

# Visitors' Experience and Lack of Knowledge of Minimum Impact Techniques in the Highlands of Brazil's Itatiaia National Park

Maria Isabel Amando de Barros  
Teresa Cristina Magro

**Abstract**—This work focuses on the issue of public use management in protected natural areas, based on shared responsibility between management and visitors and the potential for development of environmental ethics to inspire respect for those areas, help protect them, and reduce the need for restrictive control interventions. Based on the premise that responsible, well-informed visitors will act to minimize impacts, allowing regulations in protected areas to be less restrictive, we worked with the following hypotheses: (1) visitors have no knowledge of appropriate minimum impact techniques to be used in natural areas; (2) the greater the experience level in visiting natural areas, the greater the knowledge of appropriate minimum impact techniques, and (3) there are impacts to campsites and trails which can be traced back to visitor behavior and may be minimized through minimum impact practices and techniques.

Generally, results show that previous experience, referred to as “number of trips,” does not reflect an increase in the knowledge of appropriate minimum impact techniques. Furthermore, frequent visits do not add to visitors' learning, due to the fact that the highlands of Itatiaia National Park are not prepared to receive them, as there are no visitor education programs underway. Thus, those people who visit the park several times during a year or many times through several years exhibit unchanged knowledge of visitor impacts and techniques to minimize them.

## Introduction

### Visitor Education

Many natural area administrators and researchers consider environmental education a fundamental component for the long-term survival of natural areas. It can educate people on the benefits of natural areas and increase their awareness of nature's cultural, environmental and experiential values. In addition, it can help in the construction of human behavior toward the natural environment (Gunderson and others 2000).

Visitor education has been regarded as the most appropriate approach to public use management in natural areas,

both in Brazil and abroad (Indrusiak 2000; Lucas and others 1985). According to Gunderson and others (2000), administrators of protected natural areas in the United States tend to prefer educational programs that influence visitor behavior over other management techniques as education preserves personal freedom and the opportunity of choice that other alternatives do not provide. Sixty percent of protected natural area administrators in the United States have indicated that they use educational strategies to cope with several problems associated with management (Washburne and Cole 1983).

The educational approach presents several advantages, including relieving the administrator and staff of the role of “police,” which can develop in an approach that places regulations first. Taking into account the high educational level verified among most Brazilian visitors (Kinker 1999; Takahashi 1998), the educational approach is more prone to success because visitors can use the information, handle concepts and their interrelations and understand the reasons behind a specific management strategy.

In a study carried out at Eagle Cap Wilderness Area (Watson and others 1996) in which visitor attitudes and codes of behavior in the same area in 1965 and in 1995 were compared, visitors were seen to demonstrate greater support for preserving the area's natural character and were also more restrictive as to what they considered appropriate behavior in 1995. Researchers concluded that both the educational programs used by the area's management and some general changes in society's values contributed to those attitudinal changes. According to Cole and others (1997), often much more impact is caused in natural areas due to inappropriate behavior than to too many visitors.

The main premises that support an educational strategy to achieve management objectives are: (1) many impacts and problems are caused by careless and ill-advised behavior; (2) visitors, once educated, are commonly willing to adopt appropriate behavior; (3) through the education of visitors about which behaviors are adequate, many problems are minimized, thus eliminating the need for other more expensive or regulating strategies (Hammit and Cole 1998).

Visitor education is an important tool among the management alternatives available when one faces certain types of problems. Further study is necessary to identify what type of information is essential and is to be given to visitors, the best way to compile and make that information available, how to determine whether education is reaching the expected goals of behavior and, finally, how to assess the performance of the different educational strategies combined with the other management strategies.

Maria Isabel Amando de Barros, Forestry Engineer and Project Manager, Instituto Ekos, Brazil.

Teresa Cristina Magro, Professor, University of São Paulo, ESALQ, Forestry Department, Brazil.

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## Education for the Practice of Minimum Impact Techniques

According to Cole (1989), programs aimed at educating visitors must seek beyond merely teaching what visitors should do. Programs must aim at changing the way people think and evaluate their behavior. Simply changing what visitors do would be effective if there was such a thing as a definite set of practices and techniques appropriate to all situations. Unfortunately, there is not. The best practice for a certain situation could very well be the worst for another circumstance. For instance, when a group is on a trail, hiking single file is the best recommendation whereas spreading out is the best practice when hiking off trail, to avoid creating a new trail. The author points out that visitors should be taught and motivated to evaluate and judge a series of factors so as to choose the action(s) which will cause the smallest impact. They must therefore use their judgment along with knowledge about appropriate techniques to minimize impacts.

