THE ECONOMICS OF OUTDOOR RECREATION: THE CRESTON VALLEY WILDLIFE MANAGEMENT AREA

by

Sandy Anthony D'Aquino

B.A. Hons., Simon Fraser University, 1968

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF

THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

in the Department

of

Economics and Commerce

SIMON FRASER UNIVERSITY

August, 1969

THE ECONOMICS OF OUTDOOR RECREATION:
THE CRESTON VALLEY WILDLIFE MANAGEMENT AREA

by

Sandy Anthony D'Aquino

EXAMINING COMMITTEE APPROVAL

_____ Dr. Sam Sydneysmith
Senior Supervisor

_____ Dr. Kenji Okuda
Examining Committee

_____ Dr. Robert C. Brown
Examining Committee

ABSTRACT

This study examines the significance of Bill No. 65 on the recreational resources of the province of British Columbia as a whole. The study moves away from the use of cost-benefit analysis and applies socio-economic and physical indicators as social criteria of the need for the development of natural resources for outdoor recreation in British Columbia.

Chapter two outlines the theoretical economic aspects of outdoor recreation. An examination is made of the nature of outdoor recreation as a service and the problems encountered in determining a price for outdoor recreation in order to estimate the dollar benefits (revenue) accruing to outdoor recreation.

Chapter three discusses various studies undertaken to estimate levels of "effective" demand for outdoor recreation. Socio-economic and physical factors are considered to be indicators of present and expected future demand levels of outdoor recreation.

Chapter four considers various methods of projecting present and future demand for outdoor recreation in British Columbia. The study concludes with an estimate of the potential increase of supply of outdoor recreation in British Columbia resulting from the development of the Creston floodplains as a wildlife and recreation area.

ACKNOWLEDGEMENTS

A special note of thanks is due to Dr. Sam Sydneysmith who served as the senior supervisor of the author's examining committee. His suggestions and criticisms were especially helpful in improving the quality of the final product.

Thanks are also extended to Dr. Kenji Okuda for his constructive suggestions and criticisms of earlier drafts and to Dr. Robert C. Brown for his willingness to be a member of the author's examining committee.

Thanks are also extended to Mr. Gary Bowden for his assistance in the search for statistical data. His interest in research in the field of outdoor recreation resulted in many helpful suggestions for improvement.

Further, the author would like to thank Mrs. Pat Roberts for typing the preliminary drafts and the final manuscript.

Finally, to my fiancée, Donna, whose moral support made the undertaking possible, I dedicate this thesis.

TABLE OF CONTENTS

LIST OF TABLES

List of Tables, cont.

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER I

INTRODUCTION

In recent years, British Columbians and Canadians, in general, have become increasingly aware of the conflicting demands on their natural resources, and the need to make the best possible use(s) of these resources. To do so effectively requires a systematic approach to the problem of determining that use, or combination of uses, which is most beneficial to society.

In 1967, a problem of alternative demands for a limited resource came into focus in the Creston Area of British Columbia (figure 1.1). Here the problem was to choose the best use(s) for the unreclaimed land in the Kootenay River floodplain between the International Border and Kootenay Lake (figure 1.2). There appeared to be four alternatives to the development of the floodplain: (1) reclamation and development for intensive agricultural production; (2) development as a wildlife management area in conjunction with outdoor recreation facilities; (3) development of a multiple-use scheme of both agriculture and recreation facilities; or (4) the management area could be left in its present undeveloped state.

In 1968, the government of the Province of British Columbia, under a special statute (Bill No. 65), reserved the area of unreclaimed land in the Kootenay River floodplain for

Figure 1.1 Geographic Location of the Creston Area

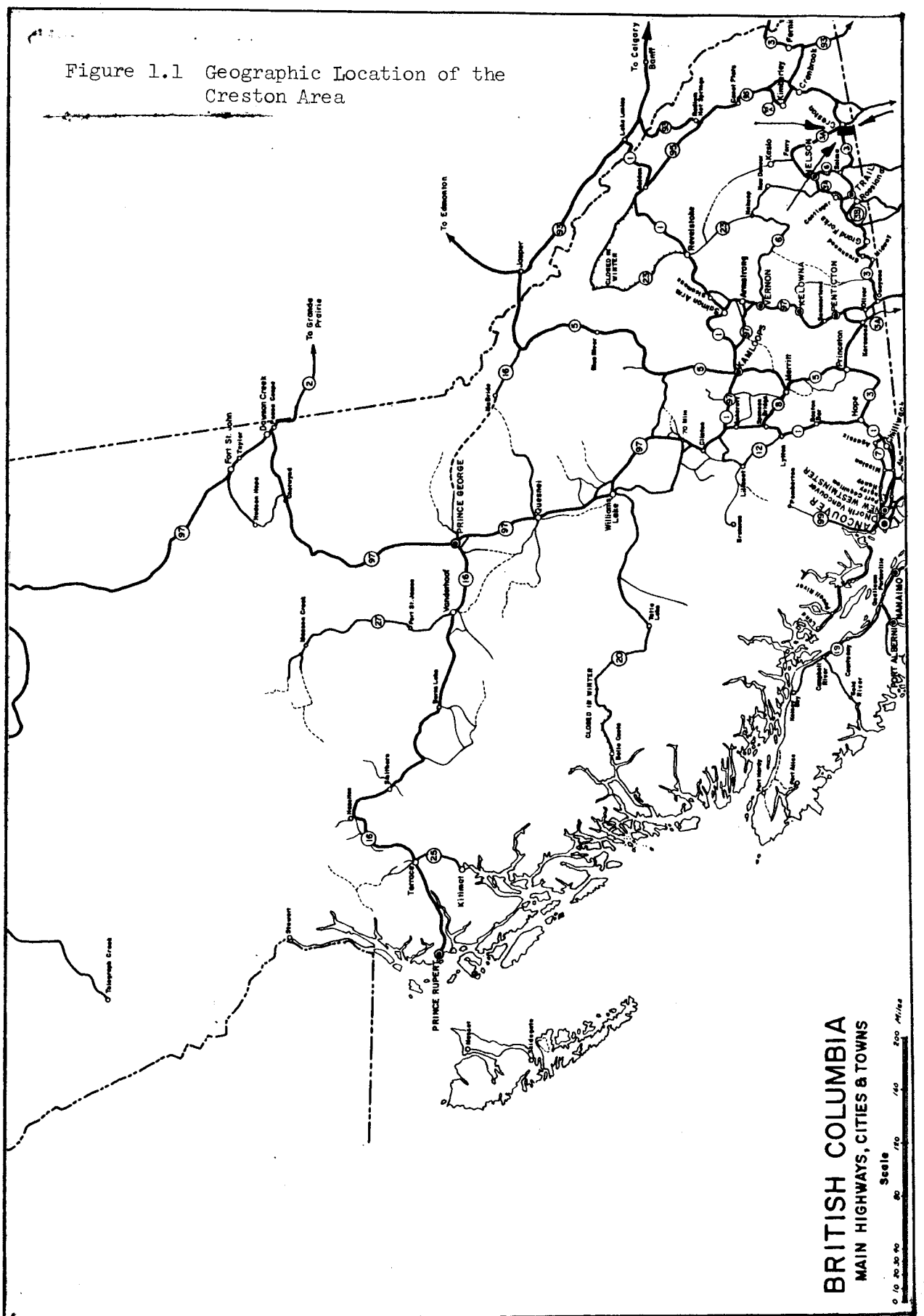
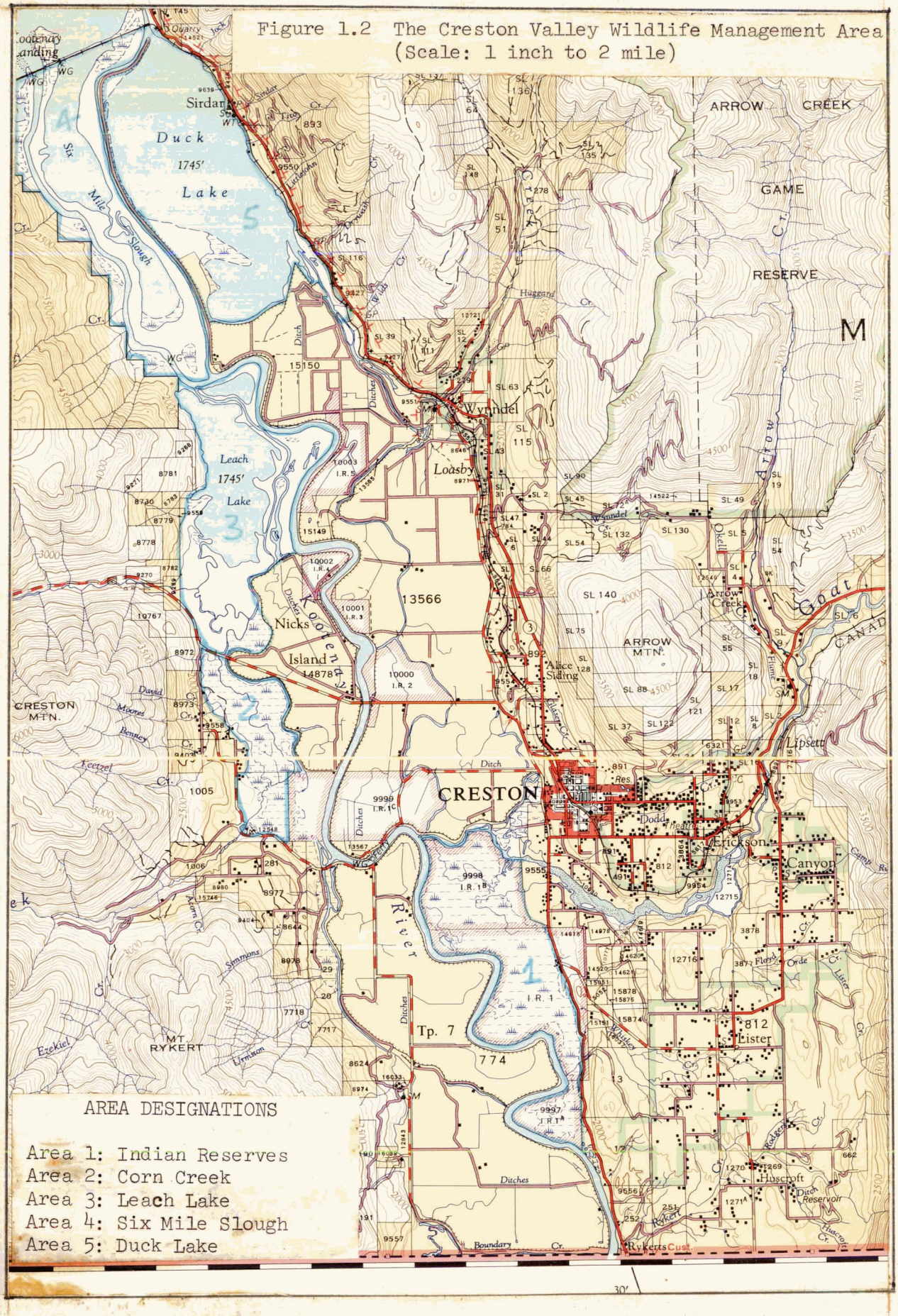


Figure 1.2 The Creston Valley Wildlife Management Area
(Scale: 1 inch to 2 mile)



purposes of wildlife management.[1] This decision effectively reduced the number of alternatives for development of the Creston flatlands to two; namely alternatives (2) and (4) above.

The rational behind Bill No. 65, and its arbitrary decision in favour of recreational use of the Kootenay floodplain to the total exclusion of agricultural use has never been revealed publicly. One of the reasons is undoubtedly the difficulty encountered in evaluating recreational benefits and costs in dollar terms, and hence the difficulty of preparing a complete benefit-cost analysis of all alternatives. Faced with this not uncommon problem and pressed for time in making a land-use decision for the area, one can only assume that the government exercised its perogative of making a pragmatic decision in the best interests of society. The inference of this decision is that, at the time the decision was made, the government considered the present value of the opportunity costs (net returns from agricultural production) to be less than the present value of expected net benefits (tangible and intangible) from recreational use of the land.

It is the purpose of this study to examine the significance of this decision (Bill No. 65) on the recreational resources of the province of British Columbia as a whole.

---

[1] Province of British Columbia, Creston Valley Wildlife Management Area Act, Bill No. 65, Victoria, B.C., 1968.

This study, therefore, moves away from the use of cost-benefit analysis and applies socio-economic and physical indicators as social determinants of the need for the development of natural resources for outdoor recreation in British Columbia. Chapter two outlines the theoretical economic aspects of outdoor recreation. An examination is made of the nature of outdoor recreation as a service and, then, a justification of the need for government allocation of natural resources for outdoor recreation is presented. The discussion of the allocation problem is followed by an outline of the costs and benefits resulting from the allocation of natural resources for outdoor recreation, and the problem of determining a price for outdoor recreation in order to estimate the dollar benefits (revenue) accruing to outdoor recreation.

Chapter three outlines the factors affecting the growth of and demand for outdoor recreation, and examines various studies that have been undertaken to determine the level of "effective" demand for outdoor recreation.

Chapter four incorporates ideas from chapters two and three into a study of the expected "effective" future demand for outdoor recreation in British Columbia. With the future expected demand for outdoor recreation in British Columbia determined, a study of the estimated growth of future supply of recreation "activity" areas is determined.

With the future demand and supply trends of outdoor recreation in British Columbia predicted, this study moves to an analysis of the Creston Valley Wildlife Management Area (C.V.W.M.A.), as an additional source of recreation activities (supply in recreation-days) in British Columbia. Basically, chapter four is an attempt to socially justify the allocation of natural resources of the Creston floodplains for purposes of outdoor recreation in the context of the overall recreation situation in British Columbia.

CHAPTER II

THEORETICAL ECONOMIC ASPECTS OF OUTDOOR RECREATION

Section 1: Introduction

> "The aesthetic value of fish and wildlife should be recognized and measured in terms other than economic value. New concepts and evaluation, based on further studies, are needed."[1]
>
> "Inspiration such as this (recreation values) cannot be measured in dollars and cents."[2]

There seems implicit in such statements the judgement that economic analysis (in the determination of economic value) is inadequate or inapplicable to problems of outdoor recreation. This is an overly pessimistic view. Any economic analysis would involve choice among alternatives to maximize some type of net return, and the net return can include aesthetic satisfaction. The application of conventional economic analysis can help clarify issues and indicate the direction of a solution to a given problem. It may also have the function of indicating why certain problems, given assumed conditions cannot be solved.

---

[1] California Public Outdoor Recreation Plan Committee, "California Public Outdoor Recreation Plan," Part II, Sacramento, 1960, p. 57.

[2] U.S. Forest Service, "Multiple Use: The National Forests and Your Family," PA No. 432, Government Printing Office, Washington, D.C., 1961, p. 19.

The traditional distinction between goods and services is not meaningful or useful in a discussion of outdoor recreation. Outdoor recreation is an experience[3] or activity undertaken by certain consumers (recreationists) at a price. In some instances the possession of tangible goods, such as fish and game, are associated with the "consumption" of a recreational experience; but even then most researchers recognize that the economic entity demanded and supplied, is primarily a service - the activity of "fishing" or "hunting." The physical source of these services can usually be identified as some area or region to which the recreationist must travel. Moreover, the potential flow of such services at these sites can be jeopardized if the sites are allocated to certain other uses such as industry, or agriculture. The opportunity costs of recreation services therefore involves the production of other services; the fact that the alternative services may be derived from the possession of tangible goods is irrelevant from the standpoint of allocating land to alternative uses (i.e. sources of alternative services).

When comparing the alternative uses of natural resources, the problem of quantification of expected values of benefits, that is, the determination of a price, is of major interest.

---

[3]Marion Clawson, "Methods of Measuring the Demand for and Value of Outdoor Recreation," Reprint No. 10, Resources for the Future, New York, 1959.

The absence of a market-determined price may arise for two reasons:

(i) the service is intangible and therefore incapable of quantification, with the result that there is not acceptable basis for establishing price.

(ii) the service is quantifiable but consumed collectively so that there is no incentive for a private market to develop.

The absence of a market-determined price need not necessarily rule out the estimation of value per unit; shadow prices or "proxies" may be developed as aids in the allocation process. However the generation of such pseudo-prices introduces additional questions as to the validity of any subsequent allocation decision.

In this chapter a discussion of the nature of outdoor recreation as a collective good may help to answer some of the questions that have been mentioned. Once the "nature" of outdoor recreation is understood it becomes easier to understand the allocation of natural resources for outdoor recreation. The discussion of the allocation of natural resources for outdoor recreation will deal primarily with the specification of the cost and benefit components accruing from outdoor recreation development.

Section 2: The Nature of Outdoor Recreation As An Economic Service

In many instances, the establishment of outdoor recreation areas involves the public allocation of natural resources. Fiekowsky would note the following arguments for the public provision of outdoor recreation:[4]

(1) It is impractical to collect fees.

(2) Benefits from consuming these goods and services extend beyond the individual to other members of the society.

(3) There is no confidence that the individual can know sufficiently well the consequence of his decision on his own welfare.

Underlying the preceeding arguments, of course, is the recognition that outdoor recreation in most instances is a collective economic service (good) rather than private.

Samuelson has developed a theory of government expenditure based on the concept of collective goods. These are goods

> "...which all enjoy in common in the sense that each individuals consumption of such a good leads to no substraction from other individuals' consumption of that good."[5]

Anthony Downs builds on Samuelson's work and shows that a perfectly competitive economy moves toward a Paretian optimum, which means that no transactions between private parties can

---

[4]Seymour Fiekowsky, "Forecasts and Economic Studies Group," Outdoor Recreation Resources Review Commission, Government Printing Office, Washington, D.C., October 23, 1959.

[5]Paul A. Samuelson, "The Pure Theory of Public Expenditure," Review of Economics and Statistics, Vol. 36, No. 4, November 1954, p. 387.

make someone better off without harming someone else.[6] However, collective goods are an important obstacle to attaining the optimum because overuse of collective goods can result in a decrease in quality of satisfaction. Downs develops a model of a rational world in which

> "...a collective good is one which provides indivisible benefits; that is, as soon as it exists, everyone is able to benefit from it regardless of whether he himself has paid for it and regardless of how many others are also benefiting from it (for example provisions of national defense). Where citizens are numerous, each man finds it advantageous to refuse to pay for such indivisible benefits ...everyone would be better off if some central agency coerced each individual to bear his share of the cost of such goods, since his share of the benefits is larger than the cost he would pay. Since such coercion makes each citizen better off than he would be in a free market, and since each citizen is rational, everyone would agree to be coerced."[7]

Margolis raises some important questions about collective goods:

> "Are these collective consumption goods? Are they the typical public services?... Against Samuelson are the facts. He claims that collective goods are not rationed - that the use a good by (A) does not involve any cost to (B). Clearly this is not the case in such common public services as education, hospitals, and highways, where capacity limitations and congestions are topics of the daily press... Possibly the only goods which would seem to conform to Samuelson's definition are national

---

[6] Anthony Downs, "An Economic Theory of Government Decision Making in a Democracy," U.S. Office of Naval Research, Stanford University Technical Report No. 32, Stanford, 1956, pp. 189-199.

[7] Ibid., pp. 194-195.

> defence and the aged lighthouse illustration. The lighthouse shines for all ships when the lanes are not crowded; and everyone receives a full share of protection from the military machine."[8]

Margolis further points out that there is no technical reason why services furnished by the government could not be furnished on a private basis.[9] Enke suggests that Samuelson's theory can handle intermediate categories of goods (between collective consumption and private consumption goods.)[10] Downs makes some reference to such intermediate cases, noting that not all collective goods benefit every member of society. Furthermore, there may be some limit to the number of citizens who can enjoy a collective good at once, for example crowding of beaches and riverbank fishing has limits on their use at any one given time period.

It appears likely that, so far as outdoor recreation is treated as a collective good, determination of an optimum allocation of the available management area will be difficult

---

[8] Julius Margolis, "A Comment on the Pure Theory of Public Expenditure," Review of Economics and Statistics, Vol. 37, No. 4, November 1955, p. 347.

[9] Ibid., pp. 347-48.

[10] Stephen Enke, "More on the Misuse of Mathematics: A Rejoiner," Review of Economics and Statistics, Vol. 37, No. 2, May 1955, p. 132.

or impossible.[11] So far as it is treated as a private good, determination of an optimum allocation can be obtained through the market or some market-like process. The most intractable case (for purposes of analysis) that appears reasonable is that outdoor recreation is partially a collective good. It will be argued here that, even for this case, economic analysis can yield a good deal of information on the proper allocation of natural resources. Krutilla lends some (small) support to this vein. In an article reviewing the literature of benefit-cost analysis, Krutilla points out many of the difficulties involved.[12] He concludes with these comments:

---

[11] Samuelson states, "Government supplies products jointly to many people. In ordinary market economics as you increase the number of sellers of a homogeneous product indefinitely, you...can hope to reach a determinate competitive equilibrium in the limit. It is sometimes thought that increasing the number of citizens who are jlintly supplied public goods leads to a similar determinate result. This is reasoning from an incorrect analogy...such a process does not lead to a determinate equilibrium...." Samuelson, "Diagrammatic Exposition of a Theory of Public Expenditure," Review of Economics and Statistics, Vol. 37, No. 4, November 1955, p. 355.

[12] John Krutilla, "Welfare Aspects of Benefit-Cost Analysis," Journal of Political Economy, Vol. 69, No. 3, June 1961, pp. 226-235.

"Does the array of positions advanced previously provide an adequate rationale for attempts to evaluate the benefits and costs of resource development alternatives? Or are the comments herein transparent rationalizations which leave little conviction that analysis of benefits and costs and of their distribution can help significantly to improve welfare through public intervention? One's view, of course, will differ depending on the nature of one's experience, one's temperment and perhaps also one's personal situation. The academic theorist without responsibility for policy can afford to (and probably should) be puritanical without regard to whether or not this is immediately constructive. On the other hand, the practicing economist in government, charged with responsibility to act under constraints of time and information, will often be grateful for perhaps even the public interest! Since the alternative is not to retire to inactivity, but, rather, to reach decisions from the belief that thinking systematically about problems and basing decisions on such analysis are likely to produce consequences superior to those that would result from purely random behavior. Nonetheless, the utility and welfare of benefit-cost analysis are likely to be viewed differently, depending on the end of the telescope through which the affected party is privileged to look."[13]

Section 3: Allocation of Public Natural Resources for Outdoor Recreation

The allocation problem arises when there exists competing alternative uses for a group of natural resources. One may broadly classify the alternative uses as:

(1) outdoor recreation use.

(2) non-outdoor recreation use.

---

[13] Ibid., p. 226.

Outdoor recreation use can be subclassified into (i) developed recreation, and (ii) undeveloped recreation.

Developed recreation encompasses a wide variety of activities that require the development of certain specific facilities such as campgrounds, picnic grounds, winter sports facilities, roads, etc. Such facilities may be furnished either by public agencies or private enterprise.

Undeveloped recreation encompasses activities that require a minimal development of natural resources. The benefits involved in undeveloped recreation are usually considered to be associated with such aspects of the recreation experience as:

(1) solitude
(2) esthetics
(3) education
(4) viewing nature (bird watching).[14]

The non-recreation use of natural resources implies some sort of development, i.e. logging, farming, pulp mills, industry, etc., which may be subclassified into:

(a) commercial development
(b) agricultural development

Commercial development refers to timber production, mining, hydroelectric power, mills and refineries; whereas agricultural development refers to irrigation, cultivation and stock raising.

---

[14]Outdoor Recreation Resources Review Commission, National Recreation Survey, Study Report No. 19, Government Printing Office, Washington, D.C., 1961.

Several points can now be made about these alternative uses. First, in some extreme cases, only one use may exist; for example, a given resource area may yield zero social or economic returns in commercial, agricultural or developed recreation uses, in which case its only use is in non-developed recreation. For such cases there is obviously no allocation problem. Clawson, Held and Stoddard,[15] in discussing such circumstances, include as an example the mountaintop which

> "...lacks commercial forests, usually because its above prime timberline; it is ungrazed, either because it lacks forage or because grazing is forebidden; too remote to be within an established park.... Such lands may have mineral possibilities not yet discovered, and they have the special recreational value of wilderness or near-wilderness areas. But otherwise they are now essentially unused, and their remoteness and lack of commercially exploitable resources are likely to keep them from being used in the future."[16]

Second, a variety of complementary and competitive relationships may exist between the alternate uses. To complicate matters, these relationships can change with intensity of use. Thus Bolle points out:

> "To a large extent, supplementary, complementary and conflicting relationships are extensions of the same relationships changing with degree of use."[17]

---

[15] M. Clawson, R.B. Held, and C.H. Stoddard, Land For The Future, published for Resources for the Future, Johns Hopkins Press, Baltimore, 1960.

[16] Ibid., p. 438.

[17] Arnold W. Bolle, "The Basis of Multiple Use Management of Public Lands in the North Fork of Flathead River, Montana," Unpublished Ph.D. Dissertation, Harvard University, December 1959, p. 191.

