ESTIMATION OF THE CONSUMPTION OF CAMPSITE SERVICES IN BRITISH COLUMBIA

by

Eusebio Stenio Herrera
For. Eng., Universidad Austral de Chile, 1971

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARTS

in the Department
of
Economics & Commerce

SIMON FRASER UNIVERSITY

April 1979

Title of Thesis/Project/Extended Essay

Estimation of the Consumption of Campsite

Services in British Columbia

Author:

(signature)

Eusebio Stenio Herrera

(name)

April 19, 1979

(date)

APPROVAL

Name: Eusebio Stenio Herrera

Degree: Master of Arts

Title of Thesis: Estimation of the Consumption of Campsite Services in British Columbia

Examining Committee:

Chairperson: S.T. Easton

R.A.D. Beck
Senior Supervisor

D.R. Maki

T. K. Peucker
External Examiner
Department of Geography

Date Approved: April 19/79

ABSTRACT

The economic evaluation of the benefits of outdoor recreation activities has focussed upon the estimation of demand for such activities. This thesis deals with estimation of the demand for overnight camping in the British Columbia park system. A sample of 20 parks and 20 regions, which yielded (20 x 20) = 400 cross-section observations for the year 1975 was analyzed.

Differences not explained by quantitative variables such as population, distance and park facilities are recognized to exist among parks and among regions. Demand models found in the literature, however, either do not deal with these differences or intend to explain them by introducing "attractiveness indices" subjectively computed. This thesis introduces intercept shift and distance slope shift dummy variables for both parks and regions to explain the differences among them after the variation in camper-night flows accounted for by population, distance and number of campsites was considered.

The results show that about half the parks and regions are statistically different from the intercept and about 25 per cent of them have significant distance slope shifts. The shifts in the distance slope coefficient indicate that the distance elasticity is not just a function of distance, but a function of the individual park and region as well. The distance variable also shows a substantially greater effect on camper-night visits within a range of 100 miles. The population elasticity is around 1, while the number of campsites elasticity is around 0.6.

The dummy variable approach used in this thesis has an objective and practical application for the estimation of recreational flows, particularly for a park system in operation. It may also be applied to inter-regional flow studies in general.

TO

JUANY, VANNIA
&
DARKO

ACKNOWLEDGEMENTS

I am deeply grateful to professors D.R. Maki and R.A.D. Beck, and my friend and fellow student Josef Bonnici, for their support and constructive criticisms during the preparation of this thesis. I particularly want to thank Rita Bonnici for her diligence and great patience in typing this thesis.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

The growing demand for recreation and the increasing concern of industrial societies about the environment have persuaded government agencies to allocate substantial areas of prime land to recreation related activities without a rigorous economic evaluation. This rise of outdoor recreation to the category of "an economic good" - since it often demands exclusive use of such scarce resources as land and water - competes with the use of land for agricultural, industrial, commercial and residential purposes. A more precise economic evaluation of outdoor recreation as an alternative in land use planning is thus desirable.

The essential questions that arise deal with the economic benefits (in dollars and cents) of the use of land for outdoor recreation activities and how these benefits compare, in the long run, to benefits that accrue to other alternate uses of land.

One important component of the answer is the estimation of the demand for recreational activities. In fact, most of the research has dealt with model formulation for estimating this demand.* Yet, the answer is far from being complete. In the Canadian context, the 1966 Federal-Provincial Parks Conference defined four "ultimate purposes" for the Canadian Outdoor

---

* Efforts have been oriented to estimating the consumption of recreational activities rather than demand as independent of supply considerations.

Recreation Demand (CORD) Study. These were,*

1) to gain a more complete understanding of outdoor recreation demand;
2) to guide investment and management planning;
3) to identify and evaluate policy choices; and
4) to forecast recreation use of resources in Canada.

Although economic theory provides a useful framework for analyzing the demand for recreational activities, its practical application often requires unavailable data. The very nature of the "consumption of quantities of recreation" makes data collection a difficult task, since categorical and qualitiative socio-economic variables are as important as quantitative ones in explaining consumer behaviour. Economists, however, have also proved to be resourceful in this area, and a good selection of approaches to the problem of recreation modelling can easily be found in the current literature. The recreation modelling experience has been focussed, lately, on three sets of "explanatory" variables representing factors at the origin, factors at the destination and frictional factors. That is, visitation flows are assumed to be the result of the joint action of (1) a set of trip generating factors at the origin, (2) a set of attraction factors at the destination, and (3) a set of intervening or frictional factors that distribute the total flow from a given origin to the various available alternative destinations.**

The set of trip generating factors at the origin are represented by the size of the population, population density, income, car ownership rate,

---

* Parks Canada Staff and Consultants (42): "Canadian Outdoor Recreation Demand Study. Volume 1: An Overview and Assessment". Federal-Provincial Parks Conference 1976, p. 6.

** See, for example, Cesario (14): "A Combined Trip Generation and Distribution Model". Transport. Sci. 9, pp. 211-223, 1975.

or some composite index including these and other socio-economic variables. The set of attraction factors at the destination are represented by the supply of recreational facilities, such as: number of campsites, number of picnic tables, area of water reservoirs, parks size, or some composite index of attraction defined somewhat subjectively by weighting differently the various recreational activities available at a given site. The set of intervening or frictional factors are represented by the distance between origin and destination - a proxy for travel cost - sometimes adjusted or corrected subjectively by a "time cost function" to account for accessibility conditions of the destination site.*

Cesario and Knetsch (18) postulated a multiplicative model for estimating recreational visits to 84 state parks located in Pennsylvania, New York and New Jersey. Visitor flows were assumed to be a function of (a) population center factors, (b) recreation site factors, (c) travel cost and (d) a factor called "competing opportunities" or "accessibility". Population size was used as a representative of all population center factors (i.e. origin) and an index of "park attractiveness" was subjectively computed and assumed to represent the set of recreation site factors. The "park attractiveness" index was computed as the weighted sum of the available recreational activities at each site. Weights were obtained for "quality" and "apparent utility" considerations. The qualities of the facilities for the different activities were scaled from 1 to 10 by a team of researchers. The apparent utility of the available recreational

---

* Cesario, F.J., and Knetsch, J.L. (19) "Time Bias in Recreation Benefit Estimates". Water Resources Res. 6(3): 700-704, 1970.
See also Cesario, F.J. (16) "Value of Time in Recreation Benefit Studies". Land Economics 52(1): 32-41, February, 1976.

activity was weighted by popularity weights. The travel cost and accessibility factors were expressed as a function of distance and travel time. Earlier, Cesario (14), proposed the same model and provided an analysis of the model's properties.

Using data from a visitor survey to 11 provincial parks and one national park in Saskatchewan during the summer of 1969, Cheung (20) approached the problem of day-use park visitation by estimating an additive regression model. While using the same concept of origin, destination and distributional factors, Cheung tested a continuous function of distance, $h(d_{ij}) = d_{ij}^{c}$, and a function $g(d_{ij}) = \frac{d_{ij}}{2}$ for $0 < d_{ij} < 20$; $g(d_{ij}) = d_{ij}$ for $20 \leq d_{ij} < 55$; and $g(d_{ij}) = d_{ij}^{3/2}$ for $55 \leq d_{ij}$ (all d_{ij} measured in road miles). He claimed that $g(d_{ij})$ gave higher R^2 value than $h(d_{ij}) = d_{ij}^{c}$, but this comparison does not necessarily imply that one variable is better than the other. In fact, comparing R^2 values of two different regressions is not a valid test.* Cheung's model also includes an "alternative factor" and an attractiveness function, both subjectively defined.

Var and Nuttall (49); Var, Beck and Loftus (48), and Nuttall (41) computed attractiveness indices as the weighted sum of a set of criteria assumed to be representative of visitors' preferences. The weights or relative importance of each criterion for a given park or touristic district were based on judgements of a group of recreational experts assumed to be representative of the whole spectrum of visitors. The indices so computed

---

* Maddala, G.S. "Econometrics". McGraw-Hill, New York, 1977, p. 124.

were introduced as a variable representing destination factors and regression models of the kind discussed above were fitted.

An interesting approach to the estimation of enroute overnight use - defined as a camper who stays at a park for one night and then moves on - was undertaken by Cheung, Smith and Beaman (21). This study fitted a multiplicative model to enroute camper data. The independent variables in the model were the annual average daily traffic count on a section of the arterial highway between two intersections leading to a park, the number of developed campsites, and the shortest road distance from the arterial highway to the entrance of the park. The study dealt only with a part of all camper-night use, and included only objective variables.

As noted above, researchers in the field of recreation flow modelling have been often concerned with the estimation of "attractiveness" of recreational areas in an attempt to improve visitation flow estimates. However, the creation of attractiveness indices has included elements of subjectivity that are not likely to remain constant for the same problem if different researchers (or a different set of experts for that matter) undertake the problem.

In addition, the models have been explicitly or implicitly estimated under the assumption of homogeneous behaviour of persons from different population centers. That is, on one hand the population is considered homogeneous in the sense that the distribution of sub-sets of socio-economic factors, and the sub-sets themselves are the same for all origins.*

---

* The assumption of homogeneous behaviour implies a constant variance or, at least, that the sample variances are not statistically different for all population conglomerates. Population size has been often considered the only relevant variable.

On the other hand, homogeneity implies an identical "reaction" for all individuals to frictional factors, given the distribution and characteristics of all alternative recreational sites,* which are, indeed given at any point in time.

While these assumptions do simplify theoretical model building - this is often the main reason for their introduction - they fail to recognize the inherent model misspecification that is likely to arise. Associated with this problem is the question of whether or not the parameters in a linear regression and the usual statistical tests, and, subsequently, the predicted recreational flows, will have any meaning. One would expect that different populations, located in different geographical areas, will differ among each other in ways not captured by population size, and that recreational site factors will not be evaluated as equally important by different populations. That is, the homogeneity assumption will prevent the analysis from accounting for these differences, and will produce biased estimators due to model misspecification.

However, the correction of these problems is not an easy task in practice. The inclusion of variables is not always possible because of lack of data and the lack of suitable proxy variables. In addition, it is likely that most of the problems are caused by the exclusion of qualitative or categorical variables (such as the quality of a road) rather than quantitative variables.

---

* Homogeneity in the quality of recreational facilities supplied has also been assumed in W. Acar and J. Beaman (1): "A Method of Allocation of Recreation Supply to Urban Centers". Canadian Outdoor Recreation Demand (CORD) Study, Vol. 2, Federal-Provincial Park Conference, 1976. CORD Technical Note No. 17.

Recognizing these limitations, this study hypothesises that a dummy variable approach would improve the estimates, i.e., it would decrease both the variance of the residuals and the variance of the estimated coefficients. Camper-night visits to provincial parks in British Columbia are used as the dependent variable, while population size, number of campsites and distance are independent variables. In addition, dummy variables are created for each park and each regional district to capture the qualitative elements involved. The results indicate that the dummy variables are statistically significant, thereby substantiating our hypothesis that parks and population centers display differences.

CHAPTER II

THE MODEL - THEORETICAL CONSIDERATIONS

Consider a world in which different population concentrations generate their own dynamics with respect to their environment. Each population center differs from at least one of the others in its response to the same factors influencing recreational activities. Each population center reacts to different sets of factors motivating or discouraging recreational experiences.

In such a world, there is no need for the set of factors generating trips to be equal for any two origins, either in the level of influence or the nature of the factors, even though it is possible to identify some common factors for all population centers. Neither is there need for the set of distributional or frictional factors to influence equally all the population centers.

