

Visitors' Characteristics, Preferences and Perception of the Impacts of Public Use at Salto Morato Natural Reserve

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Introduction

Visiting wild areas as motivated by man's desire to be in close contact with nature and to contemplate its beauty is an old recreational practice, done through activities such as hiking, hunting and picnicking.

With post-war economic changes and technological innovations in multiple fields, there has been a significant increase in spare time, leading to a corresponding increase in the number of visitors to natural areas. As a consequence, recreation in those areas has been presented as an alternative to the social and economic development of their surrounding regions.

Concern about the impacts occasioned by recreation in natural areas started to build in the early 1930's, when assessments were made of how tourists traveling on foot affected soil and vegetation conditions (Lutz 1945). In the late nineteen fifties the concept of recreational carrying capacity was introduced to assess demand and impacts of recreational use (Mc Cool 1996). That concept was widely used through the nineteen sixties, when several studies concluded that there was no direct relation between the number of visitors and the quantity of negative impacts (Hammit and 1998); Leung and Marion 2000; Hendee and Dawson 2002). From then on, studies on visitors' preferences and perception of ecological and recreational conditions have been developed to assess the impacts of visitors on natural resources and to estimate the quality of the visit.

That quality of or satisfaction about the visit is a rather wide concept, influenced by various parameters which depend both on the type of visitor and on the specific conditions of each area (Manning 1999).

Because of the limitations of some models of recreational carrying capacity that have been proposed, technicians in the U.S. Forest Service developed a system called Limits of Acceptable Changes – LAC. According to Stankey and others (1985), that system can be summarized into four main components: 1) definition of ecological and recreational impact indicators; 2) definition of the acceptable limits of impact; 3) identification of management actions that are needed to keep changes within those limits; 4) program to monitor and assess the effectiveness of those management actions.

The importance of the analysis of visitors' preferences and perception resides on the fact that it allows one to evaluate whether users are capable of perceiving the impacts of recreational use and thus assist in the definition of standards for the indicators that need to be monitored.

To reconcile such distinct objectives as conservation of biodiversity, recreation and interpretation of nature, it is fundamental that visitors' characteristics and types of uses are duly studied. Those data will define management decisions and assure high quality in the opportunities for recreation (Milano 1997; Roggenbuck and Lucas 1987). This study thus aimed at identifying the characteristics of visitors to the waterfall trail in the Salto Morato Natural Reserve and assessing their preferences and perception, in order to select the impact indicators to be monitored through the LAC planning system.

Methods

Salto Morato Natural Reserve is located in Guaraqueçaba, one of the most pristine areas of the Atlantic Rain Forest, 180km east of Curitiba, between latitudes S25°09' and S25°11' and between longitudes W48°16' and W48°20'. The 2,340-hectare protected area belongs to the Boticario Foundation for the Protection of Nature (*Fundação Boticário de Proteção à Natureza*) and in 1994 it was included as a private reserve in the Brazilian national system of protected areas (*Reserva Particular do Patrimônio Natural*). In 1999, the Reserve was designated a World Heritage Site by UNESCO.

Open to the public in February 1996, the Reserve receives on average 7,000 visitors per year, mostly during school vacations and in the summer, from December to February (table 1). Facilities include a visitor center, research facilities with lodging for researchers and interns, training center, guesthouse, restaurant, campground and picnic area with barbecue pits.

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Table 1 – Number of visitors to Reserva Natural Salto Morato, between 1996 and 2003. Guaraqueçaba/PR, 1996-7.

Years	Months												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1996						619	310	406	231	420	620	885	3491
1997	1343	1226	1420	506	582	316	611	383	426	278	376	561	8028
1998	1027	892	348	360	522	174	291	295	293	430	665	734	6031
1999	1113	1118	692	475	450	358	439	242	858	665	648	629	7687
2000	1125	908	846	994	417	302	330	216	741	459	681	966	7985
2001	1133	1366	700	843	396	443	458	383	702	591	684	890	8589
2002	983	1236	804	352	263	334	443	172	243	327	629	277	6063
2003	623	840	852	427	508	396	260	310	386	481	491	335	5909

Source: Reserva Natural Salto Morato (2003)

The area was selected for research due to its ecological importance; furthermore, the Reserve receives both state and national recognition for its high level of management.

