Recreation Demand Estimation in New Zealand:

an example of the Kaimanawa and Kaweka Forest Parks

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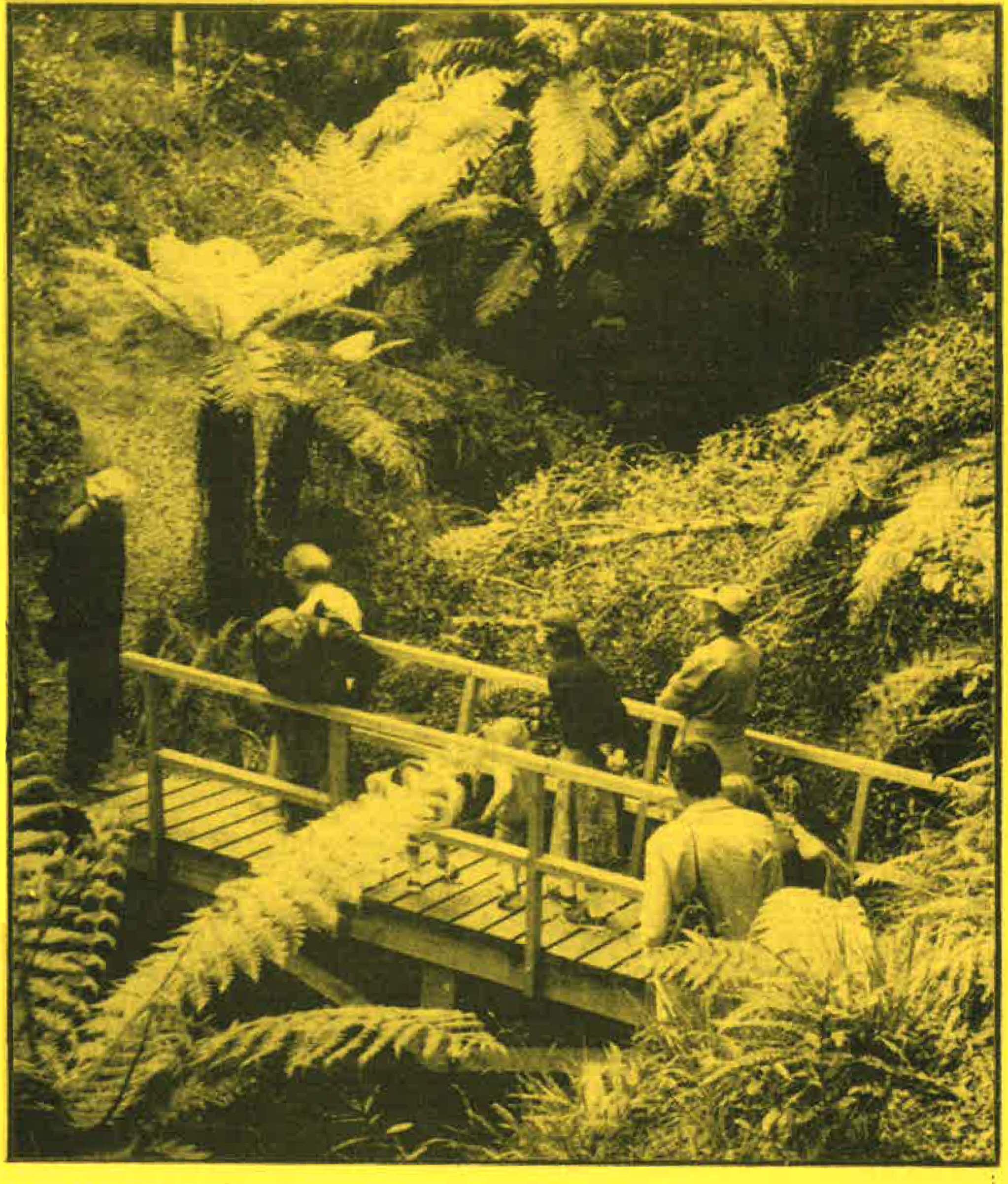

Department of Horticulture Landscape and Parks

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RECREATION DEMAND ESTIMATION IN NEW ZEALAND:
AN EXAMPLE OF THE KAIMANAWA AND KAWEKA FOREST PARKS.

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CONTENTS

CHAPTER I

INTRODUCTION

This paper is in two parts. The first examines methods of recreation resource evaluation while the second uses an existing data base to discuss the potential applications of one such method in New Zealand.

The specific objectives of the report are:

1. To discuss common economic methods of resource valuation, highlighting both their limitations, and potential contributions to the land use debate.
2. To demonstrate the use of one of these methods in valuing a New Zealand recreational resource.

CHAPTER II

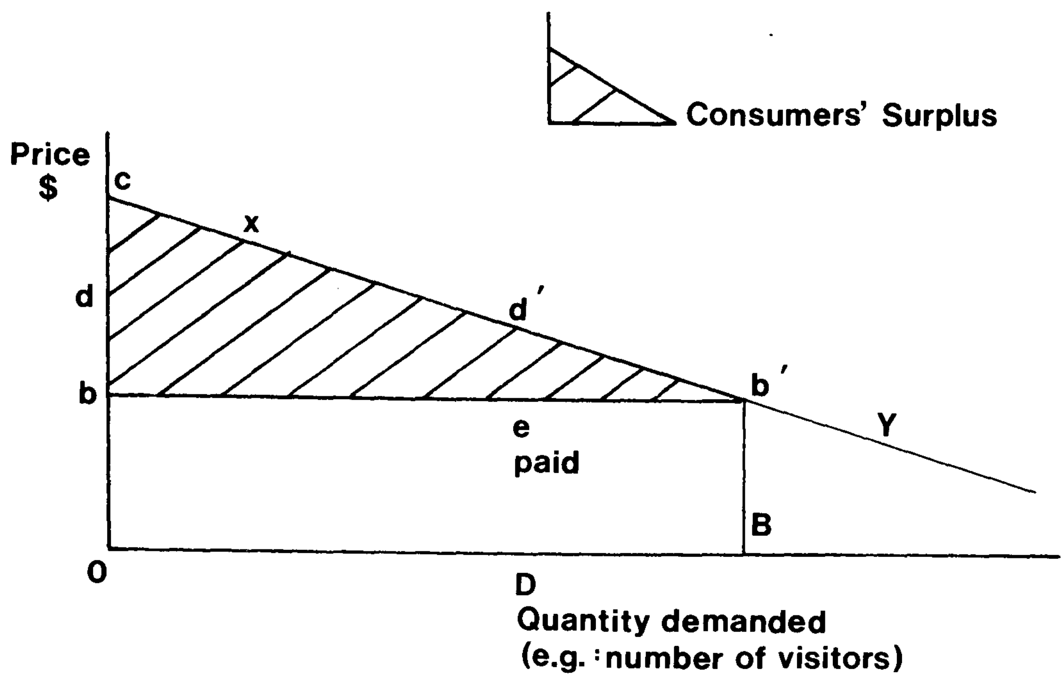
ECONOMIC METHODS OF RECREATION RESOURCE VALUATION

Consumption of outdoor recreation has increased in developed nations in the last 35 years, corresponding with an increase in leisure time. Higher living standards, population growth, education, and a trend towards urbanization have also contributed to the increasing demand for outdoor recreation (Mercer, 1977). New Zealand also shows such growth patterns (Devlin, 1980).

