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Christian, Colmore S.; Lacher, Jr., Thomas E.; Hammitt, William E.; Potts, Thomas D.
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VISITATION PATTERNS AND PERCEPTIONS OF NATIONAL PARK USERS – CASE STUDY OF DOMINICA, WEST INDIES

Colmore S. Christian
Thomas E. Lacher, Jr.
William E. Hammitt
Thomas D. Potts

ABSTRACT

The primary objective of this two-phased study, conducted at two national parks on the Caribbean island of Dominica, was to explore the relationship between selected users' characteristics (e.g. gender, age, and nationality) and their perception of resources conditions. A secondary objective was to contribute to the nature tourism and natural resource database in the context of a small tropical island. Visitor use patterns were also examined. A questionnaire survey was the primary method of data collection, supplemented by some ecological data collected in one-meter wide trail corridors as part of a larger study. There was a high level of consistency between users' perceptions of resource conditions. It was evident however, that park users' perceptions of resource conditions were different in some respects to prevailing site conditions. Chi-square test of independence revealed that there was indeed a significant relationship between users' overall rating of resource conditions and their gender. Significant relationships between users' perceptions of resource conditions and their age and geographic region of nationality were identified only after some data were pooled. Based on the results of the study it was concluded that resource managers should utilize a combination of approaches rather than a single approach for assessing and monitoring ecological changes and resource deterioration and for guiding policy decisions.

Keywords: visitation patterns, outdoor recreation, users' perception, nature tourism, Dominica, island, national park, resource impacts.

RESUMEN

El objetivo principal de este estudio de dos fases, realizado en dos parques nacionales en la isla caribeña de Dominica, fue explorar la relación entre las características de los participantes (por ejemplo, género, edad y nacionalidad) y su percepción de las condiciones de los recursos en dichos parques. El objetivo secundario fue contribuir

a la base de datos del turismo de naturaleza y recursos naturales en el contexto de una pequeña isla tropical. Los patrones de uso de los visitantes también fueron examinados. Se utilizó una encuesta como método primario para la colección de datos, suplementado por la data ecológica recogida en senderos de un metro de ancho como parte de un estudio más amplio. Se encontró un alto nivel de consistencia entre las percepciones de los usuarios sobre las condiciones de los recursos. Aun así, resultó evidente que las percepciones de los usuarios de los parques eran diferentes en algunos aspectos a las condiciones prevaletientes en los lugares. Una prueba de Chi-cuadrado (*Chi-square test*) reveló una relación significativa entre la evaluación de los usuarios sobre las condiciones de los recursos y sus edades y regiones geográficas de nacionalidad únicamente luego de haber agrupado los datos. Basado en los resultados del estudio se concluyó que los administradores de los recursos debieran utilizar una combinación de enfoques, en lugar de un solo enfoque para la evaluación y monitoreo de los cambios ecológicos de los recursos y para informar la toma de decisiones.

Palabras clave: patrones de visitas, recreación al aire libre, percepción de usuarios, turismo de naturaleza, Dominica, isla, parque nacional, impacto en los recursos

RÉSUMÉ

Cette étude, conduite dans deux parcs nationaux de l'île de Dominique, est divisée en deux phases. Notre objectif principal est d'explorer le rapport entre les caractéristiques des participants (par exemple genre, âge et nationalité) et leur perception concernant les conditions des ressources naturelles dans les parcs. Notre deuxième objectif est de contribuer à la base de données sur le tourisme vert et les ressources naturelles dans le contexte de cette petite île tropicale. Par le biais de questionnaires, nous avons examiné le patron d'utilisation de l'espace par les usagers; de même, pour avoir des données plus amples, nous avons recueilli des informations sur les ressources écologiques présentes sur des sentiers d'un mètre de large. Aussi, avons-nous constaté un rapport homogène entre les perceptions des usagers des parcs sur les conditions des ressources naturelles. Toutefois, ces perceptions divergeaient en ce qui concernait certains aspects: le test du khi carré (*Chi-square test*), par exemple, a révélé qu'il existe un rapport significatif entre l'évaluation faite par les usagers et leur genre. En outre, nous avons identifié des liens significatifs entre les perceptions des usagers par rapport à l'état des ressources, et leur âge et nationalité, mais uniquement après avoir regroupé toutes les données. D'après les résultats de notre étude, nous avons conclu que les responsables des ressources naturelles devraient privilégier un ensemble d'approches —au lieu d'une approche unique— pour évaluer et surveiller les changements écologiques de ces ressources et pour prendre des décisions informées.

Mots-clés: patron d'utilisation de l'espace, activités en plein air, perceptions des usagers, tourisme vert, Dominique, île, parc national, effet sur les ressources naturelles

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1. Introduction

This paper examines the visitation patterns and perceptions of resource conditions of users to two national parks on the Commonwealth of Dominica, more commonly referred to as Dominica. Dominica is the largest island of the Organization of Eastern Caribbean States (OECS) economic sub-grouping. The island is centrally located in the Lesser Antillean arc of islands (Figure I).

