THE UNIVERSITY OF MANITOBA

THE ESTIMATION OF DEMAND FOR AND BENEFITS DERIVED FROM OUTDOOR RECREATION AT PROPOSED SITES IN THE SOURIS RIVER BASIN, MANITOBA

by

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A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF DOCTOR OF PHILOSOPHY

DEPARTMENT OF AGRICULTURAL ECONOMICS

WINNIPEG, MANITOBA

MAY, 1974

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ACKNOWLEDGEMENTS

I am indebted to my colleagues in the Department of Agricultural Economics for the helpful criticisms which they provided throughout the course of this study. I am also deeply grateful to my supervisor, Dr. R.E. Capel, and the other members of my thesis committee, Drs. A.W. Wood, W.T. Craddock and M.E. Laub. Their guidance and criticisms were invaluable to this study. My gratitude also goes out to Mr. H. Neil Nixon, of the Manitoba Department of Tourism and Recreation. Neil readily placed his data at my disposal for building and testing my models.

Finally, words can hardly convey my appreciation for the contribution of my wife, Betty Anne, to this study. Inspite of working full time at her profession, Betty Anne again undertook the onerous task of typing and editing the many drafts of this manuscript. Most important, she provided the strong moral support that was so essential for bringing this program to a successful conclusion.

"Dedicated to Betty Anne, Mater and Carol."

ABSTRACT

Estimation of demand for and benefits derived from recreation areas at proposed sites in the Souris River Basin, Manitoba.

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Recreation areas in the Souris River Basin are scarce and relatively unattractive. Although this basin is semi-arid and experiences periodic drought, the spring run-off through the Souris River and her tributaries is very high. The construction of dams at suitable locations along the water course, may augment the moisture supply during the growing season and also provide a recreation potential that has hitherto been unrealized. Several damsites have been recommended for agricultural uses. However, if these reservoirs are suitably built, outdoor recreation may be a valuable by-product.

The main objectives of this study were to develop outdoor recreation demand models for recreationists from Winnipeg, Brandon and Southwest Manitoba, and to estimate and project demand for and benefits derived from recreation sites at four of the proposed reservoirs. Projections of demand cover the periods 1980 and 1990. Secondary objectives included the indentification of important variables associated with outdoor recreation demand in Manitoba and the determination of the main users of outdoor recreation facilities.

The method employed in this study is a modified version of the basic Hotelling-Clawson approach. Instead of being site-specific, the model is origin-specific. Hence recreation areas become the observational units. While this approach avoids some of the biases inherent in previous work, it also permits the inclusion of instrumental variables such as location

and site characteristics.

Separate models were developed for each origin or sample area, and for each age class within an origin. The number and location of recreation areas, and the water related facilities found in these areas were significantly related to demand.

While the coefficients in the Winnipeg and Brandon models were not significantly different, these coefficients were significantly different from those of southwest Manitoba. Indeed, demand and participation rates were higher in the urban areas, particularly in Brandon. No statistical difference was found among age classes from the same origin.

Unlike their rural counterparts, recreationists from urban areas were more inclined to travel great distances. Rural recreationists generally confined their visitation within 30 road miles of their residence. To the extent that the recreationists from the rural areas belonged to a lower economic class, it was concluded that, ceteris paribus, a larger proportion of recreationists from the lower income classes frequent the proximal rather than the more distant recreation areas.

Of the proposed recreation sites, the largest number of (household) visits are projected for the Nesbitt reservoir - 65028 - 68300 visits in 1980. Most of these users will come from Winnipeg and Brandon. In contrast, the estimated number of visits to the High Souris site range from 23325 to 25816; at the Patterson-Coulter sites 17886 to 20058 visits are anticipated over the same time period.

Estimated benefits per (household) visit vary from a high of \$3.39 - \$8.11 at the Patterson-Coulter sites, to \$1.58 - \$3.82 at the Nesbitt site, and \$1.43 - \$3.40 at the High Souris site. Projected benefits per visitor-day are \$0.41 - \$1.00, \$0.27 - \$0.65 and \$0.24 - \$0.58 at the Patterson-Coulter, Nesbitt and High Souris sites, respectively.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDIX TABLES

LIST OF FIGURES

Chapter I

INTRODUCTION

The Problem

Recreation areas in the Souris River Basin are scarce and relatively unattractive, when compared to other areas in the Province of Manitoba. This scarcity is due partly to the climate and partly to the soil type in this region. The basin is located in the southwestern corner of the Province and is characterized as a semi-arid grassland, with a hard and rather impermeable top soil. Since precipitation is low during the agricultural growing season, periodic drought is a common phenomenon.

In spite of the regular water deficiency, the Souris River which drains the Basin, has a very high spring run-off. Consequently, the presence of various damsites along this river and its tributaries provides a recreation potential that has hitherto been untapped. Reservoirs that have been proposed are designed for the sole purpose of augmenting the agricultural water supply with no consideration for possible recreational uses. Yet, outdoor recreation need not seriously conflict with agricultural water requirements, especially if the reservoir is suitably designed. This lack of foresight on the part of planners is due either to an unwillingness or inability to recognize that outdoor recreation can be a viable by-product of reservoir construction.

Given that outdoor recreation yields social benefits and given the unique character of the Souris River Basin, the decision as to whether outdoor recreation should be an output of the reservoir will depend on the demand for outdoor recreation and the net social benefits which will flow from the proposed recreation area. Estimates of the demand, benefits and costs are therefore crucial ingredients in the decision making process. Demand measures potential use and net benefits indicate the economic feasibility of investing funds in the outdoor recreation component of the reservoir.

One of the main reasons for deriving the demand function for outdoor recreation is to estimate the (direct) economic benefits or value of the recreation resource. Market value is usually established through the price mechanism. Therefore an econometric model of demand which includes, inter alia, the price of a good or service is a useful tool for measuring value. Unfortunately, in the case of outdoor recreation, the econometric model of demand does not provide a blue print for estimating benefits. Usually, there are no explicit prices because outdoor recreation is treated as a public good. Where prices exist they do not ration access; they are nominal and well below the average benefits which flow to the individual consumer and the society at large. Consequently, the "market price" under-estimates the value of the resource to society.

In the absence of market prices, a non-existent market has to be simulated. The procedure adopted and the interpretation of the results are critical. Within the context of Pareto efficiency, use of perfectly competitive market prices would yield the best estimate of economic value of the resources to society. Since outdoor recreation is administered as a public good, the market price can only be approximated. The transfer costs incurred in the pursuit of outdoor recreational experiences may be such an approximation. To the extent that these costs are related solely to outdoor recreation, they give reasonable estimates.

Objectives

The main objectives of this study are the following:

1. To develop outdoor recreation demand models for the recreationists from Winnipeg, Brandon and Southwest Manitoba based on a 1969 recreation survey;

2. To estimate and project the demand for and benefits derived from outdoor recreation at some of the reservoirs proposed for the Souris River and her tributaries. These projections cover the periods 1980 and 1990.

There are also some subsidiary objectives. They include:

3. To identify the important factors associated with demand for outdoor recreation in Manitoba; and

4. To determine the main users of outdoor recreation facilities. Are they urban or rural residents?

Hypotheses

It is hypothesized that:

1. Visitation rates are inversely proportional to required travel distance. Hence intermediate areas are more frequently visited than the more remote resource-based areas.

2. Outdoor recreation demand increases with age, reaching a peak in the middle age groups[1], and declining thereafter.

3. The principal users of outdoor recreation are urban residents.

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[1] Defined in Chapter IV.

4. The greater the proximity of recreatinn areas to population centers, the greater is the proportion of visitors from the lower economic stratum. Conversely, the greater the required travel distance, the greater is the proportion of visitors from the middle and upper economic strata.

Outline of Study

This study is divided into several chapters. A theory of consumer behavior is outlined in Chapter II. In addition, there is discussion of the concept of consumers' surplus and the procedures that have been employed in the estimation of benefits of public projects. Chapter III contains a review of the literature on conceptual and empirical problems encountered in estimating demand and benefits. On the basis of this review, a conceptual model is presented in Chapter IV. This model employs the generally accepted procedures of demand estimation and also incorporates ideas for dealing with some of the problems that are still unresolved in the literature studied.

To facilitate hypotheses testing, a description of the survey, and characteristics of the respondents and the recreation areas is given in Chapter V. Some of the characteristics of respondents studied include age, family size, occupation and ownership of material possessions. The analysis and results are presented in Chapter VI. Chapter VII is devoted to the estimation and projection of demand and benefits. Finally, the summary and conclusions reached, and the implications for further research are brought together in Chapter VIII.

Chapter II

THEORY OF CONSUMER BEHAVIOR

The Role of Price

According to the conventional theory of consumer behavior, it is presumed that the consumer is rational and that he attempts to maximize satisfaction or utility within a finite budget constraint. The assumption of rationality implies that the consumer has full knowledge of the alternatives available to him, and that he is able to evaluate and rank these in order of personal tastes and preferences. The ranking is ordinal, anti-symetric, consistent or transitive, monotonic increasing and complete.[1]

The ranking or ordering of preferences can be expressed in terms of a utility function U:

(1) $U_i = U(x_{i1}, x_{i2}, \ldots x_{in})$

where U_i is the utility of the i^{th} individual, $x_{i1}, x_{i2}, \ldots x_{in}$ are the quantities of goods $X_1, X_2, \ldots X_n$, respectively, that are consumed by the i^{th} individual. The function is assumed to be continuous having first and second order partial derivatives. He gains utility from the consumption of these goods and he attempts to maximize this utility subject to the budget constraint M_i given in (2):

(2) $M_i = p_1x_{i1} + p_2x_{i2} + \ldots + p_nx_{in}$

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[1] Antisymmetry - if A is preferred to B, then B cannot be simultaneously preferred to A. Consistency - if A is preferred to B and B is preferred to C, then A is preferred to C. Monotonic increasing implies that a bigger bundle of goods is always preferred to a smaller bundle.

where p_1, p_2, ... p_n are the unit prices of X_1, X_2, ... X_n, respectively. Using equations 1 and 2 the Lagrangean expression V can be constructed:

$$(3)\quad V = U(x_{i1}, x_{i2}, \ldots x_{in}) + \lambda\,(M_i - p_1x_{i1} - p_2x_{i2} - \ldots - p_nx_{in})$$

where λ is a Lagrangean multiplier, V is a function of x_i and λ ; V is also equal to U_i when all his income, M_i, is exhausted, i.e. when $M_i - P_1x_{i1} - p_2x_{i2} - \ldots - p_nx_{in} = 0$.

The first order conditions of maximization can be obtained by differentiating equation 3 with respect to x_{i1}, x_{i2}, ... x_{in} and λ , and setting the partial derivatives equal to zero. These partials are given in (4) below:

$$(4)\quad \frac{\partial V}{\partial x_{ij}} = U_j - \lambda\, p_j = 0 \qquad\qquad j = 1, 2, \ldots n$$

$$\frac{\partial V}{\partial \lambda} = M_i - p_jx_{ij} = 0$$

where $U_j = \dfrac{\partial U_i}{\partial x_{ij}}$. By transferring the second term of the first n equations in (4) to the right hand side and dividing both sides of each of the n equations by their corresponding price, the first order condition is obtained:

$$(5)\quad \frac{U_1}{p_1} = \frac{U_2}{p_2} = \ldots = \frac{U_n}{p_n} = \lambda.$$

Assuming that the second order condition is met ($\frac{d^2U}{dx_{ij}}2 < 0$, j = 1, 2, ... n)[1], the consumer maximizes satisfaction by equating the ratios of the marginal utilities (U_1, U_2, ... U_n) and their related prices. Prices can therefore serve as measures of relative value at the margin.

On the supply side, under perfectly competitive conditions, the entrepreneur attempts to maximze output (minimize cost) subject to a cost (output) constraint. The solution to this constrained maximization

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[1] J.A. Henderson and R.E. Quandt, Microeconomic Theory (Toronto: McGraw Hill Book Co., 1958), p. 13.

problem is analogous to that of the consumer model illustrated above. In equilibrium, (in the production of each commodity) he equates the ratios of the marginal products, f, and prices, r, for all factors.

$$(6)\quad \frac{f_1}{r_1} = \frac{f_2}{r_2} = \ldots, = \frac{f_m}{r_m} = \mu$$

where $f_1, f_2, \ldots f_m$ are the marginal physical products of factors 1, 2, ...m used in the production of good X, and μ is a Lagrangean multiplier.

Ultimately, a main objective of many entrepreneurs is profit maximization. If the first and second order conditions[1] are met, each factor will be paid its marginal value product. In other words, the following condition holds:

$$(7)\quad p_j f_1 = r_1,\ p_j f_2 = r_2,\ \ldots,\ p_j f_m = r_m \quad \text{for } j = 1, 2, \ldots n.$$

Thus the prices of factors, r, can be taken as measures of marginal values of resources. Therefore, both in production and consumption, prices - product and factor - can serve as measures of value at the margin.

The Demand Schedule

From the utility function, it is but a short step to the derivation of the consumer's demand function. Given all prices and income M_i in (4), there are n + 1 equations consisting of n + 1 variables, $(x_{i1}, x_{i2}, \ldots x_{in}, \lambda)$. One can therefore solve for the quantities

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[1] The second order conditions of profit maximization require that the principal minors of the Hessian determinant alternate in sign.

$$(-1)^m \begin{vmatrix} f_{11} & f_{12} & \cdots & f_{1m} & r_1 \\ f_{21} & f_{22} & \cdots & \cdot & r_2 \\ \vdots & \vdots & & \vdots & \vdots \\ f_{m1} & \cdot & \cdots & f_{mm} & r_m \\ r_1 & r_2 & \cdots & r_m & 0 \end{vmatrix}$$

which give the consumer maximum satisfaction. The quantity of X_j demanded by the i^{th} consumer can be specified as follows:

$$(8)\ x_{ij} = f(p_1, p_2, \ldots p_j, \ldots p_n, M_i)$$

where $i = 1, 2, \ldots N$, and $j = 1, 2, \ldots n$. Assuming independence of individual demand schedules, the aggregate demand schedule for the j^{th} good is simply the horizontal sum of the individual demand schedules:

$$(9)\ X_j = \sum_{i=1}^{N} x_{ij}.$$

The demand schedule obtained in equation 8 is a maximum concept of price-quantity relationships. It illustrates the maximum quantities of goods and services that the consumer is willing to buy at given prices per unit time. Alternatively, it represents maximum prices which the consumer is willing to pay for given quantities of goods and services per unit time. (It is a single valued function of prices and income, i.e. the quantity demanded is unique for a given set of prices and income.)[1] The function is homogeneous of degree zero with respect to prices and income. Thus proportionate changes in prices and income leave demand unchanged, i.e. money illusion does not exist.

Demand schedules are usually negatively sloped indicating that purchases are greater at lower prices. This inverse relationship is the resultant of two forces - a substitution effect and an income effect. As the price of a good changes, relative prices change and the consumer therefore substitutes goods that have experienced price decreases for goods that have experienced price increases; this is the substitution

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[1] Ibid. p. 21.

effect. A price change is accompanied by a change in real income, if money income remains constant; this change in real income results in the purchase of a smaller or larger bundle of goods and services.

The effect of simultaneous changes in relative prices and income can be measured by taking the total derivative of equation 4. A change in the purchase of the j^{th} good resulting from a change in its own price can be represented[1] as:

$$(10) \quad \frac{\partial x_{ij}}{\partial p_j} = \left(\frac{\partial x_{ij}}{\partial p_j}\right)_{U = \text{constant}} - x_{ij}\left(\frac{\partial x_{ij}}{\partial M_i}\right)_{\text{prices = constant.}}$$

The first term on the right represents the substitution effect caused by the price change, the level of utility remaining unchanged. The second term on the right measures the income effect, relative prices remaining unchanged.

The substitution effect is always negative.[2] However the income effect may be positive or negative. When the income effect is positive the good is described as a "normal" good. When the income effect is negative the good is called "inferior". Both forces - substitution and income effects - operate in concert for normal goods. For inferior goods the two forces work in opposition.

Consumers' Surplus and Compensated Demand Schedules

Consumers' surplus is considered an important element in the social evaluation of projects which exhibit nonmarginal changes in supply. Marshall defines a consumer's surplus as the differential between the price the consumer is willing to pay and what he actually pays.[3]

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[1] Ibid. p. 24.

[2] Ibid. p. 26.

[3] A. Marshall, Principles of Economics (London: MacMillan and Co. Ltd., 1961), p. 103.

It is an all-or-nothing concept in that it restricts the consumer to a specific price-quantity relationship. This definition is somewhat unsatisfactory since it implies that the quantity purchased at the ruling price and the maximum price he is willing to pay is the same. However this need not be the case.

To illustrate[1] this point, assume that an individual was purchasing x units of commodity X prior to the introduction of a new law which says that he must buy a license in order to purchase X. Then he would be unwilling to pay the same price for the license if he must purchase the same quantity x, instead of buying as much as he wants. The obvious reason is that purchasing the license lowers his real income hence purchasing power, and he will be willing to purchase less of X as long as the income elasticity of demand is positive.

The consumers' surplus is the amount of revenue which a perfectly discriminating monopolist can capture. It occurs in both private and public sectors as illustrated in Figure 1. The demand and supply schedules are represented by DD_1 and SS_1, respectively. If the good is sold at price OP, then the value of the good is the sum of the consumers' surplus PDE and the market value $OPED_o$. Net value to society is the sum of the areas SPE and PDE, i.e. area SDE. If the good is provided at zero price, but there are travel costs associated with its consumption, say $OPED_o$, then the consumer surplus is PDE. The imputed value of the road and vehicle is given by the area $OPED_o$.

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[1] E.J. Mishan, Cost Benefit Analysis (London: George Allen and Unwin Ltd., 1971), p. 325.

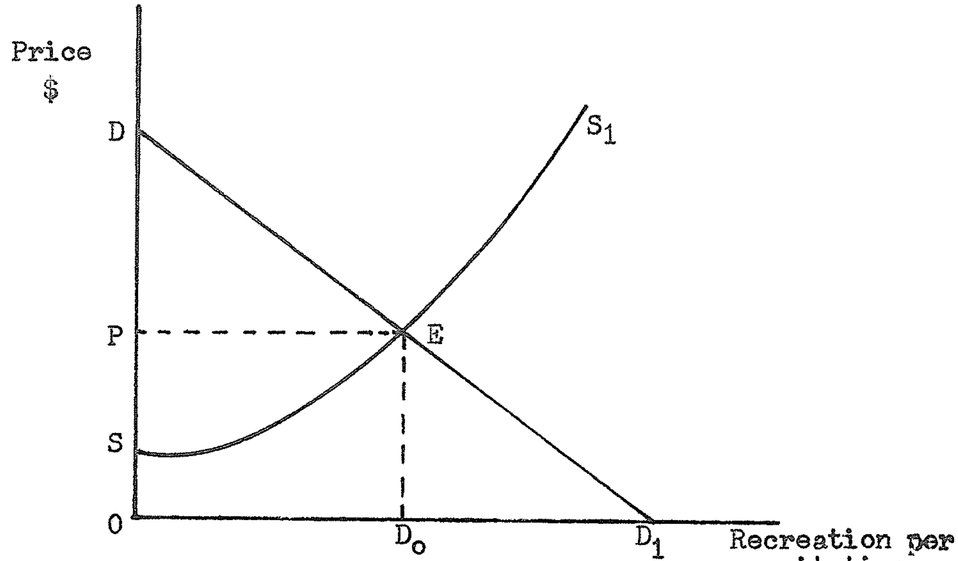

Figure 1

Consumers' Surplus

At the root of Marshall's problem is the difficulty of translating changes in real income into money income. This relationship is illustrated in Figure 2.

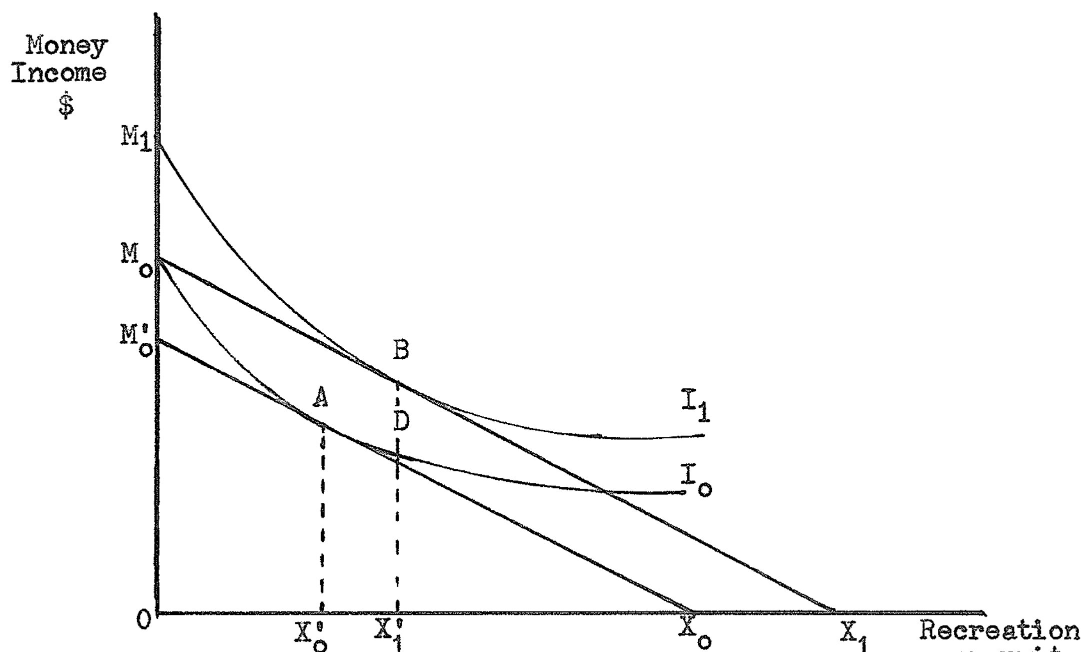

Figure 2

Relationship between Real and Money Income at a Proposed Park

The horizontal axis X measures the expected consumption of recreation at a proposed park and the vertical axis measures the recreationist's money income, M. This park is introduced at given prices depicted by budget constraint M_oX_1. His indifference curves are illustrated by I_o and I_1. Initially, the recreationist is at M_o on indifference curve I_o; I_o reflects the real income corresponding to his initial income, OM_o. Now, after the park is opened, the recreationist moves from M_o to point B on the higher indifference curve I_1, where he chooses to consume OX_1' units of recreation at the prevailing price structure. Clearly, there is a gain in real income equal to the difference between I_1 and I_o, i.e. BD. The main problem now is to convert this gain in real income into money income. Marshall assumes that the marginal utility of money, MU_m, is constant, therefore the indifference curves are vertically parallel. Therefore, at both B and D, the marginal rates of substitution of money for recreation, MRS_{xm}, are equal. Similarly, at B and D, the ratio of the marginal utility of money and the price of money is equal to ratio of the marginal utility of recreation and the price of recreation, i.e. $MU_m/P_m = MU_x/P_x$. Now, because on every indifference curve $MRS_{xm} = MU_x/MU_m = P_x/P_m = P_x$ for every X, where $P_m = 1$, the set of indifference curves can be represented by a single MRS curve which becomes the demand durve for X.

To circumvent the difficulties encountered by Marshall, Hicks[1] made a clear distinction between the income and substitution effects. By holding real income constant he was able to dispense with the restrictive assumption of constant marginal utility of money. He then proceeded to describe four measures of surplus - compensating and equivalent variation, and compensating and equivalent surplus. It is the first two that are of immediate concern here. For an existing site, the compensating variation, CV, is the

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[1] J.R. Hicks, A Revision of Demand Theory (London: Oxford University Press, 1956).

maximum price the recreationist is willing to pay to retain the option of visiting the recreation area and still maintain his initial level of welfare. The equivalent variation, EV, is the minimum bribe or compensation which the recreationist would accept for losing the option of visiting the recreation area and still be as well off as he was with visiting privileges. The CV is given by the amount $M_o'M_o$ in Figure 2, because $M_o'M_o$ represents the maximum income he is willing to sacrifice in order to visit the new area and yet maintain his initial level of indifference, I_o. At the maximum price corresponding to $M_o'M_o$, he will consume OX_o' units of recreation at the new park.

The EV is M_oM_1. This is the minimum bribe or compensation which the recreationist would accept for the loss of visiting privileges to the new park. His new money income OM_1, i.e. $OM_o + M_oM_1$, enables him to reach indifference curve I_1 even though visiting privileges are lost . Therefore, he is just as well off as he would have been with income OM_o and some consumption of recreation, i.e. OX_1'. As long as the income elasticity of demand is posivive B will lie to the right of A, and EV $>$ CV. Conversely, if the income elasticity of demand is negative, B will lie to the left of A and CV $>$ EV.

From an analysis of indifference curves, it is possible to derive demand schedules, and express the consumer's surplus in terms of these schedules. These relationships are illustrated in Figure 3.

Consider the top diagram. Let X represent units of recreation and M the money income of the recreationist. Initially, his income is OM_o. At price P_o, represented by the absolute value of the slope of M_oP_o, he is in equilibrium at A on indifference curve I_o, where he is consuming OX_o' units of recreation. The slope of M_oP_o is the ratio of the prices of X and M, i.e. P_x, where P_m the numeraire is one. If the price is reduced

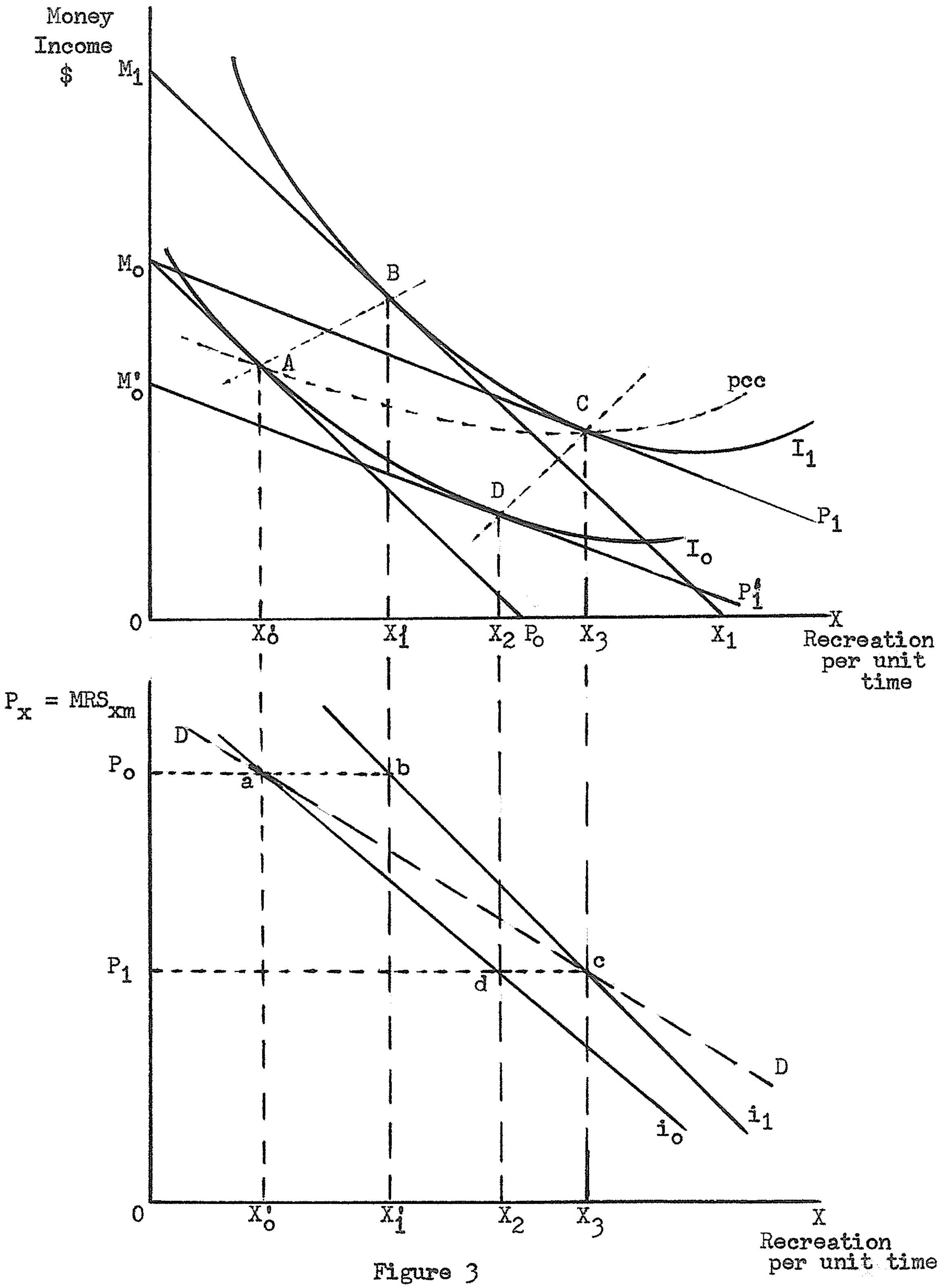

Figure 3

Consumers' Surplus, Compensated and Uncompensated Demand Schedules to P_1 given by the absolute value of the slope of M_oP_1, consumption will rise to OX_3 units and welfare is increased to I_1. What is the money equivalent of this gain?

The line $M_o'P_1'$ is drawn parallel to M_oP_1 and is tangential to I_o at D. ($X_o'X_2$ measures the substitution effect of the price change and X_2X_3 the income effect.) Now, given the new price P_1, if $M_o'M_o$ is paid by the recreationist, he will be no worse off than before the price decrease. (He will be at D on I_o having less income, OM_o', but consuming more units of recreation, OX_2.) On the other hand, M_oM_1, represents the EV; it is the minimum bribe or compensation which, if paid to the recreationist for the loss of OX_3 - OX_1' units of recreation, will enable him to still obtain the full benefits of the price decrease. (He is just as well off at B on I_1 with OM_1 income and OX_1' units of recreation as he would at C with OM_o income and OX_3 units of recreation.) If the price movement should be completely reversed, M_oM_1 would measure the CV and $M_o'M_o$ would be the EV. Thus, the CV for a price rise is identical to the EV for a price fall and the CV for a price fall is identical to the EV for a price rise.

In the lower diagram, the vertical axis measures the marginal rate of substitution of X for M, i.e. MRS_{xm}. Since in equilibrium $MRS_{xm} = P_x$, it also represents the price of X. The schedules i_o and i_1 correspond to the negative slopes of I_o and I_1. They are the compensated demand schedules which embody only the substitution effects of price changes. (Note that real income is held constant.) The points b and c are associated with B and C on I_1, and a and d are associated with A and D on the lower indifference curve I_o. The Marshallian demand curve[1] is DD. It is the inverse slope of the price consumption curve, pcc, reflecting both

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[1] M. Friedman, "The Marshallian Demand Curve," Essays in Positive Economics (Chicago: University of Chicago Press, 1966), pp. 47 - 99.

income and substitution effects.

It is recalled that the consumer's surplus is equivalent to the maximum amount of revenue that can be appropriated by a perfectly discriminating monopolist. Thus it is the area under the demand schedule. The consumer's surpluses that are of immediate interest are restricted to the areas below the demand schedules between P_1 and P_o. The CV corresponding to the price fall M'_oM_o in the top diagram, is P_1P_oad. Similarly, the EV corresponding to the price fall, M_oM_1, is area P_1P_obc. The consumer's surplus, CS, assoicated with the Marshallian demand curve DD, is P_1P_oac. Assuming that a normal good like recreation is introduced at price P_1, the EV $>$ CS $>$ CV.

The value of any commodity may be measured in terms of the maximum price an individual is willing to pay for access to the good or the minimum compensation which he will accept in exchange for loss of access to the good. Generally, the CV is the <u>maximum</u> amount of money which the recreationist would have to pay when the price of a good falls or when he purchases an option to visit, so as to retain the level of welfare he would enjoy in the absence of the price fall or right of access. The EV is the minimum compensation which the recreationist must receive (when the price falls or when he loses an existing option to visit), so as to avoid any loss of welfare. This minimum compensation or bribe will always exceed the maximum price for existing normal goods, because the bribe is aimed at forestalling a decline in the individual's welfare. On the other hand, if the maximum price or CV is paid, (after a price fall or creation of a new park), his initial level of welfare is reduced.

Strictly speaking, the compensated demand schedule is the correct schedule, since it embodies price changes and only price changes, real income remaining unchanged; i_o is the conceptually correct measure for a price decrease or purchase of the option to visit and i_1 is correct for a price increase or loss of the option to visit. The former is appropriate for estimating the demand for a proposed park, while i_1 is appropriate for evaluating the loss of access to an existing park.

In using either measurement concept - CV and EV - it is essential that actual payment occur or else one cannot be certain that welfare is maximized. (An additional dollar does not have the same utility for all recreationists.) If it is assumed that the redistribution caused by the recreation policy is perfectly efficient and costless, then the CV and EV are useful criteria for evaluating the policy. However, since government policy is neither perfectly efficient nor costless, a value judgement is necessary concerning the desirability of a given distribution of income.

