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Linking community and national park development: A case from the Dominican Republic

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Abstract

National parks have complex relationships with local communities that impact both conservation success and community well-being. Integrated conservation and development projects have been a key approach to managing these relationships, although their effectiveness has been increasingly questioned. Park–people relationships of the Armando Bermudez National Park in the Dominican Republic were studied, focusing on forests, aquatic resources, community well-being and development, and ecotourism. The park, established in 1956, is well respected by the community, based on its long history and its role in protecting water resources that are critical to the community. However, management of riparian vegetation and local fisheries present challenges in terms of finding a balance between conservation and development. Hiking and trekking opportunities attract both national and international tourists to the park, and community members benefit from employment as tour guides and providing mule rentals. At the same time, tourism activities also present continuing challenges related to: (1) the distribution of tourism benefits between local people and outsiders, and within the local community, (2) maintaining the local economic benefits of tourism while protecting park resources, and (3) developing park- or conservation-related economic opportunities to complement tourism. The results highlight the need to develop site-specific strategies to manage park–people relationships through interdisciplinary analysis.

Keywords: National parks; Dominican Republic; Conservation and sustainable development; Ecotourism.

1. Introduction

The creation of large protected areas is a fundamental strategy in biodiversity and watershed conservation (Kramer *et al.*, 1997), but their success often depends on effectively managing relationships between parks and local communities. Since the early 1980s, the trend in international conservation has been to manage this relationship through integrated conservation and development projects (McNeely and Miller, 1984; Wells and Brandon, 1992). This approach is based on the idea that providing recognized and significant benefits to park neighbours can enhance local respect for and acceptance of national parks and other protected areas. Building local people's appreciation and acceptance of such areas can be accomplished in a number of ways. One strategy is to provide economic opportunities to local communities directly related to the park, such as employment by the park, employment in the tourism industry, sale of food and handicrafts to tourists, provision of services to local communities, and allowing traditional land uses (Zube and Busch, 1990). Another strategy is the development of economic opportunities outside the park that reduce economic dependence on park resources, such as agricultural, agroforestry, forestry, or fisheries projects.

Recently, the compatibility of conservation and development has been questioned from several perspectives. Redford and Sanderson (1992) argue that conservation and sustainable development are fundamentally incompatible and that efforts to simultaneously pursue both objectives have had few successes. Brandon (1998) and Langholz (1999) have found that economic development projects in communities adjacent to parks may be successful only in changing the nature of the threats to the park — rather than eliminating them. On the other hand, pragmatic approaches have shown that linkages between conservation and development are complex and sometimes counterintuitive and even intensive agricultural development can be compatible with park protection (Brandon, 1998; Schelhas, 1992).

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The existence of 'peaceful' relationships between national parks and adjacent human communities can provide insights into the social, economic, and historical factors that influence the compatibility between conservation and development. The present article examines in detail a case study of the relationships between the gateway park community of La Ciénaga de Manabáo, Dominican Republic, and the Armando Bermudez National Park. Evidence indicates that minimal human encroachment of park resources has occurred since the creation of this park. The authors sought to understand the historical and current relationships between the park and people in this gateway community to provide insights into the factors that contribute towards the current peaceful coexistence, despite poverty. Moreover, the authors helped to identify potential future conflicts and problems and provide recommendations that would help to maintain and improve the quality of life in La Ciénaga and the park. The focus was on socio-economic and ecological issues related to agriculture, natural resources, ecotourism, and the benefits and constraints imposed by the park on the local people.

1.1 Parks and people in the Dominican Republic

First, a brief historical overview of recent social, political and ecological events in the Dominican Republic in needed to place the current situation into context. The country was under rule of the military dictator, Rafael Trujillo, from 1930 to 1961. During this time, Trujillo controlled up to 60% of all arable land in the Dominican Republic (Vargas-Lundius, 1991). In addition, Trujillo built several saw mills throughout the country, including one reputed to be the largest in the world when it was completed (Brothers, 1997), and indiscriminately logged much of the country. Also during this time, the country experienced rapid population growth. The rural population increased at rates that exceeded 2% annually, and the overall population density increased from 18.6 persons per km^2 in 1920 to 117.7 persons per km^2 in 1981 (Geifus, 1993–1994 cited in Brothers, 1997). The simultaneous occurrence of these events resulted in an increasingly impoverished rural population. The assassination of Trujillo in 1961 was followed by massive social and political unrest. Peasant farmers sought to establish claims on lands previously controlled by the dictator and widespread logging occurred as agricultural activities expanded rapidly into forested lands. The widespread social unrest prompted military intervention from the USA in 1965; since then, there has been a series of elected governments and the political situation has remained stable.

Between 1920 and 1967, it was estimated that over 60% of the country's forests were cut or severely degraded, reducing forest cover to only 4% of the country's land area (Brothers, 1997). In response to this rapid deforestation, the Direccion General Forestal (FORESTA) was transferred from the Secretariat of Agriculture to the Armed Forces in 1967 (Law 206). FORESTA immediately closed all sawmills and prohibited all logging in the country. In 1974, the Government created the Direccion Nacional de Parques (DNP) and designated a number of protected areas. In 1974, less than 1% of the country had protected status, but by 1989, 11.2% of the country was so designated (Valdez and Mateo, 1989). By 1994, this percentage had almost doubled (WRI *et al.*, 1994) and, by 1996, over 30% of the country's land area enjoyed protected status (WRI *et al.*, 1998).