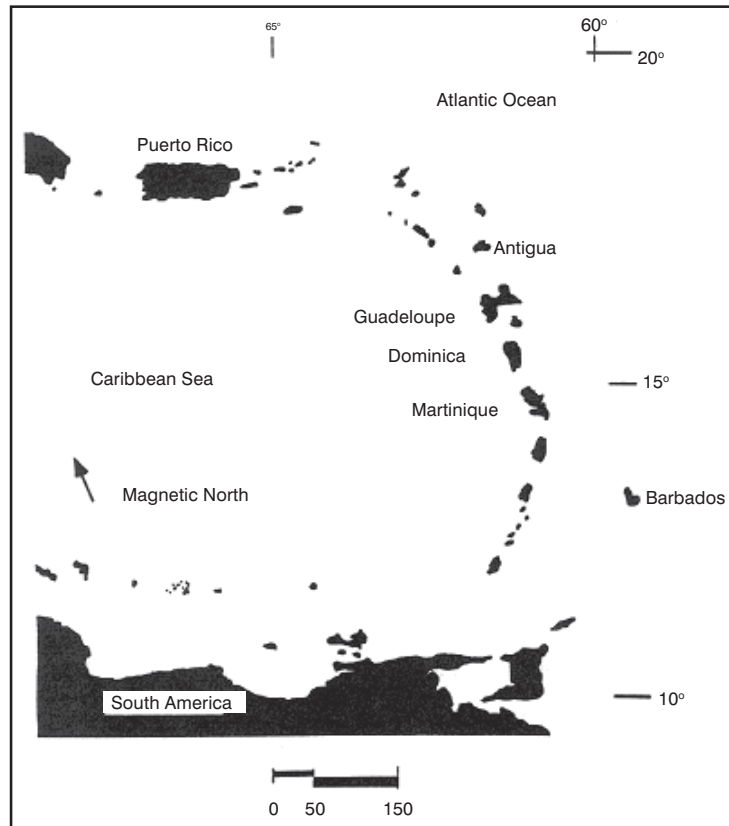


Figure 1. Location of the Island of Dominica (Source: OAS, 1993)

In comparison to the other islands of the OECS sub-grouping most of Dominica's landscape is dominated by lush green natural vegetation, several swift flowing streams, two freshwater mountain lakes, one of the world's largest boiling lakes, steam vents, warm water springs, and relatively abundant wildlife species including two endemic parrots namely the Sisserou Parrot (*Amazona imperialis*) and the Red-necked Parrot (*Amazona arausiaca*) (Evans 1986). Several mountains, a few of which are over 1000 m high, deep gorges and valleys are characteristic of the island's topography. These topographic and geomorphologic features are among the many vivid reminders of the island's volcanic origin (Lang 1967).

Dominica is known to and referred by many regional and transnational tour operators and travel writers as 'The Nature Island of the Caribbean'. Accordingly, many regional and international business travelers and tourists interested in and wishing to explore nature and natural phenomena include Dominica on their travel and vacation itineraries.

The Government and people of Dominica have recognized the potential social and economic benefits to be derived from the island's rich natural heritage, in this era of global focus and attention on the negative effects of climate change and the need for sound management of world's dwindling natural resources. Consequently, Dominica like many other countries of the world is pursuing nature-based tourism as a socio-economic development strategy (Christian *et al.* 1994; Christian *et al.* 1996). This development strategy is clearly articulated in the island's 'Medium-term Growth and Social Protection Strategy (GSPS)' paper (Government of Dominica 2006).

However, there are implications for use of natural areas. Use of natural areas for outdoor recreation, nature-based tourism, and other uses results in a range of interdependent and complex changes to the natural resource base, habitats, and ecosystems (Dickens *et al.* 2005; Hammitt and Cole 1998; Harris 1984; Hunter 1990; Wall and Wright 1977; Wight 1993), some of which may be irreversible (Marion and Rogers 1994). Changes in resource conditions may be very obvious to users of impacted sites, and subjective perceptions of such resource impacts do apparently influence recreation demand and use in respect of the impacted sites (Siderelis *et al.* 2000; Hall and Cole 2007).

Dominica was selected for the study primarily because of its nature-based tourism thrust and also in part because of the paucity of data on visitation patterns and outdoor recreation users' perceptions of resource conditions in the context of small, tropical island settings.

An important focus of the study was an examination of the research hypotheses: *Park users' perceptions of changes in resource conditions (e.g. soil erosion, damage to vegetation, and littering) are independent of gender, nationality, and age.*

In exploring various perspectives of park users' perceptions it was recognized that first time visitors to the study sites may be less sensitive to changes in natural resource conditions than repeat users, largely because the latter group has some knowledge of past conditions. Nevertheless, in many cases natural resource managers have no choice but to deal with those visitors who are on the site (Knudson and Curry 1979). Except for repeat visitation patterns differences between first time and repeat visitors were not explored in this study.