Moreover, the set of "attractiveness" factors can be conceptualized as such only in presence of potential users of a given recreational site. That is, no recreational site need have any "attraction" whatsoever "per se". The nature of the attractiveness factors, as well as their level of influence in recreational activities, are nothing but the subjective reflection of human values and culture. Therefore different origins may exhibit different reactions to a given site.

In such a world, in estimating the level of a given recreational activity at several sites by the number of visitors per unit of time, one might hypothesize a model of the following general form:*

$$v_{ij} = F\left[f_i(G_i)\ ,\ g_j(A_j)\ ,\ h_{ij}(L_{ij})\right] \qquad (1)$$

where:

v_{ij} = number of visits per unit of time generated at population center i and terminated at recreational site j.**

G_i = a set of socio-economic factors generating trips at population center i.

A_j = a set of attractiveness factors and supply considerations at site j.

L_{ij} = a set of distributional and frictional factors connecting any combination of population center-site, ij.

F = overall multivariate function.

f_i, g_j, h_{ij} = multivariate functions for the respective sub-set of factors i, j and ij.

The three sets of factors of equation (1) as implied above, are conceived as a combination of human perception (G_i and A_j), and physical or material possibilities or limitations of realization (A_j and L_{ij}). Each of these is expected to enter the recreational decision-making process of the potential visitor. The recreational decision will imply the interaction of these factors in a proportion that is peculiar to a given population.

---

* Cesario (15) uses the same concept in his general functional form in "A New Method of Analyzing Outdoor Recreation Trip Data", Journal of Leisure Research, 7(3): 200-215, 1975, p. 203.

** There is an implicit assumption here: every single visit from i to j is independent of any other visit. That is, the visitor always makes a return trip before visiting a new site. In other words, the marginal cost of visiting a second site in the same time period is assumed to be infinite.

The interdependency noted above needs to be expressed in a specific functional form. Interdependency implies variable partial effects dependent on the level of other factors. A multiplicative model is thus more appropriate than an additive model. Before assuming a specific multiplicative functional form, however, it is useful to discuss the theoretical properties of the functions f_i , g_j and h_{ij} of equation (1) in the light of specific variables assumed to be the main components of each group.

Let population size, P_i , be the main component of the set of socio-economic factors, G_i , of population center i ; the number of campsites, CS_j , be the main component of the set of attractiveness factors and supply considerations, A_j , of a recreational site j ; and distance, d_{ij} , be the main variable of the set of distributional and frictional factors, L_{ij} , connecting any combination of sites and population centers. Finally, let the number of camper-nights per unit of time, generated at population center i and terminated in a site j , v_{ij} , be the measure of the camping activity.

The expected influence of population size can be expressed as:

$$\frac{\partial v_{ij}}{\partial P_i} > 0 \qquad (2)$$

Equation (2) hypothesizes a positive effect of an increase in population on camper-night visits, at a constant number of campsites and given distance. It does not say anything about the intensity of that effect, i.e., the plausible range of the population size coefficient. This is to be estimated from the regression. However, as population size grows over time, one might expect the effect to be positive, first at an increasing rate, and then at a decreasing rate. The function would approach asymptotically a limit of physical (and probably ecological) capacity of the site. The rationale of this is that congestion will eventually develop at the recreational site and alternative recreational opportunities will also develop at the population center as it grows. For a cross-section study like the current one, however, there is no reason to expect, necessarily, such behaviour because the time effect is not present. Moreover, it is likely that the supply of campsites has also been responding to demand pressures by increasing the availability of campsites in existing sites, or the creation of new sites, or both. The intensity of the population effect is, then, an empirical question.*

To allow for a variable effect on visits through the entire domain of the population variable, it seems reasonable to assume a non-linear relationship for the function $f_i(P_i)$. In this study, the following functional form is assumed:

$$f_i(P_i) = A\, P_i^{\gamma} \qquad (3)$$

where A and γ are parameters to be estimated.

The influence of the number of campsites is expected to be:

$$\frac{\partial v_{ij}}{\partial CS_j} > 0 \qquad (4)$$

Equation (4) presupposes a positive effect of the number of campsites on camper-night visits, at constant population and distance. Since the

---

* But one must not forget that the data are only a sample which does not necessarily represent the entire spectrum of the observable universe.

population variable (representing potential users) is held constant, one expects a decreasing positive effect on visitors over the entire domain of the campsites variable, particularly for cross-section data where the time element has not had any influence on the pattern of recreational participation of the populations under study. That is, tastes and preferences are, in fact, given under these circumstances.

The functional form assumed for this variable is:

$$g_j(CS_j) = C(CS)^{\delta} \tag{5}$$

where C and δ are parameters to be estimated.

The distance effect is expressed as:

$$\frac{\partial v_{ij}}{\partial d_{ij}} < 0 \tag{6}$$

Equation (6) says that the effect on visits expected from a positive change in distance is negative. Certainly this asertion does not require further explanation.* However, since distance represents, among other things, money cost and an implicit time constraint, its effect is likely to be decreasing over the variable's domain. This conception is rationalized under the assumption that for greater distances, while the money cost is marginally constant, the time constraint is less acute, causing the last mile to be less costly for greater distances.

Since the distance variable does not have any influence "per se", but only through people's reaction to it, recalling our implicit hetero-

---

* The distance effect, at least theorectically, might well be positive for certain activities as "driving for pleasure" within a certain (low) range of the distance variable.

geneity assumption one would expect different "reactions" for different regions and sites. In addition, when distance approaches zero, one would expect camper-night visits to approach a given number, reflecting the physical limitation of the site to accommodate visitors, even at zero cost.

In accordance with these assumptions, the general functional form for the distance variable assumed in this study is:

$$h_{ij}(d_{ij}) = \exp\Big[\alpha_o + \beta_o d_{ij} + \sum(\alpha_i DR_i + \beta_i DR_i d_{ij}) + \sum(\alpha_j DP_j + \beta_j DP_j d_{ij}) + (\alpha_k D_k + \beta_k D_k d_{ij})\Big] \quad (7)$$

where:

α_o, β_o, α_i, α_j, α_k, β_i, β_j, and β_k are statistical parameters to be estimated, and DR_i , DP_j and D_k are dummy variables.

Let the total number of regions be N , and the total number of sites be M . Then, the dummy DR_i represents an intercept shift for region i and the product $DR_i d_{ij}$ represents a slope shift for region i , for $i = 1, 2, 3, \ldots, N-1$. The dummy DP_j represents an intercept shift for site j and the product $DP_j d_{ij}$ represents a slope shift for site j , for $j = 1, 2, 3, \ldots, M-1$.

D_k is a dummy variable equal to one for $d_{ij} < k$, zero otherwise. The constant k is a distance value within which most of the week-end camping trips are expected to occur. The time constraint is conceived here as formed by two main components: one is the total availability of leisure time, and the other is the travel time. The time constraint then, is not the absolute travel time which would be an indirect measure of accessibility, but the travel time relative to the total availability of leisure time. However, the key component of the time constraint is the total availability of leisure time, since travel time is often well represented by the distance variable for a given type of transportation.

Since total leisure time data are not available, the availability of time was broken down into two categories: leisure time available equivalent to a week-end, and leisure time available equivalent to more than a week-end. People's reactions to distance were then expected to differ for these two categories. The dummy D_k measuring an intercept shift, and the product $D_k d_{ij}$ measuring a slope shift are expected to capture these differences.

CHAPTER III

EMPIRICAL ESTIMATION

1. The Empirical Models

Combining equations (3) , (5) and (7) yields a specific multiplicative model of equation (1). This is shown in equation (8)

$$v_{ij} = \exp\Big[\alpha_o + \beta_o d_{ij} + \alpha_k D_k + \beta_k (D_k d_{ij}) \sum_{i \in s1} \alpha_i DR_i \sum_{i \in s2} \beta_i (DR_i d_{ij}) \sum_{j \in s3} \alpha_j DP_j \sum_{j \in s4} \beta_j (DP_j d_{ij})\Big] P_i^{\gamma} CS_j^{\delta} u_{ij} \quad (8)$$

Equation (8) includes both intercept and slope shifts. An alternative model was also estimated. This allowed only for an intercept shift, thus constraining the distance variable to the same slope for all parks and regions. Dropping the slope dummy and transforming equation (8) into natural logarithms so that the least squares technique can be applied gives equation (9) below.

$$\ln v_{ij} = \alpha_o + \beta_o d_{ij} + \alpha_k D_k + \beta_k (D_k d_{ij}) + \sum_{i \in s1} \alpha_i (DR_i) + \sum_{j \in s3} \alpha_j (DP_j) + \gamma \ln P_i + \delta \ln CS_j + \ln u_{ij} \quad (9)$$

The logarithmic transformation of equation (8) gives the second model tested, as shown below in equation (10).

$$\ln v_{ij} = \alpha_0 + \beta_0 d_{ij} + \alpha_k D_k + \beta_k (D_k d_{ij}) + \sum_{i \in s1} \alpha_i (DR_i) + \sum_{i \in s2} \beta_i (DR_i d_{ij}) + \sum_{j \in s3} \alpha_j (DP_j) + \sum_{j \in s4} \beta_j (DP_j d_{ij}) + \gamma \ln P_i + \delta \ln CS_j + \ln u_{ij} \qquad (10)$$

where:

$\ln$ = natural logarithm

v_{ij} = camper-night visits from district i to park j.

d_{ij} = distance between district i and park j, expressed in highway miles.

D_k = dummy for the distance variable. $D_k = 1$ for $d_{ij} < k$; 0 otherwise.

k = arbitrary constant. $k \cong 100$ miles

DR_i = dummy for regional districts. $DR_i = 1$ for regional district i ; 0 otherwise.

DP_j = dummy for provincial parks. $DP_j = 1$ for provincial park j ; 0 otherwise.

P_i = population size in regional district i ; measured in number of persons.

CS_j = number of campsites in park j.

u_{ij} = error term.

i = $1, 2, \ldots, N$; where $N = 20$

j = $1, 2, \ldots, M$; where $M = 20$

ϵ = "is an element of"

s1 = subset of regional districts, explained below.

s2 = another subset of regional districts, explained below.

s3 = subset of provincial parks, explained below.

s4 = another subset of provincial parks, explained below.

$\alpha_o, \alpha_i, \alpha_j, \alpha_k, \beta_o, \beta_i, \beta_j, \beta_k, \gamma, \delta$ are parameters to be estimated.

The intercept α_o includes the regions and parks for which the respective dummies are not significantly different from zero after the variation in camper-night visits accounted for by population, number of campsites and distance has been considered.* Therefore, the number of intercept shift dummies for regions, n1 , and parks, m3 , included in the respective sets s1 and s3 are

$$1 \leq n1 < N$$

$$1 \leq m3 < M$$

Similarly, the number of slope shift dummies for regions, n2 , and parks, m4 , included in the respective sets s2 and s4 are

$$1 \leq n2 < N$$

$$1 \leq m4 < M$$

and there is no need for n1 = n2 , or m3 = m4 .

It is important to examine theoretically the coefficients of the empirical models expressed above to determine whether they are consistent with the properties expressed in equations (2), (4) and (6).