If it is assumed that the income elasticity of demand is zero, i.e. zero income effect, then point A will coincide with B and point D with C, and the compensated demand schedules in the lower diagram will become indistinguishable. Therefore, the more restrictive classical assumption of constant marginal utility of money can be avoided, and the compensated demand schedules can be represented by the Marshallian uncompensated demand schedule.[1]

It is clear, that in the absence of actual payment, ambiguity arises as to the direction of the change in total welfare. Furthermore, in practice it is difficult to separate the substitution and income

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[1] Given the level of utility, the assumption of zero income effect requires that the marginal utility of money be constant for all combinations of prices and money, i.e. the utility function is well behaved and movement is along indifference curves. The assumption of constant marginal utility of money however, requires that the marginal utility for any given X be invariant with changes in levels of utility.

effects. Therefore the schedule which is usually estimated, is the uncompensated or Marshallian. (Note that given actual payment, the Marshallian schedule overestimates demand for a price decrease, and understates demand for a price increase.) However, provided that little significance is attached to the redistributive consequences of government recreation policies and given the practical difficulties encountered in estimating compensated demand schedules, then the Marshallian measure is useful in evaluating recreation policies.

Benefit Estimation

It has been shown that under an idealized market system, price serves as a measure of marginal value both in consumption and production. Since prices are non-existent in outdoor recreation, many procedures have been employed for solving the problem of value. These procedures can be placed into two categories. There are what may be called naive procedures which attempt to estimate benefits without reference to a demand function, then there are those procedures - revenue maximizing monopolist and consumers' surplus - which utilize a demand function for evaluating resources. These two approaches are discussed beoww.

Naive Procedures

Naive procedures or market-benefit measures are the most primitive techniques for measuring benefits. They all overlook the crucial step of estimating the demand function and go directly to the estimation of benefits through "educated guesses". Benefits may also be equated to the cost of the project, opportunity cost of time, gross expenditures, market value of catch or hunt, and the gross national product generated by the project. (See Lerner for a brief discussion of these methods.)[1]

As Cicchetti, Seneca and Davidson point out:

> All of these and similar efforts have sought to move directly from dollar market sums to recreation benefits. No account has been given to the key issue, namely that it is the recreation activity per se and not associated factors that results in the 'utility' to the recreationists. It is the basic shortcoming of the above approach that a systematic relationship between the amount of the good consumed (for here is where utility is generated) and various causal factors has not been presented. It is this vital issue, an analysis of a demand relationship, and all that it entails that is the basic tool of economics in determining benefit conditions and in fact the above methods offer no analysis to generate a recreation demand structure, the quantification of demand and dynamic properties of the demand function.[2]

Although market-benefit measures are devoid of theoretical foundations, they still remain the cornerstone of government decision making. Indeed, to the present time, the provision of most of the publicly owned recreation centers in Canada and the United States, have been based on political bargaining and 'merit' considerations, rather than upon any explicit economic studies. Romm suggests that:

> Many public decisions about outdoor recreation are made on the basis of "requirements" criteria. Projects are selected for their "goodness", and then justified in terms of benefit-cost analysis. Strikingly, whatever such methods lack in economic sophistication and validity, they tend to compensate for with effectiveness....
>
> The administrator who uses imaginary benefit estimates in order to smooth acceptance of his recreation project is abusing the tools of economic analysis, but he may be doing so with an awareness of public requirements not adequately measured by available benefit estimation techniques. He substitutes a sensitive subjective measure for an imperfect objective one. If objective analytic tools are to replace his criteria, they will need the capacity to identify, and the sensitivity to respond to, all aspects of social requirements that affect recreation demands.

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[1] L.J. Lerner, "Quantitative Indices of Recreational Values," Western Farm Economics Association Proceedings 1962 (August 1962), pp. 12 - 18. Also R. A. Spargo, "Methods and Techniques of Evaluation of Sport Fishing," Canada Fisheries Report, No. 4 (Ottawa: Department of Fisheries, 1965), pp. 53 - 69.

[2] C. J. Cicchetti, J.J. Seneca and P. Davidson, The Demand and Supply of Outdoor Recreation (New Jersey: Bureau of Economic Research Rutgers - the State University, June 1969), p. 289.

> Meanwhile, requirements approaches perform the important function of permitting decisions to be made in the absence of satisfactory knowledge about recreation benefit estimation.[1]

However, given the absence of any explicit economic rationale behind these techniques, further discussion is limited to the other approach.

Maximum Revenue Method

Given the demand schedule, there is a cleavage of opinion over the manner in which value or benefit is estimated. Proponents[2] of the above mentioned school suggest that value or benefits should be equated to the maximum revenue which can be appropriated by a nondiscriminating monopolist. This estimate is given by the largest rectangle which can be fitted under the demand schedule, i.e. $OPED_o$ in Figure 4. Depending on the nature of the demand function, D_o will occur at that point where marginal revenue DD_o becomes zero. (E marks the point of unitary elasticity on the demand function.)

The alleged advantage of this technique is that the value obtained therefrom, is comparable to private market values. However, this procedure is only relevant, both in the private and public sectors, where resource owners contemplate recovering all benefits. However, it is questionable whether public projects should be subject to this market test since it is because of alleged non-monetized merit considerations in the

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[1] J. Romm, The Value of Reservoir Recreation (New York: Cornell University Water Resources and Marine Sciences Center, Ithaca Technical Report No. 19, August 1969), p. 73.

[2] Clawson op. cit. Also W.G. Brown, A. Singh and E.N. Castle, An Economic Evaluation of the Oregon Salmon and Steelhead Sport Fishery, Cornwallis: Agricultural Experiment Station, Oregon State University, Technical Bulletin No. 78, 1964; O.L. Carey, "The Economics of Recreation: Progress and Problems," Western Economic Journal, III, 2 (1965); and W. Beardsley, "Bias and Noncomparability in Recreation Evaluation Models," Land Economics, XLVII, (1971), pp. 175 - 180.

first instance that governments are prompted to intervene.[1] In addition, this technique measures what the resource is worth to the monopolist, but it does not give the value of the resource to the users. Moreover, it is unlikely that monopoly pricing policies will be instituted in outdoor recreation during the foreseeable future. Consequently, this method is of little relevance.

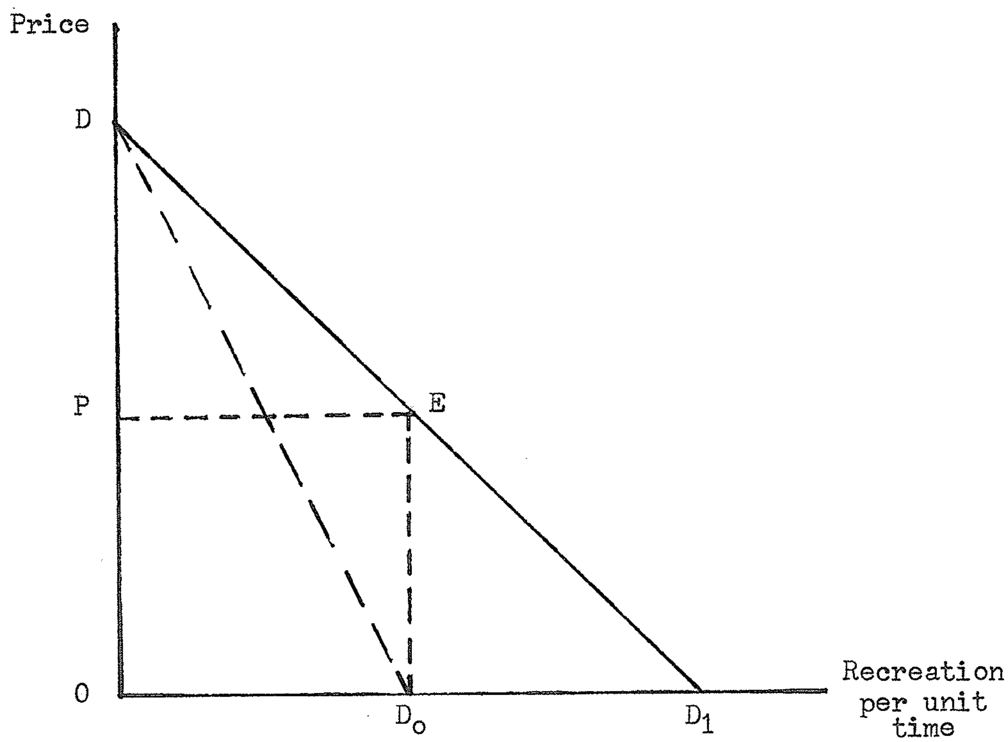

Figure 4

Illustration of Revenue Maximization

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[1] For instance, during the 1960's some public officials in the United States considered outdoor recreation as a palliative for many ills of city life, e.g. juvenile deliquency, race riots, high unemployment.

Consumers' Surplus

There is a growing school of thought which holds to the view that public projects should be evaluated on the basis of the consumers' surplus generated by the project. Because one is interested in the value of the entire recreation resource rather than the marginal value, the consumers' surplus (plus any revenue collected at the recreation area) is considered the most appropriate measure of value. Since consumers' surplus aggregates over many individuals, the demand schedule is viewed as an approximation of the marginal benefit or utility function.

Benefits estimated by the consumers' surplus plus any revenue collected will always exceed those of the revenue maximizing monopolist. This difference is illustrated in Figure 4. At price OP, the consumers' surplus PDE plus revenue $OPED_0$ exceeds the monopolist revenue $OPED_0$. The discrepancy is even greater when the price is zero. Comparisons of public projects evaluated by the consumers' surplus approach and private projects evaluated at market prices have a built-in bias against private projects. If one is concerned with recoverable benefits, particularly benefits which flow to non-residents, then it may be advisable to evaluate public projects by the monopoly revenue method. However, there is no social justification for evaluating public projects on a private market basis since there is divergence between social and private costs and benefits. Moreover, as Merewitz[1] suggests the pricing practice of the monopolist,

> ... is a behavioral observation, not a normative prescription. Making any specific price-setting assumption, such as revenue maximization is more arbitrary than using the consumers' surplus criterion, which requires no single price .... It is a great deal to ask that private market projects be evaluated from a comprehensive public point of view, measuring total willingness to pay whenever benefit estimation is required for a decision problem. It is

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[1] Merewitz, op. cit. p. 632.

> easier practically to require that public decisions conform to a hypothetical private market test, but that solution ties both sectors to imperfections of the market. Market failure is one of the major justifications for government concern and intervention.

Consumers' surplus must therefore be employed whenever private and social costs and benefits diverge. Since this study is concerned with evaluating proposed recreation areas with respect to Manitoba residents, value will be measured by the maximum willingness to pay or the CV.

Conclusion

It is recalled that in estimating demand and consumers' surplus, classical economists assume that the marginal utility of income is constant. But this condition may not be fulfilled. An alternative assumption is that the income elasticity of demand is zero, i.e. zero income effect. For, if real income remains unchanged (after the creation of a new park or the imposition of user fees at an existing park), the demand schedule is conceptually more accurate because welfare and marginal valuation are unchanged. To the extent that the relative price changes (which result from the recreation policy) are insignificant vis a vis price changes occuring in the rest of the economy, the uncompensated or Marshallian demand schedule and the consumers' surplus derived therefrom, can be reasonable approximations of the correct estimates.

> For the area under the demand curve for x is a valid measure of gain to consumers only when the introduction of good x, or a decline in its price, is accompanied by access to all other goods at unchanged prices.[1]

If the recreation project is not to affect prices, it should have a very marginal effect on visitation to existing parks. It is doubtful that the recreation areas proposed in this study will have any

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[1] Mishan, op. cit. p. 37.

appreciable effect on relative prices in Manitoba. Moreover, it is unlikely that there will be any significant impact on the prevailing income distribution in the province. Under these circumstances, the Marshallian consumers' surplus is a reasonable approximation of conceptually correct measures of the social consequences of recreation policies.

Chapter III

LITERATURE REVIEW

It has been shown that an idealized market system, will in the long run, sustain an efficient allocation of resources. Production occurs at the point where the cost of the last unit of each factor, i.e. marginal cost, is equal to its contribution to total production. In consumption, market prices are equal to the marginal utilities of goods and services. Thus factor and product prices can be used as measures of value of resources, goods and services at the margin.

The conditions for an idealized market system include perfect competition in all markets, increasing cost industries, the presence of the exclusion property, absence of public goods and other externalities. Exclusion property[1] refers to a common characteristic of commodities whereby the purchaser of such commodities has exclusive control over the benefits (costs) which flow therefrom. Typical examples include a pair of shoes, eye glasses and so on. The exclusion principle is violated when benefits (costs) flow or spillover to third parties as in the case of immunization against infectious diseases. Under these circumstances demand schedules understate (overstate) full benefits or willingness to pay and supply schedules do not reflect full costs. For instance, in the case of annual chest x-rays of individuals, the demand schedule will reflect the benefits flowing to the individuals resulting from earlier identification of tuberculosis, but it will not reflect

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[1] See R. H. Haveman, The Economics of the Public Sector (Toronto: John Wiley & Sons, Inc., 1970), p. 25 for brief discussion.

benefit of prevention of the spread of this disease to third parties.

Samuelson defines a pure public or collective consumption good as one that is consumed in equal amounts by all.

> I explicitly assume two categories of goods: ordinary private consumption goods ($X_1, \ldots, X_n$) which can be parcelled out among different individuals (1, 2, ..., i, ..., s) according to the relations
>
> $$X_j = \sum_i^s X_j^i ;$$
>
> and collective consumption goods ($X_{n+1}, \ldots, X_{n+m}$) which all enjoy in common in the sense that each individual's consumption of such a good leads to no subtraction from any other individual's consumption of that good, so that $X_{n+j} = X_{n+j}^i$ simultaneously for each and every i^{th} individual and each collective consumtion good.[1]

Each individual's consumption of X_{n+1} "is related to the total by a condition of equality rather than of summation."[2] Examples of public goods include national defense and clean air. Here, the exclusion principle which is the essence of private ownership no longer exists, for once these goods are provided benefits become universal.

Clearly, in the real world, the conditions for an idealized market system are usually violated. Market failure - "the failure of a more or less idealized system of price-market institutions to sustain 'desirable' activities or to estop 'undesirable' activities."[3] - may result from several factors. These include externalities in production and consumption, decreasing cost industries and public goods. When the market fails, resources are not allocated in an economically efficient manner.

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[1] P.A. Samuelson "The Pure Theory of Public Expenditure," Review of Economics and Statistics, XXXVI (November 1954), p. 387.

[2] ______________ "Diagramatic Exposition of a Theory of Public Expenditure," Review of Economics and Statistics, XXXVII (November 1955), p. 350.

[3] F.M. Bator "The Anatomy of Market Failure," Quarterly Journal of Economics, LXXII (August 1958), p. 351.

Strictly speaking, outdoor recreation is not a public good. It violates some of the properties of public goods. The overcrowding at recreation areas suggests that, at least beyond some level of use, consumption by one recreationist is not independent of that of other recreationists. Moreover, in some instances, the number of recreationists can be rationed by charging appropriate user fees. However, throughout North America, outdoor recreation is administered as though it is a public good. The creation and maintenance of parks, campsites and picnic-sites are therefore financed from the public purse and entry to these recreation areas is usually free or nominally priced.

Whatever the merits of public ownership of outdoor recreation areas, such intervention involves a cost. This cost can only be determined in the light of the benefits forthcoming from the project. The situation is further complicated by the provision of recreation at a zero or nominal fee. For, without a market, true preferences are not revealed. Accordingly, economists have endeavoured to find another way of estimating the demand function. This function should reflect consumer ability and willingness to pay for outdoor recreation and serve as a proxy for value. Two schools of thought have emerged - the interview or direct approach and the travel cost or indirect approach. These two schools are discussed below.

Interview or Direct Approach

It is recalled that a major problem encountered in the statistical estimation of demand for and benefits derived from outdoor recreation, is the absence of a market price mechanism. Consequently, one has to find some way of inducing the recreationist to reveal his true preference.

An obvious method of ascertaining value is to ask the recreationist himself. This is the underlying rationale of the interview approach. The recreationist is presumed to be rational and intent on maximizing his satisfaction within his time and budget constraints. A hypothetical question is put to the recreationist - what is the maximum price you are willing to pay for the use of the outdoor recreation facilities? Alternatively, he may be asked - what is the minimum compensation you are willing to accept for the loss of access to the recreation facilities?

The responses to the two questions may diverge for several reasons. It is recalled that the maximum price measures the compensating variation while the minimum bribe measures the equivalent variation. The equivalent variation (for a price fall or loss of visiting privileges) is usually greater than the compensating variation for all "normal" goods, e.g. outdoor recreation. Moreover, these two surpluses will also be equal where real income is constant. In other words, provided the introduction of a new park or the levying of user charges at an existing park does not alter real income, the two measures will be equal.

Another obstacle to the direct approach hinges on the fact that the respondent may regard outdoor recreation as a public good, particularly where the exclusion principle does not hold. Consequently, he does not have to reveal this true preference. He may underbid his price and still gain entry to the facility, for his enjoyment of the benefits which flow therefrom is a function of the total facility, rather than the fraction for which he pays as is the case of a private good.[1] It may be in his

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[1] Bator op. cit. p. 370.

interest to understate his true preference, if his taxes are to be increased to pay for the facility. If all recreationists act in this manner, recreation demand will be grossly under-estimated.

On the other hand, a recreationist may be so keen on having the project undertaken that he may overstate his true preferences. To some extent this behavior may partially offset the underestimation above. Since responses will vary with each respondent's interpretation of the question, lack of consistent responses may therefore cast great doubt on this technique.

Employing an interview method, Davis[1] undertook a study of forest recreation demand in northern Maine and Baxter State Park. Respondents were engaged in a bidding game to ascertain the maximum travel costs that they were willing to pay to visit the forest. By systematically increasing or reducing bids, the interviewer was able to ascertain the maximum travel cost that the recreationist was willing to incur rather than be excluded from the facility. The demand schedule for each household was taken to be a dis-continuous function corresponding to the maximum bid beyond which the recreationist would cease to visit. Using multiple regression analysis, an aggregate demand function was derived. Variables such as years of acquaintance with the park, household income and duration of stay were important determinants of the maximum price recreationists were willing to pay. An aggregate (continuous) demand schedule was fitted to the cumulative distribution of number of visits and associated maximum bid or price.

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[1] J. Knetsch and R.L. Davis, "Comparisons of Methods for Recreation Evaluation," Water Research, ed. A.V. Kneese and S.C. Smith (Baltimore: Johns Hopkins Press, 1966) pp. 125 - 142.

Davis also tried a variant to the willingness-to-pay (mileage levies) approach by asking the recreationist what additional distance he was willing to drive in order to visit a recreational center. Willingness-to-drive additional miles is somewhat similar to willingness-to-pay with the exception that such a question may be more palatable to the recreationist. His response may be more reliable. Moreover, willingness-to-drive can be partly transformed into a willingness-to-pay by estimating the dollar cost of travelling the distance. The partial correlation coefficient between these two measures was 0.5. However, it should be noted that whereas willingness-to-pay (mileage levies) involves both travel time and money costs, willingness-to-drive includes only travel money costs. Whereas the estimates based on these two variations were not significantly different, such a finding may be spurious if mileage charges are not significantly related to willingness-to-drive.

Pattison and Phillips[1] also support the interview approach. They employed it to estimate the benefit of moose hunting in Alberta. Unlike the bidding game used by Davis, hunters were simply asked what expenditures over and above current costs, they were willing to incur in order to preserve their hunting privileges. The sum of the additional expenditures (CV) and the license fee was taken to be the imputed value of the resource.

The biases inherent in this approach may be impossible to detect and difficult to eliminate. Knetsch and Davis[2] suggest that the questions should be framed in such a manner that the recreationist does not associate it with the propriety of charging gate fees. Responses may be more

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[1] W.S. Pattison and W. E. Phillips, "Economic Evaluation of Big Game Hunting: An Alberta Case Study," Canadian Journal of Agricultural Economics, XIX (October, 1971), pp. 72 - 85.

[2] Knetsch and Davis op. cit. p. 132.

reliable if nonrecreationists are excluded from the sample. Further accuracy may be gained by interviewing recreationists while they are engaged in outdoor recreation. (They may be more favorably disposed to respond to the questionnaire.)

While these restrictions may be useful for evaluating existing recreation areas, they do not necessarily improve estimates for proposed sites. Since the situation is so hypothetical, responses may still lack consistency . As the number of alternatives increase together with quality considerations, the accuracy of responses become more dubious. Equally important, are the statistical problems of sample size, selection and the timing of the survey. Finally, unlike the indirect approach, interviews are relatively costly, and of necessity, restricted to a small number of sites and recreationists.

Indirect Approach

Travel Cost Methods

Hotelling-Clawson Method: To date the more popular approach to demand analysis and resource valuation involves an indirect procedure. Consumer ability and willingness to pay are measured from costs incurred by recreationists in gaining access to the recreational center. This approach was first recommended by Hotelling[1] in a letter to the Director of the United States National Parks Service in 1947. He suggested, that in the absence of market prices, the distance travelled be used as a proxy for price, and that the number of visits can serve as the quantity of recreation consumed.

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[1] Letter Reprinted in W.G. Brown, A. Singh and E.N. Castle, An Economic Evaluation of the Oregon Salmon and Steelhead Sport Fishery (Cornwallis: University of Oregon, Agricultural Experimental Station, Technical Bulletin No. 78, 1964), p. 6.

Hotelling suggested that the countryside around the recreation area be subdivided into concentric distance zones and that these zones be delineated on the basis of a constant average travel cost to the recreation area. The association of each zone with a level of visitation and "price" or travel cost facilitates the derivation of a visitation schedule. Since it is generally observed that visitation diminishes as required travel distance increases, the schedule is expected to be negatively sloped.

The basic principle set down by Hotelling, and refined and extended by Clawson[1] will be examined in detail. However, before doing so, it may be of interest to list some of the important assumptions involved in Hotelling's recommendations. The base populations of the distance zones are assumed to be homogeneous with respect to all factors which influence visitation with the singular exception of travel costs. Recreationists would respond to travel costs in the same manner in which they would respond to a toll. Assuming that recreationists from the most distant zone are the marginal visitors, then intramarginal visitors place the same gross value on the resource as the marginal visitors. Intramarginal visitors therefore gain some consumer surplus equal to the difference in their travel costs and that of the marginal visitors.

In refining Hotelling's suggestions, Clawson makes his distance zones coincide with similar population sizes. Within each zone, the propensity to visit recreation areas varies among individuals. However, the average propensity to visit is similar for all zones. This feature relaxes

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[1] M. Clawson, Methods of Measuring the Demand for and Value of Outdoor Recreation(Washington: Resources For The Future Inc., Reprint No. 10, 1959).

the more restrictive Hotelling assumption of homogeneity of the entire population. Moreover, by normalizing the zonal population with respect to the propensity to visit, population becomes an endogenous variable in the demand function.

He also views the entire outdoor recreation experience as a package consisting of anticipation or planning, travel to the site, on-site experience, return travel and recollection. Total cost is taken to include expenditures over and above what would normally have occurred in the absence of such a visit. Since Hotelling's demand function is a demand for the whole experience, it imputes too much value to the recreation resource. What is needed is the demand for on-site experience which in turn reflects the demand for the recreation resource. By assuming hypothetical increases in cost, Clawson therefore uses the Hotelling demand function to derive a schedule for each population zone.

The underlying assumptions are that recreationists have similar incomes; average propensity to consume recreation is the same for each population zone, and that recreationists will respond to incremental travel costs as they would to price. The horizontal summation of these zonal demand schedules yields an aggregate demand schedule for the recreational resource. This technique is illustrated below.

In Figure 5 travel costs are plotted against distance and number of visits.[1] Since the zonal populations are homogeneous with respect to the factors influencing visitation except distance, A'G is Hotelling's aggregate demand schedule for the entire population. Now the Clawson demand schedule goes a step further. Consider Zone 0. At "price" zero

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[1] Diagram adopted from A. Scott, "The Valuation of Game Resources: Some Theoretical Aspects," Canadian Fisheries Report, No. 4(Ottawa: Department of Fisheries, 1965), p. 28.

the number of visits is given by AA'. The imposition of a toll equivalent to the travel cost of zone 1, AB, reduces the visitation rate to BB'. A further increase in travel cost to AC reduces the visitation rate in zone 0 to CC'. Additional increases in travel cost equal to those of zones 3, 4, 5 and 6 reduce the visitation rates to DD', EE', FF' and G, respectively. The demand schedule for zone 0 is therefore A'G.

Now, consider zone 1. At "price" zero, the number of visits from this zone is BB'. The imposition of a toll equal to the difference in travel cost between zone 1 and zone 2, reduces the visitation rate at 1 to CC'. An additional increase in cost equal to that of zone 3 reduces the visitation rate to DD'. Similar increases in travel costs equal to those of zones 4, 5 and 6, will reduce the visitation rates to EE', FF' and G, respectively. The demand schedule for zone 1 is therefore B'G.

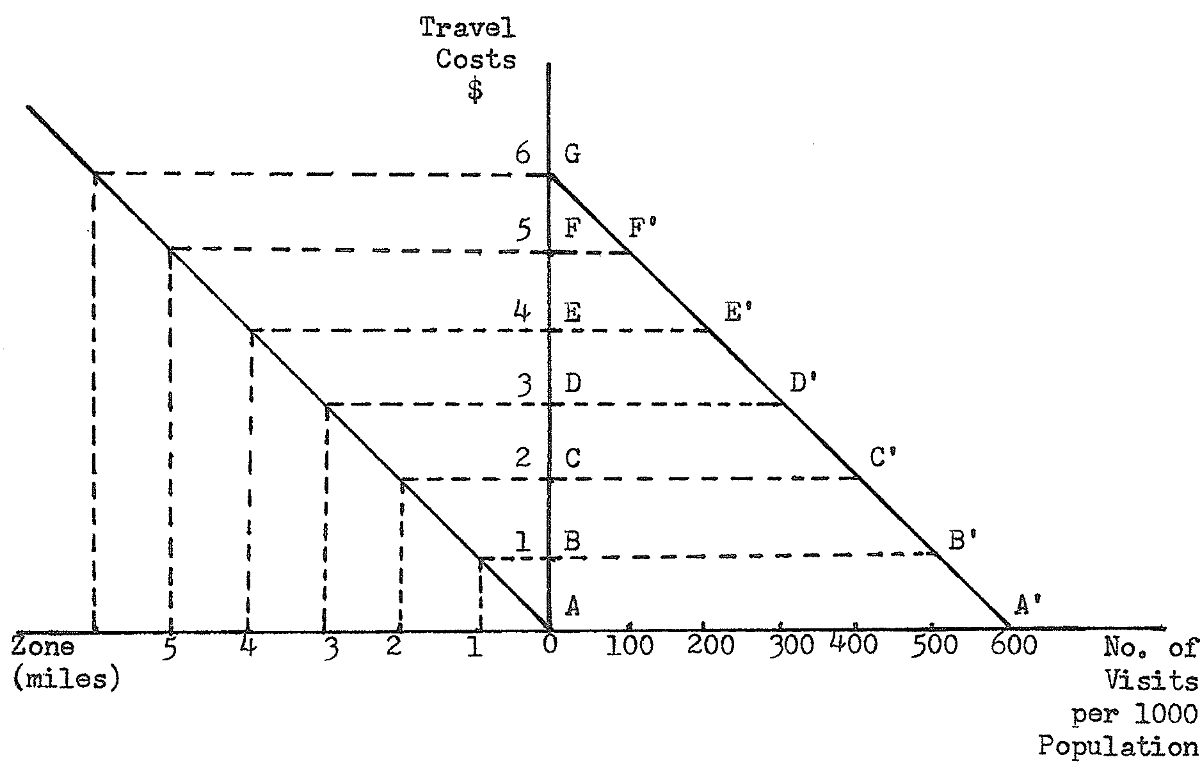

Figure 5

Hotelling-Demand Curve for Whole Recreation Experience

Employing the same procedure outlined above, the demand schedules corresponding to zones 2, 3, 4 and 5 are C'G, D'G, E'G and F'G, respectively. Knowledge of the demand schedule for each zone and the size of the zonal population, allows for the derivation of Clawson's aggregate demand schedule for the entire population. This derivation is illustrated below.

Consider the three hypothetical population zones B, D and F, numbering 1000, 4000 and 10,000 souls. They are located in zones 1, 3 and 5 where the average cost per visit to a given park is \$1, \$3, and \$5, respectively (Table 1). The functional relationship postulated is represented by equation 11:

Table 1

Demand Schedule of Whole Recreational Experience

City	Population	Cost per Visit	Number of Visits	Visits per 1000 Base Pop.
B	1000	\$1	500	500
D	4000	3	1200	300
F	10000	5	1000	100

Source:

M. Clawson and J. Knetsch, Economics of Outdoor Recreation (Baltimore: Johns Hopkins Press, 1966), Table 9, p. 79.

(11) $v_i = \alpha - \beta P$

where v_i is the visitation rate of the i^{th} zone in 100's per 1000 population, P is travel cost per visit, and α and β are constants. In this example, the Hotelling demand schedule A'G is assumed to be linear; it can be derived from equation 11 by setting α and β equal to 6 and 1, respectively:

(12) $v_i = 6 - P.$

The next step, the derivation of the Clawson demand schedule, relates total visitation or the Hotelling demand schedule to given incremental costs. From Table 1 it is seen that barring any additional cost, total visitation from the three zones is 2700. This observation gives one point on the new demand schedule. By instituting incremental charges of \$1 the intermediate points on the demand schedule can be derived from Figure 5 or equation 12. An incremental charge of \$1 increases cost per visit at B from \$1 to \$2, resulting in a fall in the number of visits to 400. Since the "price" to visitors from D is now \$4, the number of visits falls to 800 (i.e. 200 per 1000). On the other hand, at the new "price" of \$6 no visitors are forthcoming from F. Thus the total number of visits has fallen to 1200, yielding another point on the demand schedule. Succeeding points can be determined by additional dollar increments until the total number of visits approaches zero. (See Table 2 and Figure 6.)

The hypothetical response pattern results in a demand schedule that is negatively sloped. Furthermore, since demand for access to the recreation resource is a derived demand, i.e. derived from the demand for the whole experience, its elasticity should be less than the

Table 2

Effect of Increase in Costs on Number of Visits

City	Number of Visits Given Incremental Costs					
	$0	$1	$2	$3	$4	$5
B	500	400	300	200	100	0
D	1200	800	400	0	0	0
F	1000	0	0	0	0	0
Total Visits	2700	1200	700	200	100	0

Source:

M. Clawson and J. Knetsch, Economics of Outdoor Recreation (Baltimore: Johns Hopkins Press, 1966), Table 10, p. 80.

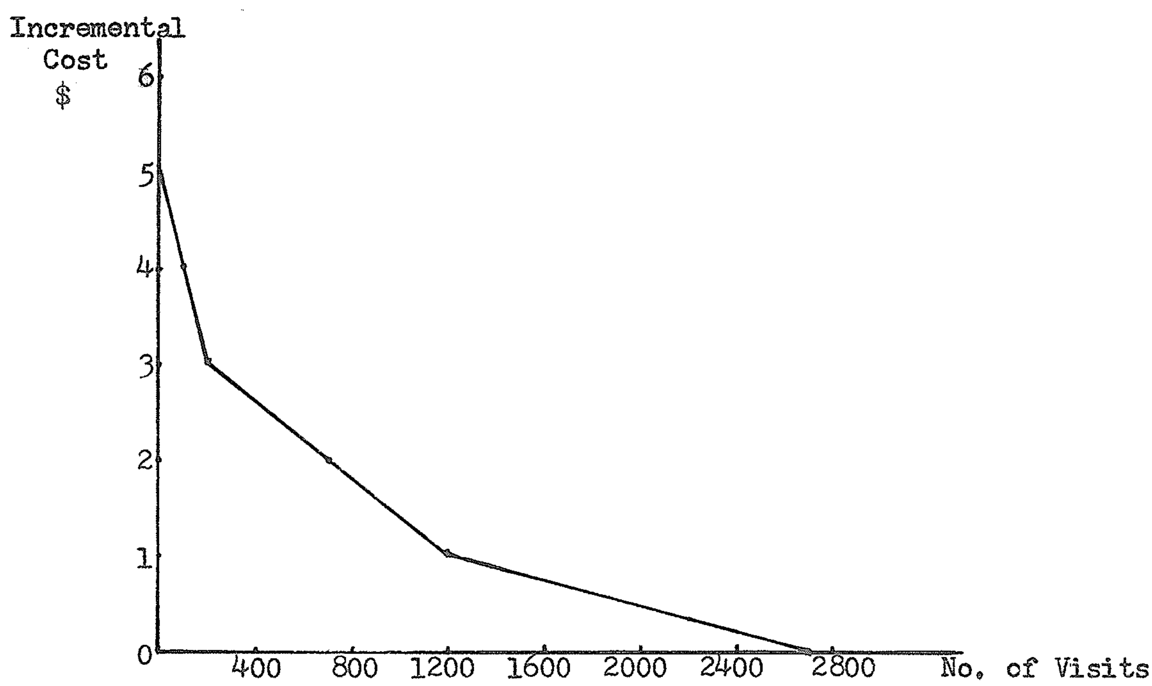

Figure 6

Clawson-Demand Curve for Recreation Resource elasticity for the whole experience.[1] The Clawson model therefore describes the demand for the specific resource as being less elastic than the elasticity of demand for the total recreation experience.[2]

The Hotelling-Clawson approach is open to many criticisms. It does not necessarily follow that recreationists from the proximal zones enjoy the magnitude of consumer surplus set by the marginal visitors. The very fact that marginal recreationists are willing and able to forego a greater amount of goods and services in order to visit the recreation area, suggests that they probably place greater value on the recreation resources. Thus, ceteris paribus, the imputed demand and benefits based on the marginal visitors may be overestimated. A further upward bias is introduced where the travel route is itself a source of pleasure, i.e. lovely sceneries. (Displeasure may cause a downward bias.) Since total experience will differ, doubt is cast on the consistency of the inferences derived from the implicit assumption of uniformity of experiences.

