocks in which the shape of the zones concentric. In such a way, zone A can serve as a reserve, and zones B and C as protective belts (Figure 3). Besides, areas open to visitors represent 67.5% of the total territory. But this national park enjoys a special status compared, e.g. to Bükk NP. Mass tourism has not started very early due to the peripherial location of its territory. Its romantic sights full of karst formations became highly frequented places after the establishment of the NP and its recognition as part of the World Heritage (1995). This is why not even the rerouting of the so called National Blues Pathway did not cause too big a conflict. Given that more than two thirds of all the tourists how visit the park (200 000 visitors yearly) go only to the cave, more sensitive areas are not disturbed by the tourists. The high rate of areas open to visitors signifies the positive attitude of the park's directorate towards tourism. Thus tourists, who come in great numbers by now, find it easy to comply with rules and observe regulations. One of the reasons for the success is that tourists are well informed: information leaflets show the zoning system of the park with areas open to visitors highlighted on them. Since this information system has proved to be so effective, the directorate of the NP decided to designate as zone B a particular area whose sensitivity allows for visitors to enter but is not a safe place at all (former mine, collapsed caves).

An interesting point to note is that even in areas designated as zone C there are strictly protected areas.

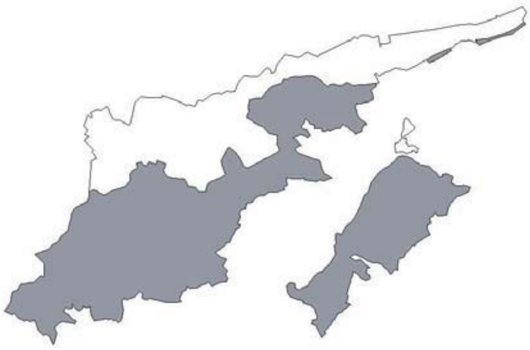

Figure 3. Zone C in the Aggtelek NP (67.5%; 13 300 ha).

Our first NP that we share with another country is the Fertő-Hanság National Park (1991), which lies along the border with Austria. The huge marshes and bogs attract great number of bird watchers (300 000 yearly), many of them from abroad. Although the park is made up of many units, only parts of its largest unit can be visited. In this area, the three zones are formed concentric which is favourable to nature conservation. Areas along the border belong to zones A and B just like in the case of ANP, except for Fertőrákos and its neighbourhood with its heavy traffic. Zone C makes up 24% of the national park and has many open pathways and displays (Figure 4). Hanság forms a separate unit and belong to zone B. Boards inform visitors when and which parts can be visited, mainly under expert supervision. It is forbidden to leave pathways.

Figure 4. Zone C in the Őrség NP (92.4%; 40 660 ha).

The long, fractional and narrow contour of the Duna-Dráva NP (1996) is shaped by the two rivers' floodplains, oxbows and dead arms. The directorate of national park is currently preparing a zoning system within the confines of its management plan. Areas fully open to visitors (130 000 yearly), those with restricted access as well as closed areas are indicated on leaflets and boards informing tourists. The majority of visitors come to see the rich animal and plant populations of the gallery forest.

The Duna-Ipoly NP (1997) faces problems similar to that encountered by the Bükk NP. The directorate of national parks disposes only over a fraction (less than 10%) of the territory in the form of property management. Due to ongoing interest reconciliation efforts with forest companies, there are still only plans available for the zoning system – a final version is yet to be seen. This mountainous national park belongs to the recreational zone of Budapest, bringing lots of visitors (about 1,5 million yearly) to areas near to the capital. The park is connected with a narrow neck across the Danube and is made up of two blocks whose frequented sights fall into strictly protected areas, which bring many conflicts given that hiking and skiing in these mountains enjoys a tradition more than a hundred years old.

Since the Balaton-felvidék NP (1997) too has a mosaic like structure, its zones cannot be designated in single blocks. When deciding on areas closed to visitors, territories with a long tradition of viniculture and tourism (about 2 million yearly) present great problems. Being part of the holiday resort around Balaton, this area is highly frequented by visitors who are attracted by the geological values of the Tihany peninsula, the volcanic hills as well as by traditional agriculture. The peaks of volcanic hills are strictly protected areas but pathway does lead into even these territories. Thus the concession can be found here as well: restricted access, do not leave the pathway. The single area that can not be visited at all covers the waters of the internationally reputed Kis-Balaton.

The Körös-Maros NP (1997) created for the protection of alkalic plains, loess grasslands, marsh residues and flood areas is made up of several smaller units. Due to the flatness of the area, hiking does not have significant traditions around here (recently 80 000 tourists per year). Visitors are coordinated to the pathways drawn by the directorate of the national park. There is no zoning system, strictly protected areas count as zone A here as well. These can be visited only with and escort and with the permit of the park's directorate. The rest is open to visitors with the usual restrictions. Pathways are not be left within strictly protected areas. Conflicts are caused by prohibition of fishing in the Körös-valley.

The highlight natural values of our youngest NP, the Őrség NP (2002) are bogs, pinewoods and mountain species. The territory also extends over villages, which have preserved ancient forms of settlement and traditional agriculture, all of which contributed towards granting national park status to this area. In spite of its fresh status, the park has already developed its zoning system, which is not official yet. It has the highest rate (92.4%) of areas open to visitors (20 000 yearly) which results from the territory's civilized features (Figure 5).

Figure 5. Zone C in the Fertő-Hanság NP (24%; 5 660 ha)

Conclusion

The great differences in zone rates and the lack of zones result from many factors of which two are crucial:

– Ministerial decree 14 of 1997 was not followed up by a decree regulating implementation.
– There is no expert agreement on how to designate areas (e.g. to what extent tourism should be taken into consideration).

Further factors are:
– Property relations in many cases make difficult the developing of proper zones.
– There are differences of opinion even within the directorate of national parks as to how to develop zones.
– The location of values to be protected (and Hungary's highly populated land) makes it sometimes impossible to develop zones into single blocks.

Possibilities for enforcing zone C:
– Zones B and C should not be separated but regulations applicable to zone B should be enforced in toto: time restrictions, space restrictions (pathways are not be to left), other restrictions (escort).
– Misinformation (see Aggtelek NP)
– Diversion of tourist pathways.
– Increased enforcement.
– Zone C follows tourist pathways.

In contrast to the areas accepted by IUCN as national parks, there are two difficulties with respect to tourism in Hungary's protected natural territories. One is that due to our geographical features, it is impossible to restrict admission to protected areas across one or two points. This is also why we do not have accurate statistical data on our national parks' visitor flows (this, however, would be essential to any carrying capacity studies).

The other difficulty arises out of citizens' inadequate ecological sensitivity. A previous study (Benkhard 2001) has shown that many visitors, whiles fully conscious of the rules applicable to a particular protected area, still enter restricted parts and leave pathways.

This is why it is a pressing task to increase tourists' ecological consciousness and to develop their sensitivity toward nature. This would ease conflicts between zoning systems and tourism.

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The effect of the tourism of the Hortobágy National Park on the surrounding settlements – lesson of a questionnaire survey

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Abstract: The Puszta in the Hortobágy represents an important, individual natural and historical-cultural value, which has been deservedly possessed the rank of UNESCO World Heritage since 1999. Due to its speciality, in 1973 the first national park in Hungary, the Hortobágy National Park was founded here. In the course of the survey we examined how the Hortobágy National Park can utilize the World Heritage status in its tourism, how it utilizes the possibilities in its ecotourism. What effects does the tourism in the national park have on the economy, basic and tourist infrastructure, and society of the affected settlements? What characterizes the tourist supply and cooperation of the HNP and the settlements? What conflicts can be derived from the two sides, and what possibilities do they have to develop?

Introduction

The international tourist trends of the last decades indicate an increase in the demand for the value-oriented tourist activities, one consequence of which the increasing utilization of national parks for tourist purpose. At the same time to develop the national protection attitude is among the important tasks of the national parks as well. Therefore the demands of tourists and the tasks of national parks especially meet in the field of ecotuorism.

The Hortobágy Puszta in Hungary provides an unusual and unique landscape experience for the European eyes since a similar one only can be found in the steppes in South-Italy. Besides the spectacle of the white alkali Puszta extending to the horizon, its riches in species of its flora and fauna, its special composition, the pastoral traditions looking back on past centuries and the ancient Hungarian domestic animals rightly make the Hortobágy a treasure which is worth of preservation on a world scale and can be proud of the World Heritage rank by the UNESCO from 1999.

Due to its speciality the first national park in Hungary was founded here in 1973 (Kapocsy 1993), the Hortobágy National Park on the area of 821.25 km^2 – henceforth HNP (Figure 1). Its international importance is increased by the fact that more than one fourth part of its area (23 thousand hectare) is a valuable habitat of international importance for waterfowls according to the Ramsar Agreement, 1971. Furthermore, in the framework of the Programme of UNESCO MAB it is a Biosphere Reserve protecting swamp and alkaline associations.

Figure1. The area of research, the HNP.

The database of the analysis is constituted on the basis of Internet information as well as the questionnaire survey and interviews among the local governments of the 19 settlements surrounding the national park (Figure 2). Of the 19 settlements 10 are towns and 9 are villages, of which five did not fill in the questionnaire with 25 questions (Figure 2).

Results

The national Parks can minimize the unfavourable effects of the tourism on the natural and artificial environment by **directing and controlling the tourist activity**, marking out the IUCN-zones providing different stage of protection. The zone system (Figure 2) in terms of tourism means the following possibilities and limits:

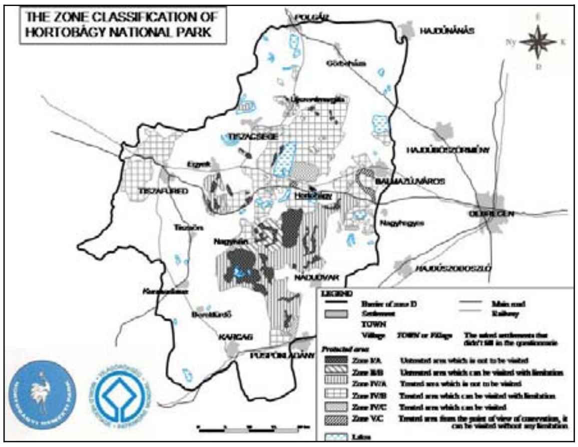

Figure 2. The environmental protection and tourist zone system of the HNP and the surrounding settlements.

– Zone A (15% of the area of the HNP): strictly protected, visiting is forbidden except for scientific observation;
– Zone B (80% of the area of the HNP): it can be visited with limitation with the permission of the national park, or with professional guide;
– Zone C (5% of the area of the HNP): it can be visited without any limitation;
– Zone D: the protective or buffer zone surrounding the national park, it can be visited without limitation, potentially it is the main site for the tourist activity (Lisztes 2001). (The studied settlements can be found here as well.)

The 5% area of the Zone C is too small for the visitor to really get something from the Hortobágy landscape experience, and to stare at its values, and by it the national park should contribute to develop her/his nature conservation attitude. If it doesn't want to increase the portion of the Zone C at the expense of the Zone A and B, a rational solution will be the use of the Zone D for tourist purpose to a greater extent. The question is how the settlements surrounding the national parks have prepared for receiving the tourist demand and what tourist supply they have at present.

The quality of the tourist supply is determined considerably by the **basic infrastructure** of the settlements. The values connected to the individual indexes are on a fairly broad scale in relation of the individual settlements, i.e. there are things to improve for example in the field of the sewer system, waste management etc. (Figure 3).

The **accommodation bed supply** is an important measurer of the stage of the tourism of a settlement. The Hortobágy National Park doesn't have commercial accommodation. Thus the tourists requiring accommodation can use accommodations in the settlements in the buffer zone, among which there are great differences in terms of this as well. Of them Tiszafüred (>3000 rooms) and Berekfürdő (<2000 rooms) are far more outstanding. Even Tiszacsege precedes the Hortobágy which is considered as the tourist centre of the HNP. Balmazújváros, Egyek, Nádudvar and Nagyhegyes have modest supply (Figure 4).

The present **programme supply** of the HNP is not too rich compared to the conditions. It has had no visiting centre yet. Four study-trails are available for the visitors and they can meet the wildlife and folk art of the Hortobágy in exhibitions. Many people like the Puszta Animal Park showing the ancient Hungarian species. On the supply palette bird-watching, watching the bird repatriating site, craftsman presentation, puszta riding, and flying appear.

The tourist programme supply of the settlements is not based on the ecotourism but it form on the basis of the medical and thermal tourism. Only some people undertook to organize free time programmes based on the natural condition of the Hortobágy landscape, management traditions and its folk art values. For example Hortobágy settlement, local council organizes walks, tours and rides showing the values of the puszta together with the HNP. The riding and puszta riding facilities of the Epona horse village with four stars constructed beside the Hortobágy settlement make the supply complete. Tiszacsege has similar programme supply.

