SCIENCE & RESEARCH SERIES NO.11

WHAKAPAPA AREA ECONOMICS BENEFITS STUDY WINTER 1985 AND SUMMER 1985/86

by

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Published by
Science & Research Directorate,
Department of Conservation,
P.O. Box 10-420,
Wellington,
New Zealand.

ISSN 0113-3713
ISBN 0-478-01094-X

First published 1989

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ECONOMICS BENEFIT STUDY
WINTER 1985 AND SUMMER 1985/86

by

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FOREWORD

In 1985 the Department of Lands and Survey contracted Massey University to undertake research into current recreational use of the Whakapapa area, which would provide information of use in preparation of a management plan for the area. The principal part of this research was a questionnaire survey of visitors to the area in both the winter season and the summer season. This paper reports on the conduct and results of these surveys.

The aim of the research was to provide information which, when completed, would provide an estimate of the economic value of the Whakapapa skifield, both to its region and to the nation as a whole. This entailed the use of applied economic techniques which, although well established overseas, have been used relatively infrequently in New Zealand. These techniques are principally:

1. an estimation of direct expenditures by visitors to the skifield with a view to deriving regional income and employment multipliers;

2. an estimation of the economic value of the skifield by use of the travel cost method of non-market valuation.

In addition, the survey was to be used to investigate further aspects of interest to park management which could be accomplished without prejudicing the main aims of the survey. In practice this involved principally the gathering of profile information about visitors, their stay in the area, and their attitudes to developments and facilities in the area.

EXECUTIVE SUMMARY

This study was commissioned by the former Department of Lands and Survey to provide information for preparation of a management plan for the Whakapapa area. The main objective was to estimate the economic value of the Whakapapa Skifield, both regionally and nationally. Information on visitor attitudes towards particular management issues, visitor and visit characteristics were a secondary objective.

Two on-site surveys provided data for the study; covering an 11-week winter period (1985) and an 8-week summer period (1985-86). A national value for the resource was estimated using the Travel Cost Method, a technique which imputes a value on the basis of costs incurred by current visitors. Results gave a value per visitor of $66 for summer use and $124 for winter use. This implies a total valuation for the area over the 8-week summer survey period of $0.84 million and for the 11-week winter survey period, $28.94 million.

Direct expenditures by visitors in the Tongariro region were fed into a regional multiplier to estimate the economic impact of visitors on the region. Results indicate that the $4 million expenditure by winter visitors (an average of $12.24 per visitor) produced additional output of $3.5 million in the region and additional income of $1.7 million retained in the region. Similarly, the $0.129 million spent in the region by summer visitors (an average of $5.80 per visitor), resulted in a further $0.105 million of extra output in the region and $0.044 million income in the region.

Over the 11-week winter survey period, 328,000 people visited the skifield, while the 8-week summer survey period attracted 22,000 people. Visitors were predominantly in family groups with children and the occupational classes of administrative/professional/technical were over-represented. However other visitor characteristics varied between and winter visitors, e.g. a higher proportion of students were found in winter than in summer. Indeed, a higher percentage of young people (<25 years) were recorded during the winter period compared with the summer. Winter visitors were mainly New Zealanders (97%), with skiing the main reason for visiting, while one third of summer visitors were international travellers and visitors were attracted to the area for a variety of activities. Other visitor characteristics varied between summer and winter visitors, as did visit characteristics (e.g. length of stay, home location).

These results indicate that the economic benefits to the nation of the Whakapapa area far exceed the value of output it generates in the region. Furthermore, that winter use is more significant than summer use, both in terms of total visitor numbers and expenditure per visitor.

I. INTRODUCTION

This study provides estimates of the economic value of the Whakapapa and village area in Tongariro National Park, through application of the travel cost methodology and analysis of visitor expenditures. Some general considerations in the economic valuation of recreation are set out below.

1.1 The Economic Dimension in Recreation Decisions

In recent years New Zealand has witnessed a rapid expansion of participation in outdoor recreation, particularly those forms based on satisfying 'inner-directed' needs for activity, adventure and appreciation of the natural environment (Henshall 1984). The reason for this expansion is usually attributed to a combination of inter-related factors including: increasing real incomes; increasing leisure time and adoption of the 'holiday' habit; increasing personal mobility through widespread car ownership and improvements to the roading network; higher attainment levels in education resulting in new awareness of the environment and its potential for recreation; and, some would argue, an increase in stress in routine urban living, necessitating more 'escapism' into a less complex outdoor environment. Other causative factors have also been suggested, but whether or not they are, and continue to be, influential, one thing remains certain: the resources available for supply of recreation facilities are limited, as are the time and money available to individuals to use them. Consequently all decisions on the provision and use of recreation resources implicitly contain an economic dimension.

This has long been recognised with respect to the supply of recreation facilities, which must compete with other activities for the use of the land, labour and capital required to provide them. In the market system which governs most economic activity, such productive factors would be used in recreation provision if the marginal returns they generated were higher than those they could earn in any alternative use. However, for much outdoor recreation in New Zealand there is no market mechanism, making it difficult to assess the returns from such factors, and the cost-effectiveness of their use.

The reasons for this are partly intrinsic to the nature of outdoor recreation, and partly historic. In certain respects, outdoor recreation displays the characteristics of market failure, and has therefore been regarded as a public good. It is practically impossible to exclude non-payers from the benefits of access to an area like a national park. Moreover, given this inability to enforce a system of charges, the scale of operation of recreational land management would be excessive for any private operator to contemplate. So in New Zealand, as in other countries, a two-tier system of recreation management has developed, with the public sector large areas of extensively used land, while the private sector operates more intensively used facilities.

This system is epitomised by the division of interests between the national park authorities and the concessionaires operating facilities in the Whakapapa area.

The historical reason for the absence of a market mechanism is that recreation has long been regarded as a 'merit good', a good thing in itself which no member of the public should be excluded from by virtue of being unable to afford it. Consequently entrance or use charges levied by public authorities have tended to be nominal or non-existent. However, quite apart from the difficulty of assessing whether recreation is such a socially beneficial activity as is sometimes claimed, such an argument that recreation is good in aggregate does not preclude the need to evaluate individual recreation sites or facilities, both in terms of economic and other criteria.

It is not uncommon to hear the argument (particularly among recreational practitioners themselves) that recreation decisions lie outside the scope of economics, and the benefits individuals obtain from it are intangible or otherwise incommensurable (e.g. health, emotional well-being etc). The implication behind this argument is that recreation is somehow different from other goods and services in the market place, but many of these other goods and services also convey intangible benefits which, moreover, are reflected in the different prices attached to superficially similar goods. Although outdoor recreation does not have an explicit price per unit of consumption, it does exhibit characteristics similar to those of other economic goods. From the viewpoint of the individual participant, it involves a sacrifice of time, effort and money to enjoy its benefits. Decisions involve the individual 'trading off' the benefits from recreation against those of other demands on his time and money, so there is an implicit opportunity cost in every decision. Moreover, recreation has scarcity, in the sense that most individuals would like to have more of it; and it displays a diminishing marginal utility, in the sense that individuals have some satiety point for recreation and that, the more they have, the less they apparently value each individual unit of recreation. So there are implicit economic choices in recreation decisions which, although rarely manifested through a market mechanism, are nevertheless revealed through individuals' behaviour.

1.2 Approaches to Economic Analysis

Agencies and individuals involved in the provision of outdoor recreation need periodically to assess the use of the resources under their control. Among the questions they may want to ask about their existing arrangements (or about proposed future arrangements) are:

a) are they effective in providing the sort of service intended;

b) are they equitable in application, and not unduly disadvantaging one group over others;

c) are they cost effective, in the sense that benefits outweigh costs;

d) are they efficient, providing benefits comparable to or greater than those obtainable by deploying the resources elsewhere?

Economic analysis is concerned principally with the third and fourth questions, and may also provide information pertinent to the second. These issues are addressed through the concepts of welfare economics, similar to those applied in cost-benefit analysis. Such an approach attempts to estimate the total benefits generated by a recreation facility, deduct from them the total cost of providing that facility, and so obtain the net benefits from the facility. "Demand", in its strict economic sense, is the relationship between the quantity of a good or service consumed and its price. The demand schedule, which can be expressed graphically as a demand curve, states the amount of a good or service which would be purchased in a given time period at specified price levels. But economic theory indicates that the primary benefits of a service or facility, those accruing directly to its users or consumers, can be estimated by calculating the area beneath its demand curve. There are also certain secondary benefits, accruing mostly to the factors used in providing the facility, but these are essentially different from the primary benefits to consumers.

The problem with respect to recreation facilities, in the absence of a market mechanism, is how to estimate the demand schedule as a basis for estimating benefits? Under the traditional economic view, in which outdoor recreation resulted from market failure and had zero cost to the participant, demand for recreation was taken as infinite with zero price (i.e. with a horizontal demand curve), so variations in the consumption of outdoor recreation were determined entirely by variations in supply (Figure 1). This economic explanation provided a justification for paternalist allocation of recreation facilities: if a public authority desired more recreation for its constituents, it had only to alter the supply of facilities to achieve the desired effect (Burton 1971). However, notwithstanding the fact that some recreation consumption is generated by the supply of facilities, in the post-war period the traditional view has been recognised as too simplistic, and economists have sought ways of measuring surrogate prices for recreation.

Two broad categories of benefits from a recreation site can be distinguished - commercial and non-commercial. The commercial benefits are more apparent, because they result from commercial transactions within the locality or region of a particular recreation facility. They act as a stimulus for further spending in the region, generating employment and income for its inhabitants. The result of successive ‘rounds’ of spending in the region by the recipients of money circulating from the initial injection produces a multiplier effect, the size of which depends on the degree of self sufficiency of the region, the local population's propensity to save or to ‘import’ goods from outside the region, and the amount of other leakages from the local economy. These form the basis of economic impact analysis.

The second category is that of non-commercial or non-market benefits, of which there are four distinct types. These benefits accrue to the consumers rather than the producers of the recreation facility, although in this case the term 'consumer' is not synonymous with 'user' of the facility. Current users of the facility obtain at least as much benefit from the use of the facility as it costs them to use it - otherwise they would not come. So for them benefits can be derived from two types of cost: the cost of using facilities, accommodation, meals and so on, over and above what they would have spent had they stayed at home; plus the travel costs associated with reaching the facility (Clawson & Knetsch 1974). In addition, there may be some people, not current users of the facility but who expect to use it in future, who would be prepared to pay to maintain the option of using it at some future date. They hold an 'option value' in the facility similar to an insurance or 'risk-avoidance' premium. Moreover, there may be some individuals who have no intention of ever using the facility, but who are nevertheless willing to pay to see its existence continue. The estimation of the value of non-market benefits is therefore dependent on being able to survey individuals' willingness to pay for certain aspects of the facility in question: additional expenditures from use, travel costs to the facility, option values for future use, and existence values.

Whereas it is most practical to measure commercial benefits at the local level, non-market values by their very nature tend to reflect values held beyond the immediate vicinity of the recreation site. Option values and existence values may be expressed by those who never go near the site, while a resource such as a national park may also draw current users from far afield. Moreover, commercial measures do not reflect the total value to consumers of the goods they are purchasing. At almost every price level at which goods change hands, there will be some consumers who would be willing to pay more, and who therefore capture a 'consumer surplus' by paying, what is to them, a bargain price. The aggregate consumer surplus is measured by the area under the demand curve but above the price currently being paid, so it is excluded from the total of commercial transactions (price times quantity). Thus there are fundamental differences between commercial values and non-market values in the scope and significance of what they include (Figure 2).

In the political arena difficulty is sometimes exhibited in distinguishing between the non-market valuation of a resource and its economic impact, as measured by commercial transactions. By analogy, the decision to bring land into agriculture is primarily determined by its agricultural productive potential, and the farmers' spending power in the local community is a secondary consideration -if, in fact, it is considered at all. Yet with recreation and tourism enterprises, the reverse emphasis seems to be the case: economic impact seems to be accorded greater significance than economic value, particularly at the local level. Problems of

comprehension of the concepts involved are compounded by the political differences between local and national interests.

There are several reasons why commercial expenditures should not be taken as indicators of the value of a recreation resource. First, many such expenditures, such as those on accommodation and meals, are not spent on the resource itself, but rather on identifiable market-priced goods and services, located at, but ancillary to, the non-market resource. If a given resource or national park ceased to exist, it is quite likely that the expenditures made within it would be transferred to other facilities elsewhere. However, the non-market benefits to consumers would be wiped out, because of the loss of opportunity to use the park.

Second, many commercial expenditures are not related to a specific site or a specific visit. Items such as fishing rods, camper vans and skis are essentially fixed costs, which should be accounted for over a number of years' use. Both the number of times they are used, and the locations in which they are used, are indeterminate. Such expenditures may be indicative of the strength of interest in a particular activity such as skiing or camping, but they cannot be allocated between individual recreation resources.

Third, if expenditures were the main determinant of land use policy, many minimal impact recreation activities would apparently undervalue the resource they use. The back-country hiker, for instance, may carry his own accommodation and food from his own town, so his expenditures in his chosen holiday area would be small. The fact that he has made sacrifices of time and money to reach his chosen destination is irrelevant to the economic impact approach to land use policy.

But the main reason for not relying on economic impact for policy decisions lies in economic theory. Marshall developed the concept of consumers' surplus which has played a central role in the subsequent development of welfare economics. At the heart of consumers' surplus is the idea that things are valued above the price actually paid for them, i.e. there are people willing to pay more than they are currently doing so to obtain access to a particular resource. Estimating this surplus is the central problem in non-market valuation.

1.3 Methods of Recreation Valuation

Economic estimates of the value of recreation have been directed mostly at the valuation of individual sites or resources, principally in an attempt to assess the cost-effectiveness of recreation provision at these sites. There may be other types of recreation valuation of interest for specific purposes - for instance, the estimation of individual utility functions to determine how leisure time is valued against non-leisure time - but most economic analysis of recreation has concentrated on resource allocation, and this is the approach adopted here.

Since recreation is provided at zero cost, a major problem in valuation is how to identify and measure an appropriate proxy for a market price. Several methods encountered in the literature are unsuitable. The value of sport fisheries, for instance, has been equated with the market value of the fish they produce, but such a method implies that the only value anglers receive is from the fish themselves, whereas anglers may enjoy fishing even when they catch nothing. Another method sometimes used is to estimate the gross expenditures on a certain site or activity. However, this suffers from all the limitations outlined above for relying on commercial transactions: the difficulty of distinguishing between fixed and variable costs, and of allocating them to particular sites. Some studies have suggested that recreation benefits equal the cost of facility provision, which clearly justifies any level of expenditure and provides no measure of the cost-effectiveness of provision. Another method is to value public sector facilities on the basis of comparison with private sector facilities, but unfortunately no true comparisons can be made: the fact that private facilities can charge indicates that the service they offer must be different in some way from that of the free public facilities.

Three methods are currently in use which yield valid estimates of individuals' willingness to pay for a recreational resource. Each approaches the problem from a different perspective, and each has its particular advantages and problems in application.

One method which still uses "real" market information from transactions records is hedonic pricing. Land agents have long recognised that amenity factors have an influence on residential land values, and this method attempts to estimate the capitalised value of proximity to recreation facilities as evidenced through prices in the housing market. The difficulty with this approach is trying to isolate the effect of recreation facilities from those of all the other influences on residential house prices, and in practice very large data series are required. This method is only applicable to urban recreation facilities, and is clearly inappropriate to rural facilities where a high proportion of users are non-residents.