Teaching the visitor to assess different situations also generates additional benefits such as helping the visitor develop a favorable structure to which new knowledge and experiences can be attached. Commitment to minimum impact practices should also be greater once the visitors have a structure to evaluate their own behavior. And the feeling of satisfaction is greater when visitors decide what is the most appropriate behavior/practice in lieu of simply following the rules. The reasons to act one way or another and the importance of the chosen behavior also should be more evident (Cole 1989). According to that same author, visitor education programs tend to supply few justifications for their recommendations. For example, visitors are usually forbidden to camp near rivers, but the reasons for that restriction are not usually made explicitly clear. When visitors do not understand why a certain action is important, they often conclude it is not relevant.

Educating the visitor on minimum impact practices should lead to the development of an environmental ethic if it is to reach its full potential. More than a set of rules and regulations, it is a matter of attitude and conscience. Visitors need to know about management's major problems and challenges and what they can do to minimize those problems. They need to learn and evaluate a variety of factors, such as soil, vegetation, wildlife, climate, type and intensity of use of an area, and then combine that analysis with their previous experience to select practices which are most adequate. This requires respect for and trust in the visitors, who will not be seen as potential troublemakers, but as capable and responsible for their own choices and actions. Moving in that direction will make it possible to count on the visitor as an ally in managing the area. In contrast, if the visitor is uncooperative, few choices are left which are not based on regulations and enforcement. However, according to Cole (1989), setting up a visitor education program with those characteristics is a difficult task that calls for a significant amount of time and effort and is a long-term objective.

It is also very important to study the factors related to non-adoption of recommended minimum impact practices. What leads the visitor to not act accordingly when knowledge of minimum impact practices is not a limiting factor? According to Harding and others (2000), several factors

may play a role in preventing the use of minimum impact practices, among them, the interpretation of the situation, the storage of information and lack of judgment. A clearer understanding of those limiting factors should lead to more effective strategies to accomplish behavioral change.

In Brazil, although environmental education is a well-developed field of study and practice, as described by Sorrentino (1997), visitor education in protected areas involves mostly activities of interpretation of nature through which the visitor is encouraged to develop appreciation for and expand knowledge about the natural environment.

As for visitor education on minimum impact practices in natural areas, there have been some initiatives since the 1990s, through which information on the topic has been compiled and disseminated. Nevertheless, there is no scientific research to date aimed at generating data and information on more adequate techniques for the Brazilian context and ecosystems. Practices and techniques diffused in Brazil are basically those thought up in other countries such as the United States, Australia and New Zealand.

## Methods

This study was carried out in the highlands of Itatiaia National Park (PNI), Brazil. Data on visitor and visit profiles were obtained by means of interviews of visitors to the park's upper lands. Historical data on public use management for the area were obtained from the park's administration, through interviews with employees and by perusal of available documents.

## Visit and Visitor Characteristics

The data on visit and visitor profiles were gathered by means of a questionnaire comprising close-ended questions, developed after studies carried out by Cole and others (1997), Kinker (1999), and Takahashi (1998). The questionnaire sought to obtain information on (1) characteristics of the visit: attributes such as group size, activities developed by the visitors, duration of visit; and (2) characteristics of the visitor: attributes such as visitor experience, preferences and demographic data. A visitor's behavior in a natural area is influenced by the type of activities undertaken as well as his/her origin, background and perceptions of the area and of its management. The attributes of a particular target public will determine certain management priorities, methods to communicate information on management and relative effectiveness of educational programs. The specific visitor attributes gathered in this study include socio-demographic characteristics—educational level, previous experience in that particular area, in natural areas in general and in camping.

## Knowledge of Minimum Impact Techniques

Data on knowledge of minimum impact techniques were obtained through a series of tests developed after studies by Confer and others (2000) and Ramthun and others (2000). Visitor behavior is partially influenced by his/her knowledge

of appropriate minimum impact practices, of an area's regulations and of the reasons for management decisions which eventually restrict public use.

Considering the information collected from PNI's administration, that is, that peak visitation occurs on holidays starting at Carnival and on dry-season weekends (usually between May and September), it was established that data collection on visit and visitor characteristics would start at Carnival and end by August, 2002.

During that period, data were collected on all long holiday weekends as well as during six regular weekends between February and August. Questionnaires were applied from midday to 6 p.m.

