



International Ecotourism and the Valuation of Tropical Rainforests in Costa Rica

Susan Menkhaus and Douglas J. Lober*

School of the Environment, Duke University, P.O. Box 90328, Durham, NC 27708, U.S.A.

Received 23 January 1995; accepted 5 September 1995

Tropical rainforests have many values beyond the timber they hold and their potential as sites for agriculture and cattle grazing. This study examined one of these additional values, rainforests as places for ecotourism. The study determined the value that tourists from the U.S. place on Costa Rican rainforests as ecotourism destinations, using the Monteverde Cloud Forest Reserve as a sampling site for tourism to Costa Rica's protected areas. The valuation method used was the travel cost model, a non-market valuation approach which uses travel expenses as a proxy for the value of the park. Data were collected by a survey of 240 U.S. tourists. This study found that the value placed by U.S. ecotourists on visiting Costa Rican rainforests was \$1150 per visit. This value can be used in policy making to better assess all the alternative land uses available.

© 1996 Academic Press Limited

Keywords: tropical rainforest, protected areas, non-market valuation, ecotourism, travel cost.

1. Introduction

Deforestation in the tropics, with its related effects of climate change, loss of biodiversity, and removal of valuable ecosystem functions, has emerged as a problem of global significance. Policy-makers and researchers have developed mechanisms and tools to slow or stop the loss of tropical forests, including establishing protected areas and reducing or eliminating subsidies and other incentives which encourage deforestation. As part of this process, there is a need to expand the understanding of the range of values which can be attributed to rainforests. These values include medicinal, non-timber products, biodiversity and ecotourism values (Peters *et al.*, 1989; Balick and Mendelsohn, 1992; Mercer *et al.*, 1995). These latter values are often excluded or inaccurately measured in most market transactions.

* *Please send all correspondence to this author*

One method for estimating some of these non-market benefits is the travel cost method. This tool estimates ecotourism benefits of a protected area based upon observed travel expenses by visitors to the area. Estimates of the total benefits can then be used by policy-makers for such actions as comparing alternative land uses, prioritizing limited public funding, or altering current entrance fee structures.

The main objective of this study was to use the travel cost model to empirically estimate the value of ecotourism benefits of tropical protected areas in Costa Rica to tourists from the United States. This estimate will help to expand the limited empirical studies evaluating international ecotourism in developing countries which exist in the literature. A secondary objective was to determine the importance of international ecotourism relative to domestic ecotourism at the Monteverde Cloud Forest Biological Reserve.

2. The travel cost method

Unlike the prices for private goods in efficient markets, the price of some goods, such as ecotourism, if measured only by direct costs such as entrance fees to parks, may not reflect the degree to which these goods are valued. This inaccurate pricing can result in lost revenue or underestimation of the importance of the good. One solution to this problem is to estimate visitors' willingness to pay for the good by using the travel cost model. This model provides an estimate of the benefits individuals receive from visiting a site by observing their travel-related expenses (Clawson and Knetsch, 1966; Krutilla and Fisher, 1975; Dixon and Sherman, 1991; Freeman, 1993).

The travel cost model requires the determination of a demand curve for visits to the protected area. The demand curve establishes a function between the price of a good (or visit) and the quantity of the good consumed. It is usually downward sloping as at higher prices, fewer people will visit, while at lower prices, the number of visitors is greater. The consumer surplus, or area under the demand curve but above the price, is a measure of the ecotourism value of this reserve.

Most published travel cost studies have focused on domestic tourism in developed countries (Smith, 1990; Freeman, 1993). A few travel cost studies have evaluated domestic tourism within developing countries (Grandstaff and Dixon, 1986; Tobias and Mendelsohn, 1991). Very few studies, however, have examined the value of international ecotourism in developing countries (Brown and Henry, 1989; Maille and Mendelsohn, 1993; Mercer *et al.*, 1995). This gap in information regarding the value of international ecotourism is significant because of the potential economic and political role of the international community in helping developing countries achieve conservation goals. The travel cost method offers one option for providing estimates of the economic value of international ecotourism.