---

* This is fully explained in the "Estimation Problems and Procedure" section, pages 20-24

From equation (8), we have,

$$\hat{v}_{ij} = \frac{v_{ij}}{\exp(u_{ij})} \qquad (11)$$

Letting

$$\begin{aligned} z = {} & \alpha_o + \beta_o d_{ij} + \alpha_k D_k + \beta_k (D_k d_{ij}) \\ & + \sum_{i \in s1} \alpha_i (DR_i) + \sum_{i \in s2} \beta_i (DR_i d_{ij}) \\ & + \sum_{i \in s3} \alpha_j (DP_j) + \sum_{i \in s4} \beta_j (DP_j d_{ij}) \end{aligned} \qquad (12)$$

equation (8) becomes

$$\hat{v}_{ij} = \exp(z)\ P_i^{\gamma}\ CS_j^{\delta} \qquad (13)$$

and

$$\frac{\partial \hat{v}_{ij}}{\partial P_i} = \gamma \ \exp(z)\ P_i^{\gamma - 1}\ CS_j^{\delta} \qquad (14)$$

and

$$\frac{\partial \hat{v}_{ij}}{\partial CS_j} = \delta \ \exp(z)\ P_i^{\gamma}\ CS_j^{\delta - 1} \qquad (15)$$

Hence the necessary condition for $\frac{\partial \hat{v}_{ij}}{\partial P_i} > 0$ in equation (14) is $\gamma > 0$, and for $\frac{\partial \hat{v}_{ij}}{\partial CS_j} > 0$ in equation (15) is $\delta > 0$,

since

$P_i > 0$, $CS_j > 0$, and $\exp(z) > 0$ regardless of the size and sign of the coefficients in equation (12) above.

From equations (12) and (13)

$$\frac{\partial \hat{v}_{ij}}{\partial d_{ij}} = (\beta_o + \beta_k D_k + \beta_i DR_i + \beta_j DP_j) \exp(z) P_i^{\gamma_1} CS_j^{\delta} \qquad (16)$$

The necessary condition for $\frac{\partial \hat{v}_{ij}}{\partial d_{ij}} < 0$ in equation (16) is

$(\beta_o + \beta_k D_k + \beta_i DR_i + \beta_j DP_j) < 0$ for any combination of regional

district-provincial park, ij ,

since,

$P_i > 0$, $CS_j > 0$, and $\exp(z) > 0$ regardless the size and sign of the coefficients and variables in equation (12).

The interdependency postulated in the general model - equation (1) - is clearly captured by equations (14), (15) and (16), since all three partial derivatives are in fact functions of population size, number of campsites and distance.

2. The Data Base

Data concerning camping attendance and facilities were obtained from the British Columbia Parks Branch (7 and 8). Party-night* figures were transformed into camper-night visits to each park from each regional district by using the average party size available by campground to estimate total camper-nights, and the percentage distribution of visitors from each regional district to allocate the total number of visits among the regions.

---

* Party-night refers to one party staying one night in a park.

Population estimates were obtained from the B.C. Population Projection (9). The distance variable was obtained from a B.C. road map (1976/77). Since the origin reference was available on a regional district base, which comprises a fairly large area, it was necessary to assume a common origin for the entire population within each district.

This origin was assumed to be the largest population center in each regional district. Brown and Nawas (10) argue against the aggregation of population data into a common origin because it might cause multicollinearity, thereby diminishing the efficiency of estimation. However, the aggregation of population at the regional district level was necessary in the current study due to lack of disaggregated data. The implicit assumption is that the errors generated by the above constraint cancel.

The distance variable was expressed in road-miles measured from the origin selected to the park entrance, by the closest highway or paved road. To avoid the bias involved in crossing by ferry from Vancouver Island to the mainland, only 20 parks and 20 regions on the mainland of British Columbia were considered. This yielded a sample of (20 x 20) = 400 cross-section observations for the year 1975.

3. Estimation Problems and Procedure

To estimate the empirical models as expressed in equation (9) and (10), it was necessary to find the parks and regional districts which were not different from the (one) park and (one) regional district first included in the intercept in order to group them in a common intercept α_0.

This was also required regarding the common slope coefficient β_o in equation (10). However, a few estimation problems developed. The $\ln P_i$ variable was a linear combination of the intercept and the entire set of regional district dummies, DR_i. The $\ln CS_j$ variable was a linear combination of the intercept and the entire set of park dummies, DP_j. These problems clearly did not allow for the direct application of regression techniques to the data. Moreover, the test for statistical significance of the dummy variables was required when both population size and campsites were included. So the exclusion of $\ln P_i$ and $\ln CS_j$, though possible, was not desirable.

Fortunately other characteristics of the models were favorable. The $\ln P_i$, $\ln CS_j$ and d_{ij} variables were orthogonal to each other. The $\ln P_i$ variable was orthogonal to the set of park dummies, DP_j. The $\ln CS_j$ variable was orthogonal to the set of regional district dummies, DR_i. These data properties allowed us to estimate the models in several steps avoiding the singular matrix problem mentioned above. The estimation procedure for grouping the regional districts and parks was similar. To select the group of regional district dummies that were significantly different from zero <u>after</u> the variation in $\ln v_{ij}$ accounted for by $\ln P_i$ was considered, the following steps were applied:

1a. The natural logarithm of camper-night visits was regressed on distance, the natural logarithm of population size and the set of park dummies.

2a. The residuals of the regression in step 1a above were regressed on distance and the set of regional district dummies, with no intercept.

3a. From the regression in step 2a, the regional district dummies that were statistically different from zero could be identified.

To select the group of provincial park dummies that were significantly different from zero after the variation in $\ln v_{ij}$ accounted for by $\ln CS_j$ was considered, the following steps were applied:

1b. The natural logarithm of camper-night visits was regressed on distance, natural logarithm of the number of campsites and the set of regional district dummies.

2b. The residuals of the regression in step 1b were regressed on distance and the set of park dummies, with no intercept.

3b. From the regression in step 2b, the park dummies that were statistically different from zero could be identified.

The two groups of regional districts and parks selected in steps 3a and 3b above were called subsets s1 and s3, respectively. This procedure broke down the linear combination problems in the original equations. Then, final regressions were run to estimate the coefficients of the variables as expressed in equation (9).

The group of distance slope dummies for regional districts was selected as follows:

1c. The natural logarithm of camper-night visits was regressed on the set of intercept dummies for parks, the natural logarithm of population size and the entire set of distance slope dummies for parks.

2c. The residuals of the regression in step 1c above were regressed on the set of intercept dummies for regional districts and the entire set of distance slope dummies for regional districts. From this regression, the arithmetic mean of the slope dummy coefficients was computed and the regional district corresponding to this mean (or the closest regional district) was selected.

3c. The residuals of the regression in step 1c were regressed on the set of intercept dummies for regional districts, distance and the set of distance slope dummies for regional districts excluding the regional district (arithmetic mean) selected in step 2c.

4c. From the regression in step 3c, the distance slope dummies for regional districts that were statistically different from the distance coefficient (arithmetic mean) could be identified.

The group of distance slope dummies for parks was identified as follows:

1d. The natural logarithm of camper-night visits was regressed on the set of intercept dummies for regional districts, natural logarithm of the number of campsites and the entire set of distance slope dummies for regional districts.

2d. The residuals of the regression in step 1d were regressed on the set of intercept dummies for parks and the entire set of distance slope dummies for parks. Then, the arithmetic mean of the slope dummy coefficients was computed and the park corresponding to this mean (or the closest park) was selected.

3d. The residuals of the regression in step 1d were regressed on the set of intercept dummies for parks, distance and the set of distance slope dummies for parks excluding the park (arithmetic mean) selected in step 2d.

4d. From the regression in step 3d, the distance slope dummies for parks that were statistically different from the distance coefficient (arithmethic mean) could be identified.

The two groups of regional districts and parks identified in steps 4c and 4d above were called subsets s2 and s4 , respectively. Then, final regressions were run to estimate the coefficients of the variables as expressed in equation (10).

CHAPTER IV

RESULTS

1. Intercept Shift Model

The intercept shift model for parks and regions attributes the differences in "emissivity" among regions and the differences in "attractiveness" among parks to an unequal "maximum potential for emissivity and attractiveness at zero distance", respectively. The coefficients of the dummies for regions and parks in equation (9) capture this difference. The empirical results are shown in Table I.

All the variables of model (9) shown in Table I are significant at the 1 per cent level with the exception of the intercept shift dummies for the Columbia - Shuswap, Thompson - Nicola and Fraser - Fort George regional districts. Columbia - Shuswap and Fraser - Fort George are significant at the 5 per cent level, while the Thompson - Nicola region is significant at the 10 per cent level.*

The intercept, α_o, includes 10 regional districts and 9 provincial parks. The regions included are Cariboo, Central Kootenay, Central Okanagan, East Kootenay, Fraser-Cheam, Greater Vancouver, Kootenay Boundary, North Okanagan, Okanagan - Similkameen and Sunshine Coast. The other 10 regions - 50 per cent of the total number of districts considered - are statistically different from α_o.

---

* The Greater Vancouver regional district was also significant at the 1 per cent level, but it was highly collinear with $\ln P_i$. For this reason it was dropped.

Table I

Equation (9) - Intercept Shift For Regions And Parks

Variable	Coefficient	t-Statistic
constant	-8.977	-18.64
D_k	1.965	8.22
d_{ij}	-0.00331	-16.84
$D_k d_{ij}$	-0.0179	- 4.89
$\ln P_i$	1.082	26.49
$\ln CS_j$	0.659	15.60
Intercept shift for regions (DR_i)		
Columbia - Shuswap	-0.340	- 2.22
Thompson - Nicola	-0.290	- 1.87
Fraser - Fort George	0.312	2.05
Dewdney - Alouette	0.419	2.75
Central Fraser Valley	0.459	3.00
Squamish - Lillooet	0.509	3.18
Peace River - Liard	0.577	3.69
Buckley - Nechako	0.599	3.84
Powell River	0.801	5.05
Kitimat - Stikine	0.950	5.83
Intercept shift for parks (DP_j)		
Alice Lake	-1.238	- 7.96
Golden Ears	-1.134	- 6.59
Jimsmith Lake	0.431	2.72
Charlie Lake	0.593	3.55
Kokanee Creek	0.619	3.95
Ellison	0.726	4.72
Lac La Hache	0.882	5.73
Maclure Lake	0.904	5.63
Lakelse Lake	1.073	6.17
Beaumont	1.105	7.14
Barkerville Historic	1.382	8.35

$R^2 = 0.8625$

$\bar{R}^2 = 0.8529$

$F_{(26, 373)} = 89.97$

S.E.E. = 0.6463

The parks included in the intercept are Bromley Rock, Canim Beach, Champion Lake, Crooked River, Cultus Lake, Manning, Emory Creek, Goldpan and Kettle River. The other 11 parks - 55 per cent of the total number of parks considered in the study - are statistically different from α_0 .

The coefficients of model (9) are consistent with the assumptions of the model. The intercept shift for a distance less than 100 miles - the coefficient of D_k - is positive, and the slope shift for the same distance range - the coefficient of $D_k d_{ij}$ - is negative. That is, the regression plane has shifted up from -8.977 to -7.012 , and substantially increased (in absolute value) its negative slope from -0.00331 to -0.0212 with respect to d_{ij} . For $d_{ij} < 100$ miles the flows of visitors are higher than for greater distances,* but at the same time the marginal mile "costs" more to the traveler within the 100 miles range. Since the money cost of the marginal mile is about the same for both distance ranges (under similar road and traffic conditions) and the travel time is also about the same, the steeper slope for $d_{ij} < 100$ miles may be attributed to a higher proportion of the total available leisure time spent in the trip. Everything else equal, considerations given to the distance variable when locating a new park and/or developing camping facilities have a greater importance within the 100 mile range from population centers than for distances over 100 miles. Tables II and III show the relative importance of camper-night visits within 100 miles and the influence of population size.

