ALTERNATIVES FOR DEVELOPMENT OF UNRECLAIMED LAND IN THE KOOTENAY RIVER FLOODPLAIN, CRESTON, BRITISH COLUMBIA: A BENEFIT-COST ANALYSIS

by

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ABSTRACT

This thesis is an investigation of the economic potential for use of 15,000 acres of land in the Kootenay River floodplain at Creston, British Columbia. The Kootenay River flows north into Canada through this floodplain and enters Kootenay Lake 20 miles north of the International Border. The total area of the floodplain between Kootenay Lake and the Border is approximately 36,000 acres, of which 20,000 acres have been reclaimed for agriculture. This study is concerned with 15,000 acres which remain undeveloped, 10,000 acres being provincial Crown land, and 5,000 being Indian Reserve.

At present this land is inundated annually by the freshet of the Kootenay River. It provides an important link in the habitat requirements of migratory waterfowl, is used lightly by hunters and fishermen, and provides limited grazing for beef cattle before and after the freshet. The impending completion of Libby Dam, upstream on the Kootenay River at Libby, Montana, will reduce the extent of annual flooding and the costs associated with more intensive use of the land. Consequently, there is considerable interest in intensive development of this land, either for agriculture as with the rest of the floodplain, or as a wildlife management area for the production of wildlife and use in outdoor recreation.

Resource managers face the problem of determining which of these alternatives represents the optimum land use. This is a difficult problem, and its solution requires that the benefits and costs associated

with each alternative be reduced to a common basis for comparison. This study attempts to make such comparisons on a rigorous basis through the use of benefit-cost analysis. The feasibility of each land use alternative is assessed, and comparisons made on the basis of the net present worth of benefits minus costs.

The principles of benefit-cost analysis are well developed, and its application is not difficult when project costs and benefits are adequately reflected in factor prices. Difficulties are encountered in the present study, however, where the output from development for wildlife and outdoor recreation is not marketed and there are no prices to reflect the values created.

In analysing the wildlife-recreation alternative, values are imputed to the recreational opportunities using recently developed concepts in evaluating non-priced resource uses. While values are established for direct recreational use, other important aspects of the output under this development are not valued (the production of wildlife independent of recreational use, the preservation of rare species, the fulfillment of international obligations regarding migratory birds). The analysis of this alternative is thus restricted to a comparison between the full costs and only those benefits which are expressed in monetary terms.

A further important issue is that the relevant measure of benefits and costs may differ, depending on the 'referent group' from whose point of view the analysis is conducted. To demonstrate the importance of this matter the analysis in this study is conducted from the point of view of three referent groups, the local Creston economy, the province of British Columbia, and Canada as a whole. The outcome of a benefit-cost analysis may also be sensitive to the discount rate adopted, and the sensitivity is tested in this study using rates of six, eight and 10 per cent.

Despite the difficulties of expressing all costs and benefits in monetary terms, a rigorous analysis is undertaken and provides the basis for a clear choice of the optimum form of land use. Analysis of agricultural reclamation reveals it to be feasible, with net present values of primary and secondary benefits ranging from $2.4 million from the local perspective to $2.2 million from the provincial and national points of view. Offset against these tangible net benefits are the intangible costs associated with the destruction of existing wildlife habitat and wildlife species. Analysis of the wildlife-recreation develop ment produces widely varying results, depending on the referent group adopted. The net present value of primary and secondary benefits is estimated at $2.1 million from the local viewpoint, $4.6 million provincially, and $7.3 million from the point of view of Canada as a whole. In addition to these quantified values, this development will produce important unmeasurable benefits.

In comparing the two, the net benefits estimated for agricultural development can be interpreted as maximum values, ignoring as they do some of the costs associated with wildlife losses. The net benefits estimated from the wildlife-recreation development are regarded as minimum values, since important additional values associated with wildlife production are not quantified. Viewed in this light the choice between alternatives favors the wildlife-recreation development from both provincial and national perspectives, but is less clear at the local level. Since a basic premise of the study is that the provincial viewpoint is appropriate for decision making, it is concluded that the wildlife-recreation development represents the optimum land use.

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INTRODUCTION

A problem of resolving conflicting demands on a limited resource base has existed for some time at Creston, in the Central Kootenay region of British Columbia. The problem is to determine the optimum use for 15,000 acres of undeveloped land in the Kootenay River floodplain between the International Border and Kootenay Lake. Reserves held by the Lower Kootenay Indian Band comprise 3,000 acres of this land, while the remainder is unalienated provincial Crown land.

Three possible uses for this land are relevant at present: it can be left in its present undeveloped state; it can be reclaimed and developed for intensive agricultural production; or it can be developed for intensive wildlife management and associated outdoor recreation. Present use of this land is light, and it yields little apparent benefit; with Libby Dam expected to provide flood control on the Kootenay River by 1973 there are growing pressures to put this land to more intensive use, either as agricultural land or as a managed wildlife and recreation area.

Selecting the optimum use for public land such as this can be very complicated. Unlike privately owned land where the owner is interested solely in maximizing the net financial return, public resource managers must consider resource uses where returns are not usually measured in financial terms. When competing alternatives are being considered, one of which yields a clearly identifiable financial return, and the other does not, making a rational choice between them is difficult.

Determining the future use of the undeveloped land at Creston requires a choice of this nature. The returns to the land if allocated to agriculture can be identified with relative ease -- agricultural output is sold through normal markets and measures of financial return are readily available. The opposite occurs with development for wildlife and recreation. Measures of the value of the output are not readily available, and it is often difficult to predict either the production of wildlife or the extent of use by recreationists.

Benefit-cost analysis is an economic technique which can be employed to deal with such problems. It provides a framework through which the necessary information can be collected and ordered so that consistent and rational decisions can be made. This thesis investigates the alternatives for development of the unreclaimed land at Creston and attempts, through comparative benefit-cost analysis, to determine the optimum future development.

Chapter I describes the undeveloped lands, the objectives of development, and the economic considerations involved. The technique of benefit-cost analysis as it is applied to projects of this kind is outlined in Chapter II. Chapter III examines the present use of the land, and provides an estimate of the values generated by the land in its present state. Chapters IV and V calculate the net economic value of intensive development for agriculture and wildlife-recreation purposes respectively. The estimates of benefits and costs under each alternative are compared in Chapter VI. In Chapter VII the special economic implications of development for the Lower Kootenay Indian Band are investigated, and Chapter VIII is a summary of findings. To simplify presentation, the detailed calculations supporting the analysis are omitted from the main body of the thesis and appear in Appendices A through L.

CHAPTER I

THE UNDEVELOPED LAND AT CRESTON

The land which this report is concerned with adjoins the International Border at the southern end of the Central Kootenay area of British Columbia. By road it is approximately 470 miles east of Vancouver, and 325 miles west of Calgary. Access to the United States is achieved through a border crossing at Rykerts; the highway leads into Idaho with connections throughout the Pacific Northwest region of the United States.

Economic activity in the Central Kootenay region depends primarily on an integrated forest industry, with mining, agriculture, and tourism ranking next in importance (Province of British Columbia 1966). In the immediate area of Creston service industries provide the largest source of employment, although forest industries, agriculture and a small amount of manufacturing account for a greater total of gross income (Province of British Columbia 1970).

The Kootenay River Floodplain and the Undeveloped Land

The Kootenay River flows north into British Columbia at this point, entering Kootenay Lake approximately 20 miles north of the International Border. The total area of the floodplain in British Columbia is approximately 36,000 acres.

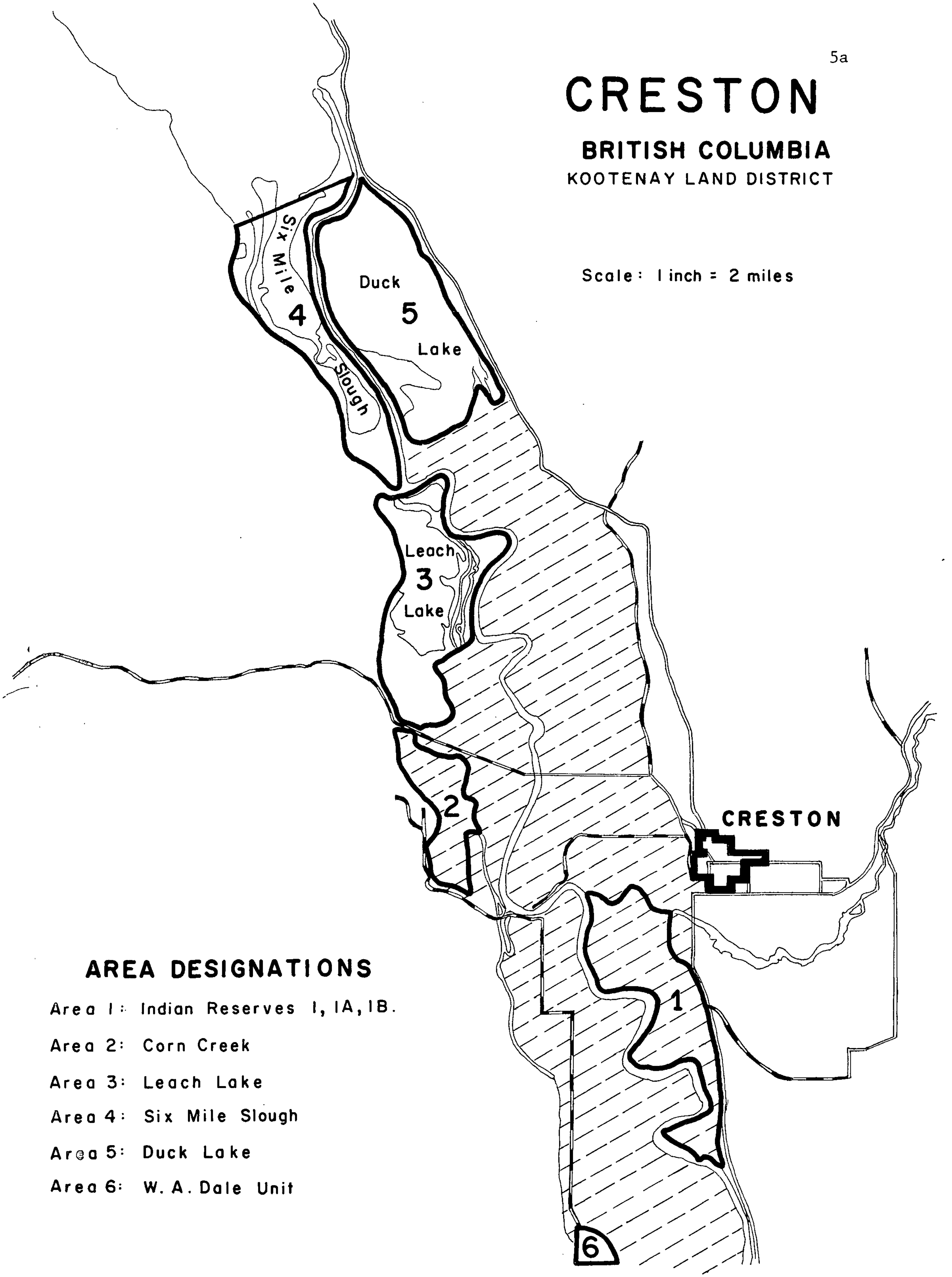
During its spring freshet the Kootenay River overflows its banks and floods the surrounding lowlands (usually during May and June) for a period of up to eight weeks. Any development in this floodplain thus requires the construction of dykes, and installation of pumping and drainage facilities. To date approximately 21,000 acres of this floodplain have been put under agricultural cultivation, behind the protection of an extensive network of dykes. Approximately 15,000 acres remain undeveloped, and these lands constitute the subject of this investigation.

The 15,000 acres which remain undeveloped are in six physically separate areasoor units. These units are shown on the accompanying map, and the approximate acreage of each is presented in Table 1.

TABLE 1

THE UNRECLAIMED LAND: ESTIMATED ACREAGE

UNIT		ESTIMATED ACREAGE
W. H. Dale Unit		200
Indian Reserves (1, 1A, 1B)		3,000
Corn Creek		1,400
Leach Lake		2,900
Six Mile Slough		2,650
Duck Lake		4,700
	Total: All Units	14,850


CRESTON
BRITISH COLUMBIA
KOOTENAY LAND DISTRICT
Scale: 1 inch = 2 miles
Six Mile
4
Slough
Duck
5
Lake
Leach
3
Lake
2
CRESTON
1
6
AREA DESIGNATIONS
Area 1: Indian Reserves 1, 1A, 1B.
Area 2: Corn Creek
Area 3: Leach Lake
Area 4: Six Mile Slough
Area 5: Duck Lake
Area 6: W. A. Dale Unit

The W. H. Dale Unit

Approximately 200 acres in size, this unit is located immediately north of the International Border on the western edge of the floodplain. Except for the peak runoff period when it is flooded by both Boundary Creek and the Kootenay River, most of the land in this unit remains dry. Due to its small area, and the fact that it is cut by a series of old stream channels, this unit has little attraction for intensive agricultural development, and would similarly have a very low priority as a wildlife development project. For these reasons this unit will be omitted from detailed analysis later in this report.

Indian Reserves 1, 1A, and 1B

Indian Reserves 1, 1A and 1B, total approximately 3,000 acres. The Kootenay River forms the boundary on the south and west, while the Goat River bounds the unit on the north. On its eastern border the area terminates in the Lister benchlands, and is also bounded by part of the Goat River flats. Flooded annually by both the Kootenay and Goat Rivers, the area remains relatively dry once the floodwaters recede.

The Corn Creek Unit

This unit lies on the western edge of the floodplain, west of the Nicks Island Dyking District, and south of the Southern Trans-Provincial Highway. The area of this unit is estimated at 1,400 acres. In addition to the annual floodwaters of the Kootenay River, the runoff from the mountains to the west flows through the unit in three major streams -- Corn Creek, French's Slough, and Summit Creek. Although completely flooded during the spring runoff, most of this unit remains dry throughout the rest of the year.

The Leach Lake Unit

The Leach Lake Unit is immediately north of the Corn Creek area, and extends from the mountains in the west to the Nicks Island Dyking District and the Kootenay River. The entire area is flooded every year when the Kootenay River is at peak runoff, and the waters of Summit Creek also enter this area from the west. While roughly one-half of this unit is dry except for the spring flood, the rest remains under water all year and forms a shallow lake known as Leach Lake. Total area in this unit is approximately 2,900 acres.

The Six Mile Slough Unit

This unit is essentially a long narrow island, bounded on the north by Kootenay Lake, and on the west and east by channels of the Kootenay River. The Canadian Pacific Railway embankment forms a barrier across the north end of the unit, separating it from Kootenay Lake. The area in this unit is approximately 2,650 acres. Almost completely flooded during the spring freshet, approximately 1,200 acres of this unit remains dry the rest of the year.

The Duck Lake Unit

Duck Lake, encompassing a total of 4,700 acres, lies on the eastern side of the floodplain across the east channel of the Kootenay River from Six Mile Slough. The area is protected from the Kootenay River by the peripheral dyke of the Duck Lake Dyking District, although it has never been reclaimed. The waters of Duck Creek, which enter the floodplain from the east at Wynndel, are diverted north and enter Duck Lake at its southeast corner. With the exception of several hundred acres of land known as West Point, the entire area is under water year round.

Status of the Undeveloped Land

Two forms of tenure apply to these unreclaimed areas. The Indian Reserves (1, 1A, and 1B) are official Indian Reservations held by the Lower Kootenay Indian Band. Their status is defined under the federal Indian Act.

Except for the W. H. Dale unit the rest of the lands have remained as unalienated provincial Crown land. In 1968 these areas were incorporated under the Creston Valley Wildlife Management Area Act (Province of British Columbia 1968) to be set apart for wildlife conservation, management and development. The Act provides for the establishment of a management authority representing both the British Columbia Fish and Wildlife Branch and the Canadian Wildlife Service.

The W. H. Dale unit, formerly private land, was recently acquired by the British Columbia Fish and Wildlife Branch. This land will be integrated in the Creston Valley Wildlife Management Area.

Implications of the Libby Dam

Construction of Libby Dam on the Kootenay River near Libby, Montana was agreed to under the Columbia River Treaty between the United States and Canada. The primary function of the dam is to generate hydro-electric power, and it is scheduled for completion by 1973. An important secondary function of this dam will be to provide flood control for reclaimed farmlands in the Kootenay River floodplain between Libby and Kootenay Lake.

The effectiveness of the Libby Dam in providing flood control benefits will depend, however, on how it is used to meet power requirements. For this reason a second dam downstream from the Libby Dam is planned for the regulation of stream flow. The function of this second dam will be to control rapid fluctuations in the level of the Kootenay River which could result from periods of peak drawdown on the Libby reservoir.

The combined effect of these dams in regulating the flow of the Kootenay River is the most important factor bearing on the potential development of the floodplain at Creston. In the case of further agricultural reclamation the existence of a degree of control over the Kootenay River reduces the expense of dyke construction, and removes the risk of dykes being breached by unusually high runoff in any year. In the same way the costs of development for intensive wildlife management are greatly reduced. As the date for completion of Libby Dam draws near, pressures for the development and use of the unreclaimed land become more intense.

Opportunities for Development

There are two realistic alternatives for development of the unreclaimed land. It can be brought under agricultural production as has been done with the other land in the floodplain, or it can be developed for wildlife and recreation as envisaged by the Creston Valley Wildlife Management Area Act. In either case the physical structures required are similar.

Agricultural development requires the construction of dykes, development of drainage networks, and installation of pumps and other maintenance facilities. After Libby Dam is built the capital cost of bringing all the land into agricultural production is estimated at $1.3 million.

Development of the land for intensive wildlife and recreational use would closely parallel that of agricultural reclamation. Much the same structures in terms of dykes, drainage, and pumps will be required, but they will be developed more intensively and are much more costly. Full development for wildlife management would see each unit protected from the Kootenay River by a peripheral dyke, just as in agriculture. Behind these dykes water levels would be manipulated to meet the needs of wildlife and recreationists and an extensive network of cross dykes and pumps is planned so that habitat conditions can be varied within each unit. Construction of these cross dykes and additional pumping capacity adds significantly to the costs of wildlife development. In addition since the units will remain under water most of the time, access has to be provided along the dykes. This requires a much wider and more expensive dyke than for farming purposes where access is achieved by roads within each area. For these reasons the total capital cost of the wildlife development plan, including the construction of an administrative centre, is estimated at $1.96 million. In addition to these capital costs, maintenance and salary expenses will be high, approximately $134,000 per year after 1978.

The Objectives of Development

Selecting the optimum form of development for this land requires careful analysis of each alternative in the light of explicit objectives. Two forms of development for this land are possible, and the incidence of benefits and costs under each will differ significantly. In addition two forms of tenure apply to the land and the objectives to be served will vary accordingly. The objectives which are adopted in this study are discussed separately for each form of tenure. These objectives are critical to the conclusions drawn from the analysis of the study.

Development of Crown Land

Development of Crown land in the Creston Valley Wildlife Management Area should proceed in the manner which maximizes the net benefits to the citizens of British Columbia, for whom it is held in trust. In choosing between the two possible developments the appropriate framework thus becomes that of the entire province.