The supply of outdoor recreation opportunities such as National Parks, Forest Parks and Wilderness Areas, cannot be increased without changing the present land use of some areas. Changing some land use patterns can be justified, on an economic basis, if the value of the recreational resource is at least as great as the next alternative use, or combination of uses, for that resource. Other uses of land, for example, include livestock grazing, timber harvesting, wildlife and bird habitat, and watershed management. These uses are not necessarily mutually exclusive, and a combination of uses may well be able to exist. An economic evaluation of recreation in an area would better enable decision makers to allocate the land base in an economically efficient way.

Generally, recreation is a so-called "non-market" good, meaning that no clearly established market price exists for it. As such a demand curve needs to be estimated for these goods using non-traditional techniques. The demand curve is simply a relationship between the price of any good and the quantity demanded at any given price. An example is given in Figure 1, where the line XY is an estimated demand curve. At a set price b the quantity B would be demanded (sold) and the resulting revenue would be equivalent to the area Obb'B.

Figure 1. Hypothetical Demand Curve



The revenue does not, however, fully measure all the 'benefits' from the purchase of these goods. The correct measure of benefits must also include the so-called 'consumer surplus'. Put simply, if the price is set at b most consumers in fact, would be prepared to pay more for the good. Consider, for example, the individual consumer, who is prepared to pay price d, but only needs to pay the set price b, and therefore receives a 'surplus' benefit (d'e) for which he/she does not pay. That is, only those last consumers included at B pay a price equal to their perceived benefit.

A workable definition of consumers' surplus is therefore the maximum sum of money consumers would be willing to pay for a given amount of the good, less the amount they actually pay, or the area under the demand curve (XY) and above the price line (bb'). This is the cross-hatched area in Figure 1, and total benefits are both this area and the money actually spent, OCb'B.

So far, two major methods of establishing the demand curve for a "free" recreation resource are acceptable on theoretical grounds (Randall, 1981). These are the so called "travel-cost" method and the "direct survey" or willingness to pay method. Each method is discussed below.

2.1 The Travel Cost Method

For the last 30 years the travel cost method has been the most popular way of estimating the value or potential value of a recreational site.

A demand function for a specific recreation site is estimated using the cost of the participant's travel to that site as a surrogate for the admission price to that location. Actual observations of these visitors, their characteristics, and visitation patterns, are used to develop a demand curve for that area at varying entry fees. The 'cost of travel and number of visits' relationship is assumed to be a proxy valuation for varying entrance fees.

The second step is to estimate the consumer surplus. This is the area beneath the demand curve and above the existing price line, as shown in Figure 1, and is found by the mathematical method of integration. This consumer surplus, the area above the price line, with the money actually paid (in travel) is then used to construct the total value of that site.

It is not possible to isolate the economic benefits of recreational activities if one cannot identify a demand function for these separate activities. The major justification for the popularity of the travel cost method is that it provides a theoretically sound basis for benefit estimation. This is because the specification of travel cost differences, (reflecting variations in 'supply') provides a means of identifying a demand curve for the specific site under observation.

Harold Hotelling, of the University of North Carolina, is generally regarded as being the "father" of this method. A letter, reprinted in the Prewit Report (cited in Brown, et al, 1964), is worth quoting in part:

> "Let concentric zones be defined around each park so that the cost of travel to the park from all points in one of these zones is approximately constant. The persons entering the park in one year, or a sample of them, are to be listed according to the zone from which they come. The fact that they come means that the service of the park is at least worth the cost, and this cost can probably be estimated with fair accuracy. The comparison of the cost of coming from a zone with the

number of people who come from it, together with a count of the population of the zone, enables us to plot one point for each zone on a demand curve for the services of the park. By a judicious process of fitting, it should be possible to get a good enough approximation to this demand curve to provide, through integration, a measure of the consumers' surplus resulting from the availability of that park."

The Assumptions of the Travel Cost Method

Four major assumptions must be satisfied in order that the travel cost method provides useful estimates of the benefits. These are:

1. Entry fees: It is assumed an individual would react to an increase in travel cost in exactly the same manner as that individual would react to an increase in, or imposition of, entry fees. This is the fundamental assumption for using the cost of travel as a proxy for the cost of entry. This recognition may be more acceptable for local sites than those especially attractive sites which draw from a national or international market area, e.g. Mount Cook and Westland National Parks.

2. Specification: All the relevant and statistically significant variables must be properly specified to find unbiased estimates of the slope of the site demand curve. These include, or may include, the availability of substitute sites, travel time, demographic variables, and a site quality index. An example of quality index may be the hunting or fishing success rate at a particular site.
3. Capacity constraints: It is assumed that demand is not constrained by crowding. This may not be a serious problem, although there may be an inter-relationship between congestion and a quality index, e.g. crowding reducing satisfaction for some people or the quality of a site changing throughout the season.
4. The final important assumption made is that once we have divided people into zones, we expect each zone to reflect the same ideas and tastes about recreation. It may be a little unrealistic to expect people living in an isolated rural community to have the same tastes as those people living in an inner city area. This assumption is known as the homogeneous (the same kind of) taste assumption and if the researcher has some thoughts that the tastes may be different, a test can be run by placing the zones into two or more separate categories.

Limitations of the Travel Cost Method

Consumers may not react to increases in entry fees in the same way as they react to increases in travel cost. An increase in entry fees tends to be a visible increase, whereas increases in travel costs may tend to be less visible or "hidden" costs. However, it is likely that most people are well aware of their travel costs, at least those incurred directly such as petrol and oil.

Much has been written on the travel cost approach, and many sites overseas evaluated by the method. While it may have limitations, the travel cost method is a widely used method of obtaining an estimate of the economic value of a recreation site, although little application has been made to New Zealand sites. It has the advantage of being accepted by agencies in North America such as the Water Resources Council as being an acceptable approach.

New Zealand Applications

Use of the travel cost method in New Zealand includes

Gluck (1974) on the Rakaia River fishing resource, Woodfield and Cowie (1977) on the Milford Track, and Harris and Meister (1981) on Lake Tutira in Hawkes Bay.

Woodfield and Cowie's paper contains an excellent discussion of the vexing question of travel time, a major problem of the travel cost technique and one which researchers are still debating. Although the authors rather modestly suggest the study is "best thought of as a reconnaissance exercise and novel application of methodology", the paper makes an important contribution to the literature in valuing New Zealand's natural resources.