The investigation of such relationships between uses must be considered an important part in the determination of the optimum use of a mixture of natural resources. Ciriarcy-Wantrup makes this point on optimum use:

> "Under the concept of optimum use, there may be several uses. The idea, however, is not to have several uses always, but to permit them if they are socially desirable. In many cases the optimum use may be a single use rather than some combination. In other cases it will be one dominant use and as many subordinate uses as do not interfere with the dominant use. In some cases there may be two or more co-dominant uses of nearly equal importance."[18]

Third, there is nothing particularly unfortunate about resource-use conflict. There may be some tendency to regard conflict as a bad thing, but all choice involves slecting between competing (conflicting) alternatives. By considering individual natural resource areas, one at a time, and deciding on their allocation, an overall set of specific allocation decisions can be developed.[19]

Costs and benefits for development of a given natural resource area may be considered marginal to the system as a whole. Thus, if the presently designated recreation areas are accepted as given, alternative development schemes of other natural resource areas may be considered one at a time.

---

[18] Sigfied Von Ciriacy-Wantrup, "Multiple and Optimum Use of Wild Land Under Different Economic Conditions," Journal of Forestry, Vol. 36, No. 7, July 1938, p. 665.

[19] U.S. Forest Service, "U.S. Forest Service Handbook," Government Printing Office, Washington, D.C., 1958, pp. 193-204.

The order of consideration can be specified by the agency involved on the basis of fairly well defined criteria, e.g. present capability of a natural resource area to yield net returns in non-recreation use.

Section 4: Benefit and Cost Components of Outdoor Recreation

Economic analysis of the allocation of a particular natural resource area can be looked at as involving two distinct steps. The first step consists of an enumeration of the components to be measured and weighted in any allocation decision. The second step involves measuring, weighting and comparing the components so as to determine the quantity of benefit and cost items.

Specification of Benefit and Cost Items

The components entering the allocative decision are of two kinds. Firstly, they consist of values or benefit items foregone by allocation of natural resources to outdoor recreation. These are the net benefits that might accrue if it were decided to develop the area for commercial or agricultural use rather than for outdoor recreation. They are net items in the sense of gains above and beyond the cost of development for commercial or agricultural use. Secondly, the components entering the allocative calculations include the net benefits derived from allocating the natural resources to outdoor recreation rather than commercial or agricultural use.

In physical terms, the source of alternative benefits foregone would include such items as board feet of timber, animal months of grazing, bushels of grain or tons of mineral production. If further distinction is made between undeveloped and developed outdoor recreation, opportunity costs of undeveloped recreation would include man-days of developed recreation foregone; for example, man-days of camping, man-days of sightseeing, etc. As noted previously, these alternatives may be competitive as well as complementary. Hence, there may be various physical combinations of these alternative uses for the same body of natural resources.

Turning to a specification of the benefits generated as a result of allocating resources to outdoor recreation, whether developed or non-developed, the most common unit of measurement is man-days of participation. Each recreationist who undertakes a day of recreational activity at the site is assumed to derive benefit from this activity, and aggregation of all individual benefits would yield total "participation" benefits of direct recreation at the site. Clearly the dollar value of the aggregate recreation benefits can only be assessed when a price per unit of recreation (man-day) is known, or an acceptable proxy of price is available. Additional recreational benefits to the site may also be claimed as follows:

(i) The vicarious benefits ascribed to non-users of the recreation area who derive satisfaction from merely knowing that the area exists.

(ii) Undeveloped recreation areas may benefit natural scientists in their scientific inquiries - the observation of nature in its virgin state.

Man-days of recreation is easiest to observe (and perhaps to accept as a bonafide benefit), but data available for its measurement and projection are open to question. The remaining benefits of outdoor recreation (if they cannot be quantified into man-days) are much less susceptible to measurement. Conceptually, watershed and wildlife benefits (in physical terms) seem capable of measurement. If these physical measures can be transposed into some measure of recreation experiences, then the accepted quantifiable benefit, man-days, can be determined. With respect to these benefits, increased levels of stream flow and of wildlife might be consistent with increased recreational use, but these presumed complementary items might be competitive at certain levels.[20]

In spite of attempts to prepare objective estimates of recreational-use benefits, there will probably remain a considerable element of administrative value-judgement in any allocative decision. The decision-making agency might weight such components in accordance with a value scheme set up by the agency to reflect the weightings of society.

---

[20] With respect to stream flow competitive aspects, see C.H. Wasser, "The Alpine: Its Place in Multiple-Use Management," Proceedings of Society of American Foresters Meeting, Government Printing Office, Washington, D.C., V.L. Fischer, U.S. Congress, Senate Committee on Interior and Insular Affairs, Hearings on S. 174, The Wilderness Act, 87th Congress, 1st Session, 1961, p. 293.

The second step in allocative decision making is to specify the costs of development of recreation areas. In most instances these will be reasonably straightforward, based on data for preparing the site for various recreational activities and providing access where necessary. The opportunity costs of recreational use will depend, of course, upon the net benefits of alternative uses foregone.

Opportunity Costs of Recreation

In terms of foregone timber production it is possible to roughtly estimate the stumpage price of the productive timber and, on the basis of the annual cut, to estimate the annual return to timber production. As far as animal grazing and agricultural production are concerned, a per acre yield (to society) must be evaluated and considered as the major part of the opportunity cost of agriculture. Reservoir development may be important in particular cases for irrigation, flood control and hydroelectric power. In so far as these benefits are mutually exclusive with respect to the alternative recreation benefits, they represent the opportunity costs of the reservoir development alternative.

It is important to note that these values will be gross returns. It is necessary to account for additional costs borne by the government in putting resources into uses other than recreational use. These costs could include timber management and administrative costs, reclaiming of floodplains through dyking systems, and disease and insect control. All items must be converted to comparable units (asset value or

service flow) by an appropriate formula. Subtracting these development costs from the gross return yields net returns. The net returns can be taken as the opportunity costs of outdoor recreation, as previously defined.

Evaluation of Benefits

There are a number of possible approaches to the evaluation of benefits of outdoor recreation. Perhaps the easiest is to attempt to avoid direct evaluation. One could calculate opportunity costs of agricultural and/or commercial production foregone, and compare these to man-days of developed and undeveloped recreation. This would be a measure of the supply price of outdoor recreation. Some sort of rule for decision making could be developed; thus one undeveloped recreation day (in general) could be set arbitrarily equal to $20 of annual agricultural production. If, in fact, more than this amount were being sacrificed, it might be decided to allocate the area out of undeveloped recreational use. It is obvious, however, that this is a weak approach and that it is sensible to weight total recreation days (developed and undeveloped) by dollar values so that comparisons can be made directly.

The estimated value of a recreation day now becomes of great interest. Here the possibilities seem to be:

(1) an arbitrary assignment of value (which has the virtue of simplicity);

(2) an attempt to infer values on the basis of past decisions; and,

(3) an attempt to estimate value directly.

An arbitrary assignment of value seems sensible if it is impossible or extremely difficult to estimate the value in any other fashion. Chester Wilson of the ORRRC has said:

> "I think it is utterly hopeless to devise a supportable formula for determining benefits resulting from the physical and spiritual results of recreation in dollars and cents."[21]

Dana and Krueger are somewhat more optimistic as to the measurability of the recreation activity (man-days) but doubt the possibility of measuring some of its social benefits:

> "...monetary measurement of the (recreation) activity is possible, although there is room for considerable improvements in the methods now used. There is as yet nothing that even approaches a satisfactory quantitative measure of the extent to which the activity makes the recreationist a most highly developed human being, a more productive worker and a better citizen; yet, these are the values for which the activity is undertaken. Even though it may never be possible to put a dollar sign on them, we certainly need to be able to identify them and to evaluate at least in broad terms their magnitude and duration."[22]

The choice of an arbitrary value might be left to the management agency involved or may be set by outside authority. Thus the 85th and 86th congresses of the United States "both saw bills introduced to establish the value of recreation at federal water projects arbitrarily at $1 per user-day."[23]

---

[21] Outdoor Recreation Resources Review Commission, "Proceedings of the Second Joint Meeting with its Advisory Council," Government Printing Office, Washington, D.C., 1960, p. 100.

[22] Samuel T. Dana and Myron Krueger, "California Lands: Ownership, Use and Management," American Forestry Association, Washington, 1958, p. 118.

[23] President's Water Resources Council, "Policies, Standards, and Procedures in the Formulation, Evaluation and Review of Plans for Use and Development of Water and Related Land Resources," 87th Congress, 2nd Session, Senate Doc. No. 97, May 1962.

Alternatively, an attempt could be made to infer values on the basis of past decisions. Here, past decisions are accepted as reflecting society's preferences, and inferences are made on the basis of foregone alternatives in those cases, relative to man-days of recreation use. Estimates could be obtained on the basis of a number of specific decisions, for example, examination of decisions made on Olympic National Park, Dinosaur National Monument, The Glacier Peak Wildlife Area and the Selway-Bitterroot primitive area.[24] Since Olympic National Park and Dinosaur Monument involved congressional decisions and the Glacier Peak and Selway-Bitterroot areas involved management agency decisions, possible differences between these groupings might be worth investigating.

Some difficulties must be noted. It may be quite difficult to estimate values for particular outdoor recreation benefits, that is, to breakdown the over-all estimated benefit in terms of its components. A complicated factor here is that scientific and vicarious benefits can be thought of as incremental benefits which will depend on the total amount of recreation areas in existence at the time of the decision. The increment of such benefits from a given wildlife management area when there are 10 others like it in existence probably differs considerably from the increment of such benefits when

---

[24]This is a procedure which has been outlined by H.J. Vaux, "Evaluation of Recreational Versus Industrial Use of Forest Lands," Research in the Economics of Forestry, Waverly Press, Baltimore, 1953, pp. 261-62.

it is the last of its kind.[25] Again, this approach does not allow for the possibility that society in the past "made a mistake" (as judged by society in the present).

There have been some efforts to go beyond arbitrary assignment of a dollar value per recreation day by attempting to estimate such values on the basis of recreationist's behavior. The following reasons can be cited for this approach:

(1) an attempt to reduce the arbitrariness of an assumed dollar value; and,

(2) an attempt to distinguish between types of recreation. Thus, are 1,000 days of developed recreation the equivalent of 1,000 days of undeveloped recreation? If not, what are the appropriate weights?

These efforts have generally involved (1) estimating a demand relation for recreation areas, and (2) estimating "consumer surplus" (equal to the area under the demand curve) and arguing that this is equivalent to total value to consumers.

---

[25] If scientific and vicarious benefits are assumed to be the same in all cases, estimates can be obtained from any pair of cases examined. Let P = socially assigned value of a recreation day; Q = number of such days; X = total value of other services (scientific, vicarious, etc.) Z = value of foregone alternative. Then $PQ + X = Z$ can be hypothesized as a general equation expressing society's evaluations. P and X are unknowns; if X is the same in all cases, then two cases will yield two equations in two unknowns, and solutions for P and X can be obtained. However, if X varies in an unknown way between cases, the solutions cannot be obtained. (Strictly speaking, $PQ + X \geq Z$ is more accurate formulation; making this an equality allows one to make minimum estimates of P and X.)

Some variation of this argument have been advanced by Hotelling,[26] Trice and Wood,[27] Milstein[28] and Lerner.[29] Clawson has estimated a demand relation in a manner similar to these studies but has rejected the consumer surplus argument.[30]

The estimation of a demand curve following Hotelling's concentric zone approach is summarized briefly below. Concentric zones are drawn around a recreation area, and then the average travel cost from each zone to the recreation area is obtained by dividing by the number of days spent in the recreation area.

Estimation of demand curves by the concentric zone approach, however, may involve some technical difficulties. The approach assumes that the population in every zone has essentially the same demand curve and the approach also assumes that the population will view travel expenses as recreation costs.[31]

---

[26]Harold Hotelling, "The Economics of Public Recreation." ("Prewitt Report"), National Park Service, Washington, D.C., 1949.

[27]Andrew H. Trice and Samuel E. Wood, "Measurement of Recreation Benefits," Land Economics, Vol. 34, August 1958, pp. 195-207.

[28]David N. Milstein, "An Economic Framework for the Study of Leisure," 10th Annual Meeting of Society for Study of Social Problems, New York, 1960, p. 15.

[29]Lionel Lerner, "Evaluation of Recreation," Interdepartmental Committee of Recreation, State of California, 1961.

[30]Clawson, op.cit.

[31]For a critique of the technical difficulties of the concentric zone approach see; Anthony Scott, "The Valuation of Game Resources: Some Theoretical Aspects," Canadian Fisheries Reports, No. 4, May 1965.

Trice and Wood obtain a sample of recreationists and plot a cummulative frequency distribution of travel-costs against visitor days and treat this as their demand curve. They then assume a "bulk-line market value is established at the 90th percentile" and subtract the median cost from this to obtain their "value of a recreation day."[32]

Figure 2.1 exhibits the Trice and Wood procedure in terms of a conventional demand curve (rather than the cumulative frequency function they present). Trice and Wood argue that $P_a - P_b$ is the average benefit obtained per recreation day. Hence, total benefits is the area I plus area II. When their argument is exhibited in terms of figure 2.1, it seems rather unconvincing. Lerner revises the Trice-Wood approach and develops a procedure for properly estimating the consumer's surplus of figure 2.1. He constructs a demand curve by treating the quantity axis as the percent of people using the recreation area; then if price (equal travel cost) is P_b, Q_1 equals total people in the zone times the percentage of use for the price P_b. It is then argued that area II plus area III is the measure of consumer benefits for a given zone since this is the consumer's surplus (or the area below the demand curve).

---

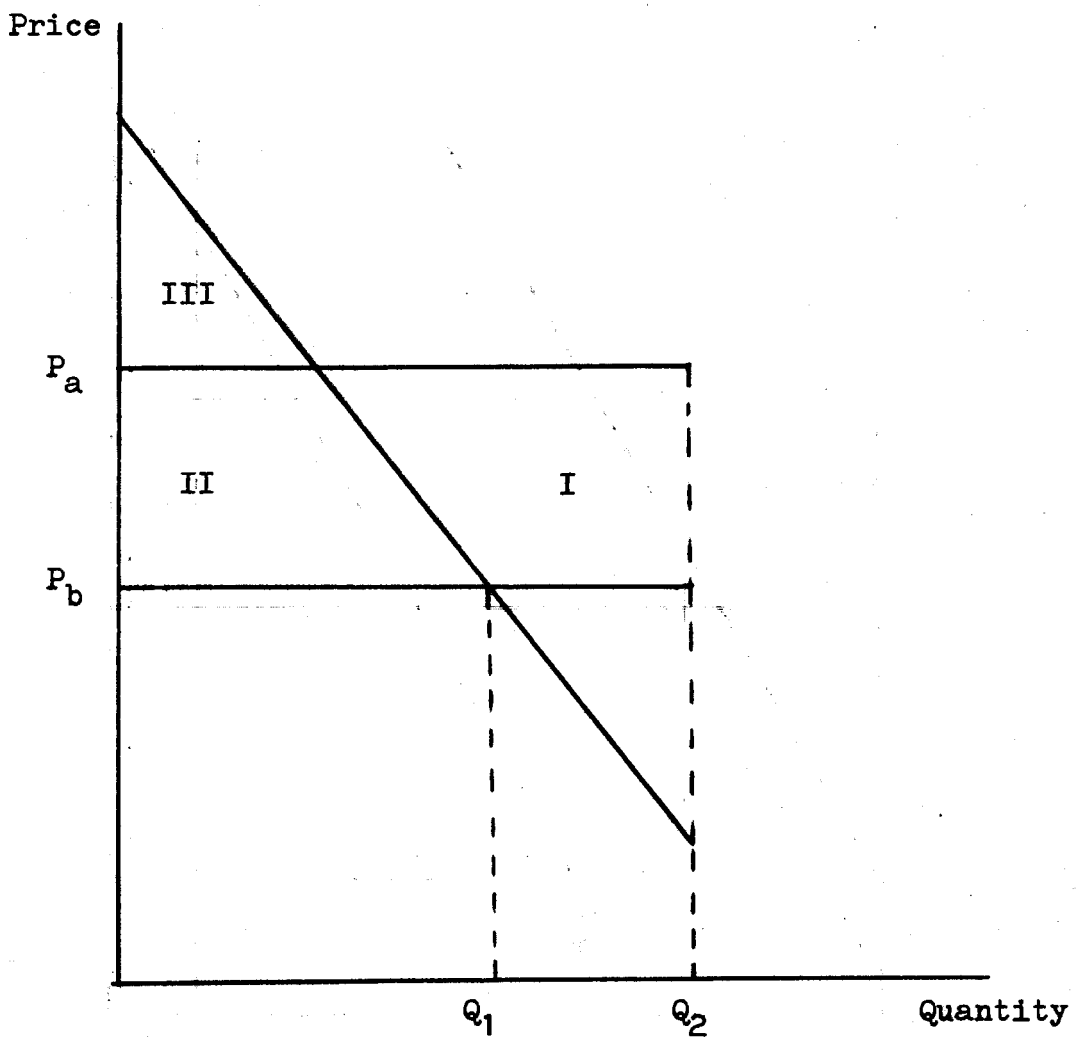
[32]Trice and Wood, op.cit., p. 204.

There are some very real difficulties involved in the use of this concept.[33] Two arguments for its use are generally implicit: (1) it expresses the value obtained by consumers; and, (2) it expresses the maximum revenue that could be obtained for the resource, if the resource owner were discriminatory monopolist. Neither argument seems to stand up very well under close scrutiny. In the first place, the term "value" usually means price per unit or total revenue. Thus one is reminded of the riddle - why is the value (price per glass, say) of water much lower than the value of diamonds (price per glass)? After all, water is vital for life. The answer usually given is embodied in Figure 2.2. In the figure, D_w is the demand for water, D_d is the demand for diamonds; supplies of the respective commodities are such that the price of diamonds is above the price of water. The value of water is generally taken to mean P_w (price per Unit) or perhaps the value of all the water consume, $P_w Q_w$. The points of this exercise are that: (1) the value of anything can vary over a wide range; and (2) consumer surplus is not particularly meaningful - certainly, if you were dying of thirst on a desert, you would pay a great deal for a drink of

---

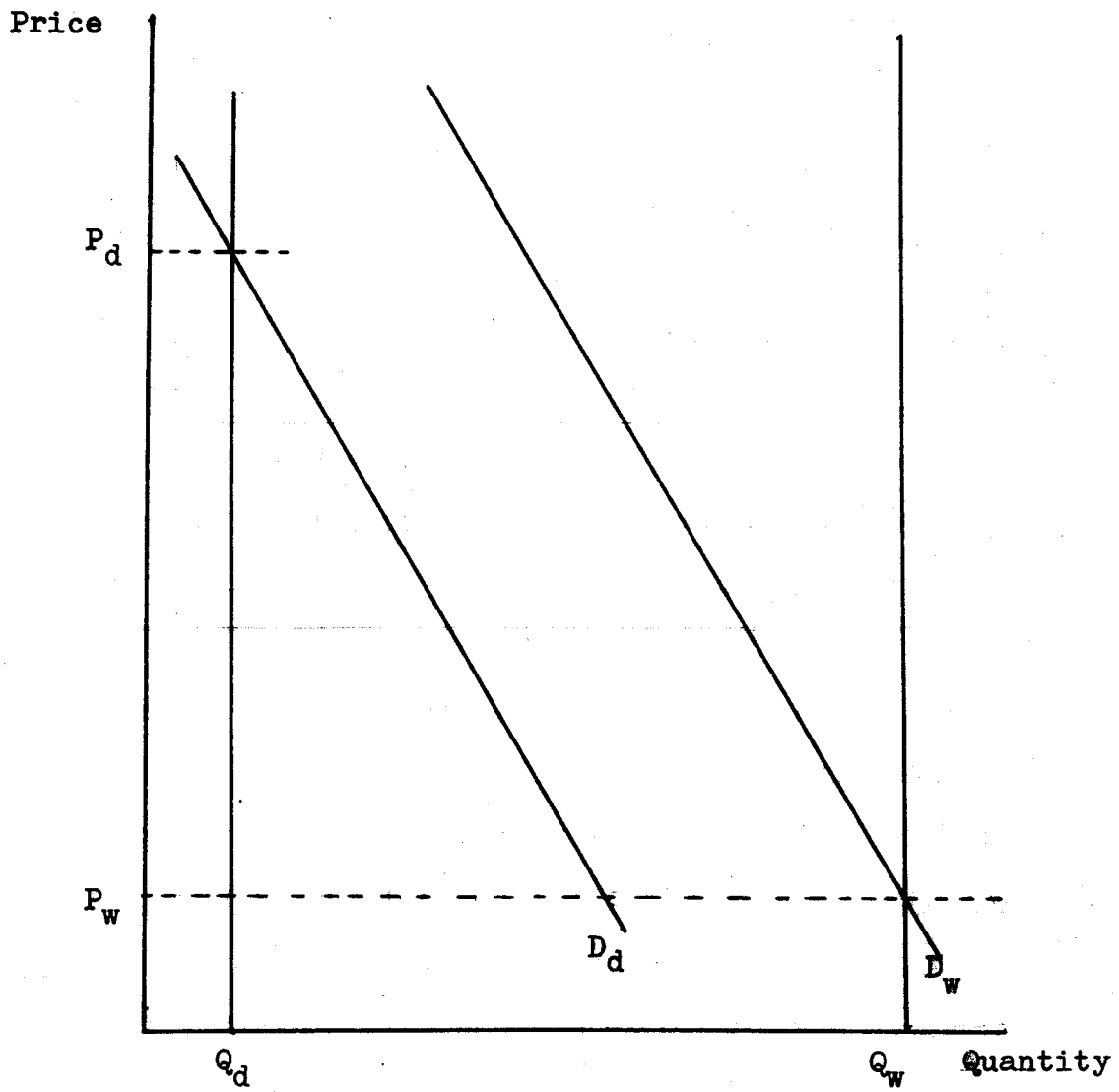
[33] Clawson, in op.cit., p. 31, notes "The usefulness of estimating consumer's surplus is questionable in any situation. Under almost any circumstances, some users of outdoor recreation will gain more from it than they would have been willing to pay if necessary. This may be taken for granted; but how can you capture it? Would public policy permit you to try, and what is to be gained from estimating its amount?" Lawrence G. Hines, in "Measurement of Recreation Benefits; A Reply," Land Economics, Vol. 34, No. 4, November 1958, p. 367, critically reviews the history of this "beguiling notion."

Figure 2.1: Hypothetical Estimated Demand for Recreation Based on Concentric Zone Approach.[34]



[34] Ibid., p. 205.

Figure 2.2: Demand and Supply of Diamonds and Water.



water. But this has no relevance to water's value here and now. The second argument advanced was that consumer's surplus measures what a discriminating monopolist can make. In this context, consumer surplus is interpreted as an upper bound for the value of recreation. The difficulty here is that the demand curve for a discriminating monopolist is not the same thing as a conventional demand curve. The discriminating monopolist case says: the monopolist charges the first consumer what the traffic will bear for the first unit, then lower the price so as to sell the second unit, and so on. This distinction is clearly drawn by Friedman in his Marshallian demand curve discussion.[35]

A major difficulty in evaluating recreation benefits requires more direct examination. If the government follows a policy of setting a zero price for recreation services, then the value of those services to the government is zero. A government that follows this pricing policy assumes that the value of the recreation services to the society, in general, is also zero. Obviously, there are free goods whose utility is not zero (for example, air, sunshine) but whose price is zero. This is a general problem that arises in the evaluation of services furnished by the government. Thus Forte and Buchanan argue against including government services in estimates of national output:

---

[35]Milton Friedman, "The Marshallian Demand Curve," Journal of Political Economy, Vol. 57, No. 6, December 1949, p. 463.

> "The free provision of services by government... guarantees that resources will be adjusted in such a manner that the services will be treated as if they were, in fact, free in the broader, zero cost sense. And since free goods have no economic value, they should not be counted in estimates of national output. The fact that the government actually uses up resources in acquiring these services and, in order to finance the aquisition, levies charges on the general taxpayer is not relevant at all. For purposes of measuring national output at market values, these services must be treated in the same way that any genuinely free good, say air, is treated."[36]

Given a demand curve, it is also possible to estimate the maximum net revenue that could be obtained by an ordinary monopolist (obtained by setting marginal revenue equal to marginal cost). In general, this maximum revenue figure will be less than the consumer surplus previously discussed.

It is possible that an administrator might be guided to some decisions by considering the maximum monopoly revenue that could be obtained for the area from two competing types of recreational development, i.e., undeveloped versus developed recreation. Assuming 100% developed or 100% undeveloped outdoor recreation, maximum revenue might be derived for each case with choice among the alternatives based on which yielded the maximum net revenue. Alternatively, given the marginal cost schedule in furnishing each type of recreation on the given area, the agency involved could act as a monopolist facing two separate markets (discriminating monopolist).

---

[36] Francesco Forte and James M. Buchanan, "The Evaluation of Public Services," Journal of Political Economy, Vol. 49, No. 2, April 1961, p. 110.