Lessinger[3] argues that location near to recreation centers is not necessarily accidental. Some people may choose such locations to reduce the price of accessibility to the recreation facilities. In so doing, they are consciously trading off accessibility to the city for accessibility to the recreation resource. Hence, these individuals may be unwilling to pay the travel cost of the most distant population zones to participate in the resource use. Any increase in "price" or required

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[1] For a discussion of derived demand, see M. Friedman, Price Theory - A Provisional Text (Chicago: Aldine Publishing Co., 1971) pp. 148 - 161.

[2] M. Clawson and J.L. Knetsch, Economics of Outdoor Recreation, (Baltimore: Johns Hopkins Press, 1966), p. 84.

[3] J. Lessinger, "Measurement of Recreation Benefits: A Reply," Land Economics, XXXIV, 4 (1958), pp. 369 - 370.

travel distance may therefore tend to force these intramarginal residents to locate nearer to the metropolitan area (where they are employed), because they will in essence be making distant trips to the park and the city. The end result of the price increase will be a greater decline in visitation than is assumed in the Hotelling-Clawson approach. Thus, because the assumption of homogeneity of the base population may not hold, ceteris paribus, the demand curve and benefits measured by the Hotelling-Clawson approach will be overestimated.

Early applications of the Hotelling-Clawson principle fail to consider many of the underlying factors which influence consumer behavior, e.g. age, education, occupation, and income. The assumption that the preference functions of the zonal populations are identical even though personal preference functions differ is still questionable since tastes and preferences among dispersed political units are likely to vary. Furthermore, the model fails to handle the problems of substitutability or complementarity among recreation areas which the recreationist is likely to consider as alternatives given the price increase. Unless there are no recreational alternatives or these areas are randomly distributed among population zones, changes in relative prices may introduce an upward bias into the estimates. In this regard, the interview approach has a distinct advantage over the indirect approach, since respondents will react to hypothetical increases in cost in the light of available alternatives.

Bias may also result from the possibility that some recreationists may encounter more intervening alternatives en route than recreationists in the proximal zones. Hence a one unit increase in price will not necessarily result in the same responses for these two classes of residents.

Indeed, to the extent that alternatives available to the proximal zones are very limited, the decline in demand in response to an increase in effective distance and therefore the number of alternatives, may be less for these zones, indicating a downward bias in the demand schedule. In other words, where the visitors encounter other recreational alternatives, price elasticities of demand will differ from those who face few alternatives. If there are no alternatives the price elasticities will tend to converge; if there are alternatives, demand of the visitors who have more choices will be more elastic relative to other visitors with less alternatives. Finally, to the extent that there are no alternatives, and individuals purposely choose to live near to recreation areas, the problem of overestimation raised by Lessinger still exists.

If the Hotelling-Clawson model is to be operational, the population of recreationists must be geographically dispersed to permit meaningful differentiation in travel cost. By making the geographical zones coincide with political boundaries a great deal of secondary data becomes available.[1] This refinement would not only permit the incorporation of socioeconomic factors like income, occupation, ethnicity and age into models, but will further relax the questionable assumption of identical demand for every population zone, since demand schedules may be developed for homogeneous subgroups within each base population.

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[1] See L. Merewitz, "Recreational Benefits of Water Resource Development," Water Resources Research, II, 4 (1966), pp. 625 - 640. Also E.L. Ullman and R. Volk, "An Operational Model for Predicting Reservoir Attendance and Benefits: Implications of a Location Approach to Water Recreation," Papers of the Michigan Academy of Science, Arts and Letters, XLVII (1962), pp. 473 - 484; and E.L. Ullman, A Measure of Water Recreation Benefits: The Meramec Basin Example (Seattle: Univ. of Washington, Center for Urban and Regional Studies, Reprint No. 5, 1964).

Furthermore, this refinement would greatly enhance the predictive performance of the model and its use as a planning tool. All in all, the deficiencies in the Hotelling-Clawson model may reflect less on the technique than on the availability of data.

> It is not the procedure as such that needs qualification and caution, but rather the basic recreation experience and the availability of data about it which are complicated and not easily interpreted.[1]

The Pearse Model:[2] Pearse attempted to refine the Clawson assumption of homogeneity of the aggregate preference function of the zonal populations by introducing income classes.[3] He compares recreationists having similar incomes but different fixed (travel) costs. Access to the recreation centers is free. If a toll is levied for entry to the park, it is reasonable to assume that visitation will decline and that this decline will continue with increasing access fees. Pearse further assumes that visitors from the same income class have similar preferences for outdoor recreation and incur similar marginal costs defined as on-site expenditures per recreation day.[4] Recreationists' indifference maps are

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[1] Clawson and Knetsch, op. cit., p. 89.

[2] P.H. Pearse, "A New Approach to the Evaluation of Non-Priced Recreational Resources," Land Economics, XLIV (February, 1968), pp. 87 - 99.

[3] A.H. Trice and S.E. Wood, "Measurement of Recreational Benefits." Land Economics, XXXIV, 3 (1958), pp. 195 - 207. Trice and Wood employed a similar principle in their study of recreation in Plumas County and Upper Feather River in California. They ranked recreationists by travel costs and arbitrarily selected the 90th percentile as representing the marginal visitors. Benefits per visitor were taken to be the difference between the travel costs of the 90th percentile and the average travel cost which in this instance corresponded to the 50th percentile. It should be noted that they make no attempt to estimate the demand function and implicitly assume that each and every individual has the same tastes and preferences. Beyond the 90th percentile benefits are assumed to be zero.

[4] Pearse, op. cit. pp. 87 - 99.

therefore assumed to be identical and their budget lines (comparing recreation and all other goods) have the same slope.

Symbolically, the model may be specified as ${}_{g}v_i = \alpha - \beta P_i$ where v is the visitation rate of the g^{th} income class from zone i to the recreation area; P is total travel cost. Within each income class, visitors can be ranked by fixed costs. The marginal recreationist is assumed to be the visitor with the highest fixed cost; he enjoys no consumer surplus. Each intramarginal recreationist enjoys some consumer surplus and purchases recreational services until his fixed cost plus on-site or variable costs equal the fixed cost of the corresponding marginal visitor. These relationships are illustrated in Figure 7.[1]

Figure 7 corresponds to recreationists in income class OM_o. The fixed costs of recreationists with the lowest travel cost is represented by M_1M_o; marginal costs are given by the slope of M_1X_1 and the related budget constraint is $M_oM_1X_1$. These recreationists attain the highest indifference curve of their income class I_1, where they spend M_4M_o on recreation and consume OX_1' units of recreation. ($M_4M_o = M_1M_4 + M_1M_o$ where M_1M_4 is on-site expenditures.)

The fixed costs of the marginal recreationists in income class OM_o, are $M_o'M_o$. They are on the lowest indifference curve I_o where a total of M_3M_o is spent on OX_o' units of recreation. The Compensating variation corresponding to these two levels of fixed costs is $M_o'M_1$; it is the consumers' surplus which can be captured by the visitors with the least travel cost, i.e. M_1M_o. It is implicitly assumed that only one recreation trip is undertaken per time period. If a toll equal to $M_o'M_1$ is levied, expenditures of the latter recreationists will rise from M_4M_o to M_3M_o and recreation consumption would fall to OX_o'. By subtracting actual travel

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[1] Ibid., p. 90.

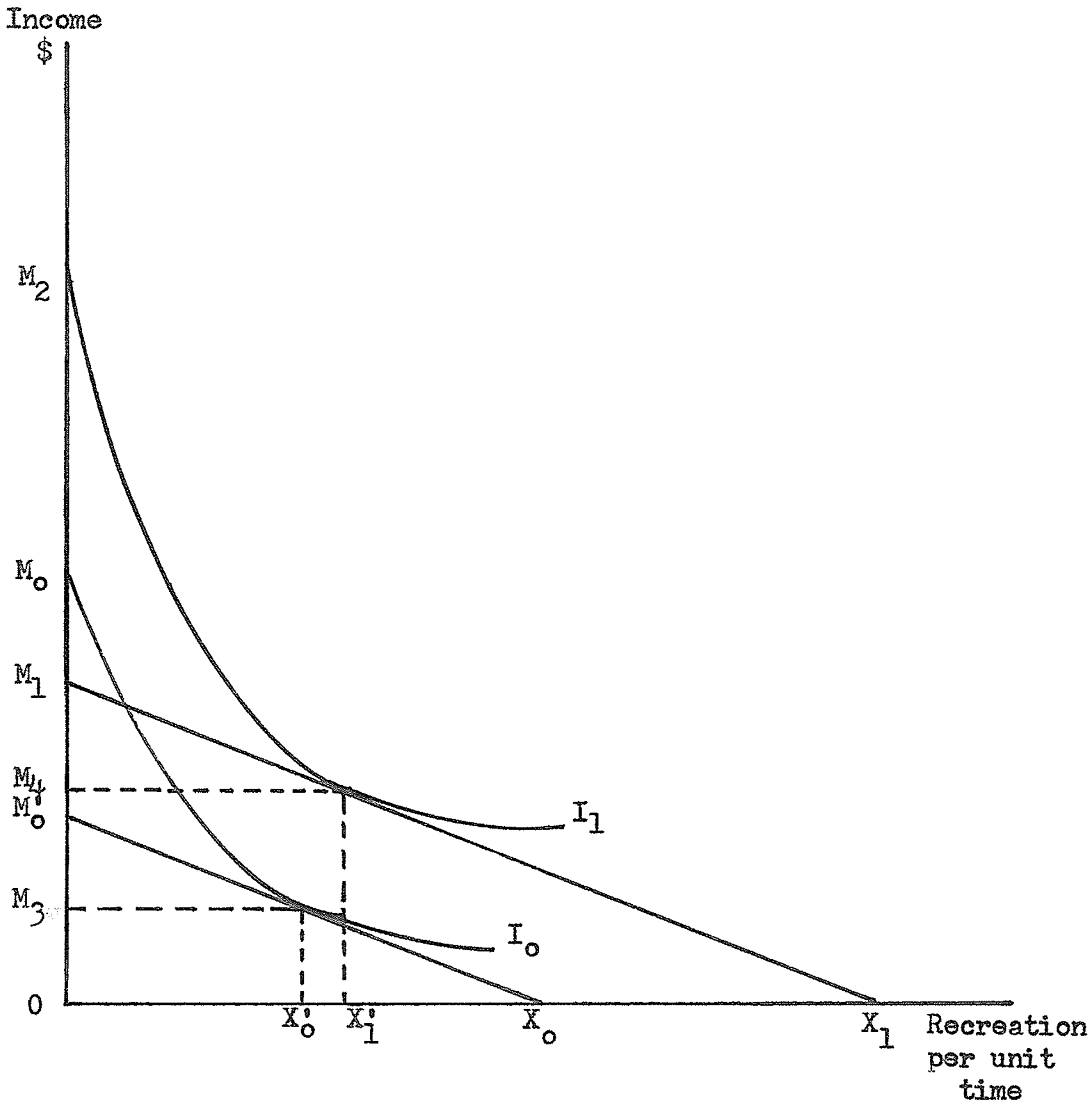

Figure 7

Equilibrium Level of Recreation Consumption
at Two Levels of Fixed Cost

cost from $M_o'M_1$ for recreationists in this income class, the corresponding demand curve of this income class can be determined. The aggregate demand schedule for the recreation center is given by the horizontal summation of the various income class visitation schedules; the sum of the areas under each demand schedule yields an estimate of the value of the recreation resource.

Like the Hotelling-Clawson model, the demand schedule is derived through an indirect procedure. If income data are unavailable, variables such as age and occupation may be substituted for income. Unlike the Hotelling-Clawson approach, however, there is one important improvement. Recreationists from the same income class who participate in similar recreational activities are presumed to have similar preference functions, hence demand, for outdoor recreation. Norton[1] criticizes the latter assumption as "merely" diverting the Clawson assumption to income groups. However, to the extent that there is greater similarity of tastes and preferences within arbitrary income groups than between arbitrary population zones, the use of subgroups within the population is an improvement. The maximum that recreationists are willing to pay to gain access to the facility is equivalent to the fixed cost of the corresponding marginal visitor, i.e. the maximum they are willing to pay is their fixed (travel) cost plus the related consumer surplus.

Choice of sample size may be crucial since income classes will have to be large enough to include some marginal users and small enough to be homogeneous. Knowledge of income distribution within the base population may facilitate selection of sample size, since it indicates the chances of randomly selecting individuals in given income classes.

Seckler[2] has criticized the use of the concept of willingness to pay or consumer surplus to measure recreation demand. In his view, willingness to sacrifice income has been rejected in hospitalization, medicare and education not merely because of externalities, but also because of

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[1] G.A. Norton, "Public Outdoor Recreation and Resource Allocation: A Welfare Approach," Land Economics, XLVI, 4 (1970), pp. 414 - 422.

[2] D.W. Seckler, "On the Uses and Abuses of Economic Science in Evaluating Public Outdoor Recreation," Land Economics, XLII, 4 (1966) pp. 485 - 494.

income inequality and societal values. The amount of income one is willing to give up is a function of the relative marginal utilities of income and the commodity in question. Thus, if A is wealthier than B and they are purchasing equal amounts of outdoor recreation services, B should enjoy the services more than A, because of B's higher marginal utility of income. In other words, for B, the good has a relatively high income elasticity of demand. The problem is particularly acute where there are large income disparities.

Seckler[1] also argues that statistical demand curves measure the diminishing marginal utility of income rather than the diminishing marginal utility of the good or service. Hence, the slope and location of the demand schedule are essentially a function of the income distribution. He therefore suggests that the statistical demand curve should be corrected for the income effect yielding a more elastic demand curve that is more representative of the diminishing marginal utility of recreation. This thesis is also supported by Stoevenor and Brown.[2] They further argue that low income projects may yield greater social value than high income projects.

> Estimated marginal benefits for projects catering to high income classes would tend to be disproportionately large compared to projects for low income families .... Yet the total pay-off, as measured by total utility or social welfare, might be much greater for the investment in urban recreational equipment.[3]

Consequently, they suggest that the demand curve should be corrected for the diminishing marginal utility of income.

The issue raised by Seckler et al involves the questionable

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[1] Ibid., p. 487.

[2] H.H. Stoevener and W.C. Brown, "Analytical Issues in Demand Analysis for Outdoor Recreation," Land Economics, XLIX, 5 (1967) pp. 1295 - 1304.

[3] Ibid., p. 1302.

assumptions that utility is cardinally measurable,[1] that the income utility function is identical for all individuals and that interpersonal utility comparisons are possible. (Interpersonal utility comparisons require value judgements.) These arguments imply that resource valuation and project development based on uncorrected statistical demand schedules either perpetuates the status quo or redistributes the income from the low to the high income earners. But this problem is not peculiar to outdoor recreation alone; it is inherent in all demand schedules. Furthermore, it is far from clear that adjustments for imperfections in one market will result in an over all improvement in welfare when imperfections exist in other markets.

Time Costs

Scott[2] disagrees with the basic Hotelling-Clawson approach to measuring demand, particularly the underlying assumption that the imposition of a toll will induce the same visitation response for marginal and intramarginal visitors. Furthermore, neglect of the opportunity cost of travel time in the models results in biased estimates, and could be corrected by using a large number of questionnaires to simulate the market or imposing a toll at recreation areas. In the absence of the large sample, he opts for the toll. His arguments are presented below.

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[1] It has long been recognized that cardinal utility measurements are very difficult to obtain. Moreover, it is unnecessary for the analysis of consumer behavior. Ordinal utility measurements are sufficient.

[2] Scott, op. cit., pp. 27 - 47

Let the following notation hold:[1]

h - travel time in hours per mile;
k - opportunity cost of travel in dollars per hour;
M_i - travel distance from zone i to recreation center;
N_i - zonal population in 1000's;
$\sum N_i = N$ .. total population;
m - "cash" travel cost in dollars per mile;
v_i - visitation per 1000 from zone i;
V_i - total visitation from zone i;
$\sum N_i v_i = V_i = V$ .. total visitation;
t - toll or entrance fee per visit;
P_i - total cost per visit.

It is recalled that the Hotelling-Clawson demand equation is represented by:

(13) $v_i = \alpha - \beta P_i$.

Assuming linear relationships, the hypothetical Hotelling-Clawson demand equation for zone i can be expanded to reveal all the components of cost. These components are presented in equations 14 and 15.

(14) $v_i = \alpha - \beta (khM_i + mM_i + t)$.

(15) $v_i = \alpha - \beta khM_i - \beta mM_i - \beta t$.

Thus total travel cost of the i^{th} zone, P, is comprised of opportunity cost of travel time (khM_i), cash travel cost, (mM_i), and the toll or entrance fee, t. The toll has the same impact on the visitation rate in zone i as has been observed in the zone with a cash travel cost equal to t. The Clawson demand for the entire population in terms of changes in t, is:

(16) $V = \sum v_i N_i$.

Substituting equation 15 for v_i yields:

(17) $V = N\alpha - \beta kh \sum N_i M_i - \beta m \sum N_i M_i - N\beta t$.

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[1] Ibid., p. 29.

Since the first three terms on the right hand side of equation 17 are constants, the Hotelling-Clawson model assumes that a regression of visitation on travel costs (distance) is an expression of equation 17 having β as the slope coefficient. This interpretation is rejected by Scott.[1] Although the imposition of a toll on zone 0 will raise money cost to equal that of say zone 1, ($mM_o + t = mM_1$), zone 0 still faces a lower and unchanged opportunity cost of travel time. Consequently, the demand curve is biased downward and the "observed" slope coefficient, β, should be corrected. This correction is illustrated below.

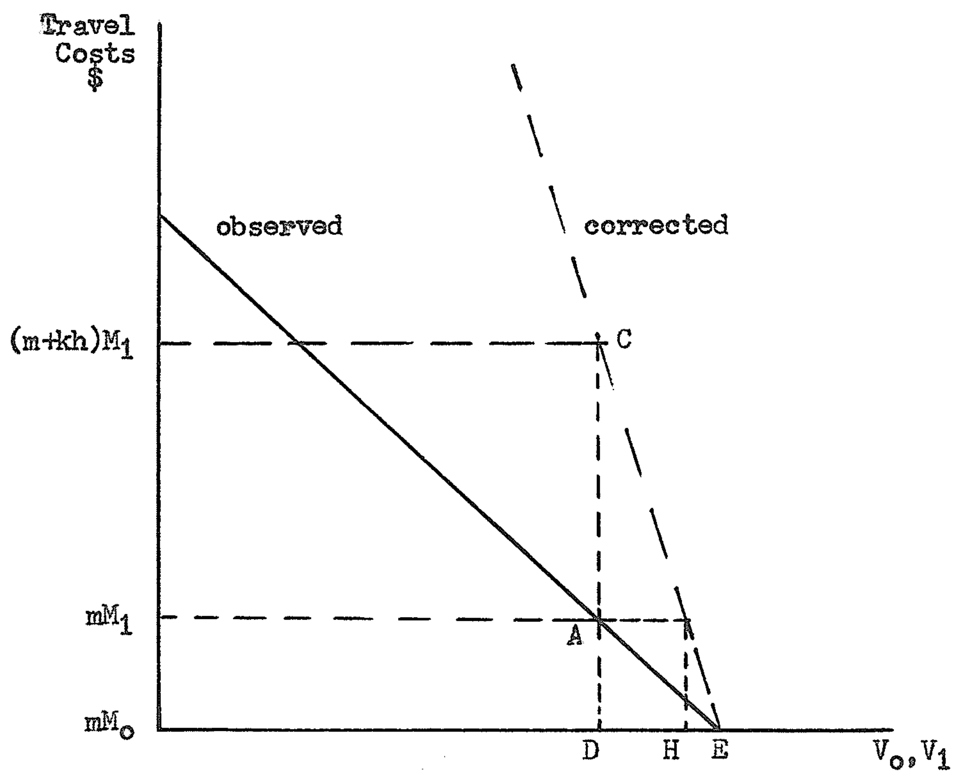

Figure 8

Clawson Demand Schedule of Zone 0 Corrected for Opportunity Cost of Travel Time

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[1] Scott, op. cit. p. 29.

In Figure 8, the imposition of a toll DA on zone 0 visitors raises money cost to that of zone 1, i.e. mM_1. By the Clawson formulation, visitation falls by DE to D. However, the total cost facing zone 1 is AD plus opportunity cost AC, $(mM_1 + khM_1)$. Hence C is located on the "true" demand curve of zone 0, CE, and the reduction in the visitation rate is HE rather than DE. The slope coefficient, b, is given in equation 18:[1]

$$(18)\ b = \beta \frac{AD}{CD}$$

where DE = bCD = βAD. In other words, the slope of the "true" demand curve, b, is a weighted average of the slope of the observed demand curve, β, (weighted by ratio of cash travel cost to total travel cost). In general, equation 18 may be represented as follows:

$$(19)\ b = \beta \frac{mM_1}{mM_i + khM_i} = \beta \frac{m}{m + kh} .$$

Assuming m, h and k are constant for all zones, the "true" demand equation can now be obtained by substituting b for observed β in equation 17.

$$(20)\ V = N\alpha - bkh \sum N_i M_i - bm \sum N_i M_i - Nbt.$$

Combine like terms on the right hand side of (20):

$$(21)\ V = N\alpha - b(kh + m) \sum N_i M_i - Nbt.$$

Equation 21 can be further transformed by substituting βm for b(m + kh):

$$(22)\ V = N\alpha - \beta m \sum N_i M_i - N\beta \frac{mt}{m + kh} .$$

Thus far opportunity cost of time spent at the recreation site has been omitted and opportunity cost of travel time has been treated as constant for all distant zones. These assumptions can be relaxed.

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[1] Based on the conventional mathematical expression of the demand function, i.e. Q = f(p).

Opportunity cost of time spent at the site is directly related to foregone income and consumption opportunities. Therefore, given income and occupation, one can hypothesize the relationship between visitation and opportunity costs of income and time spent in recreation.

Furthermore, given time as a constraint, the opportunity cost of travel time, k, should increase as the limit is approached. Therefore, k is itself a function of distance, M_i. Hence, one would expect a toll to have a negligible effect on visitors who face high opportunity cost of travel time, e.g. the high income groups. Visitors from the proximal zones, particularly zones 0 and 1, will be the main users affected by a toll. The observed or Clawson demand curve should be shifted upward by kh, the money opportunity cost in dollars per mile, making the corrected or true demand curve less elastic, (Figure 9). This decline in elasticity of demand is also dependent on h, travel hours per mile, which is generally fixed. However, with better access routes and increase in road speed limits, h declines, thereby increasing visitation and the elasticity of demand. Because marginal visitors usually have more money than time, the cash travel cost curve is fairly steep, but opportunity cost of travel time, h, may fall with faster means of transportation. In other words, because high income earners have high k values, they would choose faster and hence more expensive means of transportation. On the other hand, low income earners would prefer the slower and less expensive means of transportation. Scott therefore concludes that for marginal visitors, or high tolls, the observed and "corrected" demand curves tend to converge with faster means of transportation.

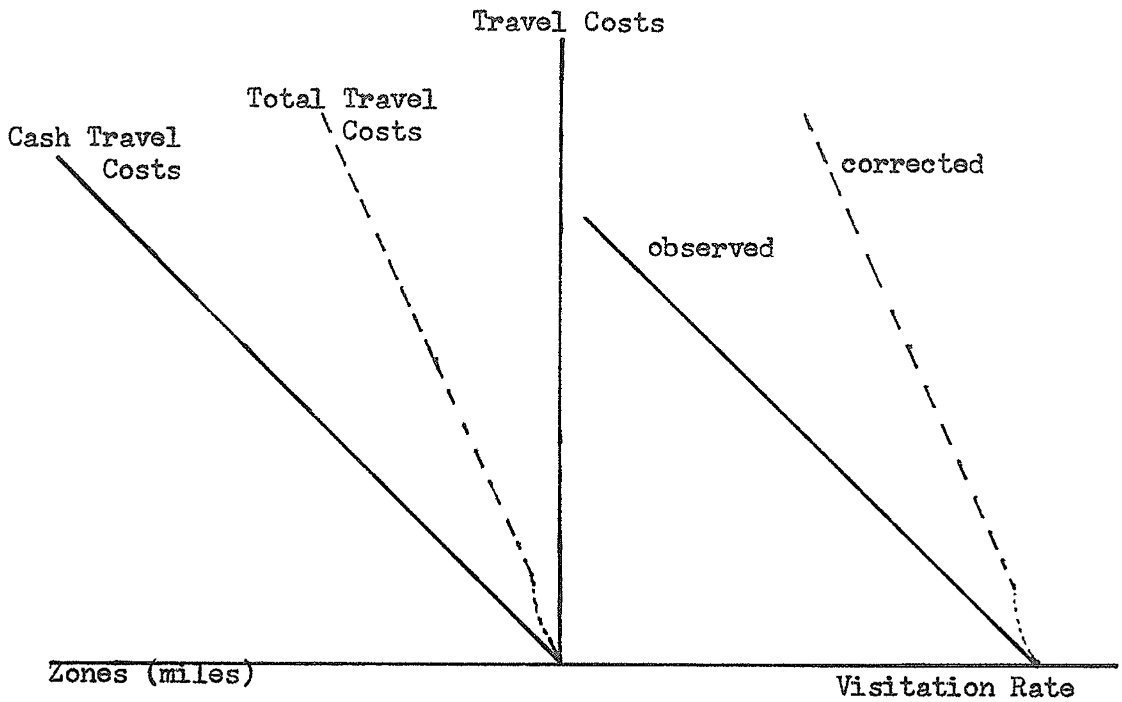

Figure 9[1]

Clawson Demand Schedule of Zone i Corrected for Variable Opportunity Cost of Travel Time

It is clear that time costs are important ingredients in the decision-making process. What is not clear is the money equivalent of these costs. From neoclassical theory of consumer behavior, the opportunity cost of an hour of leisure is simply the money wage rate of the individual. Accordingly, money wage rate is taken to be a measure of the marginal value of leisure and travel time.

Tussey,[2] in his study of recreation at the Rough River and Dewey reservoirs in Kentucky, employed a value of $1.50 per travel hour or

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[1] Ibid., p. 35.

[2] R.C. Tussey, Analysis of Reservoir Recreation Benefits (Kentucky: University of Kentucky Water Resources Inst., Report No. 2, 1967), pp. 128 - 131. The estimate of $1.50 was obtained from studies done by the American Association of State Highway Officials, 1960.

\$0.86 per person-hour (1.8 persons per vehicle). Schellenberg and Craddock[1] used \$3.36 per travel hour or \$0.75 per person-hour (with 4.5 persons/ vehicle) in their study of recreation in the Souris River Basin of Southwestern Manitoba.

Johnson[2] criticizes the use of the wage rate as a measure of the opportunity cost of time spent in the pursuit of recreation. In his view, if it is assumed that (1) the individual operates under a budget and time constraint, and that (2) both work and leisure enter his utility function as decision variables, the use of the money wage rate over-estimates opportunity cost of time.

Let the postulated Lagrangean function of the i^{th} recreationist be of the following form:

$$(23)\quad V = f(x_{i1}, x_i', W_{i1}, L_i) + \lambda(p_{iw}W_i - p_x x_{i1} - p'x_1') + \mu(T_i - t_x x_{i1} - W_i - L_i)$$

where x_1, x', W, L and T represent recreation trips, units of non-trip commodities, hours of work, hours of leisure and the fixed time endowment, respectively; p_w, p_x, t_x and p' are the money wage rate, money and time prices of recreation trips, and money price of the composite of non-recreation goods. Assuming that the first and second order conditions for maximization are satisfied, it can be shown that the marginal rate of substitution between income and recreation is equal to the sum of the money price of recreation and the recreationist's subjective money

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1 H.D. Schellenberg and W.G. Craddock, A Preliminary Economic Analysis of Outdoor Recreation in the Souris River Basin, Winnipeg: Agassiz Center for Water Studies, University of Manitoba, Internal Report No. 2, February 1971, pp. 43 - 45. The estimate is based on the mean income of the recreationists in their sample survey (\$6,450).

2 B. Johnson, "Travel Time and the Price of Leisure," Western Economic Journal, IV,2 (Spring, 1966), pp. 135 - 145.

valuation of recreation time of the last trip. This relationship can be specified as follows:

$$(24) \quad \frac{f_x}{f_m} = p_x + \frac{f_L}{f_m} / t_x,$$

where f_x, f_m and f_L are the marginal utilities of recreation, income and leisure, respectively.[1] Similarily, the marginal rate of substitution of income for leisure is equal to the sum of the money wage rate and the marginal rate of substitution between income and work (25). Symbolically,

$$(25) \quad \frac{f_L}{f_m} = p_w + \frac{f_w}{f_m},$$

where f_w is the marginal disutility of work. If it is assumed that $f_w < 0$ and $f_m > 0$, opportunity cost of leisure is overestimated by the sole use of the wage rate.

Since time is not without limit, and it is a determining factor in the choice of recreation area, and the frequency and duration of visits, it should be explicitly considered. Johnson's argument points to a basic weakness in the indirect approach; it is almost impossible to measure an individual's subjective value of time. (This problem need not arise in the direct approach.) At best it may be enough to alert the reader of the possible upward bias in the estimates of demand and benefits.

> ... so long as work and leisure enter the utility function as separate variables, the value of leisure, travel time or any use of time will be less than the money wage rate.[2]

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[1] Ibid.

[2] Ibid., p. 139.

Other Models

Ullman and Volk: Whereas many of the models that have been developed are site-specific, Ullman and Volk[1], attempted to develop models that were applicable to both existing and potential sites, to sites of similar quality and competitiveness, and populations of varying tastes and incomes. Three visitation schedules were constructed for predicting attendance and benefits at eight reservoirs in the Meramec Basin in Missouri. The "high" schedule corresponded to urban, high income counties, and/or high quality reservoirs, and/or absence of intervening alternatives. The "low" schedule represented rural, low income counties, and/or lower quality reservoirs, and/or presence of intervening alternatives. The "medium" schedule was intermediate between "high" and "low".

Whether the three functions are statistically different is not clear. However, by fitting the three separate functions Ullman and Volk make the implicit, but plausible, assumption that recreationists from urban high income counties have similar income, tastes, and preferences for outdoor recreation. Similarly, recreationists from rural, low income counties have similar income, tastes and preferences for outdoor recreation. Furthermore, since they also derived visitation schedules for reservoirs of varying sizes and quality, their models have wide application. Thus the explicit recognition of factors other than population and distance have greatly enhanced the application of these models.

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[1] Ullman and Volk, op. cit. p. 477.

Benefits are estimated in terms of a locational rent. The underlying rationale to this approach is that if the recreationist is diverted from a distant recreation area to one that is located closer to his home, the savings in travel cost represent the direct benefits to the recreationist. Some recreationists at four of the reservoirs studied were therefore asked "'If a lake similar to this one were built half as far away from your home, would this decrease your visits to this lake?' to the extent of 'eliminate completely, reduce greatly, reduce slightly, no effect, don't know.'"[1] The scores attached to the first four responses were 100%, 75%, 25% and zero respectively. On the basis of the responses to this question a visitation schedule was derived for all reservoirs; the benefits were computed as the savings in travel cost.

A variant[2] to the Ullman and Volk approach is based on the principle that if an existing recreation area is eliminated, the recreationist would be forced to visit the next best alternative which presumably is more distant and more costly. A demand schedule can be constructed for the area in question based on the forced diversion; the sum of the saving in travel costs over all users represents the value of the recreation area to be eliminated.

For this approach to be operational, the alternative recreation areas have to be similar. If they are not, it is conceivable that recreationists would be diverted to closer rather than distant alternatives.[3]

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[1] Ibid. p. 480.

[2] See R.A. Spargo, "Methods and Techniques of Evaluation of Sport Fishing," Canadian Fisheries Reports (Ottawa: Department of Fisheries, Report No. 4, 1965), pp. 53 - 69.

[3] Ibid.

In addition, this technique is more suited to the interview approach since the recreationist is better able to identify the alternative areas.

Gravity models: The basic gravity model relates visitation to travel distance. Riley adapted Newton's Law to the measurement of the influence of two cities on retail trade in a town located between the two cities.