The development which maximizes net benefits to British Columbia may also be that which maximizes the net benefit to the local area or to Canada as a whole, but this will not necessarily be the case. The relevant costs and benefits to be considered differ when the viewpoint is changed from one jurisdiction to another as is demonstrated in this study. Despite these differences a choice between the alternatives should be based on the net gains to British Columbia; considerations involving only the local economy, or the larger national economy, should not affect the choice of development.

Development of Indian Reserves 1, 1A, and 1B

Unlike the undeveloped Crown lands, tenure over the Indian Reserves is vested in the Lower Kootenay Indian Band. This pattern of ownership removes the Indian Lands from the category of a publicly owned resource and puts them on the same footing as any privately owned land.

A private owner would be expected to put his land to that use which maximized his net financial return. The same type of behaviour would be expected from the Indians except for two reasons. The Indians themselves are not culturally or socially conditioned to assume an entreprenurial role in terms of a major development project, and the Department of Indian Affairs has retained a degree of control over financial and land management affairs.

While it is maintained that the Indian Band is the appropriate referent group for selecting a development program, it should be acknowledged at the same time that any development is not likely to be undertaken by the Indians themselves, but by outside interests. We would, therefore, expect the Indians to choose whatever development maximized their net gain -- without regard to the impact on the local, provincial or national economy.

It is difficult to forecast which form of development would be chosen by the Indians as the extent to which they will benefit from any alternative depends largely on their strength in bargaining with an outside developer. We can draw some inferences regarding the amount and type of benefit which the Indians might expect from the alternatives, but their share cannot be determined with any certainty. What we can be more certain about is the total benefit from either development of the Indian lands and the respective impacts on other sectors of the economy.

Taking these matters into account the approach adopted in this study is to assess the overall distribution of the benefits and costs of any development of the Indian Reserves -- not the net gain to the Indians alone. While benefits to the Indians remain the basic criterion for a choice among alternatives, we are able to estimate in addition the net benefits which would accrue to other sectors from development of the Indian Reserves, and hence the overall economic feasibility of any investment.

Summary: Prospects for the Undeveloped Land

Completion of Libby Dam, expected by 1973, will greatly enhance the prospects for further development in the Kootenay River floodplain at Creston. This study will examine two alternative uses for presently undeveloped land; agriculture or wildlife-recreation.

The undeveloped land has a rich potential and prospects are that either type of development could yield a substantial level of net benefit. Choosing the best or most desirable alternative requires that the respective benefits and costs of each be logically ordered for comparison. Benefit cost analysis will be used for this purpose and as a guide to decision making.

Choosing between alternatives also requires a clear understanding of the objectives to be met through development. The objectives adopted in this study vary due to the different forms of tenure over the undeveloped land. For provincial Crown land it is assumed that the objective of development is to maximize the net benefits to the Province of

British Columbia. For the Indian Reserves it is assumed that the objective is to maximize the net benefits to the Indians. In both cases the implications of the alternative developments for the local and national economies will also be examined.

CHAPTER II

BENEFIT-COST ANALYSIS IN LAND USE PLANNING

Planning the future use of the undeveloped land at Creston requires choosing from the technically feasible alternatives. The problem is to choose that alternative, or combination of alternatives, which will generate the greatest excess of benefits over costs for those in whose interest the resources are managed. Benefit-cost analysis is a technique used to measure the economic feasibility of investment or resource development projects. The analysis of individual projects is carried out so that the results are directly comparable with analyses of other projects. When alternative uses for a basic land resource are analyzed in this way, it is possible to determine which use yields the greatest overall net gain to society.

Measuring the total net gain to society requires that all costs and all benefits from any development be considered and set off against one another to measure the net gain (or loss). This implies taking a very broad view of any project and considering all the real costs and benefits, in addition to purely financial ones. Real costs or benefits include purely financial measures, but go beyond them to include other effects of a development not directly reflected in project costs or benefits. In the case of a hydro-electric development, for example, in addition to purely financial costs of construction, other real costs may be incurred if recreational opportunities are destroyed or if timber producing land is flooded. An adequate benefit-cost analysis, in considering such factors, must be more comprehensive than a purely financial analysis. By considering all real costs and benefits it is possible that the conclusions of a benefit-cost analysis regarding the feasibility of any project could differ from the conclusions reached through a purely financial analysis. Only when a comprehensive benefit-cost framework is used can we be assured of realizing the maximum benefit through development of our natural resources.

Measures of Benefits and Costs

When conducting an analysis from such a broad viewpoint it is important that measures of cost and benefit are rigorously ordered and defined so that only appropriate benefits and costs are compared. To facilitate this economists classify the benefits and costs associated with a project in two categories: primary and secondary (Sewell *et al* 1962, United States Government 1962, Prest and Turvey 1965).

Primary costs and benefits are those directly associated with a project. They include such things as the direct costs of construction plus any other direct real costs -- benefits include all real benefits which are created as the primary output of the project.

Secondary costs and benefits are those which stem indirectly from, or are induced by, the main project. If, for example, a processing industry is established to handle the primary output of a project, then that industry's output constitutes a secondary benefit while its operating costs are secondary costs.

Within these two categories the extent to which the benefits and costs are amenable to economic evaluation will vary. Goods and services which are normally exchanged through the market pose no evaluation problems. The value of such commodities is registered by their prices and they are referred to as tangible benefits or costs. Other goods and services are not usually exchanged through a market, although they may be measurable in monetary terms by procedures which attribute a value to them. Such benefits and costs are referred to as intangible.

A third distinction is drawn for costs or benefits which are considered unmeasurable since they cannot be quantified in monetary terms. (Sewell *et al* 1962, p. 6). These three distinctions, deriving from the extent to which benefits and costs are amenable to economic evaluation, apply equally at the primary and secondary levels.

Comparison of Benefits and Costs

To determine whether a project is feasible the estimates of primary and secondary benefits are compared with the estimates of primary and secondary costs. The objective of this comparison is to determine a) the net benefit (or loss) from a project, taken as total benefits minus total costs; and b) the relative efficiency of the project as measured by the ratio of total benefits to total costs.

In making these comparisons the immediate problem which is encountered is that benefits and costs may occur at widely varying times. The heaviest project costs are most often incurred initially, followed by annual costs for maintenance and repair. The benefits of a project are seldom realized immediately. Benefits commonly accrue in annual increments over a project's life, frequently in an irregular pattern. The problem which must then be dealt with is one of comparing costs which are incurred in one pattern through time with benefits which accrue in a different time pattern.

To deal with these problems, all estimates of costs and benefits are reduced to present values in a base year through the process of discounting. The discounting procedure allows for the fact that a dollar of benefit or cost in the future does not have the same value as a dollar of benefit or cost at present. Future values are therefore discounted back to their 'present value equivalents' so that costs and benefits occurring at different times in the future and in different amounts can be made directly comparable in terms of their values at the present.

Selection of an appropriate discount or interest rate is an important matter in any benefit-cost analysis. A low discount rate reduces future values much less than a high discount rate. It is conceivable, therefore, that for a project requiring a heavy initial capital outlay, with benefits dispersed over a long period of time, changing from a high to a low discount rate could alter the outcome of feasibility studies. Proper selection of a discount rate remains largely a political decision, although for purposes of evaluating public projects, the interest rate paid by the relevant government on long-term bonds is often adopted as an acceptable proxy.

Criteria for Decision Making

When all benefits and costs have been estimated and discounted to an equivalent basis, they are then compared to determine whether or not a given project is feasible. Two basic measures result from this comparison: (a) a measure of net benefit (or loss) determined by subtracting total costs from total benefits; and (b) the benefit-cost ratio, determined by dividing total benefits by total costs.

Many of the basic questions surrounding any natural resource development can be answered with the aid of these measures. Some of the questions which can be answered include:

1. The basic question of a project's feasibility.

2. The optimum size for any project considered by itself.

3. The most efficient allocation of a given allotment of funds over several development projects.

4. The optimum choice between two competing projects or mutually exclusive alternatives for the same site.

The appropriate criteria for answers to these questions may differ and can be quite involved. At this point discussion will be restricted to the fourth question as it summarizes the central object of this study.

The basis for choosing between competing projects or mutually exclusive alternatives for any particular resource should be the maximum net benefit generated by each alternative (Prest and Turvey 1965, p. 704). By examining each of the technically possible resource uses in turn, it is possible to select that which makes the greatest net contribution to society's welfare.

The Referent Group, or Viewpoint for Analysis

A final important point is the matter of the referent group or the viewpoint from which a benefit-cost analysis is undertaken. This is important, particularly in the study of undeveloped land at Creston, since what constitute benefits or costs from the point of view of one region may not be similarly classed from the viewpoint of a different jurisdiction. The effect on the benefit-cost comparison of changing the referent group is demonstrated in this study by assuming three different viewpoints, namely the local Creston area, British Columbia, and Canada. With the significant effect which changes in the viewpoint have on the outcome of the benefit-cost comparison, it is critical that the appropriate referent group be unequivocally established before any decisions are taken.

Benefit-Cost Analysis in this Study

In this study benefit-cost analysis is applied to the problem of selecting the best use for undeveloped land in the Kootenay River floodplain at Creston, British Columbia. The alternatives are to leave the land in its present state, to develop it for agriculture, or to develop it for wildlife management and recreation. A brief investigation reveals that continuing with present use is an undesirable alternative -- the range of choice being narrowed to agriculture or wildlife and recreation.

Application of benefit-cost analysis to agricultural developments is a standard economic procedure. The capital costs of reclaiming the land and putting it into production are estimated. The annual profits from agricultural production are estimated, discounted to present values, and compared with costs to assess the project's feasibility. While problems are encountered in estimating both costs and benefits, the procedure is relatively standard and represents nothing new in the application of economics to resource management problems.

Using benefit-cost analysis in the case of the wildlife development alternative is much more innovative. The basic approach is the same, beginning with an estimate of the costs of development. Problems are encountered in estimating benefits to compare with costs, however, and new techniques must be employed. Recreational use is not easily predicted, and benefits are difficult to evaluate. We are forced first to derive estimates of use and then impute values to that use. The evaluation of recreation remains a relatively undeveloped area in economics, and the assumptions underlying the values adopted in this study are discussed at length in Appendix I.

Emphasis here is restricted to the fact that this represents a relatively new approach in the application of economics to resource management problems, and that if anything it fails to give full measure to the values associated with wildlife and recreation. Quantification and evaluation in this area remain difficult. In any case, quantification and evaluation is possible for only some of the values -- many of the important values associated with wildlife remain as unmeasurable and are appended to the overall results.

CHAPTER III

PRESENT USE OF THE UNDEVELOPED LAND

It was noted earlier that continuing with the present use of the undeveloped land does not present an attractive alternative -- utilization is light, and benefits apparently small. But the land is used in its present state, albeit extensively, and any new regime involving intensive development would displace present users. To the extent that present uses are displaced by new developments losses may be incurred. A complete assessment of any development would have to take such losses into account, deducting them from any benefits generated. Similarly, where an intensive development involves the continuation and improvement of some aspects of present use the total output should not be credited to the development, only the incremental output. Thus, while continuing with present patterns of use may not be an attractive alternative in itself, some knowledge of present use and the associated benefits and costs is required for a comprehensive analysis of proposed developments.

In its present state the undeveloped land affords seasonal grazing for beef cattle and recreational opportunities for waterfowl hunters, fishermen and naturalists. It also provides a key stopover for large numbers of migratory waterfowl, and provides nesting habitat for some important wildlife species, such as the osprey. Additional aspects of present use include a limited harvest of furs (muskrat and beaver), and the provision of water storage insofar as the area holds overflow water from the Kootenay River during its freshet. A summary of the extent and significance of these uses is presented here to provide a benchmark against which changes can be measured, and to indicate the losses which might be incurred by present users under a new form of use.

Present Agricultural Use

Seasonal grazing of beef cattle is the only form of agriculture at present on the unreclaimed land. Administration and management differs among the various units. Private negotiations are made between the graziers and landlords in the case of W. H. Dale Unit and the Indian Reserves, while grazing in the Corn Creek and Leach Lake areas is under Forest Service permit. On Six Mile Slough the grazing is covered by lease from the Lands Department, while grazing around Duck Lake is trespass grazing.

The total amount of seasonal grazing afforded by the unreclaimed land is summarized in Table 2. Approximately 1,200 cattle are grazed on the unreclaimed land every summer, the length of the grazing season varying with weather conditions and water levels.

TABLE 2

SUMMARY OF GRAZING,* UNRECLAIMED LAND, 1968

A R E A	NO. OF CATTLE GRAZED	NO. OF A.U.M.S** GRAZING
D a l e	40	200
Indian Reserves	370	1,485
Corn Creek and Leach Lake	550	2,208
Six Mile Slough***	100	500
Duck Lake	110	600
Total	1,180	4,993

*The few horses grazed are ignored in this summary.

**An animal-unit month (A.U.M.) of grazing is defined as one mature cow grazing for one month. Cows with calves under 6 months of age are considered as one animal unit. Yearlings or steers over 6 months constitute one animal unit.

***Average level of use in recent years. This overstates current use which has been affected by change in the ownership of the lease.

Economic Implications of Extensive Grazing

Cattle grazing on the unreclaimed land is not an intensive form of land use. Nevertheless, it is important to those persons whose incomes are enhanced by it, and it does generate a small amount of economic activity in the area. To assess the economic significance of this grazing, a brief survey of cattle graziers in the area was conducted in the fall of 1968. The results of this investigation will be summarized very briefly.

Size of herds.--Few of the beef operations are of economic significance. Only 10 of the 32 farm operators grazing cattle on unreclaimed land grazed more than 50 head. The distribution of farm operations by the number of cattle grazed is summarized in Table 3.

TABLE 3

FARM OPERATORS BY NUMBER OF CATTLE GRAZED

NO. OF CATTLE GRAZED	NO. OF FARMS
More than 100	2
50 - 100	8
21 - 49	9
10 - 20	4
Less than 10	9
Total number of farms	32

Due to the scarcity of summer grazing in the Creston area, all operators depend heavily on this grazing to maintain cow-calf operations. All operators indicated that without this grazing they would have to abandon cow-calf operations, and if they were to remain in beef production would have to switch to feed-lot operations.

Income and investment.--Few farm operators depend heavily on their grazing-oriented beef operations as a source of income. Only 10 graziers depended solely on farming for their incomes, four of these depending entirely on beef cattle, the other six being in mixed farming including hay, grain, and dairying.

Net earnings from these beef operations are generally very low, and in few cases does the farm operator earn enough to compensate for the value of his labor and pay a return on his investment. Total current revenue from the sale of cattle dependent on grazing the unreclaimed land is estimated at $124,770 in 1968. Of this, $85,090 or 68.2 per cent was required to meet current operating expenses, leaving a current profit of $39,680. This amount is available to farm operators to pay a return on their investment and compensate for their labor.

Investment in beef operations averaged $49,000 and ranged from $14,500 to $108,000. On the average 42 per cent of this investment was in land, 12 per cent in buildings, 17 per cent in machinery and equipment, and 29 per cent in the basic herd. Operators grazing more than 20 cattle on the unreclaimed land had a total of $927,000 invested in their beef operations in 1968.*

Net Economic Returns

The current operating profit of $39,680 calculated above represents a rate of return of 4.3 per cent on this capital, without allowing

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*With the exception of a few farms on the benchlands west of the Corn Creek unit, most of this investment is not irrevocably tied to a cow-calf type of beef operation. Buildings, machinery, and equipment could be adapted to alternative agricultural uses, as could most of for the value of the operators' labor input. This indicates that the farm operators in fact incur a *net economic loss* by committing capital to their beef enterprise. If instead they had invested their capital at the easily obtained rate of six per cent, they would have earned $15,940 more than the net profit from their cattle enterprises. In addition, they would have been able to earn a return on the labor otherwise devoted to cattle raising by seeking alternative sources of employment.

It should be noted that these are total figures, and conceal within them the range of profitability of various operations. However, they do point out the fact that in their present form the beef cattle operations depending on unreclaimed land for grazing provide no positive economic gain to the community -- the output being worth less, in real terms, than the inputs required to produce it. Indeed, the figures presented above probably understate the net loss as they do not include public expenses made for cattleguards and range management in the Corn Creek and Leach Lake units.

Findings such as these, with factors earning less than they could in alternative employment, are not uncommon in agriculture where the industry has been very slow in making long-run adjustments to changing market conditions. A study of beef operations by the British Columbia Department of Agriculture showed that in 1967 the return on capital

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the privately owned land. Indeed, much of the land used in these cow-calf operations appears to be more highly valued in some alternative form of agricultural production.

of less than $50,000 was -5.60 per cent, on capital between $50,000 and $100,000 - 0.12 per cent, and on capital in excess of $100,000 2.28 per cent. Cow-calf operations showed a return to capital of -3.15 per cent (Province of British Columbia 1968a). The low returns earned at Creston can be expected in view of the fact that the area is not well suited to cow-calf operations, grazing is of poor quality, and the grazing is poorly managed and divided among small farm operations.

Prospects of Continued Agricultural Use

Extensive cattle grazing on the unreclaimed land yields no net benefit when the true economic costs are considered. After allowing for the real cost of capital and labor, it can readily be demonstrated that the real cost of inputs exceeds the value of output. This conclusion is supported by other beef studies done in British Columbia.

Were this grazing continued in its present form there is little likelihood of any significant change in these relationships. A major reorganization of the available grazing might give scope for improved performance if small inefficient operations could be eliminated, allowing expansion of well managed economic units. This appears highly unlikely however, the farm operators are not very co-operative among themselves, and the diverse forms of tenure over the land are not conducive to co-ordinated management.

The effect of the Libby Dam on this form of land use is likely to be negligible. While the peak flood levels of the Kootenay River will be reduced after Libby Dam is completed, without dykes the unreclaimed lands will still flood annually. If, as appears likely, the period of flooding is prolonged but at lower levels after Libby Dam is completed it may have the effect of reducing the area available for grazing, or the grazing season, or both.

Present Recreational Use

Many persons use the unreclaimed land on the Creston flats for recreational purposes. This recreation includes sporadic use by bird watchers and others for nature observation, warmwater sportsfishing in Duck Lake, and bird hunting during the fall season. While data on this recreational use is far from precise, reasonably accurate estimates of use have been gleaned from several sources and are reviewed here.

Bird Hunting

Much of the unreclaimed land is used by hunters during the fall hunting season each year. Hunters pursue migratory birds (ducks, geese, and doves) and a small resident population of pheasants. Hunting is done on private reclaimed farm land, as well as on the Indian Reserves and Crown land.

No information was available on the extent of this hunting activity in past years. To provide accurate data for an assessment of recreational use of unreclaimed land in the area, a mail survey was conducted of hunters using the area in the 1968 hunting season. Detailed results of this survey are presented in Appendix F. The analysis of recreational use presented here is based on the findings of that survey.

During the 1968 hunting season 661 persons hunted birds on the Creston flats. Local hunters from the Creston area accounted for 242 hunters, there were 391 non-local hunters from other centres in British Columbia, and 28 hunters from the United States.

These hunters spent a total of 6,350 hunter days at their sport in 1968. Not all hunting was done, however, on unreclaimed land. Table 4 summarizes the distribution of this hunting activity among the various lands open to hunters. Hunting on private land accounted for 24 per cent of the total. Hunting on unreclaimed land was confined almost solely to Crown land, as only 105 hunter days were spent on the Indian Reserves.