Small farmers constitute the bulk of the rural population in the Dominican Republic and the establishment of the many reserves and parks invariably involved costs to resident and adjacent human populations. Over the past several decades, agriculture has expanded into more marginal lands where it has come into conflict with a growing government interest in conservation (Geisler *et al.*, 1997; Guerrero and Rose, 1998; Hartshorn *et al.*, 1981; Zweifler *et al.*, 1994). However, the strength of park management has been uneven, with unclear delineation of responsibilities, little cooperation among different government agencies, and poor park boundary definition (both legally and on the ground) (Hartshorn *et al.*, 1981). As a result, the structures in place to administer and protect national parks have failed and many have been severely degraded (Geisler *et al.*, 1997; Guerrero and Rose, 1998).

2. Methods and approaches

2.1 Study area

The Dominican Republic (48,442 km^2) occupies the eastern two thirds of the island of Hispaniola (77,914 km^2), the second largest island in the Caribbean basin, sharing its only border with Haiti to the west. With a population of approximately 8.2 million, it is one of the more densely populated countries in Latin America (ca. 165 people per km^2). Climatic patterns in the Dominican Republic reflect the strong influence of the prevailing easterly trade winds, so that a marked east-west trend of declining precipitation characterizes the island's environments ranging from wet to semi-arid. Four parallel mountain ranges transect the island in a northwest-southeast direction, which adds considerable heterogeneity to local climate regimes.

The Cordillera Central is the highest and most important mountain range in the country. Extensive areas exceed 2000 m and the highest peaks exceed 3000 m in elevation. Up to 80 km in width and approximately 125 km long, this mountain range occupies much of the central region of the country and is the source of the most important rivers. Trujillo established the Armando Bermudez National Park (766 km^2) in the high mountains of the Cordillera Central in 1956 to protect the headwaters of the Yaque del Norte and Yuna rivers. Later, in 1958, the José de Carmen Ramirez National Park (764 km^2) was established immediately to the south, to protect the headwaters of the Rio Yaque del Sur. Together, these parks make up the Madre de las Aguas

Practicum in Conservation and Sustainable Development" and included six graduate students from different disciplines, four faculty members, and several Dominican counterparts. Information was obtained from:

- Household interviews;
- A community meeting during which approximately 50 people participated in three participatory rural appraisal exercises;
- Vegetation surveys in riparian forests;
- Stream surveys to assess fish populations and habitat; and
- A three day excursion into the park to the summit of Pico Duarte to explore the ecology and infrastructure (trails, campsites and other facilities) of the park.

Interviews with farm households focused on five topical areas:

- Household characteristics and agriculture;
- Education and health;
- The environment;
- Park–community interface; and
- Community organization.

Household interviews were conducted by groups of two or three researchers, with at least one Dominican per group. Interviews were held with 20 families and included individual conversations with women, men and mixed groups. Interviews were also conducted with key informants to learn about guiding in the park, the history and importance of stream fisheries, and riparian vegetation. In addition, the community was invited to participate in three group activities:

- Community mapping;
- Preparation of a historical matrix; and
- Development of an agricultural calendar (see Schoonmaker Freudenberger, 1997).

Following the RRA, a subgroup of the initial research team remained for another four months living and working in the park and community. Subsequent research focused on the ecology of the park (Fahey and Sherman, 1997); however, by living and interacting with the community on a daily basis for an extended period, the authors were able to build upon the findings of the RRA and increase their understanding of the social issues surrounding the community.

3. Results

3.1 Community profile

3.1.1 Agriculture and employment

Agriculture is an important source of food and employment in La Ciénaga. Most households produce a variety of subsistence and cash crops, and also keep livestock. A typical landholding size for a household in the community of La Ciénaga is about 48 *tareas* (16 *tareas* = 1 hectare). Bananas and beans are important subsistence crops, supplemented in the diet with purchased rice. Subsistence crops are generally grown on hillside lands in *conucos*, a traditional polyculture system. More fertile floodplain lands are used for cash cropping of vegetables, including *tayota* (*Sechium edule*), cabbage, tomatoes, and other vegetables. These crops are irrigated with water pumped from the river during the dry season. Coffee has historically been an important cash crop, although damage to coffee plants during Hurricane Georges was severe.

At the time of the appraisal, *tayota* was the principal cash crop. *Tayota* fields range in size from 2 to 10 *tareas* and are placed in river terraces where they can be easily irrigated during the dry season. Vines climb a network of support wires, and the fruits can be harvested year-round. The fruit is generally sold to middlemen who pick up the harvest weekly at the farm gate for transportation to urban areas. Annual price fluctuations are wide, and farmers from La Ciénaga report that the price is best in the dry season when *tayota* production in other regions of the country declines due to poor access to irrigation water.