3. Costa Rica and the Monteverde Cloud Forest Biological Reserve

Costa Rica, a country of little over 3 million inhabitants, has a wealth of biological diversity. Holdridge *et al.* (1971) list an extraordinary range of ecosystems which exist in the country, including 12 different life zones ranging from tropical dry to tropical wet to tropical sub-alpine. In fact, over one quarter of the country is located within 29 parks and protected areas, one of the highest protection rates in the world (Fundacion Neotropica, 1988). Yet, despite this high level of protection, Costa Rica has extremely high rates of deforestation due to population pressures and other factors.

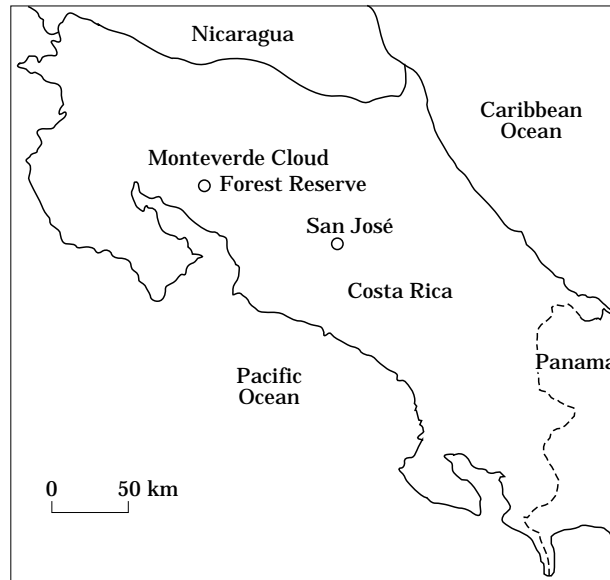


Figure 1. Location of Monteverde Biological Cloud Forest Reserve in Costa Rica.

Tourists, particularly from the United States, have increasingly come to visit Costa Rica's protected areas. In 1990, Costa Rica had 435 000 international tourists, of which 35%, or 152 200, were from the United States. Of these U.S. tourists, 39%, or 59 400, identified nature or seeing the country as their primary reason for visiting Costa Rica (Instituto Costarricense de Turismo, 1993).

The private Monteverde Cloud Forest Biological Reserve was selected as the sample site for assessing the value of ecotourism in Costa Rica as it is one of the four major ecotourism destinations in Costa Rica (Fennell, 1990). Many ecotourists pass through Monteverde due to its unique flora and fauna, its impressiveness, its accessibility, and its tourist accommodations. The Reserve is one of the few remaining fragments of the tropical cloud forest, a rare type of ecosystem found in few places of the world. This system is characterized by nearly constant clouds, "horizontal" rainfall, and vegetation associated with these conditions. It is home to the resplendent quetzal (*Pharomachrus mocinno*), a spectacular large bird of red, green and white that has played a major cultural role in central America. The Reserve, located in the Tilaran Mountains of central Costa Rica, is only a 4 hour drive from the capital city of San Jose (Figure 1). It also has high quality visitor services in the form of numerous hotels, a visitor center and the availability of guides (Lober, 1992).

Tourist visitation at the Reserve has grown rapidly from 471 visitors in 1974 to 26 660 tourists in 1990 (Figure 2; *Monteverde Cloud Forest Reserve Visitor Book*, 1990). Approximately 12% of these visitors in 1990 were from Costa Rica and 88% were from abroad. The visits to Monteverde are distributed throughout the year in a manner that corresponds with climatic conditions as well as the likelihood of observing birdlife. According to Reserve officials, the month of July is relatively representative of the overall mix of tourists. In July 1990, 73% of the total foreign visitors were from the United States (*Monteverde Cloud Forest Reserve Visitor Book*, 1990). Therefore,