2. The Study

This paper is based on a larger study. As a result a slightly different version of some of the material presented in this section of the paper appears elsewhere (Christian *et al.* in review). In addition to the Survey Instrument and Survey Procedures described below, ecological data was collected in one-meter corridors on both sides of selected trail sections at each site. Trail sections of the primary trails at the research sites which were similar in length (approximately half a mile), width, and use level were selected for the study.

2.1. The Study Sites

The Cabrits National Park (CNP) situated in the northwestern part of the island and Emerald Pool, the most popular site within the Morne Trois Pitons National Park (MTNP) in the south-central part of the island were the two study sites. On December 7, 1997 the United Nations Educational, Scientific, and Cultural Organization (UNESCO) enlisted MTNP as a World Heritage Site—natural areas category (UNESCO 2007). That same year the Government of Dominica introduced a user fee system for access to ten (10) of the island's more popular outdoor recreation and ecotourism sites, including the research sites. Under the user fee policy non-Dominican residents pay a small fee in order to gain access to those sites. The initial fee levels were: US\$2 for a single-admission, single-site pass; US\$5 for a multi-site, multiple admissions but same day pass; and US\$10 for a weekly, multi-site, multiple admission pass. In July 2008 the regulations governing the administration of the fee structure was amended as follows: US\$3 'for a site visit for presold organized tours to any ecotourism site'; US\$5 'for a site visit for private tours to any ecotourism site'; and US\$12 'for a week pass to visit any ecotourism site or sites' (Government of Dominica 2008). Three additional sites were added to the initial list of ten sites for which entrance fees are required. Nationals and long-term residents (six-months or longer) are exempted. Park wardens who monitor and control visitor access at primary entrance

points to outdoor recreation sites are generally good at identifying Dominican nationals. Persons who claim long-term residency status may be required to provide evidence of such a status to wardens.

Secondary rain forest is the dominant vegetation type found at the Emerald Pool whereas dry forest woodland and wetland are the ecosystems at Cabrits (Beard 1949; James 1985; Nicolson 1991; Shanks and Putney 1979). Both sites are relatively easily accessible to motorists. In addition, unlike Emerald Pool that is located in the interior, the coastal CNP is within walking distance of three communities each of 100 persons or more.

The study focused on national park sites. Consequently, Trafalgar Falls, a popular nature site outside the island's national park system, was not included in the study although visitation level at that site is generally higher than at the Cabrits.

2.2. Survey Instrument

A questionnaire developed with input from two experienced social scientists and researchers at Clemson University, and pretested with a five member focus group of students (three undergraduates and two graduates), was administered to visitors to the study sites during the two-phased study. The questionnaire consisted of 35 questions grouped into 3 sections. This instrument was the primary avenue pursued for gathering data with respect to visitor demographics, use patterns, and users' perceptions of changes in resource conditions.

2.3. Survey Procedures

Phase 1 of the study was implemented in the winter months (December/January), whereas Phase 2 was undertaken in the summer months (June/July). Sampling phases were selected to coincide with the winter cruise ship visitor season and the summer period of low cruise ship visitor arrivals. Visitors, according to the Central Statistical Office (2006) definition consist of 'tourists' and 'excursionists'. A Tourist is 'any person who stay for at least one night but no more than 365 nights in any land accommodation' whereas an excursionist is 'any person who does not stay for any one night in any land accommodations' (Central Statistical Office 2006). Dominica generally welcomes cruise ship visitors every day during the peak of the cruise season.

During both phases of the study sampling was usually completed at one site before the commencement of sampling at the other site simply because of the limited number of field personnel. Questionnaires were distributed between the hours of 9:00 a.m. and 4:30 p.m. Mondays

through Saturdays at the study sites. Only persons who were 15 years and older were asked to complete the questionnaires at the end of their tour of the site. However, all individuals, irrespective of age, were included in total count of users to the study sites. Park users were only approached and informed about the study at the end of their site visit so as to minimize any maturation effects and biases.

No time limit was imposed on respondents for completing the questionnaires. However, casual observations indicated that on the average respondents took 10-20 minutes. Participants were free to sit anywhere, including the comfort of their vehicles, to complete the questionnaires. In approximately four instances two or more individuals were seen collaborating in the process, in spite of the fact that participants were requested to reflect their personal opinions and observations. The completed questionnaires in question were not included in the analysis.

More than 80% of the visitors approached agreed to participate in the study. About a dozen individuals who were pressed for time were allowed to take the questionnaires home on the understanding that completed questionnaires would be returned in self-addressed, stamped, envelopes provided. Only one such questionnaire was returned. Therefore, that questionnaire was not included in the analysis.