The question of whether it is economically beneficial to arrest the eutrophication of Lake Tutira or not is examined by Harris and Meister. Although a "willingness to pay" type question is also asked of respondents, this 1981 study only reports results obtained from using a travel cost approach. These results are used to obtain a measure of the Lake's economic value, and the present value from a recreation point of view is compared with the direct costs needed to arrest the deterioration of recreational opportunities. The conclusion that a lake "clean-up" is economically justified is reached. Comparing the travel cost results with the direct survey question (discussed below) asking, "what amount of money would you be willing to pay per year to retain the use of the lake in good condition?" would have enabled a check for consistency to be made on the travel cost results. Unfortunately, the results of the direct question are not reported.

2.2 Direct Survey Method

This method is sometimes also referred to as the "direct questionnaire" or "willingness to pay" method and is the most important of the 'contingent valuation' methods. These so-called contingent valuation methods are contingent upon the existence of a hypothetical market and are treated as estimates of the value of the non-market good in question.

These direct questionnaire techniques involve some variation of the question, "how much would you be willing to pay for a change in the amount of non-market good?" or requiring the respondent to answer "yes" or "no" to a question specifying both the precise amount of a non-market good to be gained or lost and the precise amount of money to be paid or received. This enables questions to be asked on the basis of proposed changes to, or the entire resource, i.e. how much are you prepared to pay for a small increase in quality or how much are you prepared to pay for the recreational privilege? The approach requires a rigid set of criteria to be met to enable accurate information to be obtained, and these will now be discussed.

Potential Problems

Some important potential problems are encountered with this approach. Firstly, the response may be biased by the respondent's view as to how the information will be used. If, for example, the respondent considers the question was being asked because the authorities were moving towards a user-pay approach for the resource, then the answer may well be biased downwards. However, if the respondent was convinced the question was being asked because some alternative use may be made of the recreational resource, the answer may well be biased upwards. This type of behaviour from the respondent is known as strategic behaviour, and a well-conducted survey must be carefully worded to try and minimize possible strategic behaviour.

Another source of potential bias is called starting point bias - the questionnaire may start from an inappropriate figure, thus influencing the respondent's view. Care must also be taken to ensure the interviewer does not influence the respondent's answers, or introduce bias, during the course of the interview (i.e. 'interview bias').

Finally, different answers may be obtained from a question asking a respondent how much he/she would be willing to pay for a recreational site as opposed to how much he/she would have to be compensated in order to forgo the recreational opportunity. These different answers are not necessarily inconsistent, as different property rights connotations are associated with the different questions.

There can be little doubt that a carefully worded questionnaire will give an estimation of the valuation of a non-market good. In order to obtain an accurate estimation of the resource's value, it may be necessary to conduct a relatively large survey. Although such a survey is expensive and time consuming, this may well be worthwhile.

CHAPTER III

USING THE TRAVEL COST MODEL TO VALUE A NEW ZEALAND RECREATIONAL RESOURCE

Recreational hunting is a good example of an outdoor recreation, which serves to highlight changing attitudes to and economic pressures on a recreational resource.

3.1 Recreational Hunting in New Zealand

After a series of liberations throughout New Zealand, introduced animals, particularly deer, increased during the early part of the century to the extent that Government cullers were hired from the mid 1930's to control animal numbers. In spite of this culling programme and extensive recreational hunting, deer numbers remained high, and concern about ecological damage caused by this excessive herd size lead to legislation in 1956 designating, among others, deer, chamois, and thar as noxious animals. However, during the 1960's a lucrative export trade in feral venison developed, and extensive helicopter harvest of the feral herd followed.

Domestication of the feral animal led to high prices being paid for stock, and this, concurrent with venison recovery, drastically reduced the feral deer herd

(Challies, 1977). Consequently, by the mid 1970's the recreational hunter was faced with decreasing opportunities for successful hunting. This changed status of deer, and attitudes to their domestication, ultimately led to the Wild Animal Control Act (1977) a provision of which established Recreational Hunting Areas (R.H.A.'s) in designated areas of Crown Land.

These R.H.A.'s, by definition, give priority to wild animal control through recreational hunting. If other forest values are threatened because of increases in animal numbers, there is provision to implement other means of control once recreational hunters have been advised to increase hunting pressure.

The restricting of commercial interests, and conflicts arising from alternative uses of the land resource have led to some controversy over establishment of R.H.A.'s. Recreational hunters would naturally like to see more areas designated as R.H.A.'s.

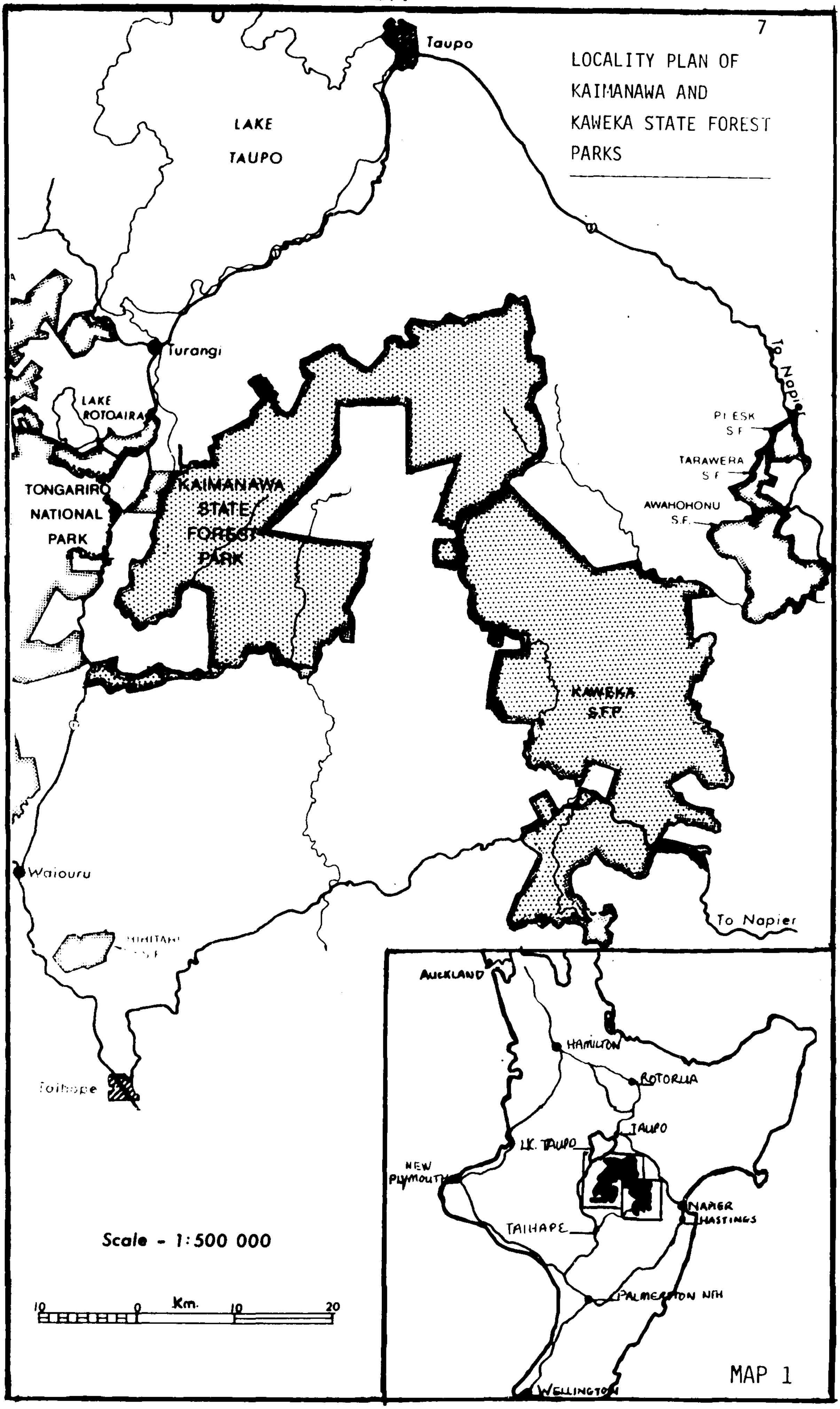
The picture that emerges is one of wide changes in the 'supply' of recreational hunting opportunities while at the same time an intensification of economic pressures on hunting herds. As suggested in the literature review, generating an economic valuation of these resources should assist in making better informed resource allocation decisions.