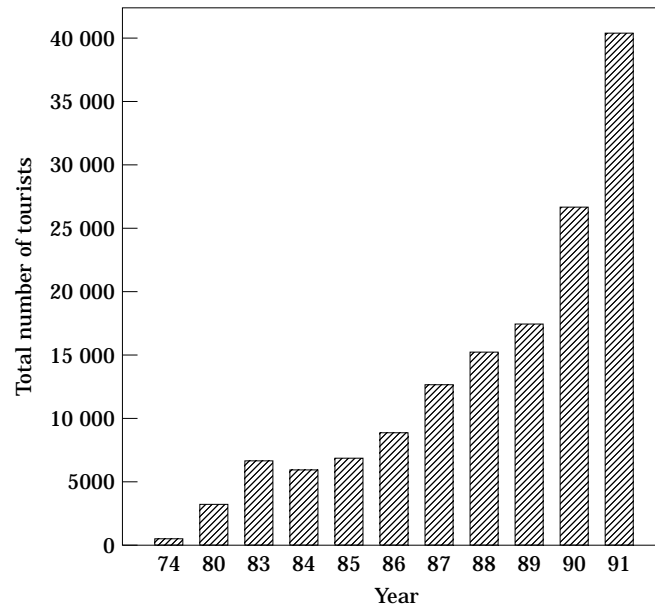


Figure 2. Tourist growth at Monteverde Biological Cloud Forest Reserve.

approximately 17 100 of Monteverde's 23 500 international tourists who visited during 1990 were estimated to be from the U.S.

4. Sampling methodology

In order to assess the travel costs that individuals incurred in visiting the reserve, a sample of 320 international visitors to Monteverde Cloud Forest Reserve were surveyed. These surveys were conducted over a 3-month period from June to August 1990. The Reserve had one main entrance at the time of the study, so it was possible at this location to sample virtually all international tourists who visited during the sampling period.

Visitors were given in-person interviews conducted by one U.S. interviewer. The sampling was random and took place at different times of day and during all days of the week to ensure a representative sample. Individuals were asked to indicate information about the cost of their airfare and in-country travel expenses as well as socio-economic variables such as age, income and education. In addition, they were asked to indicate other destinations they had visited or would visit in Costa Rica.

The response rate was extremely high with less than 5% of those asked to complete the survey refusing to respond. Of the 240 U.S. tourists interviewed, 176 were able to provide complete travel expense information. A summary of the socio-economic background of the sampled population is provided in Table 1. This information indicates a relatively educated and wealthy group of individuals visiting Monteverde, a finding consistent with that of the ecotourism literature (Fennell, 1990).

5. International travel cost methodological issues

Due to the extensive amount of literature available regarding methodological issues in travel cost studies, this paper only discusses some of the key methodological issues

TABLE 1. Summary of socio-economic characteristics of ecotourists visiting Monteverde Cloud Forest Reserve in 1990 ($N=176$)

| Variable | Response category | Percentage of sample (%) |
|--|-----------------------|--------------------------|
| Number of other parks visited in Costa Rica | 0 | 6 |
| | 1-2 | 38 |
| | 3-5 | 43 |
| | 6+ | 11 |
| | No response | 2 |
| Number of days spent in Costa Rica | 0-10 | 21 |
| | 11-20 | 33 |
| | 21-40 | 27 |
| | 41+ | 19 |
| Percentage of time spent at Monteverde while in Costa Rica (%) | 0-10 | 26 |
| | 11-20 | 35 |
| | 21-50 | 28 |
| | 50+ | 9 |
| | No response | 1 |
| Education level | High school | 15 |
| | College or university | 36 |
| | Graduate school+ | 49 |
| Income level (per capita) | 0-\$15 000 | 34 |
| | \$15 000-\$30 000 | 22 |
| | \$30 000-\$45 000 | 15 |
| | \$45 000-\$60 000 | 9 |
| | \$60 000+ | 19 |
| | No response | 1 |

which have particular relevance for international travel cost studies (Freeman, 1993). These include the quantity value used for defining the demand curve and multi-purpose visits.

Use of the travel cost method for international visitation is complicated by the difficulty in determining the quantity of environmental good demanded. Previous studies have frequently defined the quantity of visits demanded by rates of visitation from zones established by the researcher based upon average travel costs from the zone (Tobias and Mendelsohn, 1991; Maille and Mendelsohn, 1993). However, given the nature of international travel fares, travel expenses to a site from locations within certain geographic regions, even large ones, may not correlate with distance. For example, the airfares from New York to Costa Rica and from California to Costa Rica may not differ significantly, although the distances are significantly different.