All the settlements surrounding the HNP are suitable for organizing the programmes which were

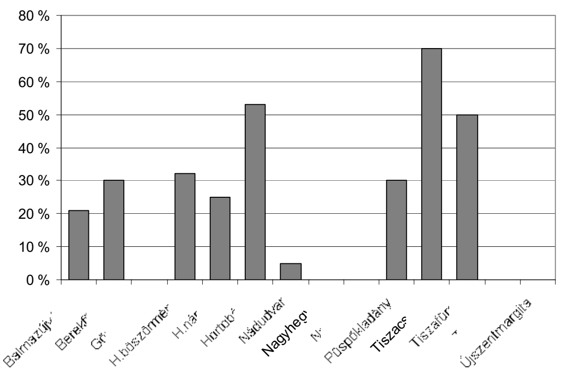

Figure 3. The extent of the sewer (Local Council 2001).

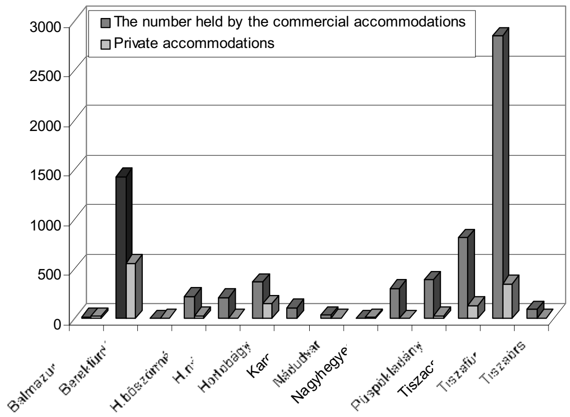

Figure 4. The number of rooms held by the commercial and the private accommodations (KSH 2000).

flashed above, however it seems that they do not know sufficiently of these possibilities. This supposition is well supported by the fact that from the 14 questionnaires filled five did not even mention the HNP among the attractive factors (Bodnár 2002).

The **human resources** are important parts of the tourist supply. Since the aesthetics of the settlement, its environmental condition, the hospitality of the host community, its tradition preservation, its spirit to venture, knowledge of languages etc. considerably influence the environment of the tourists. The evaluation of the local councils is not so flattering! Summarizing, the knowledge of languages and the spirit to venture are very poor among the inhabitants, and their environment and conservation consciousness is in need of considerable development.

The successfulness of the tourism is considerably determined by its **organization stage**. The HNP does not do travel organization activities, does not deal with selling complete travelling packs but it provides services of tourist character by own organization or according to individual order.

The range of duties undertaken by the HNP is complex as well. Within the management of the national park the tasks connecting to the tourist activity directly are carried out by two tourist professional inspector and the caretakers of the demonstration establishments (4 persons). The twelve conservation guards (and some university students) join the tourism as an occasional guide. This number of staff is not sufficient to implement a successful ecotourist activity, i.e. to carry out the tasks of the national parks prescribed in the education and development of the conservation attitude.

It is another problem that very few travel agencies undertake to sell products offering the values of the HNP. Of the local councils filling in the questionnaire only three (Hajdúnánás, Hajdúböszörmény, Tiszacsege) indicated that they have this kind of activity in their settlements. The picture is more favourable in the case of hotels where this appears as an optional programme almost everywhere. This way the HNP as a tourist product – besides Hortobágy – appears as a supply in visitors' company in Hajdúszoboszló (and the near city, Debrecen).

The **cooperation** of the parties interested in tourism can form an important condition for a successful tourism. We asked the local governments to evaluate the contacts between the real and potential parties. According to the answers Hortobágy, Tiszacsege and Hajdúnánás have the best contact system. Görbeháza, Nagyhegyes and Balmazújváros gave considerably poor classification but the picture is unfavourable either in the case of Tiszafüred or Berekfürdő counted among the important tourist target (Bodnár 2002).

There is something which should be improved in the overall picture of the contact between the HNP and the settlements! 50% of the repliers qualified this contact as poor or very poor, only the Hortobágy Local Council gave excellent mark. According to the local councils the conflict, which derives from the provision, limitation of the national park for the nature conservation, makes difficulties over the development of the good contacts. They miss the compromise skills of the HNP, the sufficient information and participation in the development of ideas.

The **guest traffic** of the HNP is characterized by considerable seasonality in time and space. The considerable part of the 200 000 tourist per year (exact data are not known) visit one or a half day the summer programmes – Bridge Fair, Horse Days – the site of which is the Hortobágy settlement of special situation. This village is the central settlement of the national park, however, roads towards it cross the protected area (Figure 2).

On the present stage of the organization it is more difficult to evaluate the tourism traffic towards the national parks from the settlements in the buffer zone, which is very poor according to the questionnaires filled in by the local councils (Figure 5). They assume tourist traffic which is regular and with considerable persons only from Hortobágy village.

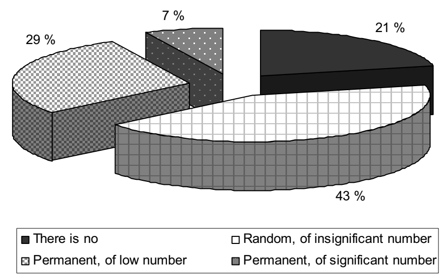

Figure 5. The extent of the tourism traffic towards the HNP from the surrounding settlements.

We can follow the guest traffic of the commercial and private accommodation, although not every visitor visits the national park by all means at all! In terms of the number of the quests Hortobágy has the first place (Figure 6). Most of the tourists staying here want to see the values of the puszta. Berekfürdő and Tiszafüred have rather swimming guests. The guest night numbers inform us about it, in terms of which both settlements precede Hortobágy (Figure 7).

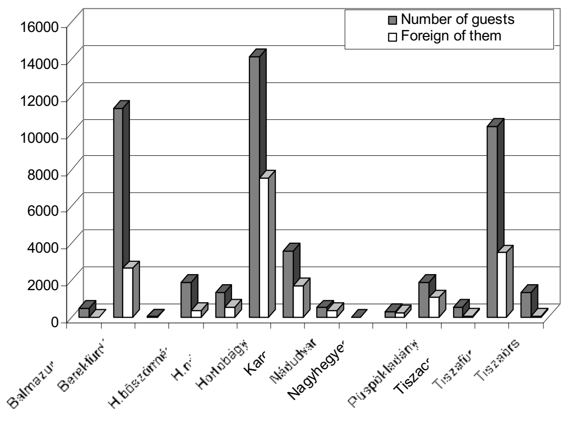

Figure 6. The guest number in the commercial accommodations (KSH 2000).

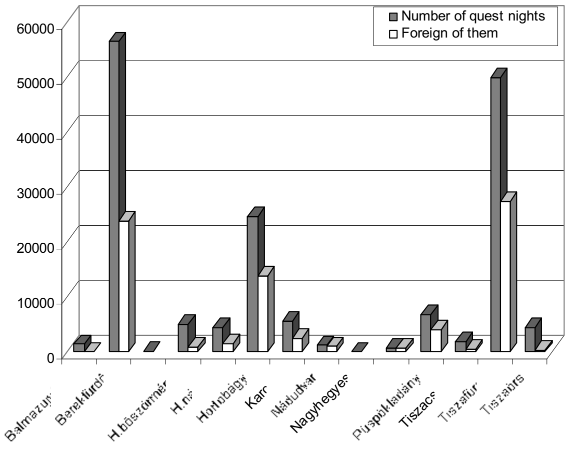

Figure 7. The number of the guest-nights in the commercial accommodations (KSH 2000).

Most of the foreign tourists stay at Hortobágy. The Germans (33.3%) and Ukrainians (30.8%) arrive in the greatest number, however this last one use the infrastructure of the business-conference tourism that the Epona Hotel provides (Marton-Erdős 2002). The share of the Austrian and American tourists in the third and fourth position is far less (3.3% and 2.2%).

I also wanted to know to what extent the local councils feel **the favourable and unfavourable effects of the tourism.** Of the damaging effects the crowdedness affecting the comfort of the inhabitants and the effect of tourism generating price increase were raised. Of the dangers counted by the national park only parking problems and wasting were raised.

Considering the multiplicator effect of tourism the opinions fairly differ. In the settlements having more important tourism, the tourism influence positively the level of the trade and hospitality. In those places where there is no considerable tourism the classification is unambigously poorer, thus this does not motivate either the local inhabitants or the local council to do tourist developments. It is surprising how poor the classification effect on the development of the basic infrastructure is, and the preservation of the folk traditions and profession from the Hortobágy Local Council. The reason for this is that the "local values" have became mass products, they have been put on the special clothes of kitsch.

Conclusion

In a special way, the World Heritage status has not resulted in making the HNP more popular among either the national or the foreign tourist. The fundamental reason for this is the poverty of the programmes, supply and the confusion which can be connected to the difficulties deriving from the lack of staff of the HNP and the financial limits. The national park region which can be characterized by a transit tourist traffic at present can meet the tourist development requirements on two condition.

It is easier to fulfil the first condition because it depends on the HNP having excellent expert guard: it should increase the number of its programmes and widen the selection. The greatest obstacle to its implementation is the lack of staff mentioned above which goes with a reduced circumstances of the financial means. Therefore the tourist infrastructure is incomplete and the level of services is insufficient. For example, the visiting centre has just started to be constructed which with a view to its directing and distributing function is an important condition for organizing ecotourism. The existing four study trails are not enough but because of the financial problem the creation of further study trails is to be left. Besides these a view change would be also needed on the part of the HNP which would assess the tourism as the most important means for developing the environmental consciousness instead of the prohibitive and limiting authority attitude.

Much more difficult to meet the other condition which has to be based on the cooperation – which is insufficient at present – between the HNP and the surrounding settlements and between the settlements. The HNP should undertake the initiative role in making contacts with the settlement. It should inform the local councils of its development ideas and the possibilities in them, i.e. they should implement tourist attraction together in the Zone D.

The results of the questionnaire survey demonstrate well that the affected 19 settlements which can take part in receiving the tourism towards the HNP – except for Hortobágy village – have not prepared for this task yet. Not only the development stage of the basic infrastructure and the number of the programme offers, and its quality are uneven but in many cases the lack of the presence and cooperation of the human resources with environmental consciousness.

The development of the region can be given a new stimulus by the supports becoming available as a consequence of our European Union accession of 1 May 2004. From this point of view the importance of the cooperation becomes more valuable as the Union supports works on the basis of the regional view. Therefore the settlements in the Hotobágy region have to cooperate; with submitting joint tenders, joint development and unified marketing proposal it can establish the basis for creating marketable tourist programme packs.

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Push and pull assemblages for modelling visitor's flows in complex landscapes

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Abstract: Visitor flows can be represented as a landscape-recreation-model with eight components: entrances, goals, exits, field units, attractors or detractors, road segments, road junctions and barriers. The model can develop towards a real-time application by increasing its complexity. Starting from a basic situation (a landscape with one road and one entrance), the influence of landscape attractiveness is included; secondly diversity of the terrain and visitor is taken into account, thirdly time variation is added and finally, the interaction between the eight above-mentioned components is incorporated. The basic framework is a cost-distance function, to estimate the probability of on- and off-track visit of any location in a nature reserve on deliberate times and in specific terrain conditions. This can be represented by mean of a push-pull concept: some of the components (like entrances) have a push effect, while others, like goals, exits (when determined in advance) and attractors, have a pull-effect. To support the conversion towards a real-time application, GPS surveys, interviews, camera observation, photographic monitoring of seasonal changes, photo comparisons, step-bridges, walking experiments, experiments about field unit division and landscape preference studies were executed. This model is being developed in marshland nature reserves in central Belgium. Ultimately this system should lead to an impact assessment and decision support tool.

Introduction

Because of increasing social and political interest in nature conservation, an equilibrium has to be found between maximizing social profit and minimizing ecological disturbance in open (accessible) nature reserves (Lindberg & Hawkins 1993, Cessford 2002, Ehrlich 2002, Reinhard et al. 2002). In strongly urbanized areas, like in Flanders, the northern part of Belgium, nature reserves are scattered and dispersed between several land use types. Most of the protected nature reserves are accessible, externally because of a dense public road network and internally because of the absence of fencing and a relatively dense network of trails. Because the probability of disturbance grows with increasing visit density and frequency, some nature reserves risk losing their special quality. Excessive recreation not only causes the degradation of the environment, but may also spoil the recreation experience of the visitor (Manning 2002).