Gathering of data

Visit and visitors characteristics

Information concerning variation in the flow of visitors throughout the year, their origin and the means of transportation was obtained from the Reserve's administration records.

Data on the profile of users were gathered through a questionnaire which comprised both open and closed questions (fig.1), developed according to studies by Takahashi (1998), Vasconcellos (1999).

Visitors Preference and perception

With **preference** defined as “the relative importance that visitors attribute to a situation of condition” (Stankey 1980) and **perception** as a judgment on what is “adequate” or “acceptable” for a certain situation (Stankey 1973), the Reserve's visitors' preference and perception were assessed according to the following indicators: 1) damaged trees in the area; 2) exposed and damaged roots; 3) insufficient natural regeneration; 4) bare soil; 5) compacted soil; 6) social trails; 7) garbage; 8) meeting other groups; and 9) noise caused by others. Those indicators were selected to test whether visitors perceive the impacts caused by recreational use and to identify the best indicators to be monitored through the LAC planning system. For such, according to Watson and others (1992) and Cole (1995), the questionnaire in fig.2 was prepared.

That questionnaire was applied to visitors who walked the trail to the waterfall, between October, 1996 and March, 1997, as follows: on two weekends in the months of October, November, December and March, drawn at random and on all weekends of January and February, period of school vacations.

Results were analyzed through *Statistica* software. Since the measured variables are ordinal qualitative ones, Spearman's correlation coefficient (r_s) was used. Two hypotheses were tested in this procedure:

H_0 : no correlation exists among answers

H_1 : answers are correlated

Figure 1 – Questionnaire applied to characterize use and users at Reserva Natural Salto Morato. Guaraqueçaba/PR, 1996-1997.

RPPN – Reserva Natural Salto Morato			
This questionnaire will help us know our visitors' profile. By answering it you will be cooperating with future management of the Reserve. Thank you!			
1. How often do you visit the reserve?			
First time	up to 3 times/year	4 to 10 times/year	More than 10 times/year
2. How did you learn of the Reserve?			
TV	Friends/relatives	Newspaper	Radio
Other: _____			
3. Who's with you?			
I'm alone	Friends	Family	Friends and Family
Other: _____			
4. How long do you intend to stay in the Reserve?			
Up to ½ day	All day	2 days	More than 3 days
5. What is your MAIN activity during your stay in the Reserve?			
Camping	River swimming	Rock climbing	Hiking/mountaineering
Other: _____			
6. What do you do with the trash you find or produce?			
leave it where it is	deposit it at the station	carry it away	
7. Would you like to receive information on the Reserve yes no			
8. If yes:			
a) I'd like to be informed about:			
its importance	its vegetation	its animals	
its history	other _____		
b) How would you like to receive that information?			
from employees	through signs or posters (panels)		
through printed material	in a visitor's center		
through talks	from guides during guided tours		
We also need some personal information:			
9. Place of residence:			
City: _____	State: _____	Country: _____	
10. Age:			
11 - 14	25 - 29	50 - 69	
15 - 19	30 - 39	over 70	
20 - 24	40 - 49		
11. Gender: male female			
12. Schooling:			
partial elementary school	Elementary school (complete)		
partial secondary school	Secondary school (complete)		
College student	College (graduate)		
Post-graduation			
13. Your monthly income is around:			
100	300 - 500	1000 - 2000	over 5000
100 - 300	500 - 1000	2000 - 5000	
14. Suggestions or complaints:.....			
.....			
.....			
.....			
THANK YOU FOR YOUR COOPERATION			

Figure 2 – Questionnaire to assess visitors' preference and perception at Reserva Natural Salto Morato. Guaraqueçaba/PR, 1996-1997.