Off-farm labor is also an important source of income. The primary sources of employment in La Ciénaga are guiding in the park and working on a large coffee plantation. The plantation employs many Haitians at a wage rate considered by the Dominicans to be too low — thus many residents of La Ciénaga choose not to work there. Many young adults leave La Ciénaga to seek employment in nearby towns or cities, often sending back money to their families. Men typically work in construction, and women in factories that make clothing for export or as domestic help. Farm households supplement their income with day labor, by guiding in the park, and by renting out mules for guided tours.

3.1.2 Health

Although there are periods of the year when food is in short supply, malnutrition was not reported to be a problem in La Ciénaga. Community members from the local health committee reported vomiting, fever, and flu to be the major health problems. They stated that diarrhea and intestinal parasites are also common, particularly in children. Many community members drink untreated river water, and the health committee has an ongoing educational programme encouraging the treatment of drinking water with bleach. It should be noted that many community members commented during household interviews on the good quality of water in streams coming out of the park. This contradiction between statements by community members and those of the health committee reflect the fact that drinking untreated water is common in rural areas of the Dominican Republic, and that water in La Ciénaga streams, while technically not potable, is considerably cleaner than that available in many other rural areas of the country. A number of households do not have latrines, and many existing latrines are poorly constructed.

3.1.3 Education and community organizations

There are two schools in La Ciénaga offering primary education from first through sixth grade. Families interviewed felt that it is important that children attend schools and that the schools in La Ciénaga were of good quality. Secondary education is rare, since it requires students to board in urban areas. Teachers draw on the park and environmental NGOs to incorporate environmental education into the school curriculum.

La Ciénaga has several grassroots community organizations that work in agriculture, health, and community development. Among these are several very active organizations with connections to outside non-governmental organizations (NGOs). The park guides have an organization that receives assistance from the Direccion Nacional de Parques and conservation NGOs.

3.2 Park profile

3.2.1 Vegetation and ecology

Hispaniola is unique among the Caribbean islands in that it supports an extensive area of tropical montane forests. These mountains are climatically similar to most other Neotropical mountain ranges and somewhat analogous vegetation zonation has been described (Hartshorn *et al.*, 1981). The vegetation of the ABNP was classified into three major types using the Holdridge life-zone system:

1) Subtropical moist and wet forest zones at the lower elevations (<800 m);
2) Lower montane moist and wet forests at mid-elevations (800–2100 m); and
3) Upper montane wet forest life zone at the highest elevations (Hartshorn *et al.*, 1981).

Perhaps the most distinctive feature of the montane forest vegetation is the predominance of an endemic pine species, *Pinus occidentalis*, throughout most of the region. Monospecific (or nearly monospecific) pine forests occur wherever the likelihood of fire has been relatively high due to lower rainfall (higher elevations and rainshadow effect) and topographic susceptibility (especially ridge tops).

From a management perspective, fire clearly represents the most critical threat to the ecology of the park. The fire regime appears to be a mixture of frequent, low-intensity surface fires and infrequent, high-intensity crown fires. Based on preliminary data obtained from dating fire scars, surface fires appear to have occurred at roughly 20-yr intervals between the mid-19th and mid-20th centuries. It appears that the last major fire year was around 1960, and it seems possible that parts of the forest now are in a condition that would be conducive to crown fires.

Currently, fires are controlled by establishing fire breaks either by burning or digging by hand. Individuals are recruited from local communities and several men from La Ciénaga have been actively involved with fire fighting operations in the past. However, conditions are similar to those in conifer forests in the Rocky Mountains of the U.S., where in extreme fire years, it is impossible to control fires in remote locations. The use of fires to prepare agricultural lands near the park boundary was recently forbidden by FORESTA and park management officials in an effort to prevent the spread of fires into the park.

3.2.2 Water resources and stream habitat

Interviews with community members indicated that, prior to 1979, fish, eels, and crabs were harvested from the streams and made a significant contribution to local diets. However, following Hurricane David in 1979, the stream fauna was completely eliminated from the Yaque del Norte and its tributaries. There was much interest by the local community in restoring a fish population in the Yaque del Norte but there was disagreement as to whether trout, an exotic species, or the native fish, *dajao* (*Agnostomus monticola*), would be most suitable. A non-local group proposed introducing trout into the stream, a species they considered a higher quality fish. Local farmers were more supportive of re-establishing the native fish population.

In general, the water quality and habitat of the river appeared suitable both for trout introductions and restoring the native stream fauna. There was major concern about the social and ecological ramifications of introducing an exotic species to the Yaque del Norte river system. Experience elsewhere has demonstrated that species introductions can result in unexpected and often devastating ecological impacts. An icthyologist and expert on the freshwater fishes in the Dominican Republic said that surveys conducted in the lower sections of the Yaque del Norte indicated a higher species richness than in other rivers in the Dominican Republic but said that the scope and comprehensiveness of existing fish collections was limited. He said that, given the lack of scientific information concerning the upper Yaque del Norte, introducing an exotic species was not a sound management plan.