Hard measures, such as fencing off the fragile zones of the reserve, detract from overall site value (Bayfield 1982). One of the possible management principles is to guide visitors towards the robust part of the landscape by track layout adjustments and management practices such as boarding and trail management (Bell 1997).

The interaction between the values of nature and trampling should be studied in two ways: the impact approach (where, when and how?) and the response approach (how does the biotope change?) (Cole 1993, Cole & Bayfield 1993, Roovers et al. 2003). This study concentrates on the first issue.

The aim of this paper is, starting from an overall landscape-recreation-model, based on eight components (entrances, goals, exits, field units, attractors, road segments, road junctions and barriers) to create a specific real-time image of marshland nature reserves and to estimate there the probability of off-track visits in any location at deliberate times and in different terrain conditions. The model is developing towards a real-time application by increasing its complexity. Starting from a basic level (a landscape with one road and one entrance: push-effect), the influence of landscape attractiveness is included (push or pull-effect); secondly diversity of terrain and visitor is taken into account, thirdly time variation is added and finally, the interaction between the eight above-mentioned components is incorporated. To support the conversion towards a real-time application, GPS surveys, interviews (Baarda et al., 2000), camera observation (Muhar et al. 2002), photographic monitoring of seasonal changes, photo comparisons, step-bridges (Cessford et al. 2002), walking experiments, experiments about field unit division and landscape preference studies (Daniel 2001, Kaplan et al. 1998, Wherrett 1998) were executed.

Previous studies about modelling visitors are for example agent based models (Itami & Gimblett 2000, Itami et al. 2002), cellular automata models (Kessel et al. 2002) artificial models (Gimblett et al. 2001), decision-making models (Daniel 2001, Lawson et al. 2002) or other spatial models (Lynch 2002, Gulinck & Dumont 2002).

The originality of this paper is the combination of a friction based model (cost-distance function) and a basic push-pull principle. Some of the eight components (like entrances) have a push effect, while others, like goals, exits (when determined in advance) and attractors, have a pull-effect.

Elementary landscape-recreation model

Visitor flows in a nature reserve can be schematically represented as a landscape-recreation-model (Figure 1) with eight components: entrances, goals, exits, field units, attractors and detractors, road segments, road junctions and barriers. This model was submitted to a friction model. A cost-distance function in GIS estimates the probability of on- and off-track visit of any location in the nature reserve on deliberate times and in specific terrain conditions.

The whole system is conceptualised as a push-pull concept: some of the components (like entrances) have a push effect, while others, like goals, exits (when determined in advance) and attractors, have a pull-effect.

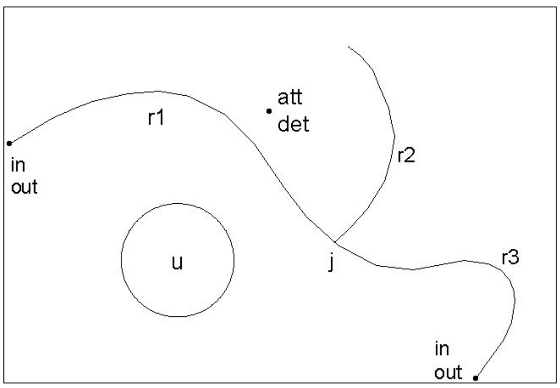

Figure 1. Landscape recreation model.

Legend:
in: Entrance
out: Exit
u: Unit
att: Attractor
det: Detractor
r: Road segment
j: Junction
a: Agents

The construction of the landscape-recreation model can be described in a sequence of complexity (Figure 2).

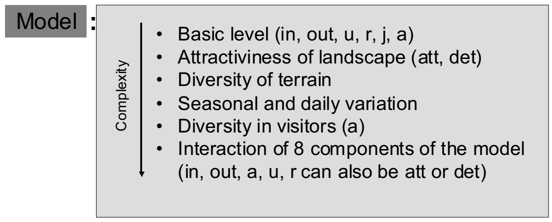

Figure 2. Levels of complexity of the landscape recreation model.

Starting from a basic situation (a landscape with one road, one entrance (push) and one exit (pull), the influence of attractors is added (pull-effect); secondly diversity of terrain and visitor is taken into account and finally, the interaction between the eight above-mentioned components is incorporated.

First, the 'Cost-model' as a **basic level**: Agents (mostly people) enter the landscape (or nature reserve) via entrances with a certain amount of initial energy and they leave via exits. Each entrance is at the same time also an exit with specific features, like for example accessibility and attainability. An agent can move along the road-network (a complex of road segments) or he can choose to walk off-road, while each step he makes decreases his residual energy. The landscape surrounding the road network is divided in units, each unit having its own characteristics (like vegetation type and –height, penetrability, visibility,…). The road network consists of road segments, which are in fact a special kind of unit (a small one).

As cost-model, an isotropic positive growth model (cost-distance function) was applied, based on the following formula:

$N_{i+1} = N_i + \sqrt{2}*R_{i/i+1}$
when both cells are in a diagonal

$N_{i+1} = N_i + R_{i/i+1}$
when both cells are in a straight line

Whereby N_i is the accumulated cost in cell i (a maximum value), $R_{i/i+1}$ is a resistance or friction factor that is taken into account in the transition from position i to i+1 and i and i+1 are respectively source and target-pixel.

The input for this model is a grid with sources and a friction-surface. The costs needed to reach the grid cells are accumulated. Starting from value 0, costs are summarized and the calculation ends when a maximum value is reached, which need to be given in the input of the Cost-Distance function. Each pixel of the landscape was mapped according to the value of the least Cost-Distance pathway (Adriansen et al. 2000).

This basic situation results in a cost-distance map, shown in Figure 3.

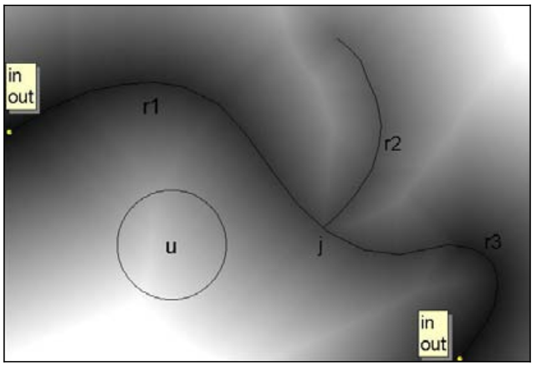

Figure 3a. Cost-Distance function applied on Figure 1, with two entrances used as sources.

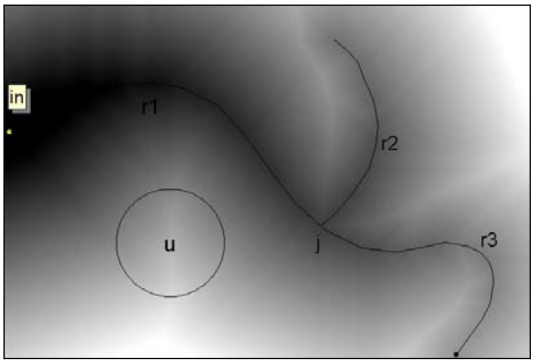

Figure 3b. Cost-Distance function with one entrance used as source.

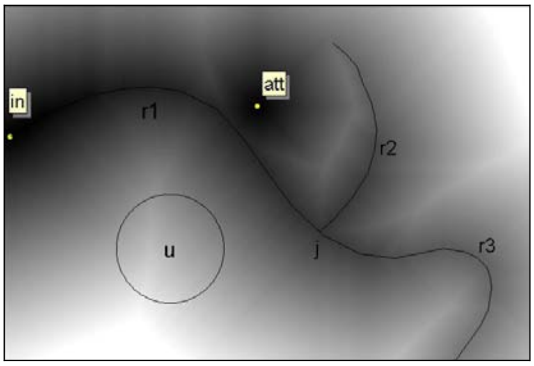

Figure 3c. Cost-Distance function with one entrance used as source and the effect of an attractor.

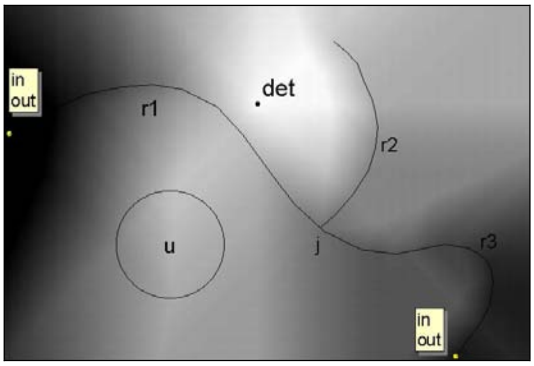

Figure 3d. Cost-Distance function with one entrance used as source and the effect of a detractor.

Legend: dark = easy accessible, high pull value
light = difficult accessible, high push value

In cost-distance maps (like Figure 3) the value of each pixel represents accessibility from one or more sources. Dark zones indicate easy accessible locations. In Figure 3a, both entrances are used as a source, while in Figure 3b only the left entrance is used as source. This is why the area around the right entrance in Figure 3a is more accessible than in Figure 3b.

This cost-model can be enriched with the **'principle of attraction'**: Agents can respond on eye-catchers (attractors or detractors) in a positive or negative way, which can influence their choices and preferences. Additional aspects of certain attractors are their energy loading capacity, like for example benches where an agent can reload its energy.

In Figure 3c, the effect of an attractor is incorporated in the cost-distance map, showing the area around the attractor easier to reach. In Figure 3d, the inverse effect of Figure 3c is incorporated (the effect of a detractor), showing a less accessible area around the detractor.

Finally, the previous concept can be integrated in a **'dynamic process'**. Influence of the terrain, visitors and seasonal and daily variation can be simulated. Agents entering the landscape via entrances (push effect), mostly already know which exit they will choose (a goal), which makes this exit (or entrance) an attractor (pull effect). When entering a certain area, an agent has a certain view, with or without an attractor. Possible present agents can, depending on the visitor act as an attractor or detractor. Further on his way, on a junction, an agent makes a choice, determined by physical resistance (vegetation type, height, barriers …) and psychological resistance (presence or absence of attractors, knowledge of the area …). Based on those choices he continues his road and finally leaves the area via an exit.

Additional to this sequence of complexity the double principle of a viewshed can be integrated. When an agent enters a landscape, he has a momentaneous visual reach at specific locations (viewshed of the agent) but, at the other site, specific landscape features (like attractors and detractors) also have their visibility area (viewshed of the object). Figure 3 can partly illustrate this idea: when an agent enters the landscape, he acts according Figure 3b (or Figure 3a, when he knows he is going to leave the landscape via the right cornered exit). From the moment he sees the attractor or detractor, Figure 3c (respectively Figure 3d) becomes the leading scenario.

Towards application in reality

To support the conversion towards a real-time application, nine data gathering tools are used: GPS surveys, interviews, camera observation, photographic monitoring of seasonal changes, photo comparisons, step-bridges, walking experiments, experiments about field unit division and landscape preference studies were executed.

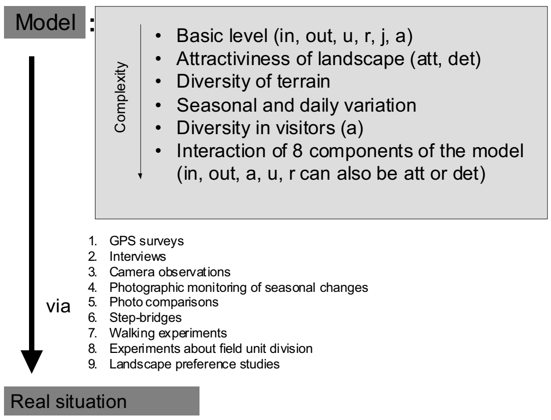

Figure 4. Summary of conversion from the model towards real-time situations.

Study areas

Two study areas were chosen, because of their appropriate characteristics: they are situated in strongly urbanised areas (Flanders) and management must increasingly take care of carrying capacity. All of the components of the models are explicitly present and clearly identifiable.

Demerbroeken

The nature reserve 'Demerbroeken' (marshes of the river Demer) is situated about 45 km east of Brussels and covers an area of 110 ha. It is a typical example of a semi-natural area surrounded by habitation, with high public accessibility. It retains a multifunctional character, since it is not only a nature reserve with fragile habitats and rare bird breeding sites, but the nature reserve is also a popular site for walking. Furthermore it is part of a floodplain, helping to reduce peak flows of the river Demer. The managers of the reserve are greatly concerned about the dilemma between opening up the site for the general public and the protection of fragile sites such as quaking fen (floating organic mats) and rare bird breeding sites.