EVALUATION OF VISITORS' PREFERENCES AND PERCEPTION IN PROTECTED AREAS		
Name*:.....Ph.nr*:.....Date: / /		
HOW DO THE INDICATORS BELOW REDUCE THE QUALITY OF YOUR VISIT AND HOW WOULD YOU RATE THE AREA'S CURRENT STATUS?		
INDICATORS	PREFERENCE	OBSERVED CONDITION
	(a) Affects much (b) Affects somewhat (c) Affects little (d) Does not affect	(1) Terrible (2) Bad (3) Acceptable (4) Good (5) Excellent
1) Damaged trees in the area	(a) (b) (c) (d)	(1) (2) (3) (4) (5)
2) Exposed and damaged roots	(a) (b) (c) (d)	(1) (2) (3) (4) (5)
3) Insufficient natural regeneration	(a) (b) (c) (d)	(1) (2) (3) (4) (5)
4) Bare soil (clearings)	(a) (b) (c) (d)	(1) (2) (3) (4) (5)
5) Compacted soil	(a) (b) (c) (d)	(1) (2) (3) (4) (5)
6) Social trails	(a) (b) (c) (d)	(1) (2) (3) (4) (5)
7) Garbage	(a) (b) (c) (d)	(1) (2) (3) (4) (5)
8) Meeting other groups	(a) (b) (c) (d)	(1) (2) (3) (4) (5)
9) Noise caused by others	(a) (b) (c) (d)	(1) (2) (3) (4) (5)
11) Any suggestion or complaint about the Reserve?		

* To foster participation, name and phone number were asked (furnished at visitor's discretion) to enter a monthly drawing of a souvenir of the Reserve (shirt, hat, button).

Results

Characteristics of visit and visitors

Visitor control in the Reserve initiated in June, 1996. Through March, 1997, 7,480 visitors were registered. According to data furnished by the administration, 60% of total visitors resided in Curitiba, 18% in Guaraqueçaba, 7% in Paranaguá, Antonina or Morretes (all towns on the state's coast), 4% in other towns within the state of Paraná, and 11% other towns in others states. As for visitors from other states, those from São Paulo were the majority (3%), probably because it is the nearest state to the site.

The most common means of transportation to reach the area was the passenger car, used by 51% of all visitors. Some visitors usually go to Guaraqueçaba by boat, and then hire transportation to reach the Reserve.

During the period of this study, between October, 1996 and March, 1997, the Reserve application of 422 questionnaires as that presented in figure 1. Users' characteristics are described below.

Visitors to Morato are characterized by an even gender distribution (50.4% of males and 49.1% of females), aged between 20 and 40 (60%), with college-level education -undergraduates or graduates - (60%) and monthly income above R\$1.000,00 (47% - the exchange rate between the real and the US dollar then was 1 to 1). About 80% of visitors were in the Reserve for the first time, 40% already knew the area and 19% learnt about it through the TV (19%) or friends/relatives (19%). They were with friends (31%), family (19%) or friends and family (21%), they intended to stay there ½ day and the main activity for 59% of visitors were to observe the nature.

Inside the Reserve visitors, were careful to collect and carry garbage (60% put it in the trash bins and 27% carried it away), visited the falls (39%) or associated that visit with the opportunities for picnicking and swimming in the river (25%). The large majority felt very satisfied with their stay in the area (83%), but would like to receive more information (95.3%), particularly about local fauna (59.3%) and local history (54.4%), and would prefer to receive that received 4,802 visitors, and their profiles stemmed from the information through folders and leaflets (48%) and during guided hikes (43%).

Visitor's preference and perception

From a total of 4.802 visitors to the Reserve, 648 users of the waterfall trail were surveyed (13.5%) by means of the questionnaire shown in figure 1.

Analysis of the answers individually (table 2) shows that meetings with other groups on the trail is the only indicator that had little or no influence on the quality of the visit. All other items had significant influence. Damaged trees and roots, as well as bare soil and scattered garbage were indicators that presented the greatest influence. It should be noted that in spite of the negative influence that garbage presents and the high level attributed to that condition, 57% of all interviewees rated the current condition of the area as excellent and almost 80% rated it as either good or excellent.

Table 2 – Percentile data on indicators of impact that have an influence upon visit and current conditions of the trail in Reserva Natural Salto Morato. Guaraqueçaba/PR, 1996-7.