---

* Since dummy variables are used to differentiate distances less than 100 miles, the function becomes disjointed at the 100 mile point. This could give rise to an inconsistent gap in the estimates of visits around this point. Both models were checked at the 99 and 101 mile level with the result that both gaps were less than 0.15 measured in $\ln v_{ij}$. Because of these relatively small gaps, joining the equations at the 100 mile level was judged as not necessary.

Table II

Aggregated Camper-night Visits To Provincial Parks

From Regional Districts Located Within 100 Miles

Park Name	Aggregated Visits Within 100 Miles	Percentage of Total Visits	Aggregated Population Within 100 Miles	Number of Regions Within 100 Miles
Alice Lake	14042	97.1	1260120	5
Barkerville Historic	2497	8.5	43969	1
Beaumont	1686	23.8	81796	1
Bromley Rock	178	6.1	108026	2
Canim Beach	0	0	0	0
Champion Lake	2026	43.4	74758	2
Charlie Lake	1680	51.1	48626	1
Crooked River	3700	62.2	81796	1
Cultus Lake	62827	96.1	1170863	4
E.C. Manning	6046	12.4	115033	2
Ellison	4513	39.2	271178	5
Emory Creek	554	14.1	158920	3
Golden Ears	41343	97.4	1307533	6
Goldpan	107	3.7	91428	1
Jimsmith Lake	783	29.7	44580	1
Kettle River	803	13.0	45419	1
Kokanee Creek	2630	33.0	74758	1
Lac La Hache	0	0	0	0
Lakelse Lake	14291	73.4	60507	1
Maclure Lake	1822	26.0	31655	1
All Parks	161528	53.9	-	-

Table III

Camper-night Visits To Provincial Parks From The Greater Vancouver Regional District

Park Name	Visits From G.V.R.D.	Percentage of Total Visits	Distance From G.V.R.D. (Miles)
Alice Lake	12483	86.3	55
Barkerville Historic	12345	42.1	477
Beaumont	1446	20.4	572
Bromley Rock	1902	65.4	191
Carnim Beach	1746	58.5	307
Champion Lake	1609	34.4	415
Charlie Lake	607	18.5	799
Crooked River	925	15.6	537
Cultus Lake	46231	70.7	62
E.C. Manning	36311	74.6	140
Ellison	4775	41.5	332
Emory Creek	2305	58.8	106
Golden Ears	36146	85.2	37
Goldpan	1939	67.3	181
Jimsmith Lake	875	33.2	543
Kettle River	3007	48.6	275
Kokanee Creek	2427	30.6	504
Lac La Hache	4682	42.4	309
Lakelse Lake	1683	8.6	864
Maclure Lake	1193	17.0	712
All Parks	174637	58.3	-

Three parks, Alice Lake, Cultus Lake and Golden Ears, comprise 40.8 per cent of all camper-night visits to the 20 parks under study throughout the province. But the three of them are located within 100 miles of an aggregated population greater than 1 million persons (see Table II).*
The combined effects of population size and distance give to these parks a privileged position with respect to the others considered in the study. However, after the location and facilities' effects have been considered, Alice Lake and Golden Ears are below the "average",** and Cultus Lake is not different from an average park, as shown by the intercept shift coefficients in Table I.

With the exception of Barkerville Historic (9.8 per cent of the total camper-night visits despite its disadvantaged location with respect to population centers), location, i.e., the combined interaction of population size and distance, is the single most important factor in determining camper-night visits by B.C. residents.

The Greater Vancouver Regional District, with over one million persons, is the origin of 58.3 per cent of the total visit flows to the 20 parks under study. The percentages for individual parks are also high for all ranges of distances (see Table III). However, these results should be interpreted carefully for distances over 100 miles since it is likely that most of these visits correspond to en-route types of visits.

---

* The conclusions derived from Table II are subject to the assumption that the population at a district is concentrated as a point mass. The actual aggregated population and the number of regions within 100 miles might change somewhat if the above assumption is released.

** "Average" refers to the excluded group of parks. Note, however, that these parks were grouped together in the intercept because the intercept shift dummies were neither positively nor negatively different from zero.

The dummies for $d_{ij} < 100$ miles were also tested for statistical significance after the variation in $\ln v_{ij}$ explained by d_{ij}, $\ln P_i$ and $\ln CS_j$. The regression results were:

$$\ln v_{ij} = -8.231 - 0.00284\, d_{ij} + 1.043 \ln P_i + 0.669 \ln CS_j \qquad (17)$$

t-values: (-12.59) (-14.23) (18.59) (12.94)

$R^2 = 0.6508$

$F_{(3,396)} = 246.1$

S.E.E. $= 0.9994$

and

$$\ln v_{ij} = -8.317 + 2.353\, D_k - 0.00215\, d_{ij} - 0.0237\, D_k d_{ij} + 1.038 \ln P_i + 0.611 \ln CS_j$$

t-values: (-13.60) (7.19) (-10.09) (-4.58) (19.76) (12.45) (18)

$R^2 = 0.6960$

$F_{(5,394)} = 180.4$

S.E.E. $= 0.9350$

The partial F-statistic for the dummies for $d_{ij} < 100$ miles, D_k and $D_k d_{ij}$, was computed as $F_{(2,394)} = 29.29$, which is significant at the 1 per cent level.

The set of dummies for regions and parks was also tested for statistical significance after the variables in equation (18) were included. From the results of equation (9) in Table I, and the results of equation (18), a partial F-statistic was computed as $F_{(21,373)} = 21.51$, also significant at the 1 per cent level.

2. Intercept and Slope Shift Model

The intercept and slope shift model attributes the differences in "emissivity" among regions and the differences in "attractiveness" among parks to a difference in the "maximum potential for emissivity and attractiveness at zero distance", respectively, and to a difference in the "marginal propensity to generate visits among regions" and to a difference in the "marginal propensity to attract visits among parks", both over the distance variable domain. These differences are estimated by the coefficients of the intercept dummies and the coefficients of the distance slope dummies for regions and parks in equation (10). The empirical results are presented in Table IV.

The coefficients shown in Table IV are highly significant. The intercept shift coefficients for Dewdney - Alouette regional district and Kokanee Creek provincial park have the lowest level of statistical significance in model (10). These two dummies are significant at the 20 per cent level. The intercept shift for the North Okanagan régional district and the slope shift for the Fraser - Fort George regional district are significant at the 10 per cent level. The shift in the intercepts for Central Fraser Valley and Fraser - Fort George regions, and the intercept shift for Maclure Lake park are significant at the 5 per cent level. The shift in slopes for Kootenay Boundary and Columbia - Shuswap, and the intercept shift for Alice Lake park are significant at the 2 per cent level. All other variables are significant at the 1 per cent level.

One characteristic of this model was that the intercept dummies for regions and parks were highly collinear with their respective slope dummies.

Table IV

Equation (10) - Intercept And Slope Shifts For Regions And Parks

Variable	Coefficient	t-Statistic
Constant	-6.874	-13.85
D_k	2.323	9.84
d_{ij}	-0.00246	-13.56
$D_k d_{ij}$	-0.0223	- 6.02
$\ln P_i$	0.940	23.37
$\ln CS_j$	0.573	11.84
Intercept shift for regions (DR_i)		
Columbia - Shuswap	-1.225	- 3.86
North Okanagan	-0.289	- 1.87
Dewdney - Alouette	0.211	1.38
Central Fraser Valley	0.329	2.14
Kitimat - Stikine	0.618	3.80
Fraser - Fort George	0.819	2.26
Slope shift for regions ($DR_i d_{ij}$)		
Fraser - Fort George	-0.00156	- 1.75
Sunshine Coast	-0.00102	- 3.05
Kootenay Boundary	-0.000761	- 2.50
Columbia - Shuswap	0.00205	2.50

Variable	Coefficient	t-Statistic
Intercept shift for parks (DP_j)		
Golden Ears	-1.327	-7.41
Emory Creek	-1.049	-3.85
Alice Lake	-0.660	-2.42
Champion Lake	-0.588	-3.72
Crooked River	-0.498	-3.17
Kokanee Creek	0.258	1.61
Maclure Lake	0.348	2.16
Ellison	0.417	2.64
Lakelse Lake	0.507	2.92
Lac La Hache	0.608	3.84
Barkerville Historic	1.094	6.38
Slope shift for parks ($DP_j d_{ij}$)		
Alice Lake	-0.00246	-4.18
Goldpan	-0.00172	-3.48
Bromley Rock	-0.00149	-3.24
Emory Creek	0.00250	3.29

$R^2 = 0.8601$

$\bar{R}^2 = 0.8487$

$F_{(30,369)} = 75.64$

S.E.E. = 0.6550

This linear correlation usually causes t-values to decrease to non-significant levels. Whenever such a problem was detected only one dummy was used. Some regions and some parks were so significant that both intercept and slope dummies were included in the final equation despite high linear correlation. This was the case for the Columbia - Shuswap and Fraser - Fort George regional districts, and for Alice Lake and Emory Creek provincial parks. The significance level for these regions and parks may be regarded as conservative because of the decreasing effect that the multicollinearity problem has on the t-values.

The multicollinearity problem found in model (10) forced the inclusion of some regions and parks either in the intercept α_0, or the slope coefficient β_0, in order to increase the efficiency of the estimated coefficients. Nevertheless, 30 per cent of the regions were statistically different from α_0 and 25 per cent were statistically different from β_0, while 55 per cent of the parks were statistically different from α_0, and 25 per cent were statistically different from β_0.

The regional districts included in α_0 are Buckley - Nechaco, Cariboo, Central Kootenay, Central Okanagan, East Kootenay, Fraser - Cheam, Greater Vancouver, Kootenay Boundary, Okanagan - Similkameen, Peace River - Liard, Powell River, Squamish - Lillooet, Sunshine Coast and Thompson - Nicola. The six regional districts with intercepts different from α_0 are Columbia - Shuswap, North Okanagan, Dewdney - Alouette, Central Fraser Valley, Kitimate - Stikine and Fraser - Fort George. The regions with slopes different from β_0 are Fraser - Fort George, Sunshine Coast, Kootenay Boundary and Columbia - Shuswap.

The provincial parks included in α_o are Beaumont, Bromley Rock, Canim Beach, Charlie Lake, Cultus Lake, E.C. Manning, Goldpan, Jimsmith Lake and Kettle River. The eleven parks with intercepts different from α_o are Golden Ears, Emory Creek, Alice Lake, Champion Lake, Crooked River, Kokanee Creek, Maclure Lake, Ellison, Lakelse Lake, Lac La Hache and Barkerville Historic. The parks with slopes different from β_o are Alice Lake, Goldpan, Bromley Rock and Emory Creek.

The partial F-statistic for the intercept and slope dummies for regions and parks in model (10) with respect to equation (18) was computed as $F_{(24,369)} = 18.03$, which is significant at the 1 per cent level.

The coefficients of d_{ij}, of the dummies for $d_{ij} < 100$ miles, of $\ln P_i$ and $\ln CS_j$ have the expected signs. The results in model (10) are consistent with the results in model (9) for Alice Lake, Cultus Lake, Golden Ears and Barkerville Historic, four of the most-visited parks. After the location and campsites availability have been considered, Cultus Lake is still an average park included in the intercept, Golden Ears and Alice Lake are below the intercept and Barkerville Historic has the highest positive intercept shift. Moreover, the distance coefficient for Alice Lake is twice the negative coefficient of d_{ij}, β_o, further suggesting that Alice Lake attracts a high number of camper-night visits mainly because of its location with respect to population centers, particularly the Greater Vancouver Regional district.