Torfbroek

The nature reserve 'Torfbroek', 10 km north east of Brussels, covers an area of 31 ha. The specific conditions of this nature reserve originate from lime- and iron-rich seepage water. Those two substances have a positive influence on the value of this unique nature. Apart from flat and arid hayfields, there are spacious pools and ditches which are important for dragonflies and mainly swamp birds.

Nine data gathering tools and relevant results

1. GPS surveys

In Demerbroeken (2001) as well as in Torfbroek (2003) entrances (in), exits (out), at- (att) and detractors (det), road segments (r) and junctions (j) were localized and digitalized.

2. Interviews

Two kinds of interviews (only in 'Demerbroeken' were set up to describe the number of visitors, their trip origin, the length of their stay, the purpose of their visit and their entrance point. The interviews were based on accurate definitions of terms and short, clear, simple and neutral questions.

The first interview schedule was examined on three different days for a total of 98 daily visitors to the 'Demerbroeken'. The second interview was set up for the managers of the nature reserve, to obtain a more detailed picture of the visitor flows throughout the whole year. Also during 2003 forms were repeatedly filled in by terrain managers, on which information about other visitors was recorded. The interviews gather information about the agents (a) of the nature reserve.

The results of the interviews for the daily visitor of the 'Demerbroeken' indicated the walk-in intensity of the different entrances and exits (in, out) was depending on several factors, such as attractive infrastructure nearby (for example a bird observation post), the accessibility, walking tracks, closest entry etc. A one-hour visit was the most common (30%) in the 'Demerbroeken' (a two-hour visit for the managers) and the main activity during visits was walking (34%), twice as high as cycling, relaxing and bird observation (Figure 5). Diversity in visitors (a) can be deduced from those data. People were generally pleased with the accessibility of the terrain, but complained about muddy tracks and impenetrable trails. Some people (12%) pointed out that the amount of benches and parking places were insufficient.

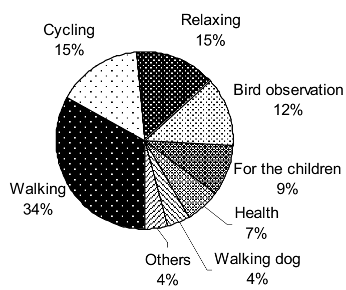

Figure 5. Reason of visit in 'Demerbroeken': information about visitor diversity.

3. Camera observation

On an important junction (j) in 'Torfbroek' a surveillance camera was installed, which registers each four seconds an image, saved at the hard disc of a PC. The camera observations gather information about the amount and walking direction of agents (a) and the percentage that does not follow the indicated trails. Also the variation of road segments (r), junctions (j) and vegetation units (u) can be followed. The observations started in August 2003 and are still running.

Four walking routes and four entrances (or exits) can be observed by the camera and the intensity of use of each route as well as percentage of use of each entrance and exit can be recorded. Results show that August is a much busier month than the following fall and winter months. One route segment is clearly used more than the other routes; however this is less clear in the following months.

The camera data also reveals information about distribution of visitors in time. Firstly, the day in the week which is the most crowded (Figure 6). Saturdays and Sundays are in general the most visited days, but also on Wednesday a lot of visitors came to 'Tofbroek'. This is probably because of the free Wednesday-afternoon at school.

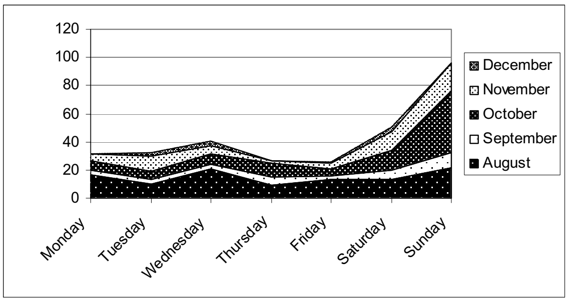

Figure 6. Cumulative visitor intensity of five months represented per day.

Secondly, the hour of the day can be represented per month (Figure 7). In general the afternoon (between 2pm and 4pm) was the busiest.

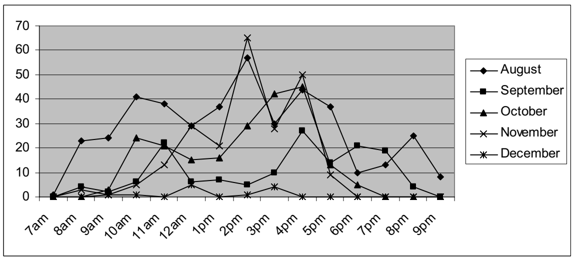

Figure 7. Monthly amount of visitor on each hour of the day.

4. Photographic monitoring of seasonal changes

In both nature reserves, a picture has been taken on previous determined locations, each season. Involved components are entrances (in), exits (out), units (u), road segments (r) and junctions (j), which each can vary in time and space. Also alterations in barriers can be notified.

5. Photo comparisons

Above-mentioned photographs were shown off-site to nine people. They had to organise the photographs in three different classes (less than average, average and more than average) once by aesthetic preference and once based on the clarity of the walking direction on the picture. At- (att) and detractors (det) are the main components involved.

When sorted, based on aesthetics, only 20 photographs were judged to be more beautiful than average. The most beautiful pictures were those of a tree lying in the water, in every season. This tree can be classified as an attractor. 56 % of the most beautiful pictures were taken in spring, which indicates that spring is a very attractive walking season. The less attractive pictures were mostly (61%) taken in fall, but on a rainy day.

Based on sense of direction, much more consistent data were gathered: 37% of the pictures were judged to be very clear about the indicated walking direction. Only 9% was not clear.

6. Step-bridges

A self developed counting system was installed at an important junction in Torfbroek. An electronic counting device registers a pulse each time a visitor (a) crosses the bridge. These data can be combined with the camera observations.

7. Walking experiments

In both nature reserves, two walking experiments were executed, where three kind of questions were asked: thirty people subsequently indicated firstly their preference judgment concerning preselected sites, their preference concerning moving in certain directions and finally their estimation on a continuous scale of the effort needed to move along certain directions throughout certain types of terrain

In 'Demerbroeken' and 'Torfbroek' a total of approximately 100 people were asked about their preferred walking direction. Generally, visitors prefer to follow the path they are walking on, except for two posts in 'Demerbroeken', where visitors wanted to follow an alternative small path or a small wooden bridge. There was no specific preference for any direction at some important junctions in 'Demerbroeken'. Also in 'Torfbroek' on an important junction no significant preferences were observed, which means that visitors are likely to take every road segment with equal frequency.

The quaking fen site (in 'Demerbroeken') is generally judged to be the most attractive site (a value of 89 on a scale from 0 = not attractive to 100 = most attractive) in the landscape, because of the rare phenomenon of floating organic mats and varying vegetation. The least attractive site (a value of 53) is where spruce-firs, nettles, rusty coloured brooks and iron fences disturb the character of the nature reserve.

In 'Torfbroek' the most beautiful site (a value of 83), is mainly because of the open character and the view on the lake. A location, in fact outside the reserve is judged to be the least attractive (value of 40), because the presence of a house and an asphalted road.

For all statistical analyses SPSS was used (SPSS. 10.0, 1999).

8. Experiments about field unit division and landscape preferences

The aim of this experiment is to divide the landscape in different units and to examine if this division is similar with the division of other people. On-site was asked to indicate polygons (spatial units (u)), lines (edges) and points (barriers, eye-catchers (att, det), junctions (j)).

Figure 8 shows how different persons split up the landscape in spatial units. Visually interpreted, most of the units are divided commonly (thick lines in Figure 8).Only a few units were divided intern.

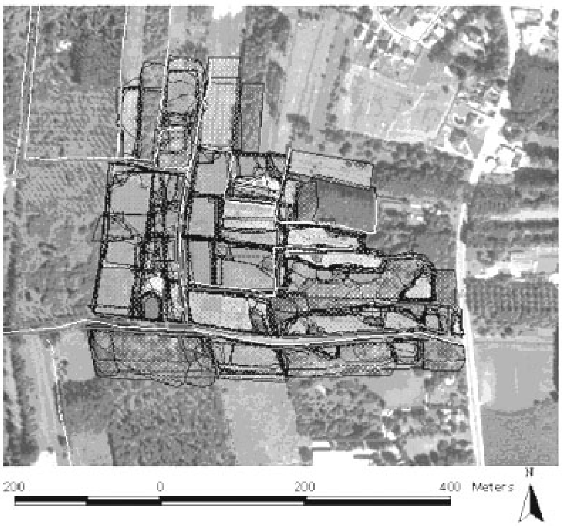

Figure 8. Division of a part of 'Demerbroeken' in spatial units.

Real-time situation in a part of 'Demerbroeken' and 'Torfbroek'

Based on the real situation (real vegetation type, road width and length, ditches, benches, fences, etc.) in 'Torfbroek' and 'Demerbroeken', Figure 9 was realised. One must be taken into account that those maps are not completely correct representations of the full complexity of the model. Variation in visitors and terrain for example are not yet incorporated. Therefore more data should be gathered during the following years, like more seasonal monitoring and interviews. Also the influence of attractors or detractors is not included, same as the interaction of the 8 components of the model. More experiments should be set up to investigate the preferences of visitors.

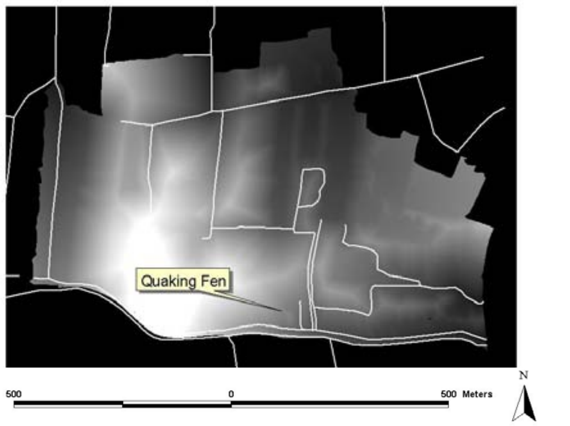

Figure 9a: Cost-Distance function of 'Demerbroeken'

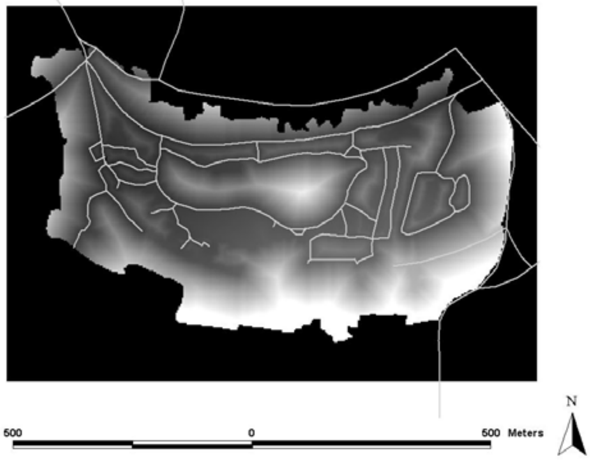

Figure 9b. Cost-Distance function on 'Torfbroek'.

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Environmental GIS in the management of visitor flows

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Abstract: Besides monitoring visitor numbers and activities, spatial data on borders, restrictions, and environmental and natural characteristics is needed to manage visitor flows in recreation and protected areas. The Finnish Environment Institute (SYKE) compiles and provides data on the state of the environment and environmental trends, and acts as a national environmental information center; collecting, formulating and disseminating data to various interest groups. This data, including GIS databases and registers, consists of natural environment data (monitoring, modeling and inventories etc.) and also land use and planning data. Wide variety of data can be used through GIS methods to reduce negative ecological impacts and conflicts between different user groups in recreation and protected areas. Our poster will present a cross-section of the characteristics of some of the most useful GIS data supporting management of visitor flows. Closer look will be given on the GIS databases on land and water traffic restrictions and the GIS database on outdoor recreation opportunities (VIRGIS).
Keywords: GIS, outdoor recreation, environmental data, land use.

Information systems of environmental administration

To manage visitor flows in recreation and protected areas data on visitors and their activities is essential. In addition to that, spatial data on location and qualities of areas is needed to constitute a realistic view of areas and to consider the best practices of management.

The Finnish Environment Institute (SYKE) serves as the national centre for environmental data in Finland. The information systems and data banks of Finland's national environmental administration include a wide range of environmental information covering the whole country. This data is widely used for environmental monitoring, modelling, forecasting, and impact analysis.

Regarding land use SYKE particularly monitors and examines the spatial structure of communities, the functionality of land use patterns, the quality of residential environments, planning issues, opportunities to use natural areas for recreational purposes, and land use along shores. Other important fields of research and development include green areas in towns and cities, and the interrelationship between the built environment and the natural environment and landscape. Data from national statistics, registration systems and geographical information systems (GIS) is used in the monitoring of land use and the built environment.