During Phase 1 of the study, questionnaires were distributed for 10 days at Emerald Pool and 5 days at Cabrits. Questionnaires were administered for a total of 12 and 8 days at the respective sites during Phase 2. A field assistant, who was either a college student or high school graduate, distributed and collected questionnaires. The field assistant was stationed at the trailhead throughout each field day. With the aid of hand-held tally counters the field assistant also monitored the total number of visitors and the number of vehicles to the respective sites on a daily basis.

The principal investigator, assisted by the research field team, assessed ecological changes in soil and vegetation as well as the presence of garbage in one-meter wide trail corridors along selected trail sections. Trees in these corridors were classified—no damage, slight damage, moderate damage, and severe damage—based on degree of impact suffered. Much of the ecological data collected as part of the larger study are discussed elsewhere (Christian *et al.*, in review).

2.4. Data analysis

Chi-square statistical test for independence was the primary statistical procedure employed in testing the hypothesis. Some descriptive statistics were also examined and reported. SAS statistical package (SAS Institute 1990) was used for data analysis.

3. Results and Discussion

3.1. Visitor Use and Visitation Patterns

Overall, the number of visitor arrivals to Dominica has been increasing annually over the last decade except for a slight decrease in the aftermath of the 9/11 incident in the USA. This trend is generally reflected in cruise ship arrivals patterns (Table I). It is logical to conclude therefore that the number of users to the study sites will follow a similar pattern because the majority of cruise ship visitors take tours to natural areas. Daily summaries of the number of users, completed questionnaires, and vehicles to the study sites were compiled during the study. During Phase 1 a total of 1881 visitors, traveling in 262 vehicles visited the Emerald Pool whereas a slightly smaller number of visitors (1588) utilizing approximately the same number of vehicles (264) visited the site during Phase 2. The highest number of visitors recorded for one day was 606 and 655 during Phases 1 and 2 respectively. At the Cabrits 360 users and 112 vehicles were recorded during Phase 1, but 561 users and 60 vehicles were recorded during Phase 2. Although the number of visitors stated above includes children under 15 years old, they were not included in any statistical analysis.

A grand total of 649 completed questionnaires were returned with respect to both sites, 286 (44.1%) as part of Phase 1 and 363 (55.9%) as part of Phase 2. Based on daily summaries of visitors to the sites Emerald

Table I. Cruise Ships Calls and Cruise Passenger Arrivals for the Period June 1997 to June 2006

(Source: Forestry, Wildlife and Parks Division, 2006).

Fiscal Year (June/July)	Number of Cruise Ship Calls	Number of Cruise Ship Passenger Arrivals
1997/1998	238	256,373
1998/1999	216	213,838
1999/2000	269	212,969
2000/2001	220	238,067
2001/2002	177	172,599
2002/2003	164	141,337
2003/2004	244	303,789
2004/2005	229	333,607
2005/2006	266	339,861
Totals	2,023	2,212,905

Pool is the more popular of the two sites. The 2005 annual report on the User Fee System indicated that the Emerald Pool attracted 35.4% (n = 210,912) of the paying visitors to the ten outdoor recreation and ecotourism sites monitored by the Forestry, Wildlife and Parks Division and was second only to Trafalgar Falls (47.1%). The Cabrits was in fourth place with 2.4% of the paying visitors (Forestry, Wildlife and Parks Division 2006). This site visitation pattern is also supported by the number of completed questionnaires received. A total of 436 (67.2%) of the completed questionnaires came from Emerald Pool visitors as compared to 213 (32.8%) completed questionnaires from visitors to Cabrits. Both sites received the highest visitation levels on Wednesdays, Tuesdays, and Mondays, respectively. Emerald Pool received 27.9%, 22.9%, and 14.3% respectively, of its users on those days whereas Cabrits received 25.0%, 24.5%, and 23.1% respectively, of its visitors on those days. Thursdays (13.9%) and Fridays (13.4%) were the days of lowest visitation to Cabrits. Saturdays (12.2%) and Fridays (8.5%) were the low visitation days at Emerald Pool. The visitation patterns between weekdays and weekends/holidays were not explored.

Based on the results of this study the most popular months for visiting Emerald Pool were December (50.8%) and July (46.2%), whereas January (3.0%) was the month of lowest visitation. June (71.3%) seemed to be by far the month of highest visitation to Cabrits whereas January (5.6%) and July (4.2%) were the months of lowest visitation.