Regression analyses examining travel expenses from states in the U.S. against visitation rates from these states and other regional socio-economic variables, such as population density and average per capita income, indicated that no strong correlation existed between average cost of travel and visitation rates from a U.S. state. This finding was further substantiated by examining the range of travel expenses from several states. The variation among average state travel expenses was minimal, although

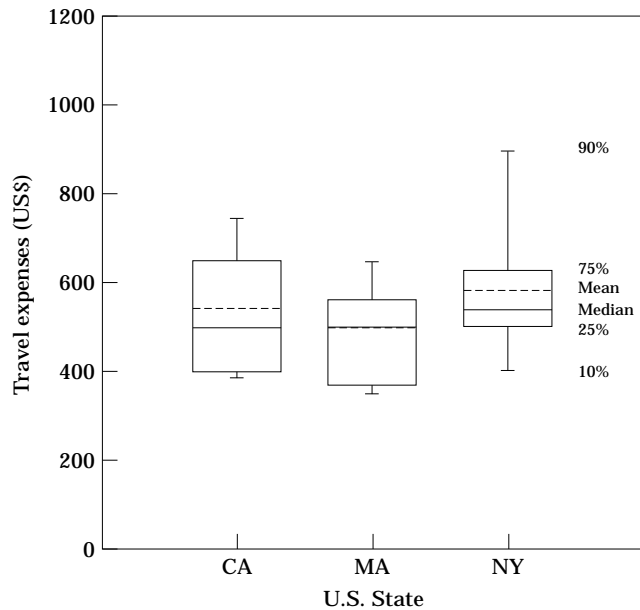


Figure 3. Box-whisker plot of average and range of airfares from three U.S. States to Costa Rica in 1990.

considerable variation existed within each state. Figure 3 provides a box-whisker plot showing the range of travel expense values for three representative states. The diagram supports the contention that designating an average travel expense from each of these states to be used for visitation rate analysis would be misleading.

An alternative methodological approach supported by this analysis is to treat all of the tourists from the United States, regardless of their home state, as from a single point of origin. A demand curve was then produced by evaluating the aggregate number of tourists (converted into a percentage) who demonstrated through their travel expenditures that they were willing to pay travel expenses of *at least* a given amount in order to visit the park. This approach uses the basic approach for formulating demand curves which assumes that all individuals are exposed to the same range of prices.

The sample of people visiting the Monteverde Cloud Forest Biological Reserve was then used as a proxy for those U.S. tourists visiting all Costa Rican parks and reserves to produce a demand curve for visits to ecotourism regions in Costa Rica. This avoids the methodological issue of correctly allocating costs to several different sites (Clough and Meister, 1991).

A second international travel cost methodological issue which is relevant for this study is the issue of multi-purpose visits. Multi-purpose visits occur when an individual travels to a region for several reasons, such as visiting a park, seeing family members or touring archeological sites. When a visit to a region has many different purposes, it is not appropriate to attribute all of the travel expenses to one activity. Travel expenses in the form of airfare and in-country spending cannot be used entirely to determine the value of the ecotourism if people visit Costa Rica for other reasons in addition to eco-tourism. Data on ecotourist visits, as mentioned above, provide an estimate of the total number of U.S. visitors who come to Costa Rica primarily for ecotourism reasons (Instituto Costarricense de Turismo, 1993). Further, on-site surveying of the visitors to