Possible uses of environmental GIS in the management of visitor flows

Several types of environmental data are useful in the management of visitor flows (Table 1). We have found at least three main forms of use:

1. Land use and outdoor recreation planning

Environmental GIS includes various types of spatial data that make basic information for land use planning regarding outdoor recreation and nature tourism. Firstly, it is important to know what makes environment attractive and suitable for different forms of recreation. Features of flora, fauna, geology (valuable cliff areas and other geological formations), landscape, and cultural heritage are the basis for recreational attractiveness of an area. Threatened species are especially interesting for nature-oriented recreationists but exact geographical data on them is restricted to official use. In planning, however, data on their location is important to avoid causing harm to sensitive habitats and species. Secondly, it is important to know where nature conservation areas, recreation areas, and land and water traffic restriction areas are situated and what instructions on land use are given in regional and local master plans. When all this information is combined with information on e.g. road network and the spatial structure of densely populated areas it makes an illustrative picture of the accessibility and attractiveness of areas and the presumable pressure on them. Analysing this data helps to consider the evenness of available recreational

Table 1. Some of the most useful national monitoring data and data systems of the Finnish environmental administration regarding management of visitor flows.

Information system	Unit of information	Data content
Nature conservation areas, conservation program areas and NATURA 2000 areas.	Single area	Nature conservation areas (Nature Conservation Act, the Act on the Protection of Wilderness Reserves, the Act on the Protection of Rapids). EU's Natura 2000 protection areas that are comprised of sites compliant with the EU Habitats Directive or Bird Directive. Nature conservation programme areas (national parks and strict nature reserves, mires, wetlands, eskers, herb-rich woodland, shores, and old-growth forests). Valuable landscapes and national landscapes, nationally important cultural historical environments, national urban parks, traditional rural biotopes, and protected areas established on private land.
Threatened species database (TAXON)	Single point	Nationwide and regionally threatened plant and animal species, species mentioned in EU Habitats and Bird Directives and other international conventions, and some other species monitored by Finnish environmental administration. (Observations and observation sites).
Land use database (SLICES)	10 m or 25 m pixel	Land use data on built land, agricultural land, forest land, and water areas. All have several classes with subclasses.
The nationwide regional plan geographical database (VASEPA)	Single plan	Combination of planning information from regional councils on regional plans.
Local master plan raster database	Single plan	Scanned master plans which were ratified according to the old Land Use Act.
The monitoring system for spatial structure of urban regions (YKR)	250 m x 250 m grid	Different functional divisions (e.g. densely populated areas), information on e.g. population, buildings and housing, labor force and working (incl. workplaces). Long time series (1980 – present day).
The information system for monitoring living environment) (ELYSE)	Municipality and the functional divisions within them	Quality of residential areas in densely populated areas. The indicators will cover the following themes: population, housing, buildings, services, traffic, land use and community structure, jobs, built cultural environment, natural environment and landscape, municipal infrastructure and energy, environmental hazards, and social environment.
Hydrological data systems	Single point, pixel	Hydrological information that contains up-to-date information on current or forecast water levels, snow cover, ice cover, water quality etc.
Algal blooms monitoring	Single point, pixel	Algal blooms in the Baltic Sea and Finland´s inland waters. (Remote sensing methods and observations.)
Land and water traffic restriction areas	Single decision area.	Water traffic speed limits, restrictions on water traffic (vessel type, anchoring, wave forming etc.), and restrictions on off-road vehicle use. Decisions are made by regional environmental centers and Finnish Maritime administration.
Outdoor recreation opportunities database (VIRGIS)	Single area, route or service.	Recreation areas (polygons), trails (linear data), and recreation services (point data).

opportunities and connections between recreation areas through green belts (Figure 1). Connections are important to enable movement of people (and animals) for longer distances and to improve the quality of living environment. Carefully planned connections make it also possible to steer visitor flows in a desired way.

Motorized outdoor recreation can be managed by restrictions. Purpose of these restrictions is to guarantee the safety of land and water traffic and to reduce negative impacts on nature. This is done by limiting speed of off-road motor vehicles and vessels, as well as by restrictions that prevent use of certain types of vessels or of any motor vehicle at all. Restriction areas are mainly located in densely populated areas but some are found in more remote locations where limitation of motor traffic is needed to protect natural values.

Hydrological data is useful both in planning and everyday management of recreational opportunities. Monitoring data on e.g. water quality (sight depth, concentration of harmful substances etc.) is important

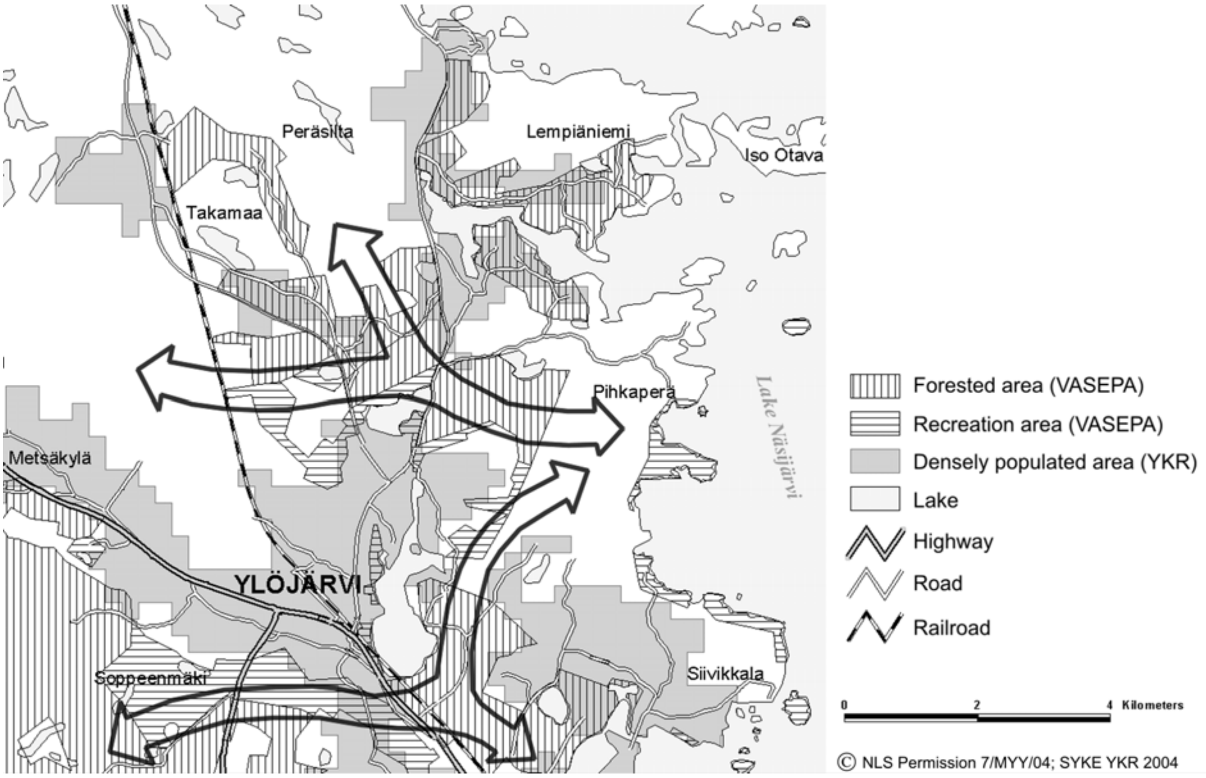

Figure 1. Regional plan data (VASEPA) on forested areas and recreation areas together with densely populated areas from the Monitoring system for spatial structure of urban regions (YKR) reveal important green belts connecting individual green areas (arrows). If not carefully monitored, these connections can become threatened by the sprawl of densely populated areas.

when planning for water based outdoor recreation opportunities.

A GIS data system focusing on outdoor recreation opportunities (VIRGIS) is under construction at SYKE. The basis for the database was made during the National outdoor recreation demand and supply assessment study in 1997–2000 (Kopperoinen & Shemeikka 2001a, 2001b). Collection of data has continued since then through the University of Jyväskylä. SYKE will work on this raw data to produce a nationwide GIS database of good quality on outdoor recreation opportunities. The database will be completed by 2006. VIRGIS is essential in land use, outdoor recreation and nature tourism planning. When comprehensive supply data is compared with demand for recreation opportunities it helps directing resources in right places and for right forms of recreation and thereby directing visitor flows.

Management of visitor flows in Finland is, however, more complicated than in many other countries. Tourism and outdoor recreational activities are greatly facilitated even in protected areas by everyman's right – the traditional and extensive right to roam in the countryside, no matter who owns the land. These rights come together with the responsibility not to disturb or harm natural surroundings or other people's property. These rights apply to foreigners as well as Finnish citizens.

2. Media

Each summer, SYKE issues regular bulletins about algal blooms in the Baltic Sea and Finlands inland waters, in co-operation with Finlands 13 regional environment centres and the Finnish Institute of Marine Research. This information redirects visitor flows to lakes and seaside as algal blooms diminish attractiveness of a body of water for water based recreation.

Regularly monitored data on snow and ice cover and ice thickness is valuable e.g. in directing users of skiing and snowmobiling trails or jiggers. Outdoor recreation on ice covered lakes, streams and sea is very popular in Finland. SYKE gives bulletins on ice thickness and warnings of fragile ice. This data is indispensable when safety of outdoor recreation is in question.

To manage visitor flows and activities of visitors data on land and water traffic restriction areas should be well-known among planners (Figure 2). It should also be shown in outdoor recreation maps, parking lots by recreation areas, and along the routes.

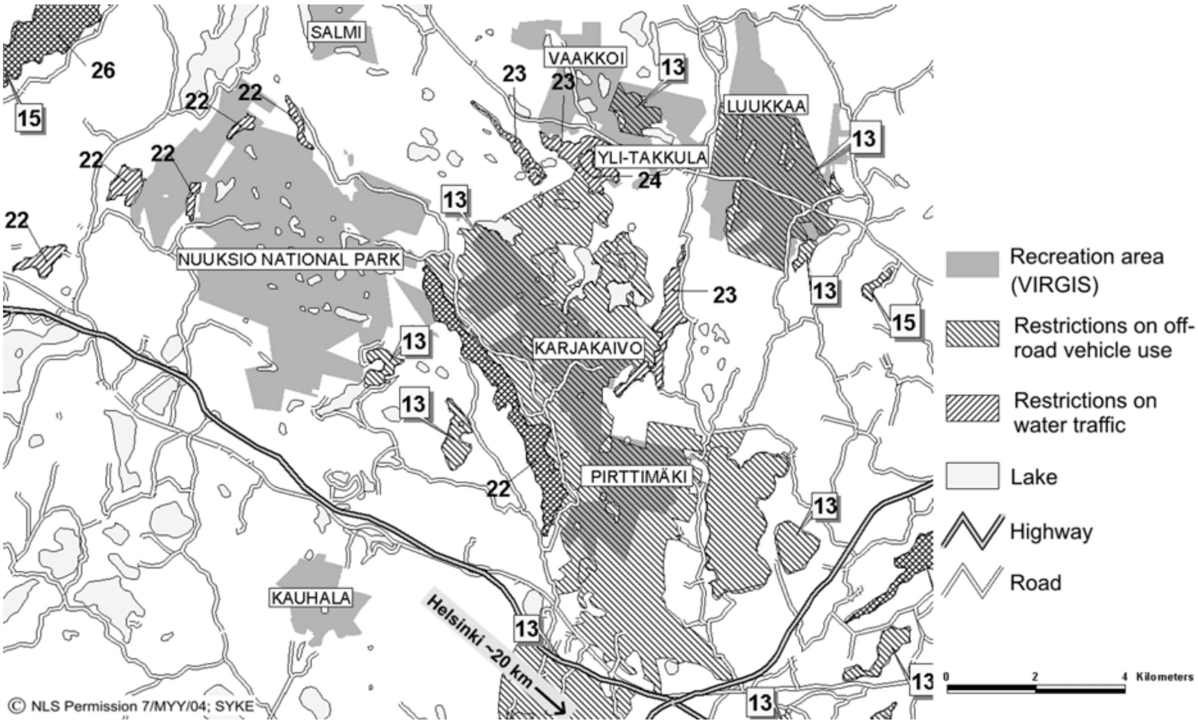

Figure 2. Areas close to major urban areas, such as Nuuksio lake plateau (situated only about 20 km from the centre of Helsinki), are subject to strong pressure and therefore need careful planning. Nuuksio area is widely covered with a net of recreation areas as well as restriction areas. This kind of information should be available not only for planners to use, but also for visitors, either on maps and/or on field. Place names on map refer to recreation areas (VIRGIS data, under construction), numbers refer to restriction types (framed numbers = restrictions on off-road vehicle use, plain numbers = restrictions on water traffic). [13 = "use of motorized vehicles on terrain and on ice-covered water-areas forbidden", 15 = "use of motorized vehicles on ice-covered water-areas forbidden ", 22 = "use of motor-boats forbidden", 23 = "use of motorized vessels forbidden", 24 = "use of motorized vessels forbidden (exceptions on vessels with electric motors)", 26 = "use of motorized vessels forbidden (restrictions on maximum engine power)"].