> Two cities attract retail trade from any intermediate city or town in the vicinity of the breaking point approximately in direct proportion to the population of the two cities and in inverse proportion to the squares of the distance from these two cities to the intermediate town.[1]

This hypothesis is symbolized in equation 26:

$$(26)\quad \frac{V_{ij}}{V_{ih}} = \frac{P_j}{P_h}\left(\frac{D_{ih}}{D_{ij}}\right)^2$$

where V is the proportion of retail trade drawn from intermediate town i; P is the population; D is travel distance to town i; and i is intermediate town; h and j are the two cities being compared. Subsequent studies have since confirmed that population and distance are among the key variables influencing visitation and that the exponents may vary with the inclusion of other variables.

Knetsch[2] applied the gravity model to predict visitation at the Kerr Reservoir in North Carolina and Virginia. Using least squares regression analysis he derived the following equation:

$$(27)\quad \log_{10} (V + 0.80) = a_o - a_1 \log_{10} C,$$

where V is the annual visitation rate per 1000 base population; a_o and

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[1] P. Kotler, Market Management: Analysis, Planning and Control (New Jersey: Prentice Hall Inc., 1967), p. 444.

[2] R.C. Tussey, Analysis of Reservoir Recreation Benefits (Kentucky: University of Kentucky Water Resources Inst., Report No. 2, 1967), p. 17.

a_1 are constants; C is the dollar travel cost; 0.80 ensures that the demand curve intersects the axes. This equation explained 97 percent of the variation in visitation to the reservoir.

The prevailing tendency is to examine variables in addition to population and distance. Merewitz[1] undertook a study of boating, fishing, water skiing and sun-bathing in Lake of the Ozarks, Missouri. Using census data for 1950 to 1954 and 1956, he regressed visitor days on 46 different characteristics. Best results were obtained with four independent variables - air travel distance, population, population density per square mile and the degree of urbanization, i.e. percent of political units with population of 2,500 and above.

The gravity model was also employed by Tussey[2] to estimate visitation to reservoirs at Rough River and Dewey in Kentucky. His model is presented below in (28):

(28) $V = KP/D^n$

where V is the annual visitor days; K is propensity to visit, P is base population of origin area; D is travel distance; and n is regression coefficient of visitation on distance. The propensity to visit, K, is constant for the base population and is derived by regression analysis. From equation 28, V is estimated for each origin area. Total annual visitor days is the summation of all V's.

Tussey's model is not unlike that of Knetsch. If equation 28 is expressed on a per capita basis and converted to logarithms, the similarity becomes obvious as is shown in (29):

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1 L. Merewitz, "Recreational Benefits of Water Resource Development," Water Resources Research II, No. 4 (1966), pp. 625 - 640.

2 Tussey, loc. cit.

(29) $\log_{10} V/P = \log_{10} K - n \log_{10} D.$

Unlike Knetsch, however, Tussey included several other variables in his model, e.g. population characteristics, out-of-way or effective travel distance, type of highway, competing facilities. Knowing the actual number of visitors from each origin area and the mean distance between origin area and recreation center, K and n are estimated by regressing per capita visitation on distance. Of the three distance variables tried - air, road, and time - air distance was the most significant in explaining visitation to Rough River and Dewey Reservoirs. In addition, he compared the performance of this model with those of Knetsch and Merewitz using the same data; he suggested that on the basis of the t-values, R^2 and coefficient of variation, his model generally gave better results.

Like Merewitz's study, Tussey's study concludes that the inclusion of variables other than population and distance does not contribute significantly to the performance of the model. Effective or out-of-way travel distance (cost)[1] is a more appropriate variable for constructing the marginal benefit or demand schedule since it relates demand and benefits specifically to the resource base. (The Clawson demand schedule is less specific and introduces some arbitrariness in the choice of incremental distance.) However, data on effective travel distance are not readily available. The selection of appropriate K and n values is crucial. Generally K is dependent on Socioeconomic

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[1] Defined as that distance which the recreationist went out of his way to visit the recreation area.

characteristics of the base population, the travel route, availability of recreation areas that are close substitutes and the quality of the resource base.

Relatively few studies have attempted to measure quality or attractiveness. Yet, quality or attractiveness is directly related to recreation demand. Ullman and Volk[1] developed separate models for recreation areas of different levels of quality. Davidson, Adams and Seneca[2] investigated the effects of changes in water quality on boating, fishing and swimming. Quality was measured in terms of milligrams of dissolved oxygen. More recently, Cheung[3] and Cesario[4] have attempted to include quality or attractiveness in their models. A direct relationship was found between quality or attractiveness and visitation.

It is recalled that quality or attractiveness may be circularly related to intensity of use.[5] Beyond some threshold level of use, overcrowding or congestion may cause a reduction in the demand for and value of the recreation area. In addition, capacity constraints, when accompanied by non-price rationing, has important measurement and welfare implications. This relationship is illustrated in Figure 10.

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[1] Ullman and Volk, loc. cit. Quality is not clearly defined in the report.

[2] P. Davidson, F.G. Adams, and J. Seneca, "The Social Value of Water Recreational Facilities Resulting from an Improvement in Water Quality; The Delaware Estuary," Water Research, ed. A.V. Kneese and S.C. Smith (Baltimore: John Hopkins Press, 1966), pp. 175 - 211.

[3] H.K. Cheung, "A Day-Use Park Visitation Model," CORD Technical Note No.1 (Ottawa: National and Historic Parks Branch, Department of Indian and Northern Affairs, undated).

[4] F.J. Cesario, "A Method of Estimating Recreation Benefits," Resource Management of the Great Lakes Basin. ed. F.A. Butrico, C.J. Touhill and I.L. Whitman (Lexington: Heath Lexington Books, 1971), pp. 143 - 172.

[5] Scott, op. cit. p. 27.

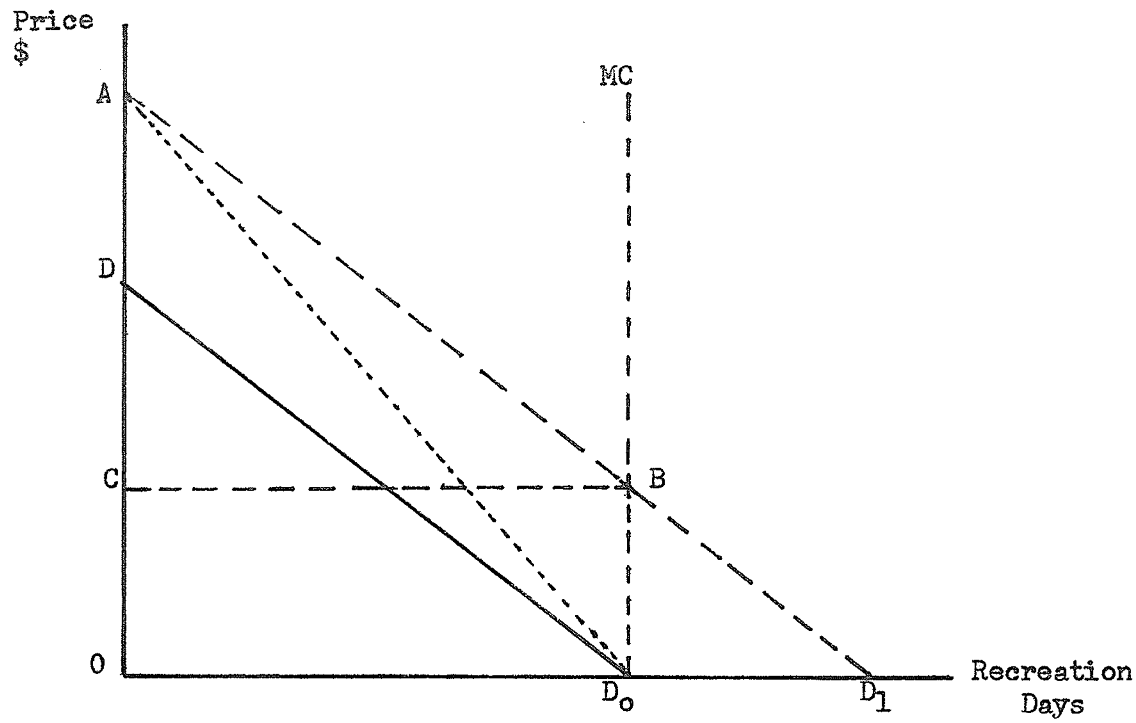

Figure 10

Effect of Capacity Constraint on Demand

Assume that DD_o is the demand schedule and the marginal cost is zero. With zero pricing, OD_o units of recreation are consumed; total benefit is given by the consumers' surplus (CS), ODD_o. If demand should increase to AD_1, then, assuming zero pricing, total benefit is represented by CS, OAD_1. Now assume that there is a capacity constraint at D_o, where the marginal cost curve, MC, becomes perfectly inelastic. If a price of OC is charged, then total benefit is equal to total revenue $OCBD_o$ plus the CS, CAB.

Thus far no ambiguity exists in the measurement of demand and benefits. The problem arises, however, when consumption of OD_o is rationed by non-price measures and entry is granted to users who otherwise would have been excluded by price rationing. Under these conditions, total benefits is no longer $OABD_o$ but some fraction (OD_o/OD_1) of $OABD_o$.[1]

The above outcome becomes clear when it is recognized that the recreationists who enter the "market" at prices below OC are willing to pay less for the resources than those recreationists willing to pay prices $>$ OC. Assuming equal probability of access, some of the former recreationists who value the resources more highly will be excluded, thus shifting the demand curve AD_1 down to AD_o. Hence total benefits is given by OAD_o.[2]

The obvious implication of non-price rationing accompanied by a capacity constraint is that the demand schedule shifts down resulting in a loss of welfare equivalent to triangle ABD_o. (This downward shift may also occur where there is overcrowding causing deterioration in quality.) This loss can be prevented by price rationing (or finding some means of discriminating against users according to their marginal valuation of the resource). Seneca concludes that:

> ... if a good is actually priced at LRMC (or zero) and excess demand exists, the welfare measures of the perfectly discriminating monopolist approach or short run marginal cost pricing consistently overstate the true welfare measure at the capacity quantity.[3]

In this study, it will be assumed that capacity limits and congestion are not usually encountered at the recreation areas studied.

Conclusion

It was pointed out that the overriding problem encountered in evaluating outdoor recreation, is the extra-market nature of this good.

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[1] For a full discussion see J. Seneca, "The Welfare Effects of Zero Prining of Public Goods," Public Choice, (Spring, 1970) pp. 101 - 111.

[2] $OAD_1 = \frac{1}{2}OA \times OD_1$; Total Benefits $= OAD_1 \times OD_o/OD_1$
$= \frac{1}{2}OA \times OD_1 \times OD_o/OD_1$
$= \frac{1}{2}OA \times OD_o = OAD_o$

[3] Ibid., p. 104.

Outdoor recreation is usually treated as a public good, therefore the price-market mechanism is nonfunctional. Many of the procedures that have been employed to overcome this problem have been discussed. These procedures generally fall into three categories - direct and indirect approaches and a mixture of both.

The direct approach is based on the premise that the recreationist knows best. Therefore demand and benefit estimations are predicated on the responses of the recreationist to hypothetical questions. This approach has several important advantages. Time costs can be implicitly or explicitly incorporated in the questionnaire. The questionnaire can ascertain whether the recreation area under study is the main destination or one of many destinations. In the case of the latter, appropriate adjustments can be made to ensure that benefits are not overestimated. Equally important is the capacity of this approach to isolate the demand for various activities and resources within a given recreation area, and to cater to the needs of different categories of recreationists. Similarly, locational bias[1] created by recreationists deliberately trading off accessibility to recreation areas over accessibility to cities is not encountered.

While the direct approach is logically sound, it has major short-comings. Interviewing is a costly exercise and of necessity must be confined to small samples and a few recreation areas. Respondents may view outdoor recreation as a public good, therefore they do not have to reveal their true preferences. Finally, since hypothetical questions

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[1] Lessinger, loc. cit.

obtain hypothetical answers, responses are likely to be inconsistent, thereby casting great doubt on the validity of this technique.

Unlike the direct approach, the indirect approach is less costly. Travel money cost has been shown to be a useful proxy for price. However, because of insufficient data, it is not clear whether demand and benefit estimates are biased by multipurpose trips. It is not sensitive enough to distinguish between categories of recreationists and preferred activities within parks. Moreover, the locational bias pointed out above is not easily corrected where such bias exists. This problem may be overcome by developing models for each area of origin.

Ullman and Volk[1] in their pioneering work attempted to meet part of these problems by developing three schedules. However, it is of interest to note that they also conducted some interviews. Perhaps a combination of both approaches is necessary.

By and large, the direct and indirect approaches have tended to omit factors other than population and distance. The studies of Tussey and Merewitz discussed above suggest that variables other than population and distance are of little consequence. Boyet and Tolley[2] tested the inclusion of variables in addition to distance. These variables included income, age, education and race. The study concluded that income and distance were important determinants of visitation, and that time series data formed a better basis for prediction than observation taken in any

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1 Ullman and Volk, loc. cit.

2 W.E. Boyet and G.S. Tolley, "Recreation Projection Based on Demand Analysis," Journal of Farm Economics XLVIII, No. 4 (1966), pp. 984 - 1001.

arbitrarily selected year. Yet, it may be more useful to develop demand models for homogeneous subgroups within the base population; within this context socioeconomic variables may assume some importance, particularly factors such as age, occupation and income of heads of households.

Finally, it should be pointed out that by concentrating on one recreation area, previous studies have tended to overlook the characteristics of recreation areas. Site characteristics may be explicitly considered if recreation areas, rather than origins, are specified as the units of observation. This study will attempt to meet some of these criticisms.

Chapter IV

CONCEPTUAL FRAMEWORK

Several procedures have been outlined for estimating demand. Although the resulting estimates may vary, these techniques share some common features. They are static in nature, implicitly or explicitly assuming fixed tastes, preferences, and knowledge of available alternatives. Where alternatives are not explicitly considered, it is implied that they are randomly distributed throughout the country. In addition, externalities are assumed away by equating private and social benefits.

Romm[1] suggests that because of the differences in emphasis and sensitivities, these various techniques measure slightly different aspects of outdoor recreation. Theoretically, provided that corrections can be made for the many biases in the direct and indirect approach, the results should not be very different. However, to the extent that the various techniques are complementary, use of any one will give only a partial, albeit important, picture of the total recreational demand.

These approaches may be illustrated in the form of a matrix. Assume that there are m areas of origins and n recreation areas. If the visitation rate, V_{ij}, from the i^{th} zone to the j^{th} recreation area is known, a matrix V of order mxn may be constructed. For the j^{th}

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1 J. Romm, The Value of Reservoir Recreation (New York: Cornell University Water Resources and Marine Sciences Center, Ithaca Technical Report No. 19, August 1969), p. 84.

recreation area, there is a column vector of visitation rates corresponding to the origins. Given the associated travel costs, D_{ij}, a demand function is specified for each recreation area:

(30) $V_{ij} = f(D_{ij})$

where $i = 1, 2, \ldots m$, $j = 1, 2, \ldots n$.

Both the direct and indirect approaches examine individual column vectors. Ullman and Volk isolated schedules according to residence, income and quality of reservoirs. Pearse employed income classes so that given a recreation area, demand relations were specified for each income class. This study employs the indirect approach with some of the refinements of Ullman and Volk, and Pearse. In addition, recreation areas are spacially distributed around each base population rather than the reverse. In other words, demand relations are derived using the row vectors of the above matrix. Thus recreation areas and <u>not</u> origins become the units of observation in the models. A separate estimating equation is associated with each origin and can also be associated with subgroups within each origin.

A clear advantage of this approach is that it allows for the inclusion of site characteristics which were generally omitted from previous studies. It also avoids some problems encountered in previous studies. These problems will be discussed in subsequent pages.

Demand Versus Consumption

It is recalled that demand for a good or service at any point in time is dependent, inter alia, on its price, the prices of substitutes and complements, consumers' disposable incomes, tastes, preferences, the number of consumers, and the range of alternatives available to consumers.

The importance of the supply of outdoor recreation facilities has been discussed by Knetsch[1], and Taylor and Knetsch[2]. They argue that a distinction should be made between consumption and demand. Consumption of outdoor recreation measures actual participation which in turn is greatly determined by the availability of recreational opportunities, i.e. supply. The absence of swimming facilities at a given park is reflected in zero participation at this site. However, zero participation or consumption does not indicate a lack of demand for swimming facilities, but rather zero supply.

The issue raised by Taylor and Knetsch is essentially one of pricing and whether the demand and supply are in equilibrium. At price P_1 in Fig. 11, the quantity demanded Q_d is greater than the quantity supplied, Q_s. This disequilibrium results from the fact that the market price P_1 is less than the equilibrium price, P_2. It is recalled that in outdoor recreation "price" does not operate as a rationing device; since it is usually set well below the equilibrium price it is conceivable that disequilibrium does exist. In so doing, society is either (un)consciously trading off economic efficiency for income distribution or the cost of collecting fees is prohibitive. (It is recalled that non-price rationing accompanied by capacity constraints at recreation areas has important measurement and welfare implications.)

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[1] J. L. Knetsch, "A Design for Assessing Outdoor Recreation Demands in Canada" (Unpublished paper prepared for National and Historic Parks Branch, Department of Indian Affairs and Northern Development, November, 1967), p. 6.

[2] G. D. Taylor and J. L. Knetsch "Canadian Outdoor Recreation Demand Study," (Unpublished Paper, July, 1968).

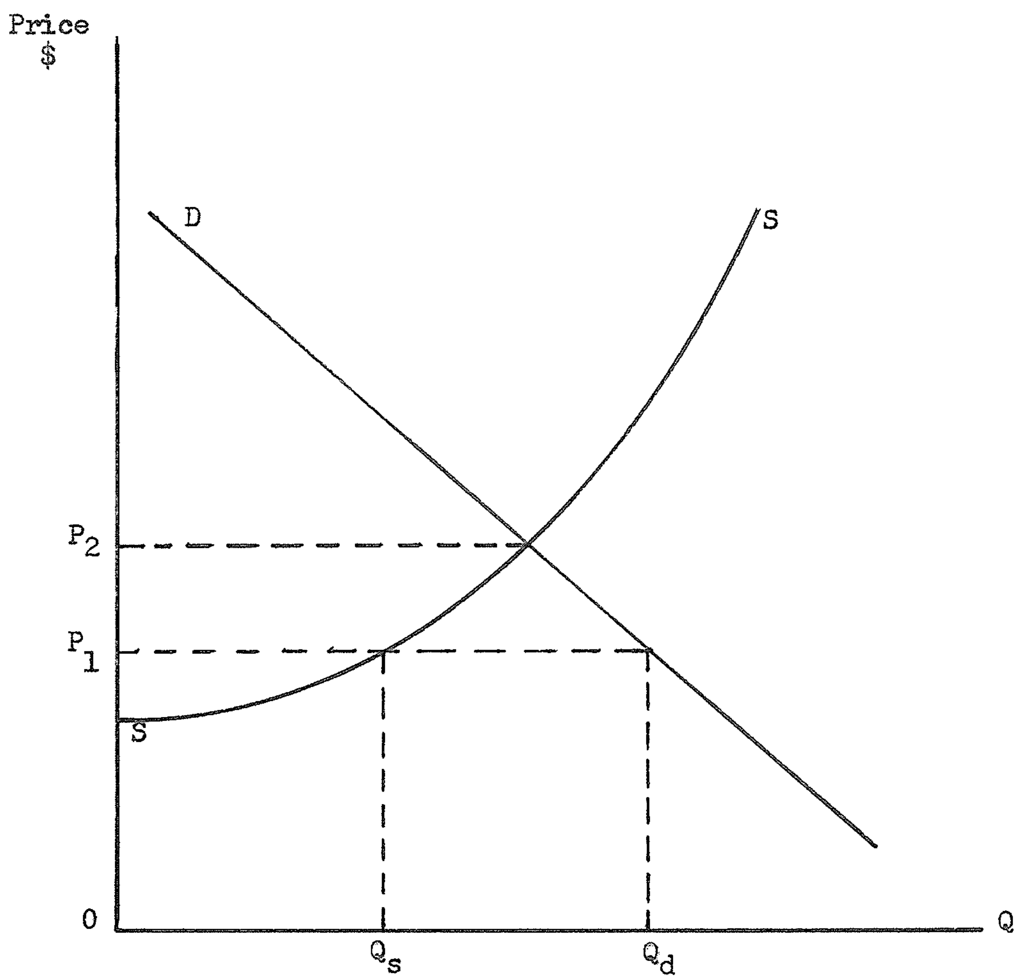

Figure 11

Demand and Supply Schedules

Confusion between consumption as measured by actual participation and demand, may have serious economic and policy implications. For the purposes of this study, demand is interpreted in the conventional sense - effective demand. As such, it is a function of willingness and ability to pay for goods and services. Demand is therefore a reflection of the preferences and purchasing power of recreationists who have visited outdoor recreation centers in 1969.

The demand schedule is essentially a list of quantities demanded at given prices per unit time. In the case of outdoor recreation, the quantity variable is not clearly defined and is subject to many interpretations. For instance, it can be number of visits, number of visitors, visitor-days, duration of visits or dollar expenditures on outdoor recreation at public (or private) lakes, parks, campsites and picnic sites. Since per capita visitation permits more useful comparisons between populations of different sizes, the quantity variable employed herein is number of (household) visits per 1000 population per summer. Number of visits can be readily converted to visitor-days, provided data are available on length of visits.

Travel Cost

In the absence of market prices, the travel costs incurred in the pursuit of outdoor recreation is a useful proxy for price in the estimation of demand. However, total costs may be a better basis for estimating benefits if the latter are not to be underestimated. Total costs include travel costs, time costs and onsite expenditures.

Travel money cost is the product of return travel distance and a predetermined mileage levy. Automobile costs may be divided into two components - variable and fixed costs. Variable costs depend directly on the number of miles covered, the manner in which the vehicle is driven, and the regularity of service and repair. Fixed costs, on the other hand, are usually beyond the control of the operator and may be unrelated to the number of miles driven, e.g. insurance, license, registration fees, and depreciation. Travel (vehicle) costs are calculated from variable costs. The main items include gas, oil, wear and maintenance. These costs will vary, inter alia, with the manner in which the car is driven, where it is driven (city or rural areas), terrain, load carried, climate, and general condition of the vehicle.

In determining travel costs, it should be recognized that the cost figures will vary with the underlying assumptions. A conservative driver would gain more wear from his tires and have less fuel and maintenance costs than a less conservative driver. For this study therefore cost figures are compiled for the average driver with a medium sized car in Manitoba.

Assuming that the mileage obtained is 17 miles per gallon and that gas cost 51.9 cents per gallon, gas cost per mile is taken to be 3.053 cents. Oil priced at $1.00 per quart, is changed every 2500 miles. Oil and air filters are priced at $3.50 and assumed to be changed every 5000 miles. It is also assumed that four tires cost 0.59 cents per mile and last 20,000 miles. Finally, maintenance costs are set at 1.05 cents per mile.

The variable costs are presented below. Travel money costs are approximated at 5 cents per mile.

	Variable Costs per Mile
gas	3.053 cents
oil	0.160
oil filter	0.070
air filter	0.070
tires	0.590
maintenance	1.050
Travel Costs	4.993

As demonstrated by Scott[1], the omission of travel time cost introduces a downward bias in the demand schedule, and hence, the benefit estimate. This bias results from the implicit but erroneous assumption that all recreationists from the different geographical areas face the same travel time cost. By developing models for each base population, this study avoids such an error. All the recreationists within each sample area face the same travel constraint, i.e. the same travel time is required of recreationists in a given sample to visit a specific site. Correspondingly, they also face the same recreational alternatives. Given the location of these recreation areas, it is assumed that recreationists respond to travel distance in the same manner as they would to recreation prices.

Time costs are essentially the opportunity costs of time spent in travel and recreation. Enormous data problems are encountered in trying to estimate opportunity costs. With the interview method, responses to questions on willingness-to-pay do include the time component of costs. For, if a recreationist is asked how much he is willing to pay to visit a recreation area or what compensation he would accept for the loss of visiting privileges, it is presumed that he will take <u>all</u> costs into account. However, with the indirect approach one has to fall back on money wage as a measure of opportunity cost recognizing that the estimate is biased upwards.[2]

This study assumes that recreation generally occurs outside working hours - evenings and weekends - and during paid vacations. In addition, only a few recreation areas have concession houses, therefore onsite expenditures are negligible and can be ignored. Consequently, only travel

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[1]Scott, loc. cit.

[2]See discussion on pp. 50 - 52.

money and time costs are relevant. The opportunity cost of travel time as considered here, is equivalent to the value of leisure time lost through travel. On the assumption that travel is a cost, one would therefore have to know the value of leisure time to the individual before an estimate of travel time cost can be made. As this information is not available, only travel (distance) money cost will be used to estimate demand. However, in deriving benefits, two estimates are given - one based on travel money costs, and the other on travel money and time costs. Time costs have been estimated at 6.9 cents per vehicle mile.[1]

Alternative Recreation Areas

One of the major weaknesses of previous studies is their failure to consider competition and complementarity among recreation areas when estimating demand for new sites. By developing models based on a single recreation area these phenomena are ignored. The implicit assumption is that either all population bases face similar alternatives with respect to accessibility and quality, or if these phenomena do occur, they are of little consequence to demand and benefits. Bias also results from the fact that by distributing population around a given recreation area some recreationists will invariably encounter more alternatives than others. Unless

[1] Average family income of the Prairie Provinces in 1969 was $8122. Statistics Canada, Income Distribution by Size in Canada, 1969 (Ottawa: Information Canada, Catalogue 13 - 544, 1972), Table 1, p. 23. It was assumed that the average number of days worked was 252, and that an average work day consisted of 8 hours. With 2016 working hours per year, the average wage was $3.44 per hour. Therefore, assuming travel speed of 50 mph, the opportunity cost per vehicle mile was 6.9 cents.

these recreation alternatives are randomly distributed throughout the population, recreationists who have many alternatives will respond differently to price changes than recreationists with few alternatives. The imputed demand for and benefits derived from sites are therefore biased. By developing a model for a given origin area based on the recreational activities of individuals within that orign, some bias can be avoided because all individuals will be facing the same alternatives.

The bias occasioned by lack of consideration for existing alternatives may be more serious where the recreation area is relatively small and unattractive. However, the problem may be less serious for a recreation area like the national park proposed for the lake-shore of Toronto. Given its proposed size, accessibility to Torontonians, improved quality of the water and the general attractiveness of the area, a large number of recreationists will be weaned away from less favorably endowed areas. Therefore, ceteris paribus, predicted visitation to the new park may approximate the true demand and value.

Another weakness in previous studies is the unstated assumption that aggregate demand is perfectly elastic. Thus the creation of a new recreation area simply increases aggregate demand by the full extent implied by the structural coefficients which underly the model. The deficiency of this assumption is readily recognized when it is pushed to its logical conclusion, i.e. as the number of recreation areas increase without limit, aggregate demand hence value, increases without limit. This weakness follows directly from the use of single equation models rather than a system of equations. As a result, interaction effects are ignored or assumed away.

Difficult though it may be to deal with these problems, greater consideration is required. Ideally, the above mentioned problems should be analyzed within a system of simultaneous equations. As stated earlier, the approach of this study is to employ recreation areas rather than recreationists as the units of observation. The recreation areas are taken to be similar except for those characteristics such as accessibility and quality which are explicitly considered in the model. Since all recreationists from the same sample face the same alternatives of recreation areas the bias encountered in other studies is reduced.

The model can be viewed as representative of the recreation areas studied. Being single equation however, it is not sensitive enough to place limits on the expansion of demand with the creation of more recreation areas. It merely measures the number of recreationists that would be drawn from the sample area to a given park which has certain physical attributes. As a result, two estimates are provided for total visitation and benefits; one is unconstrained, the other constrained. The unconstrained or "High" estimate assumes that aggregate demand is perfectly elastic. The constrained or "Low" estimate assumes that aggregate demand is perfectly inelastic, therefore the estimated demand for the new park is due solely to a redistribution of visits among all recreation areas. The true value lies somewhere between these two extremes, the range varying directly with accessibiltty and attractiveness of the new area.

Attractiveness

The attractiveness or quality of recreation areas has an important bearing on total number and distribution of visits among recreation areas. The more attractive a park, ceteris paribus, the greater will be the knowledge of it and hence the greater will be the number of visitors. Since attractiveness is highly subjective, it is an elusive concept to quantify. It varies with the eye of the beholder and the amenities and facilities - natural and artificial - found in the park.

In the case of sport fishing or hunting, one aspect of attractiveness may be defined as the relative fishing or hunting success over several seasons. Thus if 50 percent of the fishermen or hunters generally capture their bag limit in one area versus say 25 percent in another area, the first area, ceteris paribus, is more attractive than the second.

Whereas fishing and hunting success can be easily measured, it is very difficult to define and measure a comparable variable for other recreational experiences, e.g. swimming, sightseeing, etc. Cesario gets around this problem by defining attractiveness in the following manner.

> Relative attractiveness of one park with respect to another to any population group is the ratio of their relative visits over some time period, other things equal.[1]

If two recreation areas are equidistant from a given origin, and they are of equal size and attractiveness, recreationists will tend to distribute themselves equally between the two areas. Thus, ceteris paribus, the measure of relative attractiveness is the ratio of the average number of visits at two parks from a common population base. Because accessibility will also influence number of visits, he combines both accessibility and attractiveness into one attractiveness-cost index.

If the index of attractiveness is to be of value in designing recreation areas, it will have to go beyond Cesario's construct. It needs to identify the various amenities and facilities within each park and to weight these attributes by their individual capacity to attract visitors. The voting game is one alternative approach. Recreationists are given 100 points to distribute among recreational experiences within parks in order of tastes or preferences. This weighting would enable the researcher to compare relative attractiveness within parks. The voting

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[1] Cesario, op. cit. p. 156.

game can also be used to rank parks according to relative attractiveness.

Perhaps a better approach to the voting game is one based on where recreationists go and what they actually do within parks. The more attractive parks will receive a greater proportion of recreationists, ceteris paribus, than the less attractive park. Similarly, within a given park, ceteris paribus, the activities that are more attractive will experience higher participation rates than other less popular activities. Thus, assuming that a park has a number of different activities, attractiveness can be measured by the relative proportion of recreationists participating in each activity. It is therefore proposed that if 50 percent of the recreationists are usually found on beaches, then beach facilities should be given a score of 50. Similarly, if golfing tends to attract one percent on the visitors, it should receive a score of one.

A measure of the nature proposed above reflects a greater sensitivity to the preferences of recreationists within a given recreation area. It allows one to measure the pull-effect of an individual facility on visitation rates. Moreover, assuming that the weights are additive[1] (or multiplicative) for any given park, the index may meet in part, Cesario's objective of ranking parks according to relative attractiveness; the larger the index the greater is the attractiveness. (Since recreationists may seek more than one experience and there may be more than one of the same facility, the index can exceed 100.)

It should be noted that attractiveness is measured by the (non)-existence of a given facility. Moreover, in making cross comparisons

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[1] A very high correlation was found between the number of water-related facilities in a park and number of visits. This formulation was not used however because it was not as good a predictor as the index described in the text.

between sites, it is implied that the facilities are uniform from park to park. While this latter assumption may hold for man-made facilities it does not necessarily hold for the natural facilities. For instance, fishing at lake A may be better than at lake B. Alternatively, lake B may be considerably larger than lake A. There may also be some complementarity between the quality of natural resources and the existence of man-made facilities. As the magnitude of this complementarity is not known, biased estimates of visitation may result at proposed parks which lack the basic natural resource qualities. Adjustments may therefore have to be made for differences in quality and size of facilities to reduce these possible biases.

One approach to differentiating between levels of say fishing success is to weight fishing facilities according to historical success. Thus, if recreationists at lakes A and B usually capture 90 and 50 percent, respectively, of the allowable catch, then perhaps fishing facilities at A and B may be weighted by factors of .9 and .5, respectively. (Of course, if there is no fishing the score would be zero.) In the case of beaches, above some minimum size a beach may be treated as a multiple beach. In addition, since the larger recreation areas generally contain more than one site, some aspects of quantity are reflected in the index.

The above suggestions will by no means solve the problem of variations in quality of facilities. Indeed, the attractiveness index envisaged requires very detailed information of the recreation areas, the on-site activities of recreationists and the number and quality of the facilities. Moreover, where the park is extremely large and several thousand individuals participate in a given activity, e.g. swimming at Grand Beach, on more than one occasion during the day, measurement error may be significant. It may therefore be more convenient to distribute questionnaires to recreationists as they enter the park, requesting that they record what activities they participated in. Completed questionnaires can be deposited at exit gates.