These findings differ from Nuttall's results (41) in a day-use study of eight parks in the lower Mainland area of British Columbia. By using the recreational experts approach, Nuttall found that Alice Lake, Golden

Ears and Cultus Lake had the highest rank in the recreational experts' opinion. The "historical factors" criterion was ranked 11th among a total of 12 different criteria analyzed by the experts,* while the dummy variables approach used in this study found Barkerville Historic as the most attractive park.

While these somewhat contradictory results are certainly worth noting, the reader must be aware that a direct comparison between these two studies is not possible. Nuttall's study (41) refers to a day-use recreational activity for 8 parks, all located within 100 miles of Vancouver, while this study has been done for camper-night visits for 20 parks located throughout the province.

3. Practical Implications

The empirical results of both models herein support the hypotheses discussed earlier in Chapter II. Model (9) shows that 50 per cent of the regional districts and 55 per cent of the provincial parks are statistically different from the combination of regions and parks included in the intercept α_0 . Model (10) shows similar results with 30 per cent of the regions and 55 per cent of the parks having a significant intercept shift, while 25 per cent of the regions and 25 per cent of the parks have a significant slope shift with respect to the distance variable.

The size of the coefficients of the significant variables involved in both equations is an important consideration for practical purposes.

---

* Nuttall, G. "Estimating Day-Use Visitation of Public Parks". M.A. Thesis, Department of Economics and Commerce, Simon Fraser University, Burnaby, B.C., 1977, pp. 27, 31.

In model (9) the shifts in the intercepts for regions fall between -0.340 for Columbia - Shuswap and 0.950 for Kitimat - Stikine. The shifts in the intercepts for parks fall between -1.238 for Alice Lake and 1.382 for Barkerville Historic (see Table I). With an intercept α_0, of -8.977, the range in the shift of the intercepts might not appear of great practical importance. But, since the independent variable is in log form, the relative importance of an intercept shift is directly related to the volume of camper-night visits, i.e., the impact of a shift depends on the overall impact of all other variables in the model.

The shifts in the intercepts of model (10) ranges from -1.225 for Columbia - Shuswap and 0.819 for Fraser - Fort George. The shifts in the intercepts for parks falls between -1.327 for Golden Ears and 1.094 for Barkerville Historic. The slope shift for regions falls between -0.00156 for Fraser -Fort George and 0.00205 for Columbia - Shuswap. For parks, it falls between -0.00246 for Alice Lake and 0.00250 for Emory Creek (see Table IV). Alice Lake offers interesting results. It has a distance slope twice as steep as the overall β_0 distance slope. That is, its "marginal attractiveness" with respect to the distance variable alone is half as large as that for sixteen other parks included in β_0. The high attractiveness attributed to Alice Lake in Nuttall's day-use study (41) may be fundamentally explained by the park's location with respect to highly populated areas.

Table V shows the population size, number of campsites and distance elasticities for camper-night visits for both models. The population size elasticity is around 1, while the number of campsites elasticity is around 0.6.

Table V

Population Size, Number Of Campsites And Distance Elasticities For Camper-night Visits

Variable	Model (9)	Model (10)
d_{ij}	$(\beta_o + \beta_k D_k)\, d_{ij}$	$(\beta_o + \beta_k D_k + \beta_i DR_i + \beta_j DP_j)\, d_{ij}$
P_i	1.082	0.940
CS_j	0.659	0.573

The distance elasticity, however, depends on the park's location. Under the assumption of model (9), the distance elasticity is $-0.00331\, d_{ij}$ for $d_{ij} < 100$ miles and $-0.0212\, d_{ij} \geq 100$ miles, while model (10) assumes a distance elasticity which varies with the regions and parks besides the distance range.

Distance is not a policy variable, in the sense that existing parks and regions cannot be physically "moved". Nevertheless, distance elasticities are important to consider in decisions regarding budget allocation for the expansion of existing camping facilities, new camping development in existing parks, or new camping areas in new parks.

The results also indicate that the derivation of the "demand for camping curve" based on a simplified function of distance might not produce good results due to differences among the various origins and/or destination areas. This is particularly important in benefit-cost studies where the value of recreation depends heavily on the estimation of the demand curve.

No attempt was made to find out why a dummy for a region or park was significant, i.e., to find other quantitative variables that could replace the dummies. Firstly, this was not an objective of this thesis. Secondly, the differences among regions are believed to be mainly composed of socio-economic characteristics of a qualitative or categorical nature, and the differences among parks are attributed to differences in the potential users' perceptions of a site, which are also qualitative.

This limitation does not allow for a direct application of a dummy coefficient to assess the desirability of a proposed park unless that this area could be related to an existing park. However the approach is particularly useful for a park system already in operation where an accurate estimation of demand is of primary importance for allocating investment and operation costs.

This study has been based on population data aggregated at the regional district level and a corresponding aggregation of distances. The results are encouraging enough to suggest that data gathered on campers' origin at the city, town and even village level would be desirable.

The approach developed in this thesis has a promising practical application for the understanding of the recreational flows in the British Columbia Park System. But it can also be applied to inter-regional flows other than recreation.

CHAPTER V

CONCLUSIONS

Two models were used to estimate the demand for overnight camping in the British Columbia park system. One model allowed for an intercept shift for both regions and parks but was constrained to a constant slope. The second model allowed for a shift in both the intercept and slope for regions and parks. Both models demonstrated the validity of our theoretical assumptions regarding camper-night attendance in British Columbia. More important, the models estimated provide a practical and useful approach to the practitioner in the field of recreation planning.

The intercept shift model found that the Columbia - Shuswap and Kitimat-Stikine regional districts had the largest negative and positive shifts in their intercepts respectively, while Alice Lake had the largest negative shift and Barkerville Historic the largest positive shift in the intercept within the provincial park group.

The model which had both an intercept and a slope shift showed that the Columbia - Shuswap region had the largest negative intercept shift and the only positive slope shift. Fraser - Fort George had the largest positive shift in the intercept and the largest negative shift in the slope.

This model also showed that, within the provincial park group, Golden Ears had the largest negative shift in the intercept and Barkerville Historic had the largest positive shift in the intercept. Alice Lake had the largest negative shift in the slope and Emory Creek showed the largest positive shift in the slope.

The intercept shift and the slope shift dummies for distances less than 100 miles were highly significant in both models. Moreover, the dummy coefficients indicated substantial differences between types of trips. Both models showed a higher intercept and a larger negative slope for distances less than 100 miles, implying that the marginal mile is "more expensive" for distances within 100 miles. Since the money cost and the travel time are expected to be about the same for the marginal mile within the entire domain of the distance variable, the increase in cost for the marginal mile within the 100 miles range can be interpreted as a result of a higher time constraint. That is, a greater proportion of the total leisure time available is spent as travel time for distances less than 100 miles if the 100 mile range does represent week-end type of trips as assumed. Conversely, distances greater than 100 miles could include a higher proportion of "en-route" type of camping and a lower proportion of leisure time spent as travel time.

Even though a distance of 100 miles was arbitrarily chosen, it is clear that greater attention must be given to this variable with regard to its marginal effect on camping attendance. However, the overall distance effect does not depend entirely upon the distance variable itself, but also upon the particular region and park under consideration, as it is shown by the distance elasticities in Table V.

The location effect - i.e., the combined effect of distance and population size - and the level of park development as measured by the number of campsites are the most important factors influencing camper-night flows to provincial parks in British Columbia. Once these effects have been considered, parks such as Alice Lake, Golden Ears and Cultus Lake do not appear as attractive as they are usually assumed to be due to their high level of public attendance. This study shows that, as far as camping attendance is concerned, these parks are not significantly different from average after location and number of campsites have been considered. Rather, it is Barkerville Historic, despite being almost 500 miles from the most populated regions, which shows the highest attractiveness.

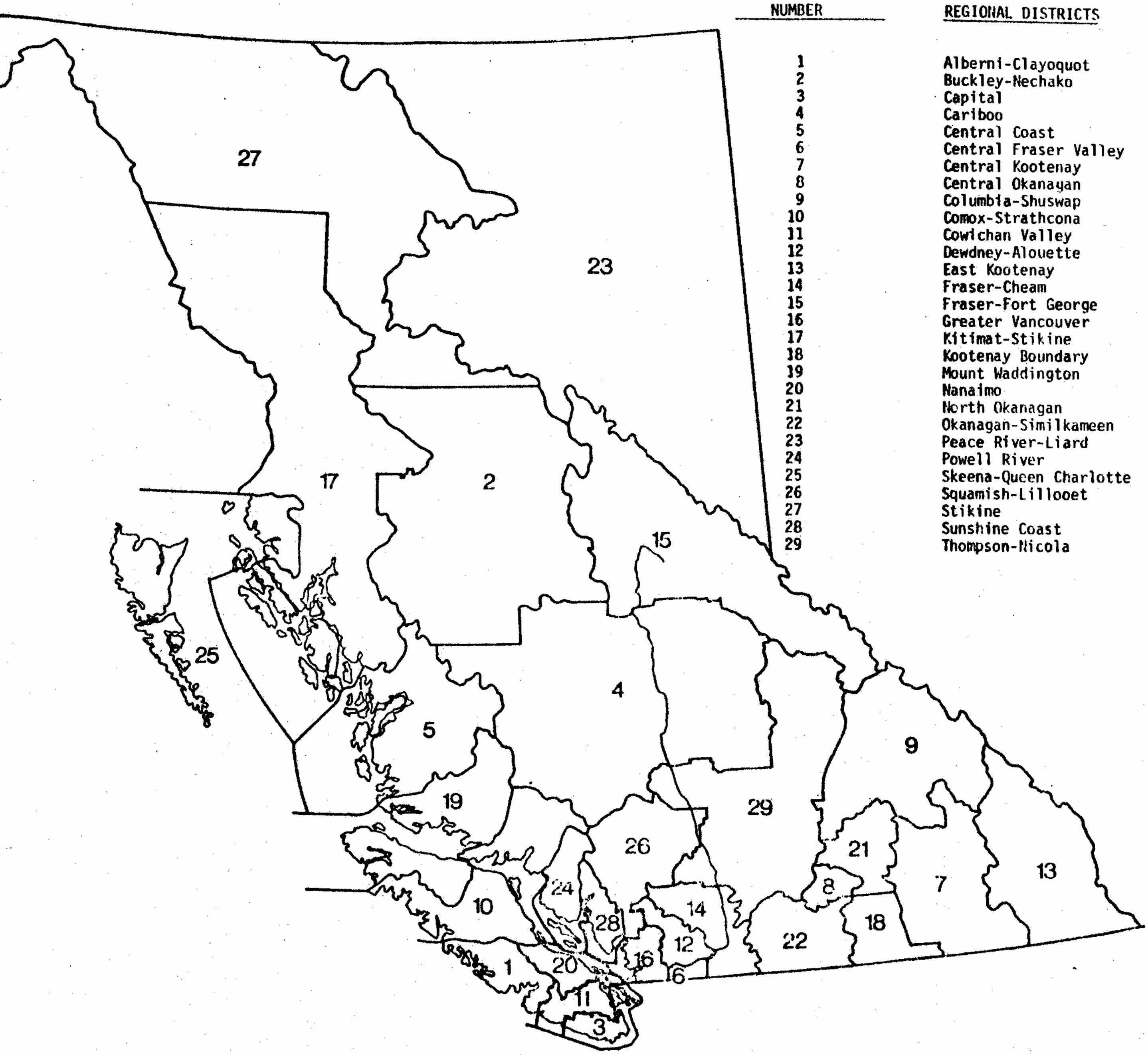
This approach may be applied to estimate camping demand to the British Columbia park system. It provides information useful for allocating investment and operation costs, and provides a means for identifying potential areas of campground developments for meeting expected demand or diverting demand pressures.