The charging of fees for outdoor recreation use, if possible, would result in efficient allocation of resources among all competing uses, including outdoor recreation. However, some may argue that the government should not set up user fees for outdoor recreation since every citizen has the right to enjoy our province's "free" natural heritage. Yet there is a precedent for such charges - highway user tolls, and hunting and fishing licences. There is the vital point that foregone alternatives - of benefits to the province - are involved. Why should such costs be borne entirely by the taxpayer? It cannot be argued that preservation of recreation areas involves an income redistribution in favour of lower income groups - evidence indicates average income for recreation users as a group is above the United States average income. Finally it is sometimes claimed that recreation areas are showing signs of congestion. Use can be expected to increase, perhaps tenfold by the year 2000.[37] What better way to ration use than by a user charge, such as a licence fee. With respect to this last argument, it must be noted that a price set to yield revenue equal to opportunity cost generally will not equal a price set to reduce man-days of use to a specified quantity.

---

[37] Outdoor Recreation Resources Review Commission, Projections to the Years 1976 and 2000: Economic Growth, Population, Labour Force and Leisure, and Transportation, Government Printing Office, Washington, D.C., 1961.

Differences between these defined prices can arise because different criteria are involved. In each case, assume the demand curve is known. In the first situation the criterion is to set net revenue of recreation equal to the opportunity cost of recreation. Price times quantity yields gross revenue. Net revenue is obtained by deducting all development costs. Using various price levels and various quantity levels, a large number of price-quantity combinations may be used to set the net revenue of recreation equal to the opportunity cost of recreation. If this is the only criterion, the agency will presumably select that price-quantity combination consisting of the minimum price and the maximum quantity.

The second criterion involves defining a maximum level of permissible use and, on the basis of this given quantity, determining the corresponding price.

Finally, it might be possible to combine the two criteria so that both are fulfilled - use is below some level, and revenue is equal to or above opportunity cost.

Section 5: Summary

To summarize briefly: in making allocative decisions some comparison of costs and benefits is possible and recommended. In some cases, fairly arbitrary procedures will be necessary. The value of a recreation day can be (1) set by administrative fiat; (2) defined on the basis of past decisions; (3) set equal to that price which ields a minimum revenue, given a demand curve; (4) set equal to that price which produces

a revenue covering all, or a particular part, of total opportunity costs; or (5) set equal to a price which limits use to a permissible maximum. It is not expected that it will be possible to obtain a very precise estimated demand curve or that it will be easy to allocate the proper share of opportunity costs to other benefits. The procedures discussed here, however, may yield some notion of the approximate magnitudes. The procedure or procedures employed will depend on the decision made with respect to the institution of user fees. If such charges are not made, the most appropriate method of evaluating the recreation day would appear to be one of the initial three methods listed. If such charges are made, one (or a combination) of the latter two methods seen appropriate. The institution of user fees is argued for because:

(1) a product or service is received by the user;

(2) all or part of the opportunity costs would be covered;

(3) generally, there is an "ability-to-pay" on the part of the recreationist;

(4) use would be rationed; and,

(5) this would provide some return to provinces which would otherwise have benefited from commercial or agricultural development.

If a user-fee seems an impossibility, then it will be difficult to justify the use of natural resource areas for recreation in terms of cost-benefit analysis - economic feasibility. The inability of present economic theory to give us the tools to quantify many recreation benefits in "dollar" terms, leaves the agency at a loss when the net benefits of a recreation project must be compared to a commercial or agricultural project. If on the other hand, an agency designates a management area for recreation, then a socio-economic study can be presented to determine relative levels of development and use of the given area.

CHAPTER III

FACTORS AFFECTING THE GROWTH AND DEMAND (PARTICIPATION) OF OUTDOOR RECREATION

- METHODS OF PROJECTION -

Section 1: Introduction

The first step in projecting the demand for outdoor recreation is to identify those factors which affect demand, and to make projections as to their probable future development. This is true whether the method of projection is a simple straight-line extropolation of past demand, or a multiple regression analysis of socio-economic variables.

It is important to determine here, what is meant by "demand." Demand, in general, refers to a spectrum of wants at different prices. "Quantity demanded" or "effective demand" is that part of demand which is actually purchased or consumed. Outdoor recreation demand, or "participation" in outdoor recreation, is that part of demand which is actually received by the consumer. Discussions centered around determination of future levels of demand for outdoor recreation are actually references to future levels of outdoor recreation participation.

Based on a survey of currently available literature, this chapter first identifies the relevant factors affecting demand of recreation facilities. It next outlines various methods of projection, and evaluates their applicability to different sized regions.

Section 2: Factors Affecting Demand (Participation)

The factors affecting demand for recreation can be grouped into two general categories; physical attributes of the available facilities in the recreation areas; and socio-economic characteristics of the population. The physical factors include time-distance required to make the vacation trip or travel to the recreational facility; the the mix of activity-possibilities available at a recreation site or during a given vacation trip; and, the degree of congestion at the recreation site. The degree of congestion at the recreation site is an important consideration in that degree of "quality" of recreation is directly related to the degree of congestion. Some physical factors can, however, be expressed in terms of socio-economic variables. For example, time-distance of travel to outdoor recreation areas is approximated by the place of residence (urban or rural) of the population.

The socio-economic characteristics of the population have been studied by the Outdoor Recreation Resources Review Commission (ORRRC), who sponsored a survey in November, 1959 and May, 1960, of the leisure-time activities of American adults.[1] The sample used represented a cross section of households throughout the United States. A questionnaire re-

---

[1] Eva Mueller and Gerald Gurin, Participation in Outdoor Recreation: Factors Affecting Demand Among American Adults, ORRRC Study Report 20, Washington, D.C., Government Printing Office, 1962.

garding participation in eleven different kinds of outdoor recreation activities, and the socio-economic characteristics of the respondents were noted on the interview forms. This survey, conducted by the Survey Research Center of the University of Michigan, classified respondents under ten socio-economic headings. The National Recreation Survey, conducted by the ORRRC staff in 1960 and 1961, used nine categories somewhat different in coverage and scope.[2] The two sets of socio-economic categories are summerized in table 3-1.

Differences in participation among the sub-groups can be examined in two ways; examining the activity related to each variable without adjusting for the possible influences of the other socio-economic variables, and examining the activity related to each variable while holding constant the influence of other variables which may be associated with it.

The second type of analysis is much more interesting and important, because its results can be interpreted causally. For example, it might show the extent to which outdoor recreation activity levels are attributable to family income levels. Thus, by holding all other factors constant, and hypothesizing an increase in family income, the corresponding

---

[2]Abbott L. Ferriss, National Recreation Survey, ORRRC Study Report 19, Government Printing Office, Washington, D.C., 1962.

TABLE 3-1

Socio-Economic Characteristics Relevant to Participation in Recreation/Tourism

Survey Research Centre (ORRRC Study Report 20)	National Recreation Survey (ORRRC Study Report 19)
Family Income Five Classifications to $10,000 and over	Family Income Eight Classifications to $15,000 and over
Education of Family Head None, Grade School, High School, College, College Degree	Education, Age 25 or over Eight (year) Classification to College Completion
Occupation of Family Head Profession, Clerical, and Labourers - Eight Classifications	All Employed, 14 and over Fourteen Classifications
Place of Residence Cities, Surburban Areas; Adjacent Areas; Outlying Areas	Place of Residence Further Breakdown
Age of Family Head 18-24; 25-34; 35-44; 45-54; 55-64; over	Age of Family Head 12-17; 18-24; 25-44; 45-64; 65 and over
Region West North Central, Northeast, South	Major Region West, North Central, Northeast, South
Sex Male, Female	Sex Male, Female
Life Cycle Single versus married; children	Physical Impairments Degree of Impairment (3) State of Health - good, fair, poor
Race White; Negro	Race Not Considered
Paid Vacation of Family Head None; 1-4 weeks or over; self employed; not in labour force	Paid Vacation of Family Head Not Considered

increase in outdoor recreation activity can be estimated.

Proceeding from a survey of the factors affecting outdoor recreation activity, therefore, a predictive method can be derived. The predictive power of devices of this type, such as factor analysis, can be evaluated in terms of how much of the observed variance in recreation participation can be explained by the socio-economic factors used. If only a low percentage of the variance can be explained in this way, one might reasonably conclude that the factors affecting demand do not effect demand very much at all, in which case different explanations should be sought.

One should be cautious in using these analytical tools, since the fact that variable (A) has a high predictive power of variable (B) may be due entirely to the relationship of both (A) and (B) to a third variable (C), which is not considered in the analysis. Multiple regression analysis for example, has been widely abused in all branches of the social sciences, including recreation. The problem of actual versus apparent causality will not be discussed here, since it is assumed that the reader is familiar with basic statistical methodology and its associated problems.[3] The ORRRC, using the socio-economic variables listed in the left-hand column

---

[3]For a discussion on the problem of serial and auto correlation see, R.C. Clelland, F.E. Brown, J.S. deCani, J.P. Bursk, D.S. Murray, Basic Statistics with Business Applications, John Wiley and Sons, New York, 1966, pp. 418-521.

of table 3-1, obtained relatively poor results in their efforts to predict participation in outdoor recreation and vacation travel behavior. The coefficients of correlation (R^2) obtained were very low, 0.30, for overall results.[4] In other words, only 30% of the variation in recreational participation and vacation travel patterns could be explained by the variables used. This led the authors of ORRRC study resport #20 to conclude that

> "...factors other than socio-economic characteristics are major determinates of outdoor recreation activity. Such things as time available, the goals and interests which the individual seeks..., the leisure time preferences of other members and friends, physiological factors, recreational experiences in childhood, interest in...competing activities..., or availability of facilities come to mind readily."[5]

A technical refinement in the measurement of recreational activity might also have contributed to a more satisfactory conclusion regarding the influence of socio-economic characteristics. For example, instead of measuring simple participation in a recreational activity in terms of "often," "a few times" and "not at all," the exact number of participation occasions could have been measured, as could the intensity of participation. A detailed breakdown of the relationships between the socio-economic variables and participation scores for outdoor recreation is to be found in table 22 of

---

[4] Participation in Outdoor Recreation: Factors Affecting Demand Among Adult Males, ORRRC, Study Report 20, 1962, pp. 26-29.

[5] Ibid., p. 27.

ORRRC study report 20. These relationships are summarized in table 3.2 of this chapter.

The National Recreation Survey (NRS), ORRRC study report 19, made a factor analysis of inter-correlations between types of outdoor recreation activities. This enables the 15 principal outdoor activities to be aggregated into four homogenous groups. These are:

(a) passive pursuits;
(b) water-related activities;
(c) physically demanding activities; and
(d) backwoods (wilderness) activities.

Regression analysis performed on the socio-economic factors listed in the right-hand column of table 3.1 for each sex and each of the four regions, yielded coefficients of correlation (R^2) of up to 0.44 in one case (Western male participation in physically demanding activities), but in most cases the explanatory value of the variables fell between 10 and 20 percent (i.e., R^2 of 0.10 to 0.20). From this analysis, however, it is possible to make some general statements regarding the pattern of dependence of the four activity groups on the socio-economic variables. These are listed in table 3.3. Other interesting information uncovered by the Survey Research Center's interviews was the reasons persons give for not participating more often in outdoor recreation activities. This data is contained in table 7 of ORRRC study report 20. They are repeated here in table 3.4.

TABLE 3.2

Relationship Between Socio-Economic Factors and Participation in Outdoor Recreation

Factor	Influence on Participation
Income	positively related
Education of Head	positively related
Occupation of Head	positively related
Paid Vacation	positively related
Urbanization	negatively related
Region	West and North Central more active - negatively related
Age of Head	negatively related
Life Cycle	negatively related to child impendence and age
Race	Non-white less active
Sex	males more active

Source: Participation in Outdoor Recreation: Factors Affecting Demand Among American Adults, ORRRC Study Report 20, 1962.

TABLE 3.3

Relationship Between Socio-Economic Factors and Four Types of Recreational Activity

Passive Pursuits	Major variable affecting participation appears to be education - participation rate increases with higher education level. Surprisingly, poorer health also goes with less passive pursuit activity.
Water Related Activity	Non-whites have lower scores, while those who live away from urban centers have higher scores. Occupational status is positively related to water-oriented activities.
Physically Demanding Activities	Dependent entirely on age, with younger persons naturally having higher scores.
Backwoods Activities	Here age and income are most strongly related, but the relationship is somewhat less clear than for other types of activities.

Source: The National Recreation Survey, ORRRC Study Report No. 19, 1962.

TABLE 3.4

Factors Preventing Desired Outdoor Activity

Reason Given	Percent of Total Respondents
Lack of time	52
Financial cost, too expensive	17
Ill Health, old age	11
Family ties	11
Lack of available facilities	9
Lack of car	5
Lack of equipment	4
Miscellaneous	9
Don't know or not ascertained	4
	122%

NOTE total adds to more than 100 percent because respondents could mention more than one factor.

Source: Participation in Outdoor Recreation: Factors Affecting Demand Among American Adults, ORRRC Study Report 20, 1962.

Section 3: Methods of Projecting Demand for Recreation Areas.

The factors affecting demand for recreation are classified as either physical or socio-economic. The methods of projecting demand for recreation areas can be divided into similar categories. These methods involve a complex mix of assumptions concerning socio-economic trends, physical variables and resulting preferences.

Projecting Demand (Future Participation) From Knowledge of Physical Variables.

This type of projection method involves the basic behavioral assumption that the use of a recreation area is inversely related to either travel cost or travel time, or some combination of the two. The more distant (measured in time-distance) or more expensive facilities are, the less frequently they will be used on a per capita basis, than competing facilities which are either closer to population centers or less expensive. Using this behavioral assumption and tabulations of visitor-days at a number of recreation areas, Marion Clawson first developed a method for estimating recreational demand curves.[6] Jack L. Knetsch later reviewed,

---

[6]Marion Clawson, Methods of Measuring the Demand for and Value of Outdoor Recreation, Reprint No. 10, Resources for the Future, Inc., Washington, D.C., February, 1959.

explained and somewhat elaborated on the "Clawson" method.[7]

The construction of a "Clawson" proxy demand curve, in outline, begins with a computation of the cost and time required to get to a given recreation area from concentric tributory zones. A proxy demand schedule is then constructed by multiplying these costs by the number of actual per capita visits. In effect this gives the quantity of recreational experiences demanded at various prices. It is necessary next to make two assumptions in order to derive the demand curve for the given recreational area from the proxy demand curve for the total recreational experience. The first is that the users of the recreational area would view an increase in entrance fees in the same way as an equal increase in the total travel cost of a visit. The second is that the visitors from one zone would behave similarly to people in other zones, if costs in time and money were equal. Accepting these assumptions, the effect of an increase in user fees can be estimated by postulating increments in travel cost and reading off the per capita rate of visits which could be expected from each tributary zone. These new per capita rates from each zone, multiplied by the populations of the zones, would yield an estimate of the total number of visits at that particular proxy price. From similar calculations of the estimated

---

[7]Jack L. Knetsch, "Outdoor Recreation Demands and Benefits," Land Economics, Vol. 34, No. 4, November, 1963, pp. 387-396.

number of visits at each level of increased fees, a new demand curve can be plotted. Clawson contends that this curve approximates the true demand curve for the recreation opportunity itself.

From such a demand curve it would be possible to predict the number of visits to an existing recreation area which would result from either a reduction in travel cost or travel time (as by building better access roads) or a change in entrance fees. However, this method is not readily applicable to the problem of predicting demand for a new recreation area with which the public has no familiarity. The result of one such demand analysis would not necessarily be valid for another recreational area, nor would it remain valid for any given area for very long. In a few years, the basic factors underlying the analysis might change dramatically. For these reasons, Knetsch suggested the inclusion of additional variables to the basic travel-cost "proxy" model. Such variables might be income, leisure, some measure of availability of substitute areas and congestion. A formula incorporating all of these variables would be more useful in predicting demand for new or altered recreational areas than "Clawson's" model.

Marion Clawson has suggested that, by carefully selecting recreational areas similar in socio-economic setting and physical attributes to a projected area, the new area could be evaluated. He did not claim that this method would produce definite answers to recreation planning problems. Rather he believed that it would provide a reasonable series

of alternatives which could then be evaluated on the basis of judgement and public policy.

A much more elaborate planning evaluation model, based on the knowledge of physical constraints and behavioral assumptions regarding the propensity to visit any particular recreational area, has been developed by J.B. Ellis of the Michigan Department of Conservation.[8] The model, called Recreation System (RECSYS), is designed to deal individually with any recreation-travel activity in the State of Michigan on an area-by-area basis. The model has three components:

(1) Destinations - Michigan was divided into 27 areas consisting of counties or groups of counties, for the purpose of measuring current and potential recreational use.

(2) Origins - Similarly, 74 areas, including 8 areas outside of Michigan, were chosen as the points of origin of recreationists.

(3) Interconnections - Built into the model are the constraints imposed by the system of 211 principal highway links which connect all of the origins with all of the destinations.

The model makes the assumptions that travel over any highway link is inversely related to the time and monetary expense required to traverse the link, and that the flow of visitors into any recreational area is positively related to the attractiveness of that area. The data required for the model are (1) a resource inventory of facilities and potential

---

[8] J.B. Ellis, Outdoor Recreation Planning in Michigan by a Systems Analysis Approach, Part 1 - A Manual for "Program Recsys," Technical Report No. 1 of Michigan Department of Conservation, Lansing, Michigan 48926, 1966.

facilities for the particular activity in question, e.g. hunting, fishing; (2) use statistics, by area, for the given recreational activity - if possible arranged in a time series, and (3) the origin of visitors to each recreational area. Before the first computer run could be made, it was necessary to assign attraction index values to each of the recreation areas, a different attraction rating being required for each recreational activity in each area.

Dr. Ellis suggested two methods of assigning attraction indices; (1) initiative construction:- subjectively rank the areas on a 5 point scale and adjust these rankings during model calibration; (2) use of factor analysis, in an attempt to empirically rank the areas from inventory data. At this stage in the use of the model, a series of trial runs must be made in an effort to calibrate the model to observed experience. In effect this fits the model to the real world. After this has been done, projections can be made with RECSYS by running the fully-calibrated model with certain changes in the base data and/or the attraction indices.

The use of a model such as RECSYS reveals unexpected results produced by interdependencies of the state's recreation system, and in so doing overcomes one of the principal weaknesses of the Clawson demand-curve analysis. RECSYS does, however, have weaknesses of its own, and might be a relatively expensive model to adapt to another region. Once programmed, the model would be available for "off-the-shelf" use by many agencies. It would therefore probably lead to consistency and economy in plan evaluation.

Projected Demand (Future Participation) From Knowledge of Socio-Economic Patterns.

The socio-economic methods of projecting recreation demand participation all involve the assumption that current relationships between recreation participation and socio-economic variables can be applied to the expected future socio-economic structure of society. The best single source for a discussion of the various socio-economic methods of demand projection is ORRRC study report 26, entitled, Prospective Demand for Outdoor Recreation.[9]

The simplest socio-economic method of projecting demand for recreation areas begins from the assumption that per capita income, leisure time and mobility are causally related to participation in recreation. A further assumption is made that each of these three factors acts independently and with a unitary elasticity. The composite effect of the three acting together may then be calculated by multiplying each factor by its respective degree of change and cross-multiplying the three products. The demand for recreation might, for example, be expressed as the product of leisure time (L), per capita income (Y) and travel mobility (M), thus:

$$D = f(L \times Y \times M)$$

If the three factors are expected to rise by 20, 30 and 50 percent, respectively, the composite effect would be

$$1.20 \times 1.30 \times 1.50 = 2.34$$

indicating an increase in recreation participation rates

---

[9] Outdoor Recreation Resources Review Commission Staff, Prospective Demand for Outdoor Recreation, ORRRC Study Report 26, Washington, D.C., 1962.

of 134%. This 134% increase could then be applied to per capita activity measures of all kinds of recreation activities.

It is obvious that the method just described involves many arbitrary assumptions. In particular, the assumption that each of the three socio-economic factors will have exactly the same degree of influence on participation all have an elasticity = 1. To overcome this objection, while maintaining as simple a predictive formula as possible, one can use multiple regression analysis to identify the relevant socio-economic factors. Assuming causation, which is sometimes dangerous, one can then estimate their coefficients of causation. This usually requires initial collection of time series data for the dependent variable, National Park Visits for example, and the independent variable which is under investigation - per capita disposable income, for example. Any number of socio-economic variables can be tested for their ability to explain participation rates in recreation, but the field is usually narrowed first by means of theoretical hypothesis. This procedure uses both past experience and present research knowledge to eliminate the use of various socio-economic variables (education, occupation, etc.) whose influence on recreation participation is incorporated in other socio-economic variables (income, mobility, etc.). In ORRRC study report 26, per capita real disposable income, per capita intercity automobile travel in miles and weekly hours of leisure per employed period for the

period 1927-1940 and 1947-1960 were found to explain 99% of the variation in per capita visits to National Parks during the same period. However, because of statistical problems arising from intercorrelation of the independent variables, it was not possible to accurately determine the independent effects of these variables.

Another method of projecting demand from socio-economic factors involves the application of multiple regression analysis to cross-section data rather than time series data. Such data, which was collected in the National Recreation Survey (ORRRC study report 19), indicate the association of socio-economic strata with participation rates in recreation generally, and with specific recreational activities. An example of the use of national cross-section data for projective purposes is to be found in ORRRC study report 26. The NRS revealed a high degree of correlation between certain socio-economic characteristics of the current population and the nation participation rates in various outdoor activities. As is common with predictions based on cross-section analysis, the current observed relationships were assumed to continue into the future.

Through multiple regression analysis, the independent effects of each socio-economic factor on participation in each of the 16 outdoor recreation activities were estimated. Projected distributions of the population, arranged by the various socio-economic factors, for 1976 and the year 2000, were then used to reweight the 1960 participation rates. This

yielded estimates of these changes on recreational participation. Again, because of inter-correlations between the socio-economic variables, such as income and levels of education, occupation, etc., the net effect of all these variables in combination is much more meaningful than the gross effect of each individual variable.

A projective technique which is quite new to the social sciences, but which is believed to have great potential, is that of principal components regression analysis. This method has a great advantage over factor analysis or step-wise regression in that it is not necessary to reduce the number of independent variables used when conditions of collinearity or near collinearity are encountered.[10] This kind of problem is likely to happen when national or local area data are being used to predict such things as use levels at a given recreational area.

Principal component analysis is also attractive because it enables large numbers of independent variables to be analyzed mathematically, completely free from human subjectivity, and permits the rapid identification of those variables with most predictive power. This is especially valuable where different units of measurement are used among

---

[10] Collinearity occurs when two or more independent variables are highly interdependent so that the net affect of each on the dependent variable is difficult or impossible to measure. If collinearity occurs, realiable prediction by multiple regression analysis is not possible.

the independent variables, making direct comparison of their predictive or explanatory power impossible. Here principal component analysis will give a series of beta (B) coefficients which are independent units of measurement.[11] Since it is typical for two or three independent variables to explain better than 90% of the variation in the dependent variable (distance and income, for example, might explain 95% of the usage of a given recreation area), principal component analysis can save much time and research effort when making recreation demand projections. In effect, it can be used as a screening process before proceeding with the construction of a multiple regression model.[12]

A valuable example of the application of the socio-economic method of projecting recreation demand is found in a publication of the California Department of Parks and Recreation in the Los Angeles area.[13] This analysis was based on 1960 per capita participation data for the Western United States which were derived from the NRS by the Stanford Research Institute. The coefficients of determination, or

---

[11]The beta coefficients indicate the relative predictive power or explanatory importance of the various independent variables under study.

[12]An interesting example of the use of principal components as an analytical tool in the social sciences is the article William F. Massy, "Principal Components Regression in Exploratory Statistical Research, Journal of the American Statistical Association, Vol. 60, No. 309, March 1965, pp. 234-256.

[13]California Resources Agency, Department of Parks and Recreation, Outdoor Recreation Outlook for 1980, Monograph No. 1, "Los Angeles Metropolitan Complex," June, 1966.

regression coefficients, of each factor were applied to the socio-economic characteristics of the urban area population expected in 1970 and 1980. The resulting reweighted per capita participation figures for each outdoor activity were then converted into total recreation occasions by multiplying them by the projected population of the region. These calculations, however, gave only the annual demand for various recreation areas. The Stanford Research Institute then studied the seasonal demand pattern for the various activities, and the daily distribution of demand within the peak season. By applying these relationships to projected 1970 and 1980 annual demands, they arrived at estimates of peak demand for these two years.

Such peak demand figures are relevant to the planning of adequate recreation areas, although it is neither economical nor necessary to build to accommodate all the people who may want to use the recreational area on a few summer holidays or the extreme peak weekends. In the Los Angeles study, it was determined that the optimum capacity need equaled only 1% of the total summer demand for all activities except camping, and 1½% of the total summer demand for camping. These capacity requirements were then compared with existing and planned facilities for each recreation area, and the deficiencies identified.