From a social perspective, the value of trout to local people was questioned. Rainbow trout were recently introduced in a nearby watershed, but local farmers do not harvest the fish for their own consumption. Trout introductions could benefit tourism by attracting sport-fishing enthusiasts and, although there might be indirect economic benefits to the local community, direct benefits would be limited. However, restoring the native stream fauna most likely would benefit the local community by providing an additional source of food and protein that was once an important part of their diets. Our analysis indicated that any fish introductions would invoke a complex set of ecological and socio-economic costs and benefits distributed differently among different stakeholders, local and non-local, with different interests in the Yaque del Norte. A better understanding of the social and ecological ramifications of introducing any fish species into this river system is needed before action is taken.

Flooding caused by Hurricanes David (1979) and Georges (1998) destroyed much of the riparian forests along the rivers, both within and outside the park. At present, there are almost no trees growing along the river bank in the La Ciénaga valley below the park boundary. Aerial photographs indicate that, prior to Hurricane David, a substantial riparian forest (averaging approximately 40 m in width) existed along the banks of the river throughout the La Ciénaga valley below the park boundary. Subsequent interviews with older residents of the community confirmed the existence of this buffer strip and indicated that flooding during Hurricane David destroyed most of these forests. The species used in these riparian buffer strips were primarily fast-growing, non-native trees, and shade coffee was commonly grown in the understory. Interviews with community members revealed widespread recognition of the importance of riparian vegetation and many landholders expressed an interest in reforestation along the stream.

An exceptional opportunity existed to gain an understanding of the ecology of these floodplain forests, as virgin primary forests existed in close proximity to 45-year-old secondary forests growing on former agricultural land that had been abandoned following the establishment of the park. Rapid recovery of forest structure was observed in the second growth forests, as average forest basal area (27.0 m^2/ha ± 5.0 SE) and canopy height (28.9 m ± 1.4) were not different from the old growth stands. The old-growth stands have been repeatedly affected by natural disturbance from hurricanes. Overall, tree species diversity was similar in the primary and secondary forests (average = 12.8 spp. per 0.1 ha plot), but whereas the primary forest contained no exotic tree species, the second-growth stands harbored an average of 2.4 non-native species per 0.1 ha, and two of these exotics exhibited both high dominance (15.3% to 38.7%) of basal area) and successful regeneration in the forest understory. The possible effects of invasion by these exotic tree species into the extremely rare, virgin riparian forests deserves further study.

3.2.3 Tourism and recreational resources

Dominicans have been climbing Pico Duarte, the highest point in the Caribbean, for over 30 years. The climb has become an important tradition for many Dominicans, particularly during the winter months, when large groups visit the park on holidays, such as Independence Day (Feb. 27). Park records indicate that, in 1998, 1093 overnight visitors entered Bermudez National Park from the La Ciénaga ranger station. Dominican groups are often schools or other organized groups, some of which have a history of bringing 100 or more people, and as many as 75 mules, to climb the peak annually. The average size of Dominican groups visiting the park was 11.1 people whereas foreigner visitors averaged 2.3 people per group. Foreign visits are spread more evenly over the year and, because groups are much smaller, require far fewer guides and mules. Recently, the park imposed a group size restriction of a maximum of 30 people per group.

Trips in the park range from 3 to 15 days in length, with 5-day trips being most common. The trail system is limited with one main trail used to climb Pico Duarte. As a result, the trail is heavily used. There are a limited number of designated camping areas with cabins, a kitchen area (wood-burning stove), a large fire pit, and tent camping areas. These camping areas have been reported to have more than 500 visitors in one night during peak visits.

There is currently no information available about visitor experiences in ABNP. Preliminary questions asked of park visitors indicated that important motivations for Dominicans included the challenge of climbing the peak, the opportunity to get away from city life, enjoyment of nature, and reducing stress. Principal complaints were the presence of trash and the poor status of the latrines around the camping areas and the poor condition of the trails. Other potential problems include depletion of firewood, overgrazing by mules, and pollution of the streams by human and animal waste.

3.3 Park–community interactions

During household interviews, people in La Ciénaga were asked how they felt about the park, including whether they thought they benefited from or were harmed by it. Nearly all respondents gave favorable responses (only 2 of 20 people interviewed thought that the park provided no benefits to them). Many respondents were quick to point out that the community had always respected and cared for the park. Specific benefits mentioned were water resources and economic opportunities through tourism.

The economic benefits of the park were widely recognized throughout the community. Most respondents mentioned that the park provides an important source of cash income through opportunities to work as guides, hire out mules, and sell food or services to tourists. The park requires that each group entering the park have a guide. Park officials set the pay scale: in 1999, a guide cost RD$175 per day (RD$16 = US$1); a riding mule was RD$125 per day; and a pack mule RD$100.

Although many of the men in the community work as guides in the park, about one third of the men interviewed did not guide at all. Among those who did work as guides, the number of trips per year ranged from one to fourteen, with 2–5 trips being the common range. Mule owners receive 100% of the mule fees, and often rent out their mules to trips which they do not guide. The authors encountered both people who worked as guides but did not own mules, and people who rented out mules but did not work as guides. Tourist facilities are basically absent in the town of La Ciénaga, although store owners and others did mention selling products or providing cooking services to tourists on occasion.