3. Environmental education

One of the greatest educational challenges of our age is to provide people with enough basic knowledge about nature, and especially to make it possible for them to build a personal relationship to nature and a genuine interest in it.

When an individual has a personal relationship to nature he or she respects nature and knows how to roam outdoors without disturbing sensitive habitats and species. GIS, together with the wide variety of environmental datasets makes it easier to meet this challenge of education.

Access to environmental GIS

Environmental GIS is used by environmental administration (The Ministry of Environment, SYKE, regional environment centres). In addition to that, other ministries, regional and local authorities, researchers, and even members of the public may use it.

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Visitor Surveys and Visitor Impact Monitoring in Recreational Areas in State Forests of Estonia

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Introduction

The State Forest Management Centre (SFMC) is the agency responsible for the management of about a half (1. 08 million hectares) of the total forested area in Estonia (2.2 million hectares). In addition to forest regeneration, silvicultural activities and timber production SFMC is also charged with the development, organization and provision of recreation opportunities in state forests. Since 1997 SFMC has been developing diverse opportunities for outdoor activities in 10 recreational areas.

In order to identify the development needs and provide tools for the optimum funding decisions SFMC has since 2002 conducted visitor surveys and monitored recreational areas.

In 2002 the visitor survey was carried out on all 10 recreational areas of SFMC to establish the motivation, preferences and needs of visitors in recreational areas and to determine whether the developed facilities meet the expectations of the users. The visitor survey was repeated in 2003 using the revised method.

Since 2002 SFMC has conducted itself and placed orders with other agencies for the ecological impact monitoring in recreational areas. The primary objective is to identify the carrying capacity of different landscapes and to develop easy-to-apply monitoring methodology.

Visitor surveys in recreational areas in state forests

In 2002 the first visitor survey on recreational areas was carried out in cooperation with Tallinn Pedagogical University. It was planned to conduct the survey during the period from May to September on all 10 recreational areas of SFMC during two days each month. Some survey dates were changed or cancelled due to the weather conditions. The respondents were not less than 15-year-old visitors, all persons visiting the recreational area alone or in couples were interviewed. One male and one female respondent were selected from minor groups (3–5 persons). The group leader and one member were selected from organized groups and 3 – 5 members from groups exceeding 10 persons. Self-administered questionnaires compiled in the Estonian and Russian languages were used. A member of the survey team translated and filled in the questionnaires for foreign visitors.

The total of 3,433 questionnaires were obtained during the period from May 22 to September 3. It proved impossible to ensure the random samples due to the weather conditions and various organizational issues. The structure of the questionnaire did not enable to identify the site preferences of the respondents.

In 2003 visitor survey the major group of respondents were not less than 15-year-old persons visiting 9 recreational areas of SFMC during the period from June to September. The sampling principles and the data collection plan were designed previously indicating the total number of questionnaires, the target group and the distribution of questionnaires between the survey locations. The schedule (weekday, part of day) for conducting the survey was predetermined by drawing lots after the survey locations were selected. Due to the unfavourable weather conditions some dates were replaced by reserve dates determined also by drawing lots.

The random sample method was used. One person with the birthday closest to the survey date was selected as respondent in groups of 2 – 4. 2 persons having birthdays closest to the survey date were interviewed from a group of 5 – 10. 4 persons – 2 female and 2 male with the birthdays closest to the survey date were selected from groups travelling by coach. One person per each tenth party using the camping sites or public picnic areas was selected as respondent. Self-administered questionnaires were compiled in the Estonian language, however each member of the survey team had at his disposal also the Russian translation of the questionnaire.

The total of 2,324 questionnaires were obtained during the period from June 15 to September 15, 2003. The survey period covers the peak of the recreational use season. The total number of survey dates was 614 and they were determined by drawing lots.

The survey of visitors in SFMC recreational areas conducted in 2002 indicated that most of the visitors stay in these areas for a short period. 40% of the visitors are residents of Tallinn and Tartu, two largest towns of Estonia. 80% of the respondents travel by car in the company of their family or friends. The findings indicate that the highest need was for fire areas and camping sites. The attitude of the majority of respondents concerning the arrangements and maintenance level of the recreation areas was positive.

However, the results of the visitor survey also indicated that the public is not aware of the opportunities offered for outdoor recreation in state forests and actually does not use the public information channels. The visitors also stressed the scarceness of on-site information – drawbacks in signage and maps of recreational areas. Upon carrying out the analysis of the shortcomings different measures were introduced to improve the provision of information and guidance to the public: information desks were established in recreational areas, the website was updated, leaflets and maps of the recreational areas were issued and events were organised to increase the awareness of the public of the present outdoor recreation opportunities. The development of the principles for the uniform guidance and signage system was undertaken.

The analysis of the visitor survey of 2003 has not yet been completed. The difference with the 2002 survey is that it is possible to identify the most often visited recreational sites. The aforementioned findings will be used to specify the locations for the installation of electronic counter units for visitor volume studies.

The results of the visitor survey of 2003 also indicate that the non-beach-holiday areas are not the primary destination of the visitors and the number of short-duration visits to these areas is higher. The optimisation of the territories of recreational areas and the linking of separate sites into the trail network was commenced in order to increase the attractiveness of the recreational areas of SFMC and to prolong the duration of the visits.

Monitoring of ecological impact of outdoor recreation

Outdoor recreation in forests is an inseparable part of the Estonian way of life. The most popular recreational activities include walking, hiking, cycling, swimming and sunbathing, picnicking in the summer season, cross-country skiing in winter and also wildlife viewing and photography.All people have in Estonia the “everyman´s right”, a legal right of access to state-owned and private forests, in case no limitations have been established.

The primary objective of the ecological impact monitoring was to determine the situation, direction and amount of changes in the ground vegetation, conditions of trees, natural regeneration and forest soils, which may vary in extent and causes, including different recreational uses of forests.

The recreational impacts are concentrated at and around recreational sites, usually developed for visitor use – visitor centers, trails, campsites, boat launching ramps, different picnic areas on the coastal strip of lakes and the Baltic Sea.

In 2002 Estonian Centre of Forest Protection and Silviculture, upon the request by the State Forest Management Centre, embarked on a case study in Kiidjärve-Taevaskoja recreational area and 3 different case studies were undertaken in 2003 on coastal areas of lake Peipsi and the Baltic Sea - Kabli-Ikla in the SW and Nõva-Peraküla in the NW of Estonia to measure and evaluate the ecological impact of outdoor recreation on the forest ground vegetation, trees, natural regeneration and forest soils.

Trails monitoring method

The situation and changes in trail conditions were monitored by field measurements in Kiidjärve-Taevaskoja recreational area in summer of 2002 and in some coastal areas adjacent to lake Peipsi in summer 2003. Measurements of the zones of the trails with different level of vegetation and soil damages, share of bare ground and vertical distance between the horizontal level and the ground surface of trails were conducted.

Recreational injuries and biotic damages to trees and natural regeneration of trees were also assessed.

Campsite monitoring method

The situation and changes in campsite conditions were monitored by field measurements on the coastal areas of lake Peipsi and the Baltic Sea - Kabli-Ikla in the SW and Nõva in the NW of Estonia in summer and autumn of 2003.

The network of permanent transects with the distance of 30 m between the transects was established in the typical areas.

The small sample plots with the area of 1 m^2 were established systematically on transect lines.

Share of bare ground and vegetation cover, plant species composition, distribution and abundance were estimated within the quadrate.

Recreational injuries and biotic damages to trees and regeneration were also assessed.

Trampling study to assess the vegetation response to disturbance

Small sample area to evaluate the forest vegetation cover, species composition and diversity response to trampling in pine stands of Vaccinium myrtillus site type was established.

The results from our trampling experiments indicate, that the forest ground vegetation shows significant increase of plant damages with 250 passes. The share of dead plants increased dramatically at the 350 pass level. Lower levels, up to 100 passes, had only little effect on ground flora.

Forest management and visitor management in recreational forests

The application of the results of the assessments can result in future in the development of better minimum-impact recommendations and land use planning in recreational areas.

Based on the ecological impact assessment of the recreational use of forest, measures for the further development of the monitoring program, training, education and guidance of visitors, better site planning, increase of the recreational carrying capacity of the site, maintenance and repairing are planned.

Considering the high level of recreational damages and needs for sustainable use of recreational areas, temporary measures to avoid traveling by cars and camping on Raadna recreational area on the coast of lake Peipsi are planned.

For effective visitor management also enforcement of new aspects of the environmental legislation is prepared.

Nationwide recreation surveys

In addition to the visitor surveys and ecological impact monitoring in recreational areas also surveys carried out to assess the attitudes of the local residents are significant. In 2003 SFMC requested two survey research agencies to conduct two omnibus surveys. The omnibus is a multi-customer survey conducted regularly (in accordance with a preset timetable) and whose overall sample is made up by the 17 to 74 year-old permanent residents of the Republic of Estonia, a total of 1 047 818 persons (Statistical Office of Estonia, January 1, 2003). The planned number of respondents is 1,000. The respondents are found from the proportional model of the overall sample by regions and types of settlement (urban/rural) and by multi-stage probability random choice. The socio-demographic structure of the sample is compared with the respective indicators of the total sample. A weighting is conducted, if necessary to increase the accuracy of the opinions.

The survey of the environmental awareness

The objective of the survey was to learn the opinion of the residents of Estonia of the state of the natural environment and to analyse the significance of forest to the public. The survey was conducted by TNS Emor in the spring of 2003. The sample is made up by 1,011 17 to 74 year-old permanent residents of Estonia. The survey indicated that about a half of the total population of Estonia visit forests at least once a month, about 2/3 are aware of or have heard of the everyman´s right and the most favoured outdoor activities include picking of forest products, spending of leisure time and various leisure sports activities. Forest is valued as an important element of the environment and in particular the younger urban people appreciate forest as an environment suitable for recreational activities.

Study of outdoor recreation

The primary objective of the study was to find out the level of awareness of the residents of Estonia concerning the opportunities developed by SFMC for the outdoor recreation activities and the level of the demand for and use of offered opportunities. The study conducted by the Survey Research Centre Faktum in the autumn of 2003 was structured as a face-to-face interview of 969 residents of Estonia aged from 15 to 74. The results of the interview indicate that 82% of the 17-74 year-old population of Estonia are aware of the opportunities for outdoor recreation developed by SFMC, 94% consider them essential and 55% use them.

Based on the results of previous research and recognising the need for cooperation in order to further develop opportunities for outdoor recreation, SFMC has organised events aimed at the provision of information to local authorities and planned the linking of locally developed recreation opportunities and the SFMC system.

The previous research forms an efficient basis for the further development of SFMC recreational areas, taking account of the user needs and serves as a tool for the supporting funding plans concurrently ensuring the preservation of the recreational values of landscapes. The cooperation between various interest groups in the development of opportunities for outdoor recreation is increasing in importance. The key words here include the clear distribution of roles, the specification of tasks and accomplishment of them. In addition to the constantly increasing ecological impact also social tolerance, support and interest by local residents and the ways to achieve it are increasing in significance.

Visual obstruction of herb vegetation, defining standards for natural barriers

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Abstract: As a result of increasing impact of recreation on natural resources and visitor experiences, wilderness managers often want to control recreational use. However, most of the attempts to alter wilderness recreational use patterns, suffer from a lack of knowledge of visitors' behaviour they seek to influence. This study concentrated on the effects of ground vegetation on perceived obstruction to recreationists. The aim was to define marginal values for the structure of natural barriers. Ratings by participants (n= 131) on a five-point scale, measured perceived obstruction. These ratings were linked to vertical cover of the vegetation. Analyses indicated a significant exponential relationship between vertical cover and perceived obstruction. A marginal vegetation height of about 54 cm could be identified as having obstructive features. Also the condition of the soil and the presence of irritating species seemed to influence visitors' judgement. It was concluded that a more intensive use of natural barriers to control recreational use, is a functional alternative with economical and aesthetical advantages.