TABLE 4

DISTRIBUTION OF BIRD HUNTING ACTIVITY, 1968

ORIGIN OF HUNTERS	PLACE OF HUNTING ACTIVITY (Hunter Days)		
	CROWN LAND	PRIVATE FARM LAND	INDIAN RESERVE
Local	2,055	906	88
Non-Local	2,394	641	15
Foreign	248	4	2
Total Hunter Days	4,697	1,551	105

Warmwater Sport Fishing

The warmwater sportfishery is confined to the waters of Duck Lake. Present utilization is somewhat restricted by the lack of easy access to the area, and the difficulty of launching boats. Fishermen are mainly residents of the local area, although some fishing is done by non-residents during the tourist season. The fish sought include bass, perch, and sunfish, the season of use extending for about 25 weeks from May to October.

Accurate data are not available on the extent of this fishing activity, and practical difficulties prevented surveying fishermen as had been done with hunters. The best estimates of the extent of utilization are based on personal observation by the staff of the Fish and Wildlife Branch at Creston, supplemented by conversations with several persons who fish the area frequently. On this basis it is estimated that the fishery supports 28 fisherman-days of use per week over the 25 week period when fishermen are active. Annual utilization is thus estimated to be approximately 700 fisherman days.

Bird Watching and Nature Observation

Further recreational use of the unreclaimed land is made by bird watchers and other persons for the simple purpose of observing nature. Even less is known about the activities of these recreationists than is known about sportsfishermen. The nature of such activity takes participants out of the range of ordinary observation and makes it difficult to estimate the extent of their activity.

There are two main attractions for such recreational activities. One is the annual migration of waterfowl through the area, highlighted by the presence of large numbers of whistling swans.* A second attrac-

*The Creston Valley is often referred to as the "Valley of the Swans."

tion is the presence of a large breeding population of ospreys which can be observed with relative ease fishing in the shallow waters of the unreclaimed land. In addition to these relatively rare birds, a wide variety of the more common species can also be observed throughout the area.

It is estimated that the unreclaimed lands support approximately 150 days of recreational use in this form annually. This estimate is presented on the basis of personal observation, and observations by Fish and Wildlife Branch personnel at Creston.

Economic Implications of Present Recreational Use

Any discussion of the economic implication of outdoor recreation must be pursued with caution. When land is set aside for recreational use its 'product' consists of opportunities for recreational enjoyment. Unlike most products in our economy, we do not commonly sell opportunities for wildlife-oriented recreation, so there is no well established measure of their value. If we are to talk about the primary benefit, or value, of recreational opportunities we must estimate what these opportunities are worth to people who are not required to pay for them. The evaluation of non-priced recreational opportunities has been the subject of considerable economic research in recent years, and two main approaches to the problem have evolved (Knetsch and Davis 1966, Pearse and Bowden 1969).

In the survey of bird hunters on the Creston flats, an attempt was made to determine the value of the hunting opportunities in the 1968 season. This is reported in detail in Appendix F. Using the approach adopted in this survey, the average value of a day spent hunting is estimated to be $4.50.

By applying this estimate of the daily value of a recreational opportunity to fishing and nature observation as well as hunting, we can estimate the primary benefit derived from recreational opportunities on the unreclaimed lands. A total of 4,802 hunter-days were spent on unreclaimed land in 1968, in addition to the estimated 700 fishermen-days and 150 days spent in nature observation. This total of 5,652 days of recreation has an estimated value of $25,490.

The primary costs associated with this recreation are negligible. There are no direct costs in connection with the 'production' of recreation opportunities. There will be some small expense insofar as policing of hunters and fishermen is required. Since Fish and Wildlife Branch staff would be required at Creston even if there were no fishing or hunting done on the flats, the appropriate measure of expense in this regard is the extra amount spent policing bird hunters and fishermen. This is probably less than $500 per year. The value of the net primary benefit from recreational use of the unreclaimed land is thus approximately $25,000 annually. Assuming a constant level of use through time, this has a present value of $312,000 when discounted at eight per cent.*

Libby Dam will not have any appreciable effect on recreational use of unreclaimed land. The warmwater fishery in Duck Lake is protected from the Kootenay River by dykes at present and will not be

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*Based on the preceding analysis of recreational activity during 1968. This assumes that activity during 1968 was typical, or representative of an average year.

affected by changes in the peak period flow, and the activity of bird watchers and others should also be unchanged.

The Undeveloped Land as Wildlife Habitat

The examination of present use of the unreclaimed land has so far been concentrated on direct use by people for farming and recreation. The role which these lands play as key habitat for many species of wildlife must also be considered as a very important "use." The unreclaimed lands provide important habitat for migratory waterfowl (ducks, geese and swans), a large colony of herons, a nesting population of ospreys, and many other species of wildlife.

Wildlife Habitat as a Form of Land Use

At first glance it may seem inappropriate to refer to land which provides habitat for wildlife as being "in use." Unlike the uses discussed previously, this does not involve direct participation by people, and we have become conditioned to considering land which is not under direct utilization as 'waste' or 'barren.' But it must be recognized that there is a certain value created by land which simply provides habitat or living space for wildlife -- and that this is a value *over and above* any values based on direct recreational participation.

Expression of these values can be observed at many levels. In the government sector they are expressed in the protection and management activities of Wildlife Agencies -- one of the basic functions of wildlife management being "the maintenance of certain species at desired population levels, and the preservation of species from extinction"

(Wright 1968). In the private sector there are many organizations dedicated to the preservation of wildlife through habitat management, Ducks Unlimited being perhaps the best known in North America. A recent example specific to British Columbia involves the purchase by private citizens of land in the Okanagan Valley to provide wintering habitat for Bighorn sheep.

In the case of migratory species, recognition and protection of these values requires international co-operation. The Migratory Birds Treaty between Canada and the United States which was signed in 1916 is designed to bring about co-operation in the management of migratory species between the two countries. Canada's fulfilment of her obligations under this treaty is carried out under the Migratory Birds Convention Act of 1917. The contribution of the unreclaimed lands at Creston in maintaining wildlife populations, and providing key habitat for migratory birds, represents an important factor in Canada's fulfilment of obligations under the Migratory Birds Treaty. This is another important aspect of the values associated with "using" land as wildlife habitat.

Utilization by Wildlife

Estimating the numbers of the various species of wildlife using the habitat at Creston is very difficult. Waterfowl use is almost exclusively during migration and as a summer staging area for moulting birds. Few ducks or geese nest successfully in the area, as most nests are destroyed by the annual flood of the Kootenay River. The few exceptions include tree nesting species (wood duck and goldeneye) and a few nests located above high water mark.

Migratory use is intensive, however. Whistling swans pass through in large numbers during their spring migration, returning in late fall and winter. At present approximately 3,000 swans use the area for an average of 60 days each -- an annual total of 180,000 swan-use-days. Canada geese also make extended use of the area, with as many as 3,000 geese in the area at one time. Total goose-days of use is estimated at 180,000, an average of 60 days per goose. Duck use is much higher, during both spring and fall migrations. As many as 70,000 ducks may be in the area on any one day achieving a total utilization of 4,200,000 days at an average of 60 days per duck. Coots are also numerous in the area, with annual use of approximately 1,500,000 days by 15,000 coots.

There is a relatively large osprey colony in the area, containing approximately 25 nesting pairs. These birds are in the area for approximately six months each year, rearing an average of three young per nest. The total population of ospreys in this area appears to be relatively stable.

There is also a large colony of herons in the area, with as many as 80 nesting pairs. As with the ospreys these birds appear to be relatively constant in number, having reached the carrying capacity of available habitat.

The Value of Wildlife Habitat

We can recognize the values associated with such wildlife habitat, but it is impossible to place an *absolute* estimate, in terms of dollars, on this value. It is possible to talk about the *relative* values, based on the importance and scarcity of the different species using the area as habitat, but such relative values cannot be compared directly with the values created by other resource uses.

The 'relative value' of maintaining additional numbers of a particular wildlife species depends to a large extent on the overall abundance of that species. With a very common species, the value of one extra animal or bird is generally low. For rare species the value of an extra animal tends to be high as it takes on a much greater significance in relation to "desired population levels." This is exemplified by the Whooping Crane in North America where the value of an extra bird is unquestionably very high, both in relation to other wildlife species, and to other resource uses which might compete for their habitat.

The relative scarcity of the bird species found at Creston is important in describing the value of wildlife habitat as a form of land use. The undeveloped lands provide excellent habitat for many birds, probably the most important of which are ducks, geese, swans, and ospreys. The relative abundance of these four species provides a good illustration of the importance of scarcity in determining the value of habitat use. Ducks are quite common throughout North America, and the value of an extra duck, compared to other species, would be quite low. Geese are much less common than ducks, and an extra goose might be given a value as much as 15 to 20 times that of a duck. Swans in turn are even rarer and the value of a swan relative to either ducks or geese would be very high. For each of these waterfowl species the unreclaimed lands at Creston provide important habitat, and form a key link in their migration routes.

The unreclaimed lands also provide important nesting habitat for a colony of ospreys, or fish hawks. Like many species of predatory birds the continental population of ospreys has declined drastically in recent years (Peterson 1969). The natural rarity of these birds, plus their 'endangered' status, makes them exceptionally valuable. The undeveloped lands provide ideal habitat for ospreys, and this form of wildlife use gives the habitat a very high relative value.

While these birds comprise the four major species utilizing the undeveloped land, its importance to the heron colony, songbirds, shorebirds, coots, hawks and owls, as well as deer, muskrats, mink and beaver should not be overlooked.

Left in its present state the land provides a partial guarantee to the continued survival of many of these species. Loss of this habitat would mean a significant reduction in the numbers of most waterfowl and the probable elimination of the osprey population. We are unable to attribute any absolute value to this function of the land, other than a recognition of its relatively high value given the species which depend on it. In the same context preservation of this habitat makes an important contribution to Canada's fulfilment of obligations under the Migratory Birds Treaty.

The impending completion of Libby Dam will probably have little effect on the utilization of this habitat by wildlife. While extreme variations in the level of the Kootenay River will be reduced, the area will still be inundated annually, and nesting habitat will not improve. Migratory birds passing through the area in early spring and late fall will not be affected, and summer residents such as ospreys and herons will also be unaffected.

Other Uses of the Undeveloped Land

Other uses of the undeveloped land at present include a small annual fur harvest taken by trappers, and its function as a water storage area during high water on the Kootenay River each summer.

Fur Production

Fur bearing species on the undeveloped lands include beaver, muskrat, and mink, with muskrat most numerous. Utilization by trappers is slight. Data collected from several persons trapping in the area indicates that the gross value of furs harvested on the undeveloped lands seldom exceeds $1,000 annually.

Incomes from trapping have been low throughout British Columbia in recent years (Newby 1969), and the returns from trapping at Creston are no exception. Disregarding the value of the labor input in trapping, the net income from the fur harvest on the undeveloped land is approximately $800 per year.

Water Storage

In another present function the unreclaimed lands provide water storage by absorbing flood waters during the annual freshet of the Kootenay River. As the river rises during runoff it overflows and inundates the unreclaimed land. Dispersal of the freshet waters over this area relieves part of the pressure on dykes in the Creston area and also lowers the floodcrest for areas downstream. While Duck

Lake does not absorb water from the Kootenay River directly, it does contain the runoff from Duck Creek and serves the same purpose of relieving pressure on downstream areas.

The value of this storage depends on many factors within the whole watershed (Krutilla 1961, 1967). It is the increment in water storage or flood protection afforded by a particular area, in relation to total river basin needs, that is important in determining its value. After the completion of Libby Dam the incremental storage provided on the unreclaimed lands will be of little significance to overall river basin needs. For practical purposes the value of water storage, if present land use is continued, can safely be ignored.

Summary, Present Use of the Undeveloped Land

This chapter reviews the extent to which the undeveloped land is used at present and provides a benchmark against which the gains or losses of alternative developments can be measured. Present patterns of use yield little measurable net benefit. In the case of cattle grazing there is actually a net loss when all economic costs are considered, and the net gain from recreation is small -- approximately $25,000 per year. The exception to this assessment is the use of the unreclaimed land as wildlife habitat. While there is no way of measuring the absolute value of this form of land use, it is asserted that the scarcity of the various species relying on this habitat gives it a very high relative value.

The completion of Libby Dam will enhance the feasibility of alternative, more intensive, uses of this land. Since the net benefits from present use are low, any move toward a form of utilization which yields a significant net benefit is to be desired. In assessing the feasibility of alternatives, this discussion of present use should not be regarded as irrelevant. To determine whether in fact a development generates a net benefit its impact on present use must be considered. While there would apparently be no net economic loss from the elimination of cattle grazing, there would be a serious and substantial loss were the wildlife habitat destroyed. These factors will be considered in analysis of the overall feasibility of the alternatives for development.

CHAPTER IV

AGRICULTURAL RECLAMATION AS A DEVELOPMENT ALTERNATIVE

Further reclamation and agricultural production on the undeveloped land at Creston is technically feasible. Assessing the economic feasibility of further reclamation projects requires that the benefits generated be compared with the costs. The capital costs of reclamation will be incurred over a very short time at the commencement of any project, while the benefits generated will accrue through the future in the form of annual profits from the sale of farm produce. Estimating the future level of annual benefits is difficult, and the most fruitful approach at Creston is to examine the benefits which accrue from presently reclaimed land. These benefits can then be used as the basis for estimates regarding further reclamation and agricultural production and compared with reclamation costs to determine the feasibility of such undertakings.

These comparisons are made in this chapter. Data relating to the net incomes of farms on presently reclaimed land are compared with the estimated costs of reclamation. Such comparisons are awkward; in addition to easily measured tangible benefits and costs some important effects of agricultural reclamation are intangible, although monetary values are attributed to them, and further effects are unmeasurable (Sewell *et al* 1962, p. 6). Furthermore, while tangible primary benefits and costs can easily be compared for individual reclamation units, intangible and unmeasurable effects are not readily divisible on the same basis.

In an attempt to draw some order out of the resulting chaos comparisons for each unit will be based on tangible primary benefits and costs only. While this constitutes only a partial benefit-cost comparison such measures are the only firm estimates which can be compared on this basis, and they do reflect the basic feasibility of reclaiming each unit as well as demonstrating the different merits of individual units. Qualifications to these comparisons are then introduced, before turning to intangible and unmeasurable primary benefits and costs and secondary benefits and costs. These latter effects are discussed for the entire unreclaimed land and the aggregate benefit-cost relationship is then demonstrated from the viewpoint of the local economy, British Columbia, and Canada.

Productivity of the Soils

Of the many assumptions underlying the analysis of this chapter perhaps the most important is that productivity of new farms will be similar to that in existing reclamation units -- an assumption that soil types are uniform throughout the floodplain. There has been no intensive soil survey on the Creston flats. The only soil map which is available was completed in January of 1949 for the B.C. Department of Agriculture by C. C. Kelly, Surveyor, and J. S. D. Smith, Assistant. This map classified most of the soil as Kuskanook, a silty clay soil, while some, primarily in the Goat River outwash, is classed as Wigwam Mix, having more gravel and sand than the Kuskanook soil. While slight variations in these soil types were observed throughout the area, they were not felt to be significant for mapping purposes.

Soils throughout the reclaimed areas have proven to be fertile, and produce heavy crop yields (see Appendix C). There is, however, a slight decline in fertility and suitability for agriculture the further north the soils from the International Border. Soils in the south are older, contain more humus, and are better drained than the more recently deposited soils near Kootenay Lake, which tend to be of a heavier clay. Were there an active market for land in this area, these differences might be reflected in land values; however, land changes hands so infrequently that no systematic measure of this difference is available.

For this analysis the initial assumption will be that soils in the unreclaimed areas are uniform and of the same quality as presently reclaimed soils. Insofar as the data pertaining to productivity are based on an average of all present reclamation units this assumption is valid. Later, discussion will deal with qualifications to this assumption and variation between soils in the undeveloped areas.

Comparison of Primary Benefits and Costs by Area

Determining the economic feasibility of proposed reclamation projects requires that the present worth of all expected benefits be compared with the present worth of all costs. If the benefits exceed the costs the project is economically feasible. Feasibility can be measured in terms of the net benefits (the excess of the present value of benefits over the present value of costs) or in terms of a benefit-cost ratio (ratio of the present value of benefits to the present value of costs). Both of these measures are employed in examining the economic feasibility of reclamation on the five areas of unreclaimed land. As explained, these comparisons are based on estimates of tangible primary costs and benefits only.

Tangible Primary Benefits

Tangible primary benefits will consist of increases in net incomes of farmers using the land and will be realized annually throughout the life of the project. These benefits must be discounted to a present value to be comparable with reclamation costs which are incurred in the initial year of the project. Choosing the appropriate discount rate is of major importance. In this analysis a rate of eight per cent is used. Selection of this rate, and the sensitivity of the results to changes over a range from six to ten per cent, is discussed in Appendix E.

To prepare estimates of primary benefits from further agricultural reclamation data was obtained on the current production and income structure of farms on reclaimed land. The inherent assumption is that future production on additional unreclaimed land will be similar in nature to that on presently reclaimed land. While the presentation of most of this data has been relegated to appendices (Appendices B and C), the important results are reviewed here.

Several methods of estimating the net return to farm enterprises are outlined in Appendix C. The estimated net returns per acre vary widely between different crops. After allowing for an eight per cent return on invested capital, net returns per acre range from $17 under barley to $93 in clover seed (see Table C-4). Correspondingly, the present worth of these net annual incomes varies from a low of $212 to a high of $1,162, when discounted at eight per cent.

A more meaningful presentation of this data is achieved by reducing these various estimates to the basis of a typical or representative acre. Assuming that the present pattern of production will remain relatively constant, a typical acre is expected to yield a net return of $30.06 after deducting all costs, except the value of the farm operator's labor. When the cost of operator's labor has been accounted for, net returns per acre are $26.31, equivalent to a present value of $329 (see Appendix C).

Several other methods were used to estimate the net worth of an acre of cropland. While the estimates derived from these methods do not coincide exactly with the figures given above, they do support the reliability of the estimates. Analysis on the basis of complete farm enterprises, not individual crops, indicated a present value of $350 per acre. Information on the sale and rental value of land, while not available on a consistent basis, nevertheless tends to support the earlier estimates of present value.

On the basis of these investigations the annual net income per acre on presently reclaimed land after allowing for the value of operator's labor income is estimated to be $26.31, having a present discounted value of $329. This forms the basis of estimated primary benefits for comparison with estimates of reclamation cost.

This value is based on an acre of reclaimed land, already in production. As such, it is not directly applicable for comparison with the costs of further reclamation. This is because there will be a lag of at least one year between the time reclamation costs are incurred and the first annual benefits begin to accrue.

This time lag has a significant effect on the comparison of benefits and costs, and can be incorporated in the analysis in two ways. Interest can be charged on reclamation costs up to the time that the first benefits accrue, the present value of benefits at that time being compared to the initial cost plus interest. Alternatively, the present value of the stream of future benefits can be discounted over the time lag to be comparable to costs at the time they are incurred. This latter approach is adopted here -- the present value of benefit streams is calculated in the year in which benefits commence and then further discounted to allow for a time lag of one year. This has the effect of reducing the present value of an acre of land which will be reclaimed to $305.