During the study period (February to August, 2002) the park's administration registered 6,700 visitors. The questionnaire was answered by 605 people throughout ten interview sessions on holidays and weekends.

## Findings

### Characteristics of the Visit

Group visits predominate among users in the park's plateau, probably due to the area's difficult access and the wild environment. Only 2 percent of all interviewees declared being alone, 53 percent said they were part of a group of two to four people, 29 percent were in a group of five to ten people and 16 percent were part of a group of more than ten. One of the main recommendations in minimum impact programs is to travel in small groups; although large groups are a small percentage of the total number of visitors, they may cause significant impacts on the quality of the experience of other people they run into in the park and may also add to some ecological impacts such as trampling of sensitive areas.

But what is a small group? According to Hampton and Cole (1995), any "optimum" number is arbitrary, though most visitors consider groups of more than 10 or 12 as large groups. Thus, 84 percent of interviewees visited the park in small groups of no more than ten people, although the plateau eventually receives groups of up to 100 people. This is probably due to the fact that it is easier to find accommodation for small groups in the park's highlands and visiting that area's attractions is more agile and safer if done in a small group. In addition, group sizes encountered were possibly related to the fact that at the time the study was carried out, the park required an accompanying guide for all groups unfamiliar with the area at a ratio of one guide for every 12 to 20 visitors.

### Visitor Characteristics

One relevant characteristic of visitors interviewed in the study is their high educational level. Those with a post-graduate degree represented 20 percent of the total and another 19 percent had completed basic college. Undergraduate students represented 33 percent while 16 percent either were attending or had completed secondary school; 11 percent were either attending or had completed elementary school. This distribution was much above that of either the national average or for the states neighboring the park. Such high level of education could greatly contribute

to the public's acceptance of a visitor education program as a better-educated visitor is more likely to understand the importance of appropriate actions in natural areas. Roggenbuck and Lucas (1987) found that trust in the success of a visitor education program largely derived from the visitors' high level of education.

### Previous Experience

While 51 percent of the people said they were visiting the park's highlands for the first time, 40 percent mentioned they visited the area up to three times a year and 72 percent stated they usually visit other natural areas. The latter was considered a high level of previous experience by Roggenbuck and Lucas (1987). Meanwhile, 9 percent of users said they had been visiting the area for two years, 10 percent for the past two to four years, 12 percent for the past four to ten years and 18 percent for more than ten years.

As to previous camping experience, 41 percent of interviewees said that when they visit other natural areas they sometimes camp, 29 percent said they always camp, 23 percent said they never camp and 7 percent did not answer. However, when one considers that 70 percent of visitors have some previous camping experience though there are extensive impacts found in a detailed survey of the highland's campgrounds, it is clear there is a need for a visitor education program which would include appropriate minimum impact techniques, particularly those related to fires, social trails, damage to trees and bushes and disposal of human waste.

### Knowledge of Minimum Impact Techniques

The questionnaire included a series of tests on minimum impact techniques that were most appropriate for situations frequently found in the highlands of Itatiaia National Park.

The appropriate distance of at least 60 m (200 ft) between a campsite and water or trails was correctly mentioned by only 21 percent of visitors. For 13 percent of interviewees, there were no techniques known for choosing a campsite. The remaining visitors chose distances smaller than 60 m or did not answer the question. This is a very important result because it demonstrates the relevance of a visitor education program on minimum impact techniques in case wild camping in non-designated areas is eventually authorized in the Park. It is clear that visitors do not know the appropriate techniques for this particular situation and would not know how to act accordingly in choosing a campsite that would minimize impacts to water sources, to the fauna and to other visitors.

Appropriate disposal of trash, taking it back home in plastic bags, was the option selected by 92 percent of interviewees. Only 2 percent of people answered that trash must be buried in a hole and 6 percent did not answer the question. This result confirms what was observed in the survey of impacts to trails and campsites, where little trash was found.

Although building fires is currently forbidden in PNI, one of the questions dealt with the issue, since numerous remnants of campfires were found in old campsites. For 77 percent of visitors, a campfire should be built on the remnants of a

previous fire, while 5 percent replied that it should be built with large branches cut from nearby vegetation. Eighteen percent did not answer, in many instances because they did not support building fires. This result was not in accordance with the survey of impacts to campsites, which pointed to two old fires for each glade or clearing inspected.