Finally, the approach developed in this study is believed to be a major contribution to the field of recreation in particular, and to inter-regional flow studies in general.

Appendix A

British Columbia Regional Districts

REGIONAL DISTRICTS



REGIONAL DISTRICT NUMBER	REGIONAL DISTRICTS
1	Alberni-Clayoquot
2	Buckley-Nechako
3	Capital
4	Cariboo
5	Central Coast
6	Central Fraser Valley
7	Central Kootenay
8	Central Okanagan
9	Columbia-Shuswap
10	Comox-Strathcona
11	Cowichan Valley
12	Dewdney-Alouette
13	East Kootenay
14	Fraser-Cheam
15	Fraser-Fort George
16	Greater Vancouver
17	Kitimat-Stikine
18	Kootenay Boundary
19	Mount Waddington
20	Nanaimo
21	North Okanagan
22	Okanagan-Similkameen
23	Peace River-Liard
24	Powell River
25	Skeena-Queen Charlotte
26	Squamish-Lillooet
27	Stikine
28	Sunshine Coast
29	Thompson-Nicola

Note: The following regional districts were not included in the study:

1. Alberni-Clayoquot	10. Comox-Strathcona	20. Nanaimo
3. Capital	11. Cowichan Valley	25. Skeena-Queen Charlotte
5. Central Coast	19. Mount Waddington	27. Stikine

Appendix B

Cities Considered Regional District Centers

District Number	Regional District	City
2	Buckley - Nechako	Smithers
4	Cariboo	Quesnel
6	Central Fraser Valley	Matsqui
7	Central Kootenay	Nelson
8	Central Okanagan	Kelowna
9	Columbia Shuswap	Salmon Arm
12	Dewdney - Alouette	Maple Ridge
13	East Kootenay	Cranbrook
14	Fraser - Cheam	Chilliwack
15	Fraser - Fort George	Prince George
16	Greater Vancouver	Vancouver
17	Kitimat - Stikine	Kitimat
18	Kootenay Boundary	Trail
21	North Okanagan	Vernon
22	Okanagan - Similkameen	Penticton
23	Peace River - Liard	Dawson Creek
24	Powell River	Powell River
26	Squamish - Lillooet	Squamish
28	Sunshine Coast	Gibson
29	Thompson - Nicola	Kamloops

Appendix C

The Data

The observations listed in this appendix are ordered by park and region. The first digit in the three digit numbers and the first two digits in the four digit numbers of identification column, PRID, identify the provincial park. The last two digits in the three or four digit numbers of column PRID identify the regional district. The identity numbers given to parks and regions are as follows:

ID.No.	Park	Park Location Reg. Dist. No.*	ID.No.	Regional District
1	Alice Lake	26	01	Buckley District
2	Backerville Historic	15	02	Cariboo
3	Beaumont	2	03	Central Fraser Valley
4	Bromley Rock	6	04	Central Kootenay
5	Canim Beach	4	05	Central Okanagan
6	Champion Lake	18	06	Columbia-Shuswap
7	Charlie Lake	23	07	Dewdney-Alouette
8	Crooked River	15	08	East Kootenay
9	Cultus Lake	6	09	Fraser-Cheam
10	E.C. Manning	22	10	Fraser-Fort George
11	Ellison	8	11	Greater Vancouver
12	Emory Creek	14	12	Kitimat-Stikine
13	Golden Ears	12	13	Kootenay Boundary
14	Goldpan	29	14	North Okanagan
15	Jimsmith Lake	7	15	Okanagan-Similkameen
16	Kettle River	18	16	Peace River-Liard
17	Kokanee Creek	7	17	Powell River
18	Lac La Hache	4	18	Squamish-Lillooet
19	Lakelse Lake	17	19	Sunshine Coast
20	Maclure Lake	2	20	Thompson-Nicola

* Reg. Dist. No. refers to Regional District Number as shown in Appendix A.

The variables shown below are defined as follows:

PRID = park-region identity vector

V = number of camper-night visits

D = distance between park and region

CS = number of campsites

P = population size

PRID	V	D	CS	P
101	1.00000	777.000	88.0000	31655.0
102	9.00000	472.000	88.0000	43969.0
103	248.000	98.0000	88.0000	67620.0
104	42.0000	468.000	88.0000	44748.0
105	30.0000	343.000	88.0000	62607.0
106	39.0000	392.000	88.0000	34739.0
107	200.000	81.0000	88.0000	43887.0
108	48.0000	596.000	88.0000	44580.0
109	113.000	110.000	88.0000	47413.0
110	15.0000	547.000	88.0000	81796.0
111	12483.0	55.0000	88.0000	0.112345E 07
112	6.00000	948.000	88.0000	60507.0
113	1.00000	450.000	88.0000	30010.0
114	6.00000	377.000	88.0000	36985.0
115	9.00000	304.000	88.0000	45419.0
116	9.00000	797.000	88.0000	48626.0
117	66.0000	199.000	88.0000	20066.0
118	1030.00	14.0000	88.0000	14615.0
119	81.0000	60.0000	88.0000	10548.0
120	30.0000	319.000	88.0000	91428.0
201	740.000	365.000	247.000	31655.0
202	2497.00	60.0000	247.000	43969.0
203	1200.00	434.000	247.000	67620.0
204	250.000	622.000	247.000	44748.0
205	1125.00	420.000	247.000	62607.0

206	485.000	384.000	247.000	34739.0
207	617.000	451.000	247.000	43887.0
208	363.000	691.000	247.000	44580.0
209	790.000	422.000	247.000	47413.0
210	3510.00	133.000	247.000	81796.0
211	12345.0	477.000	247.000	0.112345E 07
212	862.000	536.000	247.000	60507.0
213	289.000	604.000	247.000	30010.0
214	441.000	386.000	247.000	36985.0
215	645.000	459.000	247.000	45419.0
216	699.000	391.000	247.000	48626.0
217	180.000	657.000	247.000	20066.0
218	129.000	518.000	247.000	14615.0
219	24.0000	536.000	247.000	10548.0
220	2094.00	311.000	247.000	91428.0
301	755.000	150.000	49.0000	31655.0
302	251.000	153.000	49.0000	43969.0
303	208.000	529.000	49.0000	67620.0
304	56.0000	717.000	49.0000	44748.0
305	124.000	515.000	49.0000	62607.0
306	68.0000	479.000	49.0000	34739.0
307	81.0000	546.000	49.0000	43887.0
308	43.0000	625.000	49.0000	44580.0
309	81.0000	517.000	49.0000	47413.0
310	1686.00	80.0000	49.0000	81796.0
311	1446.00	572.000	49.0000	0.112345E 07
312	1287.00	321.000	49.0000	60507.0
313	92.0000	699.000	49.0000	30010.0
314	81.0000	482.000	49.0000	36985.0
315	48.0000	553.000	49.0000	45419.0
316	359.000	336.000	49.0000	48626.0
317	48.0000	743.000	49.0000	20066.0
318	16.0000	613.000	49.0000	14615.0
319	27.0000	631.000	49.0000	10548.0
320	316.000	406.000	49.0000	91428.0
401	4.00000	645.000	17.0000	31655.0
402	19.0000	339.000	17.0000	43969.0
403	193.000	148.000	17.0000	67620.0
404	42.0000	222.000	17.0000	44748.0
405	121.000	97.0000	17.0000	62607.0
406	8.00000	166.000	17.0000	34739.0
407	98.0000	165.000	17.0000	43887.0
408	42.0000	350.000	17.0000	44580.0
409	110.000	136.000	17.0000	47413.0
410	76.0000	415.000	17.0000	81796.0
411	1902.00	191.000	17.0000	0.112345E 07
412	26.0000	815.000	17.0000	60507.0
413	19.0000	204.000	17.0000	30010.0
414	30.0000	126.000	17.0000	36985.0
415	57.0000	58.0000	17.0000	45419.0
416	4.00000	671.000	17.0000	48626.0
417	45.0000	371.000	17.0000	20066.0
418	15.0000	232.000	17.0000	14615.0
419	15.0000	250.000	17.0000	10548.0
420	83.0000	126.000	17.0000	91428.0
501	8.00000	456.000	14.0000	31655.0

502	102.000	151.000	14.0000	43969.0
503	107.000	264.000	14.0000	67620.0
504	24.0000	452.000	14.0000	44748.0
505	233.000	250.000	14.0000	62607.0
506	16.0000	214.000	14.0000	34739.0
507	107.000	281.000	14.0000	43887.0
508	8.00000	522.000	14.0000	44580.0
509	24.0000	252.000	14.0000	47413.0
510	47.0000	226.000	14.0000	81796.0
511	1746.00	307.000	14.0000	0.112345E 07
512	24.0000	627.000	14.0000	60507.0
513	67.0000	434.000	14.0000	30010.0
514	55.0000	217.000	14.0000	36985.0
515	268.000	288.000	14.0000	45419.0
516	24.0000	482.000	14.0000	48626.0
517	16.0000	487.000	14.0000	20066.0
518	63.0000	348.000	14.0000	14615.0
519	4.00000	366.000	14.0000	10548.0
520	43.0000	141.000	14.0000	91428.0
601	35.0000	869.000	90.0000	31655.0
602	53.0000	564.000	90.0000	43969.0
603	172.000	372.000	90.0000	67620.0
604	655.000	42.0000	90.0000	44748.0
605	93.0000	250.000	90.0000	62607.0
606	22.0000	312.000	90.0000	34739.0
607	84.0000	389.000	90.0000	43887.0
608	89.0000	142.000	90.0000	44580.0
609	61.0000	360.000	90.0000	47413.0
610	84.0000	639.000	90.0000	81796.0
611	1609.00	415.000	90.0000	0.112345E 07
612	26.0000	1040.00	90.0000	60507.0
613	1371.00	20.0000	90.0000	30010.0
614	40.0000	283.000	90.0000	36985.0
615	71.0000	211.000	90.0000	45419.0
616	48.0000	895.000	90.0000	48626.0
617	13.0000	595.000	90.0000	20066.0
618	35.0000	456.000	90.0000	14615.0
619	5.00000	474.000	90.0000	10548.0
620	102.000	359.000	90.0000	91428.0
701	32.0000	537.000	58.0000	31655.0
702	157.000	382.000	58.0000	43969.0
703	69.0000	756.000	58.0000	67620.0
704	18.0000	944.000	58.0000	44748.0
705	92.0000	742.000	58.0000	62607.0
706	37.0000	706.000	58.0000	34739.0
707	41.0000	773.000	58.0000	43887.0
708	32.0000	852.000	58.0000	44580.0
709	13.0000	744.000	58.0000	47413.0
710	221.000	307.000	58.0000	81796.0
711	607.000	799.000	58.0000	0.112345E 07
712	24.0000	708.000	58.0000	60507.0
713	9.00000	926.000	58.0000	30010.0
714	74.0000	709.000	58.0000	36985.0
715	55.0000	779.000	58.0000	45419.0
716	1680.00	49.0000	58.0000	48626.0
717	9.00000	970.000	58.0000	20066.0