Tangible Primary Costs

The main direct costs of agricultural reclamation are the tangible primary costs of constructing dykes and installing pumps, drainage facilities, and some access structures. These costs are estimated in detail for each unit in Appendix D. Capital costs per acre vary significantly between units, the lowest estimate being $37 for Indian Reserves 1, 1A and 1B, the highest $191 for the Corn Creek unit. Additional costs for removal of existing vegetation and ground breaking average $10 per acre, with the range of total capital costs per acre thus being from $47 to $201 (see Table D-3).

The Timing of Reclamation

Agricultural reclamation can be completed in a very short time, and it is assumed that crop production would begin in the year following initiation of reclamation. In the case of Duck Lake reclamation could begin in 1970 and estimates of both the benefits and costs can be taken as 1970 present values. For the remaining areas reclamation would not begin until 1973 when Libby Dam provides effective control over the Kootenay River. To be comparable with the Duck Lake estimates, and the estimated benefits and costs of the alternative wildlife-recreation development, the present value of the benefits and costs of agricultural reclamation in these areas is further discounted to allow for the time elapsed between 1970 and 1973.

The Indian Reserves.--Reclamation of the Indian Reserves would commence in 1973 and bring 2,070 acres into cultivation. With a present worth per acre of $305, total primary net benefits are estimated at $631,000. Comparing this with the total of reclamation and soil preparation costs of $97,000 (Appendix D, Table D-3) indicates the feasibility of reclaiming this land. Benefits exceed costs by $534,000 and the ratio of benefits to costs is 6.5:1. As this area would not be reclaimed until 1973 these values are further discounted to 1970 equivalents. This has the effect of reducing the estimates of benefits to $501,000, costs to $77,000 and net benefits to $424,000; the benefit-cost ratio remains unchanged.

Corn Creek.--As with the Indian Reserves, reclamation of this area would begin in 1973. Comparison of benefits and costs for this area yields a different result depending on whether reclamation of part of Indian Reserve 1C is included in the project (see Appendix D). By including part of Indian Reserve 1C in the reclamation project, an additional 180 acres are brought into cultivation, raising the total cultivable acreage to 1,440 from 1,260 and thus increasing the benefits generated. Reclamation costs are estimated to be $275,000 whether the Indian Reserve is included or not (see Table D-3), but total costs vary after including the per acre allowance for soil preparation. With part of Indian Reserve 1C included in the reclamation, net benefits are approximately $119,000, while without the Reserve they are $77,000 (1970 values). While these figures indicate that reclamation of the area is feasible, net benefits are not large, and the benefit-cost ratios are low. This assessment involves the assumption that the adjoining Leach Lake unit would be reclaimed in conjunction with the Corn Creek unit (see Appendix D).

Leach Lake.--Assuming that the Corn Creek unit would be reclaimed concurrently, the total cost of reclaiming this area and preparing the soil for cultivation is estimated at $196,000 (Table D-3). With 2,600 acres in cultivation the present worth of primary net benefits is $793,000 indicating an excess of benefits over costs of $597,000. As this area would not be reclaimed until 1973 discounting these estimates further to 1970 values reduces them to $156,000, $630,000 and $474,000 respectively. The benefit-cost ratio is 4.0:1, clearly establishing the economic feasibility of further agricultural reclamation in this area.

Six Mile Slough.--The estimated cost of constructing access to this area, ditching, dyking, and soil preparation, is $199,000 (Table D-3). The present worth of primary benefits is $732,000 based on 2,400 acres in cultivation at $305 per acre. Benefits exceed costs by $533,000, the benefit-cost ratio being 3.7:1. This area, too, would not be reclaimed until 1973, and discounting these estimates to allow for this lag reduces the estimate of net benefits to $423,000, costs being $158,000 and benefits $581,000.

Duck Lake.--The capital cost of reclaiming an additional 3,000 acres in Duck Lake has been estimated at $240,000. Soil preparation costs will raise this by $10 per acre to a total of $270,000 (Table D-3). In comparison with these costs the present worth of primary net benefits is estimated at $915,000, yielding a net benefit of $645,000, and a benefit-cost ratio of 3.4:1.

Summary of Benefit-Cost Comparisons

The benefit-cost comparisons presented above indicate that further agricultural reclamation is economically feasible for all the areas under study. These comparisons and the resulting estimates of net benefits and benefit-cost ratios are summarized in Table 5. For all areas the benefit-cost ratios are favorable, ranging from a low of 1.3:1 in the Corn Creek area to 6.5:1 in the Indian Reserves. Net benefits range from $77,000 for the Corn Creek area to $645,000 in the case of Duck Lake.

TABLE 5.

SUMMARY OF PRIMARY BENEFIT-COST COMPARISON FOR AGRICULTURAL RECLAMATION: BY AREA

A R E A	RECLAMATION COST, PRESENT VALUE 1970 (C)	PRESENT WORTH OF BENEFITS 1970 (B)	BENEFITS MINUS COSTS (B-C)	BENEFIT-COST RATIO B/C
1. The Indian Reserves	$77,000	$501,000	$424,000	6.5:1
2. The Corn Creek Unit: Indian Reserve 1C included	229,000	348,000	119,000	1.5:1
Indian Reserve 1C excluded	228,000	305,000	77,000	1.3:1
3. Leach Lake	156,000	630,000	474,000	4.0:1
4. Six Mile Slough	158,000	581,000	423,000	3.7:1
5. Duck Lake	270,000	915,000	645,000	3.4:1

*Note: Tangible primary benefits and costs only are compared.

Supplementary Considerations

The analysis presented above has indicated that there would be substantial tangible primary net benefits from further agricultural reclamation on the Creston flats. The benefit-cost ratios for individual recamation projects are very favorable, with those for some units being particularly high. These results are unusual for an analysis of agriculture in British Columbia and the validity of the analysis should be carefully examined before it is accepted.

The most significant factor in determining the cost of reclamation, and hence the feasibility, is the level of the Kootenay River after Libby Dam. The effect of the Libby Dam is to almost eliminate the need for protective dyking against waters of the Kootenay River -- making highly productive farmland available at a minimum cost (see Appendix D). More than any other factor this explains the very favorable results of the analysis of further reclamation projects.

Many other factors could affect the final outcome or true net gains from a reclamation program. Market forces of course do not remain static, and changes in the relative costs of agricultural inputs and outputs are expected through time -- with consequent results for the feasibility conclusions reached above. Predicting either the degree or direction of these relative changes beyond the immediate future is very uncertain, however. Furthermore, many physical relationships resulting from the new regime on the Kootenay River will only be fully apparent in a decade or so. Among the many additional considerations that may affect the gains to be expected from agricultural reclamation, the following were judged to warrant special investigation:

1. Increased dyke erosion due to the reduced sediment load of the Kootenay River below Libby Dam.
2. Kootenay Lake levels after Libby Dam.
3. Variation in soil capabilities.
4. Sensitivity of the results to changes in the discount rate.
5. The effect of changes in crop practices and managerial intensity after Libby Dam.

6. Long-run trends in the prices of agricultural output.

7. The effect of a time lag between the initiation of reclamation and first harvest.

8. The feed freight subsidy and its effect on the appropriate measure of benefit.

Detailed discussion of these factors has been relegated to Appendix E. The major conclusions from examination of these factors are reviewed briefly here.

The first four factors can be discounted as of little or no practical significance. Possible changes in the regulation of Kootenay Lake levels after Libby Dam were examined, and while the proposed changes are of a conjectural nature, they are not expected to have a significant effect on further reclamation projects. The basic premise of feasibility was found to be insensitive to changes in the discount rate over a range of six to ten per cent. The effect of a two-year time lag between reclamation and realization of the first commercial harvest was also examined. While this resulted in both lower net benefits and benefit-cost ratios, there was no significant effect on the feasibility of reclamation. Provincial feed freight subsidies were considered and shown to have a negligible effect on the benefit-cost analysis.

The remaining factors are significant, however, and could play an important role in determining the final feasibility of reclamation. One such factor is the possibility of increased bank erosion by the Kootenay River which will be carrying a greatly reduced silt load after Libby Dam. While the extent of such erosion is again speculative, it could be extremely important. The main factor responsible for the very favorable results of the benefit-cost analysis is the effect of Libby Dam in minimizing reclamation costs. If extensive erosion protection becomes necessary, much of this benefit may be negated. This factor could significantly alter the costs of reclamation and hence the entire benefit-cost analysis.

Another significant factor is the variation in soil productivity among the unreclaimed areas. While the main analysis assumed a uniform productivity, there is some indication that this may not be so. It appears that the Indian Reserves are significantly above average in fertility, while the Corn Creek area and Duck Lake may be below average. If the Corn Creek area soils are significantly below average productivity it could render reclamation of this area infeasible -- of the five areas being considered it has the lowest net benefits and the lowest benefit-cost ratio.

Long-run expectations for grain prices are not good. A permanent decline in the value of farm output would reduce both the net benefits of further reclamation and the ratios of benefits to costs. Offsetting the rather bleak outlook for grain markets is a strong trend away from grain production which is expected after the completion of Libby Dam. With the flood threat removed flats farming is expected to become more intensive, and to shift toward crops which yield a higher net return than grain. Such a trend would have the effect of enhancing the feasibility of further reclamation.

In an overall assessment it must be concluded that further agricultural reclamation on the Creston flats is economically feasible. In this regard the summary presented in Table 5 with a total present value of tangible primary net benefits from $2,043,000 to $2,085,000 should be considered as the best approximation of the present value of the benefits and costs involved. It is recognized that several factors could cause the feasibility to deviate significantly from these estimates. Due to the nature of the factors involved it is not possible to estimate their significance without exhaustive technical studies which are beyond the scope of this investigation.

Intangible and Unmeasurable Primary Benefits and Costs

It is assumed that there will be no intangible or unmeasurable primary benefits associated with agricultural reclamation on the Creston flats. There will, however, be major primary costs of both types as a result of the destruction of important wildlife habitat and the loss of opportunities for outdoor recreation.

Outdoor recreation at present includes the warm water sport fishery in Duck Lake, bird watching and nature observation, and waterfowl hunting. The extent and value of this recreational use is the subject of Appendix F, and is also treated in Chapter III. The value of recreational opportunities afforded by the unreclaimed land is estimated to be $25,000 annually. These opportunities have a present value of $312,000, assuming constant future utilization. Destruction of this wildlife habitat by agricultural reclamation would eliminate these opportunities, representing a loss, or intangible primary cost of $312,000.

Perhaps more important than the loss of opportunities for recreation would be the loss of wildlife as a result of the elimination of key habitat. The significance of this habitat for many important waterfowl species, plus breeding populations of both ospreys and herons is discussed in Chapter III. There is no way of estimating the value of this habitat in its more passive role of simply providing living space for wildlife. Loss of the habitat would mean loss of the wildlife, however, constituting a significant real loss, and one which we are committed, through national policy, to avoid (Wright 1968). Such losses must be considered as unmeasurable primary costs when an attempt is made to measure the true gains from agricultural reclamation.

While it was possible to compare the tangible primary benefits and costs for each reclamation area, it is not possible to estimate either the intangible or unmeasurable primary costs on this basis. Within the unreclaimed areas the distribution of recreational activity varies from year to year, and the wildlife which provides the basis for such recreation depends on all areas for total habitat requirements. Reclamation of one area which supports only slight recreational use could still result in a large recreational loss in other areas due to the disruption of habitat and destruction of wildlife. The same difficulties arise in any attempt to attribute the unmeasurable costs to individual areas.

Because intangible and unmeasurable costs cannot be estimated for individual areas they were omitted from the comparison of primary benefits and costs on an area basis. These costs are brought into the benefit-cost analysis on an aggregate basis when the total benefit-cost relationship is demonstrated.

Secondary Benefits and Costs

As pointed out in Chapter II, secondary costs and benefits stem indirectly from, or are induced by, a development project. An example was given of a processing industry established to handle the output of a project -- its output constituting secondary benefits, its costs being secondary costs. A comprehensive benefit-cost analysis requires that all these costs and benefits be considered in conjunction with primary benefits and costs.

Secondary benefits and costs are important mainly when a project is being analyzed from a regional point of view. While they may measure a project's impact on a given area, they are of much less interest from a broader viewpoint. As a general rule it can be argued that projects which are similar in nature would have approximately the same secondary impact if undertaken elsewhere in the nation. It is argued, therefore, that emphasis should be on efficient utilization of the basic resources, as measured by primary benefits and costs, rather than on secondary impact (Ciriacy-Wantrup 1969, Sewell *et al* 1962).

It is unlikely that any new processing industries would be established at Creston to deal with production from further reclamation. What would be expected is an increase in the business of existing processing and distribution centers, and in all businesses serving the farm sector. In attempting to measure the "net value" of this secondary impact, there is a danger of serious confusion.

Matters such as employment created, incomes (usually ill-defined), business revenues, and taxes paid, are often stressed as important secondary benefits. But most of these are "gross" measures, generally costs rather than benefits, and do not in any way reflect on the net gain from the secondary activity. For this reason a very narrow definition of net secondary benefits -- the net economic gain, or the value of the secondary product or service over and above the costs of inputs -- is adopted for this analysis.

Discussion of net secondary benefits first requires an estimate of the total amount of secondary business activity which would be generated by reclamation of an additional 11,500 acres at Creston. From these estimates the true net annual gain can be derived and then discounted to a present value equivalent.

The detailed calculations required for these estimates are relegated to Appendix A. The full "multiplied" impact on secondary business revenues will vary between the local, provincial and national levels after allowing for the non-export content of Creston agricultural output at each level and the different regional multipliers.* It is estimated that with further reclamation at Creston the increase in annual secondary business revenues, which would not occur in the absence of reclamation, would be in the order of $1,310,000 in the local economy, $1,320,000 within British Columbia and $1,264,000 throughout Canada.**

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*The export-base thesis and its significance for regional multiplier analysis is reviewed in Appendix A.

**Only export content has been considered relevant in determining the degree to which secondary business revenues which would not occur otherwise are attributed to further agricultural reclamation. This accounts for the lower level of secondary spending at the national level.

These are estimates of gross business revenues which would be generated by agricultural spending. But only a small part of this will be a net gain, because of the costs involved in providing the goods and services purchased. Net gains will exist only to the extent that incomes will be higher as a result of the agricultural development than they would be if the labor and capital at the secondary level were otherwise employed. Net benefits must therefore take the form of income in excess of the normal earnings which these inputs would earn in other employment. Since these alternative earnings tend to be reflected in the costs (wages, rent, interest, etc.) of the business enterprises, net gains are manifested in the form of income in excess of costs -- business profits after the operators have allowed a normal rate of return for their own capital and labor input.

With the degree of competition which exists in the retail and service sectors of the economy, such profits tend to be low. Profits as a proportion of sales are probably in the order of two to three per cent, and a rate of three per cent is adopted in this study.

Applying a rate of three per cent to the estimates of business revenues above, the net secondary benefit per annum is estimated as follows: within the local economy, \$39,300; at the provincial level, \$39,600; within Canada as a whole, \$37,900. Discounted at a rate of eight per cent the respective present value equivalents are \$490,000, \$495,000 and \$474,000.

The Aggregate Benefit-Cost Relationship

This chapter has investigated the benefits and costs of agricultural reclamation at the primary and secondary levels. The findings at these levels are integrated in an aggregate comparison in Table 6. The table indicates the results of the analysis from three viewpoints: the local community, the province of British Columbia, and Canada. Agricultural reclamation is feasible from all points of view, although the magnitude of net benefits that can be expected varies. The unquantified loss that would result from the destruction of present wildlife habitat forms an important qualification to these conclusions.

Tangible primary benefits and costs are identical from each viewpoint. The present value of annual profits from agricultural production is estimated at $2,975,000, while the present value of reclamation costs is $890,000. Since the costs of reclamation and the values generated under agriculture would all be incurred by local interests, their magnitudes remain constant in each referent group.

Intangibles and unmeasurable costs and benefits are included in Table 6. No intangible or unmeasurable benefits are expected from agricultural reclamation, but significant costs are expected from the loss of wildlife habitat and opportunities for outdoor recreation. A present value of $312,000 has been placed on recreational use of the unreclaimed land and its loss represents an intangible primary cost. With half of the present recreational use by local residents the loss to the local referent group is given as $156,000, while the full loss of $312,000 is appropriate from the point of view of British Columbia and Canada.

TABLE 6

THE BENEFITS AND COSTS OF AGRICULTURAL RECLAMATION
(Present Discounted Values, 1970)

		REFERENT GROUP, OR VIEWPOINT		
		LOCAL COMMUNITY (CRESTON)	BRITISH COLUMBIA	CANADA
B E N E F I T S				
Primary benefits:	Tangible	$ 2,975,000	$ 2,975,000	$ 2,975,000
	Intangible	nil	nil	nil
	Unmeasurable	nil	nil	nil
Secondary benefits:		$16,375,000	$16,500,000	$15,800,000
Total benefits:		$19,350,000	$19,475,000	$18,775,000
C O S T S				
Primary costs:	Tangible	$ 890,000	$ 890,000	$ 890,000
	Intangible	156,000	312,000	312,000
	Unmeasurable	loss of wildlife habitat and wildlife species		
		"small" value to local residents	"large" value to all British Columbians	"very large" value to Canadians
Secondary costs:		$15,885,000	$16,005,000	$15,326,000
Total costs:		$16,931,000	$17,207,000	$16,528,000
Net Benefits*		$ 2,419,000	$ 2,268,000	$ 2,247,000

*As discussed in the text, unmeasurable costs must be set off against this measure of net benefit to provide a true measure of net gain.

Unmeasurable primary costs are also incorporated in Table 6. It is not possible to estimate the absolute value of the wildlife habitat to the various referent groups, but some inferences are drawn regarding its relative value between these groups. Such non-consumptive benefits accrue in relatively small degree to local residents. The maintenance of continental waterfowl habitat and the protection of rare species is largely the concern of the federal government, and to a lesser extent the provincial government. Thus the value of the existing habitat increases as the point of view broadens from the local community to the province and finally to Canada as a whole.

Secondary costs and benefits vary between the referent groups, due to the effect of the various multipliers, and the different export content of agricultural spending when assessed from three different points of view. The annual gross receipts of secondary business are discounted to present values and presented as secondary benefits in Table 6, and the present value of annual business costs is given as secondary costs. On balance the present values of net secondary benefits are small, only \$490,000 in the local community, \$495,000 within British Columbia, and \$474,000 in Canada.

When all the relevant costs and benefits are brought into balance in this way some conclusions can be drawn regarding the feasibility of further agricultural reclamation at Creston. Taken together, tangible primary and secondary benefits represent a net gain with a present value of approximately \$2.6 million. Offset against this is the loss of intangible recreational opportunities with a present worth of approximately $312,000 and an additional unmeasurable loss of important wildlife species through the destruction of their habitat.

On the basis of those benefits and costs which are evaluated the overall net gain from agricultural reclamation appears to be $2.3 million. This gain would have to be set off against the wildlife losses which are not evaluated. Whether the overall balance would favor agriculture or not depends on the value of this wildlife. If the wildlife is worth more than $2.3 million society as a whole would suffer a net loss by permitting further reclamation. If the wildlife has a value less than $2.3 million there would be an overall net gain by sacrificing it in favor of agricultural development.

The value to society of the wildlife supported by the undeveloped land remains the critical link in determining the overall feasibility of reclamation for agricultural purposes. If agricultural development is feasible, however, the key question in determining whether it is the *most desirable* form of use for the land must be the net gains which would be generated by alternative uses. Consideration of the other development possibility, wildlife and recreation development, is the subject of the next chapter. Comparison of the net gains from these alternatives will then provide a basis for selecting the optimum use for the presently undeveloped land.