Although users of natural areas have a certain fascination for fires in campsites and therefore offer great resistance to its prohibition, there are management strategies that can be used in this case. One of them is for the park to assume its position of banning fires and invest in a well-conceived visitor education program focusing on the issue. It would explain to the visitor the reasons for the ban, therefore improving on the current strategy through which a pamphlet is handed out along with a plastic bag upon the visitor's admission into the park. Results have not been satisfactory and call for more active surveillance to enforce the ban.

A second strategy would be to allow fires in designated areas specially built in established campsites. In this case, visitors would have to bring their own firewood, thus avoiding the use of local vegetation. Education and surveillance would also play an important role in this strategy.

Eight affirmative statements were presented on basic knowledge of the principles and techniques of minimum impact. Results are shown in table 1.

According to Hampton and Cole (1998), most damages to vegetation in a wilderness campsite occur on the first days of use, though there is a popular tendency to believe that permanence in a certain area is proportional to the impacts caused to vegetation (66 percent of respondents agreed that remaining in one spot for more than four days may harm vegetation.) For 20 percent of interviewees, the construction of benches and temporary structures in a campsite utilizing rocks and logs is an acceptable practice. This demonstrates the need for educating visitors that a good campsite is found as such, not built into one.

Finally, 17 percent of users responded that when camping in an impacted area, one should scatter the activities onto places that have not yet been damaged. These visitors

were unaware of the recommendation that one should concentrate the impact when using heavily impacted areas to avoid expanding the damages, whereas in remote, seldom used areas, use should be dispersed to avoid new impacts such as new trails and campsites.

In spite of the relatively easy questions, only 36 percent of respondents answered all true/false questions correctly and 7 percent had the correct answers for all the questions related to minimum impact techniques in natural areas. This result is much lower than those found in two surveys carried out in the United States, which utilized similar tests; for one, 48 percent of respondents had all the correct answers (Confer and others 2000) and an average of 5.79 correct answers out of nine questions in the survey by Ramthun and others (2000). In order to test the validity of the hypothesis that more frequent visitors to natural areas would have more knowledge of minimum impact techniques, analysis of the correlation between frequency of correct answers and visitors' previous experience was carried out by means of the chi-square ( $\chi^2$ ) test. Results are shown in tables 2 and 3.

The categories of previous experience in the analysis are associated with the frequency of correct answers to the questions on minimum impact to the level of 5 percent of significance. Fisher's test was applied to identify which categories of previous experience presented significant differences in relation to the other categories (table 4). Frequencies of correct answers observed in table 4 are not associated with previous experience.

The category of interviewees who have visited the park's plateau for more than ten years (11Y) presented a significant difference in relation to categories "first time," "for 2 years" and "for 4 to 10 years" and the highest percentage of right answers as compared with the other categories of previous experience. That possibly reflects visitors' age-related maturity and their awareness of the importance of their responsibility for the quality of the environment during their visit. The remaining categories did not show a significant difference among frequencies of correct answers.

**Table 1**—Results for knowledge of minimum impact techniques in natural areas.

True or False	T <sup>a</sup>	F <sup>a</sup>	NR <sup>a</sup>
	.....percent.....		
1. Where there are no restrooms, feces should be buried or a latrine should be built at least 60 meters from trails, water sources and campsites.	82	9	9
2. To cook in natural areas, it is better to build fires than to carry a small stove.	3	88	9
3. Remaining in the same area for more than four days may cause damage to local vegetation.	66	24	10
4. When hiking on an established, well-trodden trail it is better to walk in a single file and stay within the main path to minimize impacts.	88	2	10
5. When camping in an impacted area you should scatter your activities to places not yet damaged.	17	73	10
6. Before visiting a park or natural area you should obtain information on weather, periods of intense visitation, possible risks to your safety and activities permitted in the area (such as hiking and camping).	90	1	9
7. Building benches and temporary structures in your campsite, moving logs and rocks, is an acceptable minimum-impact practice.	20	71	9
8. Collecting and carrying plants, rocks and other natural objects does not cause impacts because there are large quantities of those materials in nature.	2	88	10

<sup>a</sup> T = true; F = false; NR = did not respond.

**Table 2**—Frequency of correct answers to questions on minimum-impact techniques, according with the level of previous experience and result of the chi-square test.