This illustrates an important issue related to demand prediction - that of peak demand versus year round demand. Unless a recreational system is prepared to carry huge amounts of surplus capacity for much of the year, peak demand can never be accommodated. Consequently, once peak demand has been predicted, it becomes a policy decision as to what percentage of this demand is supplied. Predictions of year-round demand can be very helpful in making this decision, consequently one predicts both peak and year-round demand figures.

The problem of future undercapacity can be remedied by other means than just building new capacity. European experiments have shown the effectiveness of altering seasonal vacation patterns as a means of lessening peaktime congestion of limited recreation areas.[14] In the context of a community, province or economic development region, which hopes to increase its proportion of recreation business through provision of increased facilities; the staggering of local vacations and industrial shutdown throughout the entire period of recreational use will evenly distribute the pressure of local people on recreation facilities. This would provide more opportunity for outsiders to use the existing facilities.

---

[14]In the Netherlands, for example, in the immediate post-1945 years almost all Dutch industrial closures took place in the first week of August. Today Dutch industries have been induced to stagger their closures over a six week period.

An investigation of this possibility involves overlapping physical and socio-economic analysis in the sense that recreational use patterns will depend on levels of supply of physical facilities.

The California projections incorporated the effects of physical constraints into an otherwise purely socio-economic analysis. This was done by apportioning the projected total demand for each type of recreational activity over concentric travel-time zones from the center of the Los Angeles urban area. There is no reason why this sort of combined analysis could not be used in reverse by a destination area, such as a rural recreation area, to locate the sources and volume of visitors to be expected in future periods. This information would help to pinpoint the type of recreation development which will prove most profitable and to indicate possible improvements in travel routes which will increase visitation levels. It could also be used to determine the markets in which recreation advertising will be most effective.

Because of the lack of adequate time series data on most aspects of recreation, cross-section analysis presently seems to offer the greatest predictive potential. The predictive value of cross-section analysis, however, is not very impressive. The work of the ORRRC signals greater United States national interest in the economics of outdoor recreation, and will presumably, lead to periodic recreation surveys and to other systematic data collection efforts. It would seem wise, however, for local communities, regions, provinces and Economic Development Regions of Canada, which have an

interest in the development of recreation and tourism, to begin collecting their own time series data on the utilization of their recreation facilities. In this way, more fully informed planning decisions can be made in the future.

Section 4: Summary

In practice, the method of demand projection actually chosen will depend upon (1) the type and extent of data available, (2) the time and money available to collect new data, and (3) the time and money available to conduct the actual analysis. The type of data required as a base for projections varies widely in scope and cost from one method to another, thus limiting choice of methods should be chosen as a cross-check on the results obtained. Generally, the physical methods are more appropriate for short-term or local system projections. Socio-economic data changes relatively slowly and is at best "fair" explainers of recreation behavior. The socio-economic type projections are best suited for a country as a whole, for large census regions and for other areas where adequate data is available. It is also important that these factors can themselves be predicted with some assurance. By interpolating between the present and such target data projections, intermediate patterns of demand may be estimated.

Chapter 4 attempts to make use of both physical and socio-economic factors in investigating the Creston Valley Wildlife Management Area (CVWMA) as a potential recreation area. First, an investigation of socio-economic factors will help to determine the potential demand participation for the recreation area. Secondly, an investigation of the present and potential physical factors will help to determine the potential level of recreation activity in the area.

CHAPTER IV

CRESTON VALLEY WILDLIFE MANAGEMENT AREA

Section 1: Introduction

Chapters two and three of the study have introduced the problems encountered in the application of economic analysis to the development of natural resources for outdoor recreation use. Chapter two's main concern was to outline the costs and benefits resulting from outdoor recreation development. The major problem of determining benefits was the problem of pricing non-market goods (or services) and the need to attach a price tag to outdoor recreation in order to be able to determine dollar benefits from outdoor recreation. Chapter three's main concern was a study of various methods of determining the level of effective demand for outdoor recreation areas. Two groups of factors, namely socio-economic and physical factors were found to be indicators of present and expected future demand levels of outdoor recreation.

This chapter begins with an estimation of the expected future demand for outdoor recreation British Columbia. Statistical evidence is presented to give future expected trends in both socio-economic and physical factors in British Columbia. With the future demand trend determined, an analysis of expected future supply (in recreation-day) of outdoor recreation is presented, followed by an analysis of the Creston

Valley Wildlife Management Area (C.V.W.M.A.) in terms of its potential contribution of recreation activities to the provincial total. Since the decision has already been made to use the Creston flatlands as a wildlife and recreation area, the question of economic efficiency in allocating this land among alternative uses will not be considered here. However, given this decision (Bill No. 65), it then becomes possible to assess the significance of this decision in terms of the contribution the C.V.W.M.A. will make towards meeting projected recreation demand in British Columbia in the future.

Section 2: Indicated Demand for Recreation Areas in British Columbia.

Socio-Economic Factors

Chapter III gave some examples of demand prediction for recreation areas. One conclusion drawn from Chapter III is the importance that must be attached to socio-economic factors as indicators for predicting future needed recreation areas. The Outdoor Recreation Resources Review Commission (ORRRC), in study report 26, concluded that personal income, mobility and the availability of leisure time were good socio-economic indicators of recreation demand.[1] Accepting the findings of

---

[1] Outdoor Recreation Resources Review Commission Staff, Prospective Demand for Outdoor Recreation, ORRRC Study Report 26, Washington, D.C., 1962.

ORRRC as valid, a study of the growth trend of personal income, mobility and availability of leisure time in British Columbia is helpful as an indicator of present and future outdoor recreation needs of British Columbia.

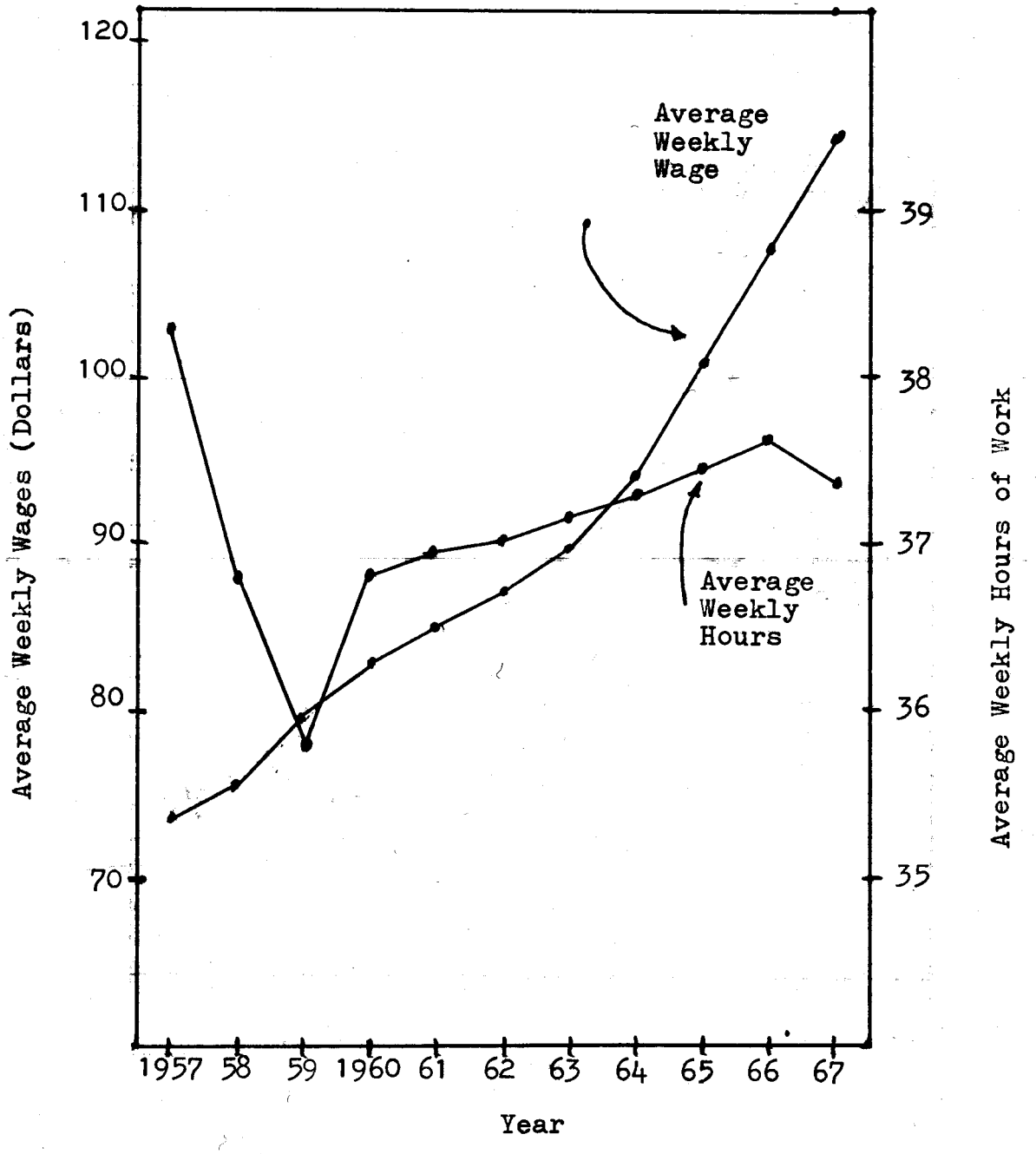
The ability of families to participate in outdoor recreation depends in part on the level of income of the family head. The assumption made here is that each family has only one income earner. For those persons who are single, their level of earnings are of equal importance. Figure 4.1 gives the average weekly wages and salaries of all employed persons in British Columbia.[1a] In the 10 year period between 1957 and 1967, weekly wages and salaries rose from $73.80 in 1957 to $114.50 in 1967. This means that salaries and wages per worker rose by approximately 58% in the 10 year period.

The second socio-economic factor to consider is the mobility of the people of British Columbia. Since the heavy concentration of the population is centered in urban areas and the available recreation areas are centered in rural areas, the ability of people to get to recreation areas is an important variable. The statistic used to determine mobility level is the number of registered passenger motor vehicles in British Columbia. Figure 4.2 shows the growth in the number of registered passenger motor vehicles in British Columbia between 1956 and 1968. If one again takes the 10 year period 1957 to 1967, the number of passenger motor vehicles increased from 371,727 in 1957 to 727,342 in 1967; an increase of 95% in the

---

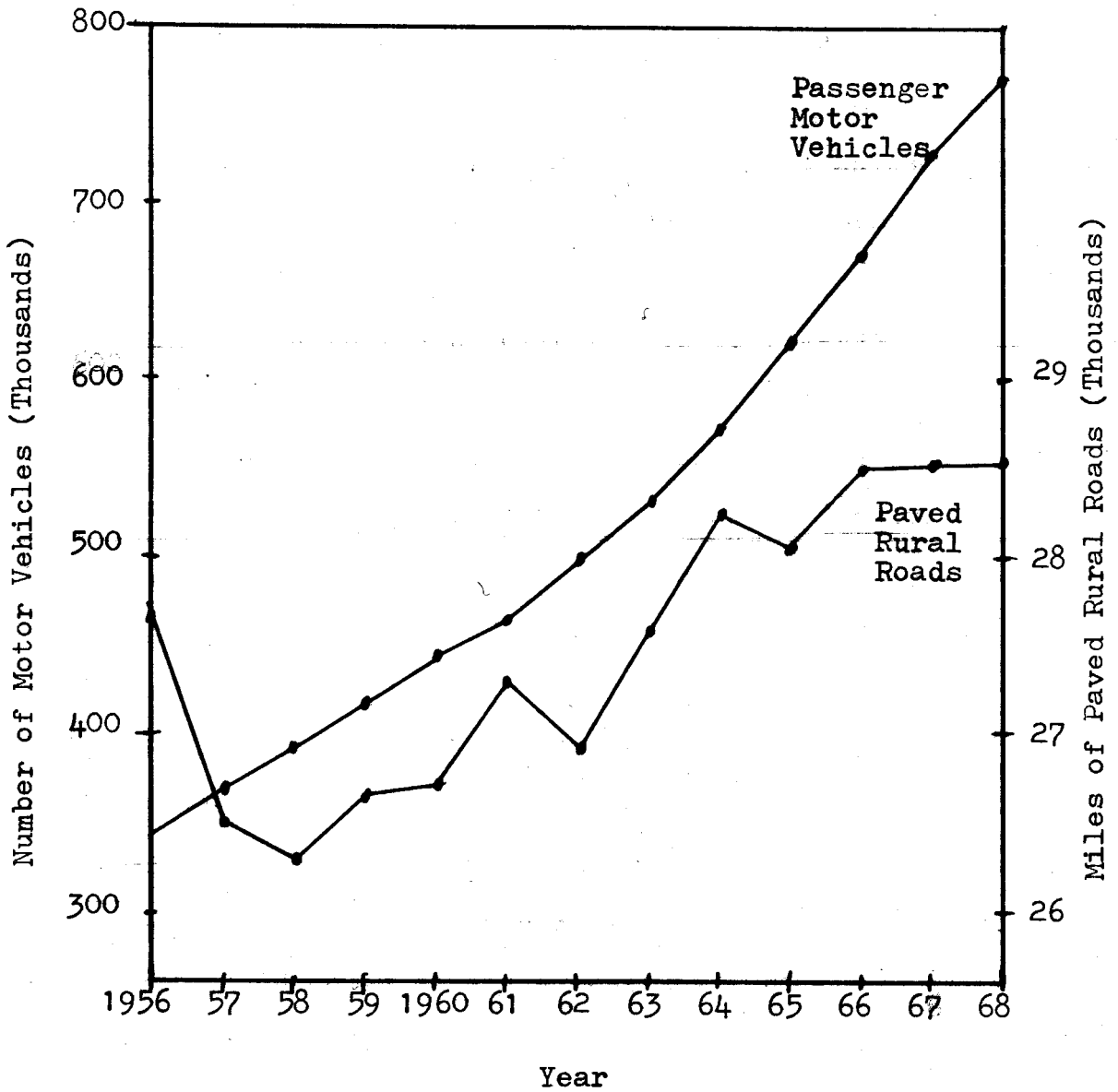
[1a] The author feels that recreationists are more concerned with money income than real income.

Figure 4.1 **Average Weekley Wage and Salaries in British Columbia, 1957-67 (in dollars) and Average Weekly Hours of Work in British Columbia, 1957-67**



Source: see table 4.6 in appendix to chapter four.

Figure 4.2 Number of Passenger Motor Vehicles and Miles of Paved Rural Roads in British Columbia, 1956-1968



Source: see table 4.7 in appendix to chapter four

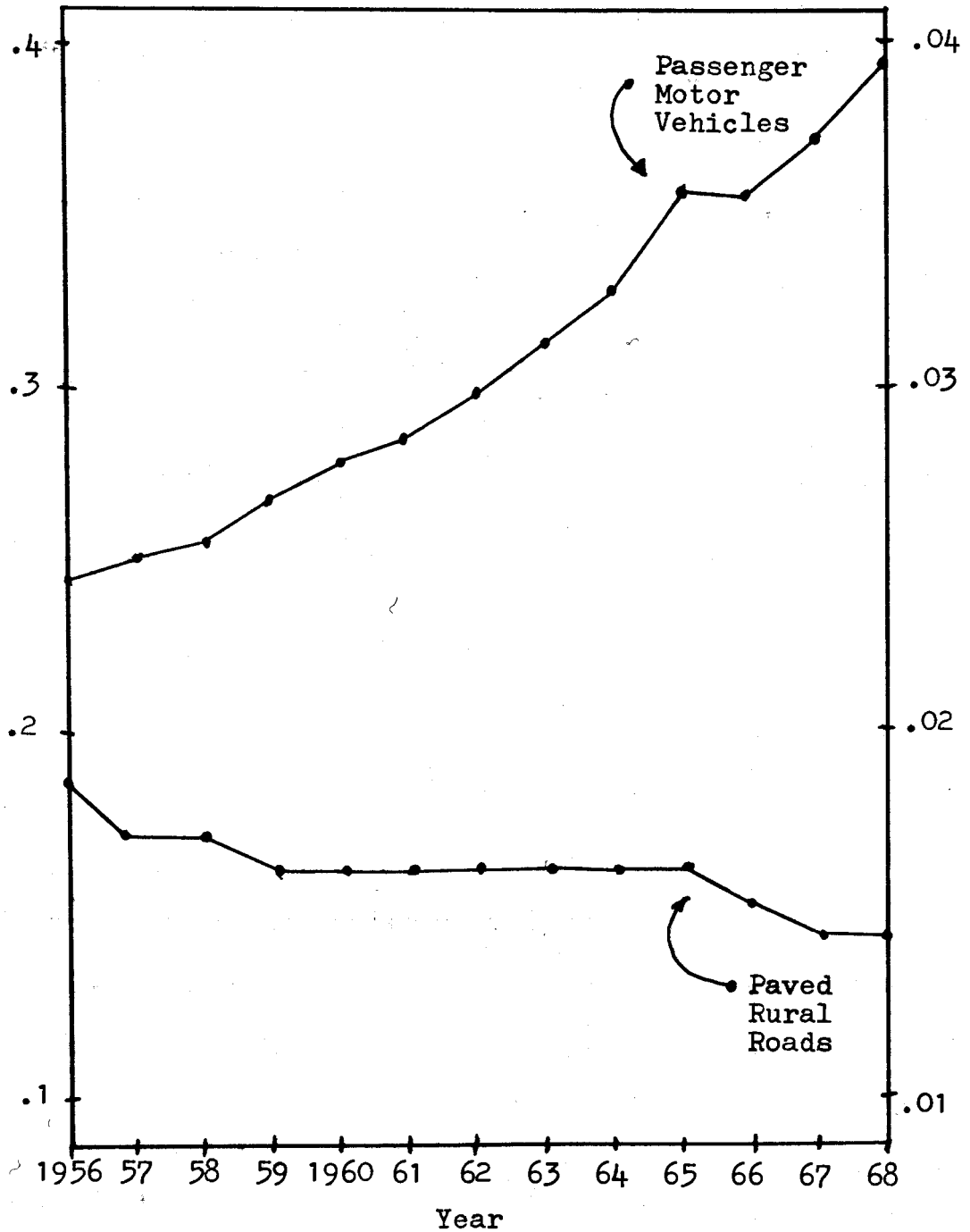
10 year period. To further assess mobility in British Columbia, the per capita number of passenger motor vehicles was determined. Figure 4.3 gives the growth of per capita passenger motor vehicles between 1956 and 1968. In the period 1956-67 per capita growth of motor vehicles was from .244 in 1957 to .394 in 1967 for an increase of 70% in the 10 year period. In order to avoid the possibility of over-estimation, the assumption made here is that, overall, the increase of mobility in British Columbia, for the 10 year period was approximately 70%.

The third socio-economic factor to consider is the availability of leisure time of the work force in British Columbia. The ORRRC studies assume that leisure time is the inverse of hours of work.[2] That is to say, if hours of work decreased by 10%, then leisure time increased by 10%. The statistic used for leisure can be found in figure 4.1. This is the average weekly hours of work per employed person in British Columbia. Taking the 10 year period 1957-67, the average weekly hours of work per employed person was 38.3 hours in 1957 compared with 37.4 hours in 1967. This means that hours of work per week decreased by 3% in 10 years. Conversely, one would conclude that the availability of leisure time increased by 3% in the 10 year period.

---

[2] Outdoor Recreation Resources Review Commission, Participation in Outdoor Recreation: Factors Affecting Demand Among Adult Males, ORRRC Study Report 20, Washington, D.C., 1962, pp. 26-29.

Figure 4.3 Per capita Number of Passenger Motor Vehicles and Per Capita Miles of Paved Rural Roads in British Columbia, 1956-68.



Source: see table 4.7 in appendix to chapter four

A further assumption made at this point is that the indication given by the above socio-economic factors for British Columbia applies equally well to all Canadians and Americans. Further, accepting the assumption that each of these three factors acts independently and with unitary elasticity, the composite effect of the three acting together may then be calculated by multiplying each factor by its respective degree of change and cross-multiplying the three products. The demand for recreation is expressed as the product of income (Y), mobility (M) and leisure time (L); thus

$$L \times Y \times M = D$$

Between 1957 and 1967, the three factors increased by 58, 70 and 3 percent, respectively; the composite effect was

$$1.58 \times 1.70 \times 1.03 = 2.96$$

indicating an increase in recreation demand of 196%.

Assuming a continuing trend in these socio-economic factors, the demand for recreation areas in British Columbia can be expected to increase by at least 392-588% in the next 20-30 years.

Physical Factors - The Mix of Activity Possibilities Available at the Recreation Site.

When attempting to determine levels of demand for recreation, a study of the level of use of physical facilities such as campgrounds, water areas for fishing and land areas for hunting may also provide a reasonable indication of future demand.

The growth of attendance at provincial parks is a physical indicator of demand for recreation areas. Figure 4.4 shows the annual attendance at provincial parks in British Columbia between 1948 and 1968. Taking the 10 year study period 1957-67, the annual attendance increased from 2,100,000 in 1957 to 6,140,000 in 1967. This means that park attendance increased by approximately 200% in the ten year period.

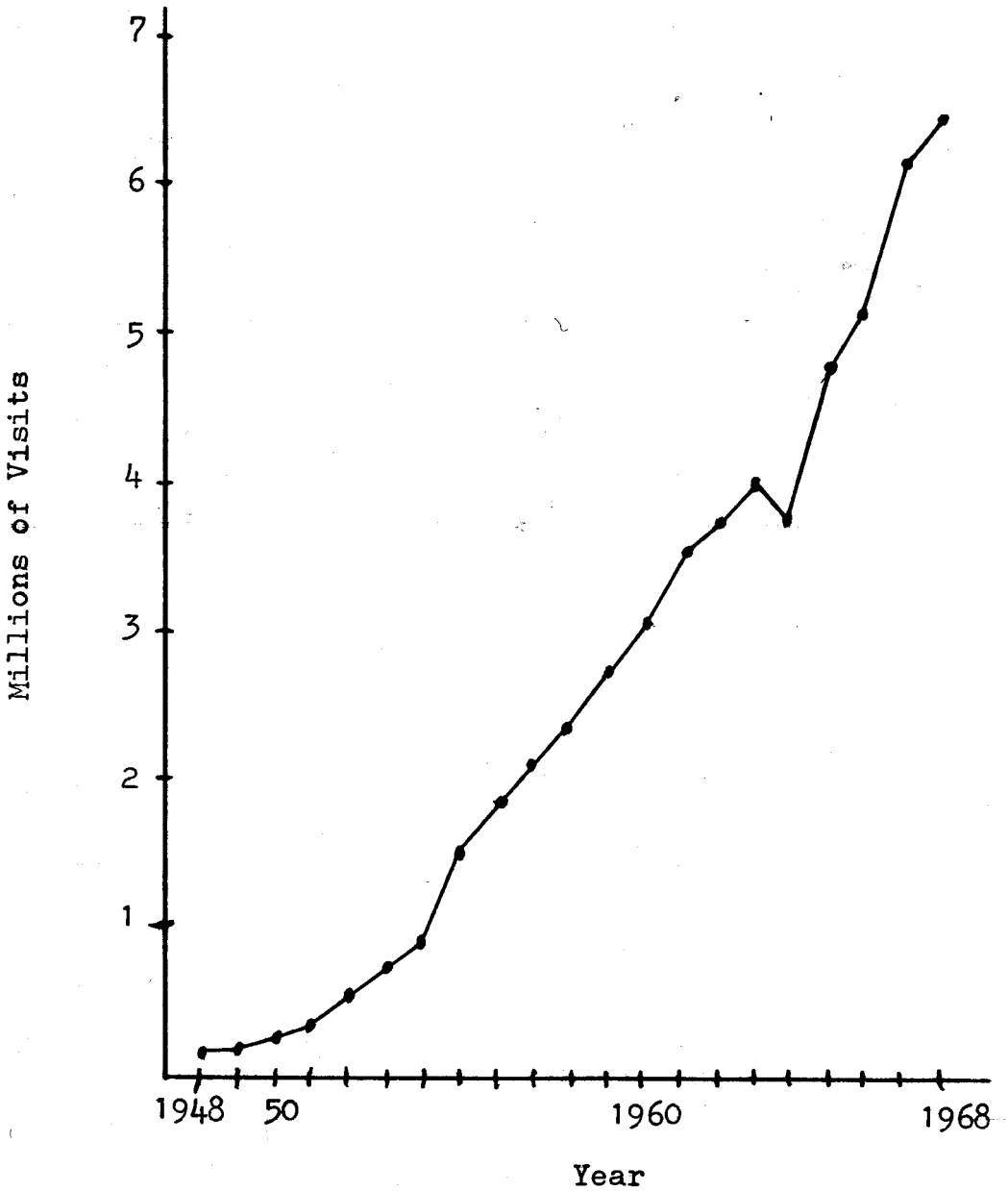
Another physical factor that helps to determine levels of demand for recreation areas is the degree of hunting in British Columbia. Figures 4.5 and 4.6 show the annual sale of resident and non-resident hunting licences in the 10 year period 1957-67. In the year 1957, the sale of resident hunting licences was 101,000 and the sale of non-resident licences was 3,186; whereas in 1967 the sale of resident licences was 143,003 and the sale of non-resident licences was 6,933. If one assumes that almost 100% of those that buy hunting licences (both resident and non-resident) do in fact hunt,[3] then the level of hunting has increased 42% by residents and 116% by non-residents in the 10 year period 1957-67.