The Distribution of Net Benefits Under Agricultural Development

A basic question which is not addressed in the usual context of benefit-cost analysis concerns the distribution of net benefits.

In the preceding analysis, for instance, we have concluded that considerable net benefits would be generated if the unreclaimed land were put into intensive agricultural production. We have not given any consideration to the distribution of these benefits, however -- simply assuming that both the benefits and the costs would be borne by the entrepreneurs undertaking reclamation.

The distribution of these benefits, in addition to their absolute level, should be taken into account when comparing alternative uses for the land in this study (Krutilla and Eckstein 1958). The primary benefits which have been estimated from agricultural reclamation would accrue to a small group of entrepreneurs. Redistribution of part of this benefit to the resource owners, British Columbia and the Lower Kootenay Indian Band, could be achieved through sale, lease, or rental. This contrasts with a wildlife and recreation development where most benefits would be distributed in the form of non-priced recreational opportunities. These different patterns of distribution will be referred to further in Chapter VI where the alternatives are compared.

CHAPTER V

WILDLIFE HABITAT AND OUTDOOR RECREATION AS A DEVELOPMENT ALTERNATIVE

Development of the unreclaimed land to improve its quality as wildlife habitat and increase its usefulness for outdoor recreation is planned as an alternative to agricultural reclamation. The physical structures required for this development were discussed briefly in Chapter I. While technically feasible and relatively simple from an engineering standpoint, it is difficult to assess the *economic* feasibility of this development. When examining the feasibility of agricultural reclamation, predictions of yields and incomes were based on experience on almost identical land which had been reclaimed. In the case of wildlife-oriented development we do not have such a convenient basis for prediction.

The development which is planned will be the first of its kind in British Columbia. While similar projects have been undertaken in the United States and elsewhere in Canada, the conditions differ significantly, and provide little more than general guidelines to what may be achieved. The exact details of management in the Creston project cannot be specified in advance as an optimum management regime will only be known after experimentation with local conditions. Similarly, the exact timing of development cannot be predicted as it, too, depends on a certain degree of experimentation and experience with local conditions.

Given these qualifications, this chapter will first discuss the nature of primary benefits which could be realized through the development plan and the area's capacity for such benefits. The extent to which this capacity will be used, and the use expected in each future year is estimated, and values placed on this use where possible. Analysis then turns to quantification of primary costs, followed by a review of secondary benefits and costs. Benefit-cost relationships are then considered at both the primary and secondary levels, with the final section of the chapter dealing with the distribution of net benefit and the separate implications of the project for the local community, British Columbia, and Canada.

Primary Benefits

The primary benefits which would be generated through the wildlife-recreation project are diverse. The benefits that can be expected are classified as follows:

1. Provision of habitat and production of fish and wildlife.
2. Education and research.
3. Outdoor recreation.
4. Agricultural production.
5. Commercial fur production.
6. Water storage.

This classification of benefits encompasses tangible, intangible, and unmeasurable benefits. Tangible benefits include agricultural production, commercial fur production, and water storage. The output in each of these classifications is normally sold at a price. For this study imputed values are assigned to the output of outdoor recreation. The first two categories of primary benefit, the provision of habitat and production of fish and wildlife, and education and research opportunities, are classed as unmeasurable since they cannot be quantified in monetary terms.

Quantifiable Primary Benefits

Recreational opportunities are the most significant primary benefits which can be quantified in monetary terms. As measures of value are not readily available for these intangible benefits, values must be assigned to the recreational output of the project. This output and its estimated values are discussed first in the following paragraphs. Tangible primary benefits are then discussed, and a brief summary draws together the total estimated value of quantifiable primary benefits.

Outdoor Recreation

One of the most important, and certainly the most easily identified benefit from the development of a wildlife management area will be the opportunities created for outdoor recreation. Opportunities will be improved for warmwater sportsfishing, hiking and trail walking, bird watching and nature photography, and waterfowl and upland bird hunting. While all of these activities take place in the area at present, the intensity of use is expected to increase dramatically as the area is developed.

One of the major factors restricting use of these areas at present is the lack of access. Provision of adequate access for recreationists will lead to the realization of significant recreational benefits. At the same time this may lead to management problems in trying to balance the number of different types of recreationists in an area at any one time, and the requirements of wildlife for undisturbed habitat. This people-wildlife conflict could become particularly severe and its resolution requires a carefully worked out compromise between desires to serve people or wildlife.

There will be three major types of outdoor recreation as a result of the wildlife-recreation plan -- warmwater sportsfishing, waterfowl and upland bird hunting, and non-consumptive recreation including hiking, bird watching, nature interpretation, and photography.

Warmwater sportfishing.--Present development plans call for warmwater sportfishing to be restricted to approximately 3,000 acres on Duck Lake with the rest of the area developed solely as nesting habitat. It is felt that the maximum capacity of the area would be 60 fishermen per day (one fisherman per 50 acres) over a six-month season from May through October or a total of 10,800 fisherman-days of use annually.

Full use of this capacity for sportfishing is not expected until 1984; the pattern of increase in use is described in detail in Appendix G. The procedure adopted to estimate the value of this recreation is reviewed in Appendix H, where the value of warmwater sportfishing is estimated at $4.00 per fisherman-day. Applying this value to the estimated future pattern of use of the fishery, and discounting the expected annual values at eight per cent, yields a capitalized present worth of sportfishing opportunities of $301,000 (see Table H-1).

Waterfowl and upland bird hunting.--After development it is expected that about four-fifths of the area or approximately 10,670 acres will be open for hunting each year.*

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*It is assumed that development plans for wildlife habitat will result in a net of 90 per cent of the area being usable after dykes and

Hunting will be the least intensive of all recreational uses. Hunters can easily overcrowd an area so that the quality of every hunter's experience deteriorates. The usual consequence of overcrowded hunting areas is poor hunting practice, leading to high crippling loss, and waste of gamebirds (Anderson 1961, Bednarik 1961).

At present it is felt that the saturation point for hunters will be reached with a concentration of one hunter per 100 acres, with two 'shifts' a day of about four to five hours each. This indicates a capacity to support approximately 215 hunters in the area per day. Over a hunting season of 10 weeks duration (70 days), the capacity of the area would then be in the order of 15,000 hunter-days per year. The unreclaimed lands (Crown and Indian Reserves) presently support about 5,000 hunter-days of use annually (Appendix F), and full development of the area will provide opportunities to increase this use by 10,000 hunter-days.

As a result of increased populations of birds in the area, additional hunting opportunities will arise on private land adjacent to the management area. It is difficult to estimate the number of days of hunter utilization which may be realized on this land. Landowners will be reluctant to permit uncontrolled public hunting, and may find it necessary to levy fees for hunting. Most of the farm operators on the flats live in the town of Creston and not on their farms, and administration and control of hunters on private property will be difficult. Additional

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access construction, the same assumption as was employed for agriculture. However, the entire area of Duck Lake will be usable for wildlife purposes, as will the W. H. Dale Unit. This increases the net usable area to 13,340 acres, four-fifths of which will be used by hunters.

constraints will be imposed by the types of crops grown, and yearly variations in the time of harvest.

At present approximately 1,500 hunter-days are realized on private land on the Creston flats (Appendix F). Assuming a significant increase in bird populations after habitat improvement and a convenient administrative arrangement for private land owners, this use may increase to 5,000 hunter-days annually, an increment of 3,500 hunter-days.

Full use of the hunting capacity of the area will be reached by 1977. Appendix H presents the estimated pattern of growth in hunting activity. Based on a study of waterfowl hunters at Creston (Appendix G) the value of hunting after the project is complete is estimated at $8.00 per hunter-day. When this unit value is applied to the expected annual pattern of growth in hunting activity and discounted at eight per cent, the capitalized present worth of hunting opportunities is estimated at $640,000.

<u>Hiking, use of nature interpretation trails, bird watching, and photography</u>.--These activities will probably account for the bulk of on-site recreational use. The upper limit to this use of the area will be determined by the tolerance of wildlife to human presence, and the tolerance of people to the presence of other people. It is expected that during the nesting season access to some marshes may have to be restricted.

Major attractions for these activities will be the rarer bird species such as ospreys, swans and geese. At the same time there will be a great abundance of more common species of birds, and it is no exaggeration to claim that the richness and diversity of wildlife will be unequalled in North America.

With full development of facilities for photography, bird watching, nature interpretation trails, and picnic sites the area could easily support 250,000 visitor-days per year by persons interested in these pursuits. The pattern of growth in utilization of non-consumptive recreation facilities is estimated in Appendix G. It is estimated that capacity would be fully utilized by 1985, with the level of use remaining constant thereafter. The value of non-consumptive recreation is estimated at $5.00 per visitor-day. Applying this value to the estimated pattern of future use and discounting at eight per cent yields a capitalized present worth of non-consumptive recreation of $10,088,000 (see Table H-3).

Agricultural Production

Present plans call for approximately 30 per cent of the area to be developed for agricultural production complementary to the management of wildlife habitat. This may take the form of grazing for cattle, or the production of selected crops, and will occupy about 3,500 acres. It is assumed that productivity on this land will be the same as on presently reclaimed land.

Gross productivity per acre will average $105, with an average annual net productivity of $26. (See Appendix C, page C-14). On 3,000 acres this will mean an annual gross output of $315,000, indicating a primary benefit of $78,000.

The final distribution of this production may differ from that on presently reclaimed land. Land devoted to crops will be under a sharecrop agreement, with the Management Area's share (approximately one-third) left in the field as feed and cover for wildlife. This portion of crop production becomes a direct input in game management, and does not pass through the normal market channels. The share left for wildlife does not enter calculation of the primary benefit of agricultural production. Rather, it represents a cost of wildlife management which is not directly registered.

The net values in agricultural production are estimated on the same basis as employed in the analysis of agricultural development in Chapter IV. The present value of agricultural production on 2,300 acres (2/3 of the total acreage used for agriculture) is estimated to be \$549,000. Values would increase in each year from 1971 through 1983, remaining constant after that time (see Table H-4).

Commercial Fur Production

Habitat development and water level control will create opportunities for an increased harvest of furs for the commercial market. The values in commercial fur harvests will not be large. It seems unlikely that the gross value of the annual harvest of furs would exceed \$10,000 and will more likely be in the neighbourhood of \$5,000. Of this, approximately \$4,000 would be expected as net returns to trappers and royalties on furs, comprising the primary benefit from trapping. The calculation of present values arising from this harvest is summarized in Table H-5. This constitutes a minor benefit, the present value in 1970 being \$37,000.

Water Storage

The portions of the area which are dyked and maintained as impoundments for waterfowl may also serve as water storage areas. Benefits resulting from water storage are in the form of downstream flood protection, and stabilization of downstream power generation. Realization of such benefits will depend on the manner in which these impoundments are managed.

Downstream benefits will only be generated if water levels in the impoundments are raised during the freshet on the Kootenay River, and drawn down later in the year. This will not be the case, however, since the object of dyking and establishing impoundments is to stabilize water levels throughout the nesting season. With water levels held constant there will, in fact, be no benefit from storage during the critical freshet period. Thus primary benefits in the form of water storage are expected to be insignificant.

In any case, after the completion of Libby Dam water storage values must be related to the incremental contribution to overall river-basin needs. With the storage and downstream protection provided by Libby Dam the incremental value of storage on the unreclaimed lands will be negligible (Krutilla 1961, 1967). The effects of water storage are therefore not considered further in this analysis.

Summary: Quantifiable Primary Benefits

The present value estimates presented above are summarized in Table 7. In making this summary two points should be emphasized. First, the benefts which have been evaluated are the incremental benefits directly attributable to the proposed development -- not the total output of the area. This is of consequence only for fishing and hunting where some utilization presently takes place in the absence of any development. Secondly, these values are only for those types of 'output' for which values can be quantified in monetary terms. They therefore omit the benefits associated with the provision of habitat and production of fish and wildlife (except insofar as this generates the recreation measured), and the benefits from educational and research use. These benefits are dealt with subsequently in the category of unmeasurable benefits.

TABLE 7

SUMMARY OF PRESENT VALUES, BENEFITS FROM WILDLIFE AND OUTDOOR RECREATION DEVELOPMENT*

BENEFIT	PRESENT VALUE, 1970	
Intangible:		
Fishing	$ 301,000	
Hunting	$ 640,000	
Non-Consumptive Recreation	$10,088,000	$11,029,000
Tangible:		
Agricultural Production	$ 549,000	
Trapping	$ 37,000	$ 586,000
Present Value of Intangible and Tangible Benefits, 1970		$11,615,000

*As discussed, this summary includes tangible and intangible primary benefits only.

Unmeasurable Primary Benefits

It is not possible to assign monetary values to some of the important aspects of the project's output -- benefits which accrue beyond those realized through on-site participation. Such benefits remain as unmeasurable -- they include the provision of habitat and production of fish and wildlife, and educational and research opportunities.

Unmeasurable benefits are particularly important in a project of this nature and are discussed in the following paragraphs.

Provision of Habitat and Production of Fish and Wildlife

This category of unmeasurable benefits arises from the wildlife-recreation development independent of on-site recreational or other use. There will be important benefits from the habitat development which will increase the production of wildlife -- such benefits being particularly important with rare or endangered species. Further benefits accrue from the maintenance and improvement of flyway habitat for migratory species not "produced" on-site, including the fulfilment of international treaty obligations.

Waterfowl production.--The proposed habitat development will greatly increase the on-site production of waterfowl, including geese and swans as well as ducks. In the past the on-site production of waterfowl has been almost negligible. Stabilization of water levels and development of nesting habitat will lead to the establishment of local breeding populations. The area can be expected to support high population densities as it has a very fertile soil and will create ideal growing conditions for aquatic feed.

Under final development, it is estimated that the area will produce 5,000 ducks annually, comprised mainly of mallards, widgeon and teal.* Production by tree-nesting species such as wood ducks will be enhanced by the installation of nesting boxes, but they will form a minor portion of the total nesting population.

Control of water levels and creation of nesting islands should enable the establishment of a large resident population of Canada geese. Annual production of young is expected to be in the order of 2,000. This will be particularly important in replacing production lost on the Duncan Marshes which have been destroyed by the Duncan Dam reservoir.

Whistling swans are common to the area, passing through in large numbers during their spring migration, and returning in late fall and winter. While some difficulty can be encountered in developing a breeding population at Creston, it is hoped that overall enhancement of the habitat will eventually lead to this. Annual production of 100 cygnets is estimated.

Production of upland game birds.--Upland game birds such as pheasants, grouse and mourning doves will also benefit from habitat development. These benefits will be incidental to agricultural utilization aimed at providing food and cover, with strict control over the use of pesticides and chemical sprays. Birds such as pheasants will benefit greatly from stabilized marsh levels, and an annual production of approximately 500 is expected.

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*Source of estimates, D. D. Moore, Supervisor, Creston Valley Wildlife Management Area.

Other birds.--Many other species will find a managed habitat attractive. Marsh, water and shore birds such as great blue herons, killdeer, bitterns, sandpipers, coots, gulls and terns can be expected to increase in number, as can jays, kingbirds, woodpeckers, dippers and various sparrows. Predatory birds such as owls and hawks will also increase. Of special significance in this regard is the breeding population of ospreys in the area. Wildlife management will play a significant role simply in securing their habitat against human encroachment. There is a definite possibility that the population may actually increase as the production of fish in the shallow lakes and marshes increases. While such an increase might only be in the order of one or two breeding pairs, this is nevertheless significant for such a rare species.

Furbearing animals.--Muskrat populations can be expected to increase as water levels are stabilized and more aquatic vegetation is introduced. Beaver and mink may also find the habitat attractive. Production of 15,000 muskrats and 400 mink per year is expected after full development.

Big game.--Benefits to big game animals are not expected to be of major significance. There may be some slight use by deer as a wintering area, but no significant increase in production is expected.

Fish production.--Fish produced within the area will consist mainly of warmwater sportsfish such as black bass, perch, and sunfish. These fish are presently found in Duck Lake, Six Mile Slough and Leach Lake. Development and management of the area for wildlife and waterfowl habitat will greatly enhance the production of these fish due to the stabilization of water levels.

Flyway habitat.--The benefit from wildlife management in this case will not be in the nature of direct waterfowl production, but rather in the provision of temporary habitat for migrating birds. The unreclaimed lands presently serve in this function, meeting the habitat requirements of migratory waterfowl in three distinct ways. These are: (a) as a staging area for spring migrants en route to northern breeding grounds; (b) a summer moulting and staging area for ducks from widely scattered areas; and (c) a staging area for fall migrants en route to southern wintering areas.

Migratory stopovers [(a) and (c) above] on the unreclaimed lands vary greatly from year to year depending on the weather, habitat condition, and continental waterfowl populations. At present it is estimated that migratory utilization by ducks averages 4,200,000 days of use per year (70,000 ducks at 60 days per duck). With intensive management it is felt that this can be raised to approximately 15,000,000 days of use -- an increase of roughly 11,000,000 duck-use-days. Total goose-days of use at present averages 180,000 annually (3,000 geese at an average of 60 days) and use by migratory swans is in the same order -- 180,000 swan-use days by about 3,000 swans. Geese respond readily to new habitat conditions and it is estimated that usage may exceed 1,000,000 days annually after development, an increase of roughly 800,000 days. While migrating swans are less responsive to habitat changes it is felt that use by them may double to 360,000 days.

At present, both Duck Lake and Leach Lake receive considerable use by ducks which are undergoing their summer moult [(b) above]. Use is mainly by males of the various species which depart from the breeding grounds while females are on the nests and seek out suitable habitat for their eclipse moult. At this time they become flightless and vulnerable to predators for about a month. Male diving ducks make greatest use of expanses of open water on these lakes, while males of dabbling species rely more heavily on the marsh areas and protection of emergent vegetation.

In addition to this summer moulting use by adult males, the unreclaimed lands act as late summer staging and gathering areas for females and young raised on nesting grounds which may be many miles away.

To the extent that use of this area for moulting and late summer staging is made by birds which nest elsewhere, it is difficult to argue that improving the habitat will increase overall use. Increased nesting populations will increase use by local birds, but unless nesting areas elsewhere in the flyway expand, use by non-local birds for moulting cannot be expected to increase. One effect of improved habitat, however, may be to increase the survival rate of birds moulting in the area.

Fulfilment of International Obligations

The continental nature of benefits from the management of waterfowl populations is recognized in the Migratory Birds Treaty of 1916 between Canada and the United States. Canada has undertaken to fulfil her treaty obligations through the Migratory Birds Convention Act of 1917. The contribution of the development at Creston to the fulfilment of these obligations is an additional benefit which must go unmeasured and unvalued, but which is nevertheless important. Such international obligations are a formal recognition of the benefits which are classed as "provision of habitat and production of fish and wildlife" -- recognizing their importance and interdependence between nations as well as their internal importance to Canada.

Educational and Research Use

There will be many opportunities for scientific research within the management area. The study of many species of waterfowl and upland game birds will provide information of value in game management. Research and its benefits should not be restricted to game management alone -- there will also be opportunities for ecological and environmental research in such fields as pesticide and herbicide control which will be of wider significance.