Influence upon quality of visit ¹					Current condition ²				
Indicators	A	b	c	d	1	2	3	4	5
I1 – Damaged trees	52	17	18	13	4	5	19	40	32
I2 – Exposed or damaged roots	42	24	22	12	2	10	23	40	24
I3 - Insufficient natural regeneration	48	19	19	11	2	10	21	41	24
I4 – Bare soil	56	13	19	11	5	6	18	35	35
I5 – Compacted soil	34	25	25	14	2	8	31	37	20
I6 – Social trails	28	22	26	20	3	8	25	34	27
I7 - Garbage	81	3	7	8	8	4	8	21	57
I8 – Meeting other groups	16	18	23	41	1	3	26	38	30
I9 – Noise caused by others	32	20	21	26	4	7	24	30	34
AVERAGE (%)	44	18	20	18	4	7	22	35	32

Options¹: a) Great influence; b) Medium; c) Small and d) None

Options²: 1) Horrible; 2) Bad 3) Acceptable; 4) Good, and 5) Excellent

A simple averaging of current status reveals that 67% of visitors considered conditions to be good. For 90% they were at least acceptable, which demonstrates that the quality of visits to the Reserve is satisfactory to 9 out of 10 visitors. The fact that 64% of visitors replied that meeting other groups has little influence on their satisfaction in relation to the area allows two possible interpretations: first, users do not really bother with the countless encounters with others that walk the same trail and second (less likely) is that users behave impeccably, not interfering with the experience of others so that no one has the final quality of their visit affected by that item.

Studies developed by Watson and others (1992) in the south of the USA showed that the number of encounters with other users – a frequently monitored indicator in the LAC planning system – was one of the least significant indicators. Those authors attributed that result to the high educational level of visitors (about 70% were either college undergraduates or graduates) and to their receptiveness to low-impact procedures and to regulations proposed in the programs for protected areas.

Thus, considering that visitors to the Reserve have both educational levels (60% with college-level education) and age bracket (60% between 20 and 40 years old) which are similar to those of visitors to the American areas, it is possible that behavior levels were the same.

By use of Spearman's correlation coefficient, correlation among answers was analyzed (table 3). Only a slight correlation was observed among the following indicators: damaged trees (-.16), meeting other groups (.16), exposed and damaged roots (-.10), noise caused by others (.1) and insufficient natural regeneration (-.09). Therefore it was verified that there was no significant correlation between the indicators that influence the visit and the rating of current conditions. Although that correlation does exist for other indicators, values were very low, as the nearer r_s is to 1 or -1, the greater the positive or negative correlation.

Implications

As a whole, visitors to Reserve rated current conditions in the area high. According to Stankey (1980), judgments of what is excellent or acceptable depend on many factors, among which the visitor's expectations in relation to the area is certainly one of the most important. Taking into account that almost 80% of all visitors were in the area for the first time and that access to the Reserve is difficult (65 km of winding, unpaved road), one can assume that expectations were high enough for users to be more demanding than usual. Still, 67% of all visitors rated the

Reserve good to excellent, which suggests that management of Morato has been adequate. About 50% of visitors did not make any suggestion or complaints about the Reserve. Among those who commented, 13% praised the Foundation's initiative to establish and maintain a protected area, 6% mentioned the need for improvements to the main access, which is actually beyond the administration's scope as it is a road under municipal jurisdiction.

Table 3 – Correlation between conditions which affect visit and those currently found in the trail at Reserva Natural Salto Morato. Guaraqueçaba/PR, 1996-7.

Indicators	Nr interviews	r (correl. coeff.)	p-value	Hypothesis H_0
I1 – Damaged trees	645	-0.165987	0.000023	Rejects H_0
I2 – Exposed and damaged roots	639	-0.105724	0.007476	Rejects H_0
I3 – Insufficient natural regeneration	624	-0.094588	0.018109	Rejects H_0
I4 – Bare soil	633	-0.073347	0.065151	Admits H_0
I5 – Compacted soil	626	0.000097	0.998060	Admits H_0
I6 – Social trails	615	-0.001374	0.972861	Admits H_0
I7 – Garbage	627	0.003847	0.923396	Admits H_0
I8 – Meeting other groups	634	0.163802	0.000034	Rejects H_0
I9 – Noise caused by others	638	0.101286	0.010469	Rejects H_0

$p < 0,05 \Rightarrow$ Correlation exists (Rejects H_0)

Remaining users simply made general comments on the area or made suggestions to implement more recreation facilities such as a volleyball court, a soccer field or building restrooms near the natural aquarium.