The final physical factor to be considered is the level of sports fishing in British Columbia. The statistic used here is the annual sale of fishing licences to resident and non-resident anglers. Figure 4.7 gives the annual sale of resident

---

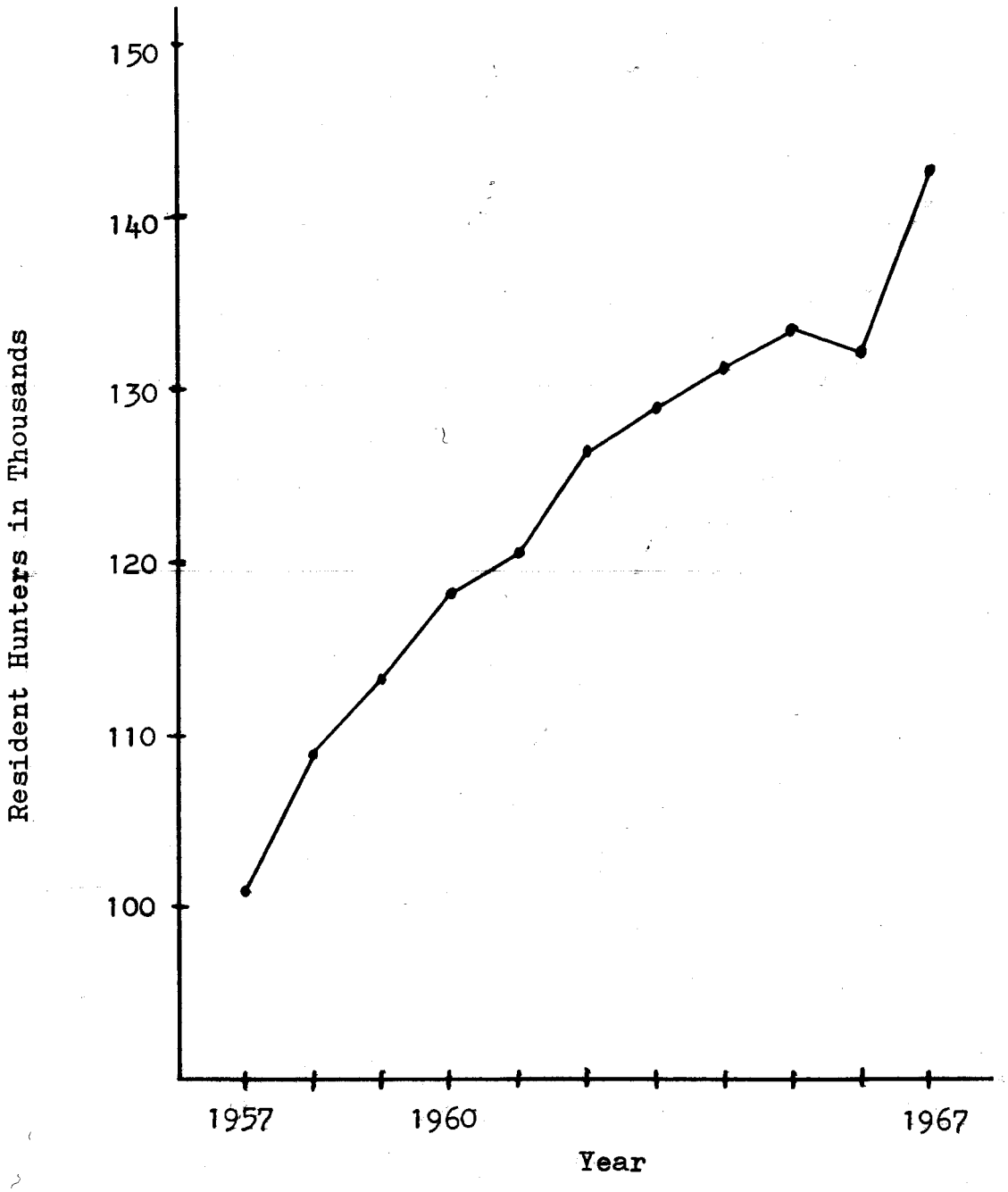
[3] G. Bowden and P.H. Pearse, Non-Resident Big Game Hunting and the Guiding Industry in British Columbia, Fish and Wildlife Branch of the Department of Recreation and Conservation, Victoria, B.C., p. 19.

Figure 4.4 Annual Attendance (Visits) at Provincial Parks in British Columbia, 1948-68.



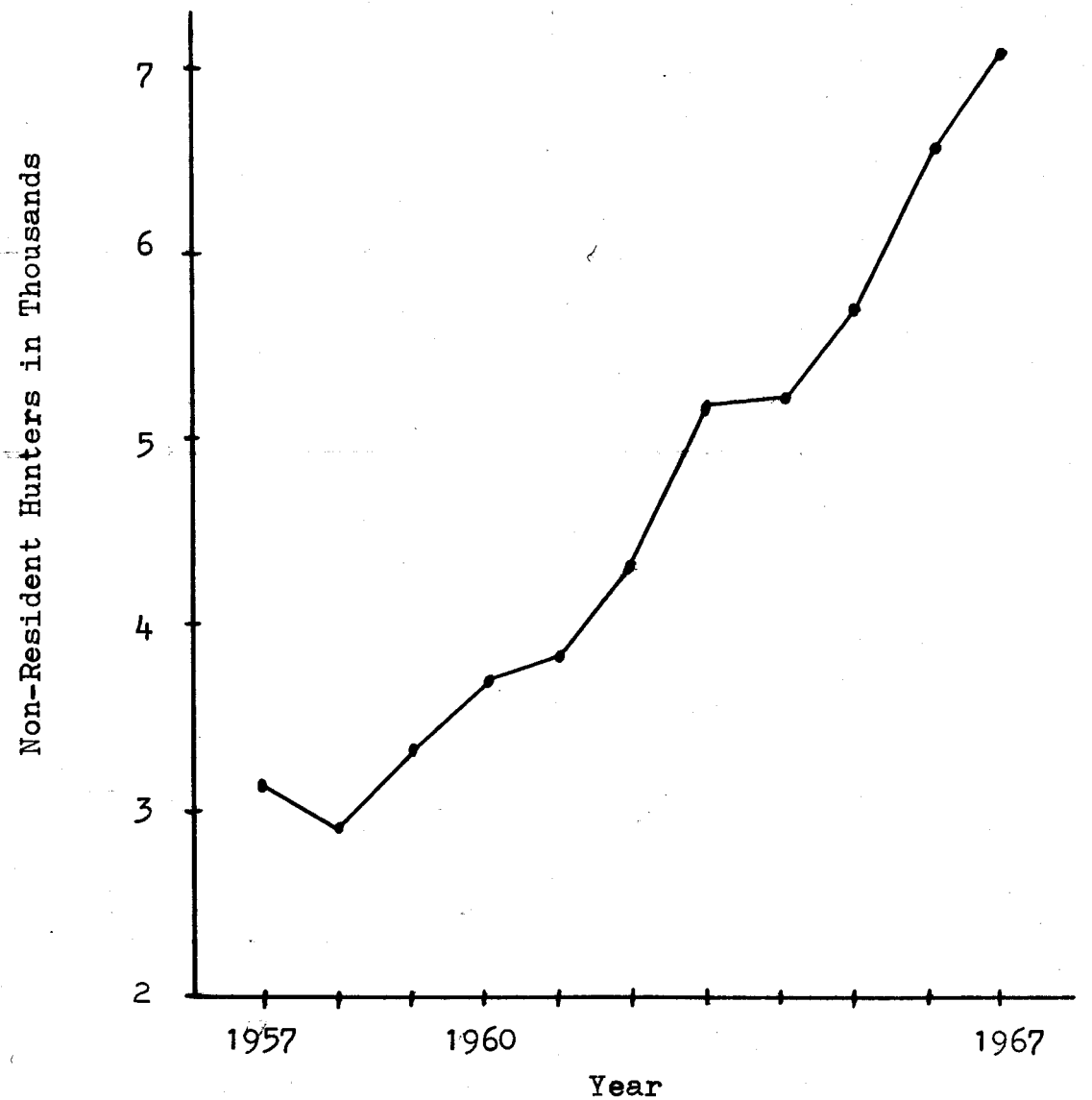
Source: see table 4.2 in appendix to chapter four

Figure 4.5 Annual Resident Hunter Licence Sales in British Columbia, 1957-67 (Thousands)



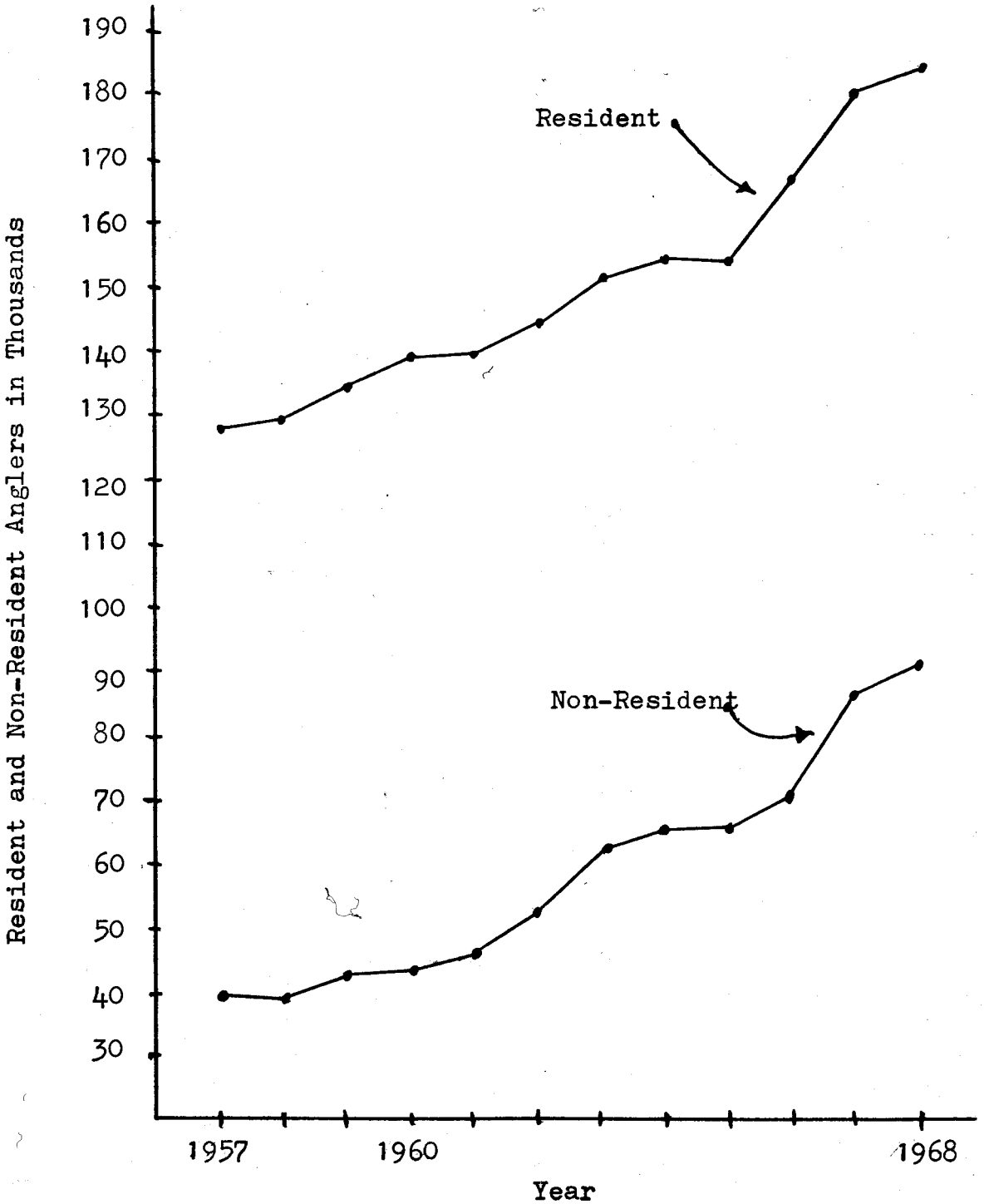
Source: see table 4.3 in appendix to chapter four

Figure 4.6 Annual Non-Resident Hunter Licence Sales in British Columbia, 1957-67 (Thousands)



Source: see table 4.3 in appendix to chapter four

Figure 4.7 Sale of Resident and Non-Resident Angler's Licences in British Columbia, 1957-1968



Source: see table 4.9 in appendix to chapter four

and non-resident anglers' licences in the ten year period 1957-67. In 1957 the sale of resident anglers' licences was 127,827 and the sale of non-resident licences was 39,363; whereas in 1967, the sale of resident anglers' licences was 184,017 and the sale of non-resident licences was 91,325. If one again makes the assumption that almost 100% of those who buy anglers' licences do in fact "fish," then the level of fishing in British Columbia has increased 45% by residents and 130% by non-residents in the 10 year period 1957.

Table 4.11

Weighted Average of Effect of Physical Factors on Demand for Outdoor Recreation, 1957-67

Physical Factor	Use in Millions		% Change (1957-67)	Weighted Average
Park Attendance	6.140	x	200	1228.000
Hunting				
Resident	.143	x	42	6.006
Non-Resident	.007	x	116	.812
Fishing				
Resident	.184	x	45	8.280
Non-Resident	.091	x	130	11.83
Total	6.565			1254.928

Weighted Average = 1254.928 ÷ 6.565 = 191%.

Limited as the statistics are, one can still safely conclude that the physical factors are a strong indication of an increased demand for recreation. Based on the estimation technique used in table 4.11, overall increase in demand for recreation, as indicated by the use of physical factors, was

191% for the time period 1957-67. Therefore, one can venture that in the next 20-30 years demand will increase by at least 382-573%.

Conclusion

The preceding discussion has shown that socio-economic and physical factors indicated a similar increase of demand for recreation in the past 10 years. Considering both groups of factors together, the expected increase in recreation demand in the next 20-30 years will be approximately 382-588%. For the purpose of simplicity, the projected increase in recreation demand in the 20-30 years is taken to be 400-600%.

Section 3: Supply of Recreation Areas in British Columbia

In a study of outdoor recreation, consideration of the demand side is not sufficient. It is important that in order to continue the growth of the recreation industry in British Columbia, the supply of recreation areas must keep "pace" with demand. Simple economic analysis tells us that if supply does not keep "pace" with demand, prices will rise (in the case of outdoor recreation, opportunity cost will rise) and consumers may be forced to seek substitutes in order to satisfy their demands. Moreover, if supply is allowed to "lag" with respect to demand, the quality of outdoor recreation will decline in the growth rate of the industry. What, then, has been the growth rate of the supply of recreation areas in British Columbia?

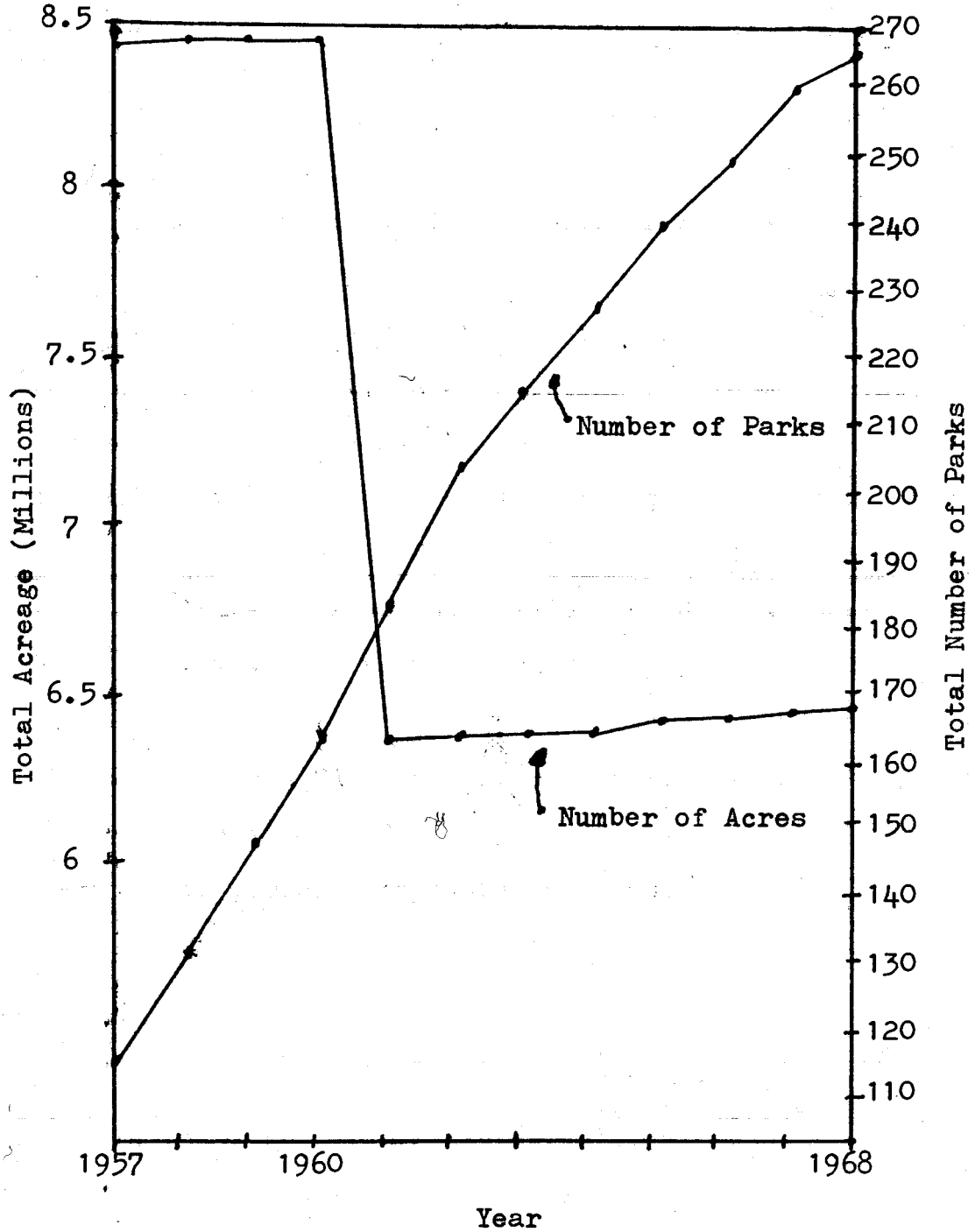
Past Growth of Recreation Supply

The question now to be considered is that of recreation supply - has supply kept "pace" with demand? To answer this question one must first determine what available statistics of British Columbia give indications of recreation supply.

Supply of outdoor recreation is determined by the number and size of "source-areas" where recreation "activities" (demand) can be realized. In order for the recreation demand of a camping-day, fishing-day, hunting-day, bird watching-day and trail-walking-day to be satisfied, land and water areas must be made available and reserved in order for the outdoor recreation activities to take place. The best available statistic on "source-areas" for many outdoor recreation activities (demand) is the number and total acreage of provincial parks and "recreation-reserves" in British Columbia.

Figure 4.8 gives the total number and acreage of all provincial parks in British Columbia for the period 1957-68. For the study period, the number of parks increased from 116 in 1957 to 260 in 1967. This is an increase of 124% for the 10 year study period. However, an examination of total park acreage indicates that, for the same period, total park acreage fell from 8,416,657 acres in 1957 to 6,424,295 acres in 1967 (see figure 4.8). This is a <u>fall</u> of 23.5% in total acreage for the 10 year period. In this sense, supply has not kept pace with demand.

Figure 4.8 Total Number and Acreage of Provincial Parks in British Columbia, 1957-1968.



Source: see table 4.5 in appendix to chapter four

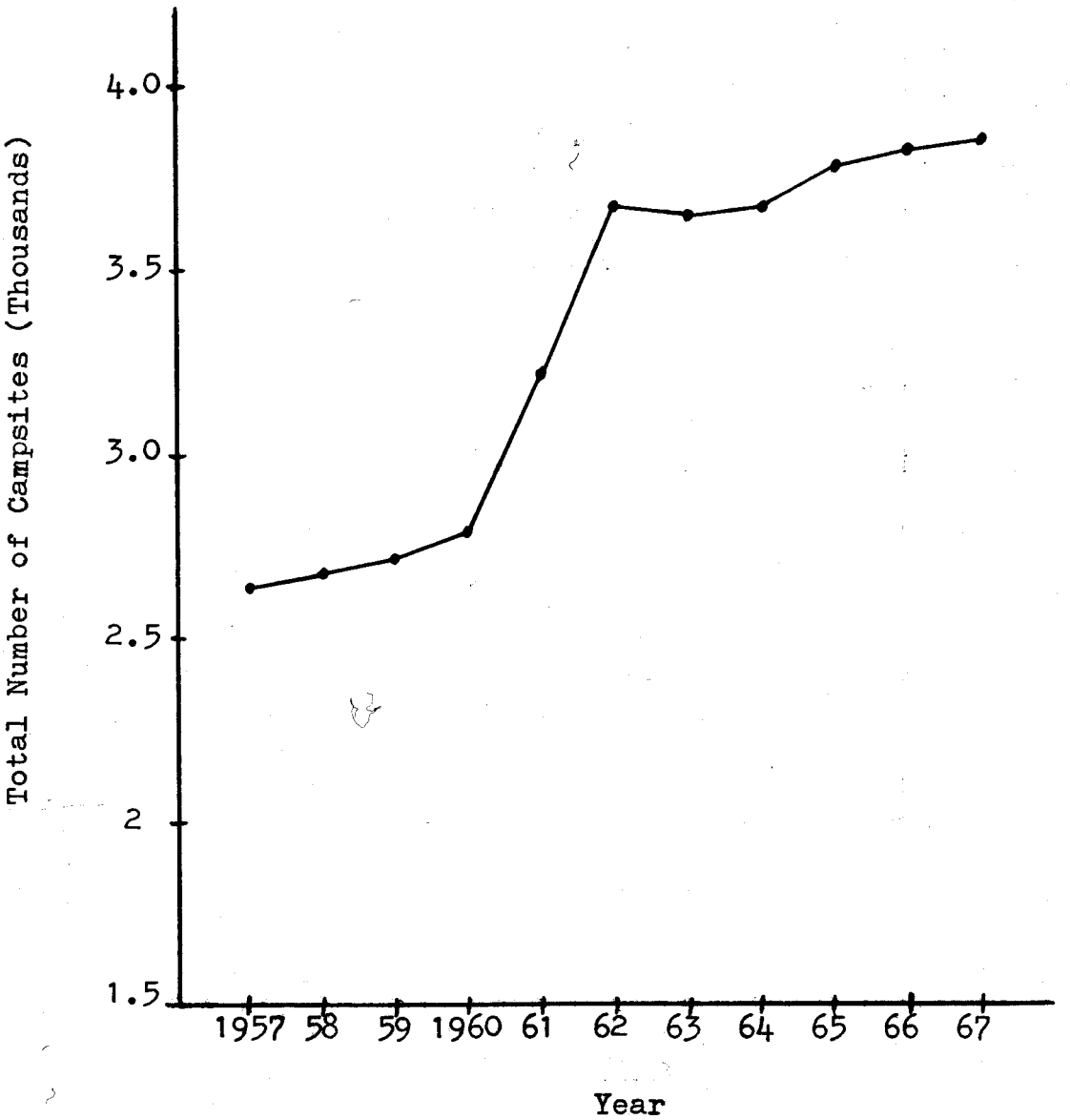
In terms of recreation "supply," by far the most important available provincial park statistics, is the number of campsites in British Columbia. Figure 4.9 gives the number of campsites in all provincial parks between 1957-67. For this study period the number of campsites increased from 2,632 in 1957 to 3,845 in 1967. This is an increase of 41% for the 10 year study period.

The question of quality of outdoor recreation continually comes to the foreground. The quality of some recreation experiences depend entirely on the degree of development of the recreation areas. In terms of existing development, the supply of class "A" parks seems to be the best available statistic.[4] Figure 4.10 gives the total number and acreage of class "A" parks in British Columbia from 1961-68. Although the time period is not the same as the previous study time periods (1957-67), it is clear that the supply of class "A" parks has not kept pace with outdoor recreation demand. Between 1961-68 the number of class "A" parks increased from 121 to 179, but total acreage decreased from 2,312,734 acres to 1,799,801 acres. For the 7 year period, the number of class "A" parks increased by 48%, whereas total acreage of class "A" parks fell by 22%.