The value of such basic research lies in the general applicability of findings and their use in improving standards of living. There is no satisfactory means of assessing the value of past research of this nature and it would be foolish to try to estimate the value of future research. Nevertheless, there may be significant values in education and research as part of the wildlife-recreation development and these values form an important benefit.

Summary of Primary Benefits

The preceding discussions indicate the significance of primary benefits generated under development of the unreclaimed land for wildlife management and outdoor recreation. Preparing a summary in which these benefits can be totalled and their relative importance established is not possible. Primary benefits which are quantified in monetary terms have a total present value of $11,615,000 of which recreational benefits are by far the most important, accounting for $11,029,000. But the unmeasurable benefits associated with this development may be of equal or greater importance, as they provide the basic purpose for the development (Province of British Columbia 1968b). These latter benefits cannot be quantified in monetary terms, and as a consequence, the total value of primary benefits cannot be estimated. This represents a serious shortcoming of the analysis, and when benefit-cost comparisons are made for this development, these important benefits can only be appended as qualitative amendments to the monetary comparisons.

Primary Costs

Improving the unreclaimed land for wildlife and recreation requires the construction of dykes and the installation of pumping capacity which will provide a means of regulating the water levels in the marshes. All primary costs of the wildlife-recreation development are tangible costs, consisting of goods and services normally priced in market transactions. No primary costs which are either intangible or unmeasurable are identified with the wildlife-recreation project.

Nature of the Wildlife-Recreation Project

Fluctuating water levels are the life blood of the marshes -- marshes continue to exist only because a stable equilibrium in water level and plant communities is not established. "A marsh survives and is productive only because of the instability of its water levels. Were the marsh held stable, the edges would gradually invade the middle and there would be nothing but a vast bed of Phragmites" (Hochbaum and Ward 1964).

Despite the fact that fluctuating water levels are necessary if a marsh is to exist at all, the fluctuation which occurs in nature may be excessive and prevent optimum utilization by wildlife. "Water -- even good, clean water -- is often of reduced value to waterfowl if the level is constantly stable or if water levels change at the wrong time" (Green *et al* 1964).

Such is the case with the unreclaimed land at Creston. The seasonal rise in water levels during the waterfowl nesting season destroys virtually all the nests which have been established except for some tree-nesting species. When spring and fall migrants arrive in the area water levels have receded and only a fraction of the total area is available for use.

Habitat development has two basic objectives. These are to make the area suitable for nesting waterfowl, and to increase its capacity to support migratory birds. The methods of achieving these objectives differ and are discussed separately below.

Improving nesting habitat.--For successful nesting, waterfowl require both a stable water level and a suitable shoreline (Moore 1969). Water levels on the unreclaimed land can be stabilized by dyking against the Kootenay River freshet, and installing pumps and control structures so that evapotranspiration losses can be offset. Suitable shoreline can be created by constructing islands or broad shallow ditches. The essential requirement is that water level fluctuation be minimized during nesting.

Increasing the capacity to support migratory birds.--The carrying capacity for non-nesting waterfowl can best be increased not so much by stabilization of water levels, but through manipulation of water levels at critical times. Plant species and undesirable vegetation or algae can be controlled by periodic drawdown of water levels. By promoting the growth of preferred food species, and regulating the water surface area, the carrying capacity of the marshes can be greatly increased.

To meet both the above objectives, peripheral dykes to protect the marshes from the Kootenay River freshet are essential. Further development in the form of internal cross dykes will serve to compartmentalize the units, allowing for variation in habitat conditions to meet the requirements of different waterfowl species.

Facilities for outdoor recreation.--In addition to improvements to the wildlife habitat, a major part of the proposed development will be concerned with providing access and other amenities for outdoor recreationists. These facilities will include such things as trails and footpaths for hikers, blinds for bird watching and photography, canoe "trails", boat launching points and possibly permanent blinds for waterfowl hunters.

Timing of Development and the Present Value of Costs

The significance of Libby Dam for future development of the unreclaimed lands has already been emphasized. There would be no point in beginning extensive capital construction on these lands before Libby Dam is operative -- it would be pointless to construct dykes capable of withstanding present Kootenay River levels if their required life is only two to three years.

It is expected that the first effect of Libby Dam will be felt in 1972, with full control expected in 1973. Thus with the exception of Duck Lake and some aspects of Leach Lake, no major capital outlays are expected before 1973. Capital costs will not all be incurred in the initial year of development. To calculate present values these costs are discounted back to their worth in 1970.

Timing of the Duck Lake development will be an exception. Duck Lake is already protected from the Kootenay River by dyke, and capital construction and installation of necessary pumps can proceed regardless of the completion of Libby Dam.

The present values of capital costs for each area are summarized in Table 8. Annual maintenance costs will depend on the extent of development, reaching maximum annual levels only after final development. To calculate the present value of maintenance costs it has been assumed that they increase in direct proportion to the extent of capital development each year. Salary and management costs will also increase in relation to the extent of development, reaching an upper limit in 1976 of \$75,000 per year. The present values of annual maintenance and salary expenses are also included in Table 8. Calculation of the present values summarized in Table 8 is presented in detail in Appendix J.

TABLE 8

THE PRESENT VALUE OF PRIMARY COSTS,
WILDLIFE AND OUTDOOR RECREATION DEVELOPMENT

I T E M	PRESENT VALUE OF CAPITAL COSTS	PRESENT VALUE OF ANNUAL MAINTENANCE
Indian Reserve 1A	$ 20,000	$ 19,000
Indian Reserves 1, 1B	223,000	62,000
Corn Creek	78,000	53,000
Leach Lake	330,000	119,000
Six Mile Slough	149,000	56,000
Duck Lake	594,000	208,000
TOTAL	$1,565,000	$581,000
Salaries		$833,000
Present value of capital costs	$1,565,000	
Present value of annual costs		$1,414,000

In Table 8 all future costs are discounted back to 1970 values using a discount rate of eight per cent. The present worth of annual costs and salaries has been calculated assuming a stream of annual expenditures in perpetuity. The present value of all costs is estimated at $2,979,000, of which $1,565,000 (53 per cent) is the present value of capital costs, and $1,414,000 (47 per cent) represents the present value of annual costs.

The simplest interpretation of these present values is that they represent the amount which would be required in a lump sum at the present to meet all future costs. Thus, if a total of $2,979,000 was invested today at eight per cent all future capital and operating costs could be met from it.

Present values have been presented as of 1970 although for most areas there will be little development until 1973. The development of Duck Lake will begin in 1970 as the first step in the overall development. 1970 is thus regarded as the commencement date for the entire project and all costs have been discounted back to this basis.

Secondary Benefits and Costs

The nature of secondary benefits and costs was discussed in Chapters II and IV. The definition of net secondary benefit applied in Chapter IV -- the net economic gain, or the value of the secondary product or service over and above the cost of inputs -- is adopted here. Secondary benefits from this development will result from spending by recreationists and others in conjunction with utilization of the area.

Discussion of these net secondary benefits requires that the total amount of secondary business activity which would be generated by the project be estimated. The true net annual gain can then be derived from these estimates and discounted to a present value. The calculations necessary for such estimates are presented in Appendix L.

A variety of factors will operate in determining the magnitude and distribution of secondary benefits from this project. The major force will be recreationists' spending, but in addition spending will be generated through agriculture and trapping. Secondary benefits will develop slowly, not being fully realized until 1985 when recreational utilization reaches the full capacity of the area.

Estimates of this impact are difficult due to the different timing assumed for the various types of utilization. It is estimated that business revenues will reach a maximum by 1985 when spending by recreationists, farmers, and trappers will be about $2,000,000.

Secondary Benefits in the Local Economy

In dealing with the net benefit resulting from this spending reference is made to the discussion of income and employment multipliers in Appendix A. The analysis in Appendix A follows from the export base thesis in which only new income to a region is considered relevant in determining the multiplied impact of new investments. At the local level, spending by Creston residents for recreation does not represent new income to the region -- simply a spending of income already earned in the local economy. We assume that Creston residents would spend the same amount in the area even if the particular recreation opportunities were not developed.

Therefore, to measure the net secondary impact attributable to development we deal only with recreational spending by non-local persons, plus spending generated by agriculture and trapping. These are the categories of spending which would not occur if there were no development. Taking account of these factors reduces the appropriate measure of initial secondary business receipts as of 1985 to $1,960,000. The local impact of this spending will be expanded through the multiplier to approximately $3,058,000. Of this, approximately three per cent, or $92,000, can be taken as net secondary benefit. This is a measure of the net secondary benefit for the year 1985 only, however. Allowing for the annual increase in benefits up to this limit, and a constant level beyond, the present value in 1970 is $731,000.

Secondary Benefits at the Provincial Level

To be consistent with the export base thesis spending considered at the provincial level includes only spending by recreationists from outside British Columbia. We assume that British Columbia residents would spend the same amount in British Columbia in the absence of recreational opportunities at Creston. Agricultural spending is also adjusted to take account of non-export content. When these adjustments are made it is estimated that gross receipts of secondary businesses would be increased by $3,237,000 in 1985 as a direct result of the proposed development at Creston ($1,413,000 in the initial or first round; $3,237,000 in total after the multiplier effect). Net secondary benefit in this year would be approximately $97,000, remaining constant thereafter. The present value of net secondary benefit at the provincial level, allowing for annual increments to 1985 is estimated to be $773,000.

Secondary Benefits at the National Level

Expanding the analysis to the national level further reduces the secondary benefit which is considered relevant. At this level only expenditures by non-Canadians are relevant, under the assumption that Canadians who spend money on recreation at Creston would spend the same amount in Canada even if the wildlife development did not take place. Appropriate adjustments are also made to agriculturally generated spending to allow for non-export content at the national level.

When these adjustments are made it is estimated that the gross receipts of businesses in Canada in 1985 would be increased by $1,790,000 due to the wildlife development at Creston. Net benefits in this year would be approximately $54,000, the present value of all net secondary benefits being $431,000.

These are interesting estimates, as they are only slightly more than half of the comparable estimates when the referent group is British Columbia. This is due to the fact that at the national level only spending attracted to Canada from outside the national borders is considered relevant. At the provincial level all spending attracted from outside British Columbia was relevant, representing a much larger amount.

This illustrates very aptly that secondary impact is mainly of interest when a project is being analyzed from a narrow regional viewpoint. These measures are of little interest from a national point of view -- at this level it can usually be argued that a similar project would have the same secondary impact if undertaken elsewhere in the nation. A second reason for emphasizing this point is that it should focus attention on the importance of primary benefits in resource development. Most of the primary benefits of this particular project accrue to people from outside the local community, and in this case the estimated primary benefits increase as the viewpoint of the analysis is broadened.

To summarize, net secondary benefits are defined as the true economic gains from business activity generated by recreational and other uses under the proposed wildlife development. The present value of these benefits to the Creston economy is estimated at $731,000, to the provincial economy $773,000 and nationally $431,000. Such benefits are mainly of interest from the local (Creston) perspective, being of less interest at the provincial and national levels.

Benefit-Cost Relationships and the Distribution Among Referent Groups

The economic feasibility of the wildlife-recreation project can be assessed by comparing the present value of benefits with the present value of costs. Estimates of the present value of costs and benefits, at both the primary and secondary levels, were presented in the preceding sections of this chapter. In comparing benefits and costs the net assessment of the project's feasibility depends on the viewpoint adopted for the analysis. In the following discussion the benefit-cost comparisons are summarized from the point of view of the three referent groups adopted in this study.

Primary Benefit-Cost Comparisons

The present value of primary costs was summarized above in Table 8, and the present value of primary benefits (except unmeasurable benefits) was summarized in Table 7. These are general summaries, however, and ignore the distribution of primary costs and benefits among the various referent groups.

Present proposals call for primary costs to be shared between the British Columbia Fish and Wildlife Branch, the Canadian Wildlife Service, and Ducks Unlimited (Canada). Ducks Unlimited will pay for the capital costs of developing the Leach Lake and Six Mile Slough areas, with a total present value of $479,000. Capital costs of developing the Indian

Reserves and Corn Creek, having a total present value of $321,000, will be borne by the Canadian Wildlife Service, and the British Columbia Fish and Wildlife Branch will bear the costs of Duck Lake and the Administrative Centre, with present values of $765,000. Annual maintenance and salary costs, having a total present value of $1,414,000, will be shared equally by the provincial and federal governments.

The distribution of the present value of primary costs between the participating bodies will be as follows:

Ducks Unlimited (Canada)	$ 479,000
Canada (Canadian Wildlife Service)	$1,028,000
British Columbia (Fish and Wildlife Branch)	$1,472,000
Total	$2,979,000

The participation by Ducks Unlimited provides an interesting point in a benefit-cost analysis such as this. Ducks Unlimited is a private, non-profit organization dedicated to the conservation of North American waterfowl resources by preservation and development of breeding habitat in Canada. Ducks Unlimited was incorporated in the United States in 1937, and the organization of Ducks Unlimited (Canada) completed in 1938. Ducks Unlimited (Canada) provides a means by which donations and private funds from the United States can be spent on habitat improvement in Canada (Gavin 1964).

Insofar as this money comes from outside Canada, the development of the Leach Lake and Six Mile Slough areas is essentially costless to Canadians. Therefore, whether the referent group is the local area, British Columbia, or Canada, the costs of these developments (estimated at

$479,000, present value 1970) are appropriately omitted from analysis. while any benefits accruing to Canada from these developments are included.

In the same way that primary costs are spread between the different referent groups, primary recreation benefits may also be widely dispersed. Recreationists using the area may be local residents, residents from elsewhere in British Columbia, Canada, or the United States. It is thus particularly important that the project's feasibility is examined from the perspective of the different referent groups.

The local economy: primary costs and benefits.--Costs would be incurred by the local area only insofar as it contributes to provincial and federal general revenue. It is difficult to argue that any particular fraction of the costs borne by either the Fish and Wildlife Branch or the Canadian Wildlife Service can be traced to revenues from the Creston area. It could be argued on one hand that no costs are borne by the local area, since all funds will come from higher levels of government. An alternative argument might be that local citizens contribute to the costs on an equal per capita basis with other citizens of British Columbia and Canada. On this basis costs borne locally are insignificant, having a present value of roughly $5,000.*

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*Creston area population is 1/3 of one per cent of B.C. population, 1/30 of one per cent of Canadian population. Total expenditures by B.C. Fish and Wildlife Branch will be $1.5 million, by Canadian Wildlife Service $1.0 million. On a per capita basis the local content of provincial expenditure would be $4,950, of Canadian Wildlife Service expenditure approximately $330.

While costs relative to the local economy are hard to identify, it is a relatively straightforward matter to identify the benefits to the local area. It is assumed that all the benefits from agriculture ($549,000) and all the benefits from trapping ($37,000) accrue to local persons. In terms of hunting, approximately 50 per cent of the benefit, or $320,000 is expected to accrue to local residents.* Similarly, it is estimated that approximately 50 per cent of the benefit from the warmwater sportfishery, or $150,000 would accrue to local fishermen. For non-consumptive recreation the proportion of local use will be very low -- not in excess of two to three per cent. The population in the Creston area is low and use by local residents will certainly not keep pace with use by others. A benefit in the order of $300,000 is thus appropriate for non-consumptive recreation.

Totalling these figures the primary benefits accruing to the local area have a present value of approximately $1,356,000. When these benefits are compared to the almost negligible estimate of primary costs a net benefit estimate of $1,350,000 appears in order.

British Columbia: primary costs and benefits.--When the referent group is expanded to include the entire province of British Columbia, all costs borne through the Fish and Wildlife Branch become relevant. These costs have a total present value of $1,472,000 as discussed above.

The relevant benefits in this case include all benefits accruing to citizens of British Columbia. Again, it is assumed that all

*At present local hunters account for 48 per cent of the utilization on the Creston flats. This is expected to increase to 50 per cent after development, with local residents being in a privileged position with respect to access to hunt on private land.

benefits from agriculture and trapping accrue to British Columbians ($549,000 and $37,000 respectively). In terms of hunting, the entire benefit -- $640,000 -- is assumed to accrue to British Columbians.* Approximately 65 per cent of the utilization of the warmwater sport-fishery may be by British Columbians, having a present value of $196,000.

Both fishing and hunting tend to be repetitive outdoor recreation activities and a high degree of utilization by British Columbians is expected. Estimating the amount of non-consumptive recreation taken by British Columbians is more difficult. Such recreation is largely non-repetitive, with most visitors (outside local residents) probably making at most one trip to the area per year.

After reviewing figures relating to park attendance in British Columbia (Appendix G), it appears unlikely that more than 35 per cent of the utilization in non-consumptive recreation will be by British Columbians from outside the local area. Combined with three per cent utilization by local residents, total use by British Columbians is 38 per cent, with a present value of $3,833,000.**

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*British Columbians presently account for 96 per cent of the hunting in the area and hunters from the United States four per cent. After expansion and development there will be sufficient pressure from British Columbians to utilize all opportunities.

**This may be a conservative estimate. It implies that in the year 1985 about 95,000 visitor-days would be taken by British Columbians. If our population grows at eight per cent per year it will total about 7.5 million in 1985. 95,000 visitor-days represents a one day visit by 1.3 per cent of the population of British Columbia. While this may appear low, it should be noted that Creston is a considerable distance from British Columbia's population centre, and that British Columbians face many high quality recreational alternatives.

The total present value in 1970 of all benefits accruing within the British Columbia referent group is thus $5,652,000, composed as follows:

Benefits to British Columbians from:

Agricultural production	$549,000
Trapping	37,000
Hunting	640,000
Fishing	196,000
Non-consumptive recreation	3,833,000
Total	$5,255,000

When compared with the present value of costs borne by British Columbia of $1,472,000 this yields a net benefit estimate of $3,783,000.

Canada: primary costs and benefits.--When the referent group is Canada all costs and benefits accruing within the country become relevant. All costs except those borne by Ducks Unlimited are included in the analysis, increasing the measure of total costs to $2,500,000 (present value 1970).

The main effect on benefits will be to increase the recreational benefits included in the comparison with costs. Hunting benefits accrue 100 per cent to Canadians (British Columbians), and we expect the proportion of fishing benefits to increase from 65 per cent for British Columbians to approximately 80 per cent, with a present value of $240,000. Referring again to the campground attendance figures it appears that as much as 40 per cent of the non-consumptive recreational use could be by Canadians from outside of British Columbia. This would increase total utilization by Canadians to 78 per cent, the present value of which is $7,869,000. The remaining utilization and benefit would accrue to non-Canadians, almost all of whom would be from the United States.

For both agriculture and trapping all benefits accrue to local residents and hence to Canadians. The total present value in 1970 of all benefits accruing in Canada is estimated to be $9,335,000, composed as follows:

Benefits to Canadians from:

Agricultural production	$549,000
Trapping	37,000
Hunting	640,000
Fishing	240,000
Non-consumptive recreation	7,869,000
Total	$9,335,000

Compared with the present value of total costs accruing within Canada of $2,500,000 net primary benefits are estimated to be $6,835,000 (present value 1970).

Summary: Primary Benefit-Cost Comparisons

The preceding analysis establishes the economic efficiency of the proposed wildlife development. The feasibility estimates are summarized in Table 9 which indicates the significance of changes in the referent groups.