718	18.0000	840.000	58.0000	14615.0
719.	4.00000	858.000	58.0000	10548.0
720.	96.0000	633.000	58.0000	91428.0
801.	147.000	275.000	93.0000	31655.0
802.	94.0000	118.000	93.0000	43969.0
803.	144.000	494.000	93.0000	67620.0
804.	27.0000	682.000	93.0000	44748.0
805.	83.0000	480.000	93.0000	62607.0
806.	27.0000	444.000	93.0000	34739.0
807.	112.000	511.000	93.0000	43887.0
808.	48.0000	590.000	93.0000	44580.0
809.	45.0000	482.000	93.0000	47413.0
810.	3700.00	45.0000	93.0000	81796.0
811.	925.000	537.000	93.0000	0.112345E 07
812.	101.000	446.000	93.0000	60507.0
813.	16.0000	664.000	93.0000	30010.0
814.	37.0000	447.000	93.0000	36985.0
815.	37.0000	518.000	93.0000	45419.0
816.	112.000	211.000	93.0000	48626.0
817.	98.0000	695.000	93.0000	20066.0
818.	16.0000	578.000	93.0000	14615.0
819.	3.00000	596.000	93.0000	10548.0
820.	173.000	371.000	93.0000	91428.0
901.	185.000	674.000	296.000	31655.0
902.	172.000	369.000	296.000	43969.0
903.	6204.00	19.0000	296.000	67620.0
904.	123.000	365.000	296.000	44748.0
905.	141.000	240.000	296.000	62607.0
906.	47.0000	289.000	296.000	34739.0
907.	1343.00	36.0000	296.000	43887.0
908.	70.0000	493.000	296.000	44580.0
909.	9047.00	7.00000	296.000	47413.0
910.	277.000	440.000	296.000	81796.0
911.	46231.0	62.0000	296.000	0.112345E 07
912.	234.000	843.000	296.000	60507.0
913.	92.0000	347.000	296.000	30010.0
914.	64.0000	274.000	296.000	36985.0
915.	136.000	201.000	296.000	45419.0
916.	183.000	694.000	296.000	48626.0
917.	145.000	238.000	296.000	20066.0
918.	187.000	103.000	296.000	14615.0
919.	55.0000	121.000	296.000	10548.0
920.	432.000	216.000	296.000	91428.0
1001	59.0000	667.000	330.000	31655.0
1002	226.000	362.000	330.000	43969.0
1003	3702.00	97.0000	330.000	67620.0
1004	345.000	274.000	330.000	44748.0
1005	442.000	149.000	330.000	62607.0
1006	247.000	218.000	330.000	34739.0
1007	1704.00	114.000	330.000	43887.0
1008	217.000	402.000	330.000	44580.0
1009	2344.00	85.0000	330.000	47413.0
1010	374.000	437.000	330.000	81796.0
1011	36311.0	140.000	330.000	0.112345E 07
1012	147.000	839.000	330.000	60507.0
1013	138.000	256.000	330.000	30010.0

1014	282.000	178.000	330.000	36985.0
1015	832.000	110.000	330.000	45419.0
1016	164.000	693.000	330.000	48626.0
1017	236.000	311.000	330.000	20066.0
1018	213.000	176.000	330.000	14615.0
1019	211.000	199.000	330.000	10548.0
1020	424.000	209.000	330.000	91428.0
1101	93.0000	641.000	54.0000	31655.0
1102	159.000	336.000	54.0000	43969.0
1103	305.000	289.000	54.0000	67620.0
1104	73.0000	284.000	54.0000	44748.0
1105	1309.00	43.0000	54.0000	62607.0
1106	174.000	46.0000	54.0000	34739.0
1107	159.000	306.000	54.0000	43887.0
1108	161.000	344.000	54.0000	44580.0
1109	171.000	277.000	54.0000	47413.0
1110	484.000	412.000	54.0000	81796.0
1111	4775.00	332.000	54.0000	0.112345E 07
1112	217.000	813.000	54.0000	60507.0
1113	129.000	273.000	54.0000	30010.0
1114	1977.00	10.0000	54.0000	36985.0
1115	345.000	82.0000	54.0000	45419.0
1116	151.000	667.000	54.0000	48626.0
1117	73.0000	512.000	54.0000	20066.0
1118	20.0000	373.000	54.0000	14615.0
1119	35.0000	391.000	54.0000	10548.0
1120	708.000	86.0000	54.0000	91428.0
1201	101.000	616.000	34.0000	31655.0
1202	56.0000	311.000	34.0000	43969.0
1203	218.000	63.0000	34.0000	67620.0
1204	90.0000	329.000	34.0000	44748.0
1205	17.0000	203.000	34.0000	62607.0
1206	44.0000	231.000	34.0000	34739.0
1207	78.0000	80.0000	34.0000	43887.0
1208	123.000	457.000	34.0000	44580.0
1209	258.000	51.0000	34.0000	47413.0
1210	95.0000	386.000	34.0000	81796.0
1211	2305.00	106.000	34.0000	0.112345E 07
1212	84.0000	788.000	34.0000	60507.0
1213	23.0000	311.000	34.0000	30010.0
1214	28.0000	236.000	34.0000	36985.0
1215	23.0000	165.000	34.0000	45419.0
1216	67.0000	642.000	34.0000	48626.0
1217	67.0000	277.000	34.0000	20066.0
1218	95.0000	147.000	34.0000	14615.0
1219	28.0000	165.000	34.0000	10548.0
1220	117.000	158.000	34.0000	91428.0
1301	94.0000	692.000	351.000	31655.0
1302	39.0000	387.000	351.000	43969.0
1303	1667.00	27.0000	351.000	67620.0
1304	94.0000	667.000	351.000	44748.0
1305	62.0000	258.000	351.000	62607.0
1306	55.0000	307.000	351.000	34739.0
1307	3132.00	7.00000	351.000	43887.0
1308	62.0000	511.000	351.000	44580.0
1309	281.000	49.0000	351.000	47413.0

1310	249.000	462.000	351.000	81796.0
1311	36146.0	37.0000	351.000	0.112345E 07
1312	39.0000	863.000	351.000	60507.0
1313	16.0000	365.000	351.000	30010.0
1314	78.0000	292.000	351.000	36985.0
1315	70.0000	219.000	351.000	45419.0
1316	16.0000	712.000	351.000	48626.0
1317	55.0000	208.000	351.000	20066.0
1318	55.0000	78.0000	351.000	14615.0
1319	62.0000	96.0000	351.000	10548.0
1320	148.000	234.000	351.000	91428.0
1401	10.0000	541.000	14.0000	31655.0
1402	15.0000	236.000	14.0000	43969.0
1403	244.000	138.000	14.0000	67620.0
1404	10.0000	394.000	14.0000	44748.0
1405	30.0000	192.000	14.0000	62607.0
1406	35.0000	156.000	14.0000	34739.0
1407	127.000	155.000	14.0000	43887.0
1408	10.0000	464.000	14.0000	44580.0
1409	117.000	126.000	14.0000	47413.0
1410	86.0000	311.000	14.0000	81796.0
1411	1939.00	181.000	14.0000	0.112345E 07
1412	15.0000	712.000	14.0000	60507.0
1413	10.0000	376.000	14.0000	30010.0
1414	15.0000	159.000	14.0000	36985.0
1415	21.0000	230.000	14.0000	45419.0
1416	15.0000	567.000	14.0000	48626.0
1417	15.0000	361.000	14.0000	20066.0
1418	21.0000	222.000	14.0000	14615.0
1419	35.0000	240.000	14.0000	10548.0
1420	107.000	83.0000	14.0000	91428.0
1501	27.0000	779.000	28.0000	31655.0
1502	46.0000	635.000	28.0000	43969.0
1503	66.0000	500.000	28.0000	67620.0
1504	224.000	147.000	28.0000	44748.0
1505	46.0000	371.000	28.0000	62607.0
1506	50.0000	312.000	28.0000	34739.0
1507	42.0000	517.000	28.0000	43887.0
1508	783.000	4.00000	28.0000	44580.0
1509	42.0000	488.000	28.0000	47413.0
1510	54.0000	549.000	28.0000	81796.0
1511	875.000	543.000	28.0000	0.112345E 07
1512	42.0000	950.000	28.0000	60507.0
1513	57.0000	148.000	28.0000	30010.0
1514	46.0000	340.000	28.0000	36985.0
1515	50.0000	332.000	28.0000	45419.0
1516	35.0000	803.000	28.0000	48626.0
1517	11.0000	723.000	28.0000	20066.0
1518	8.00000	584.000	28.0000	14615.0
1519	8.00000	565.000	28.0000	10548.0
1520	123.000	383.000	28.0000	91428.0
1601	21.0000	729.000	48.0000	31655.0
1602	21.0000	425.000	48.0000	43969.0
1603	254.000	232.000	48.0000	67620.0
1604	69.0000	142.000	48.0000	44748.0
1605	913.000	103.000	48.0000	62607.0

1606	27.0000	172.000	48.0000	34739.0
1607	179.000	249.000	48.0000	43887.0
1608	41.0000	270.000	48.0000	44580.0
1609	82.0000	220.000	48.0000	47413.0
1610	96.0000	499.000	48.0000	81796.0
1611	3007.00	275.000	48.0000	0.112345E 07
1612	27.0000	900.000	48.0000	60507.0
1613	281.000	124.000	48.0000	30010.0
1614	158.000	136.000	48.0000	36985.0
1615	803.000	64.0000	48.0000	45419.0
1616	41.0000	755.000	48.0000	48626.0
1617	34.0000	455.000	48.0000	20066.0
1618	62.0000	316.000	48.0000	14615.0
1619	7.00000	334.000	48.0000	10548.0
1620	62.0000	210.000	48.0000	91428.0
1701	44.0000	879.000	112.000	31655.0
1702	75.0000	574.000	112.000	43969.0
1703	219.000	461.000	112.000	67620.0
1704	1540.00	12.0000	112.000	44748.0
1705	314.000	253.000	112.000	62607.0
1706	172.000	322.000	112.000	34739.0
1707	136.000	478.000	112.000	43887.0
1708	436.000	130.000	112.000	44580.0
1709	86.0000	449.000	112.000	47413.0
1710	136.000	649.000	112.000	81796.0
1711	2427.00	504.000	112.000	0.112345E 07
1712	55.0000	1050.00	112.000	60507.0
1713	1090.00	55.0000	112.000	30010.0
1714	247.000	286.000	112.000	36985.0
1715	289.000	214.000	112.000	45419.0
1716	72.0000	905.000	112.000	48626.0
1717	70.0000	605.000	112.000	20066.0
1718	80.0000	466.000	112.000	14615.0
1719	30.0000	484.000	112.000	10548.0
1720	451.000	360.000	112.000	91428.0
1801	313.000	412.000	83.0000	31655.0
1802	591.000	107.000	83.0000	43969.0
1803	561.000	266.000	83.0000	67620.0
1804	132.000	454.000	83.0000	44748.0
1805	336.000	252.000	83.0000	62607.0
1806	120.000	216.000	83.0000	34739.0
1807	384.000	283.000	83.0000	43887.0
1808	68.0000	524.000	83.0000	44580.0
1809	313.000	254.000	83.0000	47413.0
1810	1356.00	182.000	83.0000	81796.0
1811	4682.00	309.000	83.0000	0.112345E 07
1812	525.000	583.000	83.0000	60507.0
1813	93.0000	436.000	83.0000	30010.0
1814	177.000	219.000	83.0000	36985.0
1815	223.000	290.000	83.0000	45419.0
1816	468.000	438.000	83.0000	48626.0
1817	84.0000	489.000	83.0000	20066.0
1818	45.0000	350.000	83.0000	14615.0
1819	57.0000	368.000	83.0000	10548.0
1820	493.000	143.000	83.0000	91428.0
1901	806.000	142.000	155.000	31655.0