---

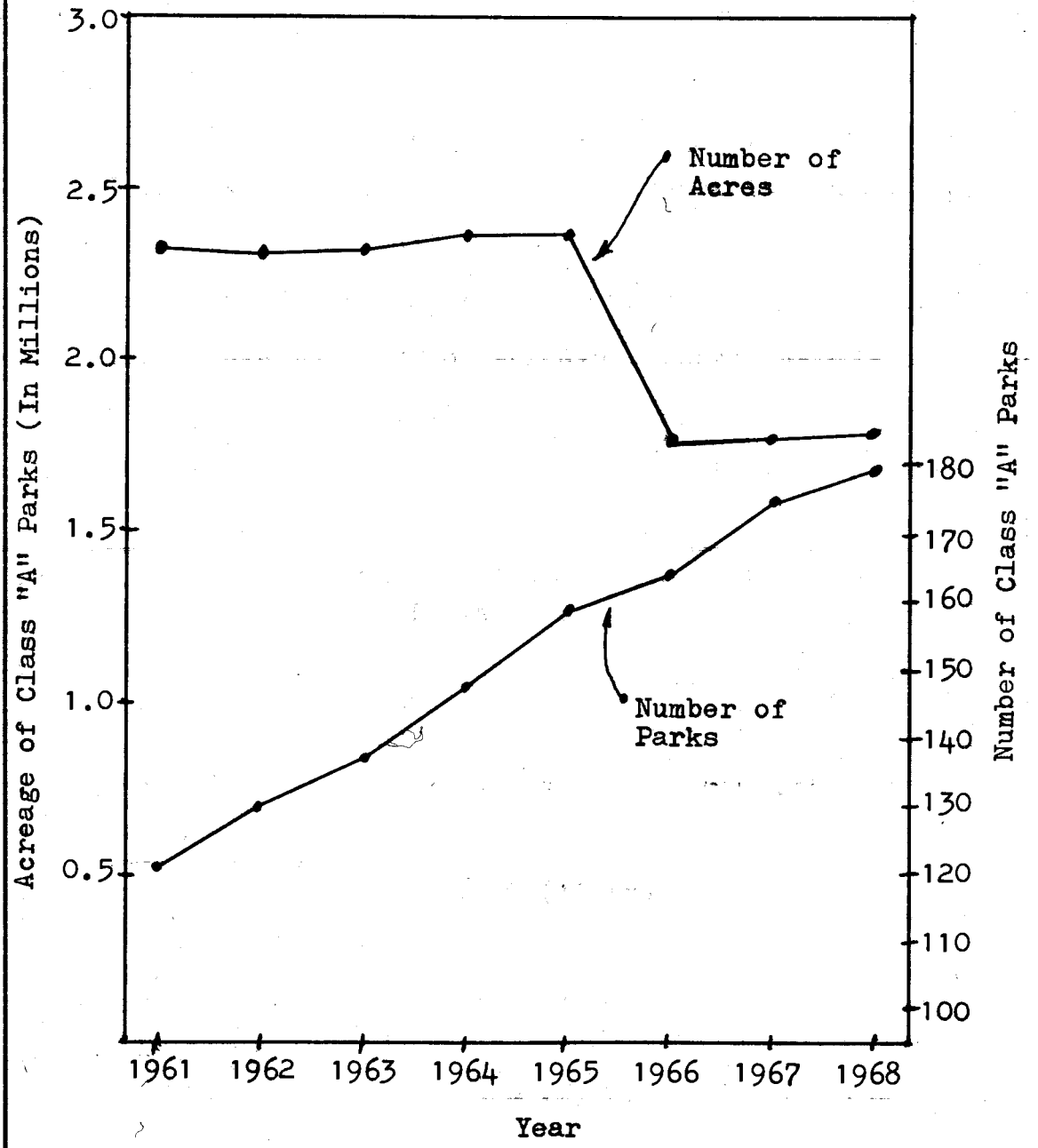
[4]According to the British Columbia Department of Recreation and Conservation, a class "A" park is one which has "full facilities", i.e., running water, toilets, individual campfire sights, individual tables, etc.

Figure 4.9 Total Number of Campsites in Provincial Parks in British Columbia, 1957-67.



Source: see table 4.10 in appendix to chapter four

Figure 4.10 Total Number and Acreage of Class "A" Parks in British Columbia, 1961-68



Source: see table 4.5 in appendix to chapter four.

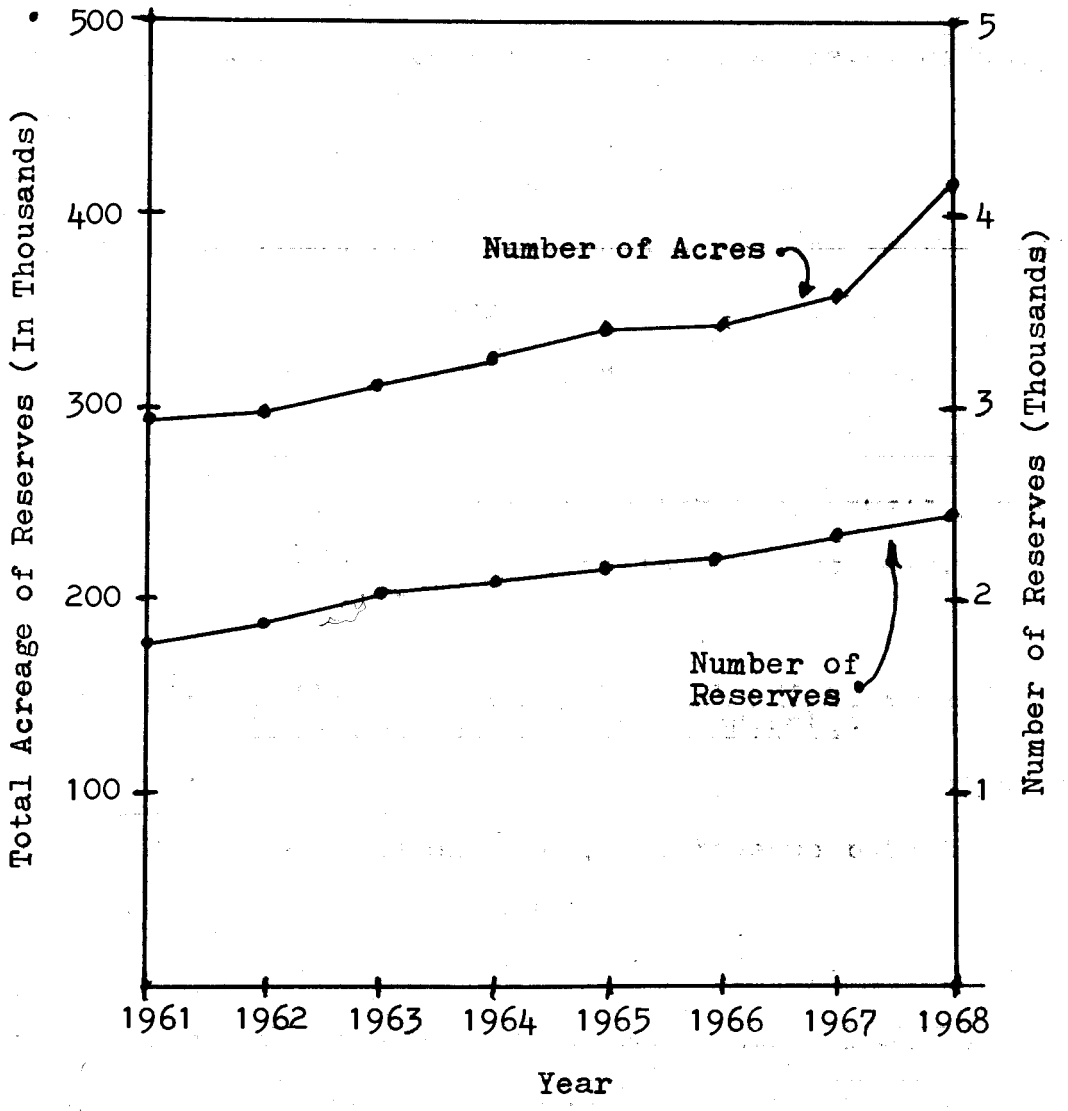
To predict the future supply of recreation areas is almost impossible. There is one available statistic that gives some indication of the degree of future development of recreation areas in the province. Figure 4.11 gives the number and total acreage of areas reserved for future public recreation in British Columbia between 1961-68. In this seven year period, the number of reserves grew from 1,793 in 1961 to 2,460 in 1968; whereas, the total acreage increased from 292,340 acres in 1961 to 417,880 acres in 1968. In terms of growth, the percentage increase of number of reserves was 33.3%, while the percentage increase of acreage reserved as 43%. If the trend is expected to continue, then in the next 20-30 years the number of reserves will increase by 100-133%; whereas the total acreage will increase by 129-171%.

Table 4.12

Growth of "Source-Areas" of Recreation in British Columbia; Projected 20-30 Years.

Source-Area	% Change	20-30 year Projection (%)
Provincial Parks		
Numbers	124% (10 yr)	248-372%
Acreage	(-) 23.5% (")	(-) 47-70.5%
Campsites in Provincial Parks	41% (10 yr)	82-123%
Class "A" Parks		
Numbers	48% (7 yr)	150-200%
Acreage	(-) 22% (")	(-) 66-90%
Reserves		
Numbers	33.3% (7 yr)	100-133%
Acreage	43% (")	129-171%

Figure 4.1 Number and Total Acreage of Areas Reserved for Future Public Recreation Use in British Columbia, 1961-68



Source: see table 4.4 in appendix to chapter four.

Table 4.11 gives the "expected" growth of "source-areas" of recreation activities in the next 20-30 years. To determine the "level of use" of these "source-areas" is not within the scope of this study. However, it is safe to conclude that the number and total acreage of "source-areas" (supply) for the various outdoor recreation activities (demand), will not keep pace with the expected demand in the next 20-30 years. The assumption that is necessary is that the "level of use" of present "source-areas" for outdoor recreation is fast approaching a maximum. Unless available "source-areas" are increased, "congestion" could occur and cause a decline in the "quality" of the recreation experience. The other possible consequence could be a "forced" cutback in demand for recreation activities. It is with this thought in mind that an analysis of the potential of one specific public recreation reserve, namely the Creston Valley Wildlife Management Area, is now discussed.

Section 4: Revenue Generated From Outdoor Recreation Participation in British Columbia

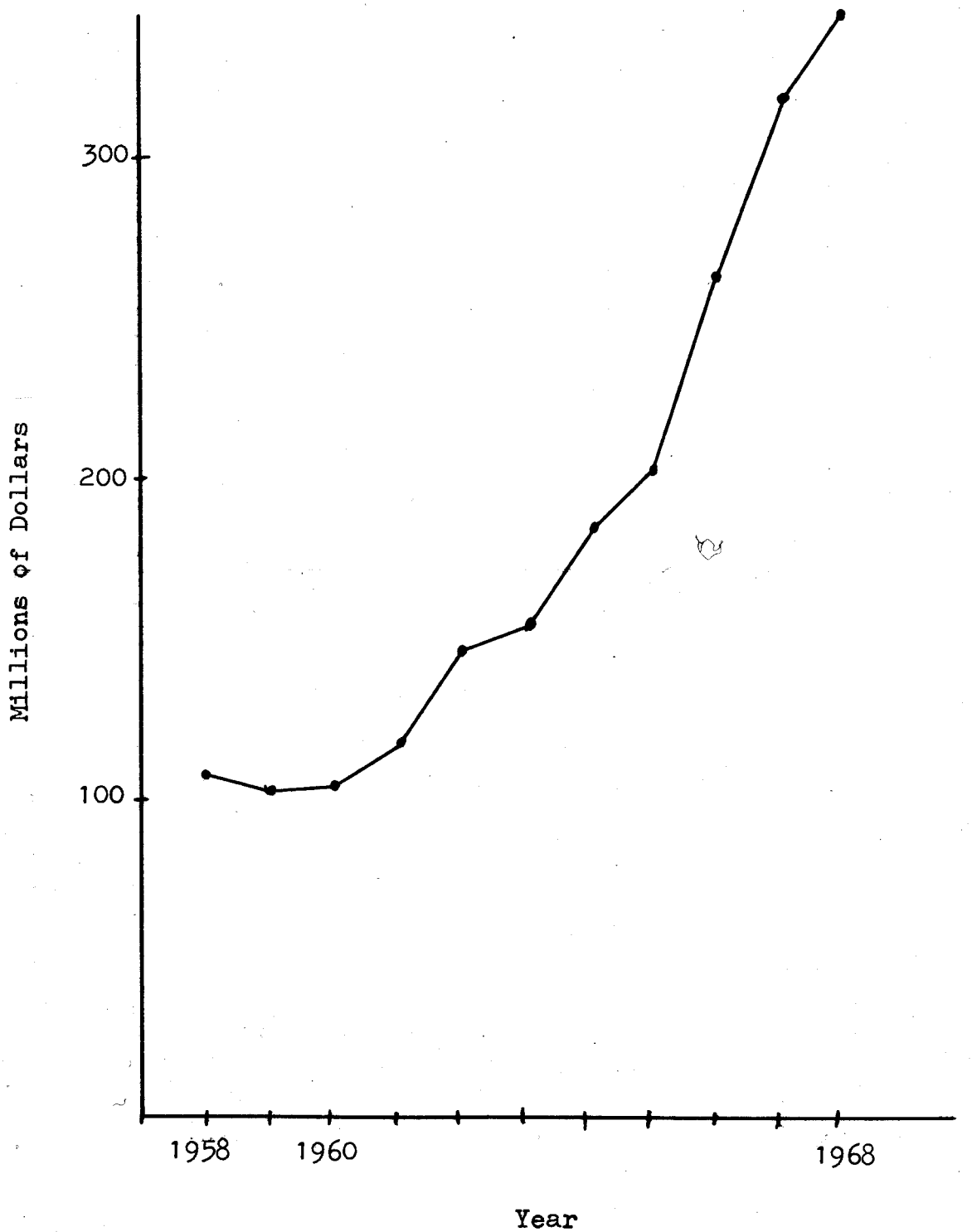
Before discussing the recreation potential of the Creston Valley Wildlife Mangement Area, the revenue potential of outdoor recreation for all of British Columbia is worth noting.

Socio-economic and physical factors studied indicate that future expected demand for recreation areas in British Columbia will increase by 400-600% in the next 20-30 years. The assumption that must hold in this case is the fact that the growth trend will at least continue in a similar manner as it

has in the past ten years. The question that comes to mind is what, if any, is the benefit of both existing or new recreation development to the province of British Columbia? As was discussed in chapter two, benefits may be quantified in both dollar or non-dollar terms. To quantify benefits in non-dollar terms is not difficult. Such terms as "man-days of hunting or fishing," "visits per day at waterfowl nests," and "daylight hours of mountain scenery" are quantified terms which provide an indication of the benefits of recreation development. To evaluate these benefits in dollar terms is a much more difficult aspect.

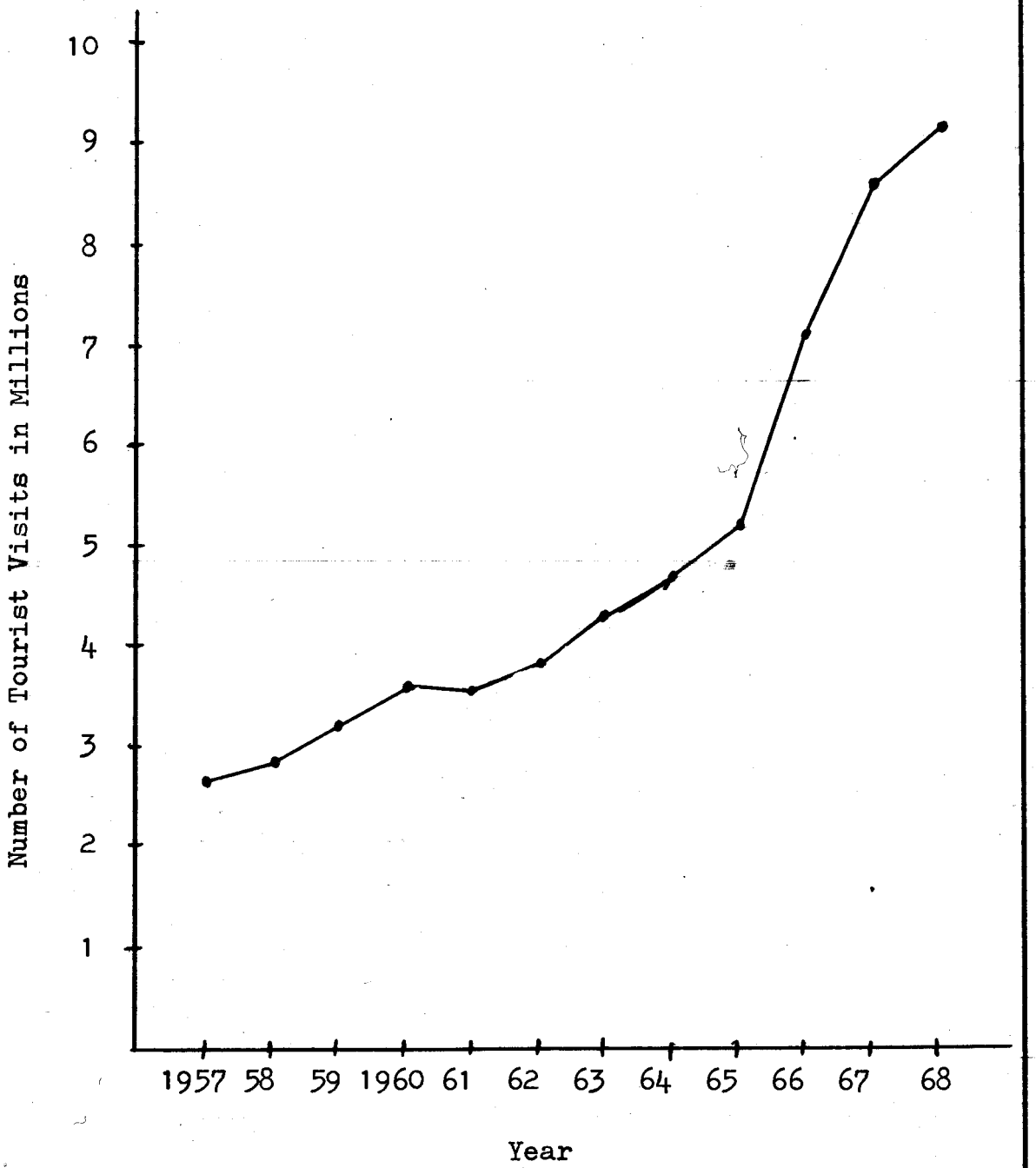
At present, statistics denoting the level of recreation expenditures in British Columbia are non-existant, since all expenditures made for recreation purposes are aggregate into total tourist expenditure. A tourist is any person who leaves his area of residence to travel to another area no matter what the reason. A recreationist is that tourist who leaves his area of residence to travel to another area and in so doing participates in some recreation activity. Figure 4.12 gives the total revenue from tourist expenditures between 1958-68 and figure 4.13 gives the total number of tourist visits to British Columbia for the same 10 year period. These figures give total tourist visits and expenditures and are not the same as total recreation visits and recreation expenditures since, obviously, some visits and expenditures by tourists are not made for recreation purposes. To determine what level of tourist visits and expenditures were in fact attributable to recreation, the data on provincial park visits (figure 4.4) is used. That

Figure 4.12 Total Revenue From Tourist Expenditures in British Columbia, 1958-1968 (in millions of Canadian dollars)



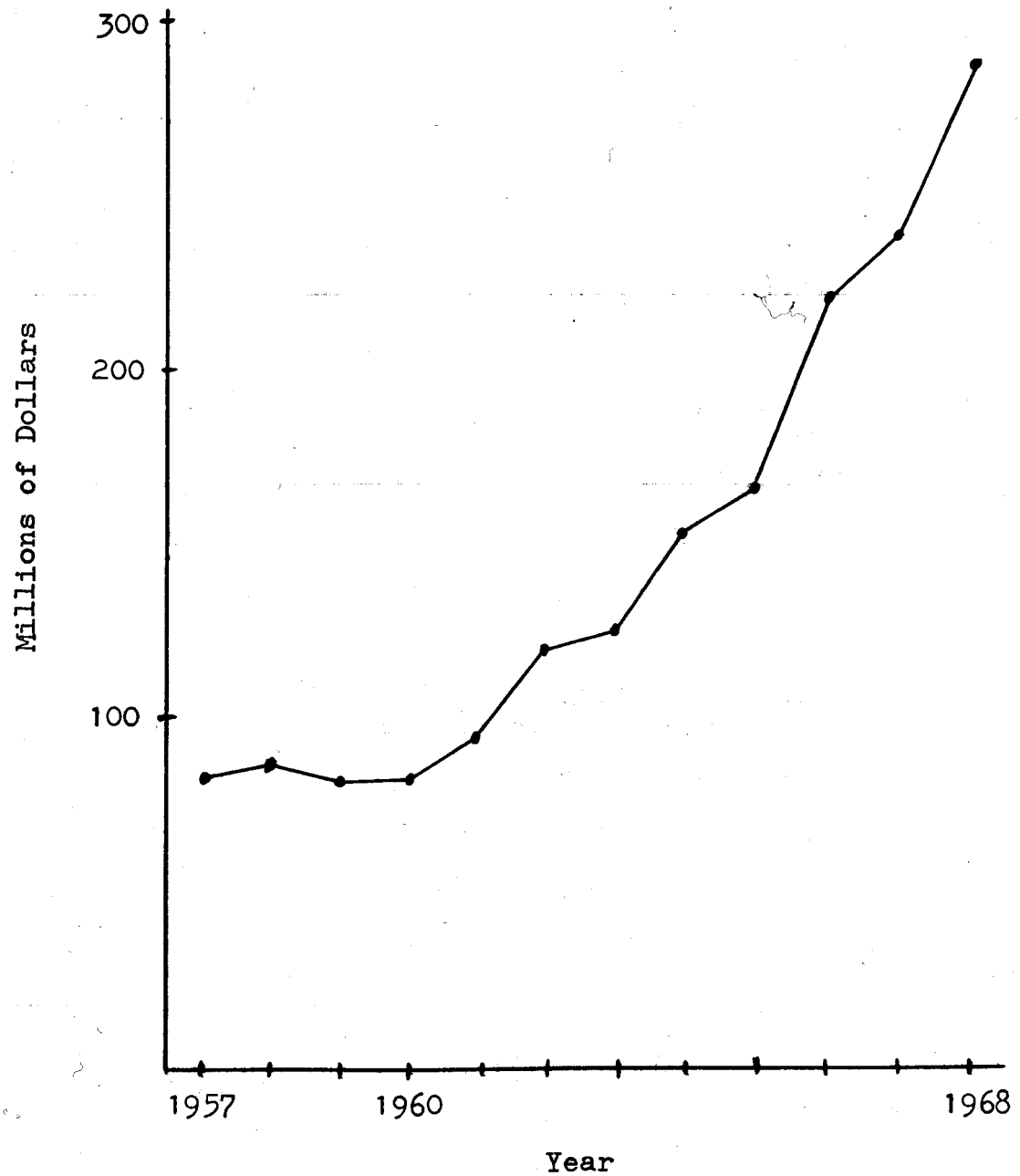
Source: see table 4.1 in appendix to chapter four

Figure 4.13 Number of Tourist Visits in British Columbia, 1957-1968.



Source: see table 4.1 in appendix to chapter four

Figure 4.14 Estimated Annual Revenues Derived from Outdoor Recreation in British Columbia, 1957-1968.



Source: see table 4.8 in appendix to chapter four

percentage of tourist visits, which were also park visits each year in British Columbia, constitutes the percentage of total tourist visits that could be considered as visits for purpose of outdoor recreation.[5] Taking a ten year average (1957-67), the percentage of tourists that were recreationists was found to be 84%. Figure 4.14 gives the estimated value of tourist revenue attributable to outdoor recreation between 1957-68. For the 10 year period 1957-67, such expenditures increased from $84,840,000 in 1957 to $266,542,915 in 1967. This means that recreation-based tourist expenditures (without consideration of price changes) increased by approximately 214% in the 10 year period. If one assumes that the past 10 year trend will continue, then expected recreation revenue of this nature will increase by at least 428-642% in the next 20-30 years. Thus, by the year 1997, tourist revenue generated by recreation activities in British Columbia could reach $1,711,205,514.

Section 5: Outdoor Recreation Potential of the Creston Valley Wildlife Management Area

Net revenue accruing to the province from recreation expenditures is determined by the source of recreation benefits within an area designated for recreation development. Once the source of total benefits is determined, then the activities arising out of these sources can be listed. It is the level of generated activities arising out of the development that determines the net addition to the entire

---

[5]For a full examination of the calculation procedures used to determine annual recreation expenditures in British Columbia see table 4.8 in appendix to chapter four, page 118.