TABLE 9

COMPARISON OF PRIMARY BENEFITS AND COSTS BY REFERENT GROUP

	CRESTON (LOCAL ECONOMY)	BRITISH COLUMBIA	CANADA
Present value of primary benefits (B)	$1,356,000	$5,255,000	$9,335,000
Present value of primary costs (C)	5,000	1,472,000	2,500,000
Net primary benefits (B-C)	1,351,000	3,783,000	6,835,000
Primary benefit-cost ratio (B/C)	271:1	3.6:1	3.7:1

In presenting this summary, it should first be reiterated that unmeasurable primary benefits are not included in this analysis. For this reason we have only a partial comparison of primary benefits with the full measure of primary costs and the feasibility estimates must be interpreted accordingly -- they understate the true degree of feasibility. It is expected that the magnitude of unmeasurable primary benefits will vary between the referent groups. While such benefits are not included in this summary, they are integrated in the total benefit-cost comparison later in this chapter.

Secondly, this summary provides an excellent illustration of the way in which the feasibility of a project varies depending on the referent group adopted. For the local economy net primary benefits are estimated at $1.35 million, the ratio of benefits to costs being 271:1. This illustrates aptly that benefits to a local area tend to be disproportionate when most costs of a development are borne by outside bodies.

The province of British Columbia is responsible for roughly 50 per cent of the development costs, but citizens of British Columbia will realize only 45 per cent of the benefit. This is reflected in the fact that the benefit-cost ratio is lowest when the referent group is British Columbia. At the national level, Canadians other than British Columbians will reap a larger share of the recreational benefits relative to the costs borne by the Canadian Wildlife Service. At this level we encounter a higher benefit-cost ratio, indicative of the fact that some of the spending by the British Columbia Fish and Wildlife Branch will generate benefits to Canadians outside British Columbia. Eighty-four per cent of the total costs are borne within Canada, and 81 per cent of total benefits realized within Canada. It is expected that costs and benefits not accounted for within the Canadian referent group will accrue almost exclusively to residents of the United States.

Discussing the reliability or accuracy of these findings is a difficult task. Many aspects of the project will be experimental, and it is a pioneering effort in British Columbia -- basic technical relationships between input and output are therefore very difficult to estimate. Compounding this is the fact that almost the entire output (except agriculture and trapping) will consist of non-marketed goods and services -- wildlife, and opportunities for outdoor recreation. These factors have made analysis difficult and frequently laborious.

Despite these problems, it is felt that the assumptions regarding the output from this project, and its value, are realistic and if they are in error it is an error of understatement. Recent experience with attendance and participation at similar facilities throughout North America supports this view.

While it is impossible to submit the estimates of this analysis to any tests other than that of judgement, one aspect which can be tested is the effect of the discount rate on the outcome of the analysis. The analysis summarized above is based on values discounted to 1970 at a rate of eight per cent. The analysis has also been carried out with discount rates of six and ten per cent and the results of this are summarized in Appendix K.

Due to the varied distribution of costs and benefits through time, these alternative discount rates alter the degree of feasibility, although only slightly. A six per cent rate deals less harshly with benefits in the future and hence increases the feasibility, while a rate of 10 per cent discounts future benefits more severely and reduces the estimated present value of net benefits. These changes are not significant, however, and the project remains feasible over the range of discount rates from six to ten per cent. The significance of the discount rate is discussed further when comparisons are drawn between the agricultural and wildlife development alternatives.

Secondary Benefit-Cost Comparisons

Secondary benefits and costs were treated thoroughly earlier in this chapter. At the secondary level all benefits and costs are tangible, and no problems arise from either intangible or unmeasurable secondary effects. Estimates of the present value of net secondary benefits vary among the referent groups. At the local level they are estimated as

$731,000, $773,000 provincially, and $431,000 nationally. Secondary benefits and costs are incorporated in the total benefit-cost comparisons of Table 10. Annual gross receipts of secondary businesses are discounted to present values and presented as benefits, and the present value of annual business costs is given as secondary costs.

Total Benefit-Cost Comparisons

A total benefit-cost comparison incorporating both primary and secondary benefits and costs is presented in Table 10, with separate comparisons for each referent group. Net benefits which are quantified in monetary terms total $2,082,000 within the local referent group, $4,556,000 within British Columbia and $7,266,000 within Canada. Incorporating unmeasurable primary benefits renders the total comparison rather awkward, and the total net benefit estimates must be qualified accordingly since they understate the true net benefits of the wildlife-recreation project. Under the wildlife-recreation development all unmeasurable effects fall in the primary benefit category, the opposite of the proposed agricultural development where all unmeasurable effects were primary costs.

When all real costs and benefits are compared in this manner, it is clear that the proposal for wildlife and outdoor recreation development represents a feasible investment project. This analysis alone, however, does not answer the question of the most efficient use for the undeveloped land. This question can only be answered through a comparison of the feasibility estimates for the two alternatives, agriculture and wildlife-recreation, which is the task of the next chapter.

TABLE 10

THE BENEFITS AND COSTS OF WILDLIFE-RECREATION DEVELOPMENT

		REFERENT GROUP OR VIEWPOINT		
		LOCAL COMMUNITY (CRESTON)	BRITISH COLUMBIA	CANADA
BENEFITS				
Primary benefits:	Tangible	$ 586,000	$ 586,000	$ 586,000
	Intangible	$ 770,000	$ 4,669,000	$ 8,749,000
	Unmeasurable	provision of habitat and production of wildlife species.		
		"small" value to local area	"large" value to all British Columbians	"very large" value to Canadians
Secondary benefits:		$24,364,000	$25,764,000	$14,365,000
Total benefits:		$25,720,000	$31,019,000	$23,700,000
COSTS				
Primary costs:	Tangible	$ 5,000	$ 1,472,000	$ 2,500,000
	Intangible	nil	nil	nil
	Unmeasurable	nil	nil	nil
Secondary costs:		$23,633,000	$24,991,000	$13,934,000
Total costs:		$23,638,000	$26,463,000	$16,434,000
Total Net Benefits*		$ 2,082,000	$ 4,556,000	$ 7,226,000

*As discussed, unmeasurable benefits must be added to these net benefit estimates to provide a true measure of net gain.

The Distribution of Benefits

This chapter has paid little attention to the basic issue of using a publicly owned land resource (excepting of course the Indian Reserves) to benefit a particular group in society, mainly outdoor recreationists. The distribution of costs and benefits between the local, provincial, and national economies was analyzed, but beyond this the more basic question of whether the users of the land (recreationists) will compensate the owners of the land (the public at large and the Lower Kootenay Indian Band) has not entered into this analysis.

Again we face the question of the final distribution of the net benefit, not its total amount. Of particular interest are the types of arrangements which can be made for recreational use of the Indian Reserves. Whatever the arrangements they do not affect the level of net benefit, only its final distribution. Distributional considerations of this nature may be important and are discussed at greater length in the next chapter when the development alternatives are compared.

CHAPTER VI

THE ALTERNATIVES COMPARED: BENEFITS AND COSTS FROM AGRICULTURE AND FROM WILDLIFE AND OUTDOOR RECREATION

The preceding chapters have examined the economic feasibility of continuing with present land use on the Creston flats, of reclaiming the land for agricultural production, and of developing it for wildlife and outdoor recreation purposes. A brief investigation of present land use revealed it to be an unattractive alternative, and it is dismissed from further discussion. For both the agricultural and wildlife alternatives the investigations reveal fundamental economic feasibility, with significant net benefits generated in each case. The object of this chapter is to compare these two alternatives and decide whether either can be clearly established as a superior development.

Use of the Benefit-Cost Framework for Comparison and Choice

Benefit-cost analysis of the two alternatives has so far answered only the very basic question of the feasibility of each. Both alternatives are shown to be feasible, and measures of net benefit and benefit-cost ratios are available for each. To choose consistently between the two projects on the basis of this information requires that the appropriate basis for the decision be clearly established.

The different applications of benefit-cost analysis were referred to briefly in Chapter II. The question which must be answered in this instance is very clear, and falls into the fourth category identified, "the optimum choice between the two competing projects or mutually exclusive alternatives for the same site."

The appropriate criterion for a decision of this nature is also very clear: the choice should be based on the maximum net benefits generated by the respective projects. Thus, for the comparisons which follow, the basis for establishing the superiority of one project over the other will be the net benefits generated, discounted to present values in 1970.

The Alternatives Compared: Local, Provincial, and National Referent Groups

In the case of the wildlife-recreation development, changing the referent group in the analysis has important implications for the present value of net benefits. In the case of agricultural development the results vary only slightly. The measures of net gain (or loss) derived in Chapters IV and V are compared below for each of the three relevant viewpoints or referent groups.

Comparison of Alternatives from the Local Viewpoint

Analysis from this viewpoint is the narrowest in scope. All primary benefits from agricultural production are included as it is assumed that local residents will undertake any development of this nature. Only a fraction of the primary benefits from the wildlife development will be included, however, as most beneficiaries are expected to come from outside the Creston area.

To facilitate discussion, the various measures of net benefit or cost for the two alternatives are summarized in Table 11. This table should be regarded as a rough balance sheet setting out the relative merits of the two alternatives from the local viewpoint.

At this level the present value of quantified primary net benefits (tangible and intangible) from the agricultural development exceeds the corresponding value from the wildlife-recreation development by approximately $0.58 million. This follows as a direct result of the narrow scope implied by this viewpoint, thereby omitting most of the benefits from the wildlife-recreation alternative.

TABLE 11

COMPARISON OF ALTERNATIVES FROM THE LOCAL VIEWPOINT

ESTIMATED VALUE OF:	AGRICULTURAL DEVELOPMENT	WILDLIFE-RECREATION DEVELOPMENT
A. *Net* Primary Benefits		
Tangible) Intangible)	$1,929,000	$1,350,000
Unmeasurable	(COST) destruction of habitat and loss of rare wildlife species	(BENEFIT) enhancement of habitat, increased production of wildlife, education and research use
B. *Net* Secondary Benefits	$ 398,000	$ 731,000

The present value of net secondary benefits is greatest in the case of the wildlife development, exceeding the comparable measure in agriculture by $0.33 million. This is explained by the fact that in the long run spending generated by recreationists will exceed that generated through agriculture by a significant margin.

Differences between the two projects are most pronounced at the level of unmeasurable benefits or costs. The wildlife development would create important unmeasurable benefits through the on-site production of wildlife, enhancement of habitat, and provision of educational and research opportunities. For the agricultural development there are no unmeasurable benefits, but serious unmeasurable costs. These costs arise from the destruction of habitat and loss of rare wildlife species.

The balance between the alternatives from the local point of view is difficult to determine. The scales are tipped in favor of agriculture by the measures of net primary and secondary benefits which exceed the corresponding measures from wildlife development by a total of $0.25 million. Offsetting this advantage, however, are the unmeasurable costs associated with the agricultural development, in opposition to unmeasurable benefits from the wildlife-recreation development.

A choice between the two projects at this level hinges on these unmeasurable benefits and costs. If the local community places little value on the production of wildlife and protection of rare species, a choice made at this level would favor the agricultural alternative with its preponderance of net measurable benefits. The preferences of the local community alone, however, do not provide a satisfactory basis for such a choice. A larger community of interest is more appropriate when such values are involved. Comparisons from the point of view of the province and the nation follow.

Comparison of Alternatives from the Provincial Viewpoint

Broadening the scope of analysis to the province as a whole has a marked effect on the comparison of the two alternatives. At this level recreational benefits included in the analysis will encompass all those accruing to persons who are residents of British Columbia, not just residents of the Creston area. The various measures of benefits and costs at this level are summarized in Table 12. Regarding this again as a rough balance sheet, it can be seen that shifting the viewpoint to the provincial level will also shift the choice in favor of a wildlife-recreation development rather than agricultural development.

TABLE 12

COMPARISON OF ALTERNATIVES FROM THE PROVINCIAL VIEWPOINT

ESTIMATED VALUE OF:	AGRICULTURAL DEVELOPMENT	WILDLIFE-RECREATION DEVELOPMENT
A. *Net* Primary Benefits		
Tangible) Intangible)	$1,773,000	$3,783,000
Unmeasurable	(COST) Destruction of habitat and loss of rare wildlife species	(BENEFIT) enhancement of habitat, increased production of wildlife, education and research use
B. *Net* Secondary Benefits	$ 413,000	$ 773,000

At this level the present value of quantified primary net benefits (tangible and intangible) from the wildlife development exceeds that from the agricultural alternative by $2.01 million. In terms of net secondary benefits the wildlife project again appears superior with an estimated present value of $0.36 million greater than that for agriculture.

Differences between the two projects are again pronounced in terms of unmeasurable benefits or costs. While these factors are of the same nature as when discussed in the local context, they will be of greater weight when the viewpoint of all British Columbians is considered relevant. Thus, the unmeasurable benefits from the wildlife project would be given a greater emphasis, adding to the project's favorable balance, while the unmeasurable costs associated with the agricultural development would also receive greater emphasis, detracting from its level of benefits.

The uncertainty which surrounded a decision at the local level is removed when the alternatives are assessed from the provincial perspective. All measures clearly favor the wildlife-recreation development. Net primary and secondary benefits have a combined present worth which exceeds that in agriculture by $2.37 million, while the balance of unmeasurable benefits also favors the wildlife development. Choosing between the alternatives at the provincial level results in the unequivocal selection of the wildlife-recreation development as the most appropriate land use.

<u>Comparison of Alternatives from the National Viewpoint</u>

From a national viewpoint the benefits accruing to all Canadians from the proposed developments become relevant, as do all costs incurred within Canada. This has the effect of increasing the present value of quantified primary net benefits (tangible and intangible) from the wildlife and recreation development to $6.89 million. In the case of the agricultural development the primary benefit-cost comparison remains as it was in analysis at the provincial level. Table 13 summarizes comparisons at the national level.

TABLE 13

COMPARISON OF ALTERNATIVES FROM THE NATIONAL VIEWPOINT

ESTIMATED VALUE OF:	AGRICULTURAL DEVELOPMENT	WILDLIFE-RECREATION DEVELOPMENT
A. *Net* Primary Benefits		
Tangible) Intangible)	$1,773,000	$6,835,000
Unmeasurable	(COST) Destruction of habitat, loss of rare wildlife species, breach of international obligations	(BENEFIT) enhancement of habitat, increased production of wildlife, fulfilment of international obligations, education and research
B. *Net* Secondary Benefits	$ 401,000	$ 431,000

At the national level this comparison reinforces the conclusion reached from the provincial perspective -- the superiority of the wildlife development is clearly established. Primary net benefits are almost four times as great as in agriculture ($6.84 million versus $1.77 million). Net secondary benefits are roughly comparable at this level, and both are deflated below previous levels due to the removal of "non-export" spending.

Comparison of unmeasurable benefits or costs again yields the same result as from the provincial viewpoint. The unmeasurable costs associated with the agricultural development are significant and constitute a reduction in the level of total benefits. For the wildlife development on the other hand important unmeasurable benefits must be counted in addition to those quantified in monetary terms.

Unmeasurable benefits are particularly significant from the national point of view. Maintaining continental waterfowl habitat and protecting rare wildlife species is largely the concern of the federal government which has commitments in this regard under the Migratory Birds Treaty. The wildlife-recreation development at Creston will make an important contribution to these international commitments, in addition to the importance of such unmeasurable benefits to many people throughout Canada.

Summary: The Alternatives Compared

The preceding comparison of the benefits and costs generated by the alternative developments produces an interesting result. At the national and provincial level the wildlife development is superior in all regards to agricultural development. However, no definite conclusions can be drawn from the comparison at the local level. The agricultural development appears clearly superior in terms of net primary and secondary benefits, its only drawback being the unmeasurable costs. This arises when recreational benefits accruing to persons from outside the Creston area are excluded from the feasibility analysis of the wildlife alternative.

This result makes the selection of the appropriate referent group very important in determining the best pattern of development for this land. If the objective of land development is to maximize net benefits to the local area only, agricultural development appears to be slightly superior to the wildlife-recreation development. But a firm conclusion cannot be drawn in this regard without exhaustive investigation of the significance at the local level of the unmeasurable costs associated with agricultural development. If the objectives of development are to maximize the net benefits within some larger framework (British Columbia or Canada), the choice is clear and the land should be developed for wildlife and recreational purposes.

It was suggested in Chapter II that the appropriate referent group for any decision regarding the development of provincial Crown land is the province of British Columbia as a whole. This argument is put forward on the basis that Crown lands of this nature are the property of all British Columbians, and as such, should be developed to the greatest advantage of the entire province, not some segment of the province. On this basis, it has been clearly established that the optimum use of the unreclaimed provincial Crown land would be under the proposal for wildlife and outdoor recreation development.

Not all of the unreclaimed land is provincial Crown land, with Indian Reserves 1, 1A and 1B comprising 3,000 acres, about one-fifth of the total. This land is the property of the Lower Kootenay Indian Band and it was suggested that they formed the relevant referent group with respect to the development of their land. Within the context of the preceding analysis of benefits and costs, if the Indians are considered as members of the various referent groups then the conclusions drawn will hold. Treatment as an independent referent group for the development of reserves 1, 1A and 1B requires a different approach with different objectives, however, and is touched on in Chapter VII.

Analysis of the benefits and costs to British Columbia and to the Indian Band is appropriate where the referent group is indicated by ownership of the resource. But the costs of the wildlife development will be shared with sources outside these referent groups -- the Canadian Wildlife Service representing the government of Canada, and Ducks Unlimited (Canada) consisting of private contributions from the United States.

It is assumed that those responsible for the investment of Ducks Unlimited funds are satisfied with their prospects of returns, or the investments would not be made.

From the point of view of the government of Canada, the question must be raised as to whether participation in the wildlife development represents an efficient use of funds. The preceding analysis suggests that it does. At the national level net primary benefits have a present value of $6.84 million and the ratio of benefits to costs is 3.7:1. While this indicates that the project at Creston is an efficient investment, it does not indicate whether the project at Creston represents the most efficient use of federal funds available for investment in wildlife. To answer this question the project at Creston would have to be compared with alternative investment opportunities elsewhere in Canada, an undertaking entirely outside the scope of the present study.

The Alternatives Compared on the Basis of Individual Units

The preceding comparison of alternatives has been based on the assumption that all the undeveloped land would be used either in agriculture or in wildlife and recreation. But the total devotion of the area to one use or the other is not necessary -- there are five physically separate units and the possibility of some combination of agriculture and wildlife should also be considered. For agriculture the feasibility of reclamation was assessed for each physical unit, and the results were found to vary significantly (see Chapter IV, Table 5). Reclamation of the Corn Creek unit appears least desirable, while reclamation of the Indian Reserves would be the most desirable.

When compared with the wildlife development on an aggregate basis the individual differences in agricultural feasibility disappear and the comparison is then based on the average efficiency. This means of comparison is not entirely satisfactory, but it is employed because of constraints imposed by the nature of the wildlife alternative.

When analyzing the wildlife and recreation alternative it is difficult to consider any one unit as a separate entity due to the closely interrelated functions of each in the overall plan. While the output or production of the total area can be identified, the actual location of various activities within the overall development may vary from year to year. Areas which are reserved as sanctuaries one year may be open to recreational use in the next and in addition the location and extent of agricultural use will vary to meet the needs of wildlife management. Therefore, while it was possible to establish the total feasibility of the wildlife project, it is very difficult to estimate the feasibility of developing any particular segment on its own. The costs for each unit can be identified, but the benefits may not be specific to the area.

Despite the problems associated with making comparisons on the basis of individual units, a brief attempt at such a comparison is made here. This is done to rectify the shortcomings of the comparison on an aggregate basis which overlooked the variation in agricultural feasibility between units.