3.2 Data Base and Empirical Analysis

The Kaimanawa and Kaweka State Forest Parks share a common boundary and jointly encompass some 140,000 ha of forested land in the central North Island. As such, they comprise a major recreation resource. With easy access from SHW 1, Taupo and Turangi, the Kaimanawa Forest Park offers many opportunities for informal use, likewise the Kaweka Forest Park lies principally in Hawkes Bay and forms an important backdrop to Napier and Hastings (Map 1).

Groome, Simmons and Clark (1983), reported widespread visitation from all over the North Island to both parks, and park managers estimate some 20,000 people per year currently visit.

During a period in January and Easter (April) 1982, a comprehensive survey of users of the Kaimanawa and Kaweka Forest Parks was compiled by Groome, *et al* (1983). A total of 1,268 questionnaires from individual users was obtained, 898 from the Kaimanawa Forest Park and 370 from the Kaweka Forest Park. These surveys included both recreational hunters (32 percent of the total) and a mix of all other users, classified here as non-hunters. One of the questions asked was the user's place of origin, and this information has enabled travel distance to be calculated.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LOCALITY PLAN OF KAIMANAWA AND KAWEKA STATE FOREST PARKS
Taupo
LAKE TAUPO
Turangi
LAKE ROTOAIRA
TONGARIRO NATIONAL PARK
KAIMANAWA STATE FOREST PARK
KAWEKA S.F.P.
To Napier
PT ESK S.F.
TARAWERA S.F.
AWAHOHONU S.F.
To Napier
Waiouru
Scale - 1:500 000
10 0 Km. 10 20
AUCKLAND
HAMILTON
ROTORUA
TAUPO
LK. TAUPO
NEW PLYMOUTH
NAPIER
HASTINGS
TAIHAPE
PALMERSTON NTH
WELLINGTON
MAP 1

Possible limitations of the data source are that the original questionnaire was not designed with the current travel cost analysis as a use, and that, although questions were asked as to the major purpose of the visit to the site, no allowance was made in the subsequent analysis for multi-site visits or multi-purpose visits to the site. The inability to measure this factor will tend to increase resulting valuations of the site. Notwithstanding this limitation, the survey presents a useful opportunity to empirically test some hypotheses, especially regarding recreational hunting in New Zealand.

3.3 Construction of the Travel Cost Model

As outlined, the basic assumption of the travel cost approach is that demand response (or visitation) to a recreation site is the same as response to travel and other recreation costs (Bowes and Loomis, 1980). Thus, the "price" is expected to be negatively related to quantity in the model outlined below. That is the number of visits will decrease as the cost increases.

The number of people visiting a recreation site, or the number of trips that an individual makes, can be assumed to depend on the cost of travel to the site, cost of entry, availability and desirability of alternative sites, and selected modifying variables.

Along with a recreational taste variable, these may include demographic variables such as income, age, and education. To illustrate this model, consider the formula:

Qijt = f (Pijt, Sit, Dit)

where

Qijt = Quantity, number of individuals from population zone i visiting a recreation site j in year t, expressed per unit of population in zone i,

f = a demand function (see below.

Pijt = Price, cost of access from zone i to site j in year t;

Sit = Substitutes, alternative or substitute recreation opportunities for resident in zone i available in year t.

Dit = Demographic, demographic characteristics of the population in zone i in year t.

The Demand Function (f)

Selection of a specific shape to graph the model must rely both on 'goodness-of-fit' tests[1] and on

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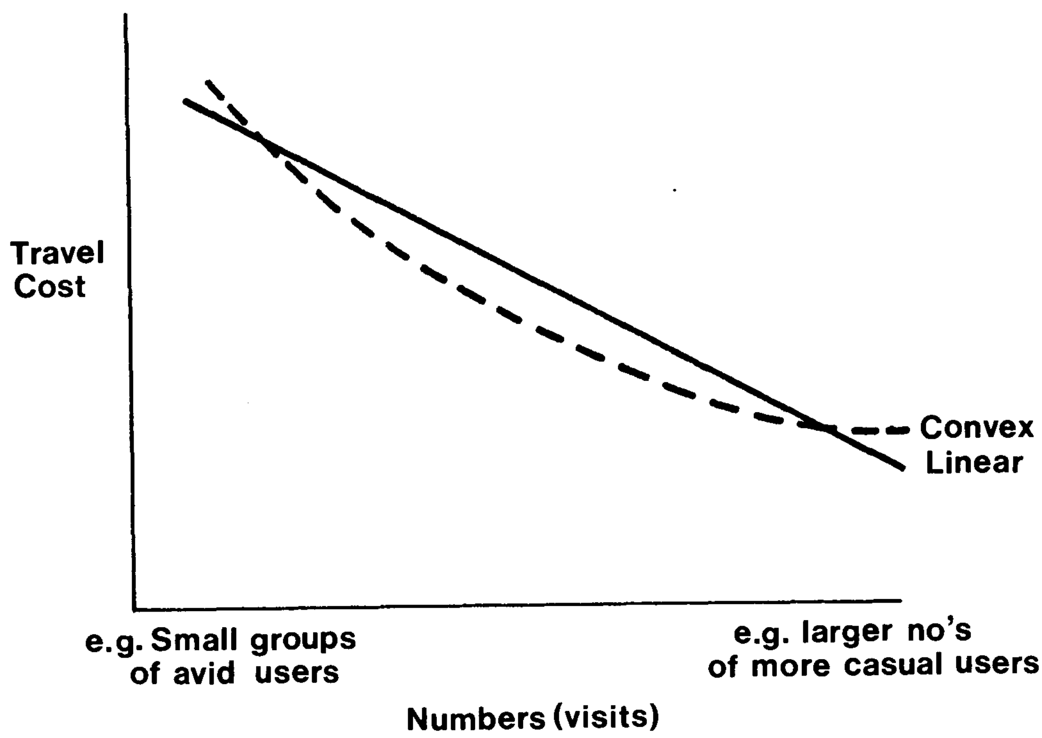
[1]Normally these tests measure how "well" the data fits the graphed demand curve, by describing how broadly or narrowly the data fits around the graph. The resultant figures can often be presented as a percentage or probability that is expressed as a 'level of confidence' in the data or relationship.

theoretical considerations. A linear graph has the questionable behavioural implication that the change in the number of people using a site is the same at high and low cost levels. A convex shape has the more theoretically appealing characteristic of modelling a small group of avid users and a larger group of more casual users to a recreation site. These two alternative shapes are shown in Figure 2, a convex shape is probably the best shape to use. Given this belief, selection from among alternative convex models can be based on the goodness-of-fit of the data.