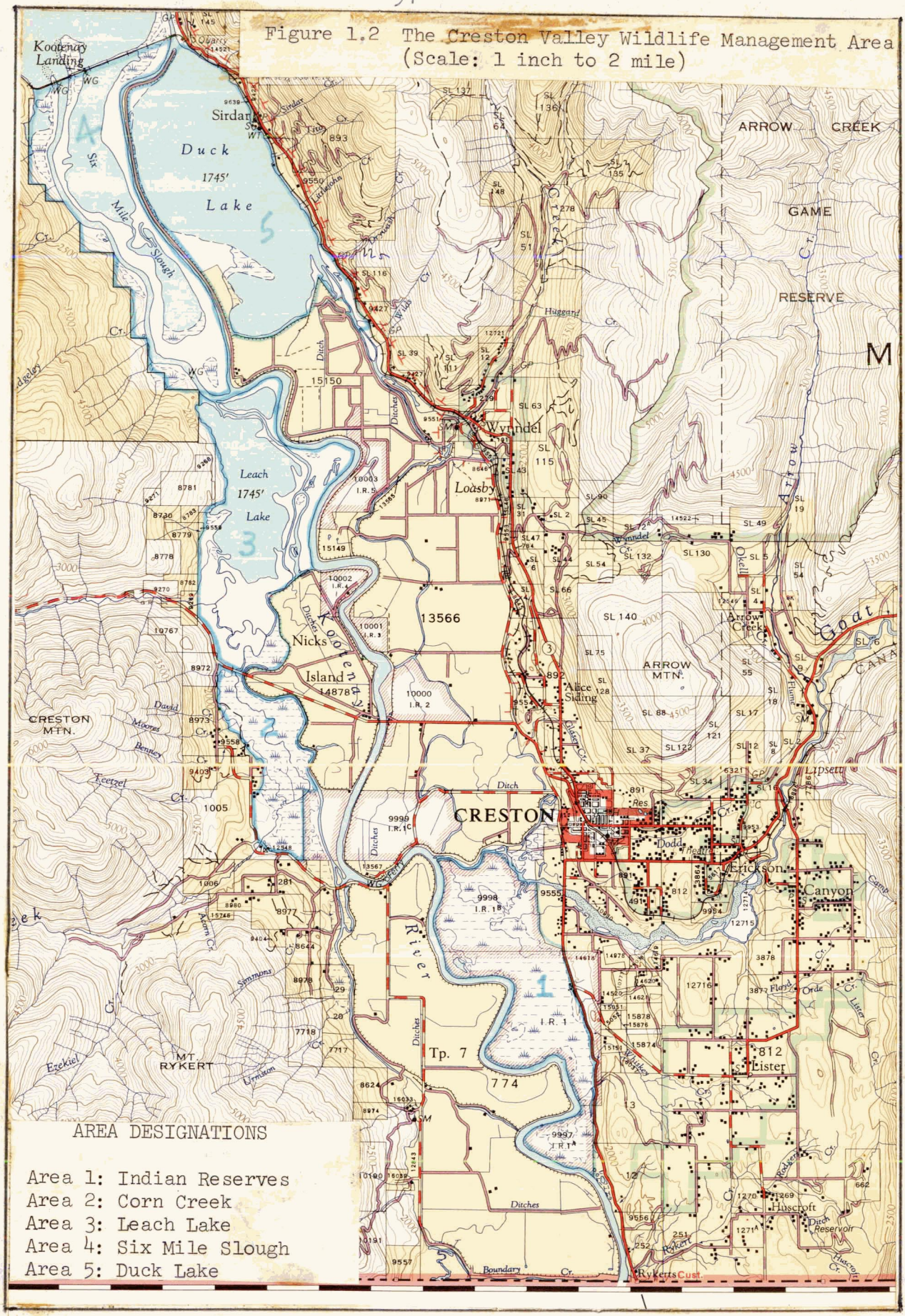
level of supply of recreation. The important question here, is to determine what level of increased supply of recreation can be generated by the development of the Creston Valley Wildlife Management Area (C.V.W.M.A.).

Source of Benefits

The C.V.W.M.A. contains various sources of recreation benefits. Chapter one gave a brief description of the management area and figure 1.2 gave a geographic outline of the five designated areas within the management area. The problem here is to determine what are the sources of recreation benefits (supply) to help meet the expected increase of demand for recreation in British Columbia. The source of recreation benefits (supply) fall into the following categories:

(1) Fish and Wildlife - the direct increased production of fish and wildlife is an important source of recreation in C.V.W.M.A. This will consist of the production of warm water sports fishing (large mouth bass, pearch, sunfish (blue gills) and dolly varden char) in Duck Lake, Six-Mile Slough and Leach Lake; as well as the entire length of the Kootenay River as it flows through the management area (see figure 1.2). As well as warm water sportsfish, a certain production level of cold water sportsfish (rainbow and cutthroat trout, and sturgeon) can be expected in Corn Creek, Summit Creek (South-west corner of area 3), Goat River (north end of area 1) and the Kootenay River at certain times of the year.

Figure 1.2 The Creston Valley Wildlife Management Area (Scale: 1 inch to 2 mile)



AREA DESIGNATIONS

Area 1: Indian Reserves
Area 2: Corn Creek
Area 3: Leach Lake
Area 4: Six Mile Slough
Area 5: Duck Lake

As far as wildlife production is concerned, the main development of the C.V.W.M.A. will be in the form of waterfowl (ducks, geese, coots, swans) production. The 4,000 acres enclosing Duck Lake is presently under development by B.C. Hydro at an expected cost of some $330,000 over the next two years. The main purpose of this development is to establish permanent nesting sites for the local waterfowl. Control of the water level of Duck Lake will prevent future flooding of nesting sites and thus enable the population of local waterfowl to increase. Another scheme that relates directly to increased waterfowl production, is the agreement involving the Canadian Wildlife Service (C.W.S.) and the Kootenay Indian Bands associated with area 1 in figure 1.2.[6] Under a 5-year contract, these 3,000 acres are reserved for the production of waterfowl in return for payment of $50,000 annually. What physical works(waterfowl nests, rookeries, etc.) that will be constructed on area 1 will depend on the agreement made between the C.W.S. and the Indian Band. In addition to the consideration of local waterfowl production, the importance of the C.V.W.M.A. as a "link" in the flyway of migratory waterfowl must be considered. The development of waterfowl nesting areas will help allow temporary residence of migrating birds. Providing this temporary residence will be very important in the maintenance of an increasing waterfowl population.

---

[6]Underwood, McLelland and Associates, Ltd., "A Review of Development Aspects of the Indian Reserves 1, 1A, 1B, Portion of the Creston Valley Wildlife Management Area," Unpublished Report, January 17, 1968, p. 8.

Secondary, but still important, is the improvement of residency for other types of wildlife. At present there exists a fair population of deer, pheasants, ruffed grouse, morning doves, marten, beaver, muskrat and many others. With the provision of increased food production and cover, the future population of these species of wildlife can be greatly increased.

Finally, there exists a variety of other types of wildlife in the form of reptiles, birds and insects. The maintenance of the natural balance of their population is important for the development of nature interpretation areas.[7]

(2) Developed Parks and Campsites - In the C.V.W.M.A., one of the major development considerations is the construction of class "A" parks at the base of Summit Creek (south-west corner of Leach Lake) and Boulder Creek (north-east corner of Duck Lake) with facilities for camping, boating, swimming, fishing and hiking. As well as the camp area development, a coordinated development plan has proposed for provision of both walking paths and roads so as to make the management area accessible for use.

---

[7] Nature interpretation areas are those areas that are set aside for the study of wildlife in its natural, undeveloped habitat. The value (in terms of recreation-days) of such areas will be for the purpose of art (painting and photography) and science (study of the characteristics of many wildlife forms) research.

(3) Agriculture - at present there exists a certain level of private (5-year leases) agriculture production on the edges of the management area in the form of cattle grazing and "hay" production. These grazing areas exist on the West side of Six-Mile Slough and Leach Lake as well as the majority of the Corn Creek Area (2). The grazing will be allowed to continue in some of the areas, but by eliminating flooding (through the control of the level of Kootenay River by Libby Dam in 1971), fencing and fertilizing, field crops will be grown for the purpose of feed for waterfowl and upland game.

Total Benefits From Recreation Activities

Benefits accruing to the province of British Columbia from the development of C.V.W.M.A. are varied. For this study, the interest is in the benefits accrued in terms of recreation-days. Thus, the implicit assumption made here is that a recreation day, whether it be a day of boating, fishing, hunting, etc., has the same recreation benefit - a recreation-day. The sources of recreation activities has been examined; the question now is to determine the level of these recreation activities (in terms of recreation-days) arising out of these sources.

Sportfishing

The C.V.W.M.A. already supports a considerable number of recreation-days of fishing. Fisherman (mainly local residents, with some use by tourists) at present fish for bass, pearch, sunfish, dolly varden char, fresh water ling cod, rainbow and cutthroat trout and sturgeon. Utilization, at

present, is restricted by lack of both easy access to fishing areas and lack of knowledge of areas potential. Utilization is year-round with winter fishing for rainbow trout in Kootenay River; January and February night spear fishing for ling cod in Summit Creek, Boulder Creek, Corn Creek and Duck Creek (south-east corner of area 5); high water runoff time (March-June) fishing for dolly varden char and sturgeon and warm and cold water fishing (July to September) of bass, perch and sunfish along with ranbow and cutthroat trout in Corn and Summit Creeks. Fishing activity will be available in almost all waters of the management area. With improvement in the access to the fishing areas (at present, access is at a minimum) and increased natural fish populations as a result of management schemes (improve natural spawning beds in Summit, Corn, Duck Creeks, Goat River and Duck Lake as well as maintaining the water level of Duck Lake), the estimated fishing use of these various water areas might be limited only by physical capacity.

A problem arises at this point - to determine the maximum number of recreation days generated in the C.V.W.M.A. from sportsfishing. Due to the lack of British Columbia statistics, estimates will be made on the basis of a fishing study conducted by Nathaniel Wollman.[8] In this study Wollman estimated that

---

[8]Nathaniel Wollman, "Recreational Uses of Water in the San Juan and Rio Grande Basins," The Value of Water in Alternative Uses, Appendix D, University of New Mexico Press, Albuquerque, 1962, pp. 220-281.

"the average fisherman fished 2 miles per fisherman-day and a section of a stream could be fished twice in one day."[9] Each mile of stream, therefore, constitutes one fisherman-day. In terms of lake fishing, Wollman estimated the "minimum average daily number of fisherman per surface acre of lake to be approximately 1.52."[10]

Table 4.13 shows the number of acres of lakes and number of miles of streams in the C.V.W.M.A. capable of supporting sportsfishing. Using Wollman's estimates, the maximum level of fishing use of the C.V.W.M.A. is estimated at 415,140 fisherman days.

Waterfowl, Upland Game and Deer Hunting

Bird hunting is one of the main activities to be enhanced by the development of the C.V.W.M.A. With the growth of the population of migratory and upland birds through schemes previously mentioned, the quality of hunting can be maintained while still making allowance for increased quantity. It is important to stress the fact that overcrowding of hunters means immediate deterioration of the hunting area. Thus, it is important to determine an upper limit to the number of hunters

---

[9] Ibid., p. 236. A "fisherman-day" is defined as a fisherman fishing during any part of the day for any duration whatever.

[10] Ibid., p. 237.

Table 4.13

Annual Number of Fisherman Days in Creston Valley Wildlife Management Area

Fishing Area	Size Miles or Acres	# of Fisherman-Days / Mile or / Acre	# of Fisherman-Days Per Day	# of Fishing Days Per Year	Total # of Fisherman Days Per Year
Lakes					
Duck Lake	3000 Acres	1.52 / Acre	4560	90	410,400
Streams					
Kootenay River	12 Miles	1.0 / Mile	12	300	3,600
Goat River	2 Miles	1.0 / Mile	2	120	240
Summit Creek	1 Mile	1.0 / Mile	1	150	150
Corn Creek	2 Miles	1.0 / Mile	2	150	300
Duck Creek	2 Miles	1.0 / Mile	2	150	300
Boulder Creek	1 Mile	1.0 / Mile	1	150	150
Total Number of Fisherman-Days Per Year					415,140

that can be accommodated in the management area. According to present plans, Duck Lake is to be reserved as a sanctuary, leaving approximately 10,000 acres for hunting. Over a hunting season of varying duration (depending on what is being hunted), the maximum number of hunting-days the C.V.W.M.A. will support depends on the number of hunters that an acre of water and/or land will support on any one day.

Waterfowl hunting can accommodate more hunters than any other type of hunting in the C.V.W.M.A. With proper control of hunting areas, i.e., proper placement of "hunting blinds," control on areas of "shooting," the upper limit for waterfowl hunting will be "one hunter per one hundred acres of land and water surface."[11] Each blind could be used twice in one day - once for the morning "shoot" and once for the evening "shoot." The result is that each 100 acres of land and water surface will yield 2 hunter-days per day. A limiting factor, however, is in order to prevent any one blind from being "shot out," each blind location would be used at a rate of once every four days.[12] The result is that each 100 acres will yield 0.5 hunter-days per day.

---

[11] E.M. Wright, "Waterfowl shooting on the Creston Valley Wildlife Management Area During 1968," June, 1969, p. 16. Mr. Wright was the B.C. Fish and Wildlife Regional Biologist in Creston in 1968. He is now employed by "Ducks Unlimited," Victoria.

[12] Ibid., p. 16.

In the case of upland bird hunting, congestion can occur more readily than with waterfowl hunting. Therefore, a larger amount of terrain is required for upland bird hunting. The assumption made here is that 200 acres of land area is required for each upland bird hunter-day. Each 200 acres would be hunted only once a day.

Finally, as far as deer hunting is concerned, it is difficult to estimate the number of hunter-days per year that could be obtained from hunting deer in C.V.W.M.A. A heavy concentration of whitetail deer are situated along the entire length of the west side of the management area. A certain number of hunter-days could be generated from hunting deer in the C.V.W.M.A., but for the purposes of this study, deer hunting will be ignored.

The problem that again arises is to determine the maximum number of recreation days generated in the C.V.W.M.A. from waterfowl and upland bird hunting. Table 4.14 shows the number of acres of land and water capable of supporting hunting. Using E.M. Wright's estimates on waterfowl hunting concentration and using the author's assumption regarding upland bird hunting, the maximum level of hunting in the C.V.W.M.A. is estimated at 4,735 hunter-days per year.

Two questions now come to mind; first, will waterfowl and upland bird hunting conflict observancy, in specific, bird watching; secondly, what level of hunting on private lands results from the increased population of birds? Firstly, the assumption made here is that bird hunting will not interfere with bird watching. Bird watching, during the hunting season

Table 4.14

Annual Number of Hunter-Days in Creston Valley Wildlife Management Area

Hunting Areas	Number of Acres	Number of Hunter-Days / 100 Acres / Day	Number of Hunters Per Day	Number of Hunting Days Per Year	Total Number of Hunter-Days Per Year
Waterfowl					
Leach Lake	2,900	0.5	14.5	70	1015
Six-Mile Slough	2,300	0.5	11.5	70	805
Corn Creek Unit	1,400	0.5	7.0	70	490
Indian Reserve	3,300	0.5	16.5	70	1155
Upland Birds					
All Land Areas Surrounding Water Areas	2,100[13]	1.0	21.0	70	1470
Total Number of Hunter-Days Per Year					4735

[13] The total acreage of the C.V.W.M.A. is approximately 16,000 acres. The five designated areas (see figure 1.2) make up 13,900 acres. This leaves approximately 2,100 acres that can be utilized for upland bird hunting.

can take place on and around Duck Lake which has been designated as a bird sanctuary. Further, on this point, most of the bird watching can take place during the year outside the hunting season, especially during the spring migration when many of the migrating birds stop in the management area for purpose of nesting. Secondly, the level of hunting on private lands will be insignificant until "crowding" occurs in the public areas. It can be assumed that once congestion occurs on the public lands, private land-owners will charge "hunting fees" for the privilege to hunt on their land.

Bird Watching, Camping, Hiking and Boating

Bird watching, camping, hiking and boating probably constitute the largest number of recreation-days in the C.V.W.M.A. The C.V.W.M.A. will provide a unique opportunity for the observation of nature. The annual migratory flocks of whistling swans attract visitors from all of Canada and Western United States. The possibility of establishing a breeding population of trumpeter swans will mean that these rare birds can be observed throughout most of the year. A large variety of ducks and geese are found in the management area. Ospreys are quite common in the area, as are heron and some eagles. All in all, birds that are a rare sight to many people are a common occurance in the management area.

Bird Watching - the number of days of bird watching that the C.V.W.M.A. can support will depend entirely on the population demand and supply of accommodations to handle the inflow of visitors to the C.V.W.M.A. In a recent study completed at the 30,000 acre Horicon Marsh Wildlife Area in Wisconsin; 41,500 persons in 1960 and 75,800 in 1961 came to watch Canadian Geese during the fall (a six week period from October to November).[14] Whereas the population is much heavier in the Horicon Marsh Area, the Creston Area has year round bird watching (an 8 week period in the spring and an 8 week period in the fall) compared to the six week period for Horicon Marsh. Assuming that accommodation expansion will take place so as to allow full utilization of the management area, table 4.12 estimates maximum annual number of nature observation (bird-watching) days that can be expected in the C.V.W.M.A. The 3000 acre Duck Lake, which has been designated as a bird sanctuary, is assumed to be the main area for bird watching. The rest of the C.V.W.M.A., however, will also support, to a lesser degree, a bird watching population. The area to be considered is assumed to be 10,000 acres.

---

[14]Lloyd B. Keith, Social and Economic Values of the Recreational Use of Horicon Marsh, Wisconsin, Wisconsin Conservation Department, 1963.

Table 4.15

Annual Number of Nature Observation (Bird Watching) Days in C.V.W.M.A.*

	Number of Acres	Time Period (Days)	Number of Nature Observers Per Acre Per Day	Number of Nature Observation Days Per Year
Horicon Marsh	30,000	42	.06	75,800
C.V.W.M.A.	10,000	112	.06	67,200

*Based on the 1961 data of Horicon Marsh as a Proxy Measure.

Using the 1961 data on the Horicon Marsh, the annual number of nature observation (bird watching) that can be expected in the C.V.W.M.A. was estimated at 67,200 days.

Camping, boating and hiking - it is difficult to estimate the number of "boaters" and "hikers" the C.V.W.M.A. will support. For the purpose of this study they will be incorporated into the estimate of "campers." Two campsites are proposed for the C.V.W.M.A. - a 100 unit campsite at Summit Creek and a 100 unit campsite at Boulder Creek. How many "camper-days" per year can be expected to be generated from a total of 200 campsite units? Based on a 1967 study, which estimated that a 250 unit campsite at Boundary Bay would attract 65,000 "camper-days" per year, the number of "camper-days" at the C.V.W.M.A. is estimated at 52,000 per

year.[15]

Clearly there exists a considerable potential for development of recreation activities in the C.V.W.M.A. The total number of recreation days per year that can be generated in C.V.W.M.A. are shown in table 4.16.

Table 4.16

Summary of Total Number of Recreation Days Per Year in C.V.W.M.A.

Activity	Recreation Days Per Year
Sportsfishing	
Lake	410,400
Stream	4,740
Hunting	
Waterfowl	3,265
Upland Birds	1,470
Nature Observation	
Bird Watching	67,200
Camping, Boating, Hiking	52,000
Total	539,075

To determine the net dollar value of these 539,075 recreation-days, in terms of recreation expenditures, to British Columbia is not within the present scope of this paper. It is worthwhile, however, to determine what is the percentage increase of supply of recreation days in British

[15] Canadian Wildlife Service, Waterfowl in the Boundary Bay Area, A Preliminary Economic Assessment of their Value in Relation to other Potential Recreational Activities in the Area, Vancouver, B.C., May, 1967, pp. 34-35.

Columbia as a result of the recreation development of the C.V.W.M.A.

In terms of sportsfishing, an estimate of the number of fisherman-days per year in British Columbia is necessary in order to estimate the percentage increase in recreation-days in British Columbia resulting from sportsfishing in the C.V.W.M.A. Wollman, in his fishing study, estimated that each resident fisherman of New Mexico "fished" 22.81 fisherman-days per season and each non-resident fisherman, "fished", 16.29 days per season.[16] Applying Wollman's estimates directly to British Columbia, the number of fisherman-days per year (1967) in British Columbia can be calculated. Thus, the percentage increase of fisherman-days in British Columbia as a result of the development of the C.V.W.M.A., can be estimated. Table 4.17 indicates that the recreation development

Table 4.17

Total Number of Fisherman-Days in British Columbia (1967) - Percentage Increase As A Result of Development of C.V.W.M.A.

Number of B.C. Angler's Licences	Fisherman-Days Per Licence Per Year	Total Fisherman-Days Per Year in British Columbia
Resident - 184,017	22.81	4,232,394
Non-Resident 91,325	16.29	1,461,200
		5,693,594
Number of Fisherman-Days Per Year in C.V.W.M.A.		415,140
Presentage Increase of Fisherman-Days in B.C. as a Result of C.V.W.M.A.		7%

[16] Wollman, op.cit., p. 239.

of the C.V.W.M.A. will increase the number of recreation-days in British Columbia (in terms of fisherman-days) by a maximum of 7%.

In order to estimate the percentage increase in recreation-days in British Columbia resulting from "hunting" in the C.V.W.M.A., the same procedure that was used for sports-fishing will be used for hunting. In the recent study on Boundary Bay it was estimated that each resident hunter, "hunted" 14.4 hunting-days per year and each non-resident hunter, "hunted" 7.9 hunting-days per year.[17] Applying these estimates to British Columbia, the number of hunting-days per year (1967) in British Columbia can be calculated. Table 4.18 indicates that the recreation development of the C.V.W.M.A. will increase the number of recreation-days in British Columbia (in terms of hunting-days) by a maximum of .25%.

Table 4.18

Total Number of Hunting-Days in British Columbia (1967) - Percentage Increase As a Result of Development of C.V.W.M.A.

Number of B.C. Hunting Licences	Hunting Days Per Licence Per Year	Total Hunting-Days Per Year in B. C.
Resident - 143,003	14.4	2,059,243
Non-Resident 6,933	7.9	55,300
Total		2,114,543
Number of Hunting-Days Per Year in C.V.W.M.A.		4,735
Maximum Percentage Increase of Hunting-Days in B.C. As A Result of C.V.W.M.A.		.25%

[17] Canadian Wildlife Service, op.cit., p. 25., p. 36.

Finally, the increase in recreation-days accruing to British Columbia as a result of campsite development in the C.V.W.M.A., can be easily determined. If one assumes that all campsites in British Columbia are equally used; then, based on the estimates of the Boundary Bay study, one can determine the percentage increase of "camping-days" in British Columbia resulting from the campsite development in the C.V.W.M.A. According to the Boundary Bay study, each "campsite-unit" in British Columbia will generate 260 "camping-days" per year.[18] Table 4.19 indicates that the number of recreation-days in British Columbia (in terms of camping-days), will be increased by a maximum of 5% as a result of the campsite developments at Summit and Boulder Creeks.

Table 4.19

Total Number of Camping-Days in British Columbia (1967) - Percentage Increase As A Result of Development of C.V.W.M.A.

Number of Individual Campsite Units	Camping Days Per Unit Per Year	Total Camping-Days Per Year in B. C.
British Columbia 3,845	260	Total - 999,700
C.V.W.M.A. 200	260	52,000
Percentage Increase of Camping-Day in B.C. As A Result of C.V.W.M.A.		5%

[18] Ibid., pp. 34-35.

The C.V.W.M.A. has added varying percentage increases to recreation activities (supply) in British Columbia. Using a "weighted average" estimation technique, the overall percentage increase of recreation-days in British Columbia as a result of the recreation development of the C.V.W.M.A. is approximately 5.16%. (see table 4.20).

Table 4.20

Weighted Average of Percentage Increase of Recreation-Days in British Columbia As A Result of the C.V.W.M.A.

Activity	Activity Days (in Millions)	% Change Due To C.V.W.M.A.	Weighted Average
Fishing	5.7	7.0	39.9
Hunting	2.1	.25	.525
Camping	1.0	5.0	5.0
Total	8.8		45.425

Weighted Average: $45.425 \div 8.8 = 5.16\%$

Section 6: Summary

British Columbia finds itself in a unique position, both in terms of geography and supply of natural resources. In terms of geographic location, British Columbia finds itself in a position of already having an overwelming existing market demand for its upply of recreation. In terms of natural resources, the province has many millions of acres of "virgin" resources, still untouched and available for recreation development. The resulting force is that expected demand for the recreational use of British Columbia's natural

resources will increase by 400-600% in the next 20-30 years. At the same time trend indications are that supply of recreation facilities, to meet the increased influx of demand, will only increase by 100-300% over the next 20-30 years. From these two basic statistics it is clear that what is needed is an increased supply of areas for outdoor recreation.

The Creston Valley Wildlife Management Area, if fully developed, can increase the supply of recreation facilities to British Columbia to the amount of 539,075 recreation-days per year. These 539,075 recreation-days would increase the supply of recreation in the province by approximately 5.16%.