Dominica generally experiences highest visitor arrivals during the winter months in the northern hemisphere. Thus, to some degree the visitation patterns to Emerald Pool mirrors the island's winter cruise ship visitor arrival trends. Visitor arrivals statistics for 2006 illustrate this trend. For example, monthly analysis of non-cruise ship visitor arrivals by sea for that year revealed that the island experienced highest visitation levels in July (12.8%, n = 23,336) and December (11.7%). Whereas June and September were the months of lowest arrivals by sea in 2006 represented by only 3.6% and 3% respectively (Central Statistics Office 2006). A similar analysis of arrivals by air for 2006 indicated that July (11.35%, n = 61,631), followed by October (11.30%), and December (9.8%) were the months of highest visitor arrivals. With respect to combined sea and air arrivals for 2006 the month of July (11.8%, n = 84,967) ranked the highest followed by October (11.2%) whereas September (5.2%) and November (5.8%) were the months of lowest combined non-cruise ship arrivals (Central Statistics Office 2006). It should be emphasized that cruise ship arrivals who normally spend less than 24 hours on the island are not reflected in the forgoing statistics.

Local residents patronized the parks more frequently during the month of June. Cabrits appears to be favored by locals over Emerald

Pool. The better swimming and picnicking opportunities, drier environment, rich historical resources in the form of the ruins of a 17th century colonial fort complex, and larger expanse of open spaces available at Cabrits may be among the primary factors and site characteristics which help to draw larger numbers of locals to that site. It is speculated that local residents tend to view Cabrits as being more conducive to group and family outdoor activities than Emerald Pool.

On the average visitors spent more time (number of minutes) in the dry, coastal forest surroundings at Cabrits (mean = 114.00, S.D. = 87.71) than at the Emerald Pool's secondary rain forest environment (mean = 67.63, S.D. = 59.55). The range of time spent at the two sites (Cabrits and Emerald Pool) was 705 and 470 minutes, respectively. Some respondents may have erroneously reported the 'total amount of time spent on the island' rather than the 'actual amount of time spent at the particular sites'.

One of the respondents at Cabrits, for example, reported having spent 12 hours (720 minutes) at that site. This was unlikely, considering that both CNP and MTNP are day-use parks and also because there are no over-night facilities at either site. Furthermore, investigations revealed that no one had been granted permission to camp at any of the sites during the study. A total of 10 respondents indicated that they had spent 6 hours (360 minutes) or more at one of the study sites. In spite of these reservations, the caretaker at the Cabrits confirmed that occasionally, some visitors did spend long periods (4-6 hours, i.e. 240-360 minutes) at the site (Percy Pierre, personal communication, 2005).

3.1.1. Mode of Travel

Almost half (49.3%, $n = 643$) of all users who responded to the relevant questionnaire item traveled to the outdoor recreation sites by taxi (cars and buses). Private automobile (19.4%) was the second most popular means of transportation, followed by rented vehicles (15.9%), and 'other' (15.4%) means of transportation. The category 'other' included persons who walked, hiked, hitchhiked, or traveled by means of motorcycles or bicycles.

At the individual site level 'other' accounted for 41.7% of Cabrits users' mode of travel, but only 2.1% for users at Emerald Pool. Emerald Pool is approximately 10 km away from the nearest community of 100 persons or more whereas Cabrits is less than 1.5 km from three such communities. Thus, the distance of the sites from communities may partly explain the large difference in the number of park users in the 'other' category between the two sites. Another contributing factor was the fact that some tourists to Cabrits walked from cruise ships, across the port

compound, directly into the CNP. The Caribbians Cruise Ship Berth, though underutilized at the time of the study, is located along sections of the park's western boundaries and adjacent to the main entrance to CNP. Dominica is one of the very few countries in the world where cruise ship passengers can literally walk from the ship through the port compound and into a national park.

3.1.2. Repeat Visitation Trends

Users surveyed reported that they had made more repeat visits to Caribbians (47.6%) than to Emerald Pool (13.9%) during the preceding 12 months. Ten percent (10%) of the 212 visitors to the Caribbians who responded to the pertinent questionnaire item which focused on visitation trend had visited that site more than 5 times during the 12 month period immediately preceding the survey. In contrast, only 2.9% of the 418 users at Emerald Pool who responded to the same question had visited that site 5 times or more during the same timeframe. Here again proximity to communities and site characteristics could be some of the possible reasons for the difference between sites.

3.1.3. Types of Visiting Groups

Very few users (2.8%, $n = 639$) visited any of the sites by themselves. Only 5.7% of the 210 Caribbians users and 1.4% of the 429 Emerald Pool users who responded to the relevant questionnaire item, visited the respective sites by themselves. Users generally came in family groups (52.4%), peer groups/clubs (29.9%), or as part of foreign tour groups (17.7%). In the case of Caribbians, 47.3% of the 205 users who responded to the relevant questionnaire item were part of family groups, 40.5% were members of peer groups/clubs, and 12.2% were members of overseas tour groups. Comparable figures for Emerald Pool were 54.9% ($n = 421$), 24.8%, and 20.4% respectively. Both at the individual site level and for the study as a whole the 'family group' component of total users was on average 17.5% higher than the 34% reported by Boo (1990) for departing visitors at the island's airports.