Figure 2. Alternate Shapes of Demand Function (f)



Estimates of total usage (20,000 visitors) of the Forest Parks were obtained from the staff at Kaimanawa Forest Park Headquarters. From these estimates it was calculated that the sampling represented 5.3 percent of annual use of the parks, and a subsequent weighting of 18.75 was given to each observation to build the sample to represent total forest usage on an annual basis. One assumption made is, of course, the park use during the January and Easter periods is, in fact, representative of year-round usage. This assumption may tend to over-estimate travel distance and bias the survey towards people travelling longer distances during New Zealand's traditional holiday periods. This would mean that the parks are, in fact, more locally orientated than the survey indicates, thus tending to over-estimate total valuations obtained from the survey.

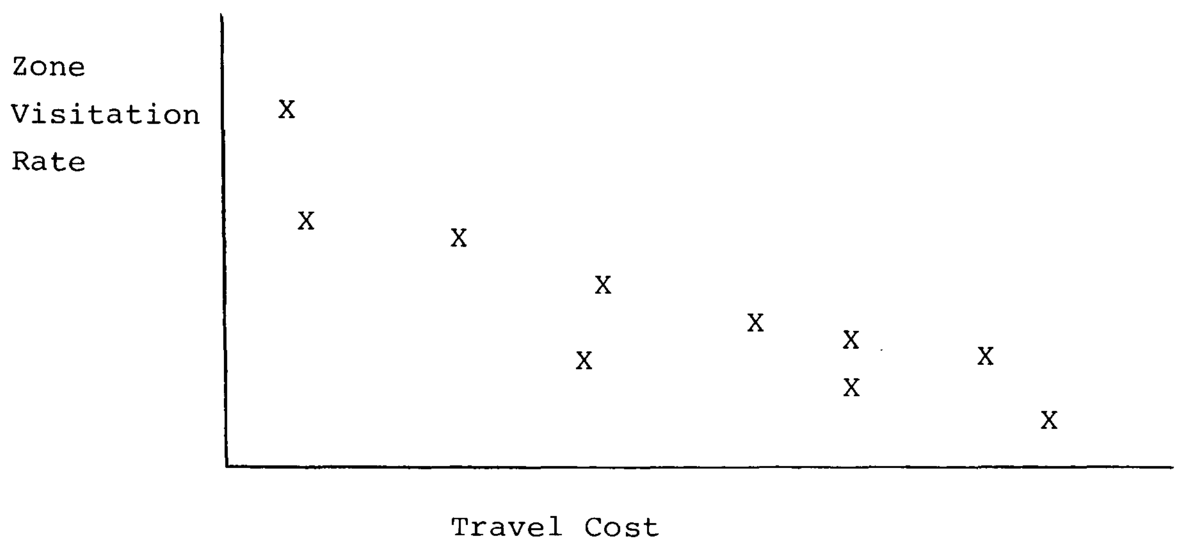
The 1981 re-imbursement accorded for private vehicle use on Government business was 21.55 cents per kilometre for a medium size car (1600 c.c.) and this figure was used to calculate round trip costs for the visitors surveyed. Average group size from the survey was 2.3 individuals, so cost was divided by this figure to obtain individual travel cost. Questions concerning the value of travel time were likewise not asked and are therefore not part of the analysis. The consequences of deleting travel time from a model has been debated in the Economics Literature over the last few years. The problem is that it becomes difficult to estimate a model using both travel time and travel cost, as a strong correlation exists between these variables. Deleting travel time implies that visits to the Forest Parks are "purely recreational" and that the time spent in travel to the site has limited value if used in other ways.

Offsetting the theoretical cost of travel time is the experience or benefits derived from the actual trip to the site. In the Lake Tutira study, 95 percent of all respondents considered the trip to the site to be a pleasant experience. Given this widespread observation it is suggested that it is unnecessary to place a cost on travel time in New Zealand (Harris, 1981).

Estimation of Visitation

To find the relationship between travel cost and visitation rate the individual visitors are first aggregated into a relatively large number (n = 223 in this example) of small zones. The next step is to find the number of visits per head of population in each zone to the recreation site and this is found by dividing the number of users by the population to fit the model (Qijt). The size of each particular zone has been debated over the years, and ranges from each individual observation at one extreme to large aggregate zones (10-12 in total) at the other extreme. We have followed Brown et. al. (1983) in using an intermediate approach and using a larger number of small zones. This approach is considered preferable by Brown et. al. to either of the other two alternatives, and our "zones of origin" have between four to seven individual observations each. The basic assumption of the travel cost method is that greater visitations to a site per head of population will be made by those recreationists living closer to the site (i.e.: those facing a lower cost to travel to the site). Thus, a relationship between travel cost and zone visitation as depicted in Figure 3 should exist.

Figure 3. Hypothesised Travel Cost - Zone Visitation Relationship



Substitute Recreation Sites

No accurate estimation of possible substitution recreational sites available at different population zones is available, so consequently the variable Sijt is deleted from the model. This will have the effect of biasing estimates of the consumer surplus upwards to an unknown degree as costs of travel to substitutable sites should be included in the analysis.

Demand Elasticity

The elasticity of a demand curve indicates the relative percentage change of the quantity taken (visitation) for a one percent change in the price of a good (travel cost). When graphed this is a measure of the 'slope' of the demand curve. The deletion of substitutes will also tend to underestimate the percentage change in use of a site with a change in either entry fees or its proxy, travel cost.

Other Limitations of the Data Base

Groome, et. al. (1983) show hunters on average spend more time in the parks than do non-hunters, with only 26.3 percent of hunters spending one day or less in the parks compared with 56 percent of non-hunters. Since our dependent variable Qijt is the number of visitors per zone to the Parks and not the number of days per visit, we would expect hunters' valuation as measured by the travel cost to be underestimated. Additionally, hunters prefer to visit an area with which they are familiar and the added value they place upon knowing the terrain and a particular habitat may not be reflected back in the travel cost valuation. Conversely, non-hunters are believed to have an increased likelihood of multi-site visits (visiting more than one recreational unit on the one trip) than do hunters. We have not adjusted for this factor, and this will tend to show an increased valuation accruing to non-hunters as a result.