The second method is known as contingent valuation, and consists of surveying individuals' willingness to pay for a certain resource. This is the most comprehensive of the three methods, since it encompasses use values, option values and existence values, but unfortunately it has a number of practical drawbacks. Chiefly these result from the fact that a hypothetical question (how much would you be willing to pay for this resource which has hitherto been free?) may produce a hypothetical answer, and there is evidence that some respondents will undervalue or overvalue their replies depending on the effect they want to give to the survey sponsors. Other practical difficulties include the choice of an appropriate vehicle for the question: ratepayers may be able to articulate willingness to pay more easily through an increment on rates, rather than trying to imagine a gate fee or lump sum payment for use of a currently free resource. A

further practical problem is the survey method itself, since interest in a particular resource is likely to be dissipated through the community, requiring a large sample to generate sufficient replies for analysis.

The third method starts on the premise that, even in the absence of any entry fee, recreation is not a free good: there are variable costs associated with each recreational trip, the principal category being travel costs. The travel cost method surveys the users of a particular site or activity, examining their total costs in using the resource: accommodation expenses, food and meal expenses over and above what they would have spent at home, travel costs and so on. The information so gathered can then be used to derive a relationship between costs (or price) and quantity of recreation "consumed" across the various distance zones from which people come, and hence a demand curve for the recreation resource. A number of variables can be built into this method to take account of individuals' valuation of time, different socio-economic characteristics, depreciation on vehicles and so on.

All three methods yield estimates of the demand curve for recreation and the consumer surplus associated with a particular site or resource. They differ greatly in method and intent from the measurement of economic impact through expenditures. These differences are illustrated in this study, which presents a travel cost valuation and an economic impact study of the Whakapapa area in Tongariro National Park.

1.4 Limits to Analysis

Any method which imputes values in the absence of explicit market values will have limitations which qualify its usefulness. Some of the limitations of the travel cost method are specifically described in the detailed exposition of the methodology, but some general reservations need consideration from the outset.

First is the question of who is counted? The travel cost model is based on a survey of current users only, so non-use values such as option values and existence values are excluded. Furthermore, the value placed on a resource by future generations (which may be very different from those of today) is totally ignored. Both existence values and future needs have a bearing on public policy towards recreation and land use.

Second is the question of what is counted? This is particularly important in a resource with multiple aims, like the joint objectives of conservation and recreation in a national park. The travel cost technique records principally the recreational use values, whereas contingent valuation would be more appropriate to estimate the existence value which current generations attach to nature conservation. It has often been noted that recreation and conservation tend to be somewhat in conflict, but the travel cost method provides little assistance in resolving such conflict.

It is sufficient for providing a single estimate of value, but inadequate for estimating separable demand curves for recreation and conservation.

A third question relates to the weighting of results in the final decision-making process. Economic analysis centres primarily on the criterion of efficiency, which broadly reflects the ratio between benefits and costs of a particular project. However, recreation planners may have other criteria for assessing their facilities: for instance, they may have an objective for providing across a 'recreational opportunity spectrum' (Stankey 1979). Depending as it does on costs incurred by current users, the demand curve derived from the travel cost model reflects the current income distributions in society, which public policy towards recreation may seek to redress. As Flegg (1976) has pointed out, the choice of economic efficiency as the dominant criterion is just as much a value judgement as the choice of any social goal, and the economic analysis is not necessarily any more "objective" than analyses based on other criteria.

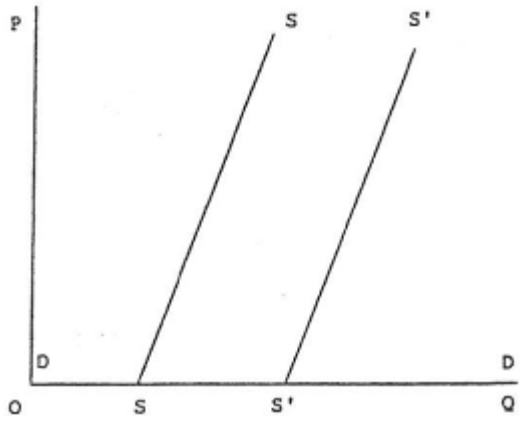
In short, economic analysis is only one part of a complex decision process, serving a variety of objectives, and should not be regarded as a prescriptive tool for decisions regarding resource allocation. The aim of economic valuation of non-market resources is not to make decisions easier, but rather to make them better informed. The travel cost method will provide an order of magnitude estimate of the value of the recreation area to the nation, but it is not the total value. The pursuit of other objectives implies other values over and above those recorded by the travel cost method, but at least the estimation of the current use values focuses attention on how large the non-use values are likely to be.

1.5 Outline of Report

Section II of this report examines the design and execution of the Whakapapa surveys, treating the summer and winter surveys separately, while Section III outlines the results, response rates and weighting procedures used. Section IV presents the visitor profiles from the survey, Section V outlines the travel cost methodology, and Section VI covers the expenditure analysis. In the Conclusion, summarised results for each of these sections are drawn together with some of the implications of their interpretation and use. This report is consistent with two preliminary reports previously prepared on the conduct and profile results of the winter and summer surveys. However, for estimates of visitor numbers and expenditures, the results of report should be considered as superseding those in the preliminary reports.

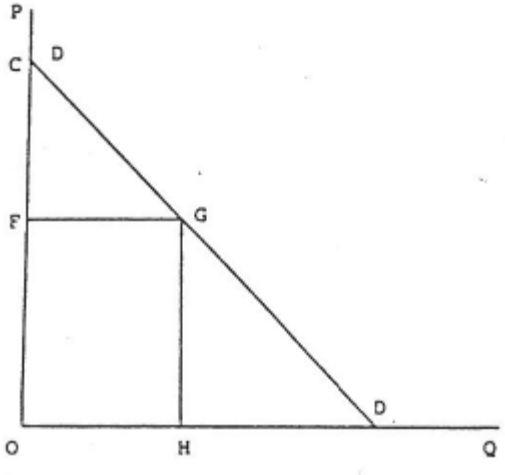
* * * * *

Figure 1



If rec has no cost, DDcoincides with Q axis of supply curve. So variations in consumption are determined by shifts in the supply curve – S to S'.

Figure 2



Demand curve for a product/service is DD. If Price = F, consumption quantity will beH, and the sum of commercial transactions will be OFGH. But there is also a consumer surplus at price F of FCG, which is the extra amount that some would have been prepared to pay. So total benefits from the product/service are given by area OCGH.

II. SURVEY DESIGN AND EXECUTION

2.1 Winter

After considering the aims of the research and discussing with Park Staff the conditions likely to be encountered during the survey, the method chosen was a self-completed questionnaire to be distributed to visitors when approaching the Whakapapa area. In view of the number of questions to be asked, a personal interview survey was thought to be too time consuming, and too likely to risk respondents' annoyance and incomplete replies. Moreover, the size of the sample sought would have required a large force of interviewers, who would need to be carefully trained to avoid bias in eliciting and recording responses.

A self-completed questionnaire survey had been conducted successfully at Turoa in 1982, so for the 1985 Winter survey a similar approach was adopted, with the added complication that there had to be two distribution points, one for visitors in cars and one for those using the mountain goats (four-wheel drive buses). The car survey point was located at First Bluff on the Bruce Road. Goat passengers were approached as they boarded the mountain goats in the car park at Whakapapa village. Bins for the return of questionnaires were located around the skifield, along the Bruce road and in Whakapapa village. To save time, respondents' names were not recorded, but each completed questionnaire had a serial number which would be entered into a draw. The prize was $200 cash (so as to appeal to non-skiers and skiers alike), and notification of the winner was posted in newspapers in Wellington and Auckland.

The actual sample was stratified according to month and transport type. The selection of survey days was based on five previous years' records of car park counts at Iwikau and Whakapapa villages, from which the distribution of usage between months and between week-end and week-days were derived. On the assumption that each car held 3.8 persons and each bus held 30, the expected use of the skifield through the season was estimated and formed the basis for survey day selection.

In order to obtain reliable computation of cross-tabulations, and on the expectation of a 60-70 per cent response rate, a total of 4,000 questionnaires were printed for distribution over 20 survey days. Selection of individual respondents was accomplished by stopping every 10th car passing the survey point on the Bruce road, and distributing a questionnaire to each "autonomous economic unit": one in the case of a family group, or one questionnaire to every adult (16 years and older) in the case of friends sharing vehicles. For surveying mountain goat passengers, a questionnaire would be given to every 10th adult in the queue to board the vehicle. Using such ratio selection procedures resulted in the sample size being self -determining.[1]

Distribution of questionnaires was carried out mostly by casual staff employed by Park Management at Whakapapa. Payment of such staff imposed a practical constraint on sampling periods, so most surveying was conducted during periods of peak traffic flow up the Bruce road, between 8.30 a.m. and 1 p.m.

In general, surveying took place whenever the skifield was operating, regardless of weather, although under extremely adverse conditions the survey teams would be withdrawn early if traffic flow was very low. In the event of road and skifield closure, the next available day of the same category (week or week-end) was surveyed instead. Similarly, those car/people declining to accept a questionnaire were substituted by the next available taking care not to disrupt the regularity of the vehicle count.

2.2 Summer

The survey during summer 1985-6 was intended to be consistent with the winter survey in 1985, so survey design was heavily influenced by the previous winter's experience. However, the summer survey was modified in an attempt to overcome a number of drawbacks which had beset the winter survey in practice.

In the summer survey contact names and addresses were collected by survey staff at the time when the questionnaires were distributed. This enabled the researchers to follow up with a reminder note and duplicate questionnaire sent to those who failed to respond. Less concentrated traffic flows made the recording of contact names a more practical proposition than in the winter survey, and in general, the technique worked satisfactorily.

In contrast to the preparation for the winter time survey, no detailed information on vehicle numbers and distribution through the summer was available, so consequently selection of days was haphazard. On the suggestion of Park Staff, surveying was restricted to the period mid-December to end of February, since outside this period traffic flows were unlikely to provide a sizeable sample.

Every third car passing up the road towards the village was stopped and asked to participate in the survey. By asking for a contact address the type of party in the vehicle was ascertained, and questionnaires were distributed to each ‘autonomous economic unit’ in the vehicle. In the case of family groups, the family itself is the ‘economic unit’ so questionnaires were distributed one per family.

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[1] A separate survey of mountain goats was required because of the reluctance of the goat operators to stop on the road. The car survey was located above Whakapapa village so as to exclude vehicles not visiting the skifield.

In the case of friends sharing a vehicle, each individual not cohabiting with another was regarded as an autonomous economic unit and hence given a questionnaire.

The traffic counter at the Bruce Road barrier was temporarily set up at the Whakapapanui Bridge below the golf course during the months of January and February 1986. From this counter's readings it is possible to estimate the number of surveyable vehicles approaching the Whakapapa Village during the survey period, and to weight the results accordingly. The survey point itself was set up beside the golf course approximately half a kilometre below the Chateau, so that all surveyed vehicles would also be recorded on the traffic counter.

Replacement of days unsuitable for running the survey, or of contacts declining to accept a questionnaire, was done as for the winter survey. Surveying on consecutive days was avoided so as not to introduce bias against long-stay visitors staying on the mountain. [2]

A total of 2000 questionnaire forms were printed, but only 707 were distributed in the roadside survey. A further 115 were sent out to non-respondents in a follow-up survey in April, and 36 were distributed to patrons by staff at the Chateau.

A number of service vehicles and cars belonging to local residents used the road during survey hours. Such vehicles were not included in the survey staff count, as far as they could be identified. (Local cars were encouraged to use flashing headlights to survey personnel). A separate count of non-surveyable vehicles was made on one day, which reconciled closely with the traffic counter and survey tally figures for the hours in question.

No formalised pretest or pilot of the summer survey was run, due to lack of time between the preparation of the survey and the start of the main holiday season. However, in some respects the winter survey acted as a pilot, since it highlighted aspects of questionnaire design and survey method which had proved unsatisfactory. Judging from the response rates to the summer and winter surveys, modifications made to improve on the winter survey outcome were successful.

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[2] Since surveying took place when visitors approached the skifield, those staying on the skifield might have a lower chance of being selected than those travelling up on consecutive days. This risk should be reduced by spacing survey days.

III. SURVEY RESULTS AND WEIGHTING

3.1 Winter

The 1985 survey of Whakapapa was run as planned on 20 days through the winter. During this period 3,245 questionnaires were distributed, 2,539 to car passengers and 706 to goat passengers. Of these, 1,018 were returned, but not all of these were usable since, in the course of coding and checking input on the computer, it became apparent that some questionnaires had been given to those outside the survey population (e.g. children in a family group) and were yielding improbable results. After checking back to questionnaires and removing the dubious ones, the usable total amounted to 924, or a response rate of 28.5 per cent.

This was a low response but, unfortunately, once the initial contact with respondents to distribute questionnaires was made, there was no way a follow-up survey or reminder notices could be sent to respondents. The collection of questionnaires in two separate locations (at Whakapapa, and at Palmerston North for freepost items) hindered monitoring of responses so that the low response rate was not identified until September.

Those manning the survey points kept tally sheets of vehicles stopped and people approached, in order to maintain the one in ten selection ratio. From these sheets it appears that 9,850 cars passed the vehicle survey point during the survey. In the vehicles stopped there were 3,620 people, 2,670 adults and 950 children, (i.e. 26.2 per cent were children accompanying adults) and there was an average of 2.72 people per vehicle. Similarly 255 mountain goats left the Whakapapa car park during the hours surveyed, and tally sheets indicate an occupancy rate of 28.75 passengers per goat. Through the survey as a whole, 57 cars stopped, and 16 goat passengers approached, declined to accept a questionnaire.

The barrier counts record all vehicles travelling up the road, but the survey was only concerned with private cars and mountain goats conveying recreational visitors to the skifield, excluding staff, trade and service vehicles. Theoretically it should be possible to estimate the proportion of non-survey vehicles in the total barrier count by comparing traffic flows with survey tally sheets for the hours the survey was running. In practice it appears that the traffic counter was persistently malfunctioning, since the total traffic count over August and September was only about 85 per cent of the number of vehicles indicated by the tally sheets. In lieu of any better information on vehicle arrivals, the barrier counts were used in arriving at the weighted results which, in consequence, may be understated.

The weighting procedure adopted was as follows:

a) estimate total vehicles over the skifield season from barrier counter;

b) divide the season's total vehicles into cars and goats in direct proportion to the number of cars and goats surveyed;

c) apply vehicle occupancy rates from survey tally to estimate total visitors to skifield;

d) calculate questionnaire response rate for week-ends and week-days as a proportion of total visitors;

e) derive weights for week-ends and week-days which, applied to survey responses, will estimate total figures for the season.

Using this procedure resulted in a season's estimate of vehicles of 50,181, divided between 20,341 at week-ends and 29,840 on week-days. The tally sheets indicated that 97.5 per cent were cars, 2.5 per cent mountain goats. Applying vehicle occupancy rates of 2.72 per car and 28.75 per goat indicated that of total visitor arrivals (not visitor days) of 169,160 over the season, 68,577 came at week-ends and 100,583 came on week-days. The valid responses to the date question indicated 442 responses from week-end visitors and 421 from week-day visitors, from which weight factors of 155.039 for week-ends and 238.663 for week-days were derived.[3] For the purposes of weighting, the season was taken as the 11 weeks from 1st August to 14th October 1985.

In essence the weighting procedure is an adjustment by (population size/sample size) and applying these weights to the responses converts them from a sample to a census of respondent arrivals over the period of the survey - assuming, that is, the responses are representative of the arrivals as a whole. This creates some problems in the calculation of visitor days, which is the product of visitors times days at Whakapapa. The survey responses are not sufficiently detailed to distinguish between those visitors who stayed above the survey point and those who stayed below the survey point during their visit to Whakapapa, so it is possible that double-counting would occur in the case of those passing through the survey point every day if the visitor days formula were applied to the weighted data. Consequently the best estimate of visitor use provided by the both the winter and summer surveys is that of visitor arrivals, which is less than the total figure of visitor days over the survey periods.