Another question which arises is whether surveys should be conducted at all recreation areas. Where each park is an observation, this requirement is unnecessary and probably misleading since the supply of facilities at recreation areas will be a partial determinant of participation. Clearly, if the only facilities at a recreation area are swimming pools and lawn tennis courts, relatively high scores will be recorded for swimming and lawn tennis. One needs to select a park that offers a wide array of recreational opportunities.[1] Under these conditions the recreationist consciously engages in preferred experiences with the full knowledge of available alternative facilities within the park. For the recreational opportunities that are highly specific to resource-based parks, e.g. waterfalls, underground caves, their effects may be measured separately through the use of dummy variables or the parks may be studied individually. This latter problem of measurement occurs mainly with resource-based areas, e.g. wilderness areas.

Population Characteristics

The size of the base population will also influence the demand for outdoor recreation. The larger the base population, the greater will be the level of participation. Similarly, as the degree of urbanisation and

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[1]To accommodate quality differences in facilities, it may be necessary to select two or three parks each of which offer a wide range of recreational opportunities. The facilities at one park should be of superior quality relative to the other two, one should be clearly inferior and third just average. In this manner, three adjustments - high, medium and low - may be made for differences in quality of facilities.

affluence increase, visitation rates should also increase. One would therefore expect higher rates of participation from metropolitan areas, e.g. Winnipeg, than from the sparsely populated rural areas, e.g. Southwest Manitoba.

In deriving demand functions it is more appropriate to develop functions for groupings that exhibit homogeneous tastes and preferences for recreation. The rural-urban dichotomy employed in this study is a step in that direction. Furthermore, by subdividing the base population according to some characteristic like income or age, homogeneity of tastes and preferences for outdoor recreation is likely to be enhanced.

Instead of income,[1] it was assumed that individuals in the same age class and from the same origin area have similar tastes and preferences for outdoor recreation. It was hypothesized that the demand for outdoor recreation increases with age, is highest in the middle age groups, (35-44 and 45-54) then declines thereafter. It may be argued that the younger heads of families, i.e. 18-25, are the most mobile. However, this study is of the view that young families are the least mobile of the adult age classes, since their income is generally lower than the other age classes. Consequently, fewer trips are expected. It is the middle age classes which have the highest income and are expected to participate more in outdoor recreation activities. (On the basis of 1969 data, average family income was found to be positively correlated with average age of head of families in Canada.)

The larger the size of the household, the less the discretionary income and therefore the lower the expected participation rate. Similarly, the younger the child, the less likely are household visits, particularly where the child is a preschooler. It is partly for the latter reason that

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[1] Income data were not available. Consequently, age class was substituted for income class. In the view of this writer, income class would have provided a better basis for subdividing the base population. (Also see Pearse op. cit.)

the under 25 may be expected to participate less than the other age groups.

Another factor that may be related to participation in outdoor recreation is occupation class. It is suggested here that individuals in the higher economic strata, i.e. Managerial, Professional and Technical personnel, will have higher participation rates, Moreover, they are more likely to travel greater distances. Alternatively, recreation areas that are in close proximity to population centers, i.e. intermediate areas, will have a greater proportion of individuals from the lower economic strata than the more distant parks. For the average grain farmer whose financial opportunity cost of time between seeding and harvesting, and thereafter, is low, visitation rates should be high, particularly at recreation areas located in the immediate vicinity. The latter argument also holds for the retired and pensioners, whose financial opportunity cost of time spent in the pursuit of recreation approaches zero; unlike farmers however, this group may be more inclined to travel greater distances to isolated areas for the peace and quiet available therein.

Finally, there is the "option demand" which lies outside all demand and benefit estimation procedures. It is a characteristic of some goods and arises partly because of uncertainty in demand and/or supply. Weisbrod[1] posits that under three conditions, the option demand is not reflected in measures of demand and consumers' surplus. These conditions occur when, (1) Individuals are uncertain of the future demand for the

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[1] B.A. Weisbrod, "Collective-Consumption Services of Individual Consumption Goods," Quarterly Journal of Economics, LXXVIII (August, 1964), pp. 471 - 477. Also see Davidson, Adams and Seneca, op. cit. p. 183; M.F. Long, "Collective-Consumption Services of Individual Consumption Goods; Comment," Quarterly Journal of Economics LXXXI (May, 1967), pp. 351-352; and C.J. Cicchetti and A. Myrick Freeman III, Option Demand and Consumer Surplus: Further Comment, R.F.F. Reprint No. 97, (Washington, D.C.: Resources for the Future, Inc., October, 1971).

good or service; they may be infrequent consumers of the good or service in question. Some of these individuals may never even use the service. (2) If the production of the good or service is curtailed or if the decision to proceed with the project is cancelled, it would be very costly or technically infeasible to reconstruct or expand production at a future date. (3) Because the exclusion property is absent, it is impossible for the resource owner to take advantage of the option demand. In other words, under these circumstances option value is a pure public good and cannot be appropriated by the resource owner. As a result, ceteris paribus, demand and benefits are underestimated.

The Model

The model outlined below attempts to meet some of the problems resulting from location and homogeneity of the base populations. It also attempts to deal with alternative recreation areas. Respondents were asked which recreation centers they had visited in the summer of 1969, and how often their visits were made. The dependent variable is the number of (household) visits made to all recreation areas visited by at least 10 respondents. Well over 100 centers were visited. In order to use as much of the data as possible, some areas were aggregated, e.g. some centers located close together which attracted relatively few visitors were combined into one area. The final number was reduced to 39.

The underlying assumptions of the model include the following. The number of recreation areas is fixed. Each consumer or recreationist has full knowledge of the array of recreation centers available to him, and the amenities and facilities offered therein. Each recreationist faces fixed "non-zero prices" measured by travel distance to the sites.

Recreationists respond to incremental travel distance in the same way as they would respond to a toll. The recreationist is rational and he attempts to maximize his satisfaction of outdoor recreation consumption within finite budget and time constraints. Moreover, the sole purpose of his visit is for on-site enjoyment at the recreation center. The recreation areas studied are not characterized by overcrowding[1]. Finally, recreationists in the same age group and from the same location are presumed to have similar tastes and preferences for outdoor recreation; these tastes and preferences remain unchanged throughout the analysis.

Symbolically, the visitation rate, ${}_kV_{ij}$, from sample area i, to the j^{th} recreation center by recreationists from the k^{th} age class, can be represented as follows:

$$(31)\ {}_kV_{ij} = f_k(D_{ij}, A_j, d_{hj})$$

V - visits per 1000 population;
D - travel distance in miles;
A - index of attractiveness;
d - dummy variable;
k - 0, 1, 2, ... 6 (age classes);
i - 1, 2, 3, (areas of origin);
j - 1, 2, 3, ... (recreation areas);
h - 1, 2, 3, (land-based facilities).

Since the dependent variable, V, is expressed on a per capita basis population becomes an endogenous variable. Each sample and each age class within a sample is analyzed separately.

Travel distance is the road travel distance from approximately the center of the sample area to the park. The procedure was somewhat different for Southwest Manitoba, where the sample was drawn from several towns. Here, travel distance was weighted by the number of

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[1] This assumption is not implausible for Manitoba where there is a large number of recreation areas relative to the size of the population.

visitors drawn from each town. Generally, but not always, the travel route was taken to be the shortest distance measured either by the shortest route or by a combination of gravel and paved road.

The attractiveness index requires an intimate knowledge of the recreation areas and the on-site activities of recreationists. The number and geographical distribution of the recreation areas considered herein preclude the possibility of obtaining such detailed information. Consequently, a simplified index of attractiveness was constructed based on the water-related facilities available at recreation sites. These facilities include beaches, sport fishing, docks, and boat launching facilities. Information on participation rates in water-based facilities was obtained from a study on the Whiteshell Provincial Park[1]. (The latter park is one of the most popular parks in the province; in addition it offers a large number of recreational experiences.)[2] The scores attached to fishing, beach facilities, and docks and ramps were 30.5, 21.4, and 13.7, respectively (Table 7). Since these scores are assumed to be additive, the index, A_j, of the j^{th} recreation area may be represented as follows:

$$(32)\quad A_j = \sum_{n=1}^{N} u_{nj} a_{nj},$$

where u_n is the number of the n^{th} recreational facility; and a_n is the score of n^{th} activity.

Data concerning the presence of facilities at recreation areas were obtained mainly from the Manitoba Vacation Handbook.[3] This

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[1] N. Nixon, Manitoba's Whiteshell Provincial Park: Visitor Survey 1968 (Winnipeg: Department of Tourism and Recreation, 1970), Table 38, p. 57.

[2] The Whiteshell occupies 675,840 acres containing about 131 lakes, 13 campgrounds and many picnic sites and cabins. It is assumed that the relative quality of the facilities in the Whiteshell is similar for all parks.

[3] Manitoba. Manitoba Vacation Handbook (Winnipeg: Department of Tourism and Recreation, 1970).

publication does not indicate differences in quality of facilities at the recreation areas. Additional information was obtained from individuals familiar with some of the areas studied. The presence of beach facilities was interpreted as swimming, and docks and ramps - natural or artificial - was taken to mean boating and skiing. Where the beach extended for more than one mile, say three miles, it was treated as three beaches. Differences in size were also reflected in the index by the very fact that the larger areas tend to have more than one site. No attempt was made to distinguish between levels of quality of a given facility.

Given the somewhat arbitrary nature of this index, too much importance should not be attached to the absolute scores for any area, but rather the relative scores which distinguish one area from another. The higher the score, the greater the variety of activities, and, ceteris paribus, the greater the attractiveness, the higher will be the expected number of visits.

Existence of some land-based facilities was measured by the use of dummy variables. If a given facility was present, the recreation area received a score of one, if it was absent the score was zero. Three such dummy variables were considered - electricity, running water and golf courses. It was anticipated that the presence of these facilities would enhance attractiveness, hence visitation.

Age, like population, was treated as an endogenous variable. A separate regression was run for each age class of head of household and each origin. Six age classes were delineated based on the standard age distribution employed by Statistics Canada. Age classes selected were < 25, 25 - 34, 35 - 44, 45 - 54, 55 - 64, and ≥ 65. The husband was generally regarded as the head of the household. However, where there was no husband, or the wife was the sole breadwinner, the wife assumed the role of head of household.

Multiple regression analysis was the main analytical tool employed. The objective of this type of analysis is to explain and predict visitation or effective demand. Only suspected relationships for which data were available were considered.

The conceptual framework outlined above forms the theoretical basis of the models developed in this study. Given the final models for each sample, demand schedules can be derived for proposed recreation centers by applying the Hotelling-Clawson incremental travel cost procedure. Total benefits are estimated by the summation of the integral of each demand schedule i.e. the sum of the areas under the demand schedules.

Before presenting the final models and the estimates computed therefrom, it may be appropriate at this juncture, to examine the data employed in the study. Such an examination will be helpful in explaining some of the underlying relationships. The following chapter will therefore be devoted to a discussion of the survey, the respondents and the recreation areas.

Chapter V

CHARACTERISTICS OF RESPONDENTS AND RECREATION AREAS

The Survey

A staff member[1] of The Department of Agricultural Economics, University of Manitoba, undertook a mailed survey in the fall of 1969. Fifteen hundred questionnaires were mailed to each of three population centers - Winnipeg, Brandon and Southwest Manitoba. The communities included in the Southwest were Virden, Melita, Pierson, Coulter, Waskada, Goodlands, Deloraine, Medora, Napinka, Tilston, Broomhill, Lauder, Reston, Pipestone, Hartney and Souris.[2] Winnpeg represents the urban sector, Southwest the rural sector and Brandon is intermediate between rural and urban.

The questionnaire attempted to ascertain among other things, the characteristics of recreationists - age, size of family, and type of living accommodation, their occupation, and their preference for outdoor recreational centers, (Appendix A). Occupation is employed as an indicator of economic status; frequency of visitation to any recreation center gives one an indication of consumption patterns; and the distance travelled demonstrates both the mobility of recreationists and the "price" they are willing to pay to gain access to and experiences at available recreation centers.

Households were randomly selected from telephone directories in

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[1] Dr. R. E. Capel, Associate Professor.

[2] Boissevain was inadvertently omitted from the Survey.

the three sample zones. The response pattern varied from 27.1 percent in the Southwest, to 23.7 percent and 17.8 percent in Brandon and Winnipeg, respectively.[1] Notwithstanding the advantages of using telephone directories in the sample surveys, the prevailing weaknesses should not be overlooked. This procedure is biased towards heads of housholds who own telephones. This problem can be crucial in those rural areas where a substantial proportion of the population does not own telephones. Perhaps more important in a study of this nature, is the inherent bias against teenagers who are living at home (or boarding out) and other "independent" dependents who participate in outdoor recreation independently of their parents (or guardians). This latter weakness is not entirely due to the use of the telephone directory, but also due to the survey's preoccupation with the heads of households. Thus to the extent that teenagers and other independent "dependents" are outdoor recreationists in their own right, their exclusion results in an underestimation of overall demand.

It must also be pointed out that outdoor recreationists may be classified by their origins as (1) local recreationists, who are Manitoba residents, and (2) out-of-province visitors, who are in essence tourists. These tourists form a significant proportion of outdoor recreationists. Tourists accounted for about 10 percent of the visitors recorded at eight selected parks during 1968 - Whiteshell, Grand Beach, St. Malo, St. Ambroise, Moose Lake, Grand Valley, Rivers, Norquay Beach and Birds

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[1] Responses may be biased due to non-response and errors in recall. Non-response bias - over-representation of the more enthusiastic recreationists - could have been corrected by a follow-up survey. Because errors in recall could not be corrected by a follow-up survey, however, the intent of the surveyor was to use the questionnaire in conjunction with gate counts to adjust for these two biases. It was assumed that gate counts approximated the true visitation parameters; the questionnaires are biased upwards; the proportion of the latter bias was constant for all parks.

Hill.[1] These tourists were excluded from the survey. Consequently, the total demand for outdoor recreation areas may be underestimated.[2]

Characteristics of Respondents

Age Distribution of Respondents

A fundamental assumption of this study is that recreationists from the same age class and place of residence have similar tastes and preferences for outdoor recreation. It was hypothesized that recreationists in the middle age groups participate more than recreationists in the other age classes. In keeping with the assumption and to facilitate hypothesis testing all data presented are cross-classified with age classes. Age classes < 25 and 25 - 34 (Groups I and II) are generally referred to as the lower age groups, 35 - 44 and 45 - 54 (Groups III and IV) are the middle age groups, and 55 - 64 and ≥ 65 (Groups V and VI) the upper age groups.

The average age of respondents from Winnipeg and Brandon were quite similar - 49 and 48 years respectively, ranging from 22 and 21 years to a high of 86 years (Table 3). Average age of respondents from Southwest Manitoba was higher - 52 years - ranging from 22 to 91 years. The age distribution of respondents from Winnipeg and Brandon were somewhat similar. In turn, these distributions were clearly different from that of Southwest Manitoba. While 49 and 46 percent of the respondents from Winnipeg and Brandon, respectively, fell in age classes III and IV, only 38 percent of the respondents from Southwest Manitoba belonged to these two

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[1] Manitoba, <u>Annual Report Fiscal Year 1968-1969</u> (Winnipeg: Department of Tourism and Recreation, 1969), p. 21.

[2] Although the study is concerned with the demand of Manitobans for outdoor recreation, the participation of tourists has to be considered when planning overall development strategies, if problems such as overcrowding are to be avoided. The participation of tourists may also have some bearing on pricing policies.

Table 3

Age Distribution of Respondents by Age Class
Winnipeg, Brandon and Southwest Manitoba, 1969

Age Class	Winnipeg	Brandon	Southwest
		(percent)	
I < 25	3.04	6.19	2.22
II 25-34	14.82	18.02	11.35
III 35-44	23.57	24.78	20.00
IV 45-54	25.09	20.84	18.51
V 55-64	17.87	16.61	23.45
VI ≥ 65	15.58	15.21	24.44
Total	100	100	100
Number of Respondents	263	355	405
Mean Age	49.3 years	48.1 years	52.4 years
Minimum	22.0 "	21.0 "	22.0 "
Maximum	86.0 "	86.0 "	91.0 "

age classes. Alternatively, 48 percent of the respondents from Southwest Manitoba were listed in the last two classes, as against 33 and 32 percent for Winnipeg and Brandon, respectively.

If there is any significant difference in the age distributions of Winnipeg and Brandon, it is that the respondents from Brandon are a trifle younger than those from Winnipeg. However, respondents from the latter two samples were, on the average, younger than those of Southwest Manitoba.

Because of the importance attached to age distribution, Chi-Square tests were undertaken to ascertain whether there were significant differences between the age distribution of the respondents and their respective base population. At the 5 percent level of significance, there were no significant differences between the samples and related base population for Winnipeg and Brandon. A significant difference was found in the Southwest dample. (Data from the four census divisions - C.D. 3, 4, 7 and 8 - used in the test, covered a considerably wider area than the sample area.)

Finally, it may be appropriate at this time to point out that according to the 1969 census, the age class 45 - 54 reported the highest average family income for the prairies - $10,527. Age class III was second with $9,843, followed by age classes V, II, I and VI with $9,311, $8,763, $6,897 and $5,490, respectively.[1] Thus the middle age groups reported the highest average family income.

Distribution of Household Size

Average household size was not much different for the three samples - 3.56, 3.44 and 3.29 for Winnipeg, Brandon and Southwest, respectively.

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[1] Statistics Canada, Income Distributions by Size in Canada, 1969 (Ottawa: Information Canada, Catalogue 13-544, 1972.).

(Appendix B, Tables, 1, 2 and 3). It ranged from one to eight in Winnipeg, and one to nine in the other areas. Household size decreased, however, as one moved from the urban to rural areas. While 34 percent of the respondents from Winnipeg lived in a family of two or less, the corresponding figures for Brandon and Southwest Manitoba were 36 and 42 percent, respectively. With respect to respondents having a family of three or four, Winnipeg had 38 percent versus 42 and 35 percent from Brandon and Southwest Manitoba, respectively. On the other hand, while 28 percent of the respondents from Winnipeg belonged to a household of 5 or more, roughly 22 percent of the respondents from the other areas lived in families of five or more. Thus Southwest Manitoba tended to have small families (≤ 2) in contrast to the large families from Winnipeg ($\geqslant 5$). Brandon was somewhat in between these extremes. Families of three or four were more prominent in the Brandon sample.

In all samples, household size appeared to increase with age, peaking in the middle age class 35 - 44, and declining thereafter. This trend is to be expected from the cumulative effects of diminishing birth rates with advancing age, departures of young adults and increased mortality rates in the upper age classes. Fifty-six percent of those respondents from Southwest Manitoba who lived alone were in the last age class; Winnipeg and Brandon recorded 48 and 25 percent, respectively. Thirty-five percent of the single respondents from Brandon were in Group I. Again, 82 percent of those respondents from Southwest who had a household of two, fell in the upper age classes; roughly two-thirds of the same respondents from Winnipeg and Brandon belonged to the upper age groups. On the other hand, more than 80 percent of the respondents from Winnipeg and Brandon, and over 70 percent of the Southwest respondents who had large families were found in the middle age groups. Similarly, the largest proportion of respondents (58 - 65 percent) listing a family of four, was concentrated in the middle age groups; 25 - 32 percent were found in Groups I and II. The distribution of household size of 3 individuals varied from sample to sample with the upper age group having a larger than or equal proportion to that of the middle age classes; except for Brandon, less than 20 percent were in the lower age groups.

Thus it is seen that household size increased as one moved from the rural to the metropolitan area. Moreover, small households were predominant in the upper age classes with intermediate and large households dominating in the middle age classes.

Age of Children

Average age of the youngest child in the three samples was over three years. The range was also similar. (Appendix B, Tables 4, 5 and 6). There appears to be a direct correlation between the age distributions of the family head and the youngest child. Thus, it is seen, that a large proportion of the preschoolers, $\leq$ 4 years, are found in Group II, the youngest children in the 5 - 9 age range are mainly in Group III, and, with one exception, the youngest child in the 10 - 24 age range are heavily distributed in Group IV. The one exception is that the largest percentage of the youngest children in the range 20 - 24 for Southwest Manitoba is placed in Group V.

The average age of children like that of the youngest child, was similar in the three samples, 11 - 12 years. Here again, as with the age of the youngest child, age distribution of children bore a direct relationship to that of the household head. This observation holds for all three samples. (Appendix B, Tables 7, 8 and 9). The majority of preschoolers were found in Group II, most of the children age 5 - 14 fell in Group III, and the 15 - 24 were in Group IV (save for Southwest Manitoba where the bulk of the children in age range 20 - 24 were in Group V). More than 60 percent of the children over 24 years of age were listed in Groups V and VI.

Occupation of Respondents

Since occupation class can give some indication of economic status, respondents were asked to list their occupation. Responses were classified into 10 categories.[1] These include Managerial, Professional and Technical; Clerical; Sales; Service and Recreation; Transport and Communication; Agriculture; Craftsman and Production Worker; Laborer; Homemaker; and Retired, Pensioner and Unemployed.

It is instructive to point out that in 1969, the Managerial, Professional and Technical class in Canada recorded the highest level of average family income roughly $13,000.[2] Sales was second with $10,236 followed by Craftsmen, Miners and Production Workers, and Clerical with $8,946 and $8,851, respectively. Average family earnings by Transportation and Communication, Service and Recreation, and Laborers were $8,526, $8,354 and $7,500, respectively. The lowest family income was found in the agricultural sector, $6,012. Indeed, the average family income of Farmers and Farm Workers was about 46 percent of that of the Managerial, Professional and Technical Class and approximately 60 percent of the Sales Class. Information was not available for the Retired, Pensioner and Unemployed. Average family income for this class is probably less than $6,000.

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[1] Classification obtained from Statistics Canada, Census Data.

[2] Ibid., Table 1, p. 23.

The largest proportion of respondents from Winnipeg and Brandon listed their occupation as Managerial, Professional and Technical; roughly one-third of the respondents from Winnipeg and a quarter from Brandon gave this class. (Appendix B, Table 10). Only 12 percent of the respondents from Southwest Manitoba were in the Professional, Technical and Managerial Class. On the other hand, 38 percent of the respondents from Southwest Manitoba were in Agriculture. In contrast, a negligible proportion of respondents from the other sample areas were listed as Farmers and Farm Workers.

The percentage distribution of respondents among Clerical, Sales, Service and Recreation, and Craftsmen and Production Workers were similar for Winnipeg and Brandon. Approximately 15 percent of the respondents were Craftsmen and Production Workers versus five percent for Southwest Manitoba. Again, 10 - 12 percent of the respondents from Winnipeg and Brandon were listed as Salesmen, and Service and Recreation; only 4 - 5 percent of the respondents from Southwest Manitoba fitted into these two classes. As expected, Southwest Manitoba with its older population, recorded the largest proportion of respondents in the Retired, Pensioner and Unemployed class. Fully 23 percent of the rural respondents were listed among the Retired, Pensioner and Unemployed as against 16 and 14 percent for Winnipeg and Brandon. The proportion of Laborers was minimal in all three samples - one percent.

In both Winnipeg and Brandon, the largest percentage of respondents within the Managerial, Professional and Technical class was found in age class 35 - 44. About 57 percent of the respondents in this occupation class were recorded in the middle age groups, III and IV. (Appendix B, Tables 11, 12 and 13.) Of the Salesmen listed in the Winnipeg sample, three-quarters were located in Groups III and IV; Brandon and Southwest Manitoba had about 56 percent in these two age classes. Similarly, well over 50 percent of the respondents listed under Service and Recreation, and Transport and Communications were found in the middle age groups. Sixty-five percent of the Craftsmen and Production Workers from Southwest Manitoba belonged to Groups III and IV; the comparable percentages for Winnipeg and Brandon were 46 and 42, respectively. Finally, in all three samples, the overwhelming majority of the Retired, Pensioner and Unemployed fell into the upper age classes, V and VI; it ranged from 80 percent in Winnipeg to 96 and 99 percent in Brandon and Southwest Manitoba, respectively.

Except for Sales, Agriculture, and Retired, Pensioner and Unemployed, the proportion of respondents from the lower age classes tended to be equal to or greater than those in the upper age classes for Winnipeg and Brandon. The picture is reversed in Southwest Manitoba where, except for the first occupation class, the older age groups reported larger percentages for most occupation classes than the lower age groups.

To summarize, therefore, it is seen that the largest proportion of respondents from Winnipeg and Brandon were listed in the occupation class with the highest average family income, i.e. Managerial, Professional and Technical. One-third of the Winnipeg respondents belonged to this class as against 24 and 12 percent for Brandon and Southwest Manitoba, respectively. On the other hand, Agriculture, the least renumerative of the occupation classes, (for which data are available), was the most prominent occupation of the respondents from Southwest Manitoba, 38 percent. In contrast, less than one percent of the respondents from Winnipeg and three percent from Brandon gave Agriculture as their occupation. Furthermore, Retired, Pensioner and Unemployed was the second most prominent class from Southwest Manitoba (23 percent); the corresponding percentages were 16 and 14 percent for Winnipeg and Brandon, respectively. The proportions of respondents listed as Clerical, Sales, Service and Recreation, and Craftsmen and Production Workers were greater in Winnipeg and Brandon than in Southwest Manitoba. Finally, the middle age groups contained the largest proportion of respondents in the high income occupations. Respondents recorded in the Retired, Pensioner and Unemployed class were found mainly in the upper age groups. For most occupations, the younger age groups from Winnipeg and Brandon reported percentages that were equal to or greater than those of the older age groups (except Sales, Agriculture, and Retired, Pensioner and Unemployed). In Southwest Manitoba, the reverse is true with the older age groups reporting higher percentages for most occupations than the lower age groups.

Ownership of Cars and Trucks

Ownership of a car or cars enhances mobility, and hence the possibility of visiting recreation areas. Most of the respondents could be considered mobile; 85 - 90 percent of the respondents in the three samples owned at least one car. Moreover, 25 percent of the Winnipeg sample versus 16 and 9 percent of the Brandon and Southwest samples owned two or more cars. Thus, if ownership of more than one car is indicative of affluence and mobility, the Winnipeg respondents could be considered the most affluent and mobile followed by Brandon and Southwest Manitoba.

Of the respondents reporting non-ownership of cars, 60 - 70 percent were in the upper age classes. (Appendix B, Tables 14, 15 and 16.) On the other hand, the distribution of ownership of one car was similar to the age distribution of respondents. The percentage of respondents owning more than one car was greatest in the middle age groups; it ranged from 80 percent in Brandon to 65 and 40 percent in Winnipeg and Southwest Manitoba, respectively. The upper age classes recorded a higher proportion of ownership of two cars than the lower age classes. Thus, ceteris paribus, Groups III and IV were the most affluent and mobile followed by the upper and then the lower age groups.

Since rural residents, particularly farmers, may use half-ton trucks in place of cars, respondents were also asked whether or not they owned such trucks. As expected, less than 10 percent of the respondents from Winnipeg and Brandon owned trucks, (Appendix B, Tables 17 and 18.) In contrast, 28 percent of the Southwest respondents owned at least one truck. (Appendix B, Table 19.) Of the latter respondents who owned one truck, Groups III and V each contained about 28 percent. Overall, 46 percent of the Southwest sample who owned one truck was listed in the middle age classes, and 38 and 16 percent were in the upper and lower age classes, respectively.

Ownership of Cottages or Cabins

While non-ownership of cottages or cabins gives no indication of the recreational activities and possible affluence of individuals, ownership can be taken as a measure of affluence and enthusiasm for outdoor recreation. Less than a quarter of the respondents from the three samples owned cottages or cabins. Ownership ranged from a high of 23 percent in Brandon, to 18 and 10 percent in Winnipeg and Southwest Manitoba, respectively. (Appendix B, Table 20.) Groups IV, III and V reported the largest percentage of ownership for Winnipeg, Brandon and Southwest Manitoba, respectively. Fifty percent of the respondents from Winnipeg and 64 percent from Brandon who owned cottages or cabins were listed in the middle age groups. In Southwest Manitoba, 49 percent were in the upper age groups and 41 percent in the middle age groups. Moreover, in all three samples, the upper age classes had a larger proportion of owners than the lower age classes.

Conclusion

Several tentative conclusions may be drawn from the characteristics of the three samples. Respondents from Southwest Manitoba were, on the average, older than those from Winnipeg and Brandon. Households were smaller and just under one-half of the sample had no children in the home.

Average age of respondents was similar in Winnipeg and Brandon. While Winnipeg respondents tended to be heads of larger households, the proportion of respondents who had children in the home were not very different in the two samples. The age distribution of children was also directly related to that of the head of households. Thus the majority of preschoolers was found in Groups II and III.

Occupation class was considered an important indicator of economic status. The most prominent class recorded by Winnipeg and Brandon was Managerial, Professional and Technical. Alternatively, the largest occupation class in Southwest Manitoba was Agriculture, followed by Retired, Pensioner and Unemployed. Since the latter two classes have the lowest average family income, and the Managerial, Professional and Technical the highest, it may be said that respondents from Winnipeg generally belonged to a higher income class followed by Brandon then Southwest Manitoba. In addition, a quarter of the respondents from

Winnipeg owned 2 or more cars relative to 16 and 9 percent for Brandon and the Southwest, respectively. To the extent that ownership of 2 or more cars is indicative of economic status, further reinforcement is given to the submission that a greater percentage of the Winnipeg respondents were in a higher income class, followed by Brandon, then Southwest Manitoba.

Within age classes, the middle age groups contained the largest proportion of the high income earners. Similarly, the majority of respondents owning more than one car was found in the middle age classes. In contrast, the Retired, Pensioner and Unemployed were listed in the upper age classes. Although the upper and lower age classes placed similar proportions of individuals in the high income occupations, a greater proportion of respondents from the upper age classes owned two or more cars.

Of significant interest is the ownership of cottages or cabins. Almost a quarter of the respondents from Brandon owned cottages or cabins, versus 18 and 10 percent from Winnipeg and Southwest Manitoba, respectively. Of those respondents reporting ownership of cottages or cabins, 64 percent from Brandon and 50 percent from Winnipeg belonged to the middle age classes; 41 and 49 percent of those from Southwest Manitoba fell into the middle and upper age classes, respectively.

Many characteristics appear to be similar in Winnipeg and Brandon. However, respondents from Southwest Manitoba were certainly different. Since the Winnipeg sample contained the largest proportion of respondents in the high income occupations, one may therefore expect Winnipeg to exhibit a greater demand for outdoor recreation than the other areas. On the other hand, a greater proportion of Brandon respondents owned cottages or cabins. To the extent that ownership of these facilities are indicative of the enthusiasm for outdoor recreation, Brandon should also have relatively high demands for outdoor recreation. Moreover, in Winnipeg and Brandon, the middle age classes should have higher demands for outdoor recreation than the other classes. In contrast, the major participants in Southwest Manitoba may well be the upper rather than the middle age groups. The extent to which these differences are statistically significant will emerge in the models developed to measure demand. These models are the subject of Chapter VI.

Location and Attractiveness of Recreation Areas

Undoubtedly, the number and geographical distribution of recreation areas is important since they not only help explain over all participation but they also help to explain differences in participation between sample areas, if such differences exist. Recreation areas listed by respondents were generally of the intermediate type. Over one hundred areas were visited at least once by respondents from the three sample areas. Some areas were aggregated, and others were later discarded. For example, some centers located close together, and which attracted relatively few visitors were combined into one area (See Table 4). The aggregation procedure permits one to use information which otherwise would have been discarded. Finally, parks which attracted less than ten respondents were eliminated from the analysis as being unrepresentative (or atypical) of recreation areas demanded.[1] Thus for Winnipeg, Brandon and Southwest Manitoba, the numbers of recreation areas visited were reduced to 18, 24 and 19, respectively.

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[1] Because of the smallness of the Winnipeg sample, eight was set as the lower limit.

Table 4

Travel Distance to Some Recreation Areas from Winnipeg, Brandon and Southwest Manitoba, 1969

Recreation Areas	Winnipeg	Brandon	Southwest
		(miles)	
Spruce Woods		43	75
Oak Lake		46	25
Rock Lake		81	114
Pelican Lake		48	43
Duck Mountain		174	178
Lake Minnewasta	76		
St. Malo	46		
Victoria Park			3
Lake Max	184[a]	63	46
Grand Valley		1	
Minnedosa		28	82
Killarney		62	53
St. Ambroise Beach	54		
Rivers		24	48
Norquay Beach	50		
Whiteshell	96	232	282
Winnipeg Beach	42	177	
Grand Beach	56	196	
Patricia Beach	50		
Victoria and Hillside Beaches and Traverse Bay	77		
Lake Metigoshe		75	36
Riding Mountain	173	60	110
Sandy Lake		57	
William Lake		63	55
Melita		84	21
Grass River		423	415[b]
Birds Hill	20	153	
Lac du Bonnet, Pine Falls	90		
Moose Lake	125		
Clearwater and Rocky Lakes		375	
Peace Gardens		62	51
Northwestern Ontario	122[c]		
Moose Mountain			65
Chain Lakes			17
Flin Flon, Bakers Narrows		445	
Hnausa and Hecla Island	66		
Birtle, St. Lazare, Asessippi Park Shellmouth Dam	261		
Austin, Neepawa		47	
Sunny Harbour, Bison Park, Lockport Lake Riviera, and Netley Creek	21		

[a] Lake Max and Peace Gardens; [b] Grass River, Flin Flon, and Rocky and Clearwater Lakes; [c] Includes Kenora, Lake of the Woods, Minaki, Long Bow Lake, Keewatin, Sioux Narrows.