The findings of the study are consistent with those reported in respect of three national park sites in south-eastern United States where social-travel groups consisted of family groups (56%, $n = 971$), friendship groups (17%), and "solo" users (12%) (Hammitt and Bixler 1994). Given these findings public lands and park managers should therefore ensure that a range of family and group oriented services and opportunities are available to visitors.

3.2. Users' Perceptions of Resource Conditions

During both phases the majority of visitors to CNP and MTNP either reported having noticed 'no disturbance' or only 'low levels' of perceived changes in the resource conditions. Mean responses were consistently below 3 on the five-point evaluation scale. Overall, 46.1% of users did not perceive any soil erosion problems while less than 1% of users concluded that a great deal of erosion had occurred (Table II).

Approximately one-fifth of the respondents reported having noticed some level of vegetation damage. However, no one assessed the level of vegetation damage noticed at outdoor recreation sites on Dominica as being 'a lot' (Table II). The standard deviations of all the mean scores were consistently less than one (Table III), indicating general agreement and some level of consistency among respondents in their perception of

Table II. Users' Perceptions of Changes in (a) Soil, (b) Litter, and (c) Vegetation Conditions at Emerald Pool and Cabrits on Dominica.

Perceived Variable Level of Change		Individual Sites		
		Emerald Pool (%)	Cabrits (%)	Both Sites (%)
(a) Soil				
	No erosion	41.7	54.4	46.1
	A little erosion	36.0	32.1	34.7
	Moderate erosion	6.4	2.3	5.0
	A lot of erosion	1.2	0.0	0.8
	Could not recall	14.6	11.2	13.4
(b) Litter				
	No litter	62.4	84.6	70.1
	A little litter	27.5	11.7	22.0
	Moderate litter	2.5	1.9	2.3
	A lot of litter	0.7	0.0	0.5
	Could not recal	6.9	11.2	5.2
(c) Vegetation				
	No damage	55.4	68.5	60.1
	A little damage	20.5	14.6	18.4
	Moderate damage	3.1	1.4	2.5
	A lot of damage	0.0	0.0	0.0
	Could not recall	21.0	15.5	19.0

Table III. Users' Perceptions of Resource Conditions at two National Park Sites on Dominica, West Indies.

Survey Question	Emerald Pool (Phases 1 & 2)			Cabrits (Phases 1 & 2)		
	N	Mean [^]	S.D	N	Mean [^]	S.D
Do you think that resource conditions of the area have been disturbed or altered in any way?	406	2.52	0.91	213	2.66	0.74
Did you notice any damage to the following classes of plants as you walked through:						
(a) to grasses and herbs	409	2.06	0.76	215	2.29	0.68
(b) to trees.	404	2.37	0.83	215	2.27	0.61
Did you notice any signs of soil erosion, litter, or vegetation damage along the trail or other designated visitor use area?						
(a) soil erosion	405	2.38	0.86	215	2.26	0.68
(b) litter [garbage]	404	2.28	0.66	214	2.13	0.49
(c) vegetation damage.	386	2.06	0.73	213	2.02	0.60
Overall, how would you rate the conditions of the designated trails at this site, in terms of the amount of disturbance or damage (erosion, trash, disturbance to trail-side vegetation, etc) evident?	386	4.04	0.89	213	4.61	0.66

[^] Mean is based on a five-point scale (1 = Cannot Recall, 2 = None, 3 = A Little, 4 = Moderate, 5 = A Lot).

resource conditions. Of course, it is recognized that unless one has the relevant professional training, first time visitors to the research sites will not have a frame of reference for accessing the level of ecological impacts at those sites.

In response to the question "Do you think that the resource conditions of the area have been disturbed or altered in anyway?" over one-third (38.3%) of the 619 visitors who responded to that question said 'no', and only 1.6% of respondents thought 'a lot' of disturbance had occurred. This is in sharp contrast to the fact that approximately 60% of the trees in the one-meter trail corridors at both sites had suffered

'moderate' or 'severe' levels of damage as assessed by the Principal Investigator (PI). At Cabrits, for example, only 2.4% of the 83 trees which occurred in the trail corridor were rated as being damage-free by the PI, and over 13.2% were assessed as having suffered either moderate or severe levels of damage, with an additional 67.5% of the trees having been felled. Comparable figures for Emerald Pool were 10.1%, 59.6%, and 6.7% respectively, based on a total of 119 trees. The evidence of differences between users' perceptions and the actual site conditions is consistent with the observations of other researchers (Marion and Lime 1986; Douglas 2000).

Interestingly, Hall and Cole (2007) reported that most of the wilderness visitors questioned as part of a study at six wilderness study sites in western USA perceived "changes in use and impacts". One possible explanation for this difference could be that a larger percentage of 'wilderness visitors' in the USA are more environmentally knowledgeable and sensitive than the visitors to Dominica's national park. An alternative explanation may be due to the fact that many of the visitors questioned may have been repeat visitors.