Introduction

As a result of the impacts of visitor distribution on resources and visitor experiences, wilderness managers often want to adjust the location of recreational use (Lucas 1990). However, most of the attempts to alter wilderness recreational use patterns suffer from a lack of knowledge of visitors' behaviour which they seek to influence. In many cases the concern of managers towards resource protection does not match visitors' interests, whereas their respective priorities interact with differences in training, education and behavioural norms (Stankey & Lucas 1984). Also, visitors dislike to be constrained by rules and regulations, as they want to experience nature because of the specific lack of everyday constraints in life and freedom (Brown & Haas 1980).

In this study, we would like to focus on a specific aspect of visitor behaviour. The objective is to estimate marginal values concerning ground vegetation structure. Although earlier research indicated that structural barriers of natural materials like logs or brushwood seem to be less effective than artificial types like barbed wire, fences or notice boards (Bayfield & Bathe 1982), it is clear that general feelings as dislike and fear can motivate avoidance and therefore have an influence on visitor behaviour (Ulrich 1986). Research by Lehvävirta (1999) indicated that natural barriers out of living vegetation could be used to limit wear, even in intensively recreated urban woodlands. Moreover, they are cost-friendly and aesthetically less disturbing (Smith & Matthews 1972). It is preferred to create standards for an adapted management of trail edges, based on repellence of vegetation towards recreationists. In this way, visitor flow can be concentrated on the trail network, while sensitive locations stay protected without provoking visitors' dislike towards intensive regulations and human interference.

Methods

Questionnaire procedure

A group of 131 persons served as participants in a questionnaire that was executed on the field. All of these persons work as personnel for the Faculty of Agricultural and Applied Biological Sciences and have enjoyed diverse education (secretary, laboratory assistant, technician, student or scientist). Both sexes were equally represented and age ranged from 18 to 55 years.

Upon arrival, participants were handed over a questionnaire form and instructions were given to fill them in on the field. During two hours, participants followed a path through the nature reserve. On eight deliberately chosen locations, participants were asked to evaluate the effort needed to move through the terrain. The vegetation in question was marked with wooden piles. Visitors were asked to evaluate the vegetation from a distance of ten metres, where a second pile was placed next to the path. This way, an optimal control was achieved about which vegetation is considered. Participants rated possible obstruction of vegetation on a five-point scale. Answer possibilities to the question 'how difficult would you experience it to walk through the indicated vegetation?', reached from 'very easy' to 'very difficult' on the questionnaire form. Hereafter, means of scale values (MSV) were deducted from the obtained pseudoreplications (Hurlbert 1984). The selected vegetation types were grassland (three times), tall herb vegetation (two times) and woodland (three times). Since we wanted to exclude differences in the perception of canopy (Nelson et al. 2001), the woodlots were of similar age and dominant tree species (*Populus x canadensis*). Also tree density (Lehvävirta 1999) seems to have a significant effect on visitor behaviour. Therefore stands of moderate density (ca. 156 trees/ha) were chosen, which do not have an explicit attractive or repulsive effect (Kaplan & Kaplan 1989). In order to set a standard for the consecutive judgements, the first vegetation encountered by the respondents was a grassland of very low height (less than 10 cm), which would obviously be evaluated to walk through very easily.

In addition, respondents were asked whether they think they were influenced in their judgement either by the height of the vegetation, vegetation characteristics of the wider surroundings around the wooden pile, humidity of the soil and the presence of irritating species. The latter are typified by characteristics like spines, thorns and other structures or secretions which can cause physical nuisance to humans when contact is made.

Vegetation data collection

In order to evaluate the effect of structural features of the vegetation on penetration by recreationists, data collection was restricted to vertical vegetation cover. The vertical component of vegetation cover was estimated using a two meter high cover pole (diameter 2.5 cm), divided into 10 cm sections (Casaer 2003). Concealment of the cover pole was estimated from a distance of 10 meters for all species together. This method is commonly used for determination of hiding cover for wildlife (Guthery et al. 1981, Haukos et al. 1998), but it also gives a more general impression of visual obstruction. Measurements were executed September 2003 following the questionnaire.

Data analysis

Respondents' rating of visual obstruction was tested for differences between vegetation types. The data were tested for normal distribution with a Kolmogorov-Smirnov test. Normality assumptions were not met and therefore non-parametric statistics (Friedman test for related samples with pairwise comparisons) were applied (Siegel & Castellan 1988). To avoid the incorporation of pseudoreplicate rating values, mean of scale values (MSV) have been related to vertical cover of the vegetation types by using regression techniques. MSV met normality assumptions. Most significant relationships were maintained. Deduction of marginal values for physical variables on the base of the obtained regression curves was based on the rating value of 3.7, which is considered to reflect the limit for 'high' ratings (Kaplan & Kaplan 1989). The influence of irritating species' presence on rating values was tested using a Mann-Whitney test. All analyses were executed using SPSS 11.0 (SPSS 2001).

Results

Regression curve estimation revealed a significant exponential relationship between means of scale values (MSV) and vertical cover (Figure 1). The rating of obstruction is correlated positively with vertical cover (Spearman correlation coefficient = 0.89; p<0.01). As such, vertical cover is assumed to be relevant to the obstructive features of vegetation and marginal values for this variable can be deducted from the regression curve. On the five-point scale of ratings a mean of 3.7, which is considered to be the marginal value of what visitors experience as difficult to walk through (Kaplan & Kaplan 1989), leads to a vertical cover of 26.8%. In dense vegetation this would correspond to a marginal vegetation height of 53.6 cm.

Considering participants response to the factors influencing their rating, it is confirmed that height of the vegetation (92%) is assumed to be an important factor, as also the humidity of the soil surface (69%) and the presence of irritating species (79%) (Figure 2). Concerning the latter, it is remarkable that vegetation where irritating species are present, also has

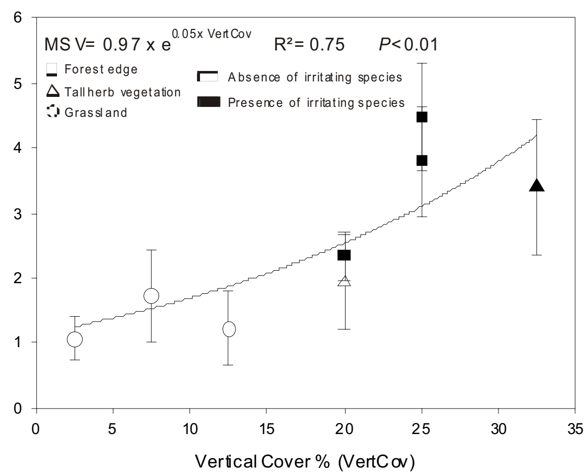

Figure 1. Scatterplot and regression between the means of scale values (MSV) for respondents' rating of obstruction and vertical cover measurements (VertCov) on nine locations of three vegetation types (forest edge, tall herb vegetation and grassland). Error bars indicate 95% confidence interval (n=131 for each MSV).

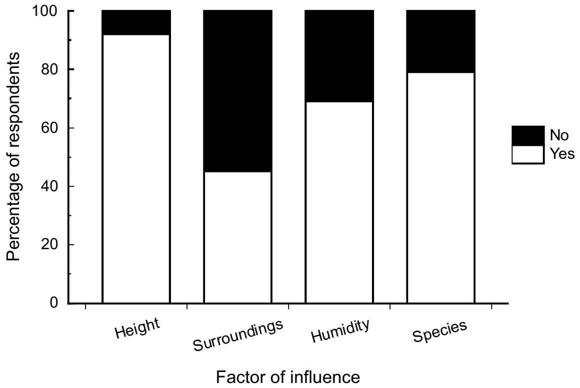

Figure 2. Percentages of respondents who assume that height of the vegetation (1), the wider surroundings of the wooden pile (2), humidity of the soil (3) and presence of irritating species (4) had an influence on their obstruction rating (*n*=131).

higher values for vertical cover (Figure 1), although no significant differences were observed. However, ratings significantly differed dependent on the presence of irritating species (Mann-Whitney test: Z= -2.21; $p<0.05$). Participants believe they were not influenced by the wider surroundings of the wooden pile when evaluating obstruction.

Discussion

This study concentrates on the perception of obstruction by vegetation. Vegetation structure has a direct influence on the physical environment, as open space has visually disappeared. Hence, spatial factors like openness are very characteristic for the psychological classification of environmental scenes (Tversky & Hemenway 1983). In contrast, the experience based information is exclusively provided by the observer and could classically involve fear factors (Kaplan & Talbot 1988). In this context, specific reasons to cause fear and avoidance could be the presence of vermin or irritating species. Another emotional reaction which is provoked by the environmental setting is the sense of mystery. However, this should be avoided where recreation is not preferred, as it forms an attraction to walk further towards more information (Kaplan & Kaplan 1989).

Our results verify that vertical cover is a significant factor in the perception of obstructive features of vegetation. An important remark in this matter is the implicit incorporation of some 3-dimensional vegetation characteristics in the variable of vertical cover, as perceived vertical cover is partially determined by the overlap of plants in front of the cover pole. From the observed exponential relationship between vertical cover and respondents' ratings, we deducted a critical height value of about 54 cm for vegetation to cause substantial perceived obstruction.

As mentioned, the physical appearance of a vegetation type is also influenced by management actions, like the mowing of grassland or thinning of forest stands. In this way, management might have an important influence on visitors' preference for a certain setting. Therefore, attention must also go to the way human influence is positioned in the context of the natural setting. Natural environments with human intrusions are less preferred than others (Kaplan & Kaplan 1989). Hancock (1973) experimentally removed vegetation on campsites, both ground cover and screening shrubs. In contrast to the verbal preferences of the visitors, use of the treated sites increased. This indicates that visitors sometimes react more instinctively than they would assume. Earlier research showed that mosses and grassy undergrowth is strongly preferred (Smith & Matthews 1972), whereas dense understorey and weed invasion is disliked (Lamb & Purcell 1990). An important factor in the perception by visitors is the presence of specific species. Ratings for vegetation with irritating species present are significantly higher as visitors indicated consciously. In our study, an important influence is assumed to follow from the presence of *Urtica dioica* L. and *Rubus fruticosus* coll. L., of which can be assumed that they have visual obstructive capabilities for recreationists because of their high status and defence mechanisms (respectively stinging hairs and spines). The correspondence between the presence of both species and high vertical cover, is probably due to their competitive strategy (Grime et al. 1988). Competitive species strongly invest in growth and therefore develop a large habitus. Respondents also seem to be influenced by soil conditions. As users seek to circumvent muddy areas, poorly drained soils significantly contribute to excessive trail widening and increased susceptibility to erosion (Leung & Marion 1996). In this way, management and visitors both benefit dry conditions.

The key to avoid problems with the spread of use is to make on-trail walking the easiest alternative for the visitor (Hammitt & Cole 1998). Our results indicate that there are possibilities to enhance the use of natural barriers. However, we must consider the fact that rather low recreational pressure might be an important precondition, as the effectiveness of barriers is most critical when high recreation activity occurs (Lehvävirta 1999).

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The Potentials for Developing Cross-border Tourism between Poland and Slovakia in the Tatra Mountains

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Abstract: This paper presents the potentials for developing cross-border tourism in the Tatra Mountains. The area is situated in Central Eastern Europe, on the border between Poland and Slovakia. The new political situation (EU enlargement in May 2004) encourages closer cooperation between neighbouring regions and offers promising perspectives for tourism development. The entire mountain range is protected by two national parks – the Tatra National Parks (TANAP in Slovakia and TPN in Poland). The differences in management politics as well as varying infrastructure and the intensity of use have been analysed in order to identify potentials of developing cross-border tourism within the protected area. Additionally, visitors' expectations and opinions of park managers have been considered. As a result, tourist border-crossings and transnational trails have been pointed. The paper discusses the perspectives of the concept implementation as well as its potential influence on visitor flows in the Tatra Mountains.

Introduction

Transboundary co-operation in the field of nature conservation and protected areas management has become an important issue nowadays. As the natural processes are not tailored to political borders, the collaboration between neighbouring regions is necessary to manage transfrontier ecosystems successfully.

Numerous cross-border initiatives have already been taken on all over the world: ranging from the large wildlife parks in Africa like the Great Limpopo Transfrontier Park of 35 000 km², through the Yellowstone to Yukon Conservation Initiative along the Rocky Mountains, Australian Alps national parks cooperative management, the Alpine Convention in Europe, to the co-operation of small neighbouring protected areas like the Thayatal National Park (Austria-Czech Republic) or the Pieniny National Park (Poland-Slovakia).

The transboundary efforts share similar problems. These often are:

– legal and governmental differences that complicate coordination and implementation;
– barriers to communication, movement and information;
– social and cultural differences including language differences that inhibit the development of trust and a commonsense of community;
– economic disparties that constrain certain stakeholders' willingness or ability to participate in the proccess (Harris et al. 2001).