Direct employment by the park is very limited and employs only three people from La Ciénaga. One former employee mentioned that he had quit because the pay was not enough to live on. Park employees also contribute to environmental education in the local schools.

In spite of the generally favorable view of the park, many people interviewed mentioned negative aspects of the park either on their own or in response to a probe about whether there were any problems associated with living so close to the park. The most common complaint was the prohibition of any extractive activities within the park boundaries. Although most people were in agreement with the need to prohibit cutting of live trees in the park, many felt that the restrictions on collecting dead wood were too extreme. Particularly before Hurricane Georges, when wood outside the park was scarce, residents of La Ciénaga found it difficult to live so close to such a large area of forest without being able to utilize any of its wood.

A number of interviewees felt that the restriction against hunting feral pigs also was too extreme. Feral pigs are the largest and most abundant mammal in the park; the only other mammals are the nocturnal *solenodon* and bats. Prior to the establishment of the park and during its early years, the hunting of feral pigs was a common activity and an important source of meat for the community. One interviewee suggested that since the pigs had escaped from the local people's ancestors, they in fact belonged to the community, not to the park. Several interviewees said that the pigs were destructive to the vegetation due to their rooting behavior. However, the authors observed only localized pig damage to vegetation in their ecological surveys of the park.

Water was often the first benefit mentioned. Respondents believed that they had very good quality drinking water, resulting in the general good health of people in the community. It was also mentioned that La Ciénaga had water when other parts of the country were dry. A reliable water source is important for household use, as well as for irrigation of crops, particularly *tayota*, during dry periods. The value of sufficient water of good quality is rendered even more significant by the poor water supplies in the Dominican Republic in general, and the Rio Yaque del Norte in particular (Witter and Carrasco, 1996).

The daily pay of a park guide is nearly double that received for a day of agricultural labor, and it is clear that guiding and mule rental could be significant sources of income for people in La Ciénaga. Although everyone interviewed indicated that agriculture was a more important source of their livelihoods than guiding, they all stressed that guiding did provide a very important source of scarce cash for them. The only way that guiding could become more important economically would be if opportunities were more evenly distributed throughout the year. In spite of the importance of the cash earned from guiding, many community members complained that the pay was too low in view of the long hours and the responsibilities involved in guiding large and often inexperienced groups. Nevertheless, most interviewees indicated that increased guiding opportunities would be welcomed.

The guides are organized into a guide association, with membership required of all who work as guides in the park. Guides were provided with an introductory training course in 1996, but not all people who guide participated in the training. The guide association meets once a month for regular business, discussion, and further training. Guides are responsible for maintaining the trails and recently made a major investment (reported to be 534 person days) to re-open the trails after Hurricane Georges. All members of the guide association were required to participate in trail maintenance. Some respondents, who did little guiding, felt like they had done more than their share but worked anyway because they did not want to lose the opportunity to guide by falling into bad standing with the association.

Contracting of guides takes place in several ways. Many regular groups have established relationships with a guide who makes all the local arrangements for their annual trip. These guides, known as the *dueño del viaje*, contract additional guides and mules. Other visitors contract guides upon arrival in town without prior arrangements (known as *viajes ambulantes*). There is no established system for rotating these opportunities among members of the association, and guiding opportunities accrue disproportionately to the people who live near the center of town and thereby have easy access to people in search of guide services. For people who live far from the center of La Ciénaga, opportunities to participate in guiding come only when a *dueno del viaje* hires them or their mules for a trip. There is considerable dissatisfaction with this arrangement among those who have fewer opportunities for guiding.

4. Discussion

The relationship between the community of La Ciénaga and Armando Bermúdez National Park (ABNP) provides an opportunity to further our understanding of the complex relationships that exist between parks and people. Recent literature (e.g. Kramer *et al.*, 1997; Redford and Sanderson, 1992; Robinson, 1993) has posed a choice between two opposing approaches: integrated conservation and development projects or strict protection. The former approach seeks to provide benefits to local people to engage their support for conservation efforts; the latter is an exclusionary approach that argues for the strict enforcement of park boundaries and ecosystem protection. The case of La Ciénaga and ABNP presents a more complex picture that supports elements of both approaches. ABNP provides two key benefits to the community of La Ciénaga:

- A reliable source of good quality water; and
- Opportunities for earning scarce cash income through guiding and renting mules.

A third factor that contributes to the high level of local awareness of and respect for the park relates to the fact that the park has been established and actively protected for over four decades. Many of the world's national parks have been established within the last two decades, while ABNP dates

back to 1956. As in the case of many U.S. national parks (Schelhas, 2001), local acceptance of the ABNP appears to have increased over time as people adjust to its presence and begin to realize the associated benefits. However, although this may explain respect for park boundaries, it does little to explain favorable local attitudes towards the park since, in some cases, local people have remained hostile to even very old parks. Hence, it appears that the three factors in combination, economic benefits, ecological benefits, and the long history of the park, contribute to the peaceful coexistence of this local community and its neighbouring park.