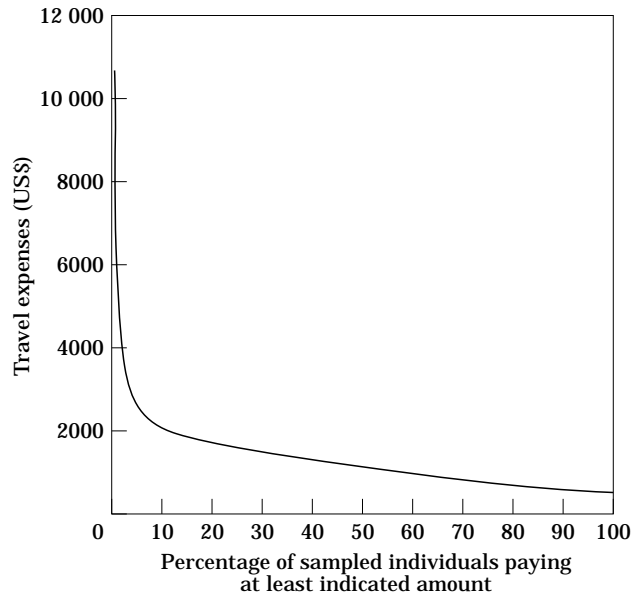


Figure 4. U.S. demand for ecotourism in Costa Rica.

Monteverde confirms that ecotourism seems to be their sole motivation for travel to Costa Rica. The tourists at Monteverde were asked to indicate which other sites they visited in the country and 95% listed national parks and other natural scenic areas as their only additional tourist destinations.

6. Results

The data were used to produce a demand curve reflecting the ecotourism value of Costa Rica by U.S. tourists (Figure 4). The demand curve was defined by 117 different points representing the 117 different travel expense values identified by the respondents. The travel expenses, as defined by the airfare to Costa Rica plus in-country expenses, were plotted against the **percentage** of the sampled population, demonstrating through travel expenditures that they were willing to pay *at least* that designated amount.

In order to determine the value of ecotourism, the area under the curve but above the price was estimated. The data in Figure 4 was fitted to a polynomial equation with the following parameter estimates (standard errors in parentheses).

$$V = -1.78 \times 10^{-9} P^3 + 3.05 \times 10^{-5} P^2 - 0.12 P + 134.07$$

$$(1.11 \times 10^{-10}) \quad (1.70 \times 10^{-6}) \quad (0.0) \quad (3.67)$$

Standard error of estimation = 9.74

Adjusted $R^2 = 0.90$

Where: P is the total travel expenses for trips to Costa Rica from the U.S. in 1990 dollars; V is the percentage of sampled population demonstrating through travel expenses that they are willing to pay at least the designated amount.

The R^2 and the low standard error for the V estimate indicate a well-defined curve.

This specification accurately reflects the parabolic shape of the $V-P$ relationship at higher prices while, at lower prices, the curve indicates a line truncated at 100%. In part, this relationship is due to the definition of the V variable as a percentage. Although the model was also run with the P^{-1} variable, the t-statistic indicated that this variable was not significant.

Consumer surplus was estimated to be approximately \$1150, representing the average annual per person valuation of the ecotourism value of protected areas in Costa Rica for the sample. This consumer surplus value can be used to determine an annual ecotourism value of Costa Rica's rainforests for the entire U.S. tourist population who would visit Costa Rica for ecotourist reasons. Multiplying the number of ecotourist visitors from the U.S. by the per person consumer surplus gives a value of approximately \$68 million.

These values can be compared to the others appearing in the literature. Maille and Mendelsohn (1991), for example, found a consumer surplus for ecotourism demand in Madagascar of between \$276 and \$360 per person. Given 8000 nature tourists in 1987, this would suggest a total value of between 2 and 3 million dollars. Mercer *et al.* (1995) found that the establishment of a new national park in Madagascar would increase consumer surplus by up to \$23 per tourist or a total annual increase in consumer surplus of \$89 400. Brown and Henry (1989) found that the 265 000 to 300 000 tourists on safari in Kenya in 1989 received a consumer surplus of \$182-\$210 million or around \$700 per tourist. The higher per capita consumer surplus findings of our Monteverde study might be explained by many factors including the relative nearness of Costa Rica to the U.S.

Although a total value for ecotourism in Costa Rica has been estimated, it may also be beneficial to value individual reserves. We used a simple method to provide an estimate of the ecotourist value of Monteverde Cloud Forest Reserve. The number of U.S. visitors to Monteverde, 17 100, was multiplied by the average consumer surplus and adjusted for the percentage of time in Costa Rica that was spent at Monteverde based on survey responses. This resulted in a total yearly U.S. ecotourism value of \$4.5 million for the Monteverde Cloud Forest Reserve. This result is greater than that found by Echeverria *et al.* (1995), who used contingent valuation to estimate an annual ecotourism value of \$2 million for Monteverde.