Visitor's previous experience	No. of right answers	Wrong answers	Right answers	X <sup>2</sup> observed	p-value <sup>a</sup>
<i>percent</i>					
How long have you visited PNI's plateau?					
First visit	21	287	6.8		
For 2 years	1	55	1.8		
For 2-4 years	5	54	8.5		
For 4-10 years	3	68	4.2		
For more than 10 years	15	94	13.8	10.2259	.0368 <sup>a</sup>

<sup>a</sup> Significant to the level of probability of 5%, p-value between 0.01 and 0.05.

**Table 3**—Frequency of correct answers to questions on minimum-impact techniques, according with level of previous experience (number visits/year) and result of chi-square test.

Visitor's previous experience	No. of right answers	Wrong answers	Right answers	X <sup>2</sup> observed	p-value <sup>a</sup>
<i>percent</i>					
How often do you visit the park?					
First time	21	280	7.0		
Up to 3 times/year	21	224	8.6		
4 to 10 times/year	2	29	6.5		
More than 10 times/year	1	16	5.9	.6267	.8903 <sup>a</sup>

<sup>a</sup> Non-significant

**Table 4**—P-value and significance level in comparison of categories of previous experience (Fisher's Exact Test).

How long have you visited PNI's plateau?	FT	2Y	4Y	10Y	11Y
First time (FT)	-	-	-	-	-
For 2 years (2Y)	.2221	-	-	-	-
2 to 4 years (4Y)	.5869	.2068	-	-	-
4 to 10 years (10Y)	.5908	.6282	.4671	-	-
More than 10 years (11Y)	.0450*	.0119 <sup>a</sup>	.4547	.0430 <sup>a</sup>	-

<sup>a</sup> Significant to probability level of 5%, p-value between 0.01 and 0.05. Value highlighted in bold type in the table.

As a whole, the results demonstrate that previous experience refers to the number of trips and does not reflect the increase in the knowledge of appropriate minimum impact techniques. In addition, it is possible to observe that the fact that a user visits the park's plateau does not contribute to his/her learning. This stems from the fact that the plateau is not prepared to receive visitors as it does not offer interpretative trails, a visitor center, information panels and signs, trained personnel or an ongoing visitor education program. Therefore, people visit the park several times during the year or many times during several years, but their knowledge of the impacts of visitation and existing techniques to minimize them remains unchanged.

## Conclusions

The data obtained in this study represent one more step towards understanding use-impact relations as well as the aspects of management related to educating the visitor. If the management actions put to use from now on result in

changes in use level, spatial distribution or type of activities performed by the users, the analysis contained in this study will be of significant help in determining the changes in resources and in visitors' perceptions. The potential of the park's highlands to offer several options of outdoor recreation is not being fully harnessed. People limit their visit to hiking to the two most famous peaks and fail to know other attractions such as Aiuruoca Falls, Mt. Altar and Couto Peak. One of the reasons for this is the lack of information available at the plateau: no visitor center, no trained employees, no interpretative trails, no information panels and signs. Other activities such as rock climbing and camping are not being practiced by visitors as the park's public use management does not view them as priorities. As a consequence, there are no studies of feasibility, planning, implementation, publicity or access.

The educational level of the visitors to the park's highlands is high, with 72 percent of people either attending or having finished college, an important factor towards acceptance and success of a visitor education program. The fact that 90 percent of visitors mentioned that the public use management

actions currently underway in the highlands did not affect or improve the quality of their visit is also an indication that visitors are receptive to a larger presence of management actions.

Only 7 percent of the total of visitors surveyed gave a correct answer to all of the questions on appropriate minimum impact practices. This result demonstrates the need for a visitor education program that focuses on minimum impact techniques because, although many ecological and recreational impacts result from inadequate management, there are impacts that can be minimized through visitors' behavior.

The hypothesis that visitors with more experience in natural areas would show better knowledge of appropriate minimum impact techniques was not confirmed. Although 40 percent of visitors had visited the park for more than two years and 48 percent more than once a year, their knowledge level of minimum impact techniques had not changed, which demonstrates that visitors do not learn about this topic when they visit the park's highlands, as there is no educational initiative underway except the campaign, "Montanha Limpa" (Clean Mountain).

A visitor education program that focuses on minimum impact practices in Itatiaia National Park should include techniques related to the following topics: deterioration of established trails, proliferation of campsites, trash and human waste disposal. It is important that further research be done in Brazil to seek the understanding of the relation between the impacts of public use and user behavior and management strategies. It is equally important to develop research on planning, design, application and effectiveness of visitor education programs aimed at promoting changes in the level of knowledge of attitudes towards and beliefs about natural areas.

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