For the Salto Morato Natural Reserve the indicators which presented correlation were: a) damaged trees; b) exposed and damaged roots; c) insufficient natural regeneration; d) meeting other groups; and e) noise caused by others. As correlations were slight and indicators *d* and *e* had the smallest impact on the quality of the visit, it is suggested that other indicators substitute those items (social trails, garbage, trail width and satisfaction) as shown in table 4.

Those new indicators were selected on the grounds that they are specific, measurable, sensitive, correlated, integrated and representative (Cole 1982; Merigliano 1987; Whittaker and Shelby 1992; and Magro 1999).

Based on the four main components of LAC system: definition of impact indicators; setting the acceptable limits of impact; identification of management actions; monitoring program, we proposed (table 4) some indicators for monitoring impacts of recreation at waterfall trail. Those indicators were selected because they could be readily collected and assessed by workers in the area and with little training.

That consideration for indicators, which are easily monitored in addition to their characteristics, is due to the fact that in Brazil there is a constant shortage of resources, equipment and personnel. Both management and level of research are still in their early stages and problems concerning the impact of visitors have only been dealt with since the early nineteen nineties. Most administrators have not received proper training for the job and have had to assume all different tasks in their protected areas due to both lack of personnel and lack of infrastructure.

With those aspects in sight and due to the accelerating and disorganized development of recreation in Brazilian protected areas, it is fundamental to foster research and publicize findings, thus providing practical information that administrators can readily apply in the management of those areas. The indicators selection will promote a better management and application of financial resources to guarantee the protected areas conservation.

Table 4 – Indicators proposed for monitoring impacts of recreation at Reserva Natural Salto Morato.

Indicators	Data collecting	Acceptable Limits	Management Actions	Monitoring
1 – Damage to vegetation (trunk, branches and roots)	Evaluate sections drawn at random ¹	1 type I ² damage	• Increase surveillance • Admit guided visits only • Improve environmental education program	Evaluate after long holidays
2 – Level of natural regeneration in the area of influence ³	Quantify total nr of regenerating plants in parcels of 1m ²	5 seedlings/m ² ⁴	• Increase surveillance • Admit guided visits only • Improve environmental education program	Evaluation after peak season (March of every year).
3 – Social trails	Evaluate the whole length of trail	1 trail	• Install barriers to social trail • Increase surveillance • Admit guided visits only • Improve environmental education program	Evaluate after long holidays
4 - Garbage	Evaluate sections chosen at random	2 occurrences ⁵	• Distribute garbage bags • Improve orientation to visitors • Impose fines	Evaluate after long holidays
5 – Trail width	Evaluate sections chosen at random	<1,3m ⁶	• Increase surveillance • Admit guided visits only • Implant restraints to keep visitors within the trail	Before and after peak season (December and March).
6 – Visitor satisfaction	Develop a questionnaire to evaluate visitor's level of satisfaction about the Reserve	<15% of visitors dissatisfied with the area	• Reevaluate visitors' expectations and the area's management objectives • Foster guided visits • Give publicity to objectives of the area • Evaluate source of dissatisfaction	Throughout the year, in a systematized form, including weekdays, weekends and school vacations.

¹ Drawn section – Total length of trail should be divided into 50-m sections and 10% of sections drawn. Those will serve as permanent parcels in which some impact indicators will be assessed.

² Type I damage – broken twigs, small cuts into bark and exposed roots, nails or holes in the trunk.

³ Area of influence - 2m-wide strip on each side of the trail, subject to damage by visitors; therefore, sample sections comprise width of trail plus 4-meter zone of influence.

⁴ Average quantity of plants (arboreal species over 15 cm high and diameter at breast height, DBH, under 5 cm). Previous research pointed that average regeneration for this trail is about 5 plants/m².

⁵ Occurrence - (one can, one biscuit wrapping, one piece of plastic, etc)

⁶ A survey in the area identified average width of the waterfall trail to be 1.22m.

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