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[3] Given a seasonal total of 169,160 and dated survey results totalling 863, the survey results would have to be multiplied on average 196 times to approximate to seasonal totals. Given the different proportions of week-end and week day visitors in the sample and population, adjusting this weighting factor by (Population Proportion - Sample Proportion) for each category of day gives adjusted weights of approximately 155 for week-end results and 238 for week-days. A consequence of this differential weighting procedure is to expand the seasonal total to 178,462, since undated responses have been weighted as week-end days, by default.

3.2 Summer

The summer survey of the Whakapapa Village area was run on 19 days between 18 December 1985 and 23 February 1986. On two days surveying was curtailed by bad weather and very low traffic levels, so the survey was effectively conducted on 17 full days and two half-days. This was less than the 20 days originally intended, but since vehicle numbers tailed off rapidly towards the end of this period, the number of survey days was cut back without appreciably reducing the sample size.

During the survey, 707 questionnaires were distributed, of which 481 were returned. This is equivalent to a basic response rate of 68 per cent. A follow-up survey, consisting of a reminder note and duplicate questionnaire, was made in April of those who failed to respond. In this follow-up, 115 questionnaires were distributed, of which 32 were returned. This represented a response rate of only 27.8 per cent from the follow-up, but this was sufficient to raise the overall survey response rate to 72.5 per cent. This overall response rate was satisfactory in terms of the target rate (70-80 per cent), and in view of the relatively low response rate of the follow-up survey and the likelihood of diminishing returns from future follow-ups, no further attempt was made to increase the level of response.

The response to the summer time survey was appreciably better than that to the winter time survey (28 per cent). Partly this can be attributed to the different conditions encountered in summer, the absence of the frenzied rush to beat the queues for parking, lifts, mountain goats and so on. But partly it reflects a greater control over the conduct of the summer survey. Fewer people were used to distribute questionnaires to the summer visitors, each of whom were well briefed on what to do and how to record what they did. In contrast to the winter survey, the number of summer time responses which had to be discarded for having been given to the wrong person (e.g. to more than one member of the same family group) was negligible. The collection of contact names and addresses proved valuable, both for the follow-up survey and for ascertaining the type of party in the vehicle.

The summer survey was roughly equally divided between week-ends and week-days. However, during the survey period as a whole, week-days outnumbered week-end days by approximately 5:2 and accounted for more traffic, so it was advisable to "weight up" the responses from week-day surveying to obtain results more representative of the period as a whole.

Over the survey period as a whole, week-day traffic out-numbered week-end traffic by approximately 3 : 1 (74.4 : 25.6), whereas for the survey responses the ratio was closer to 1 : 1 (52.7 : 47.3). A weighting factor which would inflate week-day responses to the same proportion as the total traffic flow could be obtained by dividing the response ratio into the traffic ratio thus:

$$(74.4 : 25.6) - (52.7 : 47.3) = 2.6$$

However, traffic counter figures needed to be adjusted to take account of non-surveyable vehicles in the traffic flow (e.g. service vehicles, local residents' cars etc). An hour by hour comparison of the traffic counter figures with those of the survey tally sheets (and a separate count of non-surveyable vehicles) enabled this to be done. As might be expected, total traffic on week-days contained a higher proportion of non-surveyable vehicles than total traffic at week-ends (33.7 per cent and 28.8 per cent respectively). This information was then used to estimate the flow of surveyable vehicles over the survey period as a whole:

TOTAL	9,046
WEEK-ENDS	2,441
WEEK-DAY S	6,605

From these figures a weighting factor of 2.433 was obtained which would ensure that the distribution of responses between week-days and week-ends was in direct proportion to the surveyable vehicles arriving on week and week-end days. Weighting up the results to represent the full eight week survey period (by the same procedure as that used on the winter survey) resulted in weights of 10.13 for weekends and 24.83 for weekdays.

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IV. FINDINGS OF VISITOR SURVEY

4.1 Winter

The 1985 Winter Survey of Whakapapa achieved a response rate of 28.5 per cent, sufficiently low to reduce the confidence in the survey's representativeness of visitors as a whole. Further reservations on the results arise because of ambiguities in some of the replies, and the unreliability of the mechanical vehicle counter which makes the weighting procedure suspect. These problems highlight the desirability of changing some aspects of survey design, in any future survey, including:

a) the necessity of running a full pilot through to coding/ processing stage;

b) the desirability of being able to follow up survey contacts with reminder letters and replacement questionnaires;

c) the desirability of not placing too much emphasis on the survey techniques employed successfully elsewhere under different conditions.

With respect to this last point there are clearly differences between the organisation of Whakapapa and Turoa skifields which have influenced results of surveys taken on them, including the location of accommodation relative to the skifield, the transport arrangements up the mountain, and the involvement of concessionaires in the running of the survey.

The survey tally sheets, which are not affected by the low response rate, indicate that vehicles stopped during the survey had on average 2.72 occupants, while the goats during the survey had on average 28.75. There were 924 valid survey responses which, if they are assumed as representative, would give a total response of 178,462 over the 11 week period of the ski-season (end of July to mid-October), weighted differentially according to week-day and week-end use. These figures are of visitor arrivals, NOT visitor days.

To estimate visitor days, it is known that the survey produced an average stay on the skifield of 3.479 days, counting each brief visit and part-day visit as a full day. If it is assumed that this average applies to all 924 respondents (there were 911 replies to the question on length of stay) this indicates that survey respondents spent a total of 3,214 visitor days on the skifield. Since the average party size recorded by each respondent was 3.719, this would imply a total of 11,953 visitor days from the respondents recorded in the survey. A visitor day in this sense is a visit for a day or part of a day by one person. The same individual may account for more than one visitor day, and the inclusion of what may be fleeting visits gives an inflated impression of the time spent on visits. (Visitor hours might be a more precise measure, but cannot be estimated from the survey results). These estimates

are very approximate and subject to all the general reservations on representativeness and weighting outlined above. It is not possible to estimate total visitor days over the season as a whole, for the reasons outlined in the discussion of weighting in Section III.

The weighted results suggest that the total number of visitors (i.e. respondents plus others in their family travelling with them) arriving at the over the 11 weeks of the survey period was 327,781. Unfortunately, the questionnaire responses were not sufficiently detailed to give a breakdown of the ages and other characteristics of visitors (as distinct from those of respondents).

Of the survey respondents, 84 per cent came primarily for skiing, while a further 11.4 per cent came for informal recreation such as "playing in the snow" or "sight-seeing". Tramping or mountaineering was the primary purpose of only 1.6 per cent, the remainder being those who gave as their reply some combination of skiing and other things. Almost 99 per cent of respondents were aware that the lay within a national park, and 88 per cent gave the as the main destination of their trip away from home. Around 89 per cent of respondents came in private vehicles of some kind, 4 per cent used rental vehicles, and 6 per cent used public transport (usually the service bus) or arrived on a commercial tour.

Families with children comprised 31.5 per cent of survey responses, while friends travelling together accounted for 27.3 per cent, organised groups for 13.5 per cent and couples for 12.9 per cent. The distinction between "friends travelling together" and "organised groups", or between "friends" and "couples", may be unclear. Since the survey aimed at sampling visitors as "autonomous economic units", one questionnaire was distributed to each family group but one to each vehicle occupant in the case of friends sharing, which tends to distort the proportions. Informal groups of friends travelling together accounted for 245 survey replies and this group had an average of 4.76 travelling together. Dividing through those parties who received multiple questionnaires those not using the mountain goat) by the average party size produces the following breakdown:

	Mean Party Size	-------- Number of responses ------			Adjusted total	Per cent
		Goat used	Goat not used	Adjust.		
Individual	1.0	21	30		51	7.0
Couple	2.0	42	74		116	15.8
Family with children	3.7	66	217		283	38.7
Two couples	4.0	10	46		56	7.6
Two families	6.0	6	15		21	2.9
Organised group	3.7	75	46	12	87	11.9
Informal group	4.8	79	166	35	114	15.6
Other	2.7	3	1		4	0.5
TOTAL	3.719				732	100.0

In other words, the survey's 924 responses appear to have come from 732 separate parties, nearly 40 per cent of which were family groups with children, and 15 per cent of which were friends travelling together. This can be compared with the unadjusted breakdown of respondents by party type.

Respondents came predominantly in small groups (one car load), the average party size being 3.7. There was no appreciable difference in group size between those who used the mountain goats and those who used their own vehicles to travel up the Bruce road.

One third of respondents were in the 15-24 age groups, a further 27 per cent in the 25-34 group and 25 per cent in the 35-44 age group. Because the older age groups made up a higher proportion of respondents from week-days than on week-end days, weighting the survey led to no change in the proportion of the 25-34 age group, but an increase in the older groups and a decrease in the younger groups.

Three quarters of respondents were working full time, and a further 16 per cent were in the "other non-working" category, principally students and housewives/husbands. The modal income range was $20,000-$29,999. Around 37 per cent of respondents recorded an occupation in the administrative, managerial or professional categories, a significantly higher proportion than the 9.9 per cent in this category recorded in the 1981 census. The inference to be drawn from this is that the survey respondents are not typical of the country's population as a whole, but are rather drawn from a small sub-group.

Most of the survey respondents came from north of the skifield. Auckland was the home of 40 per cent of respondents, Hamilton of 9 per cent and the Bay of Plenty (Tauranga-Rotorua) of 8 per cent. Wellington provided 14 per cent of respondents, Hawkes Bay 5.5 per cent and Manawatu-Horowhenua just under 5 per cent. Only 3 per cent of respondents came from overseas, almost all of them from Australia. The proportion of Aucklanders amongst week-end replies (44.8 per cent) was significantly higher than the proportion of week day replies (34.5 per cent).

Approximately one fifth of respondents were on their first visit to Whakapapa skifield. The percentage of respondents recording no visits to a skifield the previous year was 50 per cent for Whakapapa, 75 per cent for Turoa and 94 per cent for other skifields. The number of respondents who had been to Tongariro National Park the previous summer was about the same as the number who had visited Turoa the previous winter. The average number of days spent at Whakapapa the previous year was five, compared with two days on average spent in the Park the previous summer and less than one day on average spent at Turoa.

Most of the respondents had set out from home on the day they were surveyed, while private batches and motels were the next most frequently cited starting

points. A friend's house or private bach was the most common accommodation whilst using the skifield, accounting for one quarter of responses to the question. Club huts of various types provided accommodation for another quarter, motels were used by 18 per cent and motor camp accommodation was used by 13 per cent. The location of accommodation used whilst at the was principally divided between Whakapapa-Iwikau (i.e. within the National Park) with 30 per cent, Turangi-Tokaanu with 23 per cent and National Park township with 22 per cent. The average time spent on the skifield was 3.8 days, while the average of nights away from home was 5.2.

The average expenditure in the Tongariro region by respondents who answered the expenditure questions was estimated as $55.80 per day for those travelling as individuals or in groups of friends; and $90.27 for those travelling in other groups, families and so on. The mean expenditure per respondent was $73.40. Results weighted up to the 11 week survey period suggest that respondents spent around $4 million in total whilst in the Tongariro region comprising location zones 1 and 3. This region coincides with the territories of Taumarunui and Taupo counties and boroughs such as Taumarunui, Taupo and Turangi.

For some of the variables collected in the survey, the data were split according to some characteristic and tested for statistical significance. Some variables are amenable to calculating means which can be compared directly (e.g. those relating to time, expenditures and size of party). For others, where the value recorded is simply a label for some category of response, calculating an average would be meaningless so instead comparison has been made between the proportions of total responses exhibiting a certain category in different sub-groups of the data. So while for the variable "DAYSAWAY" (days on skifield) it was possible to compare the means of week-end and week-day respondents, for the variable "TNPACC" (accommodation type whilst using skifield) it was only possible to compare the proportions of week-day and week-end respondents using a certain category of accommodation (e.g. "hotel").

In either case, the finding of statistical significance in the difference does not necessarily imply significance per se. Rather, it implies that the two are sufficiently different to infer that they were drawn from different samples. Thus the finding of statistical significance in the difference in means of "DAYSAWAY" with respect to week-end and week-day respondents indicates that the difference is sufficiently large (given the size of the samples) for there to be 99 per cent probability that they were drawn from a different parent population. In other words week-end and week-day respondents do differ in their length of stay on the skifield, and there is only a 1 per cent chance that the two means could have been drawn from populations with the same characteristics of time spent on the skifield. What the testing procedure does not say, and must not be interpreted as saying, is that the mean of one is significantly greater or lesser than the other, e.g. that 5 is "significantly" bigger than 3. Significance testing is useful in justifying or

confirming the choice of characteristics with which to identify sub-groups, but it does not explain why those characteristics should be important.

One characteristic which was thought to be associated with different response patterns was whether visitors used the at week-ends or during the week. The data set was split according to the variable "SURVDATE" and tests run on means and proportions between these two sub-groups on a number of variables. The differences were found to be significant at the 99 per cent probability level for a number of variables, as summarized below:

	Week-end respondents	Week-day respondents
Mean days on skifield	2.5	4.3
Mean nights away from home	3.1	6.1
Mean expenditures on:		
accommodation	$15.3	$22.2
meals	$9.3	$11.9
Percentage perceiving field as overcrowded	25.7%	18.2%
Percentage giving Whakapapa		
as "main destination"	92.0%	85.5%
as "vacation stopover"	6.4%	12.6%
Percentage coming from Auckland	44.8%	34.5%

All of these differences are significant at the 99 per cent probability level, except for expenditure on meals, which is significant at the 95 per cent level. There may be nothing startling in the findings that week-end respondents spent less time per trip, and perceived more overcrowding, than respondents on week-days, but they do indicate there were differences between week-end and week-day respondents, and these have been incorporated into the weighting procedure.

Another characteristic used to create sub-groups for testing was the type of party respondents arrived in. This was essential for examining expenditure responses, since it was not clear whether these referred to individuals' or families' expenditure. The data were divided into individuals (response categories 1 and 7, a group of friends) and groups (including families, couples and so on) and mean expenditures on different items were tested accordingly. The mean expenditure on each item by family and other groups was consistently well above that for individuals, suggesting that most had indeed answered the expenditure question from the viewpoint of a single economic agent. Subsequently individual expenditures per item were calculated as the mean expenditure divided by number in the party to which the questionnaire referred (having category 1 and 7 party sizes to 1). Comparison between these expenditures for individuals and groups again showed significant difference on all items, but in a pattern not

inconsistent with expectations. Thus families spent more per person on items such as transport, purchases and miscellaneous expenditures, whereas individuals spent more on accommodation, meals, food and gear hire. This pattern could be largely explained by the existence of children in the groups category, because:

a) they obtain child and family discounts, bringing down the group average;

b) some children are "passive" visitors, who do not use facilities like lifts and gear hire;

c) families with children would be expected to have higher expenditure on items like purchases (souvenirs) and sundries (ice creams etc.)

From the survey as a whole, the average time spent on the on their visit was four days for individuals and friends travelling together, compared with 2.9 for other groups. Apart from this and the expenditure variables, none of the other variables compared between groups and individual respondents yielded any significant difference, suggesting their characteristics are essentially the same.

Another characteristic tested for difference was location of accommodation while using the skifield. Respondents were split between those staying within the Park boundaries (Iwikau and Whakapapa villages) and those staying outside. Those who stayed inside the Park stayed on the on average almost twice as long (4.9 days) as those who stayed outside (2.8 days); spent longer away from home on their trip; and spent twice as many days at Whakapapa in 1984 (6.6 days, compared with 3.3 days). These differences were significant at the 99 per cent probability level although there was no difference in party size or expenditure variables. This result raises questions about the frequency with which individuals use the skifield and its relationship with access to accommodation on the field which may bear further examination.