APPENDIX TO

CHAPTER IV

STATISTICAL TABLES

TABLE 4.1

Tourist Attendance in British Columbia

Year	# of Amer. Tourist Visits into B.C.	Rev. from Amer. Tourists in dollars	# Can. Tourist Visits	Rev. From Can. Visits in Dollars	# B.C. Intra Prov. Visits	Rev. From B.C. Visits in Dollars	Total Tourist Visits	Total Value of Tourist Revenue
1968	4,249,558	169,982,320	2,538,479	101,429,160	2,477,436	74,323,080	9,265,473	345,844,560
1967	3,903,538	156,141,520	2,326,427	93,057,080	2,270,479	68,114,370	8,500,444	317,312,970
1966	3,326,598	133,063,900	1,936,973	77,478,900	1,888,685	56,660,700	7,152,256	267,203,500
1965	2,913,220	116,528,800	1,728,936	69,157,440	514,902	15,447,060	5,157,058	201,133,300
1964	2,664,652	100,326,400	1,580,680	66,824,000	440,637	16,785,600	4,685,969	183,936,000
1963	2,067,066	85,637,318	980,106	42,843,211	615,000	22,004,951	3,662,172	150,485,480
1962	2,083,336	79,300,000	1,076,351	45,200,000	575,313	20,500,000	3,725,000	145,000,000
1961	1,763,000	70,500,000	932,500	25,300,000	530,000	19,200,000	3,225,500	115,000,000
1960							3,604,700	100,400,000
1959							3,214,000	100,000,000
1958							2,798,520	106,000,000
1957							2,625,000	101,000,000

Source: Province of British Columbia, Department of Recreation and Conservation and Travel Industry, Annual Reports, A. Sutton, Printers, Victoria, B.C., 1961-1968.

TABLE 4.2

Annual Attendance Visits at Provincial Parks in British Columbia

Year	Number of Visits	Where Visitors Came From? U.S.	Canada	B.C.
1948	125,000			
1949	175,000			
1950	250,000			
1951	350,000			
1952	525,000			
1953	700,000			
1954	875,000			
1955	1,525,000	17.7%	10.6%	71.7%
1956	1,820,000	15.5%	4.5%	80 %
1957	2,100,000			
1958	2,350,000			
1959	2,700,000			
1960	3,100,000			
1961	3,550,000			
1962	3,720,000			
1963	4,020,000			
1964	3,800,000			
1965	4,800,000	19.3%	16.9%	63.8%
1966	5,150,000	20.1%	20.1%	59.8%
1967	6,140,000			
1968	6,450,000			

Source: Province of British Columbia, Department of Recreation and Conservation, Annual Reports, 1964, p. 37; 1968, p. 50.

TABLE 4.3

Annual Resident and Non-Resident Hunter Licence Sales in British Columbia, 1957-67

Year	Non-Resident Licence Sales	Resident Licence Sales
1957	3,186	101,000
1958	2,989	109,208
1959	3,392	113,599
1960	3,767	118,608
1961	3,826	120,500
1962	4,370	126,330
1963	5,226	129,110
1964	5,265	131,668
1965	5,797	133,977
1966	6,635	132,780
1967	6,933	143,003

Source: Province of British Columbia, Department of Recreation and Conservation, Annual Reports, 1961-68.

TABLE 4.4

Areas Reserved for Public Recreation Use in British Columbia

Year	Number of Specified Areas	Total Acreage
1961	1,793	292,320
1962	1,860	298,380
1963	2,036	312,100
1964	2,100	325,800
1965	2,190	340,994
1966	2,238	341,544
1967	2,341	357,646
1968	2,460	417,880

Source: Province of British Columbia, Department of Recreation and Conservation, Annual Reports, 1961-68.

TABLE 4.5

Number and Total Acreage of Parks (Divided into Types) in British Columbia, 1957-68

Year	Number of Class "A" Parks	Total Acreage of Class "A" Parks	Number of Class "B" Parks	Total Acreage of Class "B" Parks	Number of Class "C" Parks	Total Acreage of Class "C" Parks	Total Number of Provincial Parks	Total Acreage of Prov. Parks
1968	179	1,799,801	9	4,645,608	77	29,239	265	6,474,648
1967	175	1,780,500	9	4,614,548	76	29,246	260	6,424,295
1966	164	1,777,785	9	4,611,021	75	29,207	248	6,418,013
1965	158	2,336,440	8	4,046,369	73	29,044	239	6,411,853
1964	147	2,320,266	8	4,046,369	71	28,320	226	6,394,955
1963	137	2,312,523	8	4,046,369	70	29,129	215	6,388,021
1962	130	2,311,540	7	4,035,338	65	28,701	202	6,376,580
1961	121	2,312,734	6	4,010,199	56	28,182	183	6,351,115
1960							163	8,423,406
1959							147	8,421,142
1958							132	8,418,880
1957							116	8,416,657

Source: Province of British Columbia, Department of Recreation and Conservation, Annual Reports, 1961-68.

TABLE 4.6

Average Weekly Wages and Salaries and Average Weekly Hours of Work in British Columbia, 1957-67

Year	Average Weekly Wages/Salaries	Average Weekly Hours of Work
1957	73.80	38.3
1958	75.88	36.8
1959	79.92	35.75
1960	82.85	36.83
1961	84.99	36.98
1962	87.10	37.02
1963	90.10	37.17
1964	94.11	37.28
1965	100.71	37.46
1966	107.33	37.63
1967	114.50	37.39

NOTE: Adjusted for Seasonal Fluctuations.

Source: Dominion Bureau of Statistics, Canadian Statistical Review, 11-003, 1967.

Dominion Bureau of Statistics, Review of Man-Hours and Hourly Earnings, 72-202, 1967, p. 15-16.

TABLE 4.7

Population[1] and Number of Registered Passenger Motor Vehicles[2] in British Columbia, 1956-1968

Year	Population	Number of Motor Vehicles	Per Capita Number of Motor Vehicles
1956	1,399,000	341,650	.244
1957	1,482,000	371,727	.250
1958	1,538,000	393,337	.255
1959	1,567,000	419,422	.267
1960	1,602,000	446,050	.278
1961	1,629,000	467,370	.286
1962	1,660,000	495,308	.298
1963	1,699,000	531,116	.312
1964	1,745,000	571,807	.327
1965	1,747,000	623,742	.357
1966	1,874,000	668,601	.356
1967	1,947,000	727,342	.373
1968	2,007,000	771,853	.394

Source: [1]Dominion Bureau of Statistics, Population of Canada by Provinces, 1931-1968, 91-201, 1969

[2]Dominion Bureau of Statistics, The Motor Vehicle, 1967, 53-219, November, 1968.

TABLE 4.8

Percentage of Total Tourist Visits and Revenue Attributable to Recreationists (Based on Number of Visits to Provincial Parks), 1957-1968

Year	Total Tourist Visits	Total Park Visits	% Park Visits of Total Visits	Average % over 12 - year period	Total Value of Tourist Revenue	Calculated Value of Recreation Revenue
1957	2,625,000	2,100,000	80%		101,000,000	84,840,000
1958	2,798,520	2,350,000	83%		106,000,000	89,040,000
1959	3,214,000	2,700,000	84%		100,000,000	84,000,000
1960	3,604,700	3,100,000	86%		100,400,000	84,336,000
1961	3,550,500	3,550,000	100%		115,000,000	96,600,000
1962	3,725,000	3,720,000	99%		145,000,000	121,800,000
1963	4,022,172	4,020,000	100%	84%	150,485,480	126,407,803
1964	4,685,969	3,800,000	80%		183,936,000	154,506,204
1965	5,157,058	4,800,000	92%		201,133,300	168,941,972
1966	7,152,058	5,150,000	72%		267,203,500	224,450,520
1967	8,500,444	6,140,000	73%		317,312,970	266,542,915
1968	9,265,473	6,450,000	70%		345,844,560	290,509,430

Source: Province of British Columbia, Department of Recreation and Conservation and Travel Industry, Annual Reports, 1961-68.

TABLE 4.9

Sale of Resident and Non-Resident Angler's Licences in British Columbia, 1957-1968

Year	Resident Anglers	Non-Resident Anglers
1957	129,827	39,963
1958	129,083	39,716
1959	134,690	42,933
1960	139,383	44,200
1961	139,945	46,048
1962	144,090	52,845
1963	151,271	62,809
1964	154,665	65,453
1965	154,201	65,350
1966	166,369	70,463
1967	180,823	87,107
1968	184,017	91,325

Source: Province of British Columbia, Department of Recreation and Conservation, Fish and Wildlife Branch, Reports of Annual Revenues from Various Licences, Collections, Vancouver, B. C., 1957-1968.

TABLE 4.10

Total Number of Campsites in Provincial Parks in British Columbia, 1957-68.

Year	Number of Campsites
1957	2,632
1958	2,689
1959	2,703
1960	2,797
1961	3,205
1962	3,688
1963	3,664
1964	3,684
1965	3,786
1966	3,832
1967	3,845
1968	3,900

Source: Province of British Columbia, Department of Recreation and Conservation, Annual Reports, Parks Branch, Engineering Division, 1961-68.

CHAPTER V

CONCLUSIONS

The economics of outdoor recreation centers around the problem of allocation of natural resources. Allocation of natural resources requires a procedure whereby various alternative development projects, "bidding" for the same natural resources, can be evaluated to determine which of the projects gives the greatest total "net returns." The accepted procedure has been to use cost-benefit analysis; discount net benefits over a time period, and accept the project which gives the greatest "total net dollar benefits."

Chapter II of this study explored the theoretical economic aspects of outdoor recreation. The problem of allocation of natural resources for outdoor recreation centered on the very nature of the recreation product or service. Whereas the majority of commercial and agricultural products tend to be "individual" products that have a "market determined price"; outdoor recreation tends to be a "collective" product and does not (at present) have a market determined price. The resulting problem is that when "cost-benefit analysis" is used to determine the project with the greatest net dollar benefits, outdoor recreation "tends" to be at the bottom of the allocation list in terms of economic feasibility. The result has been that the development of outdoor recreation areas has not, to any great extent,

been undertaken by private individuals. Federal and provincial governments have had to undertake public expenditures in order to meet the increasing demand for outdoor recreation areas.

Chapter III surveyed the various studies and methods used to determine "effective demand" for outdoor recreation. Two groups of factors, namely physical and socio-economic factors were found to be indicators of present and expected future demand levels for outdoor recreation.

In the discussion of physical factors, the basic behavioral assumption made was that the use of a recreation area was inversely related to either travel cost and/or travel time. Thus, the more distant (measured in travel distance) or more expensive facilities were, the less they would be used on a per capita basis. Using this behavioral assumption and tabulation of visitor-days at a number of recreation sites, Marion Clawson[1] and later Jack Knetsch[2] developed methods for estimating recreation "demand curves." Overall, this method was found to be inadequate in that the demand curves were found to be "proxy" demand curves and the problem of determining the level (position) of the supply curve was still unresolved. The result was a "weak" argument

---

[1]Marion Clawson, Methods of Measuring the Demand for and Value of Outdoor Recreation, Reprint No. 10, Resources for the Future, Inc., Washington, D.C., February, 1959.

[2]Jack L. Knetsch, "Outdoor Recreation Demands and Benefits," Land Economics, Vol. 34, No. 4, November, 1963, pp. 387-396.

which tended to weaken the whole argument for the allocation of resources for outdoor recreation.

The alternative method was to look at the socio-economic factors which influence the "effective demand" for outdoor recreation. The ORRRC studies, that were completed in 1962, did in fact determine that the socio-economic factors of income, mobility and leisure time did explain 99% of the variation in per capita visits to National Parks during the same period.[3] Accepting per capita visits to National Parks as an indicator of recreation demand (participation), the findings of the ORRRC studies were used to project expected levels of effective demand for outdoor recreation to the year 2000.

Accepting both the problem of non-market price determination as being unable to predict demand for outdoor recreation and thus being unable to give indication of the level of adequate supply and, further accepting the findings of the ORRRC studies; Chapter IV used available British Columbia statistics to determine the past and expected future "effective demand" for outdoor recreation.

---

[3]Outdoor Recreation Resources Review Commission, Participation in Outdoor Recreation: Factors Affecting Demand Among American Adults, Study Report 20, Washington, D.C., 1962.

By using socio-economic factors such as income (weekly wages and salaries), mobility (registered passenger motor vehicles) and leisure time (inverse of weekly hours of work), the increase of "effective demand" for outdoor recreation in British Columbia between 1957-67 was found to be 191%. Assuming a continued positive trend in these socio-economic factors, the demand for recreation areas could be expected to increase by 400-600% in the next 20-30 years.

A study of the physical factors (hunting, fishing and park attendance) in British Columbia between 1957-67 indicated that effective recreation demand had increased by 30-100%. It was ventured that in the next 20-30 years, recreation demand (use of physical factors) could increase by 100-300%.

With the future expected demand for outdoor recreation determined, the importance of maintaining an equivalent increase in recreation supply was emphasized. Supply of recreation areas in British Columbia (as determined by total supply of provincial parks and class "A" parks) were found to increase by 48% between 1957-67. In the next 20-30 years the expected growth of recreation areas (developed and undeveloped) could only be about 100-150%.

It was clear from these conclusions that recreation supply is "lagging" demand in British Columbia. The solution was to increase the development of recreation areas in British Columbia. The "need" for recreation areas would be "social" justification for the development of the Creston Valley Wildlife Management Area (C.V.W.M.A.) as a recreation

area. The C.V.W.M.A., if fully developed, could increase the supply of recreation in the amount of 539,075 recreation-days per year. These 539,075 recreation-days would increase the supply of recreation in the province by approximately 5.16%.

The study, then, was able to justify the allocation of natural resources in terms of social "needs" and "wants." Economic theory, at present, is unable to handle the pricing of goods which are extra-market in nature.

In 1967 recreation expenditures in British Columbia reached $266 million. It was clear that income earners were willing to spend a certain portion of their income to participate in outdoor recreation activities. How much would a recreationist be willing to spend for each experience, i.e. a fishing-day, a hunting-day, a camping-day, etc.? At present, the only reasonable method to determine the recreationist's willingness-to-pay is the imposing of "user-fees". We have nominal user-fees in terms of hunting and fishing licences and camping fees. If the public agency charges $1.00 per night to use a campsite, and the demand for campsites is still greater than existing supply; then the fee (price) should be increased so as to equate demand and supply. In this way, one is able to determine the equilibrium price level. The use of "user-fees" as a "rationing" procedure enables both the manager (either private or public) of a recreation area to maintain a required "quality" level and the economist to "price" a recreation experience so that

the "economic value" (in dollars) of recreation can be determined.

From all of this it seems that society's growing concern with the use of all natural resources has become a major controversial issue for policy makers - both in the public and private sector. There exists a growing demand to increase the maximization of uses of each individual natural resource so as to maximize some value of output. This output can be in the form of dollars - quantifiable measure which is acceptiable to the market system. The output, however, does not have to be in terms of dollars to be quantified. Quantification can take place in user-hours, distance travelled, pounds of fish and many more.

The problem of use of natural resources for recreation takes on an intangible look. The allocation of natural resources for recreation comes in conflict with the use of the resources for industry and agriculture. Since the benefits of the uses of these resources for industry and agriculture can be measured in dollar terms, it is difficult to obtain these resources for recreation use since recreation benefits, at present, are seldom measured in dollar terms. For this reason should society cease to allocate natural resource for recreation? Not likely. Today, as never before, society is demanding more outdoor recreation areas with more developed recreation facilities. It seems that since society has strongly focused on recreation demand, this is a value measure worthy of quantification.

SELECTED BIBLIOGRAPHY

Bolle, Arnold W. The Basis of Multiple Use Management of Public Lands in the North Fork of Flathead River, Montana. Unpublished Ph.D. Dissertation, Harvard University, December, 1959.

Bowden, G. and P.H. Pearse. Nonresident Big Game Hunting and the Guiding Industry in British Columbia: An Economic Study. Study Report No. 2 on the Economics of Wildlife and Recreation, Department of Recreation and Conservation, Victoria, British Columbia, 1968.

California Public Outdoor Recreation Plan Committee. "California Public Outdoor Recreation Plan," Part II, Sacramento, California, 1960.

California Resource Agency. Outdoor Recreation Outlook for 1980. Monograph No. 1, Department of Parks and Recreation, Los Angeles, California, June, 1966.

Canadian Wildlife Service, Waterfowl in the Boundary Bay Area, A Preliminary Economic Assessment of their Value in Relation to other Potential Recreational Activities in the Area, Vancouver, B.C., May, 1967.

Ciriacy-Wantrup, W.V. "Multiple and Optimum Use of Wild Land Under Different Economic Conditions," Journal of Forestry, Vol. 36, No. 7, July, 1938.

Clawson, Marion. Land and Water for Recreation. Chicago: Rand McNally and Company, 1964.

Clawson, Marion. Methods of Measuring the Demand for and Value of Outdoor Recreation. Reprint No. 10, Resources for the Future, Inc., Washington, D.C., February, 1959.

Clawson, Marion. "The Crisis in Outdoor Recreation," Parts I and II, American Forests, Vol. 65, March and April, 1959.

Clawson, Marion. Held, R.B., and Stoddard, C.H. Land For The Future. Baltimore: John Hopkins Press, 1960.

Clawson, Marion, and Knetsch, Jack L. Economics of Outdoor Recreation. Baltimore: John Hopkins Press, 1967.

Clawson, Marion, and Knetsch, Jack L. "Outdoor Recreation Research: Some Concepts and Suggested Areas of Study," Natural Resource Journal, October, 1963.

Clelland, R.C., Brown, F.E., deCani, J.S., Bursk, J.P., Murray, D.S. Basic Statistics With Business Applications. New York: John Wiley and Sons, 1966.

Daiute, R.J. "Methods of Determination of Demand for Outdoor Recreation," Land Economics, Vol. 42, 1966.

Dana, Samuel T., amd Krueger, Myron. "California Lands: Ownership, Use and Management," American Forestry Association, Washington, D.C., 1958.

Davis, Robert K. The Value of Outdoor Recreation: An Economic Study of the Maine Woods. Unpublished Ph.D. Dissertation, Harvard University, 1963.

Davis, Robert K. "Recreation Planning as an Economic Problem," Natural Resource Journal, Vol. 3, October, 1963.

Dominion Bureau of Statistics. Canadian Statistical Review, 11-003, 1967.

Dominion Bureau of Statistics. Population of Canada by Provinces, 1931-1968, 91-201, 1969.

Dominion Bureau of Statistics. Review of Man-Hours and Hourly Earnings, 72-202, 1967.

Dominion Bureau of Statistics. The Motor Vehicle, 1967, 53-219, November, 1968.

Dorfman, H. Measuring Benefits of Government Investment. Washington: Brookings Institution, 1963.

Downs, Anthony. "An Economic Theory of Government Decision Making in a Democracy," U.S. Office of Naval Research, Stanford University Technical Report No. 32, Stanford, 1956.

Ellis, J.B. Outdoor Recreation Planning in Michigan by a Systems Analysis Approach, Part 1-A Manual for "Program RECSYS." Michigan Department of Conservation, Lansing, Michigan, 1966.

Enke, Stephen. "More on the Misuse of Mathematics: A Rejoiner," Review of Economics and Statistics, Vol. 37, No. 2, May 1955.

Fiekowsky, Seymour. "Forecasts and Economic Studies Group," Outdoor Recreation Resources Review Commission, Washington, D.C., October 23, 1959.

Fischer, V.L. U.S. Congress, Senate Committee on Interior and Insular Affairs, Hearings on S. 174, The Wilderness Act, 87th Congress, 1961.

Forte, F., and Buchanan, James M. "The Evaluation of Public Services," Journal of Political Economy, Vol. 49, No. 2, April 1961.

Friedman, Milton. "The Marshallian Demand Curve," Journal of Political Economy, Vol. 57, No. 6, December 1949.

Hammond, R.J. "Benefit-Cost Analysis and Water Pollution Control: A Note," Food Research Institute Studies, Vol. 2, No. 1, February 1961.

Hotelling, Harold. The Economics of Public Recreation, National Park Service, Washington, D.C., 1949.

Keith, Lloyd B. Social and Economic Values of the Recreational Use of Horicon Marsh, Wisconsin, Wisconsin Conservation Department, 1963.

Knetsch, Jack L. "Forest Recreation: A Case of Non-Market Resource Use," Journal of Forestry, February 1967.

Knetsch, Jack L. "Outdoor Recreation Demands and Benefits," Land Economics, Vol. 39, No. 4, November 1963.

Krutilla, John. "Welfare Aspects of Benefit-Cost Analysis," Journal of Political Economy, Vol. 69, No. 3, June 1961.

Lerner, Lionel. "Evaluation of Recreation," Interdepartmental Committee of Recreation, State of California, Los Angeles, 1961.

Marglin, Stephen A. Public Investment Criteria: Benefit-Cost Analysis. Cambridge: M.I.T. Press, 1967.

Margolis, Julius. "A Comment on the Pure Theory of Public Expenditure," Review of Economics and Statistics, Vol. 37, No. 4, November 1955.

Massey, William F. "Principal Compents Regression in Exploratory Statistical Research," Journal of the American Statistical Association, Vol. 60, No. 309, March 1965.

McKean, R.N. Efficiency in Government Through Systems Analysis. New York: John Wiley and Sons, 1958.

Merewitz, Leonard. Recreational Benefits of Water Resource Development. Unpublished Ph.D. Dissertation, Harvard University, June 1964.

Milstein, David N. "An Economic Framework for the Study of Leisure," 10th Annual Meeting of Society for Study of Social Problems, New York, 1960.

Outdoor Recreation Resources Review Commission. Economic Studies of Outdoor Recreation, Study Report No. 24, Government Printing Office, Washington, D.C., 1962.

Outdoor Recreation Resources Review Commission. National Recreation Survey, Study Report No. 19, Government Printing Office, Washington, D.C., 1961.

Outdoor Recreation Resources Review Commission. Participation in Outdoor Recreation: Factors Affecting Demand Among American Adults, Study Report No. 20, Government Printing Office, Washington, D.C., 1962.

Outdoor Recreation Resources Review Commission. "Proceedings of the Second Joint Meeting with its Advisory Council," Government Printing Office, Washington, D.C., 1960.

Outdoor Recreation Resources Review Commission. Projections to the Years 1976 and 2000: Economic Growth, Population, Labour Force and Leisure, and Transportation, Study Report No. 23, Government Printing Office, Washington, D.C., 1961.

Outdoor Recreation Resources Review Commission. Prospective Demand for Outdoor Recreation, Study Report No. 26, Government Printing Office, Washington, D.C., 1962.

Pearse, Peter H. "A New Approach to the Evaluation of Non-Priced Recreational Resources," Land Economics, Vol. 44, No. 1, February 1968.

Pearse, Peter H. and Laub, Michael E. The Value of the Kootenay Lake Sport Fishery. Study Report No. 3 on the Economics of Wildlife and Recreation, Department of Recreation and Conservation, Victoria, British Columbia, 1969.

President's Water Resources Council. "Policies, Standards, and Procedures in the Formulation, Evaluation and Review of Plans for Use and Development of Water and Related Land Resources," 87th Congress, 2nd Session, Senate Doc. No. 97, May 1962.

Province of British Columbia. "Creston Valley Wildlife Management Act," Bill No. 65, 1968.

Province of British Columbia. Department of Recreation and Conservation, Annual Reports, 1961-68, Sutton Printers, Victoria, British Columbia.

Province of British Columbia. Department of Recreation and Conservation, Fish and Wildlife Branch, Report of Annual Revenues From Various Licences, 1957-1968, Vancouver, B.C.

Province of British Columbia. Department of Travel Industry, Annual Reports, 1967-68, Sutton Printers, Victoria, B.C.

Samuelson, Paul A., "Diagrammatic Exposition of a Theory of Public Expenditure," Review of Economics and Statistics, Vol. 37, No. 4, November 1955.

Samuelson, Paul A., "The Pure Theory of Public Expenditure," Review of Economics and Statistics, Vol. 36, No. 4, November 1954.

Scott, Anthony. "The Valuation of Game Resources: Some Theoretical Aspects," Canadian Fisheries Report, No. 4, May 1965.

Trice, Andrew H., and Wood, Samuel E. "Measurement of Recreation Benefits," Land Economics, Vol. 34, August 1958.

Underwood, McLellan and Associates, Ltd., "A Review of Development Aspects of the Indian Reserves 1, 1A, 1B, Portion of the Creston Valley Wildlife Management Area," Unpublished Report, Vancouver, January 1968.

U.S. Forest Service. "Multiple Use: The National Forests and Your Family," PA No. 432, Government Printing Office, Washington, D.C., 1961.

U.S. Forest Service. "U.S. Forest Handbook," Government Printing Office, Washington, D.C., 1958.

Vaux, H.J. "Evaluation of Recreational Versus Industrial Use of Forest Lands," Research in the Economics of Forestry. Baltimore: Waverly Press, 1953.

Wasser, C.H. "The Alpine: Its Place in Multiple-Use Management," Proceedings of Society of American Foresters Meeting, Government Printing Office, Washington, D.C., 1961.

Wollman, Nathaniel. The Value of Water in Alternative Uses. Albuquerque: University of New Mexico Press, 1962.

Wright, E.M. "Waterfowl Shooting on the Creston Valley Wildlife Management Area During 1968, Ducks Unlimited, Victoria, B.C., June 1969.