Although benefits are strongly recognized in La Ciénaga, they are tempered by feelings that the park also imposes an unreasonable cost on the community by prohibiting collection of dead and downed wood and by prohibiting hunting of feral pigs. These restrictions, imposed on all extractive uses of the park, represent a standard national park management practice (McNeely and Miller, 1984). However, it is also true that parks in many countries, including the U.S., have a long tradition of allowing traditional extractive uses to continue. Furthermore, for the past two decades, parks in less developed countries have been experimenting with carefully regulated extraction activities to provide benefits to local people (Schelhas, 2001; Sharma, 1990; Sharma and Shaw, 1993). Any extractive activity has some impact on park resources, but this has been seen as an acceptable trade-off in order to provide benefits to local people. Relaxation of park policies for collecting downed wood could help avert future potential conflicts. In fact, following Hurricane Georges, the park administration granted special permission to individuals to salvage fallen trees within the park, and arrangements were made for milling these logs at a portable sawmill set up in a nearby community. Examples such as this serve to strengthen the relationship between the community and park administrators. Similarly, if controlled pig hunting was allowed in the park, these relationships could be further strengthened. Many parks have active hunting programmes to eliminate feral animals (Wagner *et al.*, 1995) and it may be possible to meet both resource conservation objectives and community livelihood needs by allowing controlled hunts in the park.

Since extractive uses alone can rarely meet all local development needs and desires without degrading park resources, the development of substitute resources (e.g. fuelwood plantations) and non-park related development options outside the park also are important long-term conservation and development strategies (Sharma and Shaw, 1993). For example, restoration of riparian forests and the stream aquatic community could have both positive ecological and social benefits.

Widespread recognition of the ecological benefits of an intact riparian system and the willingness of landholders to replant was impressive, especially considering that this is prime agricultural land. However, a concerted effort that includes both technical expertise and financial assistance is needed to restore these riparian forests. Any reforestation activities should utilize native tree species to reduce possible negative impacts by exotic species on the natural vegetation of the park. Because riparian forests can have important benefits for maintaining water quality and stabilizing river banks, ensuring the quality of stream habitats, and providing a source of forest products to local landholders, it is possible to meet both resource conservation objectives and community livelihood needs through riparian restoration.

Riparian vegetation provides stream cover (overhanging vegetation and detritus) needed by many aquatic species and helps regulate stream temperatures and is thus closely linked to stream habitat quality. One older interviewee said that, before Hurricane David, the vegetation formed a thick canopy above the stream keeping the water cool year round and fallen logs created pools in the stream where residents would fish. Because fish will move freely within the stream and across park boundaries, the successful re-introduction of native fish populations into the upper Yaque del Norte will require an integrated management effort that considers the broader ecological context of their habitat including riparian restoration in the La Ciénaga valley.

Recent trends in park management policy have emphasized the expansion of ecotourism to increase park benefits to local people (Brandon, 1996; Wells, 1997). However, there is also concern that such tourism primarily benefits non-locals and provides only menial labor opportunities for local people (Brandon, 1996). There are, in fact, few cases in developing countries where ecotourism has provided sufficient returns to make it a key economic activity in a community adjacent to a park. La Ciénaga fits this pattern: even with over a thousand paying visitors per year, guiding is only a supplemental activity to the largely agricultural local economy. There are exceptions, however, such as the community of Tortuguero, Costa Rica, where the presence of a very attractive resource (nesting sea turtles) in a very small community has enabled tourism to dominate the local economy (Place, 1998). The mountain forests of Armando Bermudez National Park may not have as broad an appeal as the nesting turtles of Tortuguero, but La Ciénaga does appear to have significant tourism appeal. A relatively well-developed tourist activity already exists, and there appears to be potential for increasing both the amount of tourists and types of activities.

The interviews with community members of La Ciénaga found that there was strong interest to increase tourism activities, particularly the possibility of having tourism opportunities spread more evenly throughout the year. There appears to be a strong potential for increased foreign tourism. Foreign tourists tend to come in small groups and be backpacker-types, requiring fewer guides and mules than the larger Dominican groups. Large groups provide key economic benefits to many people in the community because they use large numbers of guides and mules, but at the same time, large groups tend to create greater environmental impacts (Hendee *et al.*, 1990). Thus there exists a tension

between protecting park resources and increasing tourism. The current group size restriction of 30 people in ABNP has already resulted in the cancellation of some large school groups with a long tradition of making annual visits to the park, but the current practice of limiting group size without trailhead or campsite quotas does little or nothing to limit park impact, since large numbers of users still visit the park during peak periods. Larger groups can be accommodated through the development of appropriate facilities, regulations on campsite and campfire uses, and careful supervision by park rangers (Hendee *et al.*, 1990).