Finally, the finding of a significant difference in the proportion of Aucklanders in the week-day and week-end responses led to tests for some variables according to home location - within Auckland or from elsewhere. No significant differences were found other than in some expenditure variables, for which the average was higher for Auckland respondents than for those from elsewhere. This difference may be related to personal income variations in the different regions.

These tests have indicated that it may be justifiable to divide the current users of the into distinct sub-groups, on the basis of whether they use the field on week-days or week-ends, what type of group they travel in, and where they stay while using the field. This section has concentrated on presenting results of the Whakapapa Winter 1985 survey of overall interest to the management planning process. More detailed economic analysis and valuation is included in sections V and VI.

4.2 Summer

The summer-time survey of the Whakapapa area was conducted on 19 days between 18 December 1985 and 23 February 1986. During the survey 707 initial contacts were made, questionnaires being handed out at the rate of one per autonomous economic unit, and after a follow up survey of non-respondents during April 1986, a final response rate of 72.5 per cent was achieved.

The survey was confined to those visitors approaching the Whakapapa Village area up SH 48, and an attempt to also survey coach tourists to the Chateau proved unsuccessful. For such coach tourists, however, many of the questions sought in the survey were inappropriate. In any case, the fact that such tourists generally stay for very short periods, and that they purchase a "package" of services at a number of sites on their tour, suggests they do not exercise the same discretion in respect to choice of visit, length of stay and activities undertaken as those in self-drive vehicles. In view of this, the responses of self-driven visitors are more significant for management purposes, both because management may be able to anticipate or influence future visits by self-driven visitors, and because the value they place on their visits may be determined by their behaviour in the area.

The survey responses were weighted according to the distribution of responses and vehicle arrivals on week-days and week-end days. The weighted results contain 888 responses, representing 640 separate groups arriving in the area. The difference resulted from the distribution of more than one questionnaire to some groups, notably the individuals in parties sharing vehicles. When weighted up to the full 8 week survey period, this implies a total of 9,607 responses, of which 3,110 were from individuals and 6,497 were from groups of some description. Dividing the number of responses in the "friends sharing" category by the mean party size for that category, this would imply a total number of parties arriving of 7,856, divided between 6,497 family and similar groups, and 1,359 groups of individuals travelling alone or with other individuals.

The 880 responses reported a mean party size of 2.97 people. Allowing for double counting by separate individuals in the same party, it is estimated that 2,044 people arrived in the parties covered by the survey. The mean time spent at Whakapapa was 2.29 days per party, where "day" is taken as a visit for all or part of a day to the Whakapapa Village area. This implies that the total visitor days recorded by the weighted survey responses was 4,681.

An alternative estimate of visitor arrivals is given by the variable "VISITORS", which is given by the summed responses to the question on numbers travelling in the party (adjusted according to whether the questionnaire is from a family or from an individual). The weighted estimate of visitor arrivals over the survey period is 22,276, with a mean of 2.32 visitors per response. The party type with the largest

mean of visitors (4.1) was the family with children. Somewhat unexpectedly, the categories of "Two or more families" and "Two or more couples" both had means of less than 4, possibly due to couples with one parent or relative accompanying them describing themselves as in these categories.

The principal purpose for the visit to Whakapapa recorded by most respondents was simply "sightseeing", but two-fifths specified either short walks or longer tramps. All respondents were aware they were visiting a national park. Slightly less than a third of respondents claimed Whakapapa was the main destination of their trip, and almost two thirds described it as a stopover on a vacation. These results contrast with those of the winter time survey, in which four fifths of respondents came primarily for skiing and nine-tenths described Whakapapa as the main destination. Had the winter survey point been below the Village as the summer one was, the preponderance of skiing may have been reduced slightly, but not to the extent of matching the summer pattern of response.

The predominant party types in the summer survey were couples and families with children, each accounting for about 40 per cent of parties arriving. Individuals travelling alone, sharing with friends or in an organised party accounted for 16 per cent of parties arriving. This was a smaller proportion of arrivals than in the winter survey. Couples or families sharing vehicles were also less frequent in the summer results. The mean party size in summer was smaller: 2.97 overall, and 3.11 for friends sharing compared with 3.7 and 4.8 people respectively in winter. However, part of this difference may be attributed to the parking charges, which give winter visitors an incentive to take more passengers over the final stretch of their journey past the survey point.

The most frequent age group of respondents was that of 35 to 44 years, with the 25-34 and 45-54 groups the next most frequent. However, the largest age group of all visitors in the survey (including vehicle occupants other than the respondent) was the under-15 years category, with 24 per cent. This is consistent with the large proportion of family groups, and the likely age range of respondents in such groups. Two thirds of questionnaires were completed by male members of visiting parties, but the division of all visitors between the sexes was approximately equal.

As in the winter-time survey, slightly over a third of summer respondents recorded an occupation in the professional and technical categories, well above what might be expected in a cross-section of the national population. Amongst summer visitors as a whole, 22 per cent came from these categories. However, the summer survey does differ from the winter survey in having a significantly smaller proportion of student respondents, and a higher proportion of retired respondents. This reflects a different age distribution, since whereas only 15 per cent of summer respondents were 24 years or younger, 34 per cent of winter respondents were in this age group. The inference is that a far higher proportion of young people are travelling independent of their parents to the Whakapapa field in winter than in summer.

A third of summer respondents gave an overseas location as their home. Comparison of the responses and the records of questionnaire recipient details show that there were no significant differences in sample proportions from the different home locations, so the survey results can be confidently taken as representative of those sampled. The one exception to this was Asia, which was under-represented in the responses, possibly due to language or other cultural barriers. Overall Auckland was the largest single source of respondents (with 22.5 per cent), followed by Australia (17.2 per cent), Wellington (12.7 per cent) and West Europe (8.7 per cent).

The home locations recorded in the summer survey differ from those recorded in the winter survey, which had less than 2 per cent of respondents from overseas and 42.8 per cent from Auckland alone. Comparing the sample proportions in the two samples at the 99 per cent confidence level, there were significantly smaller proportions in summer coming from Auckland, Waikato, Rotorua, Hawkes Bay and the local zones adjoining Tongariro National Park, and significantly larger proportions coming from Wanganui and overseas locations. Even if overseas respondents are excluded from the summer survey, the differences for Auckland and Hawkes Bay are still significant, and both Wanganui and Manawatu have a significantly larger proportion of responses in summer.

Almost two-thirds of summer respondents had been to Whakapapa before. This proportion was predominantly, but not exclusively, comprised of domestic visitors. Fewer than half of respondents reported having made winter visits, and of these 45 per cent stated that winter visits had included skiing. About 60 per cent of respondents recorded visiting Whakapapa in one or more of the previous five years; the mean number of days being 1.8 for summer visits, and 2.0 for winter visits.

While at Whakapapa Village, the most popular activities of summer respondents (in descending order) were visits to Park Headquarters for information gathering, studying displays, attendance at lectures or films, and undertaking long walks with staff. Almost half of respondents went to Top o' the Bruce during their visit, but 90 per cent of these visitors stayed there less than 3 hours. Reactions to most of the facilities and services in the village were mostly favourable, with very high proportions commenting favourably on the displays at Park Headquarters, the Tongariro Experience newspaper, huts and tracks. The most unfavourable comments were reserved for the cafeterias in the village. Respondents' attitudes to future developments in the village area were broadly in favour of a wider choice of eating, strongly opposed to accommodation being removed beyond the park boundary, and ambivalent towards the other possibilities.

Expenditures recorded in the weighted results suggest that respondents spent a total of $128,813 in the Taumarunui, Taupo and Turangi districts on their visits to Whakapapa over the period of the survey. This is equivalent to $117.35 per case or, divided by the mean visitors per case, $50.36 per visitor.

However, less than a third of respondents answered the questions on expenditure, so these figures may be understated. Certainly, when averaged across all visitors (regardless of whether they answered these questions or not) the mean expenditures seem unreasonably low at about $5.80 per visitor.

Statistical significance tests were run on a number of variables to see if there were any differences between subsets within the sample, as defined by certain characteristics. Overseas visitors and domestic visitors displayed a number of differences which were significant at the 99 per cent confidence level. Overseas visitors stayed at Whakapapa an average of 1.82 days compared with 2.5 days for domestic visitors, but their average time away from home was far longer (39 days compared with 8 days). The average size of overseas party was smaller than the average domestic party (2.5, compared with 3.2) and, perhaps partly because of this, overseas respondents spent on average rather less on boarding (meals and lodging) than their domestic counterparts ($58 compared with $85).

Age also appears to have been associated with several distinctive visitor characteristics. Those in the 25 years and over age groups spent longer away from home (18 nights, compared with 12) and spent more on boarding than the 24 and under age group ($80, compared with $42) but they had also spent less time at Whakapapa the previous winter and summer than the younger age group (about 2 days, compared with 4). Female respondents of all age groups appear to have spent longer away from home than male respondents (23 nights on average, compared with 15.5), and to have spent less on boarding ($63 compared with $82) which may be partly attributed to smaller average party size for females (2.8, compared with 3 for males) which was significant at the 95 per cent confidence level. Those receiving individual questionnaires (PARTYPE = 1, 6, 7) were different from families and other groups in some respects: spending more hours at Whakapapa on day visits, spending more nights away from home, and spending less on boarding. Higher income groups spent significantly more in most expenditure categories, but spent slightly fewer days at Whakapapa on average than other groups.

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V. RESULTS OF TRAVEL COST ANALYSIS

The travel cost method of evaluating recreation resources, as described in detail elsewhere (Clough and Meister, forthcoming), is a two stage process. The first stage consists of applying regression analysis to observed survey data on visitors' trips to the site in question, in order to establish a relationship between the costs associated with visits to the site and the number of trips made by visitors. The second stage consists of using this relationship to examine the effect of incremental increases in the cost of making a visit upon the number of visits made. The result of this second stage is a table or schedule of number of visits at each successive cost (or price) level. This forms the basis of an economic demand curve from which the total benefits of the site can be estimated.

The Whakapapa Skifield and Village surveys conducted in 1985 and 1986 were designed to provide the information required to conduct an economic evaluation of the Whakapapa area by means of the travel cost methodology. The results of the winter and summer surveys were kept separate for this analysis, since it was believed that the travel behaviour of users would differ substantially between the two seasons. In effect, therefore, two separate travel cost analyses have been conducted for the Whakapapa area, with results which differ from each other.

The procedure followed for these analyses can be broken down into three principal headings:

the definition and calculation of variables;

the choice of an explanatory demand function;

the estimation of user benefits from the demand curve.

5.1 Variable Definition and Calculation

The travel cost analyses on the Whakapapa study were conducted on aggregated data. This means that all the variables refer to averages or percentages within specific distance zones into which the survey observations were sorted. The zones used were designed specifically for the survey, based on local territorial authority areas. At the time the analysis was being conducted, results of the 1986 census were only just becoming available, so that whereas the visit rates of each zone were calculated on the basis of 1986 total population figures, other detailed information on zone age structure and income levels had to use 1981 census data.

The principal variable in travel cost analysis is the travel cost itself, but there are a number of ways in which this variable can be defined. A number of distinct travel cost variables were specified and tested to see which gave the most satisfactory results in the regression analysis. In some cases the best fit to the data was obtained from a variable which was not the most appropriate on theoretical

grounds, so there is some element of trade-off between obtaining statistical precision and a theoretically sound estimate of the demand equation.

It should be noted that travel costs in an economic sense comprise three principal components:

- the actual costs of travel e.g. vehicle running costs;
- the extra expenditure associated with travel, e.g. lodging;
- the opportunity cost of time taken to reach the site.

How to incorporate these different components into a regression equation is not unanimously agreed in the literature on the travel cost method, so some experimentation with different formulations was applied to the Whakapapa data.

Other variables which may be included in a multiple regression analysis of recreational use of a site include a variable representing site quality, a variable representing the existence or otherwise of substitute sites, and some measure of individual tastes and preferences, usually represented by a number of socio-economic variables such as age, income and education levels. In the Whakapapa analyses, inclusion of variables for site quality and substitutes proved impossible. There are theoretical grounds for excluding the site quality variable, which in other studies has often been equated with some measure of crowding, from estimates of aggregate benefits from recreation at specific sites. It was impossible to identify what substitutes to the Whakapapa area existed for summer users, and to establish what complementarity or competitiveness existed between Whakapapa and Turoa skifields in winter, so a substitute variable was omitted.

A further theoretical concern in travel cost analysis is the treatment of trips which include visits to more than one site, for which it would be inappropriate to attribute all travel costs to any individual site. Various procedures have been suggested in the literature for overcoming this problem. In both the winter and summer time questionnaires, respondents were asked if they made other stops on their visit to Whakapapa, but it was apparent in both surveys that many of these responses were inconsistent with other answers given by respondents. Consequently it was considered unwise to rely on these answers in the travel cost analysis. A more refined technique (Haspel and Johnson 1984) which has been used to adjust travel cost estimates, requires data on the total trip itinerary of visitors on a multi-stop visit, which was not available for the Whakapapa data. During the regression analysis of the Whakapapa data tests were made of cost variables adjusted by a trip index, (after Pearce and Elliot, 1981) which was defined as

(Days at Whakapapa/Total Nights Away from Home)

However, this adjustment worsened the predictive ability of the equations obtained, so these adjusted variables were not selected for second stage of the analysis.

Variables used in the analysis are as follows:

EXPEND: total daily expenditures made on the visit to Whakapapa, excluding only those on food (which would be made regardless of whether the individuals were away from home or not) and car and vehicle expenses (which are covered elsewhere).

TOTEXP: the product of EXPEND times days at Whakapapa.

TCOST: the basic return travel cost from home to Whakapapa. Where the principal mode of transport was other than by car, this was taken as the return fare or tour cost. In the majority of cases the journey was by car, travel costs for which were determined by return distance from home to Whakapapa; the size of vehicle motor; the fuel used by the vehicle. For each combination of three motor sizes and three fuel types, average vehicle running costs were obtained from Ministry of Transport publications. For those questionnaires identified as coming from an individual sharing with others, TCOST was adjusted the number of visitors sharing the vehicle, so as not to overstate the expenses incurred by these respondents. TCOST is therefore a figure per respondent, regardless of whether the respondent represents a family group or an individual.

JCOST: the sum of TCOST and TOTEXP, the total additional costs incurred in the journey to (and time at) Whakapapa.

PCOST: TCOST divided by VISITORS in the group. Questionnaires were distinguished between those for groups, from which the number of VISITORS was counted; and those for individuals, in which case VISITORS equalled 1 (the respondent). The rationale for this is that a family consititutes a single autonomous economic unit, whereas four people sharing a car represent four autonomous economic units.

ICOST: JCOST divided by VISITORS, on the same basis as in PCOST.

DTCOST: TCOST divided by the number of days spent at Whakapapa. By the same process daily cost figures were obtained for JCOST, ICOST, PCOST, to test whether length of stay affects the relationship between costs and number of visits.

SJCOST: JCOST adjusted by the TRIP INDEX. SICOST was obtained from ICOST by the same process.

AGEPC: the percentage of zone population over the age of 60 years, obtained from 1981 census data (the latest available).

INCPC: the percentage of zone population earning more than $18,000 per year, from the 1981 census.

OLDAGE: the percentage of survey respondents who recorded their age as being 60 years or over.

HIGHINC: the percentage of survey respondents who recorded their income as being category 4 or above ($30,000 and over, 1985 dollar terms).

TIME3: a variable measuring the opportunity cost of travel time of respondents. This was calculated as one third of the value of return travel time from home to Whakapapa times their hourly wage rate. The wage rate was calculated from the midpoint of each income category on the questionnaire. The adjustment by a third was on the theoretical basis that the opportunity cost of leisure time is less than an individual's wage rate (Cesario 1976). Other variables TIME2 and TIME4 were calculated as one half and one quarter respectively of the time by wage rate variable. The zone average was denoted by AVET3, AVET2, AVET4.