1902	217.000	447.000	155.000	43969.0
1903	121.000	821.000	155.000	67620.0
1904	74.0000	1009.00	155.000	44748.0
1905	121.000	806.000	155.000	62607.0
1906	50.0000	771.000	155.000	34739.0
1907	81.0000	838.000	155.000	43887.0
1908	90.0000	917.000	155.000	44580.0
1909	198.000	809.000	155.000	47413.0
1910	877.000	372.000	155.000	81796.0
1911	1683.00	864.000	155.000	0.112345E C7
1912	14291.0	29.0000	155.000	60507.0
1913	12.0000	991.000	155.000	30010.0
1914	112.000	773.000	155.000	36985.0
1915	50.0000	845.000	155.000	45419.0
1916	313.000	628.000	155.000	48626.0
1917	43.0000	1035.00	155.000	20066.0
1918	12.0000	905.000	155.000	14615.0
1919	6.00000	923.000	155.000	10548.0
1920	282.000	698.000	155.000	91428.0
2001	1822.00	10.0000	54.0000	31655.0
2002	274.000	295.000	54.0000	43969.0
2003	109.000	669.000	54.0000	67620.0
2004	34.0000	857.000	54.0000	44748.0
2005	104.000	654.000	54.0000	62607.0
2006	82.0000	619.000	54.0000	34739.0
2007	34.0000	686.000	54.0000	43887.0
2008	27.0000	765.000	54.0000	44580.0
2009	61.0000	657.000	54.0000	47413.0
2010	543.000	220.000	54.0000	81796.0
2011	1193.00	712.000	54.0000	0.112345E 07
2012	2173.00	181.000	54.0000	60507.0
2013	18.0000	839.000	54.0000	30010.0
2014	79.0000	621.000	54.0000	36985.0
2015	18.0000	693.000	54.0000	45419.0
2016	221.000	476.000	54.0000	48626.0
2017	30.0000	883.000	54.0000	20066.0
2018	13.0000	753.000	54.0000	14615.0
2019	4.00000	771.000	54.0000	10548.0
2020	169.000	549.000	54.0000	91428.0

Selected Bibliography

1. Acar, W. and Beaman, J. "A Method of Allocation of Recreation Supply to Urban Centres". Canadian Outdoor Recreation Demand (CORD) Study, Volume 2, Federal-Provincial Park Conference, 1976. CORD Technical Note No. 17.

2. Baker, K., Broderick, L., Malcolm, R. and Ward, M. Visitor Use Study of Skiing Facilities at Cypress, Manning and Mount Seymour Provincial Parks . Research Section, Planning Division, Parks Branch, Department of Recreation and Travel Industry, Victoria, British Columbia, Canada, August 1976.

3. Beaman, J. "Distance and the 'Reaction' to Distance as a Function of Distance". Journal of Leisure Research, 6 (3) : 220-231, 1974.

4. Beaman, J., Cheung, H.K., and Knetsch, J. "Obtaining Efficient Estimates of Park Use and Testing for The Structural Adequacy of Models". The Canadian Journal of Statistics, 5 (1) : 75-92, 1977.

5. British Columbia, Department of Economic Development. The Manual of Resources . Parliament Buildings, Victoria, British Columbia, 1974.

6. British Columbia, Department of Municipal Affairs. Statistics Relating to Regional and Municipal Governments in British Columbia . Victoria, British Columbia, Canada, June 1975.

7. British Columbia, Parks Branch. Data Handbook, Park Attendance . Planning Division, Department of Recreation and Travel Industry, Victoria, British Columbia, Canada, 1976.

8. British Columbia, Parks Branch. Data Handbook, Park Facilities . Research Section, Planning Division, Department of Recreation and Travel Industry, Victoria, British Columbia, Canada, 1977.

9. British Columbia Research. British Columbia Projections, 1974-1996, 1974.

10. Brown, W.G., and Nawas, F. "Impact of Aggregation on the Estimation of Outdoor Recreation Demand Functions". Am. J. Agr. Econ. 246-249, 1972/73.

Selected Bibliography (cont)

11. Bull, C.N. "Prediction of Future Daily Behaviors: An Empirical Measure of Leisure". Journal of Leisure Research, 4 (2) : 119-128, 1972.

12. Buse, A., and Choo, J. "Notes on a Model of Park Use". Research Paper No. 78-19, The Department of Economics, The University of Alberta, Edmonton, Alberta, Canada, August 1978.

13. Carruthers, G.E. "An Analysis of Public Investment in Iowa State Parks and Recreation Areas". Doctor of Philosophy Dissertation, Iowa State University, Ames, Iowa, U.S.A., 1968.

14. Cesario, F.S. "A Combined Trip Generation and Distribution Model". Transport. Sci. 9, 211-223, 1975.

15. —— "A New Method of Analyzing Outdoor Recreation Trip Data". Journal of Leisure Research, 7 (3) : 200-215, 1975.

16. —— "Value of Time in Recreation Benefit Studies". Land Economics, 52 (1) : 32-41, February 1976.

17. —— "A New Interpretation of the 'Normalizing' or 'Balancing' Factors of Gravity-Type Spatial Models". Socio-Econ. Plan. Sci., 11, 131-136, 1977.

18. Cesario, F.S., and Knetsch, J.L. "A Recreation Site Demand and Benefit Estimation Model". Regional Studies, 10, 97-104, 1976.

19. Cesario, F.J., and Knetsch, J.L. "Time Bias in Recreation Benefit Estimates". Water Resources Res. 6 (3) : 700-704, 1970.

20. Cheung, H.K. "A Day-Use Park Visitation Model". Journal of Leisure Research, 4 (2) : 139-156, 1972.

21. Cheung, H.K., Smith, S., and Beaman, J. "A Method for Predicting Enroute Overnight Park Use". Canadian Outdoor Recreation Demand (CORD) Study, Volume 2, Federal-Provincial Park Conference, 1976. CORD Technical Note No. 18.

22. Chow, G.C. "Tests of Equality Between Sets of Coefficients in Two Linear Regressions". Econometrica, 28 (3) : 591-605, 1960.

Selected Bibliography (cont)

23. Davos. N.H.W. "Some Methods of Analyzing Cross-Classified Census Data. The Case of Labour Force Participation Rates". Dominion Bureau of Statistics, Special Labour Force Studies, Series B, No. 3, Ottawa, Province of Quebec, Canada, July 1969.

24. Ellis, J., and Van Doren, C. "A Comparative Evaluation of Gravity and Systems Theory for Statewide Recreational Flows". Journal of Regional Science, 6 (2) : 57-70, 1966.

25. Fisher, F.M. "Tests of Equality Between Sets of Coefficients in Two Linear Regressions: An Expository Note". Econometrica, 38 (2) : 361-366, 1970.

26. Gearing, C.E., Swart, W.W., and Var, T. "A Simplified Procedure for Estimating the Market Attraction of a Touristic Area". Paper presented at the Travel Research Association Meeting, Boca Raton, Florida, U.S.A., June 1976.

27. Glejser, H. "A New Test for Heteroskedasticity". Journal of the American Statistical Association, 64, 317-323, 1969.

28. Goeldner, C., Gearing, C., Swart, W., and Var, T. "Bibliographic Sources for Travel and Tourism Research". Revue de Tourisme, September 1974, pp. 102-109.

29. Goldfeld, S., and Quandt, R.E. "Some Tests for Homoscedasticity". Journal of the American Statistical Association, 60, 539-547, 1965.

30. Goodchild, M.F. "Statistical Considerátions Using Gravity Type Models to Explain Visitor Flows". Canadian Outdoor Recreation Demand (CORD) Study, Volume 2, Federal-Provincial Park Conference, 1976. CORD Technical Note No. 35.

31. Gujarati, D. "Use of Dummy Variables in Testing for Equality Between Sets of Coefficients in Linear Regressions: A Generalization". The American Statistician, December 1970.

32. Hill, M., and Shecter, M. Optimal Goal Achievement in the Development of Outdoor Recreation Facilities in Urban and Regional Planning, edited by A.G. Wilson. Pion Limited, 1971.

Selected Bibliography (cont)

33. Johnston, J. "Econometric Methods". 2nd edition, McGraw-Hill, New York, 1972.

34. Knetsch, J.L. "Displaced Facilities and Benefit Calculations". Land Economics, 53 (1) : 123-129, February 1977.

35. —— "Outdoor Recreation and Water Resources Planning". Water Resources Monograph (3), American Geophysical Union, Washington, D.C., 1974.

36. Knetsch, J.L., and Cheung, H.K. "Economic Value of Recreation Areas: The Case of Saskatchewan Parks". Canadian Journal of Agricultural Economics, 24 (1) : 67-71, 1976.

37. Knopp, T.B. "Environmental Determinants of Recreation Behavior". Journal of Leisure Research, 4 (2) : 129-138, 1972.

38. Maddala, G.S. Econometrics. McGraw-Hill, New York, 1977.

39. Maki, D.R., and Beck, R.A.D. "Recreational Programming: A British Columbia Example". Discussion Paper, 75-5-2, Department of Economics and Commerce, Simon Fraser University, Burnaby, British Columbia, Canada, 1975.

40. Malcolm, R.R. Park Resource Information Handbook. Research Section, Planning Division, Department of Recreation and Travel Industry, Victoria, British Columbia, Canada, August 1976.

41. Nuttall, G. "Estimating Day-Use Visitation of Public Parks". Master of Arts Thesis, Department of Economics and Commerce, Simon Fraser University, Burnaby, British Columbia, Canada, 1977.

42. Parks Canada Staff and Consultants. "Canadian Outdoor Recreation Demand Study. Volume 1 : An Overview and Assessment". Federal-Provincial Parks Conference, 1976.

43. —— "Canadian Outdoor Recreation Demand Study. Volume 3: Data Collection and Documentation". Federal Provincial Parks Conference, 1976.

Selected Bibliography (cont)

44. Pindyck, R.S., and Rubinfeld, D.L. Econometric Models and Economic Forecasts. McGraw-Hill, New York, 1976.

45. Prescott, B.H. "An Examination of Camper Nights Generated by the City of Vancouver". Unpublished Paper, February 1977.

46. —— Day Use Information Collection. Research Section, Planning Division, Parks Branch, Ministry of Recreation and Conservation, Victoria, British Columbia, Canada, December 1976.

47. Swart, W.W., Var, T., and Gearing, C.E. "Operations Research Applications to Tourism". Discussion Paper 78-2-2, Department of Economics and Commerce, Simon Fraser University, Burnaby, British Columbia, Canada, 1978.

48. Var, T., Beck, R.A.D., and Loftus, P. "Determination of Touristic Attractiveness of the Touristic Areas in British Columbia". Discussion Paper, 76-2-1, Department of Economics and Commerce, Simon Fraser University, Burnaby, British Columbia, Canada, 1976.

49. Var, T., and Nuttall, G. "Day-Use Attraction of Public Parks". Paper presented at the Western Economic Association Meeting, San Francisco, California, June 1976.