Increasing the variety of tourist activities nearly always brings costs along with benefits since tourism has a significant potential to degrade park resources. The quality of the trekking experience in Bermudez National Park depends on clean and well-maintained facilities, potable water, and good quality guides. Currently, conditions are acceptable, but the amount of trash and human waste along the trail and in the campsites raises considerable concern for the future quality of visitor experiences and for maintaining the potability of the water in the park. The park employees and guides undertake organized clean-up expeditions from time to time, but there is a clear need to implement stronger measures to ensure proper sanitation practices and prevent littering.

Trail-related erosion is another environmental impact of high backcountry use. Although severe trail damage is often instigated by use, its proximate cause is nearly always uncontrolled water runoff, which can be greatly limited by improved trail construction and maintenance. Investments in trail maintenance must be promoted and financed by park managers, because a trail maintenance regime performed by guides for whom tourism is only a supplemental economic activity is unlikely to be adequate. If trails are improved, the trail system should easily be able to withstand higher levels of use.

Other potential impacts of increased tourism include depletion of firewood and overgrazing by packstock. Currently, the amount of firewood at the campsites appears adequate, but this is in part due to the low use the park receives during much of the year and a high volume of dead and downed wood in the wake of Hurricane Georges. Since most groups prepare their food on wood fires (in fact, until recently, gas stoves were prohibited in the park), there is the potential for depletion of wood supplies. Large numbers of packstock often accompany large groups and are frequently tethered near campsites. Provisions for limiting over-grazing, including the carrying of feed, may need to be implemented in the future. Perhaps of greatest concern to tourism activities is the danger of fires. In an extreme fire year, camping groups deep in the Pico Duarte wilderness would find it almost impossible to escape; hence, tourism activities might need to be regulated during the fire season.

Not all tourism investments opportunities are inside the park. Many trekkers would spend the night or eat a meal in La Ciénaga if facilities were available. There is potential to attract kayakers and other whitewater enthusiasts as well. Furthermore, the area is sufficiently attractive that tourist camps in La Ciénaga could attract day users interested in hiking, horseback riding, swimming, or enjoying the year-round mild temperatures. A hotel is currently being constructed in the center of town by an outsider, and an outside adventure tourism operator (the same person who donated money to build one of the local schools) is considering building a camp for kayakers in town. Community members do not feel they will receive many benefits from such outsider-owned facilities and several are interested in building tourist facilities on their own. If local people are to maximize their benefits from increased tourism, it will be necessary to provide technical and financial assistance during the start-up phases and to the management of small-scale tourist facilities.

5. Conclusions

The peaceful coexistence between the gateway community of La Ciénaga de Manabáo and the Armando Bermudez National Park in the Dominican Republic can be attributed primarily to the strong perception by community members that they receive direct benefits, both economic and ecological, from the park. These benefits are reinforced when they compare their situation to other communities where most suffer from both water shortages and poor water quality. Most members of the community maintain that they have always cared for and respected the park and feel a certain sense of ownership over this resource. Even with these benefits, local support for the park is notable, since the park contains land and forest resources that potentially could be utilized by community members. Certainly the long history of the park has played a critical role in maintaining a positive community–park relationship, because, for most residents, the presence of the park is a well-established norm. Yet, while community members stated little opposition to the park, they often did express interest in being able to use park resources in ways that have varying degrees of compatibility with park conservation objectives. The results of the study of La Ciénaga and ABNP suggest that a park–people relationship should be thought of as a work-in-progress rather than a static, or all-or-nothing, situation. The dual goals of providing benefits to the local community and maintaining park ecological values require continued attention.

The set of conservation/development recommendations presented in this paper were based on unique aspects of this specific case study; however, the general methodologies are applicable to other situations. The authors suggest that integrated conservation and development activities in and around other parks be based on a sound assessment of local park–people relationships and that they provide opportunities for local people to voice their concerns and participate in management decisions.

The present case study illustrates that the stark choice between protected area conservation and human-occupied lands often presented in the literature fails to capture some

of the nuances and mutual interest between protected areas and communities that characterize many real world situations. While some sites do have active conflicts over park ownership that must be addressed, more attention must be paid to the difficult choices inherent in managing regional landscapes that include parks as well as private lands and that require both conservation and meeting human needs. While few such efforts will satisfy all parties, neither will complete park protection nor the absence of protection.

A second important implication of this case study is that while ecotourism can provide significant benefits to communities, it alone may rarely be sufficient to support local communities. Thus integrated conservation and development approaches must be multi-faceted and include other strategies, such as agricultural development. The search for a locally appropriate suite of mutually beneficial conservation and development strategies remains a fundamental challenge of park management.

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References

Anonymous, 1996. *Madre de las Aguas Conservation Area, Cordillera Central*. Dominican Republic Parks in Peril Program Pre-Investment Analysis. Nature Conservancy.

Brandon, K., 1996. Ecotourism and Conservation: A Review of Key Issues. Environment Department Paper No. 33. The World Bank, Washington, DC.

Brandon, K., 1998. Perils to parks: the social context of threats. In: Brandon, K., Redford, K.H., Sanderson, S.E. (Eds.), *Parks in Peril: People, Politics, and Protected Areas*. Island Press, Washington, DC.

Brothers, T.S., 1997. Deforestation in the Dominican Republic: a village-level view. *Environmental Conservation* 24: 213–223.