Within 30 road miles of Winnipeg there were two recreation areas; the Brandon and Southwest samples reported three and four recreation areas, respectively. Between 30 and 65 road miles of Winnipeg there were only five areas in contrast to 8 and 10 for Brandon and Southwest Manitoba, respectively (Table 5). Thus, it is seen, that within 65 road miles, almost twice as many parks were available to Brandon and Southwest Manitoba than to Winnipeg. In terms of the total number of parks visited by respondents from Brandon and Southwest Manitoba, 54 and 63 percent of these parks were located within 65 road miles of the sample areas, as against 39 percent for Winnipeg. Within 100 road miles the percentage of parks visited by respondents from Winnipeg, Brandon and Southwest Manitoba were 72, 67 and 74 percent, respectively. Brandon recreationists not only visited the greatest number of areas but also travelled greater distances. Fully one third of the parks visited by the Brandon respondents required travelling over 138 miles. The corresponding figure for the other sample areas was 16 percent.

The distribution of visits by sample areas further reinforce apparent differences created by the supply of recreation areas. Forty-eight percent of the visits by recreationists from Southwest Manitoba were made to areas within 30 road miles of the base population. In contrast, 19 and 29 percent of the visits from Winnipeg and Brandon, respectively, were conducted within 30 road miles, (Table 6). Similarly, 37 percent of visits from Southwest Manitoba occurred within 30 - 65 miles versus 60 and 19 percent for Brandon and Winnipeg, respectively. Thus, while only 36 percent of the visits from Winnipeg occurred within 65 miles, 88 and 85 percent of the visits from Brandon and Southwest Manitoba took place within this distance. At the other extreme, seven percent of the visits from Winnipeg

Table 5

Recreation Areas Visited by Travel Distance and Sample Areas - Winnipeg, Brandon and Southwest Manitoba, 1969

Travel Distance	Recreation Areas Visited					
	Winnipeg		Brandon		Southwest	
(miles)	(No.)	(percent)	(No.)	(percent)	(No.)	(percent)
< 30	2	11	3	12	4	21
30 - 65	5	28	10	42	8	42
66 - 101	6	33	3	12	2	11
102 - 137	2	11	0	0	2	11
138 - 209	2	11	4	17	1	5
≥ 210	1	6	4	17	2	11
Total	18	100	24	100	19	100

Table 6

Distribution of Visits to Recreation Areas by Travel Distance and Sample Areas - Winnipeg, Brandon and Soutwest Manitoba, 1969

Travel Distance	Distribution of Visits		
	Winnipeg	Brandon	Southwest
(miles)		(percent)	
< 30	19	29	48
30 - 65	17	60	37
66 - 101	53	4	2
102 - 137	4	0	8
138 - 209	6	3	2
≥ 210	1	4	3
Total	100	100	100

and Brandon, and four from Southwest Manitoba were made to recreation areas requiring at least 138 road miles of travel.

From the above discussion, it is seen that the three sample areas face different supply conditions. Brandon and Southwest Manitoba listed twice as many recreation areas within an hours drive as did Winnipeg. Moreover, 48 percent of the visits from Southwest Manitoba were to parks located within 30 miles of the base population in contrast to 29 and 19 percent for Brandon and Winnipeg, respectively. On the other hand, 60 percent of the parks visited by Brandon recreationists required 30 - 65 miles of travel; this proportion compared with 37 and 17 percent for the Southwest and Winnipeg samples, respectively. All in all, over 85 percent of the visits from Brandon and Southwest Manitoba were made within 65 road miles of the respective population bases. In contrast, recreationists from Winnipeg had to travel greater distances to get to recreation areas. Consequently, only 36 percent of Winnipeg respondents visited areas within 65 road miles.

In addition to location, the distribution of attractiveness scores by travel distance may also help to explain apparent differences in demand. Individual scores for facilities are presented in Table 7; the computed index for all recreation areas are shown in Table 8. Although fewer parks were listed within a half hours drive of Winnipeg, the level of attractiveness is appreciably greater than in the other two samples (Table 9). Within an hours drive, the differences in the three areas are not very great. It bears noting also that with the exception of the more distant parks ($\geqslant$210 miles), visitation in Brandon and Winnipeg is concentrated in the zones of greatest attractiveness (Table 6); this points to a probable positive relationship between visitation and attractiveness. In contrast, the level of

Table 7

Scores for Water-Based Facilities

Water-Based Facilities	Scores
Fishing	30.5
Beach	21.4
Dock or Ramp	13.7

attractiveness of parks readily accessible to Southwest recreationists is fairly low. Moreover, 48 percent of the rural visitation was made within a zone of relatively low attractiveness. Thus while attractiveness may be found unrelated to visitation, distance may emerge as a major deterent to travel in Southwest Manitoba.

This description of the characteristics of recreationists in the sample suggests that there are differences between rural and urban residents, and between middle and other age classes. Similarly, the distribution of visits, and the number and quality of recreation areas available are different in the rural and urban samples. These apparent differences may help explain the statistical relationships found in the study. It is to these measures of relationships that attention is now focused.

Table 8

Index* of Attractiveness for Recreation Areas, 1969

Recreation Areas	Attractiveness (A)
Spruce Woods	21.4
Oak Lake	131.2
Rock Lake	154.0
Pelican Lake	131.2
Duck Mountain	260.8
Lake Minnewasta	65.6
St. Malo	65.6
Victoria Park	65.6
Lake Max	96.1
Grand Valley	35.1
Minnedosa	65.6
Killarney	131.2
St. Ambroise	35.1
Rivers	65.6
Norquay Beach	21.4
Whiteshell	1406.3
Winnipeg Beach	105.3
Grand Beach	238.0
Patricia Beach	65.6
Victoria and Hillside Beaches and Traverse Bay	131.2
Lake Metigoshe	131.2
Riding Mountain	399.0
Sandy Lake	117.1
William Lake	65.6
Melita	65.6
Grass River	286.6
Birds Hill	85.6
Lac du Bonnet, Pine Falls	207.5
Moose Lake	65.6
Clearwater and Rocky Lakes	306.6
Peace Gardens	65.6
Northwestern Ontario	393.6
Moose Mountain (Saskatchewan)	131.2
Chain Lakes	51.4
Flin Flon, Bakers Narrows	547.3
Hnausa and Hecla Island	148.0
Birtle, St. Lazare, Asessippi Park, Shellmouth Dam	361.6
Austin, Neepawa	21.4
Sunny Harbour Beach, Bison Park, Lockport, Lake Riviera and Netley Creek	245.0

* Symbolically, the index, A_j, of the j^{th} recreation area is specified as follows:

$$A_j = \sum_{n=1}^{N} u_{nj} a_{nj}$$

where u_n is the number of the n^{th} recreation facility; a_n is the score of the n^{th} activity.

Table 9

Distribution of Attractiveness Scores at Recreation Areas Visited by Travel Distance and Origins, 1969

Travel Distance (miles)	Distribution of Attractiveness Scores		
	Winnipeg	Brandon	Southwest
< 30	644.0	166.3	313.8
30- 65	575.2	1179.8	787.2
66-101	2024.2	350.8	87.0
102-137	459.2	0	553.0
138-209	495.1	689.7	260.8
$\geq$ 210	361.6	2147.5	1692.9
Total	4559.3	4534.1	3694.7

Chapter VI

MEASURES OF RELATIONSHIPS

One objective of this study is to identify some of the factors which influence demand for recreation. Variables of interest may be predetermined; they describe the natural and social environment and must be taken as given, e.g. precipitation, temperatures. Others may be instrumental variables which, to some extent, can be manipulated and modified by man, e.g. location of parks, control of water levels. To ascertain whether a desirable condition can be achieved by the manipulation of certain variables, it must be determined (a) whether the variable in question can create the desirable environment, and (b) whether the variable is instrumental.

The fact that variables are statistically associated with or change as demand changes, does not necessarily imply a causal relationship. Association may be accidental; it may indicate common cause; the association may also be circular, e.g. the presence of a swimming pool causes the demand for swimming to rise which in turn influences the supply of more swimming pools.

While the association of variables can be accurately measured and compared by correlation and regression coefficients and their variance, the specification of relationships must be based on other information, on general economic, sociological, psychological, political and educational theories, on evidence gathered for this specific purpose and on special theories developed for the occasion. The specification of relationships is equivalent to statements of hypotheses. Empirical evidence must then be obtained to test whether the hypothesis accords with reality. If the empirical evidence is not consistent with the theory, several possibilities arise. Inconsistency may result from sampling errors, statistical errors, multicollinearity, or the model may be incorrectly specified. The units of measurement may also be inappropriate.

The measures of relationships may merely reveal that the method of measurement was not sensitive enough to confirm a postulated relationship. Alternatively, if all possible sources of errors have been identified and corrected, inconsistency does indeed cast doubt on the initial hypotheses and therefore on the theory from which the hypotheses were derived in the first instance. The empirical results (a) may therefore confirm and quantify a postulated relationship, (b) they may not confirm the hypotheses but may negate the method of testing, or (c) they may indeed falsify the hypotheses.

Analytic Technique

Simple correlation and multiple regression analyses are the main analytic tools used. Correlation analysis measures the closeness of association between pairs of variables. It facilitates identification of relationships between pairs of variables. Multiple regression analysis, unlike correlation analysis, deals with more than two variables at a time. It is indeed a more powerful tool in that it postulates a causal or unidirectional relationship among variables. Two variables may be highly correlated yet bear no functional relationship. However, the correlation and regression coefficients will have the same sign. If the correlation coefficient is zero, then the corresponding simple regression coefficient should also be zero. Finally, it should be noted that if a correlation coefficient is not statistically significant, it does not necessarily follow that it should be discarded. Its importance may be greatly magnified when considered in association with other variables.

The objective of multiple regression analysis is to explain or predict values of the dependent variable, V, for given values of the independent variables, X. The model can be formulated as follows:

(33) $V_i = b_o + b_1X_{1i} + u_i$, i = 1, 2, ... n.

The basic assumptions are

1. u_i is a random variable;
2. $Eu_i = 0$ i.e. mean value is zero for all i;
3. $Eu_i^2 = \sigma_u^2$ i.e. constant variance for all i;
4. $Eu_iu_j = 0$ i.e. zero covariance for all i = j; and
5. X_i is an independent random variable and is independent of u_i.[1]

Test for Equality Between Sets of Coefficients

An important assumption of this study is that individuals in the same age class and from the same origin have similar tastes and preferences for outdoor recreation. Moreover, recreationists from different origins participate differently in outdoor recreation. Consequently, each age class and each origin is examined separately to test whether there is any statistical difference among the final relationsiips. If no difference exists then respondents belong to the same population and can be treated as such. Two techniques are generally employed to test for differences - the Chow-test and Dummy variables.

The Chow-test may be summarized as follows:[2]

(34) $V_1 = b_{10} + b_1D_{1i} + u_{1i}$ i = 1, 2, ... n_1;
(35) $V_2 = b_{20} + b2D_{2i} + u2i$ i = 1, 2, ... n_2;

where V is the visitation rate; D is travel distance; u is the random error; the b's are regression constants; and 1 and 2 refer to the data sets for say two age classes. If k is the number of independent variables, then D_1 is of order n_1 x k and D_2 is of order n_2 x k. The random variables u_{1i} and u_{2i} are normally distributed with the same variance - covariance

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[1] J. Johnston, Econometric Methods (Toronto: McGraw Hill Book Co. Inc., 1960), p. 11.

[2] Ibid. pp. 136 - 138.

matrix. The hypotheses are that $b_{10} = b_{20} = b_0$ and $b_1 = b_2 = b$.

The data sets are pooled to give $n_1 + n_2$ observations and the least squares estimate of b_0 and b, are obtained. From these estimates the sum of squared residuals Q_1, is determined. This procedure is repeated on the individual data sets 1 and 2, to obtain the sum of squared residuals q_1 and q_2, respectively. If Q_2 is defined as the sum to squared residuals q_1 and q_2, then Q_3 is taken to be the difference between Q_1 and Q_2, i.e. $Q_3 = Q_1 - Q_2$. The hypotheses that $b_{10} = b_{20} = b_0$ and $b_1 = b_2 = b$ can be tested by computing the F - ratio specified in (36):

$$(36)\quad F_o = \frac{Q_3/k}{Q_2/n_1 + n_2 - 2k)}$$

with $(k, n_1 + n_2 - 2k)$ degrees of freedom. If the observed F ratio is greater than the critical F ratio, i.e. $F_o > F_c$, then the hypotheses of equality are rejected and one can conclude that the age groups are significantly different.

Differences in the two relationshpps may be due to $b_{10} \neq b_{20} \neq b$ and/or $b_1 \neq b_2 \neq b$. But the Chow-test does not identify the source of the difference. It merely says a difference exists. The use of dummy variables, which are ordinal measures, can identify the possible sources of these differences. (It should be noted, however, that these variables only indicate the presence or absence of a given characteristic. They do not measure the magnitude of the differences.)

Dummy variables may be used anytime that the data set is logically divisible into mutually exclusive subclasses. Unlike the Chow-test which is essentially covariance analysis, dummy variables can be used for both analysis of variance and covariance by the method of least squares. Given the characteristic age group, a dummy variable is assigned to each age group except one. (The number of dummy variables must be one less than the number of age classes otherwise the cross-product matrix will be singular.) Thus, if there are six age classes with the 6^{th} chosen as the base class, the dummy variable d_1 assumes a value of one if the observation falls in age group one and zero if it does not; d_2 is assigned a value of one if the observation falls in age group two and zero elsewhere. Similarly, d_3, d_4 and d_5 are the dummy variables for groups three, four and five, respectively.

A generalized dummy variable model may be specified as follows:[1]

(37) ${}_kV_{ij} = {}_kb_o + {}_kb_iD_{ij}$ $\quad i = 1, 2, 3;\ j = 1, 2, \ldots N;\ k = 1, 2, \ldots 6;$

where V is the visitation rate from the i^{th} origin to the j^{th} park; D is travel distance from origin i to the j^{th} park; k is the age class. Since there are six age classes, equation 35 may be re-specified as six equations corresponding to each age class.

(38) ${}_1V_{ij} = {}_1b_o + {}_1b_iD_{ij}$ $\quad j = 1, 2, \ldots n_1;$

${}_2V_{ij} = {}_2b_o + {}_2b_iD_{ij}$ $\quad j = 1, 2, \ldots n_2;$

.

.

.

${}_6V_{ij} = {}_6b_o + {}_6b_iD_{ij}$ $\quad j = 1, 2, \ldots n_6.$

The number of observations can vary from group to group. The hypotheses to be tested are that ${}_1b_o = {}_2b_o = \ldots = {}_6b_o$ and ${}_1b_i = {}_2b_i = \ldots = {}_6b_i$.

To test these hypotheses the data set must be pooled yielding (39);

(39) $V_{ij} = f(D_{ij}, d_1, d_2, \ldots d_5)$ $\quad j = 1,2,\ldots N;\ N = n_1 + n_2 + \ldots + n_6$

where d_1, d_2 ... d_5 are dummy variables for the corresponding age groups. Equation 39 may be expanded to read:

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[1] D. Gujarati, "Use of Dummy Variables in Testing for Equality Between Sets of Coefficients in Linear Regressions: A Generalization," The American Statistician, XXIV, 5 (1970), pp. 18 - 21; also, "Use of Dummy Variables in Testing for Equality Between Sets of Coefficients in Two Linear Regressions: A Note," American Statistician, XXIV, 1 (1970), pp. 50 -52.

(40) $V_{ij} = a_0 + a_1d_1 + a_2d_2 + \ldots a_5d_5 + a_6D_{ij}$

d_1 = 1, if observation lies in age Group I,
= 0, otherwise;

d_2 = 1, if observation lies in age Group II,
= 0, otherwise;

.
.
.

d_5 = 1, if observation lies in age Group V,
= 0, otherwise;

a_0 = intercept for Group VI;

a_1 = differential intercept for Group I;

a_2 = " " " Group II;

.
.
.

a_5 = " " " Group V;

a_6 = slope coefficient with respect to D_{ij} for Group VI.

The equations corresponding to each class is of the following form;

(41) ${}_1V_{ij} = (a_0 + a_1) + a_6D_{ij}$

${}_2V_{ij} = (a_0 + a_2) + a_6D_{ij}$

.
.
.

${}_5V_{ij} = (a_0 + a_5) + a_6D_{ij}$

${}_6V_{ij} = a_0 + a_6D_{ij}$.

The differential intercepts a_k, of the additive dummies, d_k, measure the magnitude of the deviation of a given age class from the base class. If the deviations are not significantly different from zero as indicated by the t - statistic, it can be concluded that no significant statistical differences exist between the classes. The data can therefore be pooled and treated as one sample population.

The technique can be further extended to include slope changes. It can also be used to test for equality (or differences) between the respondents from different origins, i.e. Winnipeg, Brandon and Southwest Manitoba.

Results of Correlation Analysis

The partial correlation coefficients of visitation and distance, and visitation and attractiveness, are presented in Table 10. Correlation coefficients were computed for each sample, and for age classes within each sample. As anticipated, travel distance was inversely related to the number of visits. This relationship held for all age groups and the total samples. In the case of Winnipeg, the coefficients were not statistically significant. Except for Groups I in Brandon and I, II and III in Southwest Manitoba the coefficients were at least significant to the 10 percent level.

Correlation coefficients for attractiveness and visitation were positive and significant at the one percent level throughout all age classes in the Winnipeg sample. On the other hand, they were not significantly different from zero in the other samples. Moreover, the relationship was negative for the second age class in Brandon and all age classes in the Southwest sample. This weak negative relationship suggests that as attractiveness increases, visits from the Southwest in particular diminish. It is recalled that this index is based entirely on water-related facilities. A partial explanation may well lie in the interaction between a relatively low income rural population that contains a high proportion of elderly individuals and water-related activities that require very active participation, e.g. swimming, skiing, and expensive equipment, e.g. boats.

Partial correlation coefficients were also computed for distance and attractiveness. They ranged from 0.25 in Winnipeg to 0.49 and 0.80 in Brandon and Southwest Manitoba, respectively. They were all positive and in the case of the latter two, significant at least to the five percent

Table 10

Correlation Coefficients of Visitation with Distance and Attractiveness by Age Class and Sample Areas - Winnipeg, Brandon and Southwest Manitoba, 1969

Age Class		Winnipeg		Brandon		Southwest	
		Distance	Attractiveness	Distance	Attractiveness	Distance	Attractiveness
I	< 25	-0.2803	0.4083***	-0.2235	0.0605	-0.2864	-0.1683
II	25-34	-0.2319	0.6249***	-0.3566**	-0.0371	-0.1839	-0.0147
III	35-44	-0.1854	0.7823***	-0.3487**	0.0076	-0.2310	-0.1157
IV	45-54	-0.2027	0.6590***	-0.2901*	0.0146	-0.3105*	-0.1586
V	55-64	-0.1720	0.7270***	-0.3078*	0.0312	-0.3922**	-0.2288
VI	≥ 65	-0.1049	0.8378***	-0.2966*	0.0077	-0.3164*	-0.1537
Total Sample		-0.1939	0.7435***	-0.3257*	0.0070	-0.3003	-0.1489

* Significant at the 10% level; ** Significant at the 5% level; and *** Significant at the 1% level.

level. The very high correlation in Southwest Manitoba is a reflection of the generally low quality of recreation areas in the Souris Basin. As one travels further away from the basin, recreation areas encountered are generally more attractive.

To summarize the results of the correlation analysis, it can be said that in general, distance is not significantly related to visitation rates from Winnipeg, but it is significantly related to the visitation rates for Brandon and Southwest Manitoba. Attractiveness, on the other hand, is significnatly related to visitation for the Winnipeg sample but not for Brandon and Southwest Manitoba. Presumably the index of attractiveness does not embody those attributes of outdoor recreation which the rural population holds in high regard. Of even greater importance is the apparent inability or unwillingness of rural residents to travel long distances. (It is recalled that 48 percent of the visits by rural recreationists were within 30 miles of the base population and in the zones of lowest attractiveness.)

Results of Regression Analysis

There is no general agreement on the best functional form of recreation demand models. As a result, this study examined several functional forms and chose the model that best fitted the data. The best fit was determined on the basis of the coefficient of multiple correlation, i.e. R^2, the signs and statistical significance of the coefficients, the coefficient of variation and the consistency of performance in the three samples. (The R^2 may not be a valid criterion for comparison where the dependent variable is transformed.) A curvilinear function was finally selected as the best model. It is specified as follows:

(42) $_kV_{ij} = b_0 + b_1 D_{ij} + b_a A_j + b_3 A_j^2 + d_{hj}$

where V - visits per 1000 population;
D - travel distance in miles;
A - index of attractiveness;
d - dummy variables;
k = 0 (Total Sample);
= 1, 2, ... 6 (Age Classes);
i = 1, 2, 3 (Areas of Origin);
j = 1, 2, ... n (Recreation Areas);
h = 1, 2, 3 (Land-based Facilities).

The final results are presented in Tables 11, 12, and 13.

As hypothesized, distance was inversely related to visitation in all three samples. The coefficients ranged from a low of 3.1235 in Winnipeg to 4.4132 and 5.3932 in Brandon and Southwest Manitoba, respectively. The relative magnitudes of these coefficients would suggest that the Winnipeg recreationists are more disposed to travel than the other recreationists. This relative willingness to travel by the Winnipeg recreationists may well be partially conditioned by the fact that recreation areas are located at greater distances than in the other two sample areas. Furthermore, it is recalled that the Winnipeg sample contained a large proportion of recreationists in the high income classes. All three coefficients were at least significant at the 5 percent level. The distance ("price") elasticities for Winnipeg, Brandon and Southwest Manitoba were -0.7374, -1.6817 and -1.6110, respectively.[1]

Regression coefficients for attractiveness were of the expected signs and, in the Brandon and Southwest samples, they were significantly different from zero. Surprizingly, the coefficients for Winnipeg were not significant. It is recalled that in the Winnipeg sample the partial correlation coefficient for attractiveness was significantly different from zero, whereas the opposite was true for distance, Yet, the regression results

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[1] Calculated at the mean value.

Table 11

Results of Regression Analysis by Age Class and Total Sample, Winnipeg, 1969

Age Class	Number of Respondents	Constant (b_o)	Distance (D)	Attractiveness (A)	A^2	R^2
I < 25	8	629.6482	-5.1912* (3.2260)	1.6012 (2.3143)	-0.00026 (0.00155)	0.3257
II 25-34	34	438.0238	-3.0575** (1.6872)	0.9347 (1.2104)	0.00012 (0.00081)	0.5543
III 35-44	62	481.9697	-3.2841** (1.5996)	0.4926 (1.1476)	0.00096 (0.00077)	0.7924
IV 45-54	66	335.7001	-2.9133** (1.5420)	1.1658 (1.1062)	-0.00005 (0.00074)	0.5807
V 55-64	47	341.2240	-3.6960** (1.8691)	1.5652 (1.3409)	0.00003 (0.00090)	0.6644
VI ≥ 65	41	229.6958	-2.3143** (0.9848)	1.2488** (0.7065)	0.00001 (0.00047)	0.8097
Total Sample	263	376.6217	-3.1235** (1.4737)	1.0460 (1.0573)	0.00025 (0.00071)	0.7118

* Significant at the 10% level; ** Significant at the 5% level; and *** Significant at the 1% level.

Table 12

Results of Regression Analysis by Age Class and Total Sample, Brandon, 1969

Age Class		Number of Respondents	Constant (b_o)	Distance (D)	Attractiveness (A)	A^2	R^2
I	< 25	16	-97.8728	-5.9724*** (1.2445)	8.9151*** (1.7389)	-0.0056*** (0.0011)	0.5897
II	25-34	64	239.500	-4.5884*** (1.1285)	5.6372*** (1.5767)	-0.0035*** (0.0010)	0.4678
III	35-44	88	185.1433	-4.2449*** (0.9630)	5.3011*** (1.3455)	-0.0033*** (0.0009)	0.5075
IV	45-54	74	78.1896	-4.6562*** (0.9915)	6.4351*** (1.3853)	-0.0040*** (0.0090)	0.5596
V	55-64	59	117.7737	-4.6725*** (1.0255)	6.2085*** (1.4828)	-0.0038*** (0.0009)	0.5346
VI	$\geqslant 65$	54	46.8925	-3.3749*** (0.7991)	4.5310*** (1.1165)	-0.0028*** (0.0007)	0.5002
Total Sample		355	129.7582	-4.4132*** (0.9524)	5.7901*** (1.3307)	-0.0036*** (0.0009)	0.5415

* Significant at the 10% level; ** Significant at the 5% level; and *** Significant at the 1% level.

Table 13

Results of Regression Analysis by Age Class and Total Sample, Southwest Manitoba, 1969

Age Class		Number of Respondents	Constant (b_o)	Distance (D)	Attractiveness (A)	A^2	R^2
I	< 25	9	286.0151	-5.0592* (3.1857)	2.9065 (2.5198)	-0.0014 (0.0015)	0.1702
II	25-34	46	243.2090	-4.9234** (2.2169)	3.2863** (1.7535)	-0.0015* (0.0010)	0.2562
III	35-44	81	286.6502	-7.2838*** (4.1877)	5.2052* (3.3124)	-0.0027* (0.0019)	0.1954
IV	45-54	75	283.9735	-5.3639** (2.2649)	3.6182** (1.7915)	-0.0018** (0.0010)	0.3055
V	55-64	95	266.4615	-4.9335*** (1.8051)	3.1880** (1.4278)	-0.0016** (0.0008)	0.3803
VI	≥ 65	99	203.3705	-4.5581*** (1.7062)	3.1722** (1.3496)	-0.0016** (0.0008)	0.3588
Total Sample		405	256.1072	-5.3932** (2.2920)	3.6721** (1.8129)	-0.0018** (0.0011)	0.3016

* Significant at the 10% level; ** Significant at the 5% level; and *** Significant at the 1% level.

reveal that distance is significant and attractiveness is not. This outcome is difficult to explain, particularly since distance and attractiveness were not significantly correlated. Moreover, when visitation was regressed on distance alone, the R^2 was only four percent and the coefficient was not significantly different from zero. In contrast, a regression of visitation on attractiveness yielded an R^2 of 55 percent and a coefficient that was significant at the one percent level. The discrepancy probably arises from the functional form fitted to the data. The R^2 ranged from 71 percent in Winnipeg to 54 and 30 percent in Brandon and the Southwest, respectively. The relatively low R^2 in the latter two samples combined with the statistical significance of the regression coefficients point to the possible omission of other important variables.

Results for age classes were similar to those of the corresponding sample totals. In Winnipeg, the largest and smallest distance coefficients were found in the first and last age classes. Groups II, III and IV were about average, while Group V was above average. Thus, to the extent that the relative magnitude of the distance coefficients measures willingness and ability to travel, the youngest age group was the least mobile and the oldest the most mobile.

The attractiveness coefficients for age classes in Winnipeg were positively related to visitation reaching a peak in Groups I and V and a lower limit in Group III. Groups II, IV and VI are about average. The variance explained by the two variables ranged from 32 percent in Group I to 81 percent in Group VI. Coefficients for attractiveness were not significantly different from zero except in the oldest age class.

The distance coefficients for Brandon seem to be similar to those of Winnipeg. Again, Groups I and VI contained the largest and smallest coefficients 5.9724 and 3.3749, respectively. There appears to be very little difference between Groups II, IV and V. Group III had the second smallest coefficient. Unlike the Winnipeg recreationists, the youngest age group was the most responsive to attractiveness while the oldest age group was the least responsive. The size of the coefficients fell through Groups I, II and II, rose in IV and fell thereafter. There were upper limits to the positive influence of attractiveness in all groups and the sample as a whole. All coefficients in the age classes of the Brandon sample were significant at the one percent level. The explained variance ranged from 47 percent in age class II to 59 percent in the Group I.

The negative effect exerted by distance in the Southwest sample was greatest in Group III and lowest in Group VI. There does not appear to be much difference in the coefficients for Groups I, II and V. Given the high proportion of farmers in this sample it is not surprising that distance appears to be a major impediment to recreation travel. (It is generally observed that farmers are reluctant to pursue recreation activities which involve travelling great distances during the cropping season.)

Contrary to the results of the correlation analysis, attractiveness was directly related to visitation. This relationship may be partly due to the high correlation between distance and attractiveness (0.8). Attractiveness seems to appeal most to the age group 35 - 44 and least to the $<$ 25 group. It may be said that Groups I, II, V, and VI respond in a similar manner to attractiveness. As with Brandon, beyond certain maxima, attractiveness exerts a negative effect on demand.

Practically all coefficients for the Southwest age classes were significant at least at the 5 percent level. However, the explained variation was low, ranging from 17 percent in Group I to 38.5 percent in Group V. Given the statistical significance of the coefficients the obvious conclusion is that other important variables have been omitted from the models.

Results of Tests for Equality Between Equations.

<u>Age Classes</u>: Separate equations were estimated for each age class in the Winnipeg, Brandon and Southwest samples. The oldest age class, Group VI, was designated the base class. The differential intercept coefficients for Winnipeg and Southwest Manitoba were not significantly different from zero (Table 14). The differential intercept coefficient for Group II in the Brandon sample was positive and significantly different from zero; the interpretation is that demand in this group was significantly greater than the other classes. Thus, except for Group II in Brandon, differences between age classes within each sample were not statistically significant, and therefore do not justify separate estimating equations for each age class.

<u>Origin</u>: The samples were also tested to ascertain whether significant differences existed in the recreational behavior of urban and rural residents. Results of these tests for equality between the three origins - Winnipeg, Brandon and Southwest Manitoba, are summarised in equation 43. Brandon was chosen as the base class.

$$(43)\quad V_{ij} = 350.5870 \underset{(0.7466)}{- 4.0675} D_{ij}^{***} \underset{(0.8440)}{+ 3.4242} A_j^{***} \underset{(.0005)}{- 0.0018} A^{2***}$$

$$\underset{(129.7052)}{- 144.6265} d_1 \quad \underset{(126.1568)}{- 170.9180} d_3^{\;*}$$

$$R^2 = .3750 \quad ; \text{F ratio} = 6.6004^{**}$$

d_1 = 1; dummy for Winnipeg;
d_3 = 1; dummy for Southwest Manitoba;
i = 1, 2, 3, origins;

$j = 1, 2, \ldots N$; where $N = \sum_{i=1}^{3} n_i$.

Table 14

Regression Coefficients for Tests of Equality of Coefficients, Winnipeg, Brandon and Southwest Manitoba, 1969

Variables			Coefficients		
			Winnipeg	Brandon	Southwest
Intercept			315.8059	-15.6754	213.0598
Distance		D	-3.2078*** (0.7667)	-4.5849*** (0.4080)	-5.3536*** (1.0301)
Attractiveness		A	1.1860** (0.5598)	6.1713*** (0.5700)	3.5627*** (0.8147)
		A^2	0.0001 (0.0004)	-0.0038*** (0.0004)	-0.0018*** (0.0005)
I	$\leq$ 25	d_1	75.1222 (123.0029)	97.7500 (113.8668)	12.2316 (138.6688)
II	25-34	d_2	71.2277 (123.0029)	183.6499* (113.8668)	47.6684 (138.6688)
III	35-44	d_3	115.7555 (123.0029)	134.8749 (113.8668)	124.6052 (138.6688)
IV	45-54	d_4	9.6000 (123.0029)	116.3915 (113.8668)	74.6684 (138.6688)
V	55-64	d_5	50.1333 (123.0029)	131.0124 (113.8668)	32.1473 (138.6688)
R^2			.5746	.5172	.2353
F-ratio			16.7177***	18.0804***	4.0394***

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

The negative intercept differentials for Winnipeg and Southwest Manitoba suggest that per capita demand for outdoor recreation is greater in Brandon. While the differential intercept coefficient for Winnipeg was not significantly different from zero, the deviation for Southwest Manitoba was statistically significant. The conclusion reached therefore, is that both Brandon and Winnipeg participate differently in outdoor recreation than Southwest Manitoba. Moreover, participation rates are greater in the urban areas - Brandon and Winnipeg, than in rural Manitoba - Southwest.

Conclusion

It was assumed that individuals from the same age class and place of residence had similar tastes and preferences for outdoor recreation. The corollary could be that individuals in different age classes behaved differently with respect to the demand for outdoor recreation. Therefore separate estimating equations were developed for each age class within each sample. To justify the use of separate models, it was necessary to test whether these models were statistically different. Except for age group 25 - 34 in Brandon, Group II, there appears to be little difference in the demand for outdoor recreation between age classes in the same sample. In the case of Group II in Brandon, the intercept was significantly different from the others, suggesting that, ceteris paribus, the demand for recreation is significantly higher in this age class. The conclusion drawn, is that age classes from the same origins are not sufficiently different to justify the use of separate estimating equations for each age class.