TIME: an alternative measure of opportunity cost of travel time, based on a flat rate hourly wage of $8.46, being the prevailing national average rate in August 1985 (NZ Year-book). This variable was tested since the TIME3 variable appeared to reflect an income effect rather than a cost effect in the regression equations.

TIMETC: the sum of TCOST and TIME, i.e. a single travel cost variable encapsulating both actual costs and opportunity costs.

TIMEJC: the sum of JCOST and TIME.

TIMEPC: TIMETC divided by VISITORS.

TIMEIC: TIMEJC divided by VISITORS.

VRATE: the visitation rate from each zone expressed as visits per thousand of zone population. The zone population figures were available from the 1986 census data. The total number of visits was taken from survey results weighted up to the full period over which observations were available. In the case of the winter survey, the visit rate is based on visits over an 11 week survey period, whilst for the summer survey it is based on an 8 week period.

With the exception of the variables based on information external to the survey (VRATE, AGEPC, INCPC), all of these variables were first calculated on an individual case by case basis. Subsequently they were divided according to their recorded home locations, and zonal averages were obtained (e.g. AVETC, AVEPC, AVEJC, AVEIC etc.). Consequently the zonal figures for travel costs are a composite of running costs of cars of various engine size and fuel usage, and of other transport modes, although very few respondents used other modes or gave sufficient details for their costs to be calculated.

Theoretically the cost variable most appropriate for use in travel cost analysis would be one incorporating actual travel costs, associated costs and time costs i.e. TIMEJC or its derivatives. However, a number of studies have omitted time or non-travel costs in order to establish the necessary statistical relationship, so all of these variables were applied to equations of similar form to see which gave the best empirical results.

In addition to the variables listed above, others were created from these to facilitate the testing of specific regression equations, e.g. square root of costs, costs squared, log of costs and so on. The range of socio-economic variables that could possibly be tested is large, including zonal ethnic composition, car ownership levels, education levels, occupational groupings and so on. However, for the Whakapapa analysis testing was confined to a smaller range of variables in a variety of different functional forms.

5.2 The Choice of an Explanatory Function

The aggregated data for both the winter and summer surveys were subjected to multiple linear regression analysis on a mainframe computer using the Statistical Package for the Social Sciences (SPSSX) program. The aim of regression analysis in the travel cost method is to find an equation which gives the best fit of predicted visits against the actual observations from the survey data. Once this equation is found, the relationship it describes can be used for predicting the response of visits to variations in the cost of a visit.

There is no clear guide in the extensive literature on travel cost analysis as to what sort of function is most appropriate to describe the travel cost relationship, and in practice most applications of the method try to fit a number of different functions to their survey data. This approach was followed with the Whakapapa study, with variations in both functional form and the variables included being tested for their ability to reproduce the apparent relationship observed in the data.

An ordinary least squares regression procedure was applied to the aggregated survey data, producing equations of the form:

$$\text{Visits} = A + B\,(\text{TRAVEL COST}) + B2X + \ldots BnK + Ei$$

Where X…K are explanatory variables other than travel costs, A is a constant and E is an error term. In the case of the Whakapapa study the dependent variables were either the predicted visit rate (VRATE) or its natural log transformation (NLOG), or its square root transformation (VROOT). The independent variables included a variety of different travel cost variables, (e.g. TCOST, PCOST, JCOST, ICOST etc.),

a time variable, and age and income variables to account for socio-economic variations amongst the survey respondents and the areas from which they were drawn. Transformations were also performed on one or more of the independent variables in the equations, in particular the natural logarithm of travel cost; the square of travel cost; the square root of travel cost; the reciprocal of travel cost and so on.

Selection of the most suitable equations for the third stage of the travel cost procedure was based on a number of criteria. Initially equations were selected on the basis of their coefficient of determination (R squared), since this indicates the proportion of variability in the dependent variable which is explained by the independent variables in the equation. However, direct comparison of the R squared of functions in which the dependent variable has been transformed can not be made with those of untransformed functions, since the denominator in the formula for R squared (the total sum of squares) is different in each case. To overcome this, the predicted values of the dependent variable in the transformed equations were transformed back to a predicted visit rate figure, and then plotted against the observed visit rate. The resulting correlation and R squared statistics from these plots are directly comparable with those from untransformed equations, so they were used to rank the various equations for their predictive ability.

Other criteria used in the selection included the significance of the F statistic, which, if its probability is small, indicates the R squared of the population from which the sample is drawn is unlikely to be zero (i.e. a measure of statistical significance of the sample data); the standard error of the estimate, which provides an absolute measure of the variability of the predicted values about their mean; and the significance of the coefficients in the equations. The correlation between the independent variables within each equation was checked, in order to eliminate multicollinearity. A number of checks were also performed on the distribution of the error terms. These included a plot of error terms on a histogram, to test the assumption that the error terms are normally distributed about their mean; a check for outliers on the error plot; and a scatterplot inspection of the errors to see if any pattern existed in the error variance.

The treatment of the opportunity cost of time in the travel cost method is open to some question, so a number of time variables were introduced into the equations tested. A simple distance variable proved to be too highly correlated with the travel cost variable, so an average time cost figure, based on respondents' incomes, was introduced instead (AVET4, AVET3, AVET2). Whether time was valued at one quarter, one third or one half of the average hourly wage rate made little difference to the predictive ability of the equations in which time cost was included, some of which achieved an R squared of more than 0.8. However, the sign on the coefficient of the time variable was positive, which is not consistent with a variable intended to represent a cost. The AVET variables appeared to reflect the influence of an income effect, since the sign changed to negative when

a new TIME variable, based on a flat rate hourly wage rate across all income groups, was substituted for it. Unfortunately this change also reintroduced multicollinearity between the TIME and travel cost variables, so the only way to account for time cost appeared to be by incorporating TIME into a new range of travel cost variables: TIMETC, TIMEPC, TIMEJC, TIMEIC.

The travel cost variables which appeared most successful in predicting visit rates were those which measured total costs for the whole visit. Daily costs had only a very low predictive ability for both the winter and summer data. Similarly, the cost variables adjusted by the trip index, intended to allow for multiple destination visits, had R squared values of less than 0.01. This is not surprising, since the process of adjusting travel costs by the number of days at Whakapapa would introduce more variability into the data and make any relationship weaker. However, this does mean that the estimation of user benefits that follows contains the assumption that the entire travel cost is attributable to Whakapapa which, on theoretical grounds, is less than ideal.

Of the other variables tested, AGEPC (percentage of zone population over 60 years old) was significant in a number of equations for the winter time survey. The age and income variables based on the proportion of survey respondents were not significant. In the summer time survey, none of the socio-economic variables tested proved to be significant, with the result that simple variate equations were selected. A procedure was used in the regression analysis, which entered variables into the equation only when the F-test of the resulting quation aceived a minimum value of 3.84.

In the untransformed equations on the winter time data, AGEPC was the only significant variable, but a number of semi-logarithmic transformations on the dependent variable, with travel cost and AGEPC as independent variables, achieved an R squared value of 0.7 or over. Subsequent scrutiny of these equations eliminated some on the grounds that the R squared of their predicted visits against observed visits fell below 0.5, or because they appeared to violate some of the other assumptions essential to regression analysis. The best equations obtained are outlined in the accompanying table.

With the summer time data, considerable difficulty was encountered in achieving any predicitive ability in the equations, although the procedures followed were the same as those used on the winter data. Some of the variability in the observed visit patterns could be attributed to the high proportion of overseas visitors in the summer survey respondents (about 30 per cent), so it was decided to exclude all overseas visitors from the travel cost analysis. South Island visitors also provided anomalous results, so these too were eliminated. Finally, amalgamation of some of the distance zones with similar distances (e.g. Hamilton City with Waikato, Rotorua with Tokoroa) resulted in equations which achieved an R squared value of 0.5 or over, which formed the basis for further selection.

The decision to exclude overseas visitors is not without precedent, since a number of other studies have found their inclusion practically impossible, due to the multiplicity of fare structures in travel costs from overseas, the difficulty of incorporating reliable socio-economic variables from other countries, and the problem of allocating overseas visitors' costs amongst the numerous sights visited while in New Zealand (Kerr *et al*. 1986). A high proportion of overseas visitors in the summer survey to Whakapapa recorded their reason for visiting the Whakapapa area as "just passing by", and the absence of pre-meditation behind their visits provides a theoretical justification for not including their costs as part of the imputed value of the area. Moreover, since the travel cost method attempts to estimate the value of a site to the nation, by measuring the costs incurred by nationals on their visits to the site, there is no reason why non-nationals should be included. This does not justify the exclusion of South Islanders, which remains an unresolved problem in this study. Nevertheless, many of these too would be expected to be on a multi-purpose visit, so the extent to which such distant visitors' costs can be attributed to the Whakapapa area, or Tongariro National Park in general, is open to question.

The accompanying table shows 6 equations for the summer analysis and 5 for the winter analysis which have the best predictive ability, based on the adjusted R squared of VRATE on PREDICTED V. For the winter data, semi-logarithmic forms appeared to be most appropriate, whereas for the summer survey a variety of untransformed, semi-log and double-log forms is represented. The fact that they differ suggests that the separate treatment of summer and winter visitors was justified, and that the user differences exhibited in the survey results between the two seasons are reflected in the relationships between travel costs and visits.

In empirical studies of travel costs and visitation, an R squared value of 0.5 or over is quite acceptable (Walsh 1986). Some other studies have achieved apparently better predictive ability, but often these have been studies of sites with a smaller, more tightly defined catchment area of users. In some cases the coefficient of determination presented has been based on a trans-formed dependent variable before it has been converted to a visit rate prediction which, as is shown in the table, results in a higher coefficient of determination in some cases.

Theoretically the preferred variable to use for travel costs would include transport costs + other expenses + timecosts. Since the visitation rate used in fitting these equations was based on number of visitors (i.e. a count of all visitors in each party), the most appropriate variable to use which covers all these aspects of cost is TIMEIC, which, for both summer and winter analyses, achieves a reasonable result in a semi-log transformation on the dependent However, since the component of time cost is open to some doubt, an alternative valuation based on ICOST is also presented. In the case of the summer AVEICOST variable, both a semi-log and a double-log equation seemed feasible. However, the double- log

transformation was discarded in the estimation of user benefits, since the demand curve it predicted was asymptotic and inconsistent with the estimates from the other equations.

Table 1: Equations Chosen for Travel Cost Analysis

WINTER				R Square	VRATE on PREDV R Sq	S.E.E.	F Stat
NLOG=	7.5967	-0.0108 AVE PCOST	-0.1354 AGEPERCENT	0.7847	0.4352	0.6356	35.629
NLOG=	5.9301	-0.01195 AVE PCOST		0.7368	0.2683	0.7028	54.1866
NLOG=	8.2126	-0.074 AVE ICOST	-0.1452 AGEPERCENT	0.5918	0.7486	0.6869	29.2811
NLOG=	7.668	-0.0091 TIMEPC	-0.1366 AGEPERCENT	0.4345	0.7693	0.6579	32.6825
NLOG=	8.192	-0.00657 TIMEIC	-0.1449 AGEPERCENT	0.7419	0.5812	0.6959	28.3012
SUMMER							
VRATE=	18.86	-0.784 AVE JCOST		0.5221	0.5221	4.21	12.016
NLOG=	6.39	-0.998 lnAVEICOST		0.5467	0.5516	0.4594	15.476
NLOG=	6.502	-0.9786 lnTIMEIC		0.5348	0.5402	0.4594	14.796
VROOT=	9.1166	-1.3557 lnTIMEIC		0.5292	0.5418	0.6516	14.487
NLOG=	2.8998	-0.00803 TIMEIC		0.5088	0.5489	0.4783	13.43
NLOG=	2.9142	-0.010017 AVEIC		0.5167	0.5595	0.4744	13.831

5.3 The Estimation of User Benefits

The final stage of the travel cost method of recreation evaluation consists of using the selected equations to estimate the number of visits a site would receive at successive increments of additional cost. This stage is similar to estimating the effect of imposing an entry fee on to the site, although this is not to imply that such fees should necessarily be applied in practice. The calculations can be readily adapted to micro-computer spreadsheet programs, as is illustrated in the accompanying tables. These tables present two separate estimates for each season, the first based on a travel cost variable including time cost (TIMEIC), and the second based on a travel cost variable excluding time cost (AVEIC).

The top row of each table shows the successive increase which is added to the current cost of travel to the site from each distance zone. Each cell in the top block of the table therefore represents the cost of reaching Whakapapa from a particular zone at a given level of cost increase. The cells in the bottom block of the table calculate the predictive equation on the contents of the corresponding cells in the top block, the results of which are first converted from natural logs into a visit rate, and then multiplied by the zone population to give an estimate of the number of visitors from each zone at each level of cost. These estimates are then summed across all zones to give the total number of visits expected at each level of cost.

This information on visits at successive cost (or price) levels is the basis of an economic demand schedule, which can be graphically depicted as a demand curve. The total benefits to consumers, or the consumer surplus, can be found by calculating the area beneath the demand curve between the x axis (visits at zero extra cost) and the point where the curve crosses the y (i.e. the cost at which visits are driven to zero). This is done in each table for each successive cost level in the row entitled "Consumer Surplus Calculation". These figures are then summed to give the total consumer surplus, and finally this is converted to a mean consumer surplus per person by dividing by the current number of visitors predicted by each equation.

The estimated consumer surplus per head from the Whakapapa survey data is:

$147 from summer TIMEIC (time, transport and related costs);
$131 from summer AVEIC (transport and related costs only);
$174 from winter TIMEIC (time, transport and related costs);
$158 from winter AVEIC (transport and related costs only).

These estimates are based on a count of all New Zealand visitors arriving at the Whakapapa area during the period of the survey, regardless of their age. They could be used to estimate the total benefits flowing from the Whakapapa area by multiplying them by the total number of visitors (not visiting groups) in each season. A visitor for this purpose is a visitor arrival, since the same individual

arriving on two separate occasions would count as two separate visitors. However, as explained in the discussion of the weighting process in Section III of this report, the true total of visitor days can not be estimated from the survey data, so the figure for visitor arrivals should be regarded as a conservative approximation for visitor days.

These estimates appear high compared with those from some other recent studies employing the travel cost method in New Zealand. After adjusting up to December 1985 dollar values (by means of the All Groups Consumer Price Index), the results of these studies suggest a consumer surplus per person of $19.93 for Lake Tutira (Harris and Meister 1981); $37.11 for the Kaimanawa State Forest Park (Sandrey and Simmons 1984); and $52.99 for Mount Cook National Park (Kerr *et al*. 1986). Part of the explanation may lie in the different characteristics of the recreation sites in question: Whakapapa skifield, as one of only three commercial skifields in the North Island, is a more national recreation resource than Lake Tutira or the Kaimanawas, whose significance is more regional. However, such distinction does not apply to Mount Cook National Park, which suggests the difference in magnitude of the two estimates may be related to the application of the methodology.

The preferred estimate from the Mount Cook study was one based on a travel cost figure adjusted for multiple destination trips, an adjustment which was not feasible for the Whakapapa data. The Mount Cook study also produced estimates from unadjusted travel cost figures, of $160, $168, $175 and $182 in December 1985 dollar terms. So it is unlikely for the Whakapapa estimates to achieve a similar order of magnitude to the preferred Mount Cook estimate without making some allowance for dividing travel costs amongst different sites in multiple-destination trips.

Although it proved impossible to account for multiple-stop visits at the stage of fitting the demand equation, it is possible to adjust the consumer surplus. The unadjusted estimates effectively represent not the benefits received from the Whakapapa area itself, but rather the benefits received from the trips which included the visit to Whakapapa. Allocating all of these benefits to a single site would overestimate the value attached to that site. However, a crude adjustment to the consumer surplus can be made by applying to the estimates the trip index (days at Whakapapa/total nights away from home).