Although the overall effect of bringing together both these positive and negative biases may be to have a valuation close to the actual, the differences between hunters' and non-hunters' valuations may be accentuated, and non-hunters expected to show a higher valuation of the resource than do hunters. Accordingly, we decided to test the model using all (n = 233) zones of origin and account for hunter/non-hunter differences using a zero-one dummy variable[1] for hunters in the regression anslysis.

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[1]A dummy (zero-one) variable records a value of 1.0 in the case of hunters and zero otherwise, thus enabling statistical tests to be conducted to test for differences between the two groups.

Finally, survey data was analysed according to three sectors - Desert Road and Clements Road entrances to the Kaimanawa Forest Park, with the Kaweka Forest Park treated as a whole. Since the Desert Road is on the main Auckland-Wellington route, we would expect more casual visitors to these entrances, thus indicating greater travel distance to these entrances. To test this hypothesis we included dummy variables for the Clements Road entrance and for the Kaweka Park, and we would expect both of these to be negative.

The question of changes in demand over different time periods is an unanswered question to be left for possible future research as the surveys must be considered as occurring in the one time period or year. Often it is possible to observe changes in pattern of use by conducting surveys over several time periods, and this information can be valuable to managers. However, we only have the one year, so t becomes 1 to represent only one 'time period' in our analysis.

3.4 Valuing the Recreation Resource

Estimates using three alternative regression models to graph the demand function are shown in Table 1.[1] These are all convex forms, and all show the travel cost as negatively sloping (although the inverse function is positive, this is still a decreasing function) and strongly significant in all cases. Stated simply, the greater distance from an entrance site and subsequent travel cost, the fewer visitations. The zero-one variables for hunters, Clements Road and the Kaweka Park are all negative as suggested, with statistical significance varying among the different model formula.

The inverse model (model 'a' below) is the model used by Harris and Meister (1981) for policy analysis, and we have included this particular model to enable comparisons with the results from the Lake Tutira study. The next step is to select a model, as all three models are convex shapes.

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[1] These models are of the form:

(a) Inverse, $Y = a + b\frac{1}{x}$

(b) Exponential, $Y = ae^{bx}$

(c) Double Log, $Y = \text{Log } a + \text{Log } x$

Where Y = Qijt (dependent variable)
a = Constant
b = A coefficient to be estimated
x = Travel cost

Table 1. Demand for Kaimanawa and Kaweka Forest Park Recreation[a]

Variable	Model Formulae		
	Inverse	Exponential	Double Log
Constant	.004 (2.9)	-3.63 (31.3)	0.36 (1.5)
Travel Cost	0.16 (18.8)	-0.035 (25.0)	-1.43 (24.2)
Hunters	-.005 (2.6)	-0.65 (5.2)	-0.56 (4.4)
Kaweka Forest	-.002 (0.9)	-0.16 (1.1)	-0.51 (3.6)
Clements Road, Kaimanawa	-.004 (1.7)	-0.65 (4.3)	-0.49 (3.1)
r^2 (adjusted)	0.63	0.76	0.74
F test	94	172	161
Own-Cost Elasticity[b]		-1.67	-1.43

a Sample size 223. Absolute values of t tests shown in parentheses. As a general rule, t values greater than 2.0 mean that this variable is important in explanatory power to the model.

b Elasticity exponential model is calculated at the sample mean.

To select a model for subsequent policy analysis, we followed Rao and Miller (1971), on statistical grounds.[1] In this case, the exponential model has a statistically better 'goodness of fit' than the double log model, which in turn is a better 'fit' than the inverse model. Since the exponential model has all the required theoretical properties and is statistically a better 'fit' than the other two models, we choose this formula for subsequent analysis.

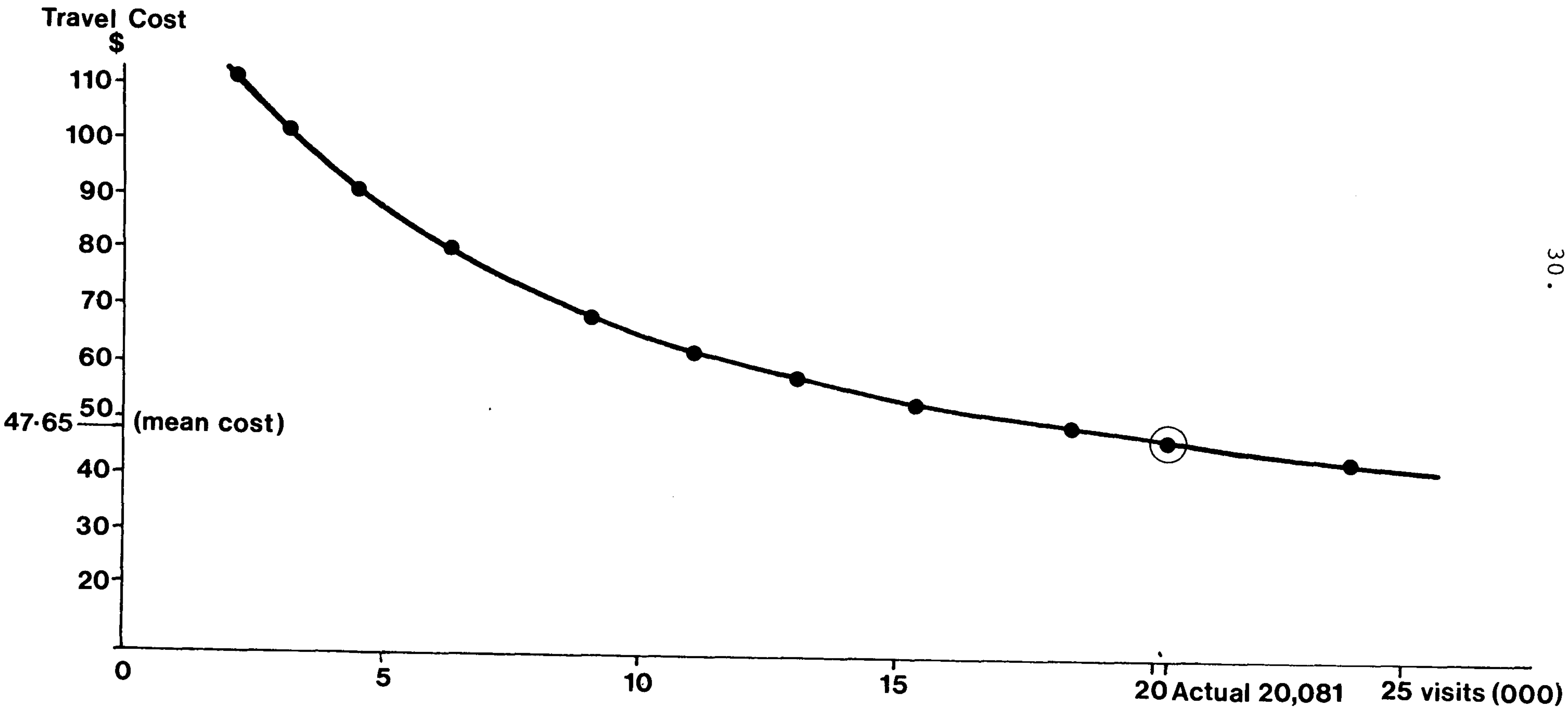
Shaping the Demand Curve

Estimated 1982 demand for outdoor recreation (both hunters and non-hunters combined) in the Kaimanawa and Kaweka Forest Parks is shown in Figure 4. This curve is drawn by multiplying our chosen exponential model coefficients by its sample mean values, adding for each hunter or non-hunter, and then graphing by varying the cost term (distance from the parks). Demands (in anti-logs) recorded here on the Y (vertical) axis are multiplied by mean population figures for each