Distinct differences did emerge between recreationists from the urban and rural areas. As expected, there was no significant difference between

Brandon and Winnipeg. However, recreationists from these two origins seem to participate more in outdoor recreation compared to recreationists from the other areas. This difference may be due in part to the relatively low level of attractive recreation areas within the Souris River Basin. Perhaps more important is the fact that the recreationists in the urban areas were generally in the higher income brackets. In addition, a greater proportion of recreationists from Brandon and Winnipeg owned cottages and cabins; a higher percentage of ownership of two or more cars was also reported in these two samples. The hypothesis that recreationists from urban and rural areas have different demand functions has not been rejected. Moreover, given the demand equations for the three sample areas, the demand is higher in the urban areas - Brandon and Winnipeg - than in the rural areas - Southwestern Manitoba. Finally, to the extent that average family income is lower in Southwest Manitoba and an overwhelming proportion of visits were conducted within 30 miles of "home", the fourth hypothesis has not been rejected, i.e. low income earners are found mainly at the proximal recreation areas and the proportion of high income earners is greatest at the distant recreation areas.

Chapter VII

ESTIMATION AND PROJECTION OF DEMAND AND BENEFITS

Two of the primary objectives of this study are the estimation and projection of demand for and benefits derived from proposed recreation sites in the Souris River Basin. Before reporting on these objectives, estimates of visitation to recreation areas generated by the estimating equations, will be tested against available data. These tests will be followed by a description of the Souris River Basin and the proposed sites. The final sections of this chapter will be devoted to estimation and projection.

Comparison of Estimates Against Available Data

An underlying weakness of this study is the insufficiency of available data. In addition, possible nonresponse bias could not be investigated, i.e. bias resulting from over-representation of the most enthusiastic recreationists. Consequently, it was necessary to generate some estimates of the frequency distribution of visits among recreation areas, and to compare these estimates with gate counts undertaken at some parks by Nixon (through the Department of Tourism and Recreation). To the extent that the estimates are significantly different from the gate counts, the estimating equations can be adjusted to correct the bias. Since it is considered too costly to obtain the number and origin of visitors at all recreation areas, the adjusted estimates can furnish the missing data. Comparable data are available for only Winnipeg residents. As a result, only the Winnipeg model is tested, i.e. the model corresponding to Total Sample in Table 11 . The results are shown in Table 15.

Table 15

Estimate of Visitation Rates to Some Recreation Areas, Winnipeg, 1969

Recreation Areas	Visits per 1000 Population	
	Present Study	Other Studies*
Lake Minnewasta	208.9	n.a.
St. Malo	302.6	308.9
Lake Max and Peace Gardens	0	2.5
St. Ambroise Beach	245.0	44.1
Norquay Beach	242.9	97.8
Whiteshell	2,039.4	512.3
Winnipeg Beach, Matlock, Whytewold & Ponemah	358.3	n.a.
Grand Beach	464.7	607.6
Patricia Beach	290.1	n.a.
Victoria & Hillside Beaches & Traverse Bay	277.6	n.a.
Riding Mountain	293.2	289.0
Birds Hill	405.5	322.8
Lac du Bonnet & Pine Falls	323.2	n.a.
Moose Lake	55.9	55.0
Northwestern Ontario	445.8	n.a.
Hnausa, Hecla, Gull, Gimli	330.7	n.a.
Birtle, St. Lazare, Asessippi Park, Shellmouth Dam	0	n.a.
Sunny Harbour, Bison Park, Lockport, Stonewall, Lake Riviera, Netley Creek	582.2	n.a.
Total	6,866.0	2,240

*Source: H. N. Nixon, Riding Mountain National Park Visitor Use: Survey 1967, Report #37, (Ottawa: National Parks Service, May 1968), Table 1, p. 6 has been updated. Assumed party size unchanged from 1967 and that 20% of vehicles came from Winnipeg; N. Nixon, Park Visitor Surveys 1969: A Summary (Winnipeg: Department of Tourism and Recreation, 1970); and N. Nixon, D.B. McCloy and R. Saurette, Park Visitors of Manitoba, Report # 106 (Winnipeg: Department of Tourism and Recreation, February, 1972).

On inspection, with the exception of three recreation areas, the estimates of this study appear to approximate those of Nixon's. However, statistical tests reveal that the two sets of estimates are significantly different. While the results for St. Ambroise and Norquay Beach are certainly biased upwards, the estimates for the Whiteshell may not be strictly comparable. It is recalled that the Whiteshell possesses a large number of recreation sites. Respondents generally listed specific sub-areas which they visited within this park. Without knowing whether these sub-areas were all visited in one or several trips, they were all counted as individual visits. In contrast, Nixon's traffic counts were conducted at entry and exit points, hence internal travel from one sub-area to another is excluded. These two differences in measurement may explain the marked discrepancy between the two values for the Whiteshell.

Assuming that Nixon's estimate of total visitation is a closer approximation to the true value, it may be appropriate to derive a correction factor to bring the two into agreement. With the exclusion of the Whiteshell and those parks for which no comparable estimates are available, the model predicts 2009.8 visits per 1000 as against 1727.7 per 1000 for Nixon. Since the positive bias is 14.04 percent, the correction factor is taken to be .86. As comparable data are not available for Brandon and Southwest Manitoba, the adjustment factor is applied to total visitation in all three sample areas.

Brandon recorded the highest per 1000 visitation of 7347.1 in contrast to 5904.8 and 5353.8 for Winnipeg and Southwest, respectively (Appendix B, Table 21).[1]

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[1] The estimating equations for Brandon and Southwest Manitoba are the equations corresponding to Total Sample in Tables 12 and 13, respectively.

This higher per capita visitation in Brandon relative to Winnipeg may be due mainly to the imbalance in the availability of recreation areas to the two population centers. The apparently low visitation rates for Winnipeg may also be caused partly by the omission of user-oriented recreation areas from the model, i.e. city parks. Undoubtedly, the parks within the city do attract an appreciably large number of recreationists.

Souris River Basin

The Souris River originates in Saskatchewan just northwest of the town of Weyburn. It flows in a southeasterly direction, through Weyburn, crossing the international boundary immediately south of the town of Glen Ewen. It then loops through Minot, North Dakota, and traverses the international boundary south of Melita. From Melita the river travels in a northeasterly direction, through the towns of Souris and Wawanesa, finally discharging into the Assiniboine River north of Treesbank. The river basin is approximately 24,680 square miles - 11,481 square miles lie in Saskatchewan, 9503 square miles in the United States and 3647 square miles in Manitoba.[1] There are four tributaries, the main two being Antler River and Gainsborough Creek. Classified as semi-arid grassland, the surface soil is hard and rather impermeable. Consequently, precipitation cannot easily penetrate to the subsoil. Periodic drought is therefore a characteristic feature of the region.[2]

Given the relative scarcity of water, several irrigation dams have been proposed for the Souris and her tributaries. This study focuses

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[1] Agassiz Center for Water Studies, Prairie Water Research Symposium I, The Souris River Basin (Winnipeg: University of Manitoba, May 8, 1968), p. 3.

[2] Canada, Melita Area Report (Ottawa: Canada Department of Agriculture, P.F.R.A., Engineering Services, January 1965), p. 1.

on four of these dams - the Coulter Dam on Antler River, Patterson Dam on Gainsborough Creek, High Souris Dam just south of the town of Souris and Nesbitt Dam, about six miles south of the town of Wawanesa (Figure 12).

Coulter Dam: The proposed location of this dam is near the mouth of the Antler River on the northwest quarter of Section 15-2-27, about 12 miles south of Melita (See Figure 12). The reservoir created would be 7 miles long, inundating approximately 1730 acres at full supply level (f.s.l.). It would vary from about 0.2 to 0.9 miles in width reaching a depth of 54 feet at f.s.l..

Patterson Dam: It was proposed that this dam be located on the the southeast quarter, Section 29-2-27, on the Gainsborough Creek, about 2 to 3 miles north east of Coulter Dam. The reservoir would be 8 miles long with a maximum depth of 49 feet and storage capacity of 16,700 acre feet at f.s.l. The flooded area would occupy approximately 870 acres ranging in width from 0.4 to 0.8 miles at f.s.l..

Nesbitt Dam: The proposed location of this dam is Section 1-7-18, six miles southwest of the town of Wawanesa. Assuming an uncontrolled spillway, the full storage capacity would be 280,000 acre feet submerging 6000 acres to a maximum of 138 feet. The reservoir would be 29 miles in length.

High Souris Dam: This dam is to be located in Section 28-7-21, about one and a half miles south of the town of Souris. The full storage capacity is 53,000 acre feet, flooding an area of 3500 acres to a maximum depth of 43 feet. The reservoir would be 30 miles long.

In order to estimate demand for outdoor recreation at these reservoirs, some description of the proposed recreation areas is necessary. Unfortunately, the reservoir development has been considered strictly from an

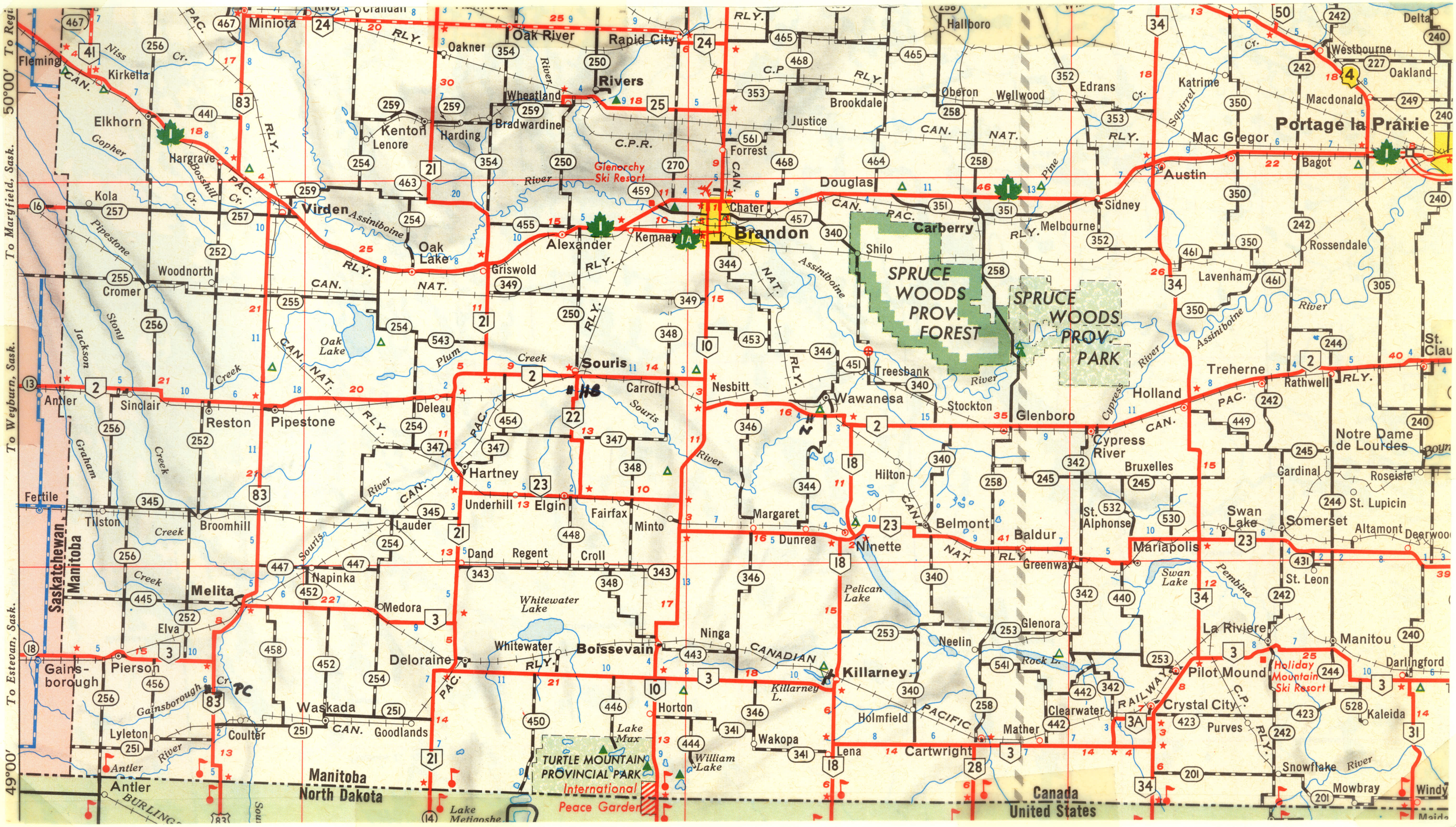

Figure 12

Proposed Recreation Sites in Souris River Basin, Southwest Manitoba

PC - Patterson-Coulter; N - Nesbitt; HS - High Souris agricultural standpoint. Little consideration has been given to uses other than irrigation. As a result, assumptions have to be made concerning the provision of recreation facilities at these reservoirs.

Peiluck and Fedoruk[1] have considered several plans for developing the recreational potential of the Patterson and Coulter reservoirs. Under what they refer to as Plan A, the water level would be adverse in two out of 12 years.[2] During this period, the low water levels expose mudflats thereby impeding access to the water and hence reducing or preventing water related activities. If Plan B is adopted, the water level would be better stabilized with adverse conditions occuring in two out of 15 years.

All Plans permit swimming, boating, skiing and fishing. Other facilities include campsites, picnic sites and hiking trails. Two recreation sites are proposed for each reservoir. The principal sites are located at the lower end of the reservoir near the dam; they cater to more intensive uses than the secondary sites.

The principal site on the Patterson reservoir is the largest recreational facility. Its large beach would have boat docks and ramps. Recreational activities flowing therefrom include swimming, boating, skiing and fishing. The subsidiary site offers some boating and fishing.

The area around the Coulter reservoir is to be kept in a relatively underdeveloped state, i.e. resource based area. Beach facilities at the two sites are minimal. Camping and picnicking facilities would be constructed with a minimum of alteration to the natural character of the area.

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[1] R.V. Peiluck and A.N. Fedoruk, Recreation - Resource Aspects of Proposed Patterson-Coulter Reservoirs (Winnipeg: Resource Planning Branch, Department of Mines and Natural Resources, 1970).

[2] Ibid., pp. 30 - 33.

In addition, whereas Patterson is designed to accomodate 80 percent of the recreationists, Coulter will handle 20 percent.

It is recalled that the attractiveness index developed in the current study is based entirely on water-related facilities. At the primary site of the Patterson reservoir it is assumed that there will be a beach, dock and ramp. There is scope for swimming, boating, skiing and fishing, giving a score of 65.6. Since a dock and ramp are also to be located at the subsidiary site, the total index for the Patterson reservoir is 79.3.

For the Coulter reservoir, no beach facilities are envisaged. The attractiveness index for a dock and ramp at the primary site is 13.7. If another dock and ramp are installed at the secondary site, the total index is 27.4. Therefore the attractiveness index for the Patterson-Coulter recreational complex is 106.7.

Similar recreation facilities are proposed for the High Souris and Nesbitt reservoirs. These facilities include a beach, dock, ramp and fishing. Thus recreationists can participate in swimming, boating, skiing and fishing. The corresponding attractiveness score is 65.6. Characteristics of proposed sites are summarized in Table 16.

Estimation and Projection of Demand

The need to accurately forecast future demand for and participation in outdoor recreation is important for several reasons. Outdoor recreation, as a public good competes with other public goods and services for budgetary allocations. Accurate forecasts will greatly facilitate government planning and therefore further rationalize public expenditures for outdoor recreation. In addition, as an instrument of economic development, knowledge of outdoor recreation demand can assist in the

Table 16

Travel Distance, Attractiveness Scores and Date of Establishment of Proposed Sites

Origins	Recreation Areas		
	Patterson-Coulter	Nesbitt	High Souris
		(miles)	
Distances from:			
Winnipeg	210	120	150
Brandon	94	29	32
Southwest	86	53	55
Census Div. 2	-	90	-
3	103	50	74
4	44	62	47
6	-	89	-
7	101	42	59
8	66	63	39
10	-	82	78
11	-	86	83
13	114	88	82
Attractiveness Score	106.7	65.6	65.6
Date of Establishment	1975	1980	1980

development of some areas or regions which otherwise would remain unexploited or depressed. It may help to resolve some of the conflicting demands on the natural resources.

Forecasts or predictions can be normative or positive. A normative forecast asserts what demand ought to be say in 1980. It may set certain criteria for or ideal types of recreation areas and the number of these areas. Then it estimates the number of visitors, hence demand which will be forthcoming. The inherent weakness in this approach is the difficulty of agreeing on what constitutes ideal types.

Positive forecasts may be conditional or unconditional. They state what the demand will be in 1980. Unconditional forecasts or projections merely extrapolate past trends. They are fast, inexpensive and very useful where explanatory variables are unknown, instrumental variables are unavailable, and when available, the forecast period is too short to permit significant changes in the structural coefficients.

Conditional forecasts are usually obtained through the use of econometric models; there is a causal relationship between the variable being estimated and the explanatory variables. A forecast of demand depends on the values which the explanatory or independent variables assume. The advantage of this technique is that it facilitates the inclusion of instrumental variables. However, the estimators of the model should be unbiased, logically consistent and efficient, i.e. yielding better results than comparable models.

Scarcity of data rules out conditional forecasts. With the exception of Riding Mountain National Park, it is only in the past few years that attempts have been made to compile data for some recreation areas. In addition, changes in supply and demand shifters may alter the usual ceteris paribus assumptions. Demand shifters such as population, income, urbanization, relative prices and tastes alter both the shape and area under the demand schedule. Depending on the relative magnitude of these shifts it may be impossible to identify the demand schedule. Interdependence between demand and supply further complicate estimation and projection. Hence it is difficult to make definitive statements about future demand. Provided that the factors which influence demand are accounted for and that the relative shifts in demand and supply remain constant over time, then the possible biases inferred above may be reduced.

Because the demand equations employed in this study are based on cross-section data, i.e. data specific to 1969, and the explanatory variables are not amenable to intertemporal forecasting, a separate estimating equation was developed using time series data for Riding Mountain National

Park. These data cover the period 1960-1971, (Appendix C). The forecasting model is given in equation 44:

(44) $V_t = f(t) \qquad t = 0, 1, 2, \ldots T.$

where V_t is vehicular traffic per capita of the Manitoba population; t is time in years; base year is 1960.

Time is assumed to be positively related to visitation. It embodies all the causal factors which change over time. (It is recalled that within the three sample areas, age, family size, occupation, etc. did not significantly influence visitation.)[1] Clawson and Knetsch found that time was highly correlated with per capita income, per capita leisure, and per capita mobility.[2] Moreover, time alone explained 98.6 percent of the visitation to National Parks in the U.S.A.. Thus time alone may be used for projection as long as one is not interested in the individual influence of the underlying causal factors.

The use of equation 44 as a basis for projecting demand has other substantial weaknesses. It is essentially a consumption trend which conceptually is different from a demand function. It is aggregative, resulting in total loss of individual characteristics of recreationists and regional differences in demand. Serial correlation of the residuals may be a problem. However, the explicit use of time may serve to reduce serial correlation. A basic assumption is that the changes in the structural parameters are insignificant or can be accounted for over the time period under consideration. The use of this site-specific model is simply to obtain the trend. In the absence of better data, this trend in visitation will be applied to the cross-section model for projecting demand.

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[1] This finding is supported by Boyet and Tolley op. cit.. Moreover they report that time series data form a better basis for projection than cross section data.

[2] Clawson and Knetsch op. cit. p. 126.

The final equation for Riding Mountain National Park is presented below:

$$(45)\ \log_{10} V_t = 2.3380 + \underset{(0.0013)}{0.0099t^{***}} \qquad R^2 = .8560.$$

Time alone explained 86 percent of the variation in per capita visitation and the coefficient is significant at the one percent level. The interpretation of the regression coefficient suggests that visitation has been increasing at an annual rate of one percent.[1] Given the estimates of the visitation rates, V_o, derived from the Total Sample equations in Tables 11, 12 and 13, the projecting equation becomes:

$$(46)\ V_t = V_o(1 + 0.0099)^t$$

where V_o is the estimated visitation rate for the base year 1969. Total number of visits is the product of projected per capita visitation, V_t, and the projected population for the corresponding t^{th} year. Population projections are presented in Table 17.

Two sets of projected estimates are determined. The "High" projections assume that aggregate demand is perfectly elastic, increasing to the full extent implied by the coefficients. The "Low" projections assume perfectly inelastic aggregate demand so that changes in number, location and quality of sites merely result in a reallocation of aggregate visitation among parks (rather than an increase in over-all visitation and welfare).

The projections of demand for outdoor recreation are presented in Table 18. It was assumed that the number and quality of recreation areas remained unchanged over the period 1969-1990. Clearly the major users of outdoor recreation facilities will be the urban residents particularly those from Winnipeg. From Table 18 it is also seen that while the demand in Southwest Manitoba is expected to decline by about 9 percent over the three decades, the number of (household) visits from Winnipeg and Brandon

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[1] Trends for User-oriented areas and State parks in the U.S. are 5 and 8 percent, respectively. See Clawson and Knetsch, op. cit. p. 122.

Table 17

Population Projections for Winnipeg, Brandon and Southwest Manitoba, 1975, 1980 and 1990

Study Areas		Projected Number of Persons[1]		
		1975	1980	1990
Winnipeg[2]		590147	633006	701050
Brandon[2]		34434	36534	39382
Southwest[3]		67000	63000	55050
Census Div.	2	32000	30500	27700
	3	17900	16400	13500
	4	11800	10800	8600
	6	30000	29650	29000
	7	79300	18400	16500
	8	18000	17500	16450
	10	17350	16900	16050
	11	10300	9500	7800
	13	11100	10800	10400

is expected in increase by 58 and 32 percent, respectively over the same time period.

The "High" and "Low" projections presented in Table 19 do not differ greatly. The difference of course is greatest for origins from which expected visitation is highest. A summary of Table 19 is given in Table 20.

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[1] Projections are based on linear extrapolations and subjective judgement.

[2] W. R. Maki, C.F. Framingham and D.J. Sandell, abstract: Population Growth in Manitoba, Some Alternatives, 1971 - 1980, Table 1, p. 5.

[3] Excluding Brandon (C.D. 3, 4, 7 and 8).

There, the differences between the "High and "Low" projections over the three time periods range from four percent in 1975 to 6-7 percent in the other two periods. An example of the calculation of the Deflation factor, ρ, is presented in footnote below.[1]

In the first year of operation, 1975, 18,261 to 19,124 (household) visits are forecast for the Patterson-Coulter reservoir. About 48 percent of these visits will originate in Brandon, and 22-23 percent each from Census Divisions (C.D.) 4 and 8. No visits are expected from Winnipeg and C.D. 2, 6, 10 and 11.

By far the largest number of visits are projected for the Nesbitt reservoir. During 1980 when the recreation area will be opened, 65,028 to 68,300 visits are anticipated. Over 60 percent of these visits will come from Winnipeg and about 19 percent from Brandon. The remainder will be drawn mainly from C.D. 3, 7 and 8 (approximately 17 percent). No visits will be forthcoming from C.D. 13.

Table 18

Projected Demand for Outdoor Recreation
1969*, 1975, 1980 and 1990

Year	Visits per 1000 Population			Number of Visits		
	Winnipeg	Brandon	Southwest	Winnipeg	Brandon	Southwest
1969	5904.8	7347.1	5353.8	3157761	231325	384127
1975	6253.0	7779.9	5669.2	3690164	267892	379838
1980	6545.1	8143.4	5934.1	4143103	297510	373849
1990	7129.4	8870.4	6463.9	4998106	306380	355838

* 1969 is base year. Number and quality of recreation areas remain unchanged over period 1969 - 1990.

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[1] Deflation factor, ρ, is defined as follows:

$$\rho = \frac{\sum \text{visits to all sites from origin i excluding new site(s)}}{\sum \text{visits to all sites from origin i including new site(s)}}$$

For example, the projected visitation from Brandon to all sites exclusive of new site is 268,235 in 1975. Projected visitation to all sites, new site included, is 277,336. Hence ρ is .96. The "High" projection for 1975 - 9101 - is then deflated by .96 to yield a "Low" projection of 8737. ρ changes over time as new parks are opened.

Table 19

Demand Estimation and Projection - "High" and "Low"*

Sites and Origins		Number of Visits					
		1975		1980		1990	
		High	Low	High	Low	High	Low
Patterson-Coulter							
Winnipeg		0	0	0	0	0	0
Brandon		9101	8737	10144	9028	12067	10740
Census Div.	2	0	0	0	0	0	0
	3	1182	1158	1138	1070	1033	971
	4	4181	3930	4020	3538	3533	3109
	6	0	0	0	0	0	0
	7	93	92	93	86	91	85
	8	4430	4208	4524	4026	4693	4177
	10	0	0	0	0	0	0
	11	0	0	0	0	0	0
	13	137	136	139	138	148	146
Total		19124	18261	20058	17886	21565	19228
Nesbitt							
Winnipeg				42069	41228	51413	50385
Brandon				12818	11408	15249	13572
Census Div.	2			45	44	45	44
	3			3455	3248	3139	3951
	4			1624	1429	1726	1519
	6			212	210	230	228
	7			4610	4287	4561	4242
	8			2480	2207	2573	2290
	10			777	761	815	807
	11			210	206	190	186
	13			0	0	0	0
Total				68300	65028	79941	77224
High Souris							
Winnipeg				0	0	0	0
Brandon				12355	10996	14697	13080
Census Div.	2			0	0	0	0
	3			1421	1336	1291	1213
	4			2417	2127	2123	1868
	6			0	0	0	0
	7			3002	2792	2971	2763
	8			4652	4140	4825	4294
	10			1100	1084	1158	1146
	11			395	387	358	351
	13			468	463	497	492
Total				25816	23325	27920	25207

* Deflation factor, ρ is given by: $\dfrac{\Sigma \text{ visits to all sites from i, excluding new sites}}{\Sigma \text{ visits to all sites from i, including new sites}}$

Table 20

Projections of Total Visitation from Origins Studied
(Summary of Table 40)

Sites	Number of Visits		
	1975	1980	1990
Upper Limit			
Patterson-Coulter	19124	20058	21565
Nesbitt		68300	79941
High Souris		25816	27920
Total	19124	114174	129426
Lower Limit			
Patterson-Coulter	18262	17886	19228
Nesbitt		65028	77224
High Souris		23325	25207
Total	18261	106239	121659

Between 23,325 and 25,816 visits are predicted for the High Souris recreation area in the year of its inception, 1980. As with the Patterson-Coulter reservoir, the majority of the visits, 48 percent, originate in Brandon. In general, visitors are not expected from Winnipeg and C.D. 2 and 6. Eighteen percent will come from C.D. 8 and 12, 9, 5 and 4 percent each from C.D. 7, 4, 3 and 10, respectively.

Demand for all three recreation areas is expected to increase over the relevant time periods. Since projected demand for all the census divisions diminishes over the period under consideration, the increase in overall demand is due to the influence of Brandon and Winnipeg (where applicable).

Estimation and Projection of Benefits

Several procedures for estimating benefits were outlined in Chapter III. This study assumes that benefits are those which could be appropriated by a perfectly discriminating monopolist. Thus, total benefit is the maximum revenue which the monopolist would be able to collect.

The functions employed in measuring benefits are specified in equations 47, 48 and 49:

$$(47)\quad V_1 = 376.6217 - \underset{(1.4737)}{3.1235}\, D_{1j}^{**} + \underset{(1.0573)}{1.0460}\, A_j + \underset{(0.00071)}{0.00025}\, A_j^2$$

$$(48)\quad V_2 = 129.7582 - \underset{(0.9524)}{4.4132}\, D_{2j}^{***} + \underset{(1.3307)}{5.7901}\, A_j^{***} - \underset{(0.0009)}{0.0036}\, A_j^{***}$$

$$(49)\quad V_3 = 256.1072 - \underset{(2.2920)}{5.3932}\, D_{3j}^{**} + \underset{(1.8129)}{3.6721}\, A_j^{**} - \underset{(0.0011)}{0.0018}\, A_j^{**}$$

These equations are the final models for Winnipeg, Brandon and Southwest Manitoba, respectively (Total samples in Tables 11, 12 and 13). The demand schedule is essentially the incremental or marginal costs incurred in visiting the proposed sites. Total benefits are taken to be the integral of the demand functions.

$$(50)\quad \text{Total Benefits} = \alpha \int_0^{100} (b_o - b_1 D_{ij})\,dD$$

where α is the return travel cost; D is travel distance; b_1 is the regression coefficient for distance; and b_o is the sum of the other terms in the demand function. (Choice of zero and 100 miles is arbitrary.) Two values for α are employed, 10 and 23.8 cents per mile. The former includes only travel money cost, while the latter includes both money and time costs.

Estimates of benefits for "High" and "Low" projections are presented in Tables 21 and 22. These estimates are expressed in current (1972) dollars. The choice of a correct discount rate for evaluating public projects is crucial. High rates result in less capital intensive projects than low rates. Moreover, the higher the discount rate, the lower are the chances of justifying projects on economic grounds. Economists, however, are in little agreement over what constitutes the correct discount rate.[1] The rate generally used is an average rate of interest paid by governments on long term bonds. Since the interest rates on federal and provincial (Manitoba) bonds vary from 5 to 8½ percent, 7 percent was selected as the discount rate.

During the first year of operation, total benefits of the Patterson-Coulter complex are projected to be in the range of $62,225 ($148,087) to $64,890 ($154,965).[2] As expected, the major beneficiaries are recreationists from Brandon. Estimated benefit per (household) visit in 1975 range from $3.95 ($9.40) in Brandon to $2.91 ($6.92) in the related Census Divisions. The average for all visits is $3.39 ($8.11) per visit.

The largest benefits are obtainable at the Nesbitt reservoir. Estimated benefits in 1980 vary from $103,094 ($245,306) to $108,052 ($260,813) averaging $1.58 ($3.82) per visit. By far the largest beneficiaries are recreationists from Winnipeg who are expected to gain $1.68 ($3.99) per visit as against $1.59 ($3.79) and $1.27 ($3.04) for Brandon and rural

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[1] For a discussion of the arguments over the choice of discount rates, see U.S. Water Resources Council, _Summary and Analysis of Public Response to the Proposed Principles and Standards for Planning Water and Land Resources and Draft Environmental Statement_ (Washington, D.C.: Water Resources Council, July 1972), pp. 89 - 107.

[2] Benefit estimation based on travel cost of 23.8¢ per mile are placed in brackets.

Table 21

Projected Recreation Benefits by Origins - "High" Projections

Sites and Origins		Benefits					
		1975		1980		1990	
		A	B	A	B	A	B
		(current dollars)					
Patterson-Coulter							
Winnipeg		0	0	0	0	0	0
Brandon		35949	85583	28569	68012	17273	41120
Census Div.	2	0	0	0	0	0	0
	3	3439	8182	2361	5616	1089	2591
	4	12165	28938	8340	19840	3725	8862
	6	0	0	0	0	0	0
	7	270	644	193	459	96	228
	8	12890	30665	9385	22473	4948	11772
	10	0	0	0	0	0	0
	11	0	0	0	0	0	0
	13	398	948	288	686	156	371
Total		64890	154965	49136	117087	27287	64945
Nesbitt							
Winnipeg				70512	167717	43797	104175
Brandon				20399	48565	12334	29364
Census Div.	2			58	137	29	70
	3			4416	10517	2039	4856
	4			2075	4350	1121	2670
	6			271	4943	149	356
	7			5892	14023	2962	7056
	8			3170	7549	1671	3981
	10			993	2365	529	1261
	11			268	639	123	294
	13			0	0	0	0
Total				108052	260813	64756	154082
High Souris							
Winnipeg				0	0	0	0
Brandon				19662	46811	11887	28301
Census Div.	2			0	0	0	0
	3			1816	4317	839	1993
	4			3089	7343	1379	3278
	6			0	0	0	0
	7			3837	9120	1930	4588
	8			5945	14133	3134	7450
	10			1414	3342	752	1788
	11			505	1200	232	553
	13			598	1422	323	767
Total				36865	87688	20476	48719

A :- = 10¢ B :- = 23.8¢ Discount rate = 7 percent

Table 22

Projected Recreation Benefits by Origins - "Low" Projections

Sites and Origins	Benefits					
	1975		1980		1990	
	A	B	A	B	A	B
			(current dollars)			
Patterson-Coulter						
Winnipeg	0	0	0	0	0	0
Brandon	34512	82160	25426	60529	15373	36598
Census Div. 2	0	0	0	0	0	0
3	3369	8016	2220	5281	1024	2436
4	11436	27204	7340	17461	3278	7798
6	0	0	0	0	0	0
7	268	637	178	424	90	213
8	12244	29129	8352	19869	4404	10477
10	0	0	0	0	0	0
11	0	0	0	0	0	0
13	396	941	286	681	154	366
Total	62225	148087	43802	104246	24323	57889
Nesbitt						
Winnipeg			69102	164364	42921	102091
Brandon			18155	43223	10977	26135
Census Div. 2			56	134	29	68
3			4151	9886	2566	6112
4			1826	4350	986	2350
6			268	639	148	353
7			5475	13049	2755	6563
8			2820	6718	1488	3543
10			972	2316	524	1249
11			263	627	121	288
13			0	0	0	0
Total			103094	245306	62516	148751
High Souris						
Winnipeg			0	0	0	0
Brandon			17499	41662	10579	25188
Census Div. 2			0	0	0	0
3			1708	4059	788	1873
4			2719	6462	1213	2884
6			0	0	0	0
7			3568	8482	1795	4266
8			5291	12578	2789	6630
10			1385	3293	744	1769
11			495	1176	228	542
13			592	1407	319	760
Total			33255	79118	18456	43913

A :- = 10¢ B :- = 23.8¢ Discount rate = 7 percent

Manitoba, respectively. In the rural areas, recreationists from Census Divisions 7, 3, 8 and 4 are the principal beneficiaries.