The result of such an adjustment is shown in the adjusted totals in the tables. The adjustment factor in each case was the mean trip index across all respondents in each of the surveys. The summer survey included a far higher proportion of multiple trips than the winter survey, which is reflected in a smaller adjustment factor in summer than in winter. The effect of this adjustment was to reduce the summer estimates by more than the winter estimates, as follows:

$66 per head, from summer TIMEIC;
$59 per head, from summer AVEIC;
$124 per head, from winter TIMEIC;
$113 per head, from winter AVEIC.

While it would be unwise to draw too close a comparison between these results and those obtained through different procedures, it is noteworthy that the adjusted summer estimates are of similar order of magnitude to those obtained for Mount Cook National Park. This is to be expected, since there are similarities between the summer time use of the two resources. It is also significant that the adjusted surplus estimates for the winter users are substantially higher than those for summer users, reflecting a different use profile and value attached to the Whakapapa area as a winter time resource.

The treatment of multiple-destination trips requires more vigorous empirical testing and a closer attention to this issue in the design of the questionnaire than was given in the Whakapapa study. Similar uncertainty surrounds the treatment of time in the travel cost variable. However, the adjusted consumer surplus figures are of a plausible order of magnitude. The estimate preferred in terms of recreation economic theory in each case is the one based on travel cost including time, TIMEIC.

* * * * *

Table 2: Calculations of Value from Travel Costs
(a) Summer – Time Cost

SUMMER TCM lnV = a + b1.TIMEIC +b2.AGEPC											
STIMEIC ln V =		2.899825	-0.008031								
AGEPC		$0.00	$200.00	$400.00	$600.00	$800.00	$1000.00	$1200.00	$1250.00	$1260.00	$1270.00
TAUMARUNUI	9.70	43.58	$243.58	$443.58	$643.58	$843.58	$1043.58	$1243.58	$1293.58	$1303.58	$1313.58
TAUPO	9.70	49.25	$249.25	$449.25	$649.25	$849.25	$1049.25	$1249.25	$1299.25	$1309.25	$1319.25
WANGANUI	14.90	87.69	$287.69	$487.69	$687.69	$887.69	$1087.69	$1287.69	$1337.69	$1347.69	$1357.69
ROTORUA C	12.90	103.81	$303.81	$503.81	$703.81	$903.81	$1103.81	$1303.81	$1353.81	$1363.81	$1373.81
MANAWATU	13.70	114.15	$314.15	$514.15	$714.15	$914.15	$1114.15	$1314.15	$1364.15	$1374.15	$1384.15
HAMILTON	10.80	130.46	$330.46	$530.46	$730.46	$930.46	$1130.46	$1330.46	$1380.46	$1390.46	$1400.46
TARANAKI	14.30	195.64	$395.64	$595.64	$795.64	$995.64	$1195.64	$1395.64	$1445.64	$1455.64	$1465.64
NAPIER	13.90	139.35	$339.35	$539.35	$739.35	$939.35	$1139.35	$1339.35	$1389.35	$1399.35	$1409.35
TAURANGA	12.90	135.41	$335.41	$535.41	$735.41	$935.41	$1135.41	$1335.41	$1385.41	$1395.41	$1405.41
MASTERTON	15.20	172.71	$372.71	$572.71	$772.71	$972.71	$1172.71	$1372.71	$1422.71	$1432.71	$1442.71
WELLINGTON	12.00	179.17	$379.17	$579.17	$779.17	$979.17	$1179.17	$1379.17	$1429.17	$1439.17	$1449.17
AUCKLAND	13.80	178.73	$378.73	$578.73	$778.73	$978.73	$1178.73	$1378.73	$1428.73	$1438.73	$1448.73
WHANGEREI	13.20	205.74	$405.74	$605.74	$805.74	$1005.74	$1205.74	$1405.74	$1455.74	$1465.74	$1475.74
PREDICTED VISITS	EXP(MLOG)										
TAUMARUNUI	29.824	382	77	10	3	1	0	0	0	0	0
TAUPO	24.440	299	60	8	2	0	0	0	0	0	0
WANGANUI	59.689	536	108	13	4	1	0	0	0	0	0
ROTORUA	111.304	879	176	21	7	1	0	0	0	0	0
MANAWATU	169.092	1228	246	30	10	2	0	0	0	0	0
HAMILTON	188.639	1202	241	28	10	2	0	0	0	0	0
TARANAKI	103.879	392	79	9	3	1	0	0	0	0	0
NAPIER	193.372	1147	230	27	9	2	0	0	0	0	0
TAURANGA	113.534	695	140	16	6	1	0	0	0	0	0
MASTERTON	87.914	399	80	9	3	1	0	0	0	0	0
WELLINGTON	328.163	1414	284	32	11	2	0	0	0	0	0
AUCKLAND	860.349	3721	747	84	30	6	1	0	0	0	0
WHANGEREI	153.846	536	107	12	4	1	0	0	0	0	0
TOTAL		12832	2575	299	104	21	4	1	1	1	0
CONSUMER SURPLUS CALCULATION			1540659	287369	40265	12446	2497	501	119	104	96
	TOTAL C.S.	1884055									
	C.S./CAPUT	$146.83									
TRIP INDEX ADJUSTMENT (0.4474)			689291	128569	18014	5568	1117	224	53	46	43
ADJUSTED	TOTAL C.S.	842926									
	C.S./CAPUT	$65.69									

Table 2 – (b): Summer - Cost

SUMMER TCM lnV = a + b1.AVEIC +b2.AGEPC											
SAVEIC2 ln V =		2.91424	-0.010017								
	AGEPC	$0.00	$200.00	$400.00	$600.00	$800.00	$1000.00	$1010.00	$1020.00	$1030.00	$1040.00
TAUMARUNUI	9.70	37.47	$237.47	$437.47	$637.47	$837.47	$1037.47	$1047.47	$1057.47	$1067.47	$1077.47
TAUPO	9.70	38.74	$238.74	$438.74	$638.74	$838.74	$1038.74	$1048.74	$1058.74	$1068.74	$1078.74
WANGANUI	14.90	72.99	$272.99	$472.99	$672.99	$872.99	$1072.99	$1082.99	$1092.99	$1102.99	$1112.99
ROTORUA C	12.90	84.50	$284.50	$484.50	$684.50	$884.50	$1084.50	$1094.50	$1104.50	$1114.50	$1124.50
MANAWATU	13.70	91.52	$291.52	$491.52	$691.52	$891.52	$1091.52	$1101.52	$1111.52	$1121.52	$1131.52
HAMILTON	10.80	107.08	$307.08	$507.08	$707.08	$907.08	$1107.08	$1117.08	$1127.08	$1137.08	$1147.08
TARANAKI	14.30	170.22	$370.22	$570.22	$770.22	$970.22	$1170.22	$1180.22	$1190.22	$1200.22	$1210.22
NAPIER	13.90	113.50	$313.50	$513.50	$713.50	$913.50	$1113.50	$1123.50	$1133.50	$1143.50	$1153.50
TAURANGA	12.90	106.99	$306.99	$506.99	$706.99	$906.99	$1106.99	$1116.99	$1126.99	$1136.99	$1146.99
MASTERTON	15.20	138.39	$338.39	$538.39	$738.39	$938.39	$1138.39	$1148.39	$1158.39	$1168.39	$1178.39
WELLINGTON	12.00	143.56	$343.56	$543.56	$743.56	$943.56	$1143.56	$1153.56	$1163.56	$1173.56	$1183.56
AUCKLAND	13.80	141.73	$341.73	$541.73	$741.73	$941.73	$1141.73	$1151.73	$1161.73	$1171.73	$1181.73
WHANGEREI	13.20	218.73	$418.73	$618.73	$818.73	$1018.73	$1218.73	$1228.73	$1238.73	$1248.73	$1258.73
PREDICTED VISITS	EXP(MLOG)										
TAUMARUNUI	29.824	378	51	7	1	0	0	0	0	0	0
TAUPO	24.440	306	41	6	1	0	0	0	0	0	0
WANGANUI	59.689	530	71	10	1	0	0	0	0	0	0
ROTORUA	111.304	880	119	16	2	0	0	0	0	0	0
MANAWATU	169.092	1246	168	23	3	0	0	0	0	0	0
HAMILTON	188.639	1190	160	22	3	0	0	0	0	0	0
TARANAKI	103.879	348	47	6	1	0	0	0	0	0	0
NAPIER	193.372	1144	154	21	3	0	0	0	0	0	0
TAURANGA	113.534	717	97	13	2	0	0	0	0	0	0
MASTERTON	87.914	405	55	7	1	0	0	0	0	0	0
WELLINGTON	328.163	1436	194	26	4	0	0	0	0	0	0
AUCKLAND	860.349	3835	517	70	9	1	0	0	0	0	0
WHANGEREI	153.846	317	43	6	1	0	0	0	0	0	0
TOTAL		12731	1717	232	31	4	1	1	0	0	0
CONSUMER SURPLUS CALCULATION			1444774	194865	26283	3545	478	5			
TOTAL C.S.	1669951										
C.S./CAPUT	$131.18										
TRIP INDEX ADJUSTMENT (0.4474)			646392	87183	11759	1586	214	2	0	0	0
ADJUSTED TOTAL C.S.	747136										
C.S./CAPUT	$58.69										

Table 2 – (c) : Winter Time Cost

WINTER TCM lnV = a + b1.TIMEIC +b2.AGEPC											
WTICAGE ln V = 8.191876 -0.006569 -0.144886											
	AGEPC	b.AGEPC	$0.00	$200.00	$400.00	$600.00	$800.00	$1000.00	$1500.00	$1900.00	$1980.00	$1990.00
TAUMARUNUI	9.70	1.4053942	146.85	$346.85	$546.85	$746.85	$946.85	$1146.85	$1646.85	$2046.85	$2126.85	$2136.85
TAUPO	9.70	1.4053942	130.45	$330.45	$530.45	$730.45	$930.45	$1130.45	$1630.45	$2030.45	$2110.45	$2120.45
WANGANUI	14.90	2.1588014	185.52	$385.52	$585.52	$785.52	$985.52	$1185.52	$1685.52	$2085.52	$2165.52	$2175.52
ROTORUA C	12.90	1.8690294	186.57	$386.57	$586.57	$786.57	$986.57	$1186.57	$1686.57	$2086.57	$2166.57	$2176.57
TOKEROA	12.90	1.8690294	134.27	$334.27	$534.27	$734.27	$934.27	$1134.27	$1634.27	$2034.27	$2114.27	$2124.27
MANAWATU	13.70	1.9849382	203.07	$403.07	$603.07	$803.07	$1003.07	$1203.07	$1703.07	$2103.07	$2183.07	$2193.07
HAMILTON	10.80	1.5647688	192.42	$392.42	$592.42	$792.42	$992.42	$1192.42	$1692.42	$2092.42	$2172.42	$2182.42
WAIKATO	10.80	1.5647688	247.63	$447.63	$647.63	$847.63	$1047.63	$1247.63	$1747.63	$2147.63	$2227.63	$2237.63
TARANAKI	14.30	2.0718698	272.63	$472.63	$672.63	$872.63	$1072.63	$1272.63	$1772.63	$2172.63	$2252.63	$2262.63
HOROMHENUA	21.40	3.1005604	276.81	$476.81	$676.81	$876.81	$1076.81	$1276.81	$1776.81	$2176.81	$2256.81	$2266.81
NAPIER	13.90	2.0139154	243.92	$443.92	$643.92	$843.92	$1043.92	$1243.92	$1743.92	$2143.92	$2223.92	$2233.92
TAURANGA	12.90	1.8690294	273.28	$473.28	$673.28	$873.28	$1073.28	$1273.28	$1773.28	$2173.28	$2253.28	$2263.28
MASTERTON	15.20	2.2022672	171.45	$371.45	$571.45	$771.45	$971.45	$1171.45	$1671.45	$2071.45	$2151.45	$2161.45
WELLINGTON	12.00	1.738632	310.84	$510.84	$710.84	$910.84	$1110.84	$1310.84	$1810.84	$2210.84	$2290.84	$2300.84
AUCKLAND	13.80	1.9994268	305.85	$505.85	$705.85	$905.85	$1105.85	$1305.85	$1805.85	$2205.85	$2285.85	$2295.85
GISBORNE	12.90	1.8690294	462.78	$662.78	$862.78	$1062.78	$1262.78	$1462.78	$1962.78	$2362.78	$2442.78	$2452.78
WHANGEREI	13.20	1.9124952	454.49	$654.49	$854.49	$1054.49	$1254.49	$1454.49	$1954.49	$2354.49	$2434.49	$2444.49
PAIHIA	13.20	1.9124952	452.33	$652.33	$852.33	$1052.33	$1252.33	$1452.33	$1952.33	$2352.33	$2432.33	$2442.33
S ISLAND	15.50	2.245733	649.61	$849.61	$1049.61	$1249.61	$1449.61	$1649.61	$2149.61	$2549.61	$2629.61	$2639.61
PREDICTED VISITS		EXP(MLOG)										
TAUMARUNUI	29.824		10068	2706	727	196	53	14	1	0	0	0
TAUPO	24.440		9189	2470	664	178	48	13	0	0	0	0
WANGANUI	59.689		7358	1978	532	143	38	10	0	0	0	0
ROTORUA	62.930		10294	2767	744	200	54	14	1	0	0	0
TOKOROA	48.374		11157	2999	806	217	58	16	1	0	0	0
MANAWATU	115.500		15097	4058	1091	293	79	21	1	0	0	0
HAMILTON	119.276		25452	6841	1839	494	133	36	1	0	0	0
WAIKATO	69.363		10299	2768	744	200	54	14	1	0	0	0
TARANAKI	103.879		7882	2119	569	153	41	11	0	0	0	0
HOROMHENUA	53.592		1414	380	102	27	7	2	0	0	0	0
NAPIER	123.119		11954	3213	864	232	62	17	1	0	0	0
TAURANGA	113.534		10507	2824	759	204	55	15	1	0	0	0
MASTERTON	87.914		11381	3059	822	221	59	16	1	0	0	0
WELLINGTON	328.163		27034	7267	1953	525	141	38	1	0	0	0
AUCKLAND	860.349		56424	15167	4077	1096	295	79	3	0	0	0
GISBORNE	70.253		1872	503	135	36	10	3	0	0	0	0
WHANGEREI	95.898		2584	695	187	50	13	4	0	0	0	0
PAIHIA	57.948		1584	426	114	31	8	2	0	0	0	0
S ISLAND	369.483		1980	532	143	38	10	3	0	0	0	0
TOTAL			233530	62772	16873	4535	1219	328	12	1	1	0
CONSUMER SURPLUS CALCULATION				29630169	7964491	2140829	575448	154678	84991	2632	56	5
		TOTAL C.S.	40553300									
		C.S./CAPUT	$173.65									
TRIP INDEX ADJUSTMENT (0.7137)				21147051	5684257	1527910	410697	110394	60658	1879	40	4
ADJUSTED		TOTAL C.S.	28942890									
		C.S./CAPUT	$123.94									