[1] The sum of squared residuals are multiplied by the squared inverse of the geometric mean of the dependent variable to enable the models to be compared. Significant differences between models are then tested using the statistic:

$d = n/2\ [\ln(\Sigma e_a^2/\Sigma e_b^2)]$, where a, b indicate two alternative functional forms. Statistic d has a chi-square distribution with one degree of freedom. Values for d between exponential and double-log models was 5.5, and between double-log and inverse models 54.4, both of which are statistically significant at the 98% level. Thus, while all models are convex shaped, the exponential model is statistically superior.

Figure 4. Estimated Demand for Recreation in the Kaimanawa and Kaweka Forest Parks



zone (139,912) and then by the total number of zones (223) to reflect total demand in the parks. Actual visitation per year (estimated from the park managers) is 20,080, compared with an estimated visitation from our model of 19,927, thus suggesting our model has a reasonably accurate prediction ability.

Consumer Surplus Valuation

Determining the area under the demand curve in Figure 4, gives us the consumer surplus measure discussed earlier as part of the correct benefit measure. Calculating from the mean overall travel cost value of $47.65[1], we obtain an estimate of $545,436 as the estimated consumer surplus. This gives an average consumer surplus per visitor of $27.16, and effectively states that each user of the Parks, on average, would pay $27.16 to visit the parks, rather than forego the opportunity to use the parks as a recreation resource.

The figure of $545,000 therefore can be added to the amount actually spent, $957,000 (20,080 people averaging $47.65) to represent a tentative estimated economic

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[1] The overseas value of $187 was chosen as an upper limit for calculations, since some limit must be placed upon the amount paid in order to calculate consumer surplus. It is extremely unlikely that any individual would pay more than this figure of $187 to visit the Kaimanawa and Kaweka Parks. This figure was chosen as it is the cost of an "overseas" South Islander, representing all "overseas", travelling to the Parks.

benefit value derived from recreation in these parks on an annual basis. This gives a total benefit of $1,502,000. Economists would argue that it can be used as a direct comparison with dollars/benefits derived from other resource uses, such as commercial hunting and timber extraction. It can also stand alongside ecological, social or political arguments for existing uses. Of note is the fact that this figure presents the estimation for only one year's use and that as well as being sustainable from year to year (although resource deterioration, near substitutes and factors such as crowding may cause subsequent reductions in value) the continued growth of outdoor recreation and tourism in New Zealand would suggest that these figures will continue to rise into the future. It does not include direct expenditure on equipment, clothing or food arising from visitation.

Incorporating these benefits into a future stream of annual benefits and discounting[1] enables an estimate to be made of the visitation value of the parks. Using the

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[1]Discounting is a technique used to equate a sum of money at a particular time in the future with a sum in current dollars. It is generally held that a future dollar is of less value than a current dollar, even when inflation is accounted for, and discounting reflects this time preference for money. If an annual value is discounted and summed over all future years, the present value or current value can be found by the formula:

$$\text{Present Value} = \frac{1}{\text{Discount Rate}} \text{(Annual Value)}$$

In this example of a 10% discount rate, the formula is:

$$\frac{1}{0.10} \text{(Annual Value)}$$, or ten times the annual value.

10 percent rate currently employed by Treasury in project evaluation this results in a present value of the parks of $14,020,000. The authors caution that this can only be fairly interpreted as a tentative evaluation. The use of an existing data base has been solely to demonstrate the potential of the travel cost method of valuation as outlined earlier in this paper.

Possible upward bias's from multi-site visits and non-inclusion of substitute recreation sites have been discussed, but there is also the downward bias from measuring the dependent variable as trips and not days at the site.

3.5 Hunters and Non Hunters

Results from Table 1 show a consistently negative coefficient associated with the variable created to test between hunters and non-hunters. This indicates fewer hunters from a given population zone can be expected to visit the parks than non-hunters. However, one must keep in mind the potential differences in the longer length of time spent at the parks favouring hunters, and the multi-site visits of casual non-hunters. Both of these bias's will tend to underestimate hunters' willingness to pay to visit the parks compared with non-hunters.

The length of stay could be accounted for by adjusting the travel cost variable to reflect other costs associated with the recreation experience, e.g. the non-hunters' multi-site visitation could be adjusted for by assigning a proportion of the travel cost to the parks. This is, however, somewhat arbitrary, and was not done in the present study, but could easily be added to future models.

Hunting tends to be more of a local attraction, as the average hunter travelled 217 kilometers each way to the parks, compared with 272 for non-hunters. Since the variable hunters has different structural dimensions we estimated the hunters and non-hunters separately, and present the result in Table 2.[1]

Both hunting and non-hunting groups demonstrate satisfactory statistical models, with the travel cost variable negative and strongly significant as above. The major difference between the two models is that the Kaweka Park now becomes positive in the hunters' group, although at a significance level which precludes

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[1]A Chow test (Pindyck and Rubenfeld, 1981, pp 123-4) confirms that these two groups are statistically different from each other. This test is, however, another way of expressing a t-test.

us making any definitive statements about policy implications. The best interpretation of this result hinges on the apparent specialized regional nature of this park whereby significant numbers of hunters are from the nearby cities of Napier and Hastings. This pattern is confirmed by using other formula (double-log and inverse models). Both the models reported in Table 2 show a satisfactory 'goodness of fit' as measured by the r^2 and F values, although the non-hunters' model has the better 'goodness of fit'.