On the one hand international borders may cause difficulties in applying homogenous management strategies, on the other one, they can function as tourist attractions (Timothy 1995).

Especially for transfrontier conservation areas, having already sufficiently developed infrastructure, cross-border tourism is an interesting alternative to enrich recreational offer, without disturbing nature (Taczanowska 2002).

The Tatra Mountains belong to relatively small transboundary areas in Europe. In spite of its biogeographical unity, the mountain range is managed by two national parks: the Polish and the Slovak one. Due to the outstanding beauty of nature and a good accessibility, the area attracts several million of visitors every year (Czochański 2000). The national parks' managements are facing the problem of introducing limitations for tourists in heavily used regions. Satisfying the needs of visitors becomes more and more difficult. The proposal of crossing the border in the Tatra Mountains and offering 'new' trails to the visitors would be an attractive solution from the recreational as well as from the nature conservation point of view.

Identifying potentials for developing cross-border tourism in the Tatra Mountains was the objective of the MSc research, carried out by the author in 2002 in the Division of Landscape Studies, University of Agricultural Sciences in Warsaw, Poland.

Study Area

General information

The Tatra Mountains are situated in Central Eastern Europe (see Figure 1). The total area of the mountain range comprises 750km^2, of which three quarters belong to Slovakia and one quarter to Poland (Mirek et al. 1997). A characteristic feature of the Tatras is the tremendous differentiation of nature, linked to a great diversity of geological structure and relief (Krzan et al. 1994). The elevation ranges from 900 to 2 655 m above sea level (Nyka 2000).

Almost the entire area lies within the borders of two national parks – the Tatra National Parks (Tatransko Narodny Park in Slovakia and Tatrzański Park Narodowy in Poland). Additionally, since November 1992 the whole mountain range has the status of the UNESCO-MaB Biosphere Reserve[1] with the common strategy of nature conservation for both national parks. Although the transfrontier cooperation concerning environmental issues is very successful, the compromise on cross-border tourism is difficult to achieve.

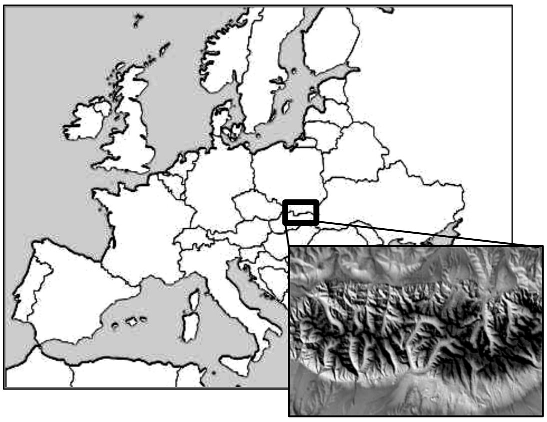

Figure 1. Study area – the Tatra Mountains.

Crossing the border

Crossing the Polish-Slovak border on tourist trails is regulated by the bilateral agreement between the governments of Poland and Slovakia signed in July 1999. So far only one tourist border-crossing has been opened in the Tatra Mountains. It is situated on the Rysy peak at the altitude of 2 500 m above see level. Apart from Poles and Slovakians, 33 other nations are allowed to cross the border there. A valid passport is required during transnational trips. Crossing the border is allowed exclusively for tourist purposes within specified seasons and hours: July-September, 7am–7pm (Euroregion Tatry 2004).

The new EU member states (including Poland and Slovakia) are not automatically joining the group of Schengen countries[2], therefore free movement across the international border is not possible at the moment.

Methods

In order to define similarities and differences in tourism management and recreational use between both national parks, comparative analysis of the Tatra National Parks have been made. Basing on present regulations and existing studies following objects were compared: tourism function placement in management strategies, zoning and infrastructure, legal and spatial conditions for different user groups, visitor load, risk management.

Additionally, in the summer season of 2002 a survey concerning visitors' needs and expectations has been conducted. Totally, 180 tourists have been interviewed in the border region of both national parks.

Next, the potential tourist border-crossings and transnational trails have been pointed. Following, strengths and weaknesses of those possibilities have been identified. In the end problem areas and critical management issues have been discussed.

Selected Results

Comparison of TPN & TANAP

Nature protection is the highest priority of the both Tatra National Parks. Tourism is an important, however not a leading function there and it is heavily constrained by nature conservation requirements.

Zoning and tourism infrastructure

Although the mountain massif is divided between two countries, the common, homogenous core zone, comprising the most valuable and least transformed areas has been established (Krzan et al. 1997).

Existing tourism infrastructure may be adopted for cross-border tourism purposes. There is a well developed marked trails network, with several 'meeting points' of the paths along the international border (Table 1). The mountain chalets and hotels offer approximately 1 200 beds, so that vast majority of visitors stay in the towns and villages situated at the foot of the mountain range. The park managements do not envisage further development of infrastructure.

Table 1. The Tatra National Parks in numbers TPN in Poland and TANAP in Slovakia (Sturcel 2001, Nyka 2000, Czochanski 2000).

	TPN	TANAP
Total area (ha)	21 164	75 405
Area of the mountains (ha)	17 500	61 000
Hiking trails (km)	273.7	577
Trails density (m/ha)	13	7,6
Chalets	8	14
Settlements	-	+
Total number of visitors (mln)	1.9	4
Visitors in the mountains (mln)	1.9	0.9

Regulations

The analysis of present legal and spatial possibilities of trails integration indicated that cross-border tourism can only apply to *hiking* in summer season (Jul–Oct) and *climbing* (no seasonal limits) (see Figure 2). According to the current regulations, in spite of adequate terrain conditions it is not possible to consider winter ski activities in terms of cross-border tourism. Due to the risk management and nature conservation reasons winter tours above the chalets in the Slovak Tatras are not allowed (Nyka 2000).

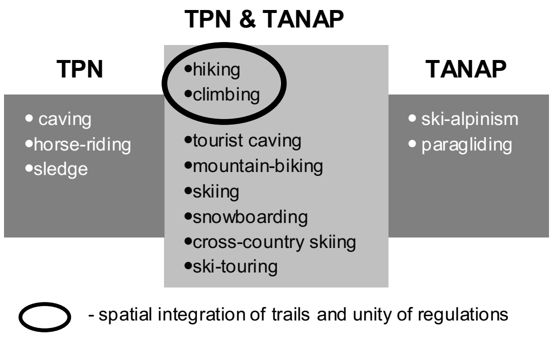

Figure 2. Activities allowed in the Tatra National Parks.

Visitor load

Significant sesonal and spatial differences in the recreational use are observed in the region. 65% of the total visitors load concentrates in the summer season (Czochański 2000). From the transnational tourism perspective, crucial are differences in visitors load between neighbouring regions. The biggest disproportion is observed in the Kasprowy Wierch massif, where from the Polish side approximately 2500 tourists per day are approaching the summit, while from the Ticha Valley (Slovakia) only four tourists per day were observed (field observations, Aug 2000).

Risk management

Regulations concerning mountain rescue and visitors safety allow for developing transnational trails, with the uniform risk management strategy.

Visitors' expectations

The results of the survey confirmed the importance of cross-border tourism issue in the Tatra Mountains.

Great majority of the interviewees visit the parks for hiking purposes (98%), one fifth of the visitors practice rock or ice climbing. Many visitors (82%) propose opening tourist border-crossings as a change in tourism organisation within the national parks. Tourists, asked about willingness to cross the international border there, are strongly interested in the idea (96%). Most of the visitors would prefer several-day trips, with overnight stops in the Polish as well as in the Slovak Tatras. Interviewees interested in other activities would be glad to do transnational mountain-bike or ski-touring trips, cross-border climbs and paragliding.

It was also found that seven hours distances are optimal for Tatra-hikers and the trips should not exceed 11 hours.

Although tourists demonstrate strong interest in the idea, just 13% of the interviewees have already crossed the border on the Rysy peak. The others consider doing a transnational trip in future.

Potential border-crossings

Basing on the analyses, potential border-crossings have been pointed along the ridge (see figure 3). Next, all trails, accommodation possibilities and accompanying attractions within the reach of the crossing have been identified. Following, distances along the cross-border trails have been checked.

These steps as well as findings of the analyses resulted in identifying problem areas (see Figure 3), where:

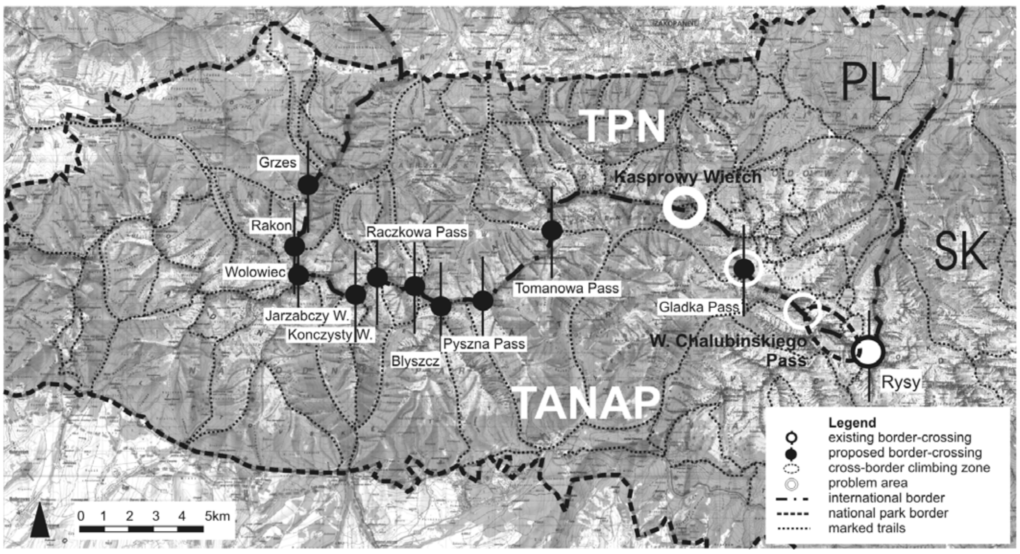

Figure 3. The potential tourist border-crossings in the Tatra National Parks.

– quality of natural resources may be endangered by radical changes in visitor flows;
– length of the cross-border trip exceeds desireable distance;
– existing infrastructure need to be extended.

Kasprowy Wierch massif belongs to the most problematic areas. As mentioned before, huge disproportion in visitor numbers between the Polish and the Slovak side may cause a danger to Ticha Valley, currently one of the wildest and less visited sites in the Western Tatras.

Conclusions and discussion

Visiting national parks is often constrained by numerous restrictions. In the Tatra Mountains there is an opportunity to open 'new' areas, basing on present infrastructure and keeping existing regulations.

The major problem that inhibits development of cross-border tourism there is significant difference in the visitor load between the Polish and the Slovak side. While the TPN management (Poland) is very interested to develop this kind of tourism, TANAP does not hide anxiety about the increase of visitor numbers in the Slovak Tatras (Graniczne… 2004).

This study showed however, that a widely believed opinion, concerning decreasing the volume of visitor load in the Polish Tatras due to the opening new tourist border-crossings, is not well founded. Long distances of the proposed routes as well as domination of an one-day 'loop' trip model, allow to assume that number of transnational tourists would not significantly change the current pattern of visitor distribution in the Tatra Mountains. Considered changes in tourism organisation would have qualitative, rather than quantitative meaning.

As the *changes of visitor flows* are the major discussion point while considering cross-border tourism development in the Tatra Mountains, it seems emerging to carry out additional studies concerning distribution of visitors in both national parks. Applying simulation tools for examining potential cross-border trails' functioning would be highly desirable, in order to estimate consequences of possible decisions more effectively and to encourage further discussion between park managers and stakeholders in both countries.

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[1] UNESCO-MaB Biosphere Reserves – are areas of terrestrial and coastal ecosystems promoting solutions to reconcile the conservation of biodiversity with its sustainable use. They are internationally recognized, nominated by national governments and remain under sovereign jurisdiction of the states where they are located. Each biosphere reserve is intended to fulfil three basic functions, which are complementary and mutually reinforcing: a conservation, development and logistic one (http://www.unesco.org/mab/).

[2] Schengen countries – The name "Schengen" originates from a small town in Luxembourg. In June 1985, seven European Union countries signed a treaty to end internal border checkpoints and controls. At present, there are 15 Schengen countries: Austria, Belgium, Denmark, Finland, France, Germany, Iceland, Italy, Greece, Luxembourg, Netherlands, Norway, Portugal, Spain and Sweden (http://www.eurovisa.info/SchengenCountries.htm).

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