Table 2 – (d): Winter Cost

WINTER TCM lnV =	a +	b1.AVEIC	+b2.AGEPC								
WICAGE ln V =	8.212612	-0.007445	-0.145223								
AGEPC	b.AGEPC	$0.00	$200.00	$400.00	$600.00	$800.00	$1000.00	$1250.00	$1500.00	$1750.00	$1760.00
TAUMARUNUI 9.70	1.4086631	140.73	$340.73	$540.73	$740.73	$940.73	$1140.73	$1390.73	$1640.73	$1890.73	$1900.73
TAUPO 9.70	1.4086631	119.94	$319.94	$519.94	$719.94	$919.94	$1119.94	$1369.94	$1619.94	$1869.94	$1879.94
WANGANUI 14.90	2.1638227	170.83	$370.83	$570.83	$770.83	$970.83	$1170.83	$1420.83	$1670.83	$1920.83	$1930.83
ROTORUA C 12.90	1.8733767	167.26	$367.26	$567.26	$767.26	$967.26	$1167.26	$1417.26	$1667.26	$1917.26	$1927.26
TOKEROA 12.90	1.8733767	117.22	$317.22	$517.22	$717.22	$917.22	$1117.22	$1367.22	$1617.22	$1867.22	$1877.22
MANAWATU 13.70	1.9895551	180.44	$380.44	$580.44	$780.44	$980.44	$1180.44	$1430.44	$1680.44	$1930.44	$1940.44
HAMILTON 10.80	1.5684084	169.04	$369.04	$569.04	$769.04	$969.04	$1169.04	$1419.04	$1669.04	$1919.04	$1929.04
WAIKATO 10.80	1.5684084	222.96	$422.96	$622.96	$822.96	$1022.96	$1222.96	$1472.96	$1722.96	$1972.96	$1982.96
TARANAKI 14.30	2.0766889	246.70	$446.70	$646.70	$846.70	$1046.70	$1246.70	$1496.70	$1746.70	$1996.70	$2006.70
HOROWHENUA 21.40	3.1077722	250.54	$450.54	$650.54	$850.54	$1050.54	$1250.54	$1500.54	$1750.54	$2000.54	$2010.54
NAPIER 13.90	2.0185997	218.07	$418.07	$618.07	$818.07	$1018.07	$1218.07	$1468.07	$1718.07	$1968.07	$1978.07
TAURANGA 12.90	1.8733767	244.86	$444.86	$644.86	$844.86	$1044.86	$1244.86	$1494.86	$1744.86	$1994.86	$2004.86
MASTERTON 15.20	2.2073896	137.13	$337.13	$537.13	$737.13	$937.13	$1137.13	$1387.13	$1637.13	$1887.13	$1897.13
WELLINGTON 12.00	1.742676	275.23	$475.23	$675.23	$875.23	$1075.23	$1275.23	$1525.23	$1775.23	$2025.23	$2035.23
AUCKLAND 13.80	2.0040774	268.85	$468.85	$668.85	$868.85	$1068.85	$1268.85	$1518.85	$1768.85	$2018.85	$2028.85
GISBORNE 12.90	1.8733767	416.66	$616.66	$816.66	$1016.66	$1216.66	$1416.66	$1666.66	$1916.66	$2166.66	$2176.66
WHANGEREI 13.20	1.9169436	398.72	$598.72	$798.72	$998.72	$1198.72	$1398.72	$1648.72	$1898.72	$2148.72	$2158.72
PAIHIA 13.20	1.9169436	387.98	$587.98	$787.98	$987.98	$1187.98	$1387.98	$1637.98	$1887.98	$2137.98	$2147.98
S ISLAND 15.50	2.2509565	579.90	$779.90	$979.90	$1179.90	$1379.90	$1579.90	$1829.90	$2079.90	$2329.90	$2339.90
PREDICTED VISITS EXP(NLOG)											
TAUMARUNUI 29.824		9429	2127	480	108	24	6	1	0	0	0
TAUPO 24.440		9020	2035	459	104	23	5	1	0	0	0
WANGANUI 59.689		7088	1599	361	81	18	4	1	0	0	0
ROTORUA 62.930		10260	2315	522	118	27	6	1	0	0	0
TOKOROA 48.374		11447	2582	583	131	30	7	1	0	0	0
MANAWATU 115.500		15198	3429	774	175	39	9	1	0	0	0
HAMILTON 119.276		26034	5873	1325	299	67	15	2	0	0	0
WAIKATO 69.363		10134	2286	516	116	26	6	1	0	0	0
TARANAKI 103.879		7650	1726	389	88	20	4	1	0	0	0
HOROWHENUA 53.592		1368	309	70	16	4	1	0	0	0	0
NAPIER 123.119		11892	2683	605	137	31	7	1	0	0	0
TAURANGA 113.534		10387	2343	529	119	27	6	1	0	0	0
MASTERTON 87.914		12844	2898	654	147	33	8	1	0	0	0
WELLINGTON 328.163		27292	6157	1389	313	71	16	2	0	0	0
AUCKLAND 860.349		57773	13034	2940	663	150	34	5	1	0	0
GISBORNE 70.253		1789	404	91	21	5	1	0	0	0	0
WHANGEREI 95.898		2672	603	136	31	7	2	0	0	0	0
PAIHIA 57.948		1749	395	89	20	5	1	0	0	0	0
S ISLAND 369.483		1913	432	97	22	5	1	0	0	0	0
TOTAL		235939	53227	12008	2709	611	138	21	3	1	0
CONSUMER SURPLUS CALCULATION			28916665	6523546	1471700	332013	74901	25735	4001	622	5
TOTAL C.S. 37349189											
C.S./CAPUT $158.30											
TRIP INDEX ADJUSTMENT (0.7137)			20637824	4655855	1050352	236957	53457	18367	2856	444	4
ADJUSTED TOTAL C.S. 26656116											
C.S./CAPUT $112.98											

VI. RESULTS OF EXPENDITURE ANALYSIS

The expenditure analysis from the Whakapapa survey was intended to give an indication of the level of economic impact in the Tongariro region associated with the recreational visitors to the Whakapapa area. Since this deals with actual expenditures made for recognisable goods and services in the region, it differs from the travel cost analysis which imputed a value for the intangible benefits from recreation.

The simplest form of expenditure analysis entails discovering how much, when and where visitors spend while visiting a district. This may be of use to the managers of recreational facilities in indicating what sort of goods and services visitors spend their money on, and hence what sort of further service provision might be appropriate in the area. A more refined form of analysis aims to establish the economic impact of visitors to the area, by establishing the secondary benefits which flow through the local economy as a result of the injection of local receipts and income from the visitors' expenditures. The most detailed of this latter type of analysis attempts to establish regional income and employment multipliers associated with visitors' expenditure.

The processing of the expenditure data from the Whakapapa surveys encountered a number of problems. One question in each of the summer and winter questionnaire forms asked respondents to list their expenditures within the Whakapapa area (defined in the questionnaire) and to list the specific location of the major expenditures under each category of spending. From the survey results, a high proportion of respondents appear not to have answered this question, and of those who did, the inclusion of locations outside the Whakapapa region suggests that many did not understand the question. A further complication for the winter time survey was that it was often not possible to distinguish between expenditures listed on behalf of individuals and those listed on behalf of family groups. These problems with the survey execution put severe qualification on the results obtained.

In view of this and the complexity of constructing a regional multiplier model (see Kerr *et al*. 1986) analysis of expenditures in the Whakapapa study was limited to the identification of local expenditures by visitors to the Whakapapa area. Multipliers developed by the. Ministry of Agriculture and Fisheries for the Tongariro region were applied to these identified expenditures, to give an indication of the impact of visitor expenditures in the region as a whole, after taking into account the direct injection of funds into the local economy and the subsequent rounds of expenditure it generates. In doing so the analysis indicates not only the absolute size of the impact of visitor expenditures, but also its magnitude relative to the intangible benefits identified during the travel cost analysis.

6.1 The Procedure Adopted in Expenditure Analysis

The basic data for the Whakapapa expenditure analysis were obtained from the winter and summer surveys of the Whakapapa skifield and Village area in 1985 and 1986. Since expenditure patterns were expected to differ substantially between the two seasons, the results were handled separately. On the basis of vehicle counts over the period of the surveys and average occupancy rates obtained from the survey results, the data were weighted up to represent the expenditures made over the full survey period. These periods covered the peak use periods in both seasons. It was assumed for the purposes of weighting that the surveyed respondents were representative of the visitors as a whole during these periods. In view of the low response obtained in the winter survey, this assumption may be open to question, but there was no means of verifying whether the results obtained were biased in any way.

For the purposes of this expenditure analysis, the Whakapapa region was defined as zones 1 and 3 of the location codes used in the processing of results. These zones broadly coincide in areal extent with Taupo and Taumarunui counties. Such a broad zone has the disadvantage of including some centres of visitor activity which have little dependence on the Whakapapa area itself, and it is likely that some expenditures recorded will not be those made primarily because of the presence of the Whakapapa area. On the other hand, choosing too small a region of study results in very small expenditures and, when it comes to multiplier analysis, relatively large leakages of funds from the region. The local region defined for this study has the advantage of being almost identical to the Tongariro region defined by the M.A.F., for which local multipliers are already available (Butcher 1985).

A number of new variables had to be defined for the expenditure analysis, namely:

LEXPEND: local expenditures: the sum of all expenditures recorded on questionnaires as having been made in the region under study;

ACTEXP: local expenditures on recreational activities: specifically on walking, other categories for summer users, and the same with the addition of ski expenses and lift expenses for winter users;

TRAVEX: expenditures on travel, including car expenses, public transport (including mountain goat charges), and the car park charge for winter users. This last item could be considered as an activity charge, since it was incurred usually when skiing, but it was decided that it had more similarities with the public transport charge.

BOARDEX: the combined expenditures on accommodation and meals. Although the questionnaire asked for these two items separately, in a large

number of cases they were indistinguishable, so the combined figure was used.

In addition to the new variables outlined above, the analysis also used the existing variables such as XPMISC, XPFOOD, XPPURCH. For the purposes of the multiplier analysis, the variables were grouped into two broad categories, according to the appropriate economic sector grouping. These were:

PERSONAL SERVICES: comprising XPMISC, ACTEXP.

RETAIL, WHOLESALE, RESTAURANTS and HOTELS (H & R): into which category fell all the other variables .

The expenditure variables used for this analysis differ from those used in the travel cost method, since they include food and vehicle expenses, include spending by overseas tourists, and are limited solely to those items of expenditure attributable to zones 1 and 3. Because of the failure of many respondents to identify the location of specific items of expenditure, it was necessary to assume for the purpose of this exercise that all expenditure not specifically allocated to some other location was attributable to the Tongariro region.

The total LEXPEND figures were broken down by visitor origin, party type and length or stay, and averaged across the number of cases in each of these categories. They were also broken down into constituent expenditure categories and averaged across all visitors. Some of these averages across all visitors are so low as to suggest expenditures may be understated by non-response in the returned questionnaires. Only 11 per cent of cases in the summer survey and 31 per cent in the winter survey recorded expenditures which could be attributed to the Tongariro region. This may reflect a higher proportion of visitors in the summer survey on multiple-destination trips who were just passing through the Whakapapa area, but it also reflects a tendency for cases to be "lost" in the data processing as variables were more tightly defined. (E.g. fewer cases had valid responses for expenditures and location within the Whakapapa area, than for just expenditures alone).

Multiplier analysis attempts to establish the effect of an initial injection of money into a local economy through subsequent rounds of spending by the local recipients of such an injection. The principal effects of such an inflow of funds into a regional economy are:

INITIAL EFFECT: an injection of funds into a regional economy (such as tourist expenditures) manifested as increased output in specific sectors of the economy;

PRODUCTION INDUCED EFFECT: the first and subsequent rounds of purchases by the sectors receiving the initial stimulus;

CONSUMPTION INDUCED EFFECT: the increase in output, income and employment associated with the increased demand for goods made by households receiving increased income from the initial and subsequent rounds of production increase.

The multipliers used to assess the impact of the expenditures of visitors to Whakapapa were:

TYPE IB: (Initial Inflow + Production Induced Effect)/Initial Inflow
TYPE II: (Initial + Production Induced + Consumption Induced)/Initial

Such multipliers were applied directly to the expenditures recorded in each of the H & R and Service sectors to give an indication of the multiplied impact of those expenditures on the output of those sectors. With respect to the employment and income multipliers, it was necessary to convert the recorded expenditures into Job equivalents and income retained estimates. The factors used for this conversion were national indices given by Butcher (1985): in the H & R sector, 50.2 jobs and $232,000 income per million dollars direct injection; and in the service sector, 90.2 jobs and $431,000 per million dollars direct injection. These figures are based on national averages, whereas the multipliers used are specific to the Tongariro region.

The job ratios in particular are likely to be distorted, since they are based on a national input output table for 1976-77, and the effect of inflation is likely to have reduced the number of jobs created per million dollars of injection. However, deflating visitor expenditures by the Consumer Price Index back to 1976 dollar values produced job ratios which seemed exceptionally low. Comparison of the employment ratios applied to the deflated and the undeflated expenditure figures gives a feasible range within which the employment impact is likely to lie, but in the absence of better information on these ratios greater precision is impossible.

6.2 Results of Expenditure Analysis

Recorded expenditures in the Whakapapa region totalled $4.01 million over the period of the winter survey (11 weeks) and $0.13 million over the period of the summer survey (8 weeks). The principal expenditure categories in winter were accommodation and meals (accounting for 33 per cent), activities (31 per cent) and travel (19 per cent). In summer the principal categories were accommodation and meals (60 per cent), travel (22 per cent) and food (8 per cent).

Since it was not always possible to distinguish between genuine nil responses and missing responses from the questionnaire forms, it is likely that these expenditures are understated. However, rather than making assumptions on the level of expenditure by those for whom no answers were received from the expenditure questions, this analysis confines itself to the amounts actually recorded as having been spent.

The accompanying table shows the recorded expenditure in total, broken down by origin zones, party type and length of stay in the Whakapapa area. This generally shows a higher expenditure in the summer than in winter, but this is partly offset by a larger number of visitors per case in the summer time. Visitors from the local area had the lowest expenditures per case, as might be expected, while those from the rest of New Zealand generally recorded lower expenditures per case than those from the principal overseas origin zone, Australia. The summer totals for American and British visitors suggest rather low expenditures per case. This may be explained by the arrival of such visitors in the company of New Zealand and relatives, in which case the costs they incurred were likely to be lower than they would be had they been travelling completely independently.

Two further tables show the winter and summer totals broken down by expenditure category, and averaged across cases (LEXP/CASE) and across all visitors (LEXP/ALLV) recorded in the questionnaires. Since the expenditure per visitor figures are averaged across both those who did and did not record local expenditures, these averages could be applied to estimates of total visitor numbers to obtain a conservative estimate of expenditures over the season as a whole. The component expenditure categories do not sum precisely to the total LEXPEND figure because of rounding in the calculations.

In the right hand section of these tables the regional economic multipliers of Butcher (1985) are applied to the expenditure figures from the survey data. For this purpose, the total local expenditures (LEXPEND) were regarded as a direct inflow of money into the regional economy, and their multiplied impacts were estimated using Type IB and Type II multipliers. The expenditures were first divided between those in the wholesale, retail, hotel and restaurant sector (H & R) and those in the personal services sector, since these sectors have different multipliers. The total impact in 1985 dollar terms was then calculated as the sum of the two impacts.

The results of this table show that, after taking into account the indirect and induced effects measured by the Type II multiplier, the $4 million of expenditure by winter visitors produced an additional $3.6 million of output in the region and $1.6 million of income retained in the region. The number of jobs supported in the region ranged from 113 (on the basis of deflated ratios) to 355 (with the undeflated ratios). Similarly the $129,000 spent in the region by summer time visitors resulted in a further $105,000 of output and $44,000 retained income in the region. This would have supported between 3 jobs (on deflated ratios) and 9 jobs (undeflated ratios). The top level of the employment ranges are, however, probably overstated, since the ratio of employment to dollars of direct injection is likely to have changed since the time when the ratios used were formulated.

On the basis of these tables and the Type II multipliers employed, it appears that a dollar of visitor expenditure in summer results in $1.82 of output and $0.34 of income retained in the region. In winter a dollar of expenditure results in $1.91 of output and $0.41 income retained in the region. Winter expenditure appears to have a higher impact than summer expenditures, not only because of the relative scale of expenditures involved between the two seasons, but also because a higher proportion of winter expenditure is made in the personal services sector, whose output multiplier and output : income ratio is higher.