Interestingly, whereas park users on the average rated individual parameters of the natural resource base at the sites as exhibiting 'no signs' of impact to 'little' evidence of impact, the users ($n = 386$) to the Emerald Pool and to the Cabrits ($n = 213$) assessed the overall conditions at the individual sites as being between 'moderately impacted' and 'highly impacted'.

3.3 Research Hypothesis Testing

A three-step approach was adopted in the process of testing the research hypothesis: *Park users' perceptions of changes in resource conditions (e.g. soil erosion, damage to vegetation, and littering) are independent of gender, nationality, and age.*

3.3.1. Relationship between Users' Perceptions of Impacts and Gender

Based on a chi-square test of independence it was concluded that there was evidence to suggest that users' overall rating of resource conditions was influenced by their gender ($X^2 = 14.24$, $df = 4$, $p = 0.007$). Thus, male and female Dominican park users have different perceptions of changes in resource conditions. A higher percentage (50.7%, $n = 298$) of females rated the overall conditions of the designated trails and other high-use zones as being 'very good' as compared to 38.1% ($n = 273$) of male respondents (Table IV). At the other end of the rating

Table IV. Frequencies and Independent Chi-square Comparisons of Overall Users' Perceptions of Resource Conditions at Emerald Pool and Cabrits and Users' Gender on Dominica.

Gender	Overall Rating Classes (Cell X^2 Contribution) ¹					Totals
	Poor	Fair	Average	Good	Very Good	
Male	3 (0.62)	15 (0.00)	18 (0.57)	133 (3.60)	104 (2.63)	273
Female	1 (0.57)	16 (0.00)	27 (0.53)	103 (3.30)	151 (2.41)	298
Totals	4	31	45	236	255	571

¹ The appropriate SAS statistical analysis option (i.e. Cellchi2) was used in conjunction with Chi-square Tables command to generate individual cell X^2 contribution.

scale, males (1.1%) more often than females (0.3%) judged conditions as being 'poor'.

Additional evidence of such a relationship between users' perceptions and their gender comes from the findings of Tarrant *et al.* 2002:175 who stated, "...Southern women and younger people have stronger biocentric values about forests and stronger pro-environmental attitudes than men and older people".

3.3.2. Relationship between Users' Perceptions of Impacts and their Nationality

The chi-square test of independence was also used to evaluate the relationship between respondents' nationality and their overall rating of resource conditions. To obtain valid results it was necessary to pool categories, and in this regard the variable 'nationality' was grouped into five broad sub-groupings: North American (i.e. U.S.A. and Canada), Caribbean (i.e. all Caribbean islands), Latin American (including Central America), European (i.e. all European countries), and Others (i.e. all other nationalities). Responses about resource conditions were all regrouped into two sub-groupings: 'good' and 'very good' were placed in the same sub-group whereas the other sub-group consisted of the other categories (i.e. 'poor', 'fair', and 'average').

The analysis of the pooled data revealed a significant relationship ($X^2 = 12.43$, $df = 4$, $p = 0.014$), indicating a possible relationship between users' perceptions of impacts and their broad geographic region of nationality (Table V). This perceived relationship may not be irrefutable however, considering the fact that two cells had less than the expected count of five.

3.3.3. Relationship between Users' Perceptions of Resource Impacts and Age

To test this component of the hypothesis the overall rating score of trail disturbance (Survey question 26) was compared to respondents' age (Survey question 31). Results of the initial chi-square analysis revealed that many cells (28.0%) had less than the expected count of five necessary to make the test valid. To overcome this problem rating scores of 'poor' and 'fair' were pooled and the analysis was repeated.

Analysis of the pooled data produced significant results at the 0.05% significance level ($X^2 = 25.71$, $df = 12$, $p = 0.012$) (Table VI). Based on these results there is reason to conclude that users' perceptions are not mutually independent of their age. Put another way, there is evidence to suggest that there is a significant relationship between the two variables based on the pooled data. In comparison to the other age groups, a higher percentage (90.6%, $n = 64$) of respondents in the youngest age group (15-19 years) rated trail conditions as being either 'good' or 'very good.' This is in contrast to 88% ($n = 125$) of the respondents in the 40-49 age group, 85.9% ($n = 142$) of the respondents in the 30-39 age group, and 86.5% (163) of the respondents in the 20-29 age group ratings of 'good' or 'very good' categories.

Closer examination of the data revealed that persons 30 years and older tend to rate the conditions as being 'poor', 'fair' or 'average' more frequently than those in the 15-29 age group. The most frequent score of those in 30-49 years age group was 'good.' Seniors, that is persons 50 years and older, ratings of 'good' (39.5%) were similar to their scores

Table V. Frequencies and Independent Chi-square Comparisons of Overall Users' Perceptions of Resource Conditions at Emerald Pool and Cabrits on Dominica and Users' Nationality Groupings.