Making such a comparison becomes very complex, due to the recurrence of problems associated with the referent groups in the wildlife development. The incidence of benefits and costs creates no problems in the case of agricultural analysis where all costs and benefits are borne locally. In the case of wildlife-recreation development, maintenance and salary costs will be divided equally between the provincial and federal governments, while capital costs will be met from a variety of sources (see Chapter V). To compare the alternatives for any unit thus entails sorting out the relative costs and benefits for each referent group in the case of wildlife, and comparing them with those from agriculture. This has been done for British Columbia and Canada as referent groups, and the results are summarized in Table 14 which compares the alternatives on the basis of net primary benefits (tangible and intangible) for each unit.

To make these comparisons it was assumed that the wildlife-recreation benefits attributable to each unit would be in direct proportion to its area. Thus Duck Lake, with 32 per cent of the total area under development is assigned 32 per cent of the benefits at both the federal and provincial levels. A similar procedure was adopted in distributing general salary and personnel costs between the five units. The total costs of the Administrative Centre was apportioned between units in this manner also, with the distribution of this particular cost between British Columbia and Canada following that given in Chapter V.

The comparisons presented in Table 14 will be given only a brief review. The estimated net primary benefits in agriculture are given in the first column, and these estimates remain constant for both the provincial and national viewpoints. The second column summarizes the net primary benefits of the wildlife-recreation development from the provincial viewpoint, while the third column presents the same estimates from the national perspective. Comparing each unit in this manner bears out the earlier conclusions based on an aggregate comparison of the alternatives. In all cases, the wildlife-recreation development represents the optimum use for the unreclaimed land.

TABLE 14

THE ALTERNATIVES COMPARED ON THE BASIS OF INDIVIDUAL UNITS*

		WILDLIFE-RECREATION	
UNITS	AGRICULTURE**	PROVINCIAL VIEWPOINT	NATIONAL VIEWPOINT
1. THE INDIAN RESERVES Net Primary Benefit	$ 361,000	$ 910,000	$1,371,000
2. THE CORN CREEK UNIT Net Primary Benefit	101,000	413,000	657,000
3. LEACH LAKE Net Primary Benefit	403,000	858,000	1,517,000
4. SIX MILE SLOUGH Net Primary Benefit	360,000	811,000	1,440,000
5. DUCK LAKE Net Primary Benefit	548,000	791,000	1,850,000
6. ALL AREAS Net Primary Benefit	1,773,000	3,783,000	6,835,000

*These comparisons are based only on estimates of the net primary tangible and intangible benefits from each alternative. Unmeasurable costs and benefits are ignored since they can only be appended as qualifications and would make comparisons for each unit awkward. Inclusion of unmeasurable costs or benefits would serve to enhance the superiority of the wildlife-recreation alternative in each area.

**The present values of primary net benefits in agriculture are below those given in Chapter IV because intangible costs have been included in calculating net benefits.

Final Qualifications: Comparison of Alternatives Through Benefit-Cost Analysis

This report has aimed at comparing the relative merits of two alternatives for undeveloped land in the Kootenay River floodplain at Creston through a comparative benefit-cost analysis. The results of this comparison, as outlined in this chapter, consistently favor the investment in wildlife and recreation over the alternative investment in agricultural development.

Performing the analysis, however, required many simplifying and sometimes arbitrary assumptions. The effect of these assumptions on the outcome of the analysis cannot be tested, but it is believed that the assumptions are realistic and the results of the analysis are valid. Nevertheless some final qualifications to the outcome of this analysis are appended here.

A. Changing Relative Values

The analysis of benefits arising from both the recreational and agricultural development has been based on current values for the two types of output. The prices of agricultural produce are readily observed and easily adopted to estimate the value of output. The value of recreational output is not so easily observed, and our analysis was based on imputed values in this case.

Consideration of the likelihood of changes in the relative value of these two outputs leads to a qualification of the conclusions. Aside from changes in the general price level, it is entirely likely that there will be pronounced changes in the relative values placed on agricultural ouptut and recreation opportunities in the future.

Improvements in agricultural technology and increased efficiency in production mean that agricultural output is becoming cheaper relative to other goods and services. With an abundance of agricultural output in Canada the value placed on increases in production will be steadily declining, relative to scarcer goods and services which could alternatively be produced. This trend has already been strongly apparent in Canada, and will increase in the future.

On the other hand, opportunities for outdoor recreation are growing increasingly scarce relative to the population and the production of other goods and services. The value placed on increases in the availability of such opportunities will rise in the future, relative to the value placed on other goods and services.

Based on static, or current values, we have estimated that net benefits under a wildlife development will exceed those of an agricultural development by significant margins. The implications of this qualification are that these margins can be expected to widen significantly as the relative value of the two outputs changes through time.

B. Effect of the Discount Rate on Comparison of Alternatives

The importance of the discount rate in benefit-cost analysis has already been stressed, and the sensitivity of the results for each alternative was tested for rates of six, eight, and ten per cent. While changing the rate over this range automatically had a bearing on the results, in no case were the basic conclusions regarding feasibility of individual projects altered.

But due to the different distribution of costs and benefits through time in the two alternatives the possibility remains that comparing alternatives at different rates could change the results of the comparison. While this possibility is not investigated in great detail it can be checked by comparing the analysis of Appendix E with respect to discount rates with that in Appendix K. Such a comparison reveals that the results obtained when the alternatives are compared with different discount rates are not changed.

It is concluded that the basic results of this analysis are in no way changed by selecting discount rates over the range of six to ten per cent.

C. Problems in Wildlife and Recreation Evaluation

The problems involved in evaluation of recreation and wildlife resources have already been discussed. In the case of the wildlife and recreation development we were able to place values on most of the output (recreation, agriculture and trapping), but were unable to do so for educational and research use, the provision of habitat and production of wildlife, and the satisfaction of international treaty obligations. These factors tend to drop from sight in the course of the benefit-cost analysis as dollar values are not attached to them. They represent additional benefits from a wildlife development, however, and as such should not be ignored. Considering these additional factors it seems appropriate to treat the value estimates derived from the other forms of output as *minimum values* created by wildlife and recreational development. This qualification is especially important when the development is being compared with an alternative such as agriculture where dollar values can be attached to the entire output.

D. Distributional Aspects of the Alternatives

When the alternatives are compared it should be recognized that the distribution of benefits and costs varies significantly between the two projects. In the case of agricultural reclamation the direct on-site costs would be borne by farmers, and primary benefits in the form of agricultural incomes would also accrue to them. This analysis cannot estimate the extent to which this net benefit might be redistributed from farm operators to the landowners (the citizens of British Columbia, and the Indian band), and in any case, redistribution does not reduce the level of net benefit.

In the case of the wildlife and recreation alternative the pattern of benefit and cost distribution (ignoring those benefits arising from agriculture and trapping) is much different. While development costs would be borne by citizens at large through the provincial and federal governments, the benefits in the form of recreational opportunities would be distributed free of charge to the users. With this form of distribution the benefit is not 'captured' in the normal sense, and not available to be redistributed.

This should be an important consideration in an analysis of this nature. Yet within the benefit-cost framework itself there is no means of giving weight to such matters. Benefit-cost analysis is concerned with measuring the net gain to a particular referent group from any project -- not the distribution of benefits and costs within that group. The actual incidence of benefits and costs within the referent group does not affect the measure of net benefit, or the benefit-cost ratio, a fact which is frequently overlooked when applying the results of benefit-cost analysis (Krutilla and Eckstein 1958).

In choosing the appropriate form of development for the unreclaimed land at Creston, these distributional patterns should at least be acknowledged. Agricultural reclamation yields benefit which would accrue to a small group of farmers, with the possibility of some of that benefit being redistributed to the citizens of British Columbia at large (including the Indian Band). Under the proposed wildlife and recreation development the major benefits would be of a non-marketed nature, with distribution restricted to a large number of recreationists from many areas, and little or no opportunity to 'capture' this benefit for redistribution.

E. Precision of Estimates for Comparative Purposes

In attempting to draw positive conclusions from the results of an analysis such as this, one should not be misled by the apparent precision of the results. For both projects all costs and benefits lie in the future and precise magnitudes are difficult to ascertain.

Although the majority of costs would be incurred in the initial stages of either project, cost estimation is difficult. Even with extensive testing and investigation the true cost of such undertakings is often known only when the project has been completed. Even greater difficulties are encountered when dealing with the estimation and evaluation of benefits. In this particular analysis, the normal problems are magnified by the non-market nature of the benefits generated through wildlife development. While values were imputed for most of the output associated with the wildlife development, some output defies evaluation and as a result is omitted from the direct benefit-cost comparison.

Consequently, this analysis should not be regarded as certain within a narrow range of precision. Instead, the results should be interpreted as the best estimates possible, given the present uncertainty about future values. In the event that the two alternatives were found to be closely comparable this analysis would have to be regarded as insufficient to support a choice on one side or the other. However, in this particular study there are significant differences between the alternatives, and these differences are great enough to warrant a decision. On the basis of investigations carried out the proposal for wildlife and outdoor recreation development appears to be superior in all regards to an undertaking aimed at further agricultural reclamation.

CHAPTER VII

THE IMPACT OF ALTERNATE DEVELOPMENTS ON THE LOWER KOOTENAY INDIAN BAND

The Indian Band as A Referent Group

The need for clearly defined development objectives and referent groups was stressed in Chapter I. That discussion noted that Indian Reserves 1, 1A, and 1B constituted a special case with respect to selection of the referent group. These Reserves are not Crown land, as is the case with the rest of the unreclaimed land, but are the property of the Lower Kootenay Indian Band. As such, the Indians constitute the appropriate referent group in analysis of development alternatives for their land.

But the analysis to this point has not focused on the Indian Band as a referent group. Instead, the alternatives of wildlife or agricultural development have been analysed from the broader perspective of the Creston economy, British Columbia, and Canada. While this analysis has indicated the relative desirability of developing the Indian Reserves from the point of view of these larger interest groups, it has not shed any light on the relative impact of the alternatives on the Lower Kootenay Indian Band.

Such an analysis represents a difficult undertaking within a standard economic framework. Perhaps the most meaningful form of benefit which the Indians might realize from development of their land would be in terms of social "involvement" or cultural integration. But the degree to which such benefits may be realized is practically impossible to predict and in any case they are not benefits which economists are capable of quantifying.

What we can indicate within the context of this analysis is the extent to which more easily measured benefits such as incomes and employment, might accrue to the Indian Band.* With rough approximations of the impact to be expected in these more conventional terms it is then possible to speculate on the likelihood of significant "social" benefit following from land development.

Incomes and Employment Under Agriculture

Under the alternative for agricultural development incomes could accrue to the Indians in two forms. Band members could engage directly in the business of farming and earn incomes in that way, or income could arise from rents paid for the land by Creston area farmers. Given the present levels of skill and managerial ability of the band members, it is felt that the first alternative is highly unlikely, and that the only realistic approach to agricultural development of these Reserves is through some form of a rental or lease agreement with Creston area farmers.

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*While employment creation in itself is not considered a net benefit within a broader social context, in the case of the Indian Band where unemployment is one of the most serious social problems, the creation of jobs can be taken as a direct form of benefit.

Income to the Indians would then depend on the rental or lease arrangements made. These arrangements in turn would depend on who assumed responsibility for dyking and reclaiming the Reserves. Reclamation could be undertaken by the Indian Band (or the Department of Indian Affairs and Northern Development on their behalf), or it could be done by the farmers who intended to rent the land. In either case, the net impact on the Indian Band will be essentially the same -- the only difference being in the shifting of responsibility for reclamation. Incomes will accrue to the band in the form of annual rental payments, and will be available for whatever purposes the Band Council desires.

These Reserves are the most fertile of all the unreclaimed land for agricultural purposes and as such would earn relatively high rental or lease payments. Assuming annual rentals in the order of $15 per acre, with 2,070 acres in cultivation, the Indian Band could expect approximately $31,000 annually.

While the generation of incomes to the Indian Band should be considered an important benefit from agricultural reclamation, the creation of employment opportunities for the band members is probably of equal importance. Given the present skills of the Band members, the possibility of Indians engaging directly in farming has already been discounted. It is equally unlikely that opportunities for employment on farms would be available to Indians.

At the present moment there are no Indians capable of maintaining a full-time farm job. Chief Zachary Basil has estimated that there are about 15 adult males capable of employment and training, but at present they are unreliable and poor farm workers. While they may have the potential to be trained and employed, it is unlikely that Creston area farmers would be willing to assume the duties of this training. As long as non-Indian farm labor can be hired in the local area, there is no reason to expect that Indians would be offered employment on farms.

This contention is supported by examining the conditions on presently reclaimed flatlands. There are already several Indian Reserves which are included in dyking districts and are being farmed (Indian Reserves 1C, 2, 3, 4 and 5). Yet no employment is generated for Indians on these lands, or on any other reclaimed lands. There is no reason to expect that the situation would be any different with respect to Indian Reserves 1, 1A, or 1B.

To summarize, reclamation of Indian Reserves 1, 1A, and 1B for agricultural purposes would probably have little significant impact on the members of the Indian Band. It is unlikely that the Indians themselves would operate farms on the land, and equally unlikely that they would receive employment opportunities from farmers renting the Reserve lands. Redistribution of net benefits from the farmers to the Indians in the form of annual rentals would generate incomes which could be used as the Band Council desired. The impact of this income (approximately $31,000 annually) on individual band members would probably be negligible in terms of social and economic development.

Incomes and Employment Under Wildlife and Recreational Development

It is difficult to forecast what the Indians might expect in terms of annual incomes from a wildlife and recreational development on their Reserves. The Canadian Wildlife Service is presently leasing these Reserves for $50,000 per year, and this can be taken as a rough guide to the payments which might be expected under a permanent wildlife development. In addition, the Indians could anticipate receipts from the sale of hunting permits yielding as much as $5,000 per year when the area is fully developed.

Opportunities for employment under this alternative might be slightly better than under agricultural development, but would still not be significant. There would probably be some opportunities for the Indians to work on maintenance and development of the wildlife habitat, and the possibility of providing guiding services for hunters and other tourists. While work of this nature might be better suited to the temperament of the Indians than farming, it still remains unlikely that full-time employment equivalents for more than two or three persons would be created.

The Alternatives Compared From The Perspective of the Indian Band

In the preceding discussion we have been unable to identify any significant benefit to the Indians from either development alternative. Under either form of development the Indians would expect to receive a rent or lease payment for the use of their land, but the magnitude of such payments is difficult to estimate. Annual cash returns in the order of $55,000 might be expected from a wildlife and recreational development, versus approximately $31,000 under agricultural development. While the income prospects are significantly greater under a wildlife and recreational development, in neither case are the incomes significant relative to the needs of the Indian Band.

Employment prospects are almost certainly non-existent in the case of an agricultural development, as witnessed by the current lack of employment for Indians in Creston agriculture. In the case of a wildlife and recreation development there are prospects of a small amount of initial employment with later opportunities rendering tourist services. The extent to which Indians would be assimilated into such work is, of course, open to speculation.

It is difficult to draw any definite conclusions as to the most desirable development of Reserves 1, 1A and 1B from the point of view of the Lower Kootenay Indian Band. It appears that actual cash flows and employment opportunities will be small under either alternative, although there will be greater advantages under a wildlife and recreation development than under agriculture. Similarly, the prospects for social "involvement" or cultural integration as a result of development of the land are poor.

While these prospects are not encouraging, they should not be surprising. Both of the alternatives which have been discussed are concerned with development and utilization of the basic land resource; neither alternative is concerned with development of human resources.

It appears from our investigations that any project which is concerned with development of the land resource alone will have little impact on the Indian people.

CHAPTER VIII

SUMMARY AND CONCLUSIONS

This report presents the findings of an economic investigation into possible patterns of development for 15,000 acres of land in the Kootenay River floodplain at Creston, British Columbia. Three alternatives for the future use of this land were considered in this study. These alternatives are: (a) continuation of present patterns of use; (b) reclamation and development for agriculture; and (c) development as wildlife habitat for intensive outdoor recreation use.

Present patterns of use are investigated in some detail in Chapter III. This chapter assesses the feasibility of continuing with the present regime and provides a benchmark for measuring the value of present resource uses which might be sacrificed under more intensive developments.

Continuing with present use on the unreclaimed lands is an unattractive alternative. The intensity of use is low and the land yields a negative economic return under cattle grazing. Annual flooding with extreme variations in water levels produces habitat conditions which are far from optimum for waterfowl production or recreational use. While the completion of Libby Dam would reduce the variation in water levels, it would have little effect on the quality of the habitat for waterfowl production or recreational use and there is a possibility that it would reduce the season of use for cattle grazing. With the feasibility of more intensive forms of land use greatly enhanced by Libby Dam it is concluded that continuing with present use is an unacceptable alternative.

The two development alternatives are investigated in Chapters IV (Agricultural Reclamation as a Development Alternative) and V (Wildlife Habitat and Outdoor Recreation as a Development Alternative). Both alternatives are technically feasible, and benefit-cost analysis has been used to provide a logical framework for assessing the economic implications of these alternatives and for choosing between them. Selection of the most economically desirable alternative is made on the basis of the net primary benefits generated within the relevant referent groups.

The magnitude of these measures varies widely depending on the 'referent group' or point of view from which a decision is to be made. Before a meaningful decision can be reached on the basis of these economic measures, it is thus necessary to ensure that they relate to the appropriate referent group. Three referent groups, the local area (Creston), the province of British Columbia, and Canada are suggested in this study and the feasibility of each alternative is examined and compared within those frameworks.

Optimum Land Use From The Local Viewpoint

Agricultural reclamation has been successfully carried out on 21,000 acres of land adjacent to the land under study. Considered from the point of view of the local economy, reclamation and agricultural development of the entire 15,000 acres (with the possible exception of the Corn Creek unit) appears economically feasible. Investment in this undertaking would yield net primary benefits having an estimated present value of $1,929,000. Additional secondary benefits in the form of profits in secondary businesses have an estimated present value of $398,000.

Offset against these estimated benefits from agricultural reclamation are costs created by displacing present land uses. These costs include the destruction of wildlife habitat, and elimination of rare species of wildlife. From a purely local viewpoint, the net primary and secondary benefits would probably outweigh such losses, rendering agricultural reclamation feasible on total balance.

However, a decision to proceed with agricultural development would only be rational if a comparison had first been made with the net gains to be expected from the alternative development for wildlife and outdoor recreation. At the local level, net primary benefits from the wildlife development have an estimated present value of $1,350,000 while the present value of net secondary benefits is estimated at $731,000. While agricultural development entailed the loss of habitat and elimination of wildlife species, such values would be preserved and enhanced under this alternative. Present levels of grazing could also be accommodated within the needs of wildlife management.

Choosing between these alternatives from the point of view of the local community is very difficult. Directly measured gains from an agricultural development are greater, although not to a significant degree, than they would be from the wildlife development (net primary and secondary benefits totalling $2,327,000 compared to $2,081,000). But the destruction of wildlife species resulting from agricultural reclamation could tip the scales in favor of a wildlife development. The results of the present analysis must therefore be considered inconclusive from the local point of view. Without extremely detailed and exhaustive investigations it is impossible to conclude that either alternative is clearly superior.

The Provincial Viewpoint and Optimum Land