These tables have looked only at the impact of visitors' expenditures made in the region. Two further categories of expenditure associated with recreational visits have an impact on the regional economy. One of these is the category of pre-paid bookings which, given the uncertainty surrounding the reliability of the questionnaire replies, may have been recorded by some respondents. A detailed survey of tour operators would be required to ascertain how much they receive in pre-paid bookings and how much is passed on to the establishments in the region. The other category is that of payments made by the administrators of the national park, such as payment of ranger salaries, and purchases of services from local contractors. Such payments, if known, could be added to the expenditure figures and applied to the multipliers to obtain revised estimates of impact.

* * * * *

Table 3: Breakdown of Total Expenditures and Mean Expenditures per Respondent (Case) at Whakapapa by Visitor Origin, Type of Party and Length of Stay

LOCAL EXPENDITURES	Winter Survey		Summer Survey	
By Visitor Origin:	Total $	Mean/Case	Total $	Mean/Case
Local	243028	$43.99	0	$0.00
Other NZ	3586380	$75.51	108863	$121.87
Australia	184009	$96.37	18701	$113.57
U.S.A.			670	$27.00
British Is			577	$57.00
	4013417		128811	
By Type of Party:				
Individual	214178	$59.05	607	$60.00
Couple	430901	$78.18	28505	$126.43
Family	1929543	$103.54	57713	$117.06
2 Couples	120926	$45.05	3104	$62.50
2 Families	61968	$46.38	9818	$280.93
Org. Group	554222	$52.55	1377	$68.00
Informal G	658837	$57.77	27686	$106.72
Other	13333	$86.00		
	3983908		128810	
By Length of Stay:				
1 day only	447544	$58.16	98306	$183.91
2 day/W-E	926586	$73.27	6848	$72.28
3-7 days	1710949	$79.97	17656	$54.53
8-15 days	138802	$57.32	5830	$44.94
Over 15day	31919	$28.76	172	$17.00
Unspecific	742914	$75.67		
	3998714		128812	

Table 4: Economic impact of Whakapapa visitors in the Tongariro region, and the effect of Type 1B and Type II Multipliers (1985 dollar terms).

WHAKAPAPA SUMMERTIME IMPACT				Tongariro Regional Multipliers				
					Injection		Type IB Multiplier	Impact
TOTAL VISITORS	22227			OUTPUT				$
Cases	9582			H & R	120615		1.3	156800
MEAN V/C	2.3197			Services	8198		1.2	9838
				TOT IMPACT				166637
LEXPEND $	128813							
by Cases	1093			EMPLOYMENT		Job Equiv.		Job no.
		LEXP/CASE	LEXP/ALLV	H & R	120615	6.05	1.3	7.87
	128260	$117.35	$5.80	Services	8198	0.74	1.1	0.81
Accomm'n	77005	$70.45	$3.46	TOT IMPACT Undefl.				9
Travel	28066	$25.68	$1.26	H & R	38449	1.93	1.3	2.51
Activities	3345	$3.06	$0.15	Services	2613	0.24	1.1	0.26
Food	10760	$9.84	$0.48	TOT IMPACT Deflated				3
Purchases	4784	$4.38	$0.22					
Misc. Exp.	4300	$3.93	$0.19	INCOME		Inc Retain		$
				H & R	120615	27983	1.3	36377
Total H&R	120615			Services	8198	3533	1.1	3887
Total Serv	8198			TOT IMPACT				40264

WHAKAPAPA WINTERTIME IMPACT				Tongariro Regional Multipliers				
					Injection		Type IB Multiplier	Impact
TOTAL VISITORS	327781			OUTPUT				$
Cases	174683			H & R	2460982		1.3	3199277
MEAN V/C	1.8764			Services	1552436		1.2	1862923
				TOT IMPACT				5062200
LEXPEND $	4013418							
by Cases	54212			EMPLOYMENT		Job Equiv.		Job no.
		LEXP/CASE	LEXP/ALLV	H & R	2460982	123.54	1.3	160.60
	3978899	$73.40	$12.24	Services	1552436	140.03	1.1	154.03
Accomm'n	1301497	$24.01	$3.97	TOT IMPACT Undefl.				315
Travel	772654	$14.25	$2.36	H & R	784492	39.38	1.3	51.20
Activities	1245950	$22.98	$3.80	Services	494873	44.64	1.1	49.16
Food	261385	$4.82	$0.80	TOT IMPACT Deflated				100
Purchases	125446	$2.31	$0.38					
Misc. Exp.	271967	$5.02	$0.83	INCOME		Inc Retain		$
				H & R	2460982	570948	1.3	742232
Total H&R	2460982			Services	1552436	669100	1.1	736010
Total Serv	1552436			TOT IMPACT				1478242

	Type II Multiplier	Impact
		$
	1.8	217197
	2.1	17216
		234323
		Job no.
	1.4	8.48
	1.3	0.96
		9
	1.4	2.70
	1.3	0.31
		3
		$
	1.4	39176
	1.3	4593
		43769

	Type II Multiplier	Impact
		$
	1.8	4429768
	2.1	3260116
		7689883
		Job no.
	1.4	172.96
	1.3	182.04
		355
	1.4	55.13
	1.3	58.03
		113
		$
	1.4	799327
	1.3	869830
		1669157

VII. SUMMARY AND CONCLUSIONS OF THE WHAKAPAPA STUDY

7.1 Overview of Survey Operation

A survey of visitors to the Whakapapa area was taken in the winter of 1985 and the summer of 1985/6, using a self-completed questionnaire distributed to the occupants of vehicles approaching the and village area. The winter survey was run on 20 days over 11 weeks of the peak ski season, while the summer survey was run on 19 days over 8 weeks of the peak summer period around the new year holiday.

In the winter survey, 3,245 questionnaires were distributed, of which 1,018 were returned. After processing these replies and discarding some, the usable total of questionnaires was 924, equivalent to an effective response rate of 28.5 per cent. This is a low response rate but, due to the method of distribution chosen, there was no means of recontacting non-respondents in the winter time survey.

In the summer survey, 707 questionnaires were distributed, of which 481 were returned. A follow-up survey of non-respondents was conducted which yielded some extra replies, bringing the overall response rate to 72.5 per cent. The summer survey was unable to effectively survey coach visitors to the Chateau, but since such visitors generally spend very little time in the Whakapapa village area, this ommission was not critical to the economic analyses.

For neither survey was a field pre-test or pilot survey run, partly because of time constraints and partly because of weather conditions. This ommission proved critical to the results of the winter survey, since a number of drawbacks in questionnaire design only became apparent after the survey had been running for some days. The experiences of the winter survey led to modifications of the summer survey which contributed to its better response rate. There were, however, qualitative differences between visitors in the two seasons - in particular summer visitors were more relaxed and in less of a hurry to "hit the slopes" - which also have a bearing on the differing results of the two surveys.

The results suggest that some changes in design would be desirable for any future survey, including:

1. running a full pilot through to stage;

2. following-up non-respondents with reminder letters;

3. not placing too much emphasis on techniques employed elsewhere under different conditions.

7.2 Findings on Visitor Profiles

The survey findings on visitor profiles are numerous and out-lined more fully in Section IV of this report. The weighted results suggest that over the 11 weeks of the winter survey period, 328,000 visitors arrived at the skifield, while over the 8 weeks of the summer survey there were 22,000 arrivals. In both surveys, families with children were the predominant party type, and there was a preponderance of respondents who described their occupation as being in the administrative, technical and professional categories. The winter survey had a higher proportion of respondents in the 25 years and younger age groups, and a higher proportion of students, than the summer survey.

The "average" winter visitor arrived in a party of about 4 people, stayed on the skifield for about 4 days and was away from home for 5 nights. Only 20 per cent of winter visitors were on their first visit to the skifield, and 87 per cent gave skiing as their reason for visiting the skifield. All but 3 per cent of winter visitors were New Zealanders, and 40 per cent of them were from Auckland alone. The regions to the north of Whakapapa (including Hawkes Bay) were home to nearly two-thirds of respondents. Wellington was home to 14 per cent of visitors.

The "average" summer visitor arrived in a party of 2 to 3, stayed 2 days in the Whakapapa area on a trip away from home of around 19 nights. Around 30 per cent of visitors were on their first visit to the Whakapapa area, and no single activity (such as sight-seeing, tramping or natural history study) predominated in the list of stated reasons for the visit. One third of summer visitors came from overseas - predominantly Australia but also a significant proportion from Western Europe - in which case they spent on average less than two days at Whakapapa on a tour averaging 39 nights away from home (compared with 8 nights for New Zealanders). Auckland was the largest single source of visitors (22 per cent) followed by Australia (17 per cent) and Wellington (14 per cent).

A number of comparisons have been made between the results of the winter and summer surveys in this report. Amongst the conclusions to be drawn are:

a) Visit characteristics differ considerably between the seasons. Summer visitors tend to be longer away from home and have a broader spread of purposes and activities in mind when visiting the Whakapapa area. They are also more likely to regard Whakapapa as one of a mix of complementary sites in the region than winter visitors.

b) Although many characteristics of summer and winter visitors are similar (e.g. income and occupation), others are quite different (e.g. ages, party types). While the winter and summer visitors are apparently drawn from similar subsets of the population at large, it is clear that the individuals in

the two sets are to a large extent different (i.e. the probability of a visitor being both a winter and a summer user is low). This makes it particularly difficult to reconcile conflicting views on developments in the area expressed by the two groups.

c) Despite reservations about the representativeness and incompleteness of the winter survey, it is probable that the impact of winter visitors is considerably greater than that of summer visitors, both in terms of numbers arriving and of expenditures made.

7.3 Results of Economic Analysis

The travel cost method of recreation evaluation and expenditure analysis were applied to data collected from the winter and summer surveys of the Whakapapa and village area conducted in the winter of 1985 and summer of 1986. The results summarised here are all in 1985 dollar terms.

The travel cost technique aims to impute a national value for a non-market resource on the basis of the costs incurred by current users in visiting it. The results suggest a value per visitor of $66 for summer time use and $124 for winter time use, using a travel cost variable which includes a value for the opportunity cost of travel time. (An alternative, less preferred estimate excluding a value for travel time, is included in the summary table). This implies a total value for the area over the survey periods of $0.84 million in summer and $28.94 million in winter. The estimates per visitor could be applied to reliable estimates of visitor numbers in each season to arrive at an estimate of value over the entire year.

Over the same periods the survey results indicated that visitors to the area made direct expenditures in the Tongariro region of $4 million in winter and $0.129 million in summer. Averaged across all visitors, direct expenditures per visitor were $12.24 in winter and $5.80 in summer. After allowing for multiplier effects through the regional economy, these expenditures by winter visitors are likely to have resulted in extra output of $3.5 million, and income of $1.7 million retained in the region. The impact of expenditures by summer visitors is likely to have generated an extra $0.105 million and resulted in $0.044 million income retained in the economy.

Results of the national value from travel cost analysis and regional value from expenditure analysis are summarised in the table below. The results indicate that the value of the Whakapapa area to the nation far exceeds its value to the region. They also show that the significance of winter use exceeds that of summer use by an amount even greater than would be suggested by the difference in visitor numbers alone.

Table 5: Summary Table of Whakapapa Area Economic Analysis

RESULTS OF TRAVEL COST ANALYSIS				
	Value per Visitor		Aggregated Value	
	$	$ exc Time	$ Million	$M ex Time
SUMMER USE	66	59	0.84	0.75
WINTER USE	124	113	28.94	26.66

RESULTS OF EXPENDITURE ANALYSIS							
	Direct	Type IB	Multiplier		Type II	Multiplier	
(all $M)	Injection	Output	Income	Employment	Output	Income	Employment
SUMMER USE	0.129	0.167	0.04	9	0.234	0.044	9
WINTER USE	4.013	5.062	1.478	315	7.689	1.669	355

7.4 Conclusions

The surveys of the Whakapapa skifield and village area have provided information on visitor profiles, attitudes to management, local expenditures and travel costs to the area. While the data collected represents an advance on the level of knowledge of visitors, there are limitations to the analysis which should be recognised in any subsequent use of the estimates from the surveys.

With respect to the operation of the survey, in retrospect the aims of the survey may have been too ambitious for the survey techniques employed. Although the information needs on visitor profiles, attitudes, travel costs and expenditures overlap to some extent, in combination they require a lengthy questionnaire which may have affected the response rate to the surveys as a whole. The survey responses on some of the questions, particularly those on expenditures, are sufficiently ambiguous to reduce confidence in the results, which suggests that for this sort of information a smaller, closely controlled interview survey might have been more successful.

This comment applies not only to the type of survey, but also to its size. The decision taken at the start to survey across the whole of the ski season effectively precluded the possibility of running a pilot or of acting on its outcome. Given that the peak winter and summer seasons are relatively short, two options exist for the incorporation of a pilot into the survey:

(a) pilot in the early season and main survey in late season;
(b) pilot in one season and main survey next season.

Neither of these options were feasible given the timetable of the Whakapapa study and its intended scope. As a result, the survey method adopted for the winter survey can not be regarded as particularly successful.

Paradoxically, while for the profile data the summer survey may be considered as more successful than the winter survey, the winter data provided a better fit to the theoretical constructs of travel cost analysis than did the summer data, which needed a number of adjustments to achieve a satisfactory result. This may be attributed partly to the nature of the travel cost model and the visit patterns displayed at Whakapapa in the summer time. The travel cost model was originally developed for application to sites which form the major destination of their users for day or week-end visits, but the question of how to attribute travel costs amongst sites in a multiple-destination trip is still open to conjecture. The Whakapapa profile data suggests that the winter visitors to a large extent conform to the single-destination requirements of the travel cost model, but the summer visitors do not fit this pattern so well.

With respect to the impact analysis presented here there are two main limitations: data, and the age of the multiplier estimates. Both the income and employment multipliers used in the analysis are likely to have changed since they were calculated in 1976, to an extent which can only be crudely approximated by deflating current values to 1976 dollar terms. Yet the alternative of estimating a new set of tourism multipliers from the survey data can only be justified by a higher level of confidence in the completeness of the expenditure responses than was obtained in the Whakapapa surveys.

A general comment on the results of the economic analyses is that the estimates presented are average values, not marginal values. Economic theory suggests that land should be used for a given purpose to the point where its marginal revenue (or value) is equal to its marginal cost (i.e. the marginal revenue from its next most valuable activity), yet the estimates from both the travel cost analysis and the impact analysis do not provide marginal values. So these estimates can not be used to decide between recreational land use and other land uses for individual increments of land.

A further limitation is that the results of a travel cost valuation may not be strictly comparable with valuations obtained by other procedures (i.e. of agricultural production), since other valuation methods may exclude the consumer surplus which is funda-mental to the travel cost method. The inability to compare like with like in recreation valuation applies even to the results obtained by different applications of the travel cost method, since in practice variables and functions are often specified quite differently by different researchers.

Nevertheless, despite these reservations, the travel cost analysis does provide useful information on which to base further management decisions of recreational resources. For an agency charged with managing a number of separate sites,

the application of travel cost analysis to each provides a more comprehensive measure of value than alternatives available such as visitor days or numbers arriving. It can provide a means of comparing separate sites even where there has been some variation in the method's application and, particularly where the same procedures have been applied to different data sets, it provides a measure of the relative importance of the different sites.

In the Whakapapa study, the difficulties encountered in obtaining the survey data place qualifications on the estimates from the travel cost and impact analyses as absolute measures of value. However, the relative significance of the Whakapapa area revealed in the results, in terms of its national value and its regional value, or in terms of its winter use values and its summer use values, is relatively less affected by these difficulties in survey execution.

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