Of the three recreation areas, the High Souris yields the lowest benefits - \$33,255 (\$79,118) to \$36,865 (\$87,688) in 1980. It is recalled that projected visitation to this area is greater than that of Patterson-Coulter. However, because of the lower value placed on the recreation resource of the High Souris, benefits are substantially lower. Benefits per visit average \$1.43 (\$3.40), ranging from \$1.59 (\$3.79) in Brandon to \$1.27 (\$3.04) in the other areas.

A summary of overall benefits are shown in Table 23. The most valuable recreation area is the Nesbitt. Because of its location, it is able to draw visitors from as far as Winnipeg, thereby increasing its value. Patterson-Coulter yields greater benefits than the High Souris although the latter has a larger attendance. However, in the final analysis ranking of these projects will have to depend on the relative net benefits which they contribute.

Finally, it may be of interest to express benefits in terms of visitor-days. To do so, assumptions would have to be made about the average size of the visiting parties and the average duration of visits. Nixon, in his surveys of 1969, reported that average size of party varied from about 3.2 to 4.5.[1] Consequently, 3.9 was selected as the average size of party. It was assumed that the average length of stay was 1.5 days. Therefore, total number of visitor-days per party was taken to be 5.85. If the projected benefits per (household) visit in 1980 are \$2.42 (\$5.78), \$1.58 (\$3.82) and \$1.43 (\$3.40) for Patterson-Coulter, Nesbitt and High Souris,

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[1] H.N. Nixon, "Park Visitor Surveys 1969 - A Summary," op. cit. Table 2, p. 3.

Table 23

Projected Recreation Benefits at Proposed Sites

Sites	Projected Benefits					
	1975		1980		1990	
	A	B	A	B	A	B
	(current dollars)					
<u>High Projections</u>						
Patterson-Coulter	64890	154965	49136	117087	27287	64945
Nesbitt	-	-	108052	260813	64756	154082
High Souris	-	-	36865	87688	20476	48719
<u>Low Projections</u>						
Patterson-Coulter	62225	148087	43802	104246	24323	57889
Nesbitt	-	-	103094	245306	62516	148751
High Souris	-	-	33255	79118	18456	43913

A :- = 10¢ B :- = 23.8¢ Discount rate = 7 percent

respectively, then projected benefits per visitor-day at the three areas are \$0.41 (\$1.00), \$0.27 (\$0.65) and \$0.24 (\$0.58), respectively. (To illustrate the degree of sensitivity of these results to changes in the discount rate, present values were calculated using 6.5 and 7.5 percent. At 6.5 percent, projected benefits per visitor increased by 3.8 percent; projected benefits fell by 3.7 percent when the discount rate was 7.5 percent.)

Chapter VIII

SUMMARY AND CONCLUSION

Summary

The principal objectives of this study were (1) to develop outdoor recreation demand models for Winnipeg, Brandon and Southwest Manitoba, and (2) to estimate and project demand for and benefits derived from proposed recreation sites in the Souris River Basin. Secondary objectives included (3) the identification of important factors associated with the demand for outdoor recreation and (4) the determination of the main users of outdoor recreation areas. Are they rural or urban residents? The data used in the analysis were obtained from a mailed survey conducted by a member of staff of the Department of Agricultural Economics, University of Manitoba.

Estimation procedures that have been used in previous studies fall into two categories - the direct and the indirect approaches. In the direct approach, estimates of demand and benefits are predicated on the response of recreationists to hypothetical questions. These hypothetical questions try to induce the recreationist to reveal his true preferences for outdoor recreation areas. On the other hand, the indirect approach tries to measure demand and benefits on the basis of what, among other things, recreationists actually do.

This study employs the basic indirect approach, together with a few modifications. The models developed herein are origin-specific rather than site-specific. In so doing it avoids many of the biases encountered in previous work. While population becomes an endogenous variable, it is still possible to develop separate models for homogeneous subgroups within the base population. Since recreation areas rather than recreationists become the units of observation, important instrumental variables like site characteristics can be explicitly studied. In addition, adjustments for the observation that demand for outdoor recreation cannot increase without limit and that recreation areas compete for this finite demand, certainly increase the accuracy of the estimates.

Conclusions

The final models developed for the three sample areas are summarized in equations 47, 48 and 49. The models for Winnipeg and Brandon were not significantly different. However, significant statistical differences were found between these two models and that of Southwest Manitoba. The main users of outdoor recreation are the urban residents. While total use is undoubtedly greater in Winnipeg, per capita visitation was highest in Brandon and lowest in Southwest Manitoba.

Several factors appear to be significantly related to outdoor recreation. These include origins, and the number, location and attractiveness of recreation areas. The low per capita participation rate in Winnipeg, relative to Brandon and the other areas is due, in part, to the small number of recreation areas around Winnipeg. The greater the number of recreation areas, the higher the participation rate. Furthermore, the closer the recreation areas are to population centers, the greater will be the degree of participation. This inverse relationship is borne out by the negative coefficients for distance. Thus the hypothesis that distance is inversely related to demand has not been rejected.

The lower distance coefficients for Winnipeg and Brandon, relative to Southwest Manitoba indicate a greater willingness and ability to travel to distant parks. Thus, to the extent that recreationists from these two origins are more affluent, the hypothesis that a greater proportion of recreationists from the middle and higher income strata will be found at the more distant parks has not been rejected. Alternatively, as is evidenced by the rural sample, low income recreationists are generally found at the proximal recreation areas. (Forty-eight percent of all visits occurred within 30 miles of the base population.)

The number and diversity of recreation facilities within a park also enhance visitation. Beach facilities, fishing and boat docks and ramps, were found to be significantly related to demand for outdoor recreation. The presence of running water, golf courses and electricity, at least in the presence of the water-based facilities, did not appear to be of major statistical significance.

Differences appear to exist between urban and rural residents' perception of park "attractiveness". The rural residents are less attracted by the water-related facilities included in the attractiveness index. This finding should be of interest to park planners seeking to meet the needs of rural as well as urban residents.

Little or no statistical difference was found among age classes from the same origin. On the basis of economic status, the middle and upper age classes should have exhibited higher demands than the lower age classes. Since these differences were not statistically significant, the hypothesis that demand increases with age reaching a peak in the middle age classes has not been supported. In effect, differences among age classes from the same origins were not sufficiently great to warrant separate estimating equations.

Demand and benfits were estimated and projected for three proposed recreation areas. Because of its location, the Nesbitt reservoir is expected to attract the largest number of recreationists. The estimated demand for 1980 range from 65,028 to 68,300 (household) visits. In contrast, the projected demand for the other sites over the same time period range from 23,325 to 25,816 visits at the High Souris and 17,886 to 20,058 visits at the Patterson-Coulter. In 1975, it is estimated that 18,261 to 19,124 visits will be made to the Patterson-Coulter complex.

As with demand, benefits are highest at the Nesbitt site. Although the Patterson-Coulter sites are expected to attract fewer visitors than the High Souris, total benefits are greater at these sites. Indeed, projected benefits per visit at the Patterson-Coulter recreation area range from \$3.39 to \$8.11. On the other hand, estimated benefits per visit range from \$1.58 to \$3.82 at the Nesbitt site and \$1.43 to \$3.40 at the High Souris site. Projected benefits per visitor-day are \$0.41 - \$1.00, \$0.27 - \$0.65 and \$0.24 - \$0.58 at the Patterson-Coulter, Nesbitt and High Souris sites, respectively.

The ranking of these projects in terms of economic efficiency will depend on their net value to the region and/or the province. This study examines gross benefits to users. One would therefore have to know the relative costs of constructing the recreation component of the reservoirs, before the most economically efficient projects can be identified.

Finally, it should be emphasized that economic efficiency is not the only criterion for choosing public projects. Other important social criteria include the income and employment generating potential of the projects, regional development and the distribution of recreational benefits in relation to the prevailing distribution of income and recreational opportunities.

Further Research

An underlying weakness of this study is the insufficiency of both cross-section and time series data. In a mailed survey, it is necessary that tests for non-response bias be undertaken. Such tests enable the researcher to have greater confidence in his data. Income has been shown to be an important determinant of demand. To the extent that individuals in the same income class exhibit similar tastes and preferences for outdoor recreation, separate models can be developed for each income class. Moreover, knowledge of the income distribution of recreationists can be an important input in rationalizing the financing of outdoor recreation.

This study makes no attempt to distinguish between day visitors and over-night visitors. The needs of these two classes of recreationists may be very different. Hence their demands should be measured separately. The same argument holds for resident and non-resident recreationists.

Until very recently, the information collected on recreation areas and their facilities was very inadequate. No attempt was made to distinguish facilities according to size and quality. Thus comparability of parks was not facilitated. It is necessary to document the size of these recreation areas and the nature of the facilities which they contain. In particular, one needs to know the surface area of the water normally used for swimming, fishing, etc., the quality of the water (color, odor, temperature, etc.), the size of beaches, number of camp-sites, picnic sites and so on. Given the large number of actual and potential recreation areas in the Province, gathering such information can be a costly exercise. Thus, an important contribution of this study is the identification of the more important recreation areas in the Province. The next step may be the documentation of the size of these areas, and the number and quality of the facilities found therein. Although most of the recreation areas may be characterized by excess capacity, research can be directed at determining capacity limits.

It is necessary that a standard measure of attractiveness be established for ranking parks. The index developed herein points to one possible approach. With some refinements, it can be used to rank parks.

Further research into the differential effects of qualitative factors on visitation by various socio-economic groups is also need. The results of this study suggest that water-related facilities may not be major attractions to rural residents. More specifically, research should ascertain which site characteristics are considered attractive by rural residents.

Different models may also be developed for each recreation activity, e.g. camping, picnicking. Surveys should also seek information on expenditures over and above travel costs which are associated with recreation. Experience elsewhere has shown that outdoor recreation can be a vehicle for regional development. Research into the income and employment generating effects may therefore provide useful information for regional planning.

At present, usable time series data are available for only one park. It will be another five years before such data will be available for other areas. Consequently, the basis for projection is rather shaky. (Even in the United States where better time series data are available, projections for the 1960's were grossly underestimated.) Projections should therefore be revised periodically in light of observed participation.

Finally, it is essential that outdoor recreation areas in the Province be viewed as a system, including city parks and other recreation areas. Individual recreation areas influence the over-all system and in turn are influenced by it. Therefore, ways and means must be found to take account of these interaction effects. This study has employed one approach. However, it can certainly be improved.

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APPENDIX A

Department of Agricultural Economics,
University of Manitoba

<u>Outdoor Recreation Survey</u>
(for research on planning)

Dear Householder:

Would you please do us a favor and complete this questionnaire? The research we hope to do is in your interest and depends on your help. Thank you.

R.E. Capel, Assistant Professor.

Your replies will be kept strictly confidential.
Enter an X if you cannot or do not wish to answer one or more of the questions.
PLEASE RETURN THE QUESTIONNAIRE EVEN IF YOU DID NOT VISIT ANY OF THE PLACES LISTED.

<u>Questions</u>

1. Number of persons in your household ____ 2. (a) age of husband or head of household ____ (b) if applicable, age of wife ____ (c) ages of children (list) ________

3. If employed, (a) occupation of husband or head of household ________ (b) occupation of wife ________

4. Type of dwelling (check one) house ______ apartment______

5. Model(s) and Year(s) of car(s), pickup(s), truck(s), etc. owned.
____

6. Do you own a cottage or cabin? _____ if yes, where? ________

7. How many times did you visit the following outdoor recreation areas in 1969 (enter 0,1,2,3,etc., or "often" if more than 3 times and you are not sure how many)

Spruce Woods	____	Minnedosa Lake	____	Lake Metigoshe	____
Oak Lake	____	Killarney Lake	____	Riding Mountain	____
Rock Lake	____	St. Ambroise	____	(including Clear	
Pelican Lake	____	Amaranth Beach	____	Lake, etc.)	
Lynch's Point	____	Rivers Lake	____	William Lake	____
Duck Mountain	____	Norquay Beach	____	Melita	____
Lake Minnewasta	____	Whiteshell	____	Grass River	____
(Morden)		Winnipeg Beach	____	Bird's Hill	____
St. Malo	____			Grand Beach	____

Other areas (list, with number of times visited)______________

APPENDIX B

Table 1

Family Size Distribution of Respondents by Age Class
Winnipeg, 1969

Age Class		Family Size						
		1	2	3	4	5	≥ 6	Total Sample
					(percent)			
I	∠ 25	14.28	4.34	2.56	1.66	0	0	3.04
II	25-34	9.52	10.14	10.25	30.00	15.38	5.71	14.82
III	35-44	14.28	4.34	10.25	33.33	41.02	45.71	23.57
IV	45-54	4.76	15.94	25.64	25.00	38.46	40.00	25.09
V	55-64	9.52	33.33	30.76	10.00	2.56	8.57	17.87
VI	≥ 65	47.61	31.88	20.51	0	2.56	0	15.58
Total		100	100	100	100	100	100	100
Number of Respondents		21	69	39	60	39	35	263
Mean Size		3.56						
Minimum		1.0						
Maximum		8.0						

Table 2

Family Size Distribution of Respondents by Age Class, Brandon, 1969

Age Class		Family Size						
		1	2	3	4	5	≥6	Total Sample
		(percent)						
I	< 25	35.00	5.50	1.81	2.12	0	0	4.50
II	25-34	10.00	13.76	29.09	23.40	15.55	6.25	18.02
III	35-44	5.00	3.66	10.90	31.91	60.00	62.50	24.78
IV	45-54	10.00	8.25	25.45	34.04	22.22	21.87	20.84
V	55-64	15.00	27.52	27.27	7.44	2.22	9.37	16.61
VI	≥ 65	25.00	41.28	5.45	1.06	0	0	15.21
Total		100	100	100	100	100	100	100
Number of Respondents		20	109	55	94	45	32	355
Mean Size		3.44						
Minimum		1.0						
Maximum		9.0						

Table 3

Family Size Distribution of Respondents by Age Class, Southwest Manitoba, 1969

Age Class		Family Size						
		1	2	3	4	5	≥6	Total Sample
					(percent)			
I	< 25	8.00	1.36	5.26	1.53	0	0	2.22
II	25-34	4.00	4.79	14.47	23.07	19.23	4.87	11.35
III	35-44	0	2.73	9.21	35.38	48.07	53.65	20.00
IV	45-54	8.00	8.90	31.57	24.61	21.15	21.95	18.51
V	55-64	24.00	35.61	22.36	12.30	9.61	17.07	23.45
VI	≥ 65	56.00	46.57	17.10	3.07	1.92	2.43	24.44
Total		100	100	100	100	100	100	100
Number of Respondents		25	146	76	65	52	41	405
Mean Size		3.29						
Minimum		1.0						
Maximum		9.0						

Table 4

Age Distribution of Youngest Child of Respondents by Age Class, Winnipeg, 1969

Age Class		Age of Youngest Child						
		≤ 4	5-9	10.14	15-19	20-24	≥25	Total Sample*
					(percent)			
I	< 25	4.44	0	0	0	0	0	1.16
II	25-34	46.66	19.56	2.94	0	0	0	18.02
III	35-44	35.55	54.34	38.23	9.61	0	0	33.13
IV	45-54	8.88	23.91	44.11	54.83	57.14	0	31.97
V	55-64	4.44	2.17	14.70	25.80	35.71	0	12.20
VI	≥ 65	0	0	0	9.67	7.14	100	3.48
Total		100	100	100	100	100	100	100
Number of Respondents		45	46	34	31	14	2	172
Mean Age		3.56	years					
Minimum		1	"					
Maximum		8	"					

*Respondents (66%) reporting having children.

Table 5

Age Distribution of Youngest Child of Respondents
By Age Class, Brandon, 1969

Age Class	Age of Youngest Child						
	≤ 4	5-9	10-14	15-19	20-24	≥25	Total Sample
			(percent)				
I < 25	1.35	1.88	2.08	0	0	0	1.33
II 25-34	52.70	13.20	2.08	0	0	0	20.88
III 35-44	40.54	60.37	37.50	10.52	0	0	37.33
IV 45-54	2.70	24.52	41.66	52.63	77.77	0	27.55
V 55-64	1.35	0	16.66	34.21	22.22	33.33	11.11
VI ≥ 65	1.35	0	0	2.63	0	66.66	1.77
Total	100	100	100	100	100	100	100
Respondents	74	53	45	38	9	3	225

Mean Age	3.44 years
Minimum	1 years
Maximum	9 years

*Respondents (63%) reporting having children.

Table 6

Age Distribution of Youngest Child of Respondents
By Age Class, Southwest Manitoba. 1969

Age Class		Age of Youngest Child ≤ 4	5-9	10-14	15-19	20-24	≥25	Total Sample
				(percent)				
I	< 25	5.12	0	2.17	0	0	0	2.21
II	25-34	43.58	8.51	0	0	0	0	16.81
III	35-44	42.50	55.31	28.26	5.55	6.66	0	33.18
IV	45-54	5.12	23.40	43.47	52.77	33.33	25.00	26.54
V	55.64	2.26	12.76	21.73	36.11	46.66	25.00	17.25
VI	≥ 65	1.28	0	4.34	5.55	13.33	50.00	3.98
Total		100	100	100	100	100	100	100
Respondents		78	47	46	36	15	4	226

Mean Age 3.29 years

Minimum 1 years

Maximum 9 years

*Respondents (56%) reporting having children.

Table 7

Average Age Distribution of Children of Respondents
By Age Class, Winnipeg, 1969

Age Class	Average Age of Children ≤ 4	5-9	10-14	15-19	20-24	≥ 25	Total Sample
	(percent)						
I < 25	9.09	0	0	0	0	0	1.16
II 25-34	68.18	32.55	4.87	0	0	0	18.02
III 35-44	22.72	51.16	60.97	11.11	0	0	33.13
IV 45-54	0	11.62	26.82	64.44	55.55	0	31.97
V 55-64	0	4.65	7.31	20.00	38.88	0	12.20
VI ≥ 65	0	0	0	4.44	5.55	100	3.48
Total	100	100	100	100	100	100	100
Respondents	22	43	41	45	18	3	172

Mean Age	12.37 years
Minimum	1 years
Maximum	39 years

*Respondents (66%) reporting having children.

Table 8

Average Age Distribution of Children of Respondents
By Age Class, Brandon, 1969

Age Class	Average age of children						
	≤ 4	5-9	10-14	15-19	20-24	≥25	Total Sample
			(percent)				
I < 25	2.50	0	1.78	1.69	0	0	1.33
II 25-34	75.00	26.78	3.57	0	0	0	20.88
III 35-44	20.00	64.28	53.57	16.94	0	0	37.33
IV 45-54	0	1.78	12.50	23.72	18.18	0	27.55
V 55-64	0	1.78	12.50	23.72	81.81	33.33	11.11
VI ≥ 65	2.50	0	0	1.69	0	66.66	1.77
Total	100	100	100	100	100	100	100
Respondents	40	56	56	59	11	3	225

Mean Age 10.95 years

Minimum 1 years

Maximum 30 years

*Respondents (63%) reportint having children.

Table 9

Average Age Distribution of Children of Respondents
By Class, Southwest Manitoba, 1969

Age Class	Average Age of Children						
	4	5-9	10-14	15-19	20-24	25	Total Sample
			(percent)				
I < 25	8.69	0	0	1.96	0	0	2.21
II 25-34	63.04	19.14	0	0	0	0	16.81
III 35-44	26.08	68.08	43.10	9.80	5.55	0	33.18
IV 45-54	0	10.63	36.20	49.01	33.33	40.00	26.54
V 55-64	2.17	0	20.68	33.33	44.44	20.00	17.25
VI ≥ 65	0	2.12	0	5.88	16.66	40.00	30.98
Total	100	100	100	100	100	100	100
Respondents	46	47	58	51	18	5	225

Mean Age	11.28	years
Minimum	1	years
Maximum	35	years

*Respondents (56%) reporting having children.

Table 10

Occupation of Respondents, Winnipeg, Brandon, and Southwest Manitoba, 1969

Sample Areas	Occupation Class										Total Sample
	Managerial, Professional, Technical	Clerical	Sales	Service, Recreation	Transport, Communication	Agriculture	Crafts, Production Workers	Laborer	Homemaker	Retired, Pensioner, Unemployed	
	(percent)										
Winnipeg	31.93	4.56	10.26	12.92	5.70	0.38	15.58	1.14	0	16.38	100
Brandon	24.50	3.09	11.83	10.42	13.52	2.81	14.08	1.12	0	13.80	100
Southwest Manitoba	12.09	1.72	3.95	5.18	7.40	38.02	4.93	1.45	0	22.71	100

Occupation of 1, 5, and 2 percent of respondents from Winnipeg, Brandon and Southwest Manitoba, respectively, were not reported.

Table 11

Occupation of Respondents By Age Class, Winnipeg, 1969

Age Class	Managerial, Professional, Technical	Clerical	Sales	Service, Recreation	Transport, Communication	Agriculture	Crafts, Production Workers	Laborer	Homemaker	Retired, Pensioner, Unemployed	Total Sample
	Occupation Class										
	(percent)										
I < 25	2.38	0	0	0	14.70	0	2.44	0	0	4.65	3.04
II 25-34	17.85	33.33	7.41	14.70	14.70	0	26.83	0	0	2.32	14.82
III 35-44	30.95	16.67	18.52	20.58	53.33	0	26.83	33.33	0	4.65	23.57
IV 45-54	26.19	16.67	59.26	35.29	13.33	100	19.51	33.33	0	2.32	25.09
V 55-64	19.04	33.33	14.81	20.58	20.00	0	21.95	33.33	0	6.98	17.87
VI ≥ 65	3.57	0	0	8.82	0	0	2.44	0	0	79.07	15.58
Total	100	100	100	100	100	100	100	100	0	100	100
Number of Respondents	84	12	27	34	15	1	41	3	0	43	263*

* Occupation of one percent of respondents was not reported.

Table 12

Occupation of Respondents By Age Class, Brandon, 1969

Age Class	Occupation Class										Total Sample
	Managerial, Professional, Technical	Clerical	Sales	Service, Recreation	Transport, Communication	Agriculture	Crafts, Production Workers	Laborer	Homemaker	Retired, Pensioner, Unemployed	
	(percent)										
I < 25	0	0	4.76	0	2.08	0	2.00	0	0	0	4.50
II 25-34	26.43	9.09	14.28	21.62	18.75	20.00	24.00	25.00	0	2.04	18.02
III 35-44	32.18	54.54	33.33	27.03	29.17	0	22.00	50.00	0	2.04	24.78
IV 45-54	26.43	27.27	23.81	32.43	27.08	30.00	20.00	0	0	0	20.84
V 55-64	12.64	9.09	19.05	16.22	22.92	50.00	24.00	25.00	0	8.16	16.61
VI ≥ 65	2.29	0	4.76	2.70	0	0	8.00	0	0	87.75	15.21
Total	100	100	100	100	100	100	100	100	0	100	100
Number of Respondents	87	11	42	37	48	10	50	4	0	49	358*

* Occupation of about 5 percent of respondents was not reported.

Table 13

Occupation of Respondents By Age Class,
Southwest Manitoba, 1969

Age Class	Occupation Class: Managerial, Professional, Technical	Clerical	Sales	Service, Recreation	Transport, Communication	Agriculture	Crafts, Production Workers	Laborer	Homemaker	Retired, Pensioner, Unemployed	Total Sample
	(percent)										
I < 25	4.08	0	6.25	4.76	0	0.64	5.00	0	0	0	2.22
II 25-34	28.57	28.57	6.25	9.52	16.67	12.99	10.00	0	0	0	11.35
III 35-44	20.40	14.28	25.00	33.33	13.33	29.22	35.00	33.33	0	0	20.00
IV 45-54	22.44	14.28	31.25	19.05	46.67	20.43	30.00	0	0	1.09	18.51
V 55-64	18.36	42.86	31.25	23.81	20.00	31.17	20.00	66.67	0	10.87	23.45
VI ≥ 65	6.12	0	0	9.52	3.33	5.84	0	0	0	88.04	24.44
Total	100	100	100	100	100	100	100	100	0	100	100
Number of Respondents	49	7	16	29	30	154	20	6	0	92	405*

* Occupation of two percent of respondents was not reported.

Table 14

Distribution of Ownership of Cars By Age Class, Winnipeg, 1969

Age Class		Number of Cars Owned 0	1	2	3
		(percent)			
I	< 25	5.00	3.14	1.67	0
II	25-34	10.00	16.98	13.33	0
III	35-44	5.00	22.64	38.33	25.00
IV	45-54	12.50	27.04	26.66	50.00
V	55-64	17.50	18.86	15.00	25.00
VI	≥ 65	50.00	11.32	5.00	0
	Total	100	100	100	100
No. of Respondents		40	159	60	4

Table 15

Distribution of Ownership of Cars By Age Class, Brandon, 1969

Age Class		Number of Cars Owned 0	1	2	3
		(percent)			
I	< 25	13.33	2.75	4.08	14.28
II	25-34	11.11	22.44	4.08	28.57
III	35-44	6.66	23.62	46.93	28.57
IV	45-54	4.44	21.25	32.65	28.57
V	55-64	24.44	15.74	12.24	0
VI	≥ 65	40.00	14.17	0	0
	Total	100	100	100	100
No. of Respondents		45	254	49	7

Table 16

Distribution of Ownership of Cars By Age Class, Southwest Manitoba, 1969

Age Class		Number of Cars Owned 0	1	2	3
		(percent)			
I	∠ 25	5.12	2.12	0	0
II	25-34	7.69	11.21	17.64	0
III	35-44	7.69	21.81	17.64	0
IV	45-54	7.69	18.78	26.47	50.00
V	55-64	25.64	22.42	29.41	50.00
VI	≥ 65	46.15	23.62	8.82	0
	Total	100	100	100	100
No. of Respondents		39	330	34	2

Table 17

Distribution of Ownership of Trucks* By Age Class, Winnipeg, 1969

Age Class		Number of Trucks Owned 0	1	2	3
		(percent)			
I	< 25	3.12	0	0	0
II	25-34	14.84	0	0	0
III	35-44	23.43	40.00	0	0
IV	45-54	24.60	60.00	0	0
V	55-64	17.96	0	0	0
VI	≥ 65	16.01	0	0	0
	Total	100	100	0	0
No. of Respondents		256	5	0	0

Two Respondents in Groups II and III reported owning five Trucks.

* Trucks ≤ 1 ton.

Table 18

Distribution of Ownership of Trucks* By Age Class, Brandon, 1969

Age Class		Number of Trucks Owned			
		0	1	2	3
		(percent)			
I	< 25	4.79	0	0	0
II	25-34	16.16	52.63	0	0
III	35-44	25.44	15.78	0	0
IV	45-54	20.65	15.78	100.00	0
V	55-64	16.16	15.78	0	0
VI	≥ 65	16.16	0	0	0
	Total	100	100	100	0
No. of Respondents		334	19	2	0

* Trucks ≤ 1 ton

Table 19

Distribution of Ownership of Trucks* By Age Class, Southwest Manitoba, 1969

Age Class		Number of Trucks Owned 0	1	2	3
			(percent)		
I	< 25	2.72	0.98	0	0
II	25-34	10.54	14.70	0	0
III	35-44	17.00	27.45	50.00	0
IV	45-54	18.02	18.62	33.33	33.33
V	55-64	22.10	28.43	16.67	0
VI	≥ 65	29.59	9.8	0	66.67
	Total	100	100	100	100
No. of Respondents		294	102	6	3

* Trucks ≤ 1 ton

Table 20

Distribution of Ownership of Cottages or Cabins By
Age Class, Winnipeg, Brandon and Southwest Manitoba, 1969

Age Class		Winnipeg,	Brandon,	Southwest Manitoba
		(percent reporting)		
I	< 25	4.16	2.50	2.43
II	25-34	4.16	11.25	7.31
III	35-44	18.75	36.25	21.95
IV	45-54	31.25	27.50	19.51
V	55-64	27.08	15.00	26.82
VI	≥ 65	14.58	7.50	21.95
	Total	100	100	100
Number of Respondents		43	66	41

Table 21

Adjusted Estimates of Visitation Rates to Some Recreation Areas, 1969

Recreation Areas	Visits per 1000 Population		
	Winnipeg	Brandon	Southwest
Spruce Woods	-	53.5	0
Oak Lake	-	537.0	491.2
Rock Lake	-	497.5	140.1
Pelican Lake	-	529.3	407.7
Duck Mountain	-	539.0	110.1
Lake Minnewasta	179.6	-	-
St. Malo	260.2	-	-
Victoria Park (Souris)	-	-	406.7
Lake Max	0[a]	322.4	295.7
Grand Valley	-	278.7	-
Minnedosa	-	318.6	128.7
Killarney	-	476.3	361.4
St. Ambroise Beach	210.7	-	-
Rivers	-	333.8	198.0
Norquay Beach	208.9	-	-
Whiteshell	1753.9	104.1	207.3[b]
Winnipeg Beach	308.1[c]	0	-
Grand Beach	399.6	377.3	-
Patricia Beach	249.5	-	-
Victoria & Hillside Beaches, Traverse Bay	238.7	-	-
Lake Metigoshe	-	426.9	440.2
Riding Mountain	252.1	1377.3	716.8
Sandy Lake	-	435.8	-
William Lake	-	185.8	165.5
Melita	-	106.1	495.2
Grass River	-	0	0
Birds Hill	348.7	0	-
Lac du Bonnet, Pine Falls	277.9	-	-
Moose Lake	48.1	-	-
Clearwater & Rock Lakes	-	0	-
Peace Garden	-	189.6	184.0
Northwestern Ontario	383.4[b]	-	-
Moose Mountain	-	-	305.7
Chain Lakes	-	-	299.5
Flin Flon, Bakers Narrows	-	219.6	0
Hnausa, Hecla Island	284.4	-	-
Birtle, St. Lazare, Asessippi Park, Shellmouth	0	-	-
Austin, Neepawa	-	38.3	-
Sunny Harbor, Bison Park, Lockport, Lake Riviera, and Netley Creek	500.7	-	-
Total	5904.8	7347.1	5353.8

Adjustment Factor = .86

[a] Lake Max and Peace Gardens; [b] Includes Kenora, Lake of the Woods, Minaki, Long Bow Lake, Keewatin and Sioux Naroows; [c] Includes Matlock, Whytewold and Ponemah.

APPENDIX C

RIDING MOUNTAIN NATIONAL PARK

Riding Mountain National Park is located about 62 miles north of Brandon. Established in 1929, it is the oldest and largest park in the province. The terrain can be described as rolling woodlands dotted with 75 lakes. These lakes, particularly Clear Lake and Lake Audy, offer excellent fishing, swimming, boating and sailing opportunities. Other recreational facilities available at the park include golfing, hiking, picnicking, camping and winter skiing. Given its long history, Riding Mountain National Park is the only park in the province which has records from which reasonable forecasts can be made. Annual data are available for the periods 1960 through to 1971.

The general model employed was of the following form.

(1) $V_t = f(t)P_t$ where V_t is the summer vehicular traffic, t is time in years and P is the annual population of Manitoba. Final results are presented in equation 2:

$$(2)\ \log v_t = 2.3380 + \underset{(0.0013)}{0.0099t^{***}} \qquad R^2 = .8506$$

*** significant at the 1%; v_t is annual summer vehicular traffic per 1000 population. (Population is treated as an endogenous variable.)

Time explained 85 percent of the variation in seasonal vehicular traffic entering the park. The results suggest that the annual rate of growth in attendance is one percent. The regression coefficient is significant at the one percent level.

Table 22

Vehicular Traffic Riding Mountain
National Park, May 1 - September 31

Year	Vehicles	Passengers	Vehicles/1000	Passengers/1000
1960 - 61	215,846	629,140	234.1	682.5
1961 - 62	218,674	642,931	237.2	697.5
1962 - 63	225,296	654,251	244.4	709.8
1963 - 64	247,718	693,316	268.7	752.2
1964 - 65	242,741	681,313	263.3	739.2
1965 - 66	245,514	687,957	266.3	746.4
1966 - 67	269,304	738,724	279.6	767.0
1967 - 68	265,728	731,172	275.9	759.0
1968 - 69	279,119	759,967	289.8	789.1
1969 - 70	301,140	793,072	312.6	823.4
1970 - 71	278,412	755,210	289.0	784.1
1971 - 72	282,400	752,251	293.2	781.1

Source:

Park Superintendent, Riding Mountain National Park, Wasagaming, Manitoba.