	Overall Rating Classes (Cell X^2 Contribution) ¹		
	Poor/Fair Average	Good/Very Good	Totals
Caribbean	15 (1.734)	140 (0.272)	155
European	26 (4.994)	98 (0.784)	124
Latin American	1 (0.040)	8 (0.006)	9
North American	34 (0.599)	252 (0.094)	286
Others	3 (3.374)	5 (0.530)	8
Totals	79	503	582

¹ Pooled categories. The appropriate SAS statistical analysis option (i.e., Cellchi2) was used in conjunction with Chi-square Tables command to generate individual cell X^2 contribution.

Table VI. Frequencies and Independent Chi-square Comparisons of Overall Users' Perceptions of Resource Conditions at Emerald Pool and Cabrits on Dominica and Users' Age Groups.

Age Groups	Overall Rating Classes (Cell X ² Contribution) ¹				
	Poor/Fair	Average	Good	Very good	Totals
15 to 19	1 (1.740)	5 (0.003)	20 (1.736)	38 (3.086)	64
20 to 29	7 (0.364)	15 (0.295)	54 (3.001)	87 (2.747)	163
30 to 39	8 (0.016)	12 (0.036)	70 (1.847)	52 (2.072)	142
40 to 49	7 (0.010)	8 (0.400)	65 (3.035)	45 (2.115)	125
50>	8 (3.023)	6 (0.036)	32 (0.112)	35 (0.04)	81
Totals	31	46	241	257	575

¹ Pooled data categories. The appropriate SAS statistical analysis option (i.e., Celllchi2) was used in conjunction with Chi-square Tables command to generate individual cell X² contribution.

of 'very good.' In this particular case the young and seniors think alike. Except for the relevant cell related to the 50 or older age group all the individual cells associated to 'very good' category contributed 2 or more to the total X² and together the cells associated to categories 'good' contributed 19.79 to the total X² of 25.71 (Table VI). It has been demonstrated in similar studies that "...age influenced public values toward forest and environmental attitudes" (Tarrant *et al.* 2002:185)

4. Conclusions and Policy Implications

Dominica national park users do not seem to be unduly concerned about changes in the resource conditions of the parks. A large percentage of users rated the resource conditions at the study sites as being either 'very good' (30.7% during Phase 1 and 54.2% during Phase 2) or 'good' (52.8% during Phase 1 and 34.2% during Phase 2). The results of the study point to a high level of consistency between Dominica national park users' perceptions of resource conditions. It was evident from the results however, that park users' perceptions of resource conditions were different in some respects to prevailing site conditions.

Data on visitation patterns and users' perceptions of resource conditions are useful guides to management in long-range planning and strategic visioning (Tarrant *et al.* 2002; Hall and Cole 2007). This is particularly important in ecotourism developing island-nation settings such as Dominica, where the ratio of users (residents and visitors) per unit of outdoor recreation area tends to be higher than in the developed nations. However, sound outdoor recreation inventory, monitoring and manage-

ment programs should of necessity focus on both the natural science and social science dimensions of impacts (Manning *et al.* 2006; Saunders *et al.* 2006) given that conservation problems cannot be solved through biological knowledge only (Sanders *et al.* 2006), and also acknowledging the critical importance of documenting and tracking of changes in resource conditions (Marion and Rogers 1994).

The data analysis indicated that respondents' perceptions of changes in resource conditions are related to their gender. The fact that evidence of significant relationships between respondents' perceptions of changes in resource conditions their 'age', and 'broad geographic region of nationality' were detected only after some of the data categories were pooled allude to the need for longer future studies to authenticate or otherwise these findings.

The only aspect of the differences between residents and visitors explored in the study was in respect of the relationship between users' perception of ecological impacts and their nationality. Visitor satisfaction is one of the objectives of resource managers. Thus, an understanding of park users' perceptions of resource conditions will guide future management policies and actions. Future studies, therefore, should explore other differences such as visitation trends, types of visiting groups, users' perception of resource impacts and age and gender, among others, between the two groups.

In light of the results of this study and the conclusions of many other past studies, it is advisable that resource managers should not depend solely on data from visitor surveys "... as sensitive indicators or early warnings of resource deterioration" (Knudson and Curry 1979:94). Marion and Lime (1986) expressed similar opinions. This recommendation should not be interpreted to imply that there is no need for visitor surveys. On the contrary, it would be unwise for resource managers to completely ignore the need for and the results of such surveys, because one of the objectives of management should be to provide opportunities for a satisfying and rewarding experience for the park visitor. Thus, periodic feedback from visitor surveys is indeed useful to management, particularly for purposes of determining whether and to what extent changes in resource conditions affect users' level of satisfaction and outdoor recreation experience.

Management's primary objectives, however, must be to maintain the biological diversity and to protect the overall integrity of the resource base. In this regard resource managers should rely more on the results of continuous monitoring of resource conditions, rather than on the results of periodic visitor surveys, for effective and timely determination of the occurrence of resource impacts in natural areas (Cole 2006).

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