One of this study's goals was to estimate the value of international ecotourism relative to local tourism. A previous study at Monteverde using the travel cost model found that the Reserve had a domestic ecotourism value of about \$35 per visit or an annual total value of \$97 500-116 200 for the year 1988 (Tobias and Mendelsohn, 1993). The Tobias and Mendelsohn study of domestic tourism estimated that the value of foreign visitation would be between \$400 000-500 000, based only on the greater number of foreign visitors to the site. However, it suggested that the true value was likely to be higher due to the lack of substitutes for U.S. tourists as well as U.S. visitors' higher levels of income. Though other locations such as the Galapagos, Belize, Guatemala and Brazil might be considered substitutes for Costa Rica, few of these places have the quality of tourist and transportation facilities, range of natural sites, safe host country and ease of visitation that are associated with Costa Rica parks. Our findings not only confirm that the value of international tourism is greater than domestic tourism but provide a more accurate estimate.

7. Discussion

Costa Rica is experiencing rapid growth in both general tourism and in ecotourism. The numbers of international tourists visiting Costa Rica have increased from 435 000

in 1990 to 610 000 in 1992 and the five-year annual growth rate has been 17%. Monteverde has also experienced this rapid increase in tourists with 40 000 visitors visiting the Reserve in 1991, up from 26 000 in 1990. The resulting large and growing ecotourism values represented by these visitors need to be determined and utilized in policymaking for several reasons.

First, these results can be used in an overall cost-benefit analysis of the protected area system in Costa Rica. The costs of preservation are typically in the form of foregone development or resource extraction options. Estimates from the travel cost method can be used to ensure that ecotourism benefits are included in any potential land management analysis. Second, an international travel cost study provides particular information regarding the role that foreign tourists play in utilizing and valuing scarce tropical resources. This knowledge might facilitate the transfer of additional resources from the wealthier to less wealthy countries for resource conservation. The results can be used, for example, to calculate new, higher entrance fees which more adequately reflect the ecotourism benefit of the area. In our study, this can be calculated by dividing the consumer surplus of \$1150 by the 29 parks and protected areas to suggest an average entrance fee of \$40 per park, considerably higher than the \$5-10 usually charged.

This study does not address many of the ecotourism issues which have arisen with the growth in this activity. Ecotourism can have a negative as well as a positive impact on a region. The number of tourists can exceed the carrying capacity of the reserve, destroying fragile habitats (Martin and Uysal, 1990). Distributional issues can also play an important role in evaluating ecotourism projects as the local population may not receive any of the benefits of tourism (Murty and Menkhaus, 1994). Finally, a privileged group of the wealthy may be the primary beneficiaries of ecotourism benefits (Thrupp, 1990). Nonetheless, determining the value of a protected area to those who are able to pay for it seems an important step in promoting conservation.

8. Conclusion

Tropical rainforests, which have traditionally been viewed as sources of wood or potential sites to graze cattle or practice agriculture, have many other values, such as for ecotourism, medicines and non-timber products. Ecotourism is difficult to value in private markets but its value can be estimated by the travel cost model. Given that foreign ecotourism can often be a significant part of total tourism, it is crucial to include this component in any ecotourism estimate. This study has indicated the importance U.S. tourists place on visits to a biological reserve in Costa Rica. This ecotourism value can then be used to achieve a more efficient allocation of domestic or international funding for the preservation of biological diversity.

We wish to acknowledge the assistance of the Monteverde Conservation League and the Tropical Science Center. We would also like to thank Bruce Faust, Gabriel Katul, Randy Kramer, Evan Mercer, Ram Oren and Subhrendu Pattanayak for their comments and assistance.

References

- Balick, M. J. and Mendelsohn, R. (1992). Assessing the economic value of traditional medicine from tropical rain forests. *Conservation Biology* 6, 128-130.
- Brown, G. and Henry, W. (1989). *The Economic Value of Elephants*. LEEC Discussion Paper 89-12. London: Environmental Economics Centre.

- Clawson, M. and Knetsch, J. L. (1966). *Economics of Outdoor Recreation*. Baltimore: The Johns Hopkins Press.
- Clough, P. W. J. and Meister, A. D. (1991). Allowing for multi-site visitors in travel cost analysis. *Journal of Environmental Management* **32**, 115-125.
- Dixon, J. A. and Sherman, P. B. (1991). Economics of protected areas. *Ambio* **20**, 68-74.
- Echeverria, J., Hanrahan, M. and Solorzano, R. (1995). Valuation of non-priced amenities provided by the biological resources within the Monteverde Cloud Forest Preserve, Costa Rica. *Ecological Economics* **13**, 43-52.
- Fennell, D. A. (1990). *A profile of ecotourists and the benefits derived from their experience: A Costa Rican case study*. Waterloo, Ontario, Canada: Department of Recreation and Leisure Sciences.
- Freeman, A. M. III (1993). *The Measurement of Environmental and Resource Values: Theory and Methods*. Washington, D.C.: Resources for the Future.
- Fundacion Neotropica (1988). *Desarrollo Socioeconomico y el Ambiente Naturel de Costa Rica*. San Jose, Costa Rica: Fundacion Neotropica.
- Grandstaff, S. and Dixon, J. A. (1986). Evaluation of Lumpinee Public Park in Bangkok, Thailand. In *Economic Valuation Techniques for the Environment: A Case Study Workbook* (J. A. Dixon and M. M. Hafschmidt, eds.) Baltimore: Johns Hopkins University Press.
- Holdridge, L. R., Grenke, W. C., Hatheway, W. H., Liang, T. and Tosi, Jr., J. A. (1971). *Forest Environments in Tropical Life Zones: A Pilot Study*. New York: Pergamon Press.
- Instituto Costarricense de Turismo (1993). *Plan Estrategico de Desarrollo Turistico Sustentable de Costa Rica (1993-1998)*. San Jose, Costa Rica: Comision de La comunidad Europea y el instituto costarricense de turismo.
- Krutilla, J. V. and Fisher, A. C. (1975). *The Economics of Natural Environments: Studies in Valuation of Commodity and Amenity Resources*. Baltimore: The Johns Hopkins University Press for Resources for the Future.
- Lober, D. J. (1992). Using forest guards to protect a biological reserve in Costa Rica: one step towards linking parks to people. *Journal of Environmental Planning and Management* **35(1)**, 17-41.
- Maille, P. and Mendelsohn, R. (1993). Valuing ecotourism in Madagascar. *Journal of Environmental Management* **38**, 213-218.
- Martin, B. S. and Uysal, M. (1990). An examination of the relationship between carrying capacity and the tourism lifecycle: management and policy implications. *Journal of Environmental Management* **31**, 327-333.
- Mercer, E., Kramer, R. A. and Sharma, N. (1995). Rainforest tourism: estimating the benefits of tourism development in a new National Park in Madagascar. *Journal of Forest Economics* **1**, 239-269.
- Monteverde Cloud Forest Reserve Visitor Book* (1990). Monteverde: Tropical Science Center.
- Murty, M. N. and Menkhaus, S. M. (1994). Economic and other benefits of wildlife preservation: a case study of Keoladeo National Park, Bharatpur, Rajasthan. Working paper. New Delhi, India: Institute of Economic Growth.
- Peters, C., Gentry, A. H. and Mendelsohn, R. (1989). Valuation of a tropical forest in Peruvian Amazonia. *Nature* **339**, 655-656.
- Smith, V. Kerry (1990). Can we measure the economic value of environmental amenities? *Southern Economic Journal* **56**, 19-32.
- Thrupp, L. A. (1990). Environmental initiatives in Costa Rica: a political ecology perspective. *Society and Natural Resources* **3**, 243-256.
- Tobias, D. and Mendelsohn, R. (1991). Valuing ecotourism in a tropical rainforest reserve. *Ambio* **20**, 91-93.
- Tropical Science Center (1982). *Costa Rica: Country Environmental Profile*. San Jose, Costa Rica: Tropical Science Center.