Table 2. Hunters and Non-Hunters Exponential Model
(t test in parentheses as absolute values and elasticity as before)

Variable	Hunters	Non-Hunters
Constant	-4.56 (17.3)	-3.58 (30.6)
Travel Cost	-0.036 (10.6)	-0.034 (23.0)
Kaweka Forest	+0.34 (1.2)	-0.35 (2.3)
Clements Road, Kaimanawa	-0.16 (0.6)	-0.89 (5.0)
r^2 (adjusted)	0.68	0.79
F test	50	194
Own-Cost Elasticity	1.45	1.74
Observations	70	153

Elasticity

As previously stated, elasticity measures the relative percentage change in visitations expected with a one percent change in the admission price, or its proxy, travel cost. Table 1 reports an elasticity of 1.67 for the exponential model, and this effectively states that a one percent rise in travel cost (admission price) would result in a 1.67 percent decrease in the numbers of people visiting the parks. Similarly, a one percent decrease in travel cost (admission price) would lead to a 1.67 percent increase in the numbers of people using the parks. This result is very similar to Harris and Meister's Lake Tutira study, as they report an elasticity of 1.53 for their double-log model.[1]

Elasticity results from the hunters and non-hunters estimated separately are 1.45 and 1.74 respectively using an exponential model (Table 2). From these results a slightly higher proportion of non-hunters than hunters would use, or cease to use, the parks with a respective decrease or increase in travel cost or imposition of entry fees. Some of this difference may result from the reasons discussed earlier, i.e. longer stay at the parks from hunters and the multi-site visits from non-hunters, or may reflect a stronger goal orientation among the hunting group.

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[1] Our corresponding figure for the double-log model is 1.43. Harris and Meister do not report an exponential model.

3.6 Other Considerations in Economic Valuations

Economists are becoming increasingly aware that factors other than the "use" value of a recreational area are important when considering the total value of a given area. The "use" or visitation value as discussed in the previous section refers only to those persons who actually use the site. Others to be considered are non-users of the parks and future members of society. It is, therefore, necessary to examine valuation in a wider sense. Issues to be discussed here are existence value, option value, intergenerational equity, and the concept of irreversibility.

Existence value refers to the value people place upon the importance of knowing that a given system exists, even though they will probably never use or observe that system. The most quoted example is the 'save the whale' campaign. In fact the concept of existence value is the fundamental cause on which most conservation groups are based. People making a contribution to save a species from extinction are generally doing so because of the value they place upon knowing that the species exists.

Option value is slightly different, and refers to a person not currently using a commodity, or site, but places some positive value upon the option to use it in the future. Deer hunting offers a good example of option value - some experienced hunters may be taking a break for a season or two, or other persons may be intending to take up the sport at a future date. These persons would place a positive value on a RHA, even though this value has not been recorded in the use value as measured in this paper.

Intergenerational equity is also a factor receiving increasing importance. In many resource allocation issues the endowment stream of future benefits is in the hands of the current generation. Should we be presumptuous enough to dictate to future generations? In many instances the discounting concept negates future benefits and this is to the detriment of the next generation. However, no firm rules yet exist for evaluating future generations' welfare with respect to changes we make.

Finally, many of the conservation and environmental issues currently being debated involve a question of change which, when made, can not be altered. Thus, the irreversible logging of natural forests is a good example. Even though benefits may outweigh costs at the moment, this situation could change in a decade's time. The longer we can keep all our options open for the future, the less likely we are to make a decision that may be regretted.

A recent Australian study (Majid, Sinden, and Randall, 1983) surveyed households in eastern New South Wales, for willingness to pay for existing and proposed parks. This survey showed that visitation, or user values, accounted for about only one third of total value. The authors conclude "these results suggest that, while recreational values have dominated the literature in the past, much more attention could properly be paid to non-visitor (i.e. option and existence) values". No comparable study has been conducted in New Zealand, although many of these issues have been raised with respect to the Rakaia River Use Plan in Canterbury. It is important to recognise that the use or visitation value estimated for the Kaimanawa and Kaweka Forest Parks represents a minimum valuation. The travel cost method is unable to answer these broader questions of total valuation, and these areas of broader economic research are likely to become more important in the future.

CHAPTER IV

POLICY IMPLICATIONS AND CONCLUSIONS

The two major methods of evaluating a non-market good, the travel cost and direct survey methods, have been outlined, and advantages and disadvantages of both discussed. Provided the financial resources to conduct a survey are available and care is taken in both constructing the questionnaire and carrying out interviews, then the direct interview (contingent valuation) approach may be the preferred option, particularly when the recreation site is a specialized local site such as a city park. However, in many instances data on users' zones of origin may be easy to collect, or already available, and in these instances the travel cost approach will provide a theoretically valid measure of a resource's valuation.

Using existing travel cost data a model can be made more accurate by inclusion of information on:

(a) Visits to nearby or intervening substitute recreational sites.

(b) Group travel arrangements.

(c) Multiple site visits.

(d) Length of time spent at the recreational site being evaluated.

(e) The value of travel time.

This information could readily be included in planning and management studies and will provide a relatively accurate estimate of a recreational site's economic value. Given that the Nation may face increased pressure on selected outdoor recreational sites for alternative development, it is important to have a reliable method to compare economic benefits from these alternative uses.

This information can be valuable from at least two perspectives. The first issue that some economic information can assist with is that of changes in land use patterns of an area. Looking at the costs and benefits from re-classifying an area to establish another RHA is a good example of this. Do the benefits involved from hunting out-weigh the costs incurred? These costs are the direct costs (administrative, rangers' salaries, etc.) and the indirect costs from possible loss of benefits from other uses, such as commercial hunting, timber harvest, or watershed management.

The second issue an economist can assist with is deciding where to allocate scarce resources, e.g. to which area should the new park ranger be sent? Ideally, from an economic view-point, the new ranger should be sent to the area where the most benefits will result from having that extra ranger.

It is difficult to measure incremental increases in quality of the site - for example, with an increase in hunting success rates resulting from a larger deer herd, how much would the site value increase? These types of questions are important, however, and may require a direct survey asking questions such as "how much extra would you be prepared to pay in order to have a 50 percent greater success rate?". If, however, several RHA sites were available to hunters and the success rate and hunters' expectations of success rate known, then the travel cost method would be able to obtain a measure of the quality index.

While this report has concentrated on the travel cost approach in the empirical study, limitations of this method as discussed, must be kept in mind.

No account of any potential regional effects of direct expenditure in a particular area can be accounted for in an analysis of this nature. These are the so-called regional multiplier effects and whilst important to a small, regional economy, these effects are outside of the scope of these particular economic models.

An empirical example of the travel cost method has been presented. This example is based upon survey data collected from users of the Kaimanawa and Kaweka Forest Parks in the Central North Island. Although the results must be viewed as tentative, these results do indicate that a substantial value is placed on the parks by recreational users.

Elasticity values provide an indication of the percentage change in use of the parks which can be expected with a percentage change in travel cost. From the results calculated, a one percent change in travel cost will result in a 1.45 percent change in usage by hunters and a 1.74 percent change in usage by non-hunters. Reasons for differences in these figures are discussed in the text.

Substantial consumer surplus is generated by the Forest Parks. Adding the money actually spent to the consumer surplus gives a tentative value estimated at $1.5 million on an annual basis. Discounting future benefits resulted in a present value of the parks in the order of $15 million. If demand for outdoor recreation continues to grow, this figure may well increase, in real terms, in future years. An increase in the deer herd may have the effect of increasing both hunter success rate, the number of hunters, or both, thus benefit increases from the RHA area of the parks would be cumulative.

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