Dinerstein, E., Olson, D.M., Graham, D.J., Webster, A.L., Pimm, S.A., Bookbinder, M.P., Ledec, G., 1995. *A Conservation Assessment of the Terrestrial Ecoregions of Latin America and the Caribbean*. The World Bank, Washington, DC.

Fahey, T.J., Sherman, R.E., 1997. Vegetation-Environment Relationships in Forest Ecosystems of the Madre de las Aguas Conservation Area, Dominican Republic. Proposal to The Nature Conservancy. Cornell University, Ithaca, NY.

Geisler, C., Warne, R., Barton, A., 1997. The wandering commons: a conservation conundrum in the Dominican Republic. *Agriculture and Human Values* 14: 325–335.

Guerrero, K., Rose, D.A., 1998. Dominican Republic: Del Este National Park. In: Brandon, K., Redford, K.H., Sanderson, S.E. (Eds.), *Parks in Peril: People, Politics, and Protected Areas*. Island Press, Washington, DC.

Hartshorn, G., Antonini, G., DuBois, R., Harcharik, D., Heckadon, S., Newton, H., Quesada, C., Shores, J., Stables, G., 1981. *The Dominican Republic: Country Environmental Profile. A Field Study*. USAID/SOD/PDC-0247. JRB Associates, McClean, VA.

Hendee, J.C., Stankey, G.H., Lucas, R.C., 1990. *Wilderness Management*. North American Press, Golden, Colorado.

Kramer, R., van Schaik, C., Johnson, J., 1997. *Last Stand: Protected Areas and the Defense of Tropical Biodiversity*. Oxford University Press, New York.

Langholz, J., 1999. Exploring the effects of alternative income opportunities on rainforest use: insights from Guatemala's Maya Biosphere Reserve. *Society and Natural Resources* 12: 139–149.

McNeely, J.A., Miller, K.R., 1984. *National Parks, Conservation, and Development: The Role of Protected Areas in Sustaining Society*. Smithsonian Institution Press, Washington, DC.

Place, S.E., 1998. The impact of national park development on Tortuguero, Costa Rica. *Journal of Cultural Geography* 9: 37–52.

Redford, K.H., Sanderson, S.E., 1992. The brief barren marriage of biodiversity and sustainability. *Bulletin of the Ecological Society of America* 73: 36–39.

Robinson, J., 1993. The limits to caring: sustainable living and the loss of biodiversity. *Conservation and Biology* 7: 20–27.

Schelhas, J., 1992. Socio-economic and biological analysis for buffer zone establishment. In: Willison, J.H.M., Bondrup-Nielsen, S., Drysdale, C., Herman, T.B., Munro, N.W.P., Pollock, T.L. (Eds.), *Science and the Management of Protected Areas*. Elsevier, Amsterdam.

Schelhas, J., 2001 in press. The U.S. national parks in international perspective: have we learned the wrong lesson? *Environmental Conservation* 28(4): xx–xx.

Schoonmaker Freudenberger, K., 1994. *Tree and Land Tenure: Rapid Appraisal Tools*. FAO, Rome.

Sharma, U.R., 1990. An overview of park–people interactions in Royal Chitwan National Park, Nepal. *Landscape and Urban Planning* 19: 133–144.

Sharma, U.R., Shaw, W.W., 1993. Role of Nepal's Royal Chitwan National Park in meeting the grazing and fodder needs of local people. *Environmental Conservation* 20: 139–142.

Valdez Sierra, G., Mateo Felix, J.M., 1989. *Sistema de areas protegidas de Republica Dominicana*. Direccion Nacional de Parques, Santo Domingo, R.D.

Vargus-Lundius, R., 1991. *Peasants in Distress: Poverty and Unemployment in the Dominican Republic*. Westview Press, Boulder, CO.

Wagner, F.H., Foresta, R., Gill, R.B., McCullough, D.R., Pelton, M.R., Porter, W.F., Salwasser, H., Sax, J.L., 1995. *Wildlife Policies in the U.S. National Parks*. Island Press, Washington, DC.

Wells, M.P., 1997. Economic Perspectives on Nature Tourism, Conservation and Development. Environment Department Paper No. 55. The World Bank, Washington, DC.

Wells, M.P., Brandon, K., 1992. *People and Parks: Linking Protected Area Management with Local Communities*. The World Bank, Washington, DC.

Witter, S.G., Carrasco, D.A., 1996. Water quality: a development bomb waiting to explode. *Ambio* 25(3): 199–204.

WRI, UNEP, UNDP, World Bank, 1994. *World Resources 1994–95*. Oxford University Press, New York.

WRI, UNEP, UNDP, World Bank, 1998. *World Resources 1998–99*. Oxford University Press, New York.

Zube, E.H., Busch, M.L., 1990. Park–people relationships: an international review. *Landscape and Urban Planning* 19: 117–131.

Zweifler, M.O., Gold, M.A., Thomas, R.N., 1994. Land use evolution in hill regions of the Dominican Republic. *Professional Geographer* 46: 39–53.