CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA

PROGRAMA DE ENSEÑANZA PARA EL DESARROLLO Y LA CONSERVACION

ESCUELA DE POSTGRADO



# ESTIMATING PROTECTED AREA REVENUE IN ANTIGUA AND BARBUDA: AN EVALUATION OF THE CVM FOR LAND USE PLANNING IN A DEVELOPING COUNTRY

POR

McRONNIE H. D. HENRY

Turrialba, Costa Rica
1997

CENTRO AGRONOMICO TROPICAL DE
INVESTIGATION Y ENSEÑANZA

PROGRAMA DE EDUCACION
ESCUELA DE POSTGRADO



CATIE

# ESTIMATING PROTECTED AREA REVENUE IN ANTIGUA AND BARBUDA: AN EVALUATION OF THE CVM FOR LAND USE PLANNING IN A DEVELOPING COUNTRY

Tesis sometida a la consideración de la escuela de Postgrado, Programa de Educación en Ciencias Agricolas y Recursos Naturales del Centro Agronomico Tropical de Investigación Enseñanza, para optar por el grado de

*Magister Scientiae*

Por

McRonnie H. D. Henry

Turrialba, Costa Rica
1997

Esta tesis ha sido aceptada en su presente forma, por la Jefatura del Area de Postgrado en Ciencias Agrícolas y Recursos Naturales del CATIE y aprobada por el Comité Asesor del estudiante como requisito parcial para optar al grado de:

*MAGISTER SCIENTIAE*

FIRMANTES:

Steven Shultz
Profesor Consejero

Octavio Ramírez
Miembro Comité Asesor

José Villa
Miembro Comité Asesor

Juan A. Aguirre
Jefe, Area de Postgrado

Markku Kanninen
Director, Programa de Enseñanza

McRonnie H.D. Henry
Candidato

ACKNOWLEDGEMENTS

I would like to thank my wife, Joycelyn and two sons (Ariel and Tristan) for their love, patience and understanding during the many months that I have been away from home. My thanks also to the German Service for Academic Exchange (DAAD) for providing me with the scholarship that enabled me to undertake this programme of studies. I must give thanks also to Dr. Juan Aguirre on behalf of CATIE and the Post Graduate School for accepting me into the Master's programme and for securing the scholarship on my behalf. I am particularly indebted to Dr. Steven Shultz, - Academic Advisor - for his guidance throughout all stages of my research, and for his reviews and valuable comments on all earlier drafts. I thank also the other members of my advisory committee - Dr. Octavio Ramirez and Jose Villa for their guidance and support. Special thanks and appreciation to Herminia Palacios for her encouragement and kind support and also to my friend Juan Carlos Godoy. Finally, I am grateful to the numerous individuals, including my class mates, who encouraged and assisted me through the tough times and who contributed in any way to my eventual success.

## ABSTRACT

A contingent valuation method (CVM) survey was administered to two groups of foreign visitors and two groups of local residents, representing both actual and potential visitors to the proposed Wallings Forest National Park in Antigua, during the period April to August, 1997. The primary objectives were to determine the willingness to pay (WTP) for entrance fees to the proposed park, and to evaluate the CVM as a useful valuation technique for protected area planning in the context of Antigua and Barbuda and other developing countries of the Caribbean. Secondary objectives included evaluating the possible existence of information bias by examining the differences in WTP values of foreign visitors who had visited the proposed park and those who had not, and the possible existence of cultural/strategic bias among local residents based on whether the respondents are interviewed in person or allowed to complete the questionnaires in private. The mean WTP for entrance to the proposed park was US $29 and $22, for the group of foreign visitors who had not visited and those who visited, respectively. The mean WTP for the group of local residents who were interviewed in person was US $7, compared to US $6 for the group of local residents who completed the questionnaires in private. In addition, there was evidence that the amount of information provided was a significant factor in determining WTP. The presence of cultural/strategic bias, with respect to WTP among local respondents, based on whether the survey was conducted in person or whether residents responded privately, was also detected. Finally, The results indicate that the CVM is indeed a useful valuation technique that can be used in protected area planning in Antigua and Barbuda.

TABLE OF CONTENTS

Table of Contents Cont'd.

Table of Contents Cont'd.

LIST OF TABLES

List of Tables Cont'd.

LIST OF FIGURES

# INTRODUCTION

In Antigua and Barbuda, the use of non-market valuation methods have assumed greater importance because of the significant environmental impacts and the degradation of natural resources associated with development efforts. Specifically, land use planners and policy makers need to know the potential economic values of natural areas that are often public goods without market prices. As well, non-market valuation methods are needed to determine whether such parks and protected areas, once established, can be self-sufficient and sustainable in their operation and management.

This is important because, in Antigua and Barbuda and many other developing countries, national parks and other protected areas provide important sources of direct and indirect revenues in addition to protecting biodiversity and national heritages. The establishment of national parks and protected areas must be seen as an aspect of comprehensive land-use planning based on a number of criteria including protection of biodiversity, watershed conservation, provision of recreational opportunities, and the generation of tourism income (Dixon and Sherman, 1990).

The Wallings Forest Reserve in Antigua has been identified as a unique multi-purpose area of natural, historical, environmental, educational, biodiversity and recreational significance with revenue generating potential. However,

expected or potential revenues from visitors entrance fees, contingent upon certain improvements in the goods and services offered by the site, need to be evaluated. There is a need, therefore, to establish a rational mechanism for determining entrance fees for Wallings and other protected areas.

The Contingent Valuation Method (CVM) has become the most widely used non-market method to value public goods. However, there exist the need to evaluate its effectiveness and suitability in developing countries, especially in Central America and the Caribbean, and in fact, few CVM studies with a methodological focus have been undertaken in developing countries (Shultz et al. 1997). Although these studies have shown that CVM surveys can potentially be used to determine visitors willingness to pay (WTP) for future visits to national parks and other protected areas, several methodological limitations have been identified including: the need to include potential park visitors in survey samples, the lack of detailed information framing and contingent scenarios for park related WTP questions, and the threat of cultural/strategic biases when surveying residents of a developing country (Shultz, et. al., 1997). The issue of how CVM estimates of WTP may be affected by survey mode has received little empirical research.

In order to address the issues mentioned above, a CVM survey of both foreign visitors and local residents, representing actual and potential visitors to the proposed Wallings Forest National Park, was conducted during the period April to August, 1997. The primary objectives of the survey were to determine the WTP

for entrance fees to a hypothetically improved park and to evaluate the CVM as a useful valuation technique for protected area planning in the context of Antigua and Barbuda and other developing countries in the Caribbean. Secondary objectives focused on the methodological limitations indicated above. By knowing the WTP values for different groups, land use planners can determine expected or potential revenues from entrance fees by adjusting for different visitation rates.

The results of this study has important implications with respect to determining the potential economic values of Wallings and other natural areas, and their economic viability under management, as well as contributing towards the debate regarding the appropriateness of the CVM in the developing country context.

# BACKGROUND AND LITERATURE REVIEW

## NATIONAL PARKS AND PROTECTED AREAS IN ANTIGUA AND BARBUDA

The Country of Antigua and Barbuda is located about 250 miles southeast of Puerto Rico in the southern section of the Leeward Islands (Figures 1A and 1B). The institutional framework for a parks and protected areas system has been established in the form of the National Parks Act of 1984 that created the Antigua and Barbuda National Parks Authority (NPA).

Currently, national parks and protected areas include the Nelson's Dockyard National Park, the Diamond Reef Marine Park located near Antigua, and the Palaster Reef Marine Park located near Barbuda (Antigua and Barbuda Country Environmental Profile, 1991). The Nelson's Dockyard National Park is the only national park/protected area in Antigua and Barbuda where visitors are charged an entrance fee. The fees currently charged range from US $2.60 - 4.00. The other sites do not have any effective day to day management, consequently, the government does not receive any direct benefits from them. However, several private enterprises make use of the natural resources of these sites, by offering services such as day cruises and scuba diving.

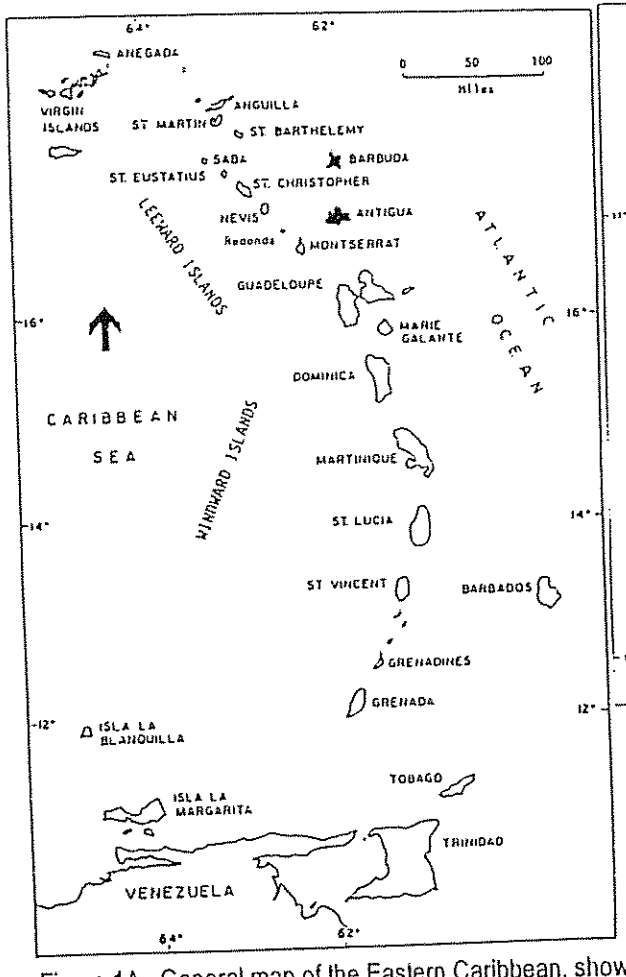


Figure 1A. General map of the Eastern Caribbean, showing the location of Antigua and Barbuda.

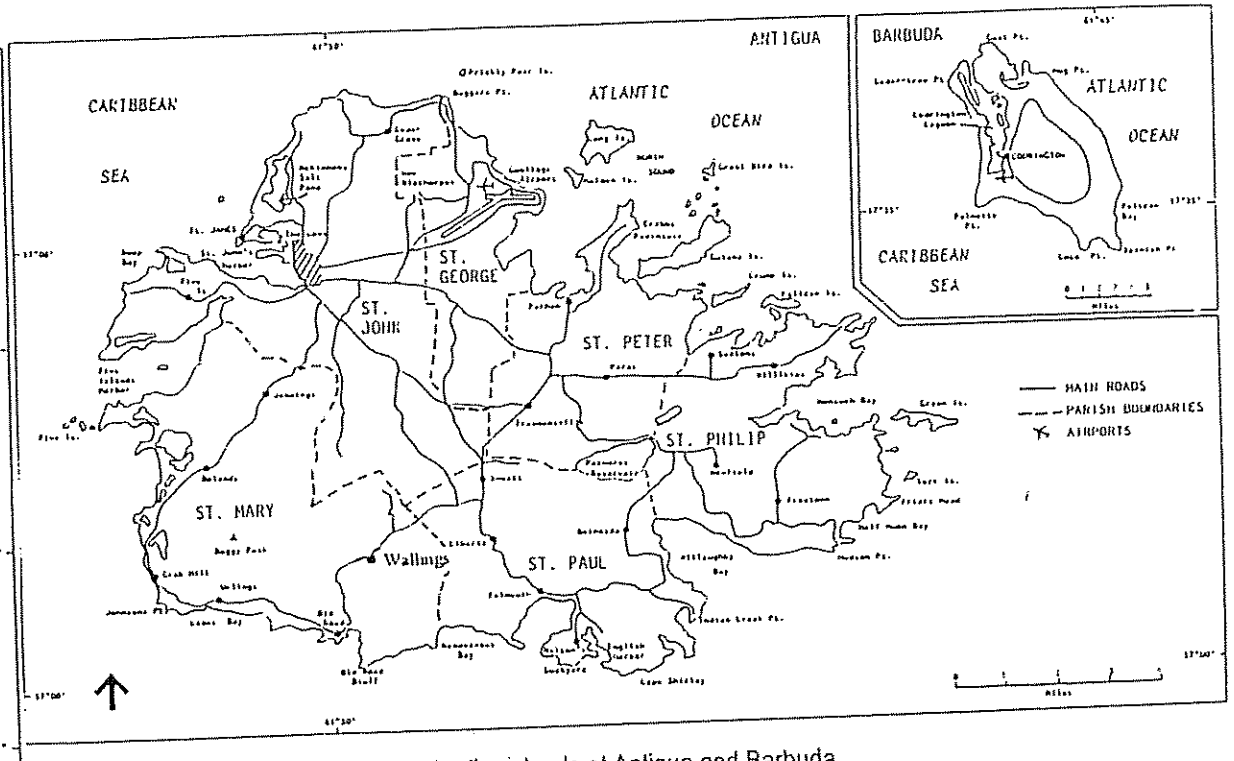


Figure 1B. General location map for the islands of Antigua and Barbuda.

## THE PROPOSED WALLINGS FOREST NATIONAL PARK

The publicly owned Wallings Forest is located in the south of Antigua, and occupies an area of approximately 130 ha. It is set in a surrounding matrix of diverse vegetation types including moist, dry and coastal forests. Most of the surrounding lands are privately owned, but many property owners have indicated a willingness to sell their land and have it incorporated into the Wallings Conservation Project.

The Wallings Forest is unique in that it represents the largest remaining tract and the best example of the "moist evergreen forest" which covered much of the island before the Europeans initiated logging over three centuries ago. Today the forest shows advanced secondary growth, with some trees approaching 24 m in height. The vegetation, lush by Antigua standards, benefits from receiving 25% more rain (1400 mm annually compared to a country-average of 1120 mm) falling on nutrient rich, volcanic soil. However, the soil layer is very thin and if the trees are removed, this productive top soil will quickly disappear; thus reducing the capacity of the system to capture, store and gradually release water to the down-slope areas during drier times. The Wallings Forests therefore provides an invaluable ecological and social "service" through protection, and through its free and efficient water management in a drought-prone island (Horwith, 1996).

Wallings is not only of natural, but also of great historical significance. The dam and spillway of the Wallings Reservoir are an excellent example of Victorian

Industrial Architecture. The sides and bottom of the reservoir are lined with an intricate pattern of stone-work. There is also an impressive system of channels, constructed of stones, designed to channel the water from the slopes to the reservoir.

Wallings is a primary habitat for the 'Bridled Quail Dove' which has been the subject of very limited study to date. However, it is proposed to embark on a more detailed study of its status including habitat requirements, under a separate biodiversity program. A few members of the nearby communities of John Hughes, Sawcolts and Bishops have traditionally extracted a limited quantity of "wattle", which is a special type of woody material that is used as braces in the construction of the local fish traps.

There is a general lack of sensitivity in Antigua to the need for environmental conservation, thus Wallings serves as an excellent laboratory and outdoor classroom to educate members of the public on these critical issues. It is being used more and more for this function, especially by school children, clubs and other special groups.

Work has already commenced on the establishment of a picnic area, as well as improving the more than 7.5 km network of trails. An information brochure on the area is now available. The estimated cost of this phase of development is EC $202,500.00 (US $75,000). Funding is being provided partly through a grant from the International Institute of Tropical Forestry (a branch of the United States

Forest Service), and partly from public funds. The remainder is expected to come from revenues generated from visitors entrance fees.

The intention is to begin charging a fee for the entrance and use of the resources and to use the funds generated along with Government/Donor contribution to install new facilities, and to further develop the site. There are no official visitation records for Wallings, although over two (2) thousand persons were taken on special trips to the site in 1995, and several taxi drivers have been making a tourist stop there as they travel along the famous 'Fig-Tree Drive' which forms part of the major tourist route.

This route includes a stop at the Nelson's Dockyard National Park, and takes in the beautiful south coast with its off-shore coral reefs, the southern mountains and the tropical moist forest, as well as the Jolly Harbour Marina, shopping center and 500-condominium complex. The reserve itself is situated about 30 minutes drive away from the major hotel sections of the island. It is expected that any development scheme for the area will take greater advantage of the stream of tourists as well as locals that travel this route.

PROTECTED AREAS AND USER FEES

The national parks and protected areas (terrestrial and marine) throughout the countries of Caribbean and Central America, attract millions of tourists and local visitors annually. However, these parks and protected areas serve not only as tourists attractions, but also as economic development tools and educational

and recreational instruments as well as being mechanisms for conservation (Dixon and Sherman, 1990; Laarman and Gregersen, 1996).

In nearly all of the countries in the Caribbean region where protected areas exist or are actively planned, government expenditures currently provide the most consistent source of funding for management, and for many countries, the only source (Geoghegan, 1994; van't Hof, 1992). However, the level of funding provided for the management of these protected areas is almost always inadequate for needed services and infrastructure.

According to Harris and Driver (1991) and Leclerc (1994), the use of entrance fees for national parks and protected areas in North America is justified in order to recover costs and generate revenues to ensure the provision of quality goods and services; reduce subsidized competition with privately owned protected areas; and to promote comparative equity by promoting the user pay philosophy rather than relying on general funding sources for parks and protected areas. User fees can also be used to limit access to fragile sites and help in regulating visitation levels at different types of parks and protected areas when a multi-tiered or differential fee structure is used.

However, user fees are presently not widely used in protected areas in the Caribbean, but faced with the pressures of major budgetary restrictions, the principle of systematically charging user fees that more accurately reflect the

cost of services and of maintaining the natural attractions of interest has been gaining acceptance in recent times (Van't Hof, 1992).

Traditionally, the establishment of entrance fees to parks and other protected areas in developing countries have been based primarily upon management cost and/or political factors. Entrance fees are directly correlated to the cost of management, and adjusted as the cost changes (Geoghegan, 1994).

It has been suggested that some form of combination of approaches be used including: attempting to cover administrative cost, gradually increasing fees until excess demand is reduced, and by surveys, market studies, or more complex WTP estimates obtained through the use of the Travel Cost Method (TCM) or the Contingent Valuation Method (CVM) (Lindberg, 1991; Laarman and Gregersen, 1996). The judgement and intuition of local park managers must also be taken into account.

The implementation of entrance and other user fees for parks and protected areas services is a complex, as well as controversial, area of public service management. User fees should help the cause of protected areas by becoming a precious source of revenue for financing the costs of management and infrastructure at sites, as well as conservation and environmental education, not a source of friction between advocates of resource protection and those who advocate development (Leclerc, 1994; Laarman and Gregersen, 1996)

## THE CONTINGENT VALUATION METHOD

The Contingent Valuation Method (CVM) is an attempt to measure the value that individuals in society place on various natural resources that are presented in a hypothetical market. This is accomplished by determining the maximum dollar amount that a person is willing to pay for a contingent improvement to a public good (Randall et al., 1983).

The contingent role in contingent valuation (CV) surveys is critical and according to Mitchell et al., (1995), If the description of the good or its market context is changed in an important way, it is expected that this could change the value the respondents hold for the good. Second, whenever scenarios fail to provide information about contingent elements that are important to respondents the respondents will tend to fill in the missing information by making default assumptions. Finally, if a good is only described vaguely in a CV survey, it is likely that the respondent will give a vague answer.

Mitchell et. al., (1995) stressed the fact that, a contingent valuation scenario consists of more than a WTP question. Instead of a general *attitude* towards a good or class of goods, Contingent Valuation WTP questions measure a behavioral intention towards paying for a particular good. To predict successfully, a behavioral intention question must be as congruent as possible with the purchase decision in terms of what is bought and the context in which it is bought.

In the case of public goods, this means, first, that the specific features of the good must be described and, second, that it must be presented in a clearly defined market scenario (Randall et al., 1983; Mitchell et al., 1995). The description of the good and the market context together comprise the conditions on which the willingness to pay decision is contingent; hence the method's name.

An important point to note is that prior experience with a good is not required as some have argued for respondents to understand its characteristics. While it is often easier to describe a good to a respondent who has had experience with it, this is not always the case (Mitchell et al., 1995).

CVM Survey Techniques

CVM surveys target both specific sub-populations and general populations in order to elicit their WTP for a particular environmental good. In either situation, the population is randomly sampled, the contingent valuation survey is conducted, and then inferences are made about the larger population.

There are three basic procedures or bidding formats used to elicit an individual's WTP for an environmental good or service: the open-ended, iterative, and dichotomous choice. The determination of which format to use depends on a variety of factors including the type of survey being conducted, the type of respondents being sampled, the nature of the contingent valuation, the degree of bias that exists, and the chosen payment vehicle (Shultz, et. al., 1991).

## Biases in CVM Survey Estimates

Contingent valuation researchers have identified several sources of possible biases in their survey estimates: hypothetical bias, vehicle bias, starting point bias, non-response bias, and of particular interest in this study, strategic bias, information bias and sampling bias (Goodstein, 1995; Shultz et al., 1991).

Strategic bias arises in situations where respondents use their bids to influence the provision of an amenity by intentionally distorting the amount they say they are willing to pay for the good or service in question. This would be a particularly good strategy if the respondent thought that larger WTP values in the survey results would lead to a higher likelihood of the provision of the good or service - a form of strategic behavior called "overbidding." Respondents would be expected to overbid if they believe they will not actually have to pay the amount they state, yet believe also that the stated amount can influence provision of the amenity.

However, the form of strategic behavior which has received the greatest attention in the literature is "free-riding", where someone pays less than a public good is worth to him in the expectation that others will pay enough to provide it nevertheless. With respect to CV surveys, it follows that free-riding respondents would underbid if they believe they will actually have to pay the amount they reveal, and believe also that there is a good chance the good will be provided even if they understate their true WTP amount (Mitchell and Carson, 1989).

Another form of bias which is closely related to strategic bias, and which is also of particular interest in this study, is often referred to as "compliance bias". Survey researchers tend to believe that people generally are motivated to tell the truth to an interviewer, but are prone to shape their answers to please either the interviewer or the sponsor. For example, if in-person interviews are used, the bias (interview bias) would be present to the extent that respondents shape their answers in a way that they think will either please the interviewer or increase their status in the interviewer's eyes (Mitchell and Carson, 1989).

Information bias is often a serious problem in CV surveys. Answers will be strongly affected by the amount of information available about a particular issue. For example, respondents who have actually visited a particular site, such as a national park, tend to be more realistically informed about the amenities of the site than respondents who must rely solely upon a word description of those same amenities in a contingent valuation scenario, and are thus likely to have different WTP values.

However, according to Mitchell and Carson (1989), the researcher who wishes to make a contingent valuation scenario more realistic by providing more information, faces a tricky problem: on the one hand, an insufficiently realistic scenario will be vulnerable to bias; on the other, the elements which add realism to a scenario may themselves cause bias.

Sampling bias is cited as another potential source of problems when conducting CVM studies of parks and other protected areas. For example, in the majority of cases, only actual visitors to the parks are surveyed. The resulting sample therefore captures only repeat visitors so that no predictions can be made regarding the values placed on park characteristics by individuals who do not visit the parks. This limited and rather specialized sample is believed to be partly responsible for the non-significance of many of the socio-demographic explanatory variables encountered in such studies. This occurs because the respondents in the limited sample tend to be more uniform with respect to those variables.

Determining who to interview for a CV study and how to locate and interview these people is extremely important and involves a series of decisions. The first decision to be made is how to define the population which is likely to be influenced by the change in the level of the public good. A source of sampling bias arises when the survey population does not match the target population (Edwards and Anderson, 1987). Choosing the correct population is simplest when the population who will pay for the good (or who would be presumed to pay according to a given vehicle, such as park entrance fees) coincides with the population who will benefit (Mitchell and Carson, 1989).

WTP Question Formats and Functional Forms

The elicitation mechanism or the format of asking respondents their WTP is a contingent scenario feature of considerable importance in creating a plausible choice situation. The Dichotomous Choice Bidding Format, also known as close-ended, discrete, or referendum style bidding, was originally used with mail surveys which required straight-forward and easily understood bidding formats.

The Dichotomous Choice format is the most widely accepted method because it has been shown to minimize both hypothetical and strategic biases because respondents are not asked to state their WTP directly. It has also been shown that when specified in a log linear format such as logit analysis, dichotomous choice valuations are consistent with utility maximization, Hicksian demand curves and consumer demand theory (Hanemann, 1984).

In this format, a respondent is asked (yes/no) whether he or she is willing to pay a specific dollar amount for an environmental good. When a wide range of dollar values are used (different values for different respondents), the discrete responses lead to accurate inferences concerning mean WTP values (Cummings et al., 1986; Shultz and Lindsay, 1990).

In one study, Mitchell et al., (1995) found that respondents felt comfortable with this referendum format. The format works well because it answers the question respondents frequently ask at earlier points in the interview: 'how much is this going to cost me'?

The Mechanics of Logit Analysis and Dichotomous Choice

Dichotomous logit analysis is a nonlinear, maximum likelihood estimation (MLE) technique that can be used for referendum style questions. In a CVM framework, the logistic equation describes the pattern of yes/no responses obtained from respondents at alternative dollar amounts (bids). The predicted logit probabilities of a 'yes'/'no' response are expressed by the following logistic equation:

$$Z = b_o + b_1X_1 + b_2X_2 + \ldots + b_kX_k + u_i \qquad (1)$$

$$\text{Where } Z = \log \frac{\text{(probability of yes)}}{\text{(probability of no)}}$$

$b_o,\ldots, b_k$ are the estimated coefficient parameters.
$X_1$ = the dollar amount of the bid.
$X_2,\ldots, X_k$ are independent variables which are consistent with demand theory and therefore influence WTP
$u_i$ is the random disturbance term.

After the logit model above is estimated, predicted probabilities can be calculated by using the following equation:

$$P = \frac{\exp^Z}{(1 + \exp^Z)} \qquad (2)$$

Where: P = the probability of a 'yes' response to the WTP question,
and, Z = the estimated logit of the probability of a 'yes' response.

The reported coefficient estimates of a logit regression are asymptotic, unbiased, and efficient point estimates, therefore permitting t-tests to be interpreted in a similar manner as the t-tests associated with ordinary least squares (OLS) regression coefficients when large sample sizes are used. The estimated

standard errors also provide the usual measure of the likely variation in the estimated coefficients (Aldrich and Nelson, 1984). However, it should be noted that the change in the dependent variable resulting from a unit change in the independent variable cannot be interpreted directly from logit coefficients as they are with OLS procedures. The goodness of fit measure of a logit regression which tests the joint hypothesis that all coefficients are equal to zero is based on a likelihood ratio statistic which results in a chi-square test statistic and distribution.

The Estimation of Mean WTP Values

The choice of which formula is the most appropriate for estimating the mean WTP value that is implied by a logit or similar statistical model fitted to data from a discrete-response contingent valuation survey, depends on the form of the model utilized. The approach adopted in this study is that put forth by Hanemann (1989). One of the two families of utility model introduced by Hanemann (1989) takes the form:

$$\Delta v = \alpha - \beta A, \text{ with } \beta > 0. \qquad (3)$$

According to Hanemann, The correct formula for estimating the mean WTP associated with this model is:

$$\text{Mean WTP} = \alpha/\beta \qquad (3')$$

Where $\alpha$ is a grand constant which is calculated by multiplying each of the obtained coefficients by it's mean (with the exception of the variable BID). The

coefficients are obtained by estimating a logistic regression equation (as represented by equation 1). These products are summed and then added to the original constant or intercept value. Beta ($\beta$) is the coefficient for the bid variable (A).

In this particular model the median of the distribution of true WTP corresponds with the mean:

$$\text{Median} = \alpha/\beta = \text{mean} \qquad (3'')$$

This formula permits WTP to assume negative values, regardless of the sign of $\alpha$. Thus it follows that sign (mean) = Sign (median) = sign ($\alpha$).

There is also a debate about whether the mean or the median should be used to estimate the mean WTP. In some models, the mean and median differ. Sometimes, the difference can be dramatic. For example, in an analysis of Bishop and Heberlein's data, Hanemann (1989) obtained an estimate of $5.30 for the median and $15.54 for the mean WTP for a goose hunting permit. Similarly, Shultz (1990) obtained a mean WTP value of $129 and a median WTP of $40 for groundwater protection in Dover, New Hampshire.

Some researchers, for example Johansson et al., (1989), advocate using the mean. Their view is that "the median must be used with great care in contingent valuation studies." Hanemann (1984) advanced several arguments in favour of selecting the median in the context of benefit-cost analysis and not just in the context of discrete-response contingent valuation experiments. This is

justified by the fact that the median is less sensitive to skewness or kurtosis in the original data, and is also less sensitive than the mean to minor differences in the method of estimating the structural model (e.g., generalized least squares versus maximum likelihood). However, as indicated above, in the model adopted in this experiment, the median coincides with the mean.

Once the mean WTP estimate is calculated for the sample, there are two approaches for determining aggregate WTP values for the population in question. One method is to multiply the mean WTP value by the number of sample units in the population (Walsh et al., 1985). It should be noted that this approach is inherently based upon the assumption that there are no statistical differences between respondents and non-respondents and that their mean WTP values are the same.

A more conservative method of aggregation is to assign all of the non-respondents a mean WTP value of zero and then add this value to the product of the remaining population by their estimated mean WTP value. Obviously, this approach is more conservative as it is based on the assumption that non-respondents do not value the resource in question.

## The use of CVM in Parks and Protected Areas in the Caribbean and Central America

Most of the CVM studies conducted in Central America and the Caribbean countries focused on the valuation of either the supply of potable water or the establishment and conservation of protected areas. Few of these studies

included methodologically based validation emphases within their study designs.

The CVM has been used to value the amenities provided by the biological resources within the Monteverde Cloud Forest Reserve in Costa Rica (Echeverría et al., 1995), and to determine WTP to enter the Manuel Antonio and Poas Volcano National Parks in Costa Rica (Shultz et al., 1997). Other studies involving the use of CVM in relation to parks and protected areas within Central America and the Caribbean include: the issue of user fees at protected areas in Costa Rica ( Baldares and Laarman, 1991); the economic and ecological analysis of the Bonaire Marine park (Scura and van't Hof, 1993), and national park entrance fees at the Manuel Antonio, and Poas, and Irazu volcano national parks in Costa Rica (Chase, 1995).

Echeverría et. al., (1995) found that Costa Rican's were willing to pay US $137 for the protection of the Monteverde Cloud Forest Reserve, while non-Costa Ricans were willing to pay US $118. The Monteverde study also showed a difference in WTP depending on the payment vehicle. For example, the mean WTP a one-time or lump-sum payment was US $130, while respondents indicated a mean WTP an annual or recurring sum of US $110.

The mean WTP value for resident visitors for a future visit to a hypothetically improved Manuel Antonio park was estimated to be $13, while the median WTP value was $11. The corresponding values for the Poas Volcano park was $11

and $10. In the case of foreign visitors, both the mean and median WTP for entrance to a hypothetically improved Manuel Antonio park was $14. The mean WTP for Poas was $23 while the median WTP was $25 (Shultz et al., 1997).

However, the researchers indicated some concern over the elicitation mechanism, especially when comparing the response of Costa Ricans and non-Costa Ricans to the bid question. For example, Echeverría et. al., (1995) pointed out that while the mean annual income of Costa Rican's was US $19,086, which represented 34 percent of the mean non-Costa Rican income of US $56,687, Costa Ricans valued the resource 13 percent higher than non-Costa Ricans.

These studies (Echeverría et al., 1995 and Shultz et al.,1997) concluded that the CVM can be used as a tool to determine visitors' WTP for entry to different types of national parks in Costa Rica, and for the protection of the natural resources and other amenities offered by these sites. However, several potential problems associated with the use of CVM for estimating entrance fees were also noted by these studies.

First, the studies cited above surveyed only actual visitors to the parks, after visitors completed their visit and were leaving. The resulting sample therefore, captured only repeat visitors. People who did not visit the park, possibly because they were not willing to pay the current entrance fee, were not included (Shultz et al., 1997).

Shultz et al., (1997) further suggested that this might help to explain why many of the socio-demographic explanatory variables of the CVM models developed were not significant. For example, income or educational levels of visitors may not have influenced WTP because most of the respondents in the limited sample were all relatively wealthy and well educated (at least in comparison to the general population which was not included in the sample). The solution to this problem involves sampling the full population of potential visitors to national parks. In other words, WTP values for different national parks at alternative entrance fees of actual and non-visitors need to be quantified.

Second, Shultz et al., (1997) pointed out that the information framing or contingent valuation scenarios used in the Poas volcano and Manuel Antonio national parks survey in Costa Rica were relatively limited, at least in comparison to standard CVM valuation scenarios (Mitchell and Carson, 1995). The results of the study indicated the need for future research efforts focusing on how different contingent information framing scenarios influence WTP values for different parks.

A final potential problem noted by Shultz et al., (1997) with CVM studies to determine WTP values for entrance fees to parks in Costa Rica, and possibly many other developing countries, is related to possible strategic/cultural biases associated with personal surveys. As indicated above (Echeverría et. al., (1995) and Shultz et al., 1997), significantly disproportional WTP values were observed between local and foreign visitors to the Poas Volcano and Manuel Antonio

parks and with respect to WTP for the protection of the Monteverde Cloud Forest.

It was suspected that the primary reason why Costa Rican residents appear to have much higher relative WTP values than foreigners is related to a cultural/strategic bias based on the fact that Costa Ricans are unfamiliar with personal surveys and providing truthful negative responses to interviewers (Shultz et al., 1997). It is possible that a similar situation exist in the countries of the Caribbean where people are not accustomed to such questionnaires and specifically their non-personal, truth-seeking, and confidential nature.

In a study conducted in Nigeria as part of an evaluation of rural households' WTP for public taps and private connections to improve drinking water systems, Whittington et al., (1992) found that respondents who were allowed time to evaluate the proposed water system had significantly lower WTP values than those who did not have that time. Similar results were observed in a CVM study to estimate WTP for water services in southern Haiti (Whittington et al., 1990). This raises the question of the possible existence of bias, for example, information bias because of more time to study the questions and to be 'better' informed, or some form of strategic bias. It is suggested, therefore, that CVM research concentrating on methodological issues such as how WTP responses of residents in developing countries vary with different survey and question formats be conducted.

# OBJECTIVES

## PRIMARY OBJECTIVES

The primary objectives of this thesis are as follows:

1. To determine WTP for entrance fees to the proposed Wallings Forest National Park in order to estimate the amount of money that the site can be expected to generate under alternative development strategies.

2. To evaluate the CVM as a useful valuation technique for protected area planning in the context of Antigua and Barbuda and other developing countries of the Caribbean.

## SECONDARY OBJECTIVES

The following are the secondary objectives that are the focus of this thesis:

1. To evaluate whether or not WTP for entrance fees differ between foreign visitors who have been and those who have not been to the site.

2. To investigate the possible existence of cultural/strategic biases among local residents, based on whether the respondents are interviewed in person (face-to-face interview) or allowed to complete the questionnaires in private, and the potential influence of these biases on WTP values.

## HYPOTHESES

The hypotheses relating to the objectives above are as follows:

1. That the CVM can successfully be used as a tool to determine: (1) how much to charge to enter the Wallings Forest Recreation Area, (2) how much money the park can expect to generate, and (3) what specific services visitors are willing to pay for. Successful is defined as the generation

of statistically robust WTP models with many significant variables and high rates of correct model prediction based on a log-likelihood Chi-Square test statistic.

2. That WTP values differ significantly between foreign visitors who have been to the site and those who have not been to the site:

   $H^o$: WTP (Foreigners- not been to the site) = WTP (Foreigners- been to the site)
   $H^A$: WTP (Foreigners- not been to the site) ≠ WTP (Foreigners- been to the site)

3. That WTP values of local residents vary significantly depending on whether the surveys are administered personally (using face-to-face questioning) or when the respondents are allowed to complete the questionnaire privately:

   $H^o$: WTP (Local- face-to-face interview) = WTP (Local- private response)
   $H^A$: WTP (Local- face-to-face interview) ≠ WTP (Local- private response)

# METHODS

## CONDUCTING THE SURVEY

A CVM survey to determine the WTP for entrance fees to the proposed Wallings Forest National Park, and to evaluate the usefulness of the CVM as a valuation technique for protected area planning in Antigua and Barbuda, was administered to both foreign visitors and local residents, representing actual and potential visitors to the site. The survey was conducted during the period April to August, 1997.

Completed questionnaires are from the four (4) groups of respondents in the study. These groups and the number in each are shown in Table 1. The three page questionnaire was identical for both groups of foreign visitors. Similarly, a modified version was used for both groups of local residents. A copy of each questionnaire, which includes the information framing and contingent valuation section and a set of options following the WTP question, which were designed to capture the major reasons why respondents said no, are included in Appendix A.

Table 1. The four (4) groups of respondents in the study and the number in each group.

| | |
|---|---|
| Foreign visitors who had not visited the site | -208 |
| Foreign visitors who had actually visited the site | -208 |
| Local residents in direct interaction with interviewers | -224 |
| Local residents who completed questionnaires in private | -224 |

The questionnaire relating to the local residents was tested and later modified based on the experiences of two focus group meetings. In a similar manner, the questionnaire for the foreign visitors was pilot tested in the departure lounge of the country's international airport. It was discovered that the most effective way to administer the survey to the foreign visitors, was to allow them to complete the questionnaire themselves after a brief introduction and explanation of the purpose of the survey.

The majority of the respondents representing the group of foreign visitors who had not been to the site were surveyed in the departure lounge of the international airport. However, several respondents were drawn from randomly surveying foreign visitors at several beaches around the island. In addition to the information framing and contingent scenario section of the questionnaire, each respondent was shown three photographs depicting various aspects of the site. The group of foreign visitors who actually visited the site were presented with the same information framing and contingent valuation scenario and were also shown the same set of photographs as the group of foreign visitors who had not been to the site.

One photograph emphasized the historical aspects of the Wallings Forest Reserve by showing the dam and spillway of the Wallings reservoir as an excellent example of Victorian Industrial Architecture. Another photograph showed a panoramic view of the surrounding hills and associated vegetation,

and the third photograph depicted a typical scene of the vegetation and wildlife at the higher elevations of the site.

As indicated above, the questionnaires for both groups of local residents were identical. However, in the case of one group, the survey was administered face-to-face with the respondents being asked the questions directly by interviewers. In the case of the second group of local residents, following an introduction and explanation of the survey, the respondents were given the questionnaires in envelopes and instructed to complete and return them in private at a later time. Each respondent was shown the same set of three photographs as in the case of the foreign visitors. The local respondents were drawn primarily from mass events at the beach, and from both public and private offices within the city. The interviewers attempted to follow a system of interviewing every second eligible individual encountered. The primary restriction was that respondents should be seventeen years or older.

## THE INDEPENDENT VARIABLES INCLUDED IN THE SURVEY

The questions included in the survey are associated with relevant independent variables that will help to explain WTP for entrance to the proposed Wallings Forest National Park through a multivariate logit model. More specifically, the impact that each of these variables have on the dependent variable (yes/no to the WTP question), will be tested for with both t-tests and a chi-square test.

The socio-economic questions on the survey are included either on the basis of past studies which indicate that they have a significant effect on WTP for parks and protected areas, or those for which their potential effects are of interest to land use and economic development policy makers in Antigua and Barbuda.

The independent variables included in the survey and the null hypothesis associated with each are discussed briefly below. The corresponding alternative hypotheses (for one-tailed asymptotic t-test) as well as the categories associated with each independent variable are shown in Table 2 (foreign visitors) and Table 3 (local residents).

- Visitors origin (ORIG) is believed to have a positive influence on WTP values because of differences in wealth between people from different regions, as well as different attitudes towards and preferences for nature recreation. For example, visitors from North America are believed to be more wealthy than visitors from Europe or other Regions and are likely to have higher WTP values. With respect to the local residents, it is believed that origin (city, suburb or country-side) has a significant influence on WTP values;

- The length of time in the country (elapsed time - #DAYS) is believed to positively influence WTP values. A longer elapsed time tend to suggest more money to spend, and given the fact of more time, there is a need for a greater number of alternative activities;

- The number of previous visits (#VISITS) to the country is expected to have a positive influence on WTP values;

- On the basis of past observations, there is a tendency for locals residents to associate a visit to the Wallings Forest with an enjoyable experience. Hence it is believed that a previous visit to the Wallings Forest (VWAL) would positively influence their WTP;

- It is believed that the intention of visitors to visit other parks/recreational or historical sites (PLAN) on the current trip have a significant (negative) effect on their WTP for entrance to any one particular park. The more areas they plan to visit, the less money and/or time will be available to spend on a single park/recreational site;

- In the context of outdoor recreation, AGE has been shown to have a negative influence on WTP values in may instances. That is, generally speaking, older visitors tend to participate less than younger visitors in outdoor recreational activities and thus have lower WTP values;

- The SEX of the respondent is believed to have a significant influence on WTP values. On the basis of several past studies, females tend to have higher WTP values than males with respect to parks and protected areas;

- It is believed that children (CHIL) accompanying visitors to the country have a positive influence on WTP values since there is likely to be a greater demand for the type of outdoor recreation offered by Wallings. Consequently, they are likely to have higher WTP values;

- Education (EDU) is believed to have a positive influence on WTP values. The more highly educated a person, the more likely they are to understand and appreciate natural resources/environmental relationships, and are thus more willing to pay to enjoy their benefits;

- It is believed that the FOCUS of the trip has a significant influence on WTP values. People who visit primarily for the beaches, honeymoon, business, or a cultural event (the majority of visitors) will tend to have lower WTP for entrance to the Wallings Forest National Park than people whose primary purpose for visiting is to go hiking, exploring or outdoor camping;

- The primary activity (ACT) of interest at the site is believed to have a positive influence on respondent's WTP. Respondents are likely to have higher WTP values for activities which are of greater interest to them than others.

- The more favorable an individual's impression (IMP) of the site is, the greater will be that individual's WTP to visit that site;

- The annual income (INC) of visitors and the amount of money that they are willing to pay to enter the site (BID) are included because they have been found to be significant in almost all past WTP models. The variable BID is expected to have a negative influence on WTP while income is hypothesized to have a positive influence.

THE BID VALUES USED IN THE SURVEY

In the case of foreign visitors, the range of dollar values for the BID variable was US $1 to $50, BY $2 increments. For the local residents, the range for the BID variable was US $0.37 to $11 (Eastern Caribbean 'EC' $1 to $30). These values were selected in order to encompass a wide range of bids around the fees currently charged (US$2.60 - 4.00) to enter the Nelson's Dockyard National Park.

Table 2. The independent variables (with associated categories) included in the survey (foreign visitors).

| DEFINITION | CODES/VALUES | Ha: |
|---|---|---|
| Origin of visitor * ORIG1 ORIG2 ORIG3 | ORIG1 = North America<br>ORIG2 = Europe Yes = 1<br>ORIG3 = Other No = 0 | $b_{ORG}>0$ |
| Number of days in country (days) | #DAYS | $b_{\#DAYS}>0$ |
| Number of previous visits to country | #VISITS | $b_{\#VISITS}>0$ |
| Plan to visit other park/recreational sites | PLAN Yes = 1 No = 0 | $b_{PLAN}<0$ |
| Respondent's age (years) | AGE | $b_{AGE}<0$ |
| Sex of respondents | SEX Male = 1 Female = 0 | $b_{SEX}>0$ |
| If Respondents traveling with children | CHIL Yes = 1 No = 0 | $b_{CHIL}>0$ |
| Respondent's level of education | EDU College/University = 1<br>Elementary/High school = 0 | $b_{EDU}>0$ |
| Main focus of visit to country* FOCUS1 FOCUS2 FOCUS3 FOCUS4 | FOCUS1 = Beach bathing<br>FOCUS2 = Honeymoon<br>FOCUS3 = Rest & Relaxation<br>FOCUS4 = Other Yes = 1 No = 0 | $b_{PUR}<0$ |
| Activity of primary interest at site* ACT1 ACT2 ACT3 ACT4 | ACT1 = Hiking<br>ACT2 = Nature Watching<br>ACT3 = Rest & Relaxation<br>ACT4 = Other Yes = 1 No = 0 | $b_{ACT}>0$ |
| Respondent's impression of the site* IMP1 IMP2 IMP3 | IMP1 = Unique<br>IMP2 = Average<br>IMP3 = Poor Yes = 1 No = 0 | $b_{IMP}>0$ |
| Annual income (INC $) of Respondents | INC | $b_{INC}>0$ |
| Bid value (BID $) for eliciting WTP | BID | $b_{BID}<0$ |

* Indicates the use of dummy variables (eg. 1/0)

Table 3. The independent variables (with associated categories) included in the survey (local residents).

| DEFINITION | CODES/VALUES | Ha: |
|---|---|---|
| Origin of visitor * ORIG1<br>ORIG2<br>ORIG3 | ORIG1 = City Yes = 1<br>ORIG2 = Suburbs No = 0<br>ORIG3 = Countryside | $b_{ORIG}>0$ |
| Whether respondent visited site before | VWAL Yes = 1 No = 0 | $b_{VWAL}>0$ |
| Whether respondents visited: | | |
| Nelson's Dockyard National Park | NDNP Yes = 1 No = 0 | $b_{NDNP}>0$ |
| Cades Reef | REEF Yes = 1 No = 0 | $b_{REEF}>0$ |
| North Sound Islands | NSI Yes = 1 No = 0 | $b_{NSI}>0$ |
| Other parks/recreational sites | PARKS Yes = 1 No = 0 | $b_{PARKS}>0$ |
| Respondent's age (years) | AGE | $b_{AGE}<0$ |
| Sex of respondents | SEX Male = 1 Female = 0 | $b_{SEX}>0$ |
| Respondent's level of education | EDU College/University = 1<br>Elementary/High school = 0 | $b_{EDU}>0$ |
| Activity of primary interest at site* | | $b_{ACT}>0$ |
| ACT1 | ACT1 = Hiking | |
| ACT2 | ACT2 = Camping | |
| ACT3 | ACT3 = Picnicking | |
| ACT4 | ACT4 = Nature watching | |
| ACT5 | ACT5 = Other | |
| Respondent's impression of the site* | | $b_{IMP}>0$ |
| IMP1 | IMP1 = Unique | |
| IMP2 | IMP2 = Average | |
| IMP3 | IMP3 = Poor | |
| Annual income (INC $) of respondents | INC | $b_{INC}>0$ |
| Bid value (BID $) for eliciting WTP | BID | $b_{BID}<0$ |

* Indicates the use of dummy variables (eg. 1/0)

## ANALYSIS OF THE DATA

### The Multivariate Logit Models

The socio-economic characteristics of respondents were treated as the independent variables and the log of the probability ($\pi$) of a 'yes' over the probability of a 'no' response to the WTP question as the dependent variable. This resulted in dichotomous logistic models with the following variables:

$$\text{Log}(\pi \text{ yes}/\pi \text{ no}) = B_0 + B_1\text{BID} + B_2\text{ORIG1} + B_3\text{ORIG2} + B_4\text{ORIG3} + B_5\#\text{DAYS} + B_6\#\text{VISITS} + B_7\text{PLAN} + B_8\text{AGE} + B_9\text{SEX} + B_{10}\text{CHIL} + B_{11}\text{EDU} + B_{12}\text{PUR1} + B_{13}\text{PUR2} + B_{14}\text{PUR3} + B_{15}\text{PUR4} + B_{16}\text{ACT1} + B_{17}\text{ACT2} + B_{18}\text{ACT3} + B_{19}\text{ACT4} + B_{20}\text{IMP1} + B_{21}\text{IMP2} + B_{22}\text{IMP3} + B_{23}\text{INC} + U_i$$

*[foreign visitors]* (4)

$$\text{Log}(\pi \text{ yes}/\pi \text{ no}) = B_0 + B_1\text{BID} + B_2\text{ORIG1} + B_3\text{ORIG2} + B_4\text{ORIG3} + B_5\text{VWAL} + B_6\text{NDNP} + B_7\text{REEF} + B_8\text{NSI} + B_9\text{PARKS} + B_{10}\text{AGE} + B_{11}\text{SEX} + B_{12}\text{EDU} + B_{13}\text{ACT1} + B_{14}\text{ACT2} + B_{15}\text{ACT3} + B_{16}\text{ACT4} + B_{17}\text{ACT5} + B_{18}\text{IMP1} + B_{19}\text{IMP2} + B_{20}\text{IMP3} + B_{21}\text{INC} + U_i$$

*[local residents]* (5)

The data from the completed surveys were entered into a database and subsequently analyzed through the use of a statistical program. Both descriptive (Univariate) statistics as well as multi-variate logit analysis were conducted. The mean and median WTP values were calculated from the multivariate models by the use of equation (3') which is restated below:

$$\text{Mean WTP} = \alpha/\beta$$

A Multivariate Test For Overall Differences Between Groups

Of particular importance in this study is whether or not the underlying structure of WTP differs among foreign respondents who (1) had not visited the site and (2) those that had actually been to the site. Similarly, it is of interest as to whether or not WTP values differ between local residents who were (1) interviewed in person and (2) those who completed the questionnaire in confidence. In order to determine whether or not the WTP values differ between the groups as indicated above, it requires testing the equality of the two logit regression equations representing the corresponding groups. Taking the case of the two foreign groups as an example, the equations representing both groups can be expressed as follows:

$\hat{Y} = \beta_0^a + \beta_1^a X_1 + \beta_2^a X_2 + \ldots\ldots + \beta_k^a X_k$ for the group of foreign visitors who did not visit the site (a) (6)

$\hat{Y} = \beta_0^b + \beta_1^b X_1 + \beta_2^b X_2 + \ldots\ldots + \beta_k^b X_k$ for the group of foreign visitors who visited the site (b) (7)

To test the equality of these two equations, that is, to test whether the structure of the two equations is the same, the null hypothesis to be tested is:

$H_o: \beta_o^a = \beta_o^b$ and $\beta_1^a = \beta_1^b$ and $\beta_2^a = \beta_2^b$ and ..... and $\beta_k^a = \beta_k^b$

The steps to follow in conducting this test are:

1. estimate the equation using only the observations in group a to obtain the log likelihood$_a$ value ;

2. estimate the equation using only the observations in group b to obtain the log likelihood$_b$ value;

3. estimate a pooled equation using all observations, that is, a combination of the observations in groups a and b to obtain the log likelihood$_{ab}$ value for the combined data.

The test statistic, which follows, approximately, a Chi-Square distribution (when the null hypothesis is true) with $k$-1 degrees of freedom is :

$$c = -2[\text{log likelihood}_{ab} - (\text{log likelihood}_a + \text{log likelihood}_b)] \quad 8$$

Where: c = the Chi-Square test statistic

In addressing the question of different structural relationships between the groups, it is important to note that exactly the same structure (variables included, units of measurement on the variables, and functional form, etc.,) must be used.

In addition to comparing the mean WTP values between the different groups, other comparisons were made including the number of statistically significant variables and the number of correct predictions of each model. The same statistical tests were conducted for the case of foreign visitors who had been to the site and those who had not visited, as well as for local residents who were surveyed in person (using face-to-face questioning), and those who completed the questionnaire in private.

# RESULTS

## DESCRIPTION OF THE VARIABLES

### The Dependent Variable

The dependent variable (Yes/No) describes whether a respondent was willing or not to pay a specified dollar bid for entrance to the proposed Wallings Forest National Park on the basis of the hypothetical improvements presented to them in the questionnaire. Of the respondents representing the group of foreign visitors who had not visited the site, 116 (56%) responded 'yes' while 92 (44%) responded 'no' to the WTP question. Similarly, 95 respondents, representing 46% of the group of foreign visitors who visited the site replied 'yes' versus 113 (54%) who responded 'no'.

In the case of local residents who were interviewed personally (face-to-face), 129 (58%) responded 'yes' against 95 (42%) who said 'no', while 116 (52%) responded 'yes' versus 108 (48%) who responded 'no' with respect to the group of local residents who completed the questionnaire in private. Table 4 shows a summary of the responses for each group.

These results indicate that park management authorities can give serious consideration to the notion of introducing entrance fees, subject to the proposed improvements in the services offered by the site, since people have indicated a willingness to pay. A subsequent step is to examine the reasons why respondents said 'no' to the WTP question.

Table 4. Response of each group to the willingness to pay (WTP) question.

| GROUP | RESPONSE 'yes' | % | 'no' | % |
|---|---|---|---|---|
| Foreign visitors who had not seen site | 116 | 56 | 92 | 44 |
| Foreign visitors who had visited site | 95 | 46 | 113 | 54 |
| Local residents - personal interview | 129 | 58 | 95 | 42 |
| Local residents - in private | 116 | 52 | 108 | 48 |

In the event of a 'no' response to the WTP question, respondents were asked to indicate their reason for saying 'no' by selecting from among four (4) options that followed the WTP question. These options included the following: (1) I do not think that I or anyone else should pay to protect and use these resources, (2) I cannot afford the amount of money specified, (3) I did not have enough information to determine whether I would pay, and (4) any other reason for saying no. The results of these responses are shown in Figure 2.

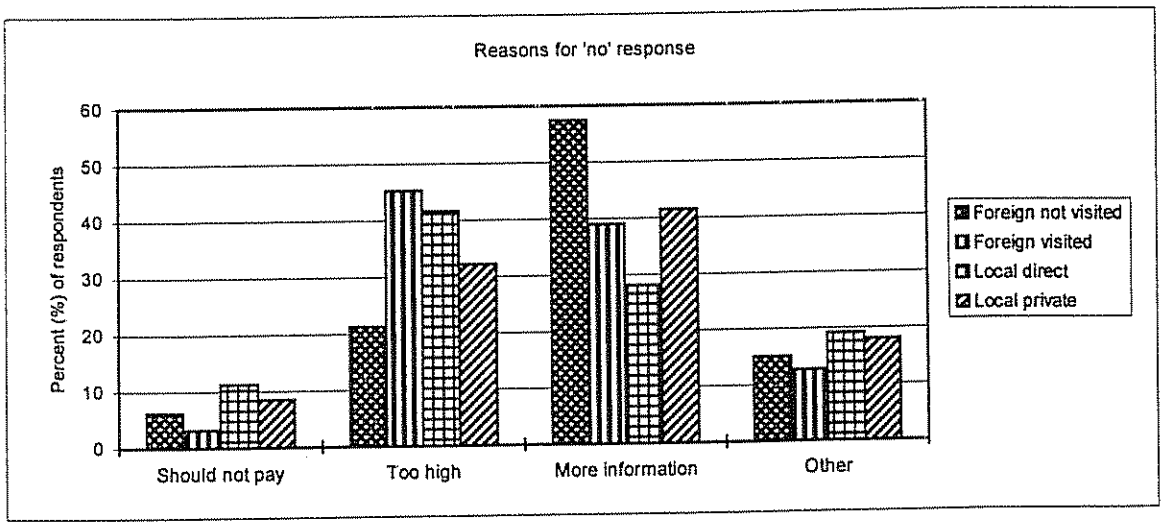


Figure 2. Summary of reasons for 'no' response among survey groups.

The information framing section of the questionnaire attempted to provide more detailed information than several of the studies conducted in the region in the past. In addition, each respondent was shown three photographs depicting various aspects of the site to further add to the information available. In spite of this, 58% of the respondents representing the group of foreign visitors who had not actually been to the site, indicated the need for more information as the reason for saying 'no' to the WTP question, while 21% felt that they could not afford the amount specified.

With respect to the group of foreign visitors who visited the site, and hence had more information about it, only 39% (compared to 58% for the previous group) indicated a need for more information. For this group of respondents, 45% found the amount specified too high while 13% (15% in the previous group) had other reasons for saying 'no'.

In the case of the local residents who were interviewed personally (face-to-face), 28% indicated a need for more information versus 42% for the group that completed the questionnaire in private, although 37% of the group that completed the questionnaire in private had actually visited the site, compared to 26% for the group that was interviewed personally. This might suggest some form of bias based on the interaction with the interviewers, in the case of the group that was surveyed face-to-face, which led to them being better informed. Of interest is the fact that 42% of the local residents who were interviewed personally stated that they could not afford the amount specified,

while only 32% of those who responded privately, gave as their reason for saying 'no', their inability to pay the specified amount.

The number of respondents who felt that no one should pay to enter the proposed Wallings Forest National Park ranged from 3% in the case of the foreign visitors who had been to the site and 11% for the group of local residents who were interviewed personally. Responses in the category 'other' included: (1) the need for group rates; (2) children's rate; (3) membership fee; (4) Differential fees - tourists versus locals and (5) government upkeep from general funds.

The Independent Variables

The mean and standard deviation, as well as the mean 'yes' and 'no' responses associated with each of the independent variables included in the survey, are summarized in Tables 5 and 6. The mean for the variable BID, which is the dollar value that was presented to each respondent is US $25 for both groups of foreign visitors and US $6 for both groups of local residents. Significant differences exist between the mean 'yes' and 'no' BID values for all four groups in the survey. In the case of the foreign visitors who visited the site, the mean values for origin (ORIG) also differ significantly between those who responded 'yes' and those who responded 'no', with respondents from Europe having a greater tendency to say yes. Similarly, the results indicate that there is a significant difference between the 'yes' and 'no' responses of local residents living in the city and suburbs in the case of respondents who were interviewed in person.

Table 5. Independent variables: descriptive statistics for the group of foreign visitors who had not been to the site and those who had been to the site.

| Var. | Foreign visitors - not been to the site | | | | Foreign visitors who visited the site | | | |
|---|---|---|---|---|---|---|---|---|
| | Mean | S. Dev. | Mean (yes) | Mean (no) | Mean | S. Dev. | Mean (yes) | Mean (no) |
| Yes/No | *0.557* | 0.498 | 1.00 | 0.00 | *0.457* | 0.499 | 1.00 | 0.00 |
| BID | 25.04 | 14.97 | *18.52* | 33.25* | 25.02 | 14.96 | *13.32* | 34.86* |
| ORIG1 | 0.43 | O.50 | 0.39 | 0.48* | 0.37 | 0.48 | 0.32 | 0.42* |
| ORIG2 | 0.45 | 0.50 | *0.48* | 0.41 | 0.48 | 0.50 | *0.59* | 0.38* |
| ORIG3 | 0.12 | 0.33 | 0.13 | *0.11* | 0.15 | 0.36 | 0.09 | *0.20** |
| #DAYS | *8.24* | 9.09 | 8.34 | *8.11* | *6.06* | 4.55 | 6.55 | *5.65* |
| #VISITS | 1.15 | 4.27 | 1.28 | *0.98* | 0.85 | 2.24 | 1.29 | *0.47** |
| PLAN | *0.25* | 0.44 | *0.28* | *0.22* | *0.50* | 0.50 | *0.57* | *0.45** |
| AGE | *34.36* | 10.97 | 34.78 | 33.83 | *36.06* | 9.75 | 36.87 | 35.38 |
| SEX | 0.54 | 0.50 | 0.54 | 0.53 | 0.51 | 0.50 | 0.57 | 0.47 |
| CHIL | *0.04* | 0.20 | *0.05* | 0.03 | *0.09* | 0.28 | *0.14* | 0.04* |
| EDU | *0.68* | 0.47 | *0.68* | 0.68 | *0.76* | 0.43 | *0.82* | 0.71* |
| FOCUS1 | *0.28* | 0.45 | *0.24* | 0.33* | *0.36* | 0.48 | *0.38* | 0.34 |
| FOCUS2 | 0.11 | 0.31 | *0.11* | 0.11 | 0.08 | 0.27 | *0.05* | 0.10 |
| FOCUS3 | 0.37 | 0.48 | 0.37 | 0.37 | 0.32 | 0.47 | 0.35 | 0.30 |
| FOCUS4 | 0.23 | 0.42 | 0.26 | 0.19 | 0.24 | 0.43 | 0.21 | 0.27 |
| ACT1 | *0.12* | 0.33 | 0.13 | *0.11* | *0.17* | 0.38 | 0.15 | *0.19* |
| ACT2 | 0.41 | 0.49 | 0.41 | 0.41 | 0.39 | 0.49 | 0.43 | 0.35 |
| ACT3 | 0.21 | 0.41 | 0.19 | 0.23 | 0.19 | 0.40 | 0.23 | 0.16 |
| ACT4 | 0.25 | 0.44 | 0.26 | 0.25 | 0.25 | 0.43 | 0.19 | 0.30* |
| IMP1 | *0.34* | 0.47 | 0.40 | *0.26** | *0.45* | 0.50 | 0.44 | *0.45* |
| IMP2 | *0.61* | 0.49 | 0.57 | *0.65* | *0.51* | 0.50 | 0.55 | *0.49* |
| IMP3 | 0.06 | 0.23 | 0.03 | 0.09* | 0.04 | 0.19 | 0.01 | 0.06* |
| INC | 35286 | 16854 | *37844* | 32059* | 35228 | 15461 | *42105* | 29446* |

Corresponding means that are significantly different from each other between both groups of foreign visitors are indicated in bold italics.

*Denotes a significant difference between the 'yes' and 'no' means, within each group, using a t-test at the 0.05 significance level.

Table 6. Independent variables: descriptive statistics for the group of local residents who were surveyed in person and those who responded in private.

| Var. | Local residents - personal interview | | | | Local residents - private response | | | |
|---|---|---|---|---|---|---|---|---|
| | Mean | S. Dev. | Mean (yes) | Mean (no) | Mean | S. Dev. | Mean (yes) | Mean (no) |
| Yes/No | 0.576 | 0.495 | 1.00 | 0.00 | 0.518 | 0.501 | 1.00 | 0.00 |
| BID | 15.06 | 9.14 | 10.51 | 21.24* | 15.06 | 9.14 | 10.22 | 20.25* |
| ORIG1 | 0.29 | 0.45 | 0.33 | 0.23* | 0.26 | 0.44 | 0.24 | 0.28 |
| ORIG2 | *0.22* | 0.42 | 0.16 | *0.32** | *0.14* | 0.35 | 0.15 | *0.13* |
| ORIG3 | *0.49* | 0.50 | *0.51* | *0.45* | *0.60* | 0.49 | *0.61* | *0.59* |
| VWAL | 0.31 | 0.46 | *0.26* | 0.37* | 0.37 | 0.48 | *0.37* | 0.36 |
| NDNP | 0.86 | 0.35 | 0.84 | 0.89 | 0.88 | 0.34 | 0.84 | 0.92* |
| REEF | 0.11 | 0.32 | 0.12 | *0.09* | 0.14 | 0.35 | 0.11 | *0.17* |
| NSI | 0.15 | 0.36 | 0.16 | 0.14 | 0.15 | 0.36 | 0.18 | 0.11 |
| PARKS | *0.56* | 0.50 | 0.57 | *0.59* | *0.48* | 0.50 | 0.49 | *0.47* |
| AGE | *31.70* | 10.81 | *30.33* | 33.55 * | *33.95* | 10.57 | *32.97* | 35.01* |
| SEX | *0.27* | 0.45 | *0.26* | 0.29 | *0.35* | 0.48 | *0.37* | 0.32 |
| EDU | 0.40 | 0.49 | 0.44 | 0.35* | 0.39 | 0.49 | 0.39 | 0.40 |
| ACT1 | 0.22 | 0.42 | 0.24 | 0.20 | 0.27 | 0.45 | 0.28 | 0.26 |
| ACT2 | *0.17* | 0.37 | *0.16* | 0.17 | *0.11* | 0.32 | *0.09* | 0.13 |
| ACT3 | *0.16* | 0.37 | 0.15 | 0.18 | *0.21* | 0.41 | 0.19 | 0.23 |
| ACT4 | 0.23 | 0.42 | *0.21* | 0.25 | 0.27 | 0.44 | *0.31* | 0.22* |
| ACT5 | *0.21* | 0.41 | *0.22* | 0.20 | *0.14* | 0.35 | *0.12* | 0.16 |
| IMP1 | 0.50 | 0.50 | *0.53* | 0.45 | 0.47 | 0.50 | *0.43* | 0.51 |
| IMP2 | 0.46 | 0.50 | *0.44* | 0.47 | 0.47 | 0.50 | *0.54* | 0.40* |
| IMP3 | 0.04 | 0.21 | 0.02 | 0.07* | 0.06 | 0.23 | 0.03 | 0.09* |
| INC | *20625* | 14833 | 21686 | *19184* | *24754* | 16893 | 24181 | *25370* |

Corresponding means that are significantly different from each other between both groups of local residents are indicated in bold italics.

*Denotes a significant difference between the 'yes' and 'no' means, within each group, using a t-test at the 0.05

The mean net annual income (INC) is US $35,286 for the group of foreign visitors which had not visited the site, and US $35,228 for the group of foreigners who had visited. These means are not significantly different from each other. However, in the case of both groups, the mean 'yes' ($37,844) and 'no' ($32,059) values for those who had not visited the site and 'yes' ($42,105) and 'no' ($35,228) values for those who had been to the site were significantly different from each other. This indicates that INC has a positive influence on WTP in the case of both groups. Figure 3 shows the income distribution for 'yes' responses for both groups of foreign respondents.

With respect to the local residents, the mean net annual income (INC) is EC $20,625 (US $7, 639) and EC $24,754 (US $9,168), respectively, for those who were interviewed in person and those who responded confidentially. In contrast to the foreign groups, the mean annual income is significantly different between both groups of local residents. However, within both groups, there is no significant difference between the mean 'yes' and 'no' responses.

In the case of the local respondents who completed the questionnaire in private, the mean annual income associated with 'yes' responses (EC $24,181 - US $8,956) is lower than the mean annual income for 'no' responses (EC $25,370 - US $9,396). This result is unexpected since it indicates that annual income has a negative influence on WTP values. Figure 4 shows the income distribution for 'yes' responses for both groups of local respondents.

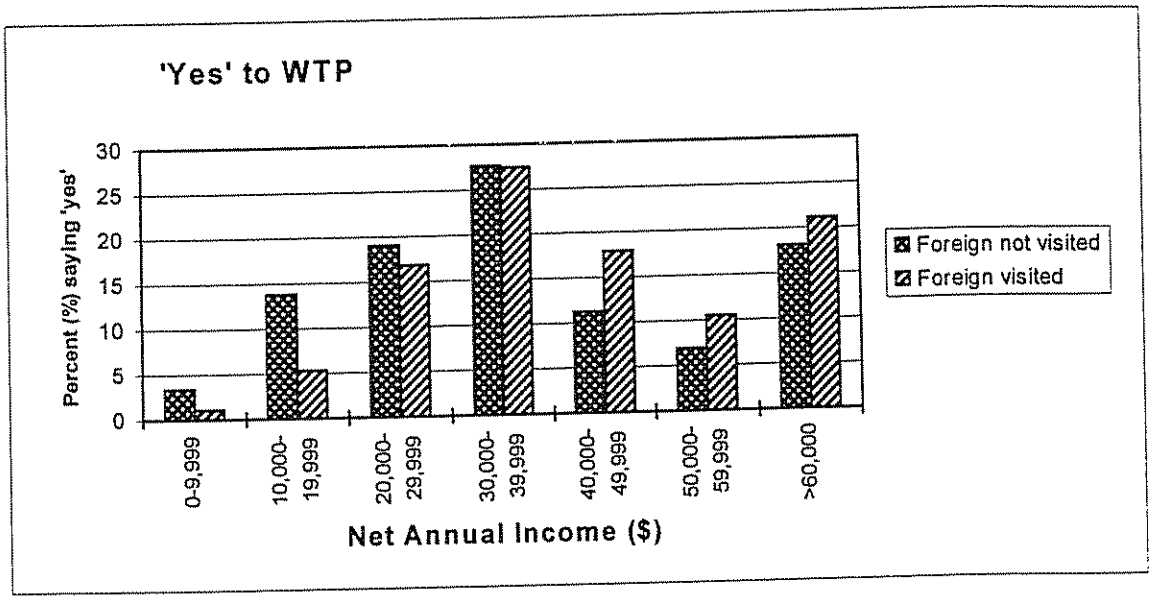


Figure 3. Income distribution for 'yes' responses for both groups of foreign visitors.

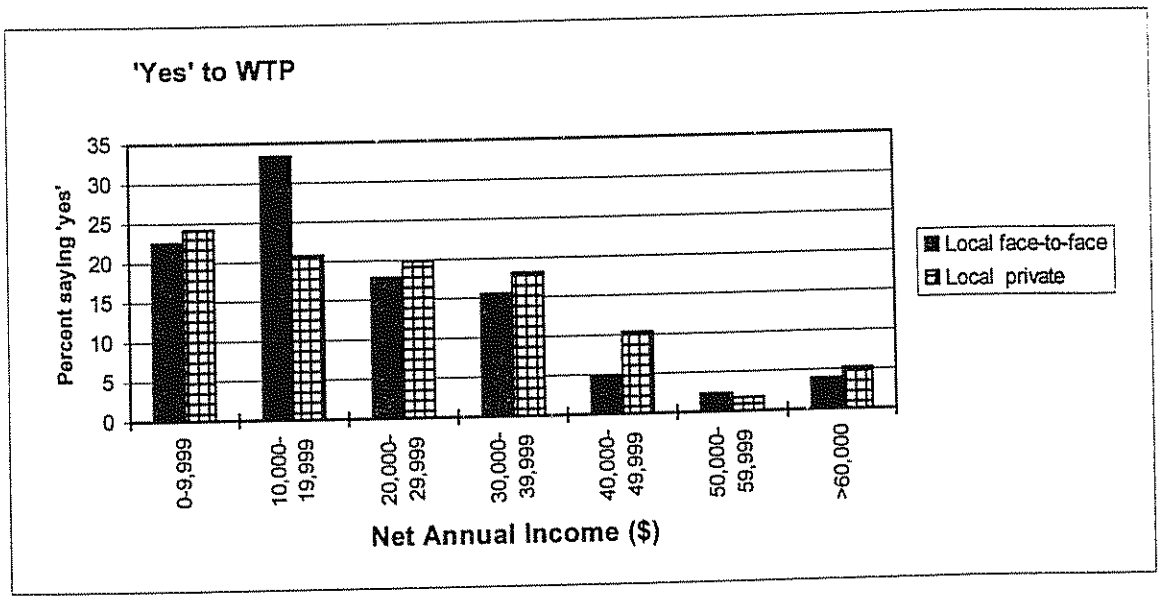


Figure 4. Income distribution for 'yes' responses for both groups of local residents.

## CONCLUSIONS OF DESCRIPTIVE STATISTICS

In order to examine the effect that the independent variables had on the WTP question, the variables were separated into two categories ('yes' and 'no') responses. In all cases, the mean 'yes' and 'no' responses were compared with t-tests, and in the case of the variable INC, with the use of distribution graphs. From these comparisons, it was observed that the variable BID had a negative influence on WTP across all four groups, in that, the higher the bid the greater the tendency to say 'no'.

In at least two of the groups, the origin (ORIG) of the respondents appeared to have some influence on their WTP. Similarly, in the case of the group which visited the site, having children (CHIL) appeared to have a positive influence on WTP. Likewise, having a college or university education (EDU) and annual income (INC), except in the case of the local residents who completed the questionnaire in private, tend to have a positive influence on WTP. In contrast, having a poor impression of the site (IMP3) appeared to have a negative influence on WTP.

Although this bivariate analysis provide a quick indication of the relationship between the independent variables and the dependent variable, it's overall validity and importance is limited. This occurs because it is not known whether the apparent relationship between the independent variable in question and the dependent variable is attributable to the independent variable itself or to an interaction with one or more of the other independent variables.

In order to know whether an independent variable has a statistically significant influence on WTP, a multivariate regression analysis which takes into account all of the independent variables, must be used. Because the dependent variable is a binary response variable (yes/no), a multivariate logit regression is utilized.

## CORRELATIONS AMONG THE INDEPENDENT VARIABLES

An important step in the process of conducting the multivariate logit analysis is determining whether or not there is evidence of interaction in the data. That is, the relationship between the independent variables should be examined for the possibility of multicollinearity. Table 8 shows an example of the correlation matrix for the independent variables with respect to the group of foreign visitors who had not been to the site.

In general, from the results shown in Table 8, the correlation coefficients are low except for a few notable cases. Of particular concern, is the apparently high correlation between origin from North America (ORIG1) and Europe (ORIG2), with a correlation coefficient of -79. There is also a high degree of correlation between considering the site to be unique (IMP1) and considering it to be average (IMP2) with a correlation coefficient of -88. Similar correlation matrices were generated for the other three groups in the study. The pattern of the relationships among the independent variables were quite similar to the case highlighted above.

As a further check on the possibility of multicollinearity, the standard errors of the coefficients associated with each of the independent variables should be examined after conducting a multivariate logit regression (Johnson et al., 1987). Another test for multicollinearity, not carried out in this analysis, is to regress each of the independent variables against all of the other independent variables and to examine the $R^2$ values.

## THE ESTIMATED MULTIVARIATE LOGIT MODELS

Taking the log of the probability of a 'yes' response over the probability of a 'no' response to the WTP question as the dependent variable, and all of the socio-economic variables (including the elicited bid) as the independent variables, a logit regression was conducted for each of the four groups in the study. In all cases, a full model including all the variables was first generated. Equation 4 was used to conduct the logit regressions using the data from both groups of foreign visitors, while equation 5 was used in the case of both groups of local residents.

Subsequent to the development of the "full" model, a "reduced" model was developed by using a stepwise approach in which variables were selected for inclusion or exclusion from the model in a sequential fashion on the basis of statistical criteria. In this case, the data sets were analyzed with the statistical criteria for inclusion or exclusion from the model set at $\alpha$ values of 0.15 and 0.1.

**Table 7. Correlation matrix for the independent variables with respect to the group of foreign visitors who had not been to the site**

| | O1 | O2 | O3 | L | V | SI | AG | S | CH | E | F1 | F2 | F3 | F4 | A1 | A2 | A3 | A4 | IM1 | IM2 | IM3 | IN | BID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O1 | 1 | | | | | | | | | | | | | | | | | | | | | | |
| O2 | **-.79** | 1 | | | | | | | | | | | | | | | | | | | | | |
| O3 | **-.32** | **-.34** | 1 | | | | | | | | | | | | | | | | | | | | |
| L | -.03 | .18 | -.22 | 1 | | | | | | | | | | | | | | | | | | | |
| V | -.08 | -.17 | **.39** | .04 | 1 | | | | | | | | | | | | | | | | | | |
| SI | -.04 | .00 | .06 | .02 | -.04 | 1 | | | | | | | | | | | | | | | | | |
| AG | -.14 | .12 | .03 | .06 | .19 | .02 | 1 | | | | | | | | | | | | | | | | |
| S | -.04 | .01 | .05 | .05 | .05 | .12 | .09 | 1 | | | | | | | | | | | | | | | |
| CH | -.14 | .14 | -.01 | -.05 | -.03 | -.07 | .06 | -.04 | 1 | | | | | | | | | | | | | | |
| E | .13 | -.13 | -.01 | .09 | .05 | .19 | -.19 | .09 | -.16 | 1 | | | | | | | | | | | | | |
| P1 | -.04 | .12 | -.13 | .02 | -.12 | -.12 | -.00 | .06 | .08 | -.08 | 1 | | | | | | | | | | | | |
| P2 | .28 | -.20 | -.13 | .03 | -.10 | .04 | -.29 | -.07 | -.07 | .08 | -.22 | 1 | | | | | | | | | | | |
| P3 | -.08 | .16 | -.13 | -.00 | -.13 | .05 | .01 | .03 | -.02 | -.03 | **-.48** | -.27 | 1 | | | | | | | | | | |
| P4 | -.08 | -.18 | **.39** | -.05 | **.36** | .05 | .22 | -.02 | -.00 | .05 | **-.34** | -.19 | **-.42** | 1 | | | | | | | | | |
| A1 | .16 | -.19 | .05 | -.07 | -.04 | .06 | -.19 | -.01 | -.01 | .12 | -.06 | .15 | -.10 | .04 | 1 | | | | | | | | |
| A2 | -.06 | .14 | -.13 | -.04 | .00 | .05 | .17 | -.05 | .11 | -.04 | -.04 | -.08 | .10 | .00 | **-.31** | 1 | | | | | | | |
| A3 | -.03 | .04 | -.01 | .08 | .04 | -.08 | -.07 | .02 | -.11 | -.03 | .08 | -.07 | .05 | -.08 | -.19 | -.43 | 1 | | | | | | |
| A4 | -.02 | -.04 | .09 | .03 | -.01 | -.01 | .01 | .05 | -.02 | -.00 | .03 | .04 | -.08 | .02 | -.22 | **-.49** | -.30 | 1 | | | | | |
| IM1 | .17 | -.20 | .05 | -.08 | -.08 | .19 | -.14 | .01 | -.10 | -.02 | -.08 | .14 | .00 | -.00 | .17 | .02 | -.04 | -.11 | 1 | | | | |
| IM2 | -.22 | .22 | -.00 | .11 | .11 | -.14 | .15 | -.02 | .12 | .02 | .04 | -.12 | .01 | .02 | -.19 | -.04 | .05 | .13 | **-.88** | 1 | | | |
| IM3 | .12 | -.06 | -.09 | -.07 | -.06 | -.10 | -.04 | .02 | -.05 | -.01 | .08 | -.02 | -.02 | -.04 | .04 | .04 | -.02 | -.05 | -.18 | -.31 | 1 | | |
| IN | .21 | -.07 | -.22 | .14 | .04 | .01 | **.32** | .23 | -.01 | .07 | .03 | .01 | .02 | -.05 | -.01 | .10 | -.01 | -.08 | -.03 | .02 | .01 | 1 | |
| BID | .08 | -.14 | .08 | -.09 | -.05 | .06 | -.07 | .03 | -.02 | -.10 | .09 | -.02 | -.05 | .00 | -.00 | .06 | .00 | -.07 | .03 | -.09 | .12 | -.14 | 1 |

*See Tables 2 and 3 for coding scheme*

O1 = ORIG1 O2 = ORIG2 O3 = ORIG3 L = #DAYS V = #VISITS SI = PLAN AG = AGE S = SEX CH = CHIL E = ED F1 = FOCUS1
F2 = FOCUS2 F3 = FOCUS3 F4 = FOCUS4 A1 = ACT1 A2 = ACT2 A3 = ACT3 A4 = ACT4 IM1 = IMP1 IM2 = IMP2 IM3 = IMP3 IN = INC

The variables that satisfied these criteria, and hence made it into the reduced model, were the same at both values of $\alpha$ for all four groups in the survey: foreign visitors who had not been and those who had been to the site, and local residents who were interviewed in person and those who completed the questionnaire in private.

The reduced model is justified on the basis of seeking the most parsimonius model that still explains the data. One rationale for minimizing the number of variables in the model is that the resultant model is more likely to be numerically stable, and is more easily generalized (Hosmer and Lemeshow, 1989), and in this case facilitates an easier estimation of mean WTP values.

The following section describes the results of the multivariate logit regression models for the four groups of respondents in the survey: foreign visitors who had not been and those who had been to the site, and local residents who were interviewed in person and those who completed the questionnaire in private. Firstly, for each group, the results of the "full" model will be described followed by the results of the "reduced" model. The section ends with an overall summary of the variables that are significant in the "full model" along with their corresponding signs for all four groups in the study.

Foreign Visitors Who Did Not Visit The Proposed Park

The Full Model

Table 8A shows the results of the "full" logit regression model for the group of foreign respondents who did not visit the site. The majority of the variables in the full model are not significant at the level of $\alpha \leq 0.1$. However, from the score statistic, which test the joint significance of the explanatory or independent variables, we can conclude that the combined effect of the independent variables in the full model (Chi-Square value 64.62) is significant with p-value of 0.0001. Similarly, the -2 log likelihood ratio Chi-Square value of 74.376 indicates a significant relationship between the independent variables and the dependent variable with a p-value of 0.0001. The model correctly predicts the 'yes'/'no' response 83% of the time versus a discordant rate of 17%.

The independent variables which are significant at the 90% level or better are income (INC) and BID. These two variables were also shown to influence a 'yes' or 'no' response in the analysis of the univariate descriptive statistics.

The Reduced Model

The results of the stepwise approach to variable selection on the basis of the statistical criteria $\alpha = 0.1$ is shown in Appendix B-1. The "reduced" model was also significant with a Chi-Square value of 59.692 and a p-value of 0.0001. The log likelihood ratio chi-square value of 68.908 was also significant with a p-value of 0.0001. The model has an 81% correct prediction rate. The independent variables that are significant in this model are Origin from North America

Table 8. Summary of the full logit regression model for the group of foreign visitors who had not visited the proposed park.

| Variable | Coefficient | Mean | Standard Error | Wald Chi-Square |
|---|---|---|---|---|
| Yes/No | ----- | 0.5577 | ----- | ----- |
| ORIG1 | -0.7456 | 0.4279 | 0.6536 | 1.3014 |
| ORIG2 | -0.1637 | 0.4519 | 0.6632 | 0.0609 |
| #DAYS | -0.00688 | 8.2404 | 0.0180 | 0.1467 |
| #VISITS | -0.00163 | 1.1490 | 0.0558 | 0.0009 |
| PLAN | 0.4872 | 0.2548 | 0.4249 | 1.3151 |
| AGE | -0.0202 | 34.3654 | 0.0192 | 1.1056 |
| SEX | 0.0131 | 0.5385 | 0.3623 | 0.0013 |
| CHIL | 0.5101 | 0.0433 | 0.8919 | 0.3271 |
| EDU | -0.4948 | 0.6827 | 0.4036 | 1.5029 |
| PUR1 | -0.5880 | 0.2788 | 0.5411 | 1.1808 |
| PUR2 | -0.5386 | 0.1106 | 0.7239 | 0.5535 |
| PUR3 | -0.5263 | 0.3702 | 0.5047 | 1.0876 |
| ACT1 | -0.0892 | 0.1202 | 0.6173 | 0.0209 |
| ACT2 | -0.00159 | 0.4135 | 0.4542 | 0.0000 |
| ACT3 | -0.2048 | 0.2067 | 0.5029 | 0.1659 |
| IMP1 | 1.0906 | 0.3365 | 0.8367 | 1.6990 |
| IMP2 | 0.1489 | 0.6058 | 0.8124 | 0.0335 |
| INC | 0.000029 | 35286 | 0.000012 | 5.6997** |
| BID | -0.0868 | 25.0385 | 0.0140 | 38.2295*** |
| Constant | 2.8438 | | 1.3257 | 4.6019** |

n = 208 'yes" = 116 'no' = 92 -2 Log likelihood = 211.198

Chi-Square (19 d.f): 64.62 (p=0.0001) Concordant = 82.8%; Discordant =17.1%; Tied = 0.1% Level of significance: .10 (*); .05 (**); .01 (***)

Note: The following categories were omitted: O3, P4, A4 and IM3 and were therefore captured by the intercept or constant term.

(ORIG1), the site as being unique (IMP1), INC, BID. The positive signs associated with the variables IMP1 and INC as well as the negative sign of the variable BID conform to expectations. However, the negative sign associated with the variable ORIG1 is not what is expected.

When compared to the "full" model, it is clear that there is no significant loss of predictive capability in the model (83% in the case of the "full model versus 81% in the reduced model). In addition, there is no drastic change in the value of

the coefficients or standard errors. Whereas only the variables BID and INC were significant in the "full" model, the "reduced" model contained, in addition to these two variables, the variables ORIG1 and IMP1. This indicates that some degree of multicollinearity exist in the data. This is consistent with the results of the correlation matrices which show a high degree of correlation between the variables ORIG1 and ORIG2 and between IMP1 and IMP2.

Foreign Visitors Who Visited The Proposed Park

The Full Model

The 'full' logit regression model associated with the group of foreign visitors who visited the proposed park is summarized in Table 9A. As with the previous group, this 'full' model is also significant (Chi-Square value = 121.871) with a p-value of 0.0001. The -2 log likelihood Chi-Square value of 179.070 is also significant with a p-value of 0.0001. The model successfully predicts the 'yes'/'no' responses 96% of the time. The significant variables in this case are ORIG2, rest and relaxation (ACT3), INC and BID. These results are consistent with our observations, in that, the majority of the foreign visitors who visited Wallings on their own tended to be of European origin.

The Reduced Model

The results of the stepwise selection of variables show that the variables ORIG2, INC and BID are significant at $\alpha \leq 0.1$. Both the score chi-Square value (118.676) and the log likelihood chi-Square value (164.205), with three (3) degrees of freedom, are significant with a p-value of 0.0001. The reduced model has a correct prediction rate of 94.8% compared to 95.7% for the "full" model. A summary of the reduced model is shown in Appendix B-2.

Table 9. Summary of the full logit regression model for the group of foreign visitors who visited the proposed park.

| Variable | Coefficient | Mean | Standard Error | Wald Chi-Square |
|---|---|---|---|---|
| Yes/No | ----- | 0.4567 | ----- | ----- |
| ORIG1 | 0.8573 | 0.3702 | 1.0948 | 0.6131 |
| ORIG2 | 2.4593 | 0.4760 | 1.0918 | 5.0735** |
| #DAYS | -0.0273 | 6.0625 | 0.0726 | 0.1409 |
| #VISITS | 0.4009 | 0.8462 | 0.3115 | 1.6557 |
| PLAN | 0.0998 | 0.5048 | 0.5790 | 0.0297 |
| AGE | -0.0148 | 36.0625 | 0.0318 | 0.2176 |
| SEX | 0.2255 | 0.5144 | 0.5275 | 0.1828 |
| CHIL | 0.5134 | 0.0865 | 1.0135 | 0.2567 |
| EDU | 0.8830 | 0.7596 | 0.7025 | 1.5802 |
| PUR1 | 0.5154 | 0.3558 | 0.7718 | 0.4460 |
| PUR2 | 0.1285 | 0.0769 | 1.2206 | 0.0111 |
| PUR3 | -0.5632 | 0.3221 | 0.7533 | 0.5591 |
| ACT1 | 1.3000 | 0.1683 | 0.9468 | 1.8851 |
| ACT2 | -0.00906 | 0.3894 | 0.6679 | 0.0002 |
| ACT3 | 1.5004 | 0.1923 | 0.8821 | 2.8930* |
| IMP1 | 1.0139 | 0.4471 | 1.3650 | 0.5518 |
| IMP2 | 0.5021 | 0.5144 | 1.3632 | 0.1357 |
| INC | 0.000078 | 35228 | 0.000023 | 11.8253*** |
| BID | -0.2108 | 25.0288 | 0.0343 | 37.7915*** |
| Constant | 2.8438 | | 2.1903 | 0.2545 |

n = 208 'yes" = 95 'no' = 113 -2 Log likelihood = 107.719
Chi-Square (19 df): 121.871 (p=0.0001) Concordant = 95.7%; Discordant = 4.2%;
Tied = 0.0% Level of significance: .10 (*); .05 (**); .01 (***)

Note: The following categories were omitted: O3, P4, A4 and IM3 and were therefore captured by the intercept or constant term.

A comparison of the results of the "full" logit regression models for the group of foreign visitors who did not visit the site and those who visited, shows that there are only two significant variables, INC and BID, in the case of those visitors who did not visit the site, while there are four significant variables, ORIG2, ACT3, INC and BID for the group of foreign visitors who visited the site. However, it must be pointed out that in the stepwise selection of variables, in addition to the variables INC and BID, the variables ORIG1 and IMP1 were also significant in the case of the group of foreign visitors who did not visit the site.

Local Residents Who Were Interviewed In Person

The Full Model

The 'full' logit regression model for the group of local residents who were interviewed in person is summarized in Table 10A. The model itself is statistically significant with a score Chi-Square value of 95.919 and a p-value of 0.0001. The -2 log likelihood Chi-Square value of 120.430 is also significant with a P-value of 0.0001. The model has a successful prediction rate of 89%.

The significant variables ($\alpha \leq 0.1$) are ORIG1 (city), AGE, IMP1, INC and BID. The results indicate that living in the city, viewing the site as being unique and annual income all have a positive influence on WTP to enter the proposed park. In contrast, and as expected, age had a negative influence on WTP, with older respondents having correspondingly lower WTP values than younger persons.

The Reduced Model

A summary of the reduced model is shown in Appendix B-3. Again the results show that the model is statistically significant (Chi-Square value = 87.599) with a p-value of 0.0001. The success prediction rate of the model is 87% compared to 89% in the case of the "full" model. The significant variables in this reduced model are AGE, INC and BID.

Table 10. Summary of the full logit regression model for the group of local residents who were interviewed in person.

| Variable | Coefficient | Mean | Standard Error | Wald Chi-Square |
|---|---|---|---|---|
| YeS/No | ----- | 0.5759 | ----- | ----- |
| ORIG1 | 1.0752 | 0.2902 | 0.5558 | 3.7423* |
| ORIG3 | 0.6549 | 0.4866 | 0.4873 | 1.8058 |
| VWAL | -0.2215 | 0.3080 | 0.4263 | 0.2700 |
| NDNP | -0.2050 | 0.8616 | 0.6056 | 0.1146 |
| REEF | -0.4177 | 0.1116 | 0.7089 | 0.3471 |
| NSI | 0.0139 | 0.1518 | 0.5896 | 0.0006 |
| PARKS | -0.4565 | 0.5759 | 0.4110 | 1.2335 |
| AGE | -0.0518 | 31.7009 | 0.0199 | 6.7626*** |
| SEX | -0.1303 | 0.2723 | 0.4708 | 0.0765 |
| EDU | 0.1545 | 0.4018 | 0.4008 | 0.1485 |
| ACT1 | 0.2800 | 0.2232 | 0.5703 | 0.2412 |
| ACT2 | 0.0958 | 0.1652 | 0.5991 | 0.0256 |
| ACT3 | -0.4419 | 0.1607 | 0.6570 | 0.4524 |
| ACT4 | -0.2912 | 0.2277 | 0.5627 | 0.2678 |
| IMP1 | 1.7630 | 0.5000 | 0.9748 | 3.2712* |
| IMP2 | 1.4573 | 0.4553 | 0.9661 | 2.2751 |
| INC | 0.000055 | 20625 | 0.000016 | 11.2710*** |
| BID | -0.2151 | 15.0625 | 0.0301 | 51.2337*** |
| Constant | 2.7670 | | 1.2949 | 4.5660** |

n = 224 'yes" = 129 'no' = 95 -2 Log likelihood = 184.920
Chi-Square (18 d.f): 95.919 (p=0.0001) Concordant = 88.7%; Discordant = 11.2%
Tied = 0.1% Level of significance: .10 (*); .05 (**); .01 (***)

Note: The following categories were omitted: O2, A5 and IM3 and were therefore captured by the intercept or constant term.

## Local Residents Who Completed The Questionnaire In Private

### The Full Model

The results of the 'full' logit regression model for the group of local residents who were asked to complete the questionnaire in confidence is summarized in Table 11A. As in the case of the previous groups, the model is statistically significant ($\alpha \leq 0.1$) with a Chi-Square value of 83.865 and a p-value of 0.0001. The -2 log likelihood Chi-Square value of 100.531 is significant with p=0.0001. The model correctly predicted the 'yes'/'no' responses 86% of the time.

The significant variables in the 'full' model are NDNP (previous visit to Nelson's Dockyard National Park), NSI (previous visits to the North Sound Islands), AGE, ACT4 (nature watching), IMP2 and BID. In this case, the variables NDNP and NSI significantly influence the response to the WTP question as expected. However, the negative (-) sign associated with the variable NDNP is not what is expected. Also of importance, is the fact that the variables ACT4 and IMP2 have the expected positive relationship with the dependent variable. Perhaps the most striking observation among these results, is the fact that income (INC) has no significant influence on the response to the WTP question and that the sign associated with this variable in negative (-), contrary to expectations.

The Reduced Model

A summary of the results of the reduced model is shown in Appendix B-4. The model has a score Chi-Square value of 76.398 with a p-value of 0.0001. It correctly predicts the 'yes'/'no' response 84% of the time compared to 86% in the case of the "full" model. The significant variables are NDNP, NSI, AGE and BID. The fact that there are two less significant variables in the reduced model when compared to the "full" model (The variables ACT4, IMP2 eliminated) shows that there is some degree of interaction between certain independent variables.

With respect to the local residents, the results of the "full" logit regression model for the group that was surveyed in person show a total of five (5) variables which significantly influenced WTP. These variables are ORIG1, AGE, IMP1, INC AND

BID. In comparison, the model associated with the group of local residents who completed the questionnaire in private has six (6) significant variables: NDNP, NSI, AGE, ACT4, IMP2 and BID. These results indicate that for the most part, the WTP values of two groups of local residents were being influenced by different factors.

Table 11. Summary of the full logit regression model for the group of local residents who completed the questionnaire in private.

| Variable | Coefficient | Mean | Standard Error | Wald Chi-Square |
|---|---|---|---|---|
| Yes/No | ----- | 0.5179 | ----- | ----- |
| ORIG1 | -0.4640 | 0.2589 | 0.6236 | 0.5536 |
| ORIG3 | -0.1881 | 0.6027 | 0.5554 | 0.1147 |
| VWAL | 0.0367 | 0.3661 | 0.3858 | 0.0090 |
| NDNP | -1.2014 | 0.8795 | 0.5259 | 5.2193** |
| REEF | -0.0471 | 0.1384 | 0.5417 | 0.0076 |
| NSI | 1.0530 | 0.1473 | 0.5495 | 3.6714* |
| PARKS | 0.0644 | 0.4821 | 0.4141 | 0.0242 |
| AGE | -0.0403 | 33.9598 | 0.0195 | 4.2939** |
| SEX | 0.3342 | 0.3482 | 0.4085 | 0.6692 |
| EDU | -0.4179 | 0.3929 | 0.3975 | 1.1056 |
| ACT1 | 0.5947 | 0.2723 | 0.6087 | 0.9547 |
| ACT2 | 0.00883 | 0.1116 | 0.7263 | 0.0001 |
| ACT3 | 0.8722 | 0.2098 | 0.6338 | 1.8941 |
| ACT4 | 1.0507 | 0.2679 | 0.5952 | 3.1159* |
| IMP1 | 1.2469 | 0.4688 | 0.8681 | 2.0632 |
| IMP2 | 1.6402 | 0.4732 | 0.8661 | 3.5863* |
| INC | -7.71E-7 | 24754 | 0.000011 | 0.0046 |
| BID | -0.1748 | 15.0625 | 0.0245 | 50.7459*** |
| Constant | 3.2976 | | 1.4155 | 5.4274** |

n = 224 'yes" = 116 'no' = 108 -2 Log likelihood = 209.713
Chi-Square (18 d.f): 83.865 (p=0.0001) Concordant = 85.5%; Discordant = 14.4%
Tied = 0.1% Level of significance: .10 (*); .05 (**); .01 (***)

Note: The following categories were omitted: O2, A5 and IM3 and were therefore captured by the intercept or constant term.

Summary Of The Results Of The Logit Regression Models

Table 12 shows a summary of the significant variables and their respective signs (in bracket) for the four ("full") models representing the four groups of respondents in the survey. From these results, it is clear that the annual income and the bid, and in the case of the group of foreign visitors who visited the site, origin and activity, are the principal factors influencing the WTP values of the foreign visitors. By contrast, in addition to the annual income (not significant in the case of the local residents who responded in confidence) and bid, other factors such as age, origin, impression of the site and visits to other parks/protected areas have a significant influence on the WTP values of local residents.

Table 12. Summary of the significant variables and their respective signs for the four models representing the four groups of respondents in the survey.

| Foreign visitors who had not been to the site | Foreign visitors who visited the site | Local residents who were surveyed in person | Local residents who completed the questionnaire in private |
|---|---|---|---|
| (+) INC | (+) ORIG2 | (+) ORIG1 | (+) VWAL |
| (-) BID | (+) ACT3 | (-) AGE | (-) NSI |
| | (+) INC | (+) IMP1 | (-) AGE |
| | (-) BID | (+) INC | (+) ACT4 |
| | | (-) BID | (+) IMP2 |
| | | | (-) BID |

## THE PREDICTED PROBABILITY OF A 'YES' RESPONSE

The estimated coefficients and sample means can be used to calculate the estimated logit of the probability, and subsequently, the predicted probability of a typical (average) respondent saying 'yes' to the WTP question. Taking the case of the reduced model for the group of foreign respondents who had not visited the proposed park as an example, we find that:

$$\text{logit (p)} = \text{'z'} = 1.5020 - 0.0831(\text{BID}) + 0.000024(\text{INC}) + 1.1556(\text{IMP1}) \\ 0.7178(\text{ORIG1})$$

$$= 1.5020 - 0.0831(25.0385) + 0.000024(35286) + 1.1556(0.337) \\ 0.7178(0.428) = 0.35038345$$

$$\text{and 'p'} = e^{0.35038345}/(1+e^{0.35038345}) = 0.5867 \text{ or } 59\%$$

This value (p) is the predicted probability that a respondent will say 'yes' when the bid (BID) is 25.0385, the net annual income (INC) is US $ 35,286, regarding the site as unique (IMP1) has a mean of 0.337, and the mean value of origin from North America (ORIG1) equals 0.428. This procedure is important because it makes it possible to analyze the effect of selected independent variables on WTP. That is, the predicted probability of a respondent saying 'yes' to the WTP question at different levels of a particular independent variable can be calculated.

## THE EFFECT OF SELECTED INDEPENDENT VARIABLES ON WTP

The relationship between the independent variables and the dependent variable can be demonstrated graphically by converting the predicted logit values 'z' to predicted probabilities, as demonstrated above, and then graphing

the independent variable in question against the probability of a 'yes'/'no' WTP response, while holding all the other variables in the equation constant. Figures 5 through 8 show the probability of a 'yes' response at different levels of the variables BID and INC while holding all the other variables constant at their means for the four groups of respondents in the survey.

These graphs, in addition to clearly showing the positive or negative relationship between the independent variables under consideration and the dependent variable, also allows for the comparison between groups, that is, between both groups of foreign respondents and between both groups of local residents. In the case of the local residents who completed the questionnaires privately, the variable INC (income), which was found not to be significant, is included here to demonstrate that fact, and also to show that it had a negative trend, contrary to expectations.

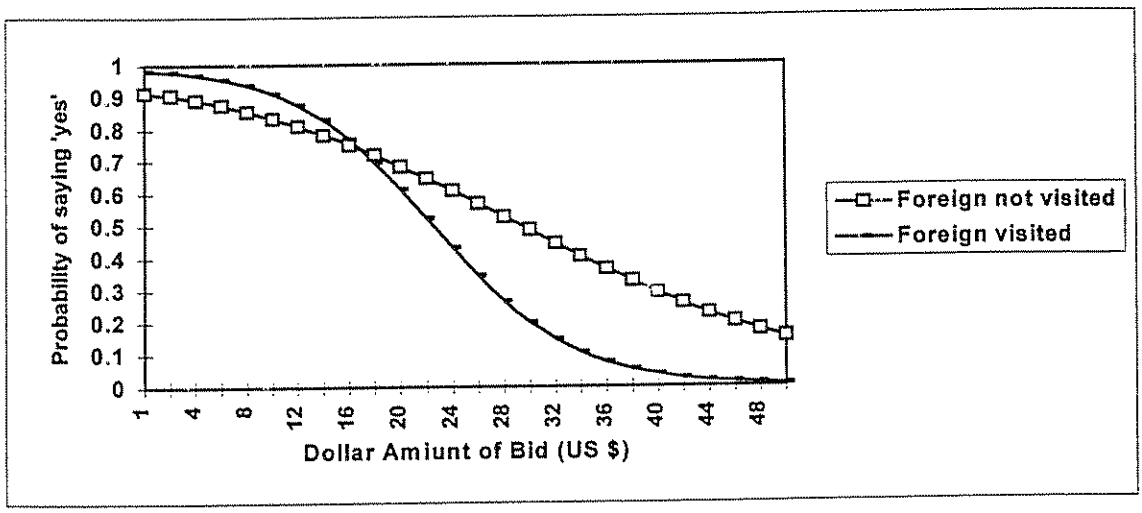


Figure 5. Probability of WTP at different BID values for both groups of foreign visitors.

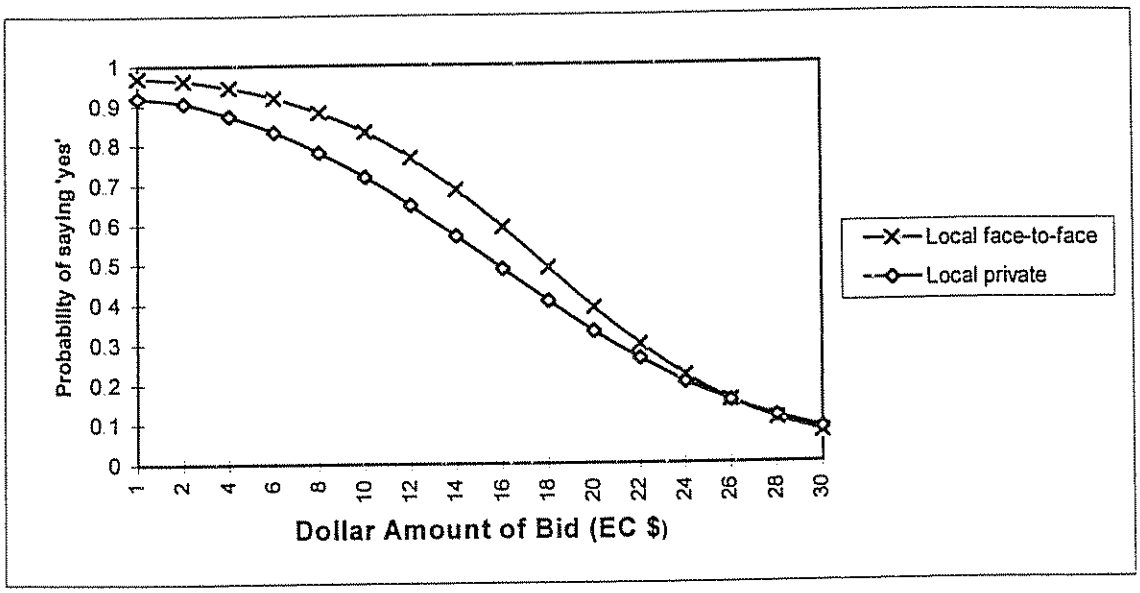


Figure 6. Probability of WTP at different BID values for both groups of local residents.

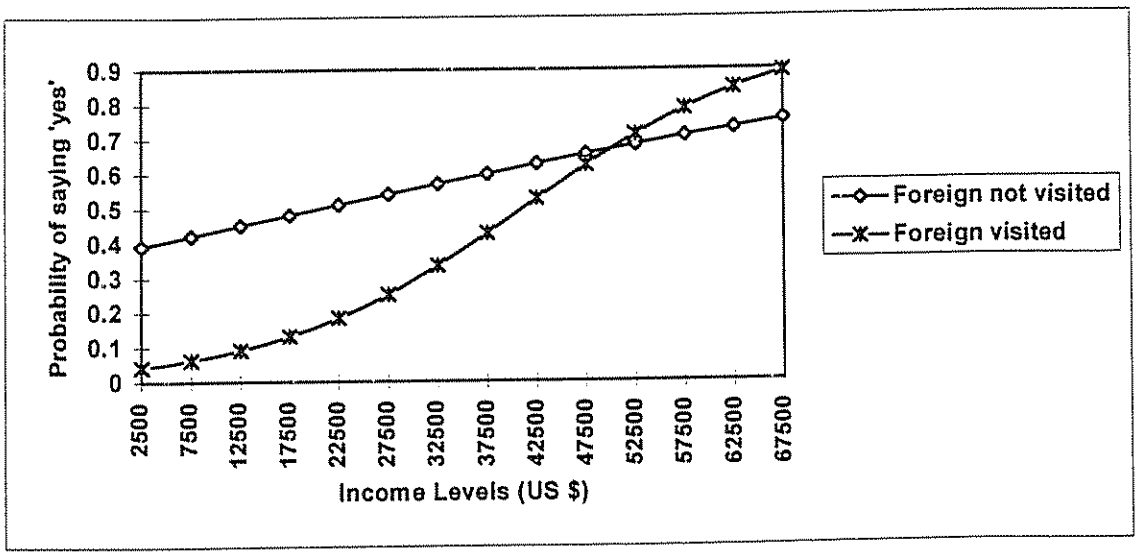


Figure 7. Probability of WTP at different income levels for both groups of foreign visitors.

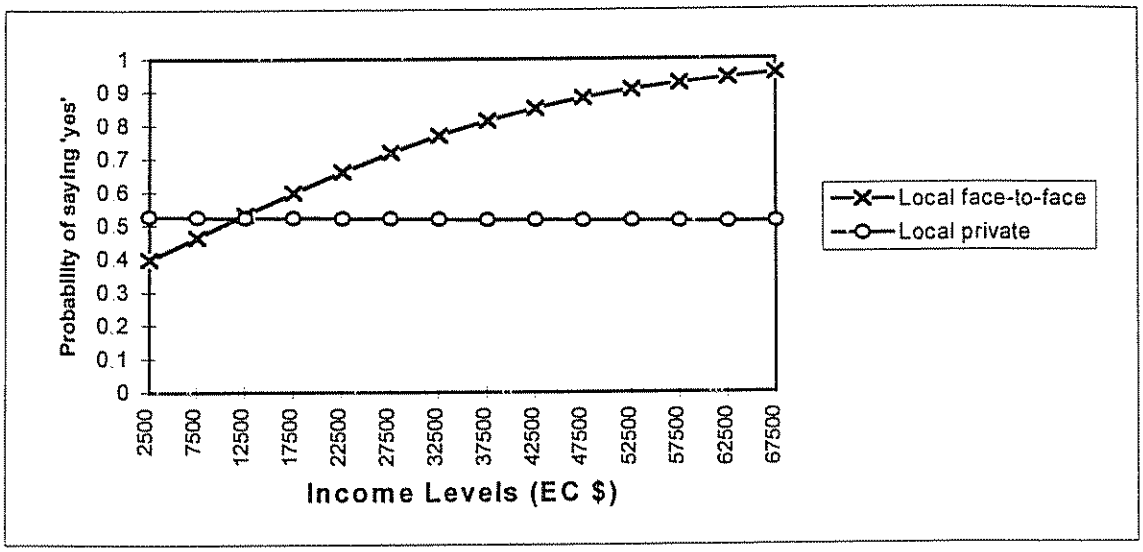


Figure 8. Probability of WTP at different income levels for both groups of local residents.

THE ESTIMATION OF MEAN WTP

Using the coefficients obtained from the reduced logit regression models for each group of respondents (Appendix B), the mean WTP for entrance to the proposed Wallings Forest National Park was calculated by utilizing equation (3') as described in both the literature review and methods section. That is, a grand constant was calculated for each group by multiplying each coefficient (with the exception of the Variable BID) by its mean, summing these products and adding this sum to the original constant. This grand constant is subsequently divided by β (the coefficient of the variable BID). The grand constant, the BID coefficients and the estimated mean WTP values are summarized in Table 13.

Table 13. The grand constant, BID coefficients and estimated mean WTP values for the four (4) groups of respondents in the study.

| Group | Grand Constant | BID^ Coefficient | Estimated Mean WTP (US $) |
|---|---|---|---|
| Foreign respondents who had not visited the site | 2.43108 | 0.0831 | 29 |
| Foreign respondents who visited the site | 4.16261 | 0.1852 | 22 |
| Local respondents who were interviewed in person | 3.65547 | 0.2050 | 7 [1] |
| Local respondents who completed the questionnaires in private | 2.59564 | 0.1651 | 6 [2] |

^ - Negative sign on BID coefficient changed as a result of equation (3)
[1] - (EC $18) [2] - (EC $16)

Among foreign visitors who had not been to the proposed Wallings Forest National Park, the mean WTP value for future visits to a hypothetically improved park was US $ 29, which is considerably higher than the mean WTP value of US $22 for foreign visitors who actually visited the proposed park. It is probable that the group of foreign visitors who visited the site, and was thus better informed, had WTP values that are more linked to the realities of the site. These mean WTP values of $29 and $22 represent 725% and 550%, respectively, of the maximum fee ($4) currently charged to enter the Nelson's Dockyard National Park. For purposes of comparison, a "regular" tourist tour is valued at approximately US $80, a Jolly Roger boat cruise cost US $50, a single scuba diving trip cost US $85 and a trip to the North Sound Islands (NSI) cost US $60 -75.

In the case of local residents who were surveyed in person, the mean WTP value for future visits to the proposed park, contingent upon the specified improvements in the services offered by the park, was US $7 or 175% of the fee currently charged to enter the Nelson's Dockyard National Park. The corresponding value for the group of local residents who completed the questionnaire in private was US $6 or150% of the current fee.

## AGGREGATION OF WTP BENEFITS

As indicated above, land use policy makers in Antigua and Barbuda need to know the potential economic values of natural areas which are often public goods without market prices, and whether such parks and protected areas can be self-sufficient and sustainable in their operation and management. By knowing the mean WTP for different groups, planners and policy makers can make simulated projections, and sensitivity analysis, of potential revenues from entrance fees to the proposed Wallings Forest National Park as well as other sites by adjusting for potential visitation rates.

For example, by using the mean WTP for the group of foreign visitors who actually visited the site (US $22), and an expected annual visitation rate of 5,000, then the park could expect to generate $110,000. Similarly, by using the mean WTP value for the group of local residents who were surveyed in person (US $7) and a potential annual visitation rate of 5,000, the expected or potential revenues from entrance fees is US $35,000. These aggregated values are important in benefit-cost analysis and facilitate the comparison of different

development options and thus aid in land use policy decisions. Table 14 shows a summary of aggregated WTP values (expected or potential revenues) for alternative visitation levels with respect to each of the four groups in the survey.

Table 14. Summary of aggregate WTP values (expected or potential revenues) for alternative visitation levels for the four groups in the survey.

| Potential visitation rates | Foreign visitors who had not been to the site | Foreign visitors who visited the site | Local residents who were surveyed in person | Local residents who completed the questionnaire in private |
|---|---|---|---|---|
| | Mean WTP US $29 | Mean WTP US $22 | Mean WTP US $7 | Mean WTP US $6 |
| 1,000 | 29,000 | 22,000 | 7,000 | 6,000 |
| 5,000 | 145,000 | 110,000 | 35,000 | 30,000 |
| 10,000 | 290,000 | 220,000 | 70,000 | 60,000 |
| 15,000 | 435,000 | 330,000 | 105,000 | 90,000 |

## A MULTIVARIATE TEST FOR OVERALL DIFFERENCES BETWEEN GROUPS

In order to compare whether the structure of WTP differs between both groups of foreign respondents and between both groups of local respondents, the procedure outlined in the methods section captioned "A Multivariate Test for Overall Differences Between Groups" is employed. The test requires the use of equation (8), which is repeated below, and involves testing for the equality of the two logistic regression equations, corresponding to the group of foreign visitors who had not visited the site and the group which visited. Similarly, the equality of the two logistic regression equations corresponding to the two groups of local residents (face-to-face and private) was tested.

$c = -2(\log likelihood_{ab} - (\log likelihood_a + \log likelihood_b)$

Where: c = the Chi-Square test statistic

The statistical programme used to analyze the data reports the value of the statistics as *-2 log L* (likelihood). In the case of the foreign groups, the -2 log $likelihood_a$ value is 211.198; the -2 log $likelihood_b$ value is 107.719 and the -2 log $likelihood_{ab}$ value is 368.594. Therefore, the Chi-Square test statistic (c) is [368.594 - (211.198 + 107.719)] = 49.677, and the critical Chi-Square value ($\chi^2_{19, 0.90}$) is 27.20. The results clearly indicate that there is a significant difference in the structure of WTP between the group of foreign respondents who had not visited the site and those who visited the site.

Similarly, in the case of the local respondents, the -2 log $likelihood_a$ value (where the subscript a represents the group of local residents who were interviewed in person) is 184.920. The group of local residents who completed the questionnaires in private had a -2 log $likelihood_b$ value of 209.713, while the -2 log $likelihood_{ab}$ value is 423.236. The Chi-Square test statistic is therefore [423.236 - (184.920 + 209.713)] = 28.603, and the critical Chi-Square value ($\chi^2_{18, 0.90}$) is 25.99. Again, the results indicate that there is a significant difference in the structure of WTP (taking account of all variables jointly) between the group of local residents who were interviewed in person and those who completed the questionnaires in private.

# CONCLUSIONS

## SUMMARY OF THE FINDINGS

The primary objectives of this thesis were to: (1) determine the WTP for entrance fees to the proposed Wallings Forest Reserve National Park in Antigua, in order to estimate the amount of money that the site could be expected to generate under alternative development strategies and (2), evaluate the CVM as an appropriate valuation technique for protected area planning in the context of Antigua and Barbuda and other developing countries of the Caribbean. The secondary objectives of the thesis were to: (1) evaluate whether or not WTP for entrance fees differed between foreign visitors who had not been to the site and those who had been to the site and (2), investigate the possible existence of cultural/strategic bias among local residents based on the manner in which the survey was conducted (face-to-face interview versus more private question answering).

It was determined that the mean WTP for entrance fees to the proposed park, with respect to the group of foreign respondents who had not been to the site, was US $29. Foreign respondents who actually visited the site were willing, on average, to pay US $22, while local residents who were interviewed in person and those who completed the questionnaire in private had mean WTP values of US $7 (EC $18) and $6 (EC $16) , respectively. It is important to note that in both cases, that is, between both foreign groups and between both local groups, the

mean WTP values, or the structure of WTP, are statistically different (at the 90% level).

By using the mean WTP value and potential annual visitation rates of 1,000 to 15,000, the expected or potential revenues from park entrance fees, with respect to the group of foreign visitors who had not been to the site ranged from US $29,000 to $435,000. In the case of foreign visitors who actually visited the site, the expected or potential revenues ranged from US $22,000 to $330,000. The corresponding values for the local residents were US $7,000 to $105,000 for those who were surveyed in person, and US $6,000 to $90,000 in the case of those who completed the questionnaire in private. If the site is developed as proposed and adequately promoted, it is conceivable that the actual visitation rate could be much higher, thus resulting in higher revenues.

Given the results of this study, especially with respect to the revenue generating potential of the proposed park, it is recommended that the Wallings Forest Reserve be developed as a prime nature reserve, providing a number of benefits for both local residents and foreign visitors. In terms of recreation, the initial focus should be on basic facilities such as hiking/nature trails, localized camping and picnic sites, and scenic lookouts. Wallings should serve as an outdoor laboratory for educational purposes. It should be maintained for its aesthetic qualities and for its role in maintaining biological diversity.

The camping facilities should be sited above "Cistern Rock" where there is ample open space but with sufficient surrounding shade and flat land. There is a need for basic amenities such as water and bathroom services. With the employment of a Site Manager and two or three trained guides, and the establishment of a reception/interpretation center including parking facilities, a visit to Wallings can be an exceptional environmental educational experience for both locals and foreigners alike.

A small vendor/private enterprise area could be developed and strategically located, and strictly controlled by a licensing system. Revenues generated from these licenses should be used to further develop and maintain the site. It is anticipated that there will be considerable spin-off effects to the adjacent communities of John Hughes, Sawcolts, and Old Road.

Currently, the government invests approximately US $4,000 in the Wallings Forest Reserve as direct maintenance cost, without receiving any direct benefits in return. The estimated cost for the development of the site and the establishment of the facilities indicated above is in the region of US $202,500. The results of this study indicate that with a system of differential entrance fees for foreign visitors and local residents, taking into account the intuition of local park managers and the prevailing local conditions, and with a phased development strategy, the Wallings Forest, once established as a national park with the proposed improvements, can be self-sufficient and sustainable under management.

The information framing section of the survey attempted to provide detailed information about the situation or 'good' in question including the proposed improvements to the good, to aid the respondent in making a decision concerning their maximum willingness to pay (WTP). In spite of this, 58% of the foreign visitors who did not visit the site indicated a need for more information as the reason for saying 'no' to the WTP question. However, in comparison, of the group of foreign respondents who visited the site, and therefore, could be considered to have had more information, only 39% indicated a need for more information.

Similarly, the group of local residents who were interviewed in person (face-to-face) indicated a significantly lower need for additional information (28%) compared to the group of local residents who completed the questionnaires in private (42%). This suggest some form of bias based on the interaction with the interviewer, which led to them being 'better' informed, even though the group that responded in private had more time to study the information provided, as well as having a greater number of individuals who had actually visited the site. Thus, it is clear that the need to provide more detailed information, including a clearer explanation of how entrance fees would benefit the park or protected area directly, must be taken into account when designing and conducting CVM surveys within the Caribbean and Central America.

The significant variables in the "full" model representing the group of foreign visitors who had not visited the proposed park were the annual income and the

bid. By contrast, in addition to the annual income and the bid, origin from Europe and rest and relaxation significantly influenced the WTP values of foreign visitors who visited the site. The significant difference in WTP between the group of foreign visitors who had not visited the site (US $29) and those who visited (US $22) is a further indication that the amount of information provided is an important factor in determining willingness to pay.

With respect to the local residents who were surveyed in person, five (5) variables- living in the city, age, and a unique impression of the site, in addition to the annual income and bid, significantly influenced the WTP values. By contrast, the six (6) variables that were significant in the model representing the group of local residents who completed the questionnaire in private included, previous visit to the proposed park, previous visit to the North Sound Islands, age, nature watching, average impression of the site and the bid. It is interesting to note, that in the case of the local residents who completed the questionnaire in private, the annual income variable had no significant effect on WTP, which was contrary to expectations.

With respect to cultural/strategic bias, the results of this study showed, as expected, that local residents had significantly lower WTP values than foreign visitors. These results differed from those of recent CVM studies of WTP for the access and protection of national parks and protected areas in Costa Rica. It was found in Costa Rica that Local residents had higher WTP values for the protection of the Monteverde Cloud Forest Reserve (US $137) than non-Costa

Ricans (US $118), and similar WTP values for entrance fees to an improved Manuel Antonio National Park, with US $13 and $14, respectively, for local residents and foreign visitors.

The difference between the mean WTP values for the group of local residents who were surveyed in person (US $7) and those who completed the questionnaire in private (US $6) is not large, although the difference is statistically significant. Similarly, the number of significant variables in each group is almost identical (5 in the case of the group that was surveyed in person and 6 in the case of those who completed the survey in private). Thus, although the results indicate the possible existence of strategic/cultural bias, it is not known if the effects are based upon cultural, time or information elements.

Although many of the socio-economic variables in the survey were not statistically significant, the overall logit regression models were all highly significant and robust with high a predictive capability, ranging from a success prediction rate of 82%, in the case of foreign visitors who had not visited the site, to 96% for the group of foreign visitors who visited the site. The results confirm the fact that the BID is a very important factor, and in this experiment, the most important factor in determining respondents' WTP. However, other factors such as income, origin of respondents, impression of the site, age and visits to other parks/protected areas were shown to be important in determining respondent's WTP for entrance fees to the proposed park.

In spite of the fact that the variable "primary activity of interest at the site" (ACT) was not statistically significant in determining WTP, it was possible to establish a priority list from a simple cataloging and counting of the responses. For example, the opportunity to enjoy nature (nature watching) and rest and relaxation featured prominently among both groups of foreign visitors. In the case of the Local residents, in addition to nature watching, hiking and picnicking/barbecuing as well as camping featured highly. However, it is proposed that within the context of CVM studies in the region, more specific or direct research regarding what goods and services to provide be conducted.

## IMPLICATIONS AND NEEDS FOR FUTURE RESEARCH

As indicated above, land use planners and policy makers in Antigua and Barbuda need to know the potential economic values of natural areas, and whether such parks and protected areas, once established, can be self-sufficient and sustainable in their operation and management. By knowing the mean WTP for different groups, planners and policy makers can make simulated projections, and sensitivity analysis, of potential revenues from entrance fees to the proposed Wallings Forest National Park as well as other sites by adjusting for potential visitation rates.

Another implication of these findings, given the significant difference in WTP between foreign visitors who had not been to the site and those who had been, is the need to include potential, as well as actual, park visitors in CVM survey

samples. The amount of information that is available to the respondents clearly has an effect on WTP values. In this case, the group that actually visited the site had a lower WTP value than the group that had not visited the site. Therefore, it is probably worth the extra cost to transport potential visitors to the site, in order to avoid unrealistically high WTP estimates.

There was evidence of cultural/strategic bias in the case of the local residents, with respect to the survey mode. For example, the number of locals who felt that no one should pay to enter the hypothetically improved park was higher in the case of those who were interviewed face-to-face than those who completed the questionnaire in private. Yet the group that was surveyed in person had a higher mean WTP value. The results also indicate that those local respondents who completed the questionnaire in private, and thus had more time, had significantly lower WTP values than those who were surveyed in person, and consequently had less time. This result is consistent with the findings of Whittington et al., (1992), who found that respondents who were allowed time to respond to the WTP question bid significantly less than those who do not have that time.

It is suggested that further studies be carried out to determine total WTP values under different scenarios, including different types of parks and potential visitation rates. It is further recommended that future park related CVM survey designs take into account both actual and potential park visitors. The cost of conducting face-to-face versus more private question answering need to be

evaluated, and also, in spite of the difficulty involved, the relationship between expressed WTP and actual WTP, within the context of different survey modes, as a further check on the validity of which survey mode is most appropriate. The results also indicate a need to provide more detailed information framing and contingent scenarios, including how the proposed entrance fees will benefit the national park or protected area.

Finally, the results of this study demonstrate that the CVM is a useful valuation technique that can be used in protected area planning in Antigua and Barbuda and perhaps in other countries in the Caribbean and Central America.

# LITERATURE CITED


Aldrich, J. H. and F. D. Nelson. 1984. Linear Probability, Logit, and Probit Models. Sage University Press.

Antigua and Barbuda Country Environmental Profile. 1991.

Baldares, M. J. and J. G. Laarman. 1991. 'User fees at protected areas in Costa Rica'. Draft Report in Vincent, J. R. (ed) *Valuing Environmental Benefits in Developing Economies.* Michigan State University, East Lansing, Michigan. 87-108.

Bateman, Ian J, Ian H. Langford, R. Kerry Turner, Ken G. Willis and Guy D. Garrod. 1995. Elicitation and truncation effects in contingent valuation studies. Ecological Economics 12 (1995) 161-179. Elsevier.

Chase, L. 1995. National park entrance fees in Costa Rica. Masters Thesis. Dept. of Agricultural and Resource Economics, Cornell University, Ithaca, N. Y.

Cummings, R. G., D. S. Brookshire and W. D. Schulze. 1986. Valuing Environmental Goods: An assessment of the contingent valuation method. Rowman and Allanheld, Totowa, N.J. 270pp

Dixon, John A. and Paul B. Sherman. (eds). 1990. Economics of protected areas: a new look at benefits and costs. Island Press, Washington, DC

Echeverría, Jaime, Michael Hanrahan and Raúl Solórzano. 1995. Valuation of non-priced amenities provided by the biological resources within the Monteverde Cloud Forest Preserve, Costa Rica. Ecological Economics 13 (1995) 43-52. Elsevier Science B.V.

Edwards, Steven F. and Glen D. Anderson. 1987. Overlooked biases in contingent valuation surveys: some considerations. Land Economics. Vol 63. No. 2, May 1987.

Geoghegan, Tighe. 1994. Financing strategies for protected areas in the insular Caribbean. Parks. Vol. 4 No.2. June, 1994. pp 28-38.

Goodstein, Eban S. 1995. Economics and the environment. Prentice-Hall, Inc. Englewood Cliffs, NJ. 07632.

Hanemann, Michael W. 1984. Welfare evaluations in contingent valuation experiments with discrete response data. American Journal of Agricultural Economics, 66 (3), 332- 341.

Hanemann, Michael W. 1989. Welfare evaluations in contingent valuation experiments with discrete response data: reply. American Journal of Agricultural Economics, 71 (4), November, 1989. 1057-1061.

Harris, Charles, C. and B. L. Driver. 1987. Recreation user fees I. pros and con. Journal of Forestry, 85(6):25-29.

Horwith, Bruce. 1996. Brochure of Wallings Forest Reserve ecotourism development project.

Hosmer, David. W and Stanley Lemeshow. 1989. Applied logistic regression. John Wiley & Sons. New York.

Johansson, Per-Olov, Bengt Kriström and Karl Göran Mäler. 1989. Welfare evaluations in contingent valuation experiments with discrete response data: comment. American Journal of Agricultural Economics, 71 (4), November, 1989. 1057-1061.

Johnson, Aaron. C., Marvin B. Johnson and Rueben C. Buse. 1987. Econometrics - Basic and Applied. Macmillan, New York.

Laarman Jan G. and Hans M. Gregersen. 1996. Pricing policy in nature-based tourism. Tourism Management, 17(4):247254.

Leclerc, Antoine. 1994. User fees in natural parks - issues and management. Parks. Vol. 4 No.2. June, 1994.

Lindberg, Kreg. 1991. Policies for maximizing nature tourism's ecological and economic benefits. International Conservation Financing Working Paper. World Resources Institute. New York. February, 1991. 37pp.

Mitchell, Robert Cameron and Richard T. Carson. 1989. Using surveys to value public goods: the Contingent Valuation Method. Resources for the Future. Washington, D. C.

Mitchell, Robert Cameron and Richard T. Carson. 1995. A current assessment of the CVM. In P. O. Johansson, B. Kristrom, K. G. Maler. eds., Current Issues in Environmental Economics. Manchester University Press.

Randall, A., J. P. Hoehn and D. S. Brookshire. 1983. Contingent Valuation Surveys for Evaluating Environmental Assets. Natural Resources Journal, 23, 635-648.

Scura, L. F. and T. van't Hof. 1993. The ecology and economics of Bonaire Marine Park. Environment Department Divisional Paper No. 1993-44. The World Bank. Washington, D. C.

Shultz, Steven D. and Bruce E. Lindsay. 1990. The Willingness to pay for ground water protection. Water Resources research, Vol. 26, NO. 9. p. 1869-1875. September, 1990

Shultz, Steven D., A. E. Luloff and David A. King. 1991. The contingent and hedonic valuation methods: techniques for valuing a community's resources. Journal Of The Community Development Society. Vol. 22, No. 2, 1991.

Shultz, Steven, Jorge Pinazzo and Miguel Cifuentes. 1997. Opportunities and limitations of contingent valuation surveys to determine national park entrance fees: evidence from Costa Rica. Forthcoming in Environment and Development Economics.

Van't Hof, Tom. 1992. Coastal and marine protected areas in the Caribbean: how can we make them work? Parks. Vol. 3. No.1. January, 1992.

Walsh, R. G., J. B. Loomis and R. S. Gillman. 1985. Valuing option, existence, and bequest demands for wilderness. Land Econ., 60, 14-29.

Whittington, D., Briscoe, J., Mu, X. and Barron, W. 1990. Estimating the willingness to pay for water services in developing countries: a case study of the use of contingent valuation survey in southern Haiti. Economic Development and Cultural Change, 38 (2).

Whittington, D., Smith, K., Okorafor, A., Okore, A., Liu, J. and McPhail, A. 1991. Giving respondents time to think in contingent valuation studies: a developing country application. Journal of Environmental Economics and Management, 22.

# APPENDIX A

## CONTINGENT VALUATION SURVEY QUESTIONNAIRES

### QUESTIONNAIRE 1 - FOREIGN VISITORS

### QUESTIONNAIRE 2 - LOCAL RESIDENTS

**Dear Respondent,**

We are presently conducting a survey concerning the future development of the Wallings Forest Reserve in the Fig-Tree Drive area. You have been selected as part of a sample which represents either actual or potential visitors to the site. Your participation is extremely important and very much appreciated. The information provided will be strictly confidential and will be used in the process of making decisions on the best way to develop the area.

Thank you for your cooperation.

McRonnie Henry
Forestry Officer
Ministry of Agriculture
Antigua

1

____/____/_____
*Day Month Year*

*QUESTIONNAIRE NO.* _____

**Please tick the appropriate box or fill in the space provided.**

1) **Where are you from (Nationality)?** ☐ USA ☐ Canada ☐ Europe ☐ Asia ☐ Other Caribbean islands ☐ Other_____

2) **How long have you been in Antigua?** _____ days

3) **How long are you planning or were you planning to stay in Antigua?** _____ days

4) **Number of previous trips to Antigua?** _____

5) **Do you (did you) plan to visit other parks/recreational sites on this trip to Antigua?** ☐ yes ☐ no

6) **What is your age?** _____ Years

7) **Your sex:** ☐ Female ☐ Male

8) **Are you traveling with children?** yes ☐ no ☐

moist evergreen forests that covered much of the island before the Europeans initiated logging over three centuries ago. It is an area of great natural, historical, environmental, educational, biodiversity and recreational significance.

There is currently a debate regarding future development strategies for this site. Options include private commercial development, a mix of private and public development and finally, the establishment of a national park. If the site is not developed and managed as a national park, it is likely to undergo private commercial development or remain in its natural state.

If the Government develops and manage the Wallings Forest as a national park, with recreational facilities including an information center, trails for hiking and signs that describe the different types of plants, animals and other natural features, as well as the history of the area, picnic and camp sites, bathroom facilities, parking facilities and the employment of park guards and guides to conduct guided tours.

**Question: Would you visit this site in the future?**

**Yes** ☐ **No** ☐

**Question: Would you be willing to pay $ ___2___ for the entrance fee in a future visit to this park?**

**YES** ☐ **NO** ☐

**If you answered no, please tick the box which corresponds to your reason or fill in the space marked other.**

☐ I do not think that I or anyone else should pay to protect and use these resources.

☐ I cannot afford the amount of money specified.

☐ I did not have enough information to determine whether I would pay.

Other (specify)_____

_____

_____

**Dear Respondent,**

We are presently conducting a survey concerning the future development of the Wallings Forest Reserve in the Fig-Tree Drive area. You have been selected as part of a sample which represents either actual or potential visitors to the site. Your participation is extremely important and very much appreciated. The information provided will be strictly confidential and will be used in the process of making decisions on the best way to develop the area.

Thank you for your cooperation.

McRonnie Henry
Forestry Officer
Ministry of Agriculture
Antigua

2

____/____/_____
*Day Month Year*

*QUESTIONNAIRE NO.* _____

**Please tick the appropriate box or fill in the space provided.**

**1) Where in Antigua do you live?**
☐ City ☐ Suburbs (Grays Farm/Greenbay/Point) ☐ Countryside

**2) Have you visited the Wallings Forest Reserve Before?**
☐ yes ☐ no

**3) Have you visited any of the following sites before?**

| | | |
|---|---|---|
| Nelson's Dockyard National Park | ☐ yes | ☐ no |
| Cades Reef | ☐ yes | ☐ no |
| proposed North Sound Islands Marine Park | ☐ yes | ☐ no |
| Other parks/protected areas/recreational site | ☐ yes | ☐ no |

**4) What is your age?** _____ Years

**5) Your sex:** ☐ Female ☐ Male

6) **What best describes the highest level of education that you have Completed?**

☐ Elementary ☐ High school or technical school

☐ College/University ☐ Graduate school

7) **What activity (#1 choice) will be of greatest interest to you at this site?**

☐ Hiking ☐ Bird-watching ☐ camping ☐ Picnic/Barbecue

☐ Scientific research ☐ Nature (plants/animal) watching

☐ Rest ☐ To film/photograph ☐ Other (specify) _____

_____

☐ Peace and quiet/fresh air

8) **What are your impressions of the site?**

☐ **unique** ☐ Average ☐ poor

9) **What is your approximate net annual income EC $?**

| | |
|---|---|
| ☐ **less than $ 5,000** | **$35,000 - 39,999** |
| ☐ **$ 5,000 - $ 9,999** | **$40,000 - 44,999** |
| ☐ **$10,000 - $14,999** | **$45,000 - 49,999** |
| ☐ **$15,000 - $19,999** | **$50,000 - 54,999** |
| ☐ **$20,000 - $24,999** | **$55,000 - 59,999** |
| ☐ **$25,000 - $29,999** | **$60,000 - 64,999** |
| ☐ **$30,000 - $34,999** | **$65,000 or more** |

10) **Please read the following information and look at the set of photographs provided which represents selected scenes at Wallings and then respond to the questions that follow.**

The Wallings Forest Reserve and its surroundings, located in the south of Antigua - about 40 minutes drive from the city of St. John's and the major tourists areas - is a unique multipurpose area that represents the largest remaining tract and best example of the moist evergreen forests that covered much of the island before the Europeans initiated logging over three centuries ago. It is an area of great natural, historical, environmental, educational, biodiversity and recreational significance.

There is currently a debate regarding future development strategies for this site. Options include private commercial development, a mix of private and public development and finally, the establishment of a

national park. If the site is not developed and managed as a national park, it is likely to undergo private commercial development or remain in its natural state.

If the Government develops and manage the Wallings Forest as a national park, with recreational facilities including an information center, trails for hiking and signs that describe the different types of plants, animals and other natural features, as well as the history of the area, picnic and camp sites, bathroom facilities, parking facilities and the employment of park guards and guides to conduct guided tours.

Question: **Would you visit this site in the future?**

Yes ☐ No ☐

Question: **Would you be willing to pay EC __?__ for the entrance fee in a future visit to this park?**

YES ☐ NO ☐

**If you answered no, please tick the box which corresponds to your reason or fill in the space marked other.**

☐ I do not think that I or anyone else should pay to protect and use these resources.

☐ I cannot afford the amount of money specified.

☐ I did not have enough information to determine whether I would pay.

Other (specify) _____

_____

_____

_____

_____

# APPENDIX B

TABLE B-1

TABLE B-2

TABLE B-3

TABLE B-4

Table B-1. Summary of the reduced logit regression model for the group of foreign visitors who had not visited the proposed park.

| Variable | Coefficient | Mean | Standard Error | Wald Chi-Square |
|---|---|---|---|---|
| Yes/No | ----- | 0.5577 | ----- | ----- |
| ORIG1 | -0.7178 | 0.428 | 0.3648 | 3.8873** |
| IMP1 | 1.1556 | 0.337 | 0.3808 | 9.2101*** |
| INC | 0.000024 | 35286 | 0.000011 | 4.9814** |
| BID | -0.0831 | 25.0385 | 0.0133 | 38.8720*** |
| Constant | 1.5020 | | 1.3257 | 4.6019*** |

n = 208 'yes" = 116 'no' = 92 -2 Log likelihood = 216.666
Score Chi-Square (4 d.f): 59.692(p=0.0001) Concordant = 81.4%;
Discordant =18.4%; Tied = 0.2% Level of significance: .10 (*); .05 (**); .01 (***)

Table B-2. Summary of the reduced logit regression model for the group of foreign visitors who visited the proposed park.

| Variable | Coefficient | Mean | Standard Error | Wald Chi-Square |
|---|---|---|---|---|
| Yes/No | ----- | 0.4567 | ----- | ----- |
| ORIG2 | 1.2575 | 0.4760 | 0.4757 | 6.9887*** |
| INC | 0.00008 | 35228 | 0.000019 | 17.6486*** |
| BID | -0.1852 | 25.0288 | 0.0268 | 47.7560*** |
| Constant | 0.7458 | | 0.7380 | 1.0214 |

n = 208 'yes" = 95 'no' = 113 -2 Log likelihood = 122.585
Chi-Square (3 d.f): 118.676 (p=0.0001) Concordant = 94.8%; Discordant =5.1%;
Tied = 0.1% Level of significance: .10 (*); .05 (**); .01(***)

Table B-3. Summary of the reduced logit regression model for the group of local residents who were interviewed in person.

| Variable | Coefficient | Mean | Standard Error | Wald Chi-Square |
|---|---|---|---|---|
| Yes/No | ----- | 0.5759 | ----- | ----- |
| AGE | -0.0559 | 31.7009 | 0.0181 | 9.5812*** |
| INC | 0.000054 | 20625 | 0.000014 | 15.0331*** |
| BID | -0.2050 | 15.0625 | 0.0279 | 53.8452*** |
| Constant | 4.3138 | | 0.7493 | 33.1405*** |

n = 208 'yes" = 129 'no' = 95 -2 Log likelihood = 198.388
Chi-Square (3 d.f): 87.599 (p=0.0001) Concordant = 86.9%; Discordant = 13.0%
Tied = 0.1% Level of significance: .10 (*); .05 (**); .01(***)

Table B-4. Summary of the reduced logit regression model for the group of local residents who completed the questionnaire in private.

| Variable | Coefficient | Mean | Standard Error | Wald Chi-Square |
|---|---|---|---|---|
| Yes/No | ----- | 0.5179 | ----- | ----- |
| NDNP | -1.1789 | 0.8795 | 0.4959 | 5.6521** |
| NSI | 1.0899 | 0.1473 | 0.4972 | 4.8050** |
| AGE | -0.0359 | 33.9598 | 0.0163 | 4.8454** |
| BID | -0.1651 | 15.0625 | 0.0225 | 53.6669*** |
| Constant | 4.6911 | | 0.9154 | 26.2605*** |

n = 224 'yes" = 116 'no' = 108 -2 Log likelihood = 221.596
Chi-Square $_{(4\ d.f.)}$: 76.398 (p=0.0001) Concordant = 83.8%; Discordant = 16.1%
Tied = 0.1% Level of significance: .10 (*); .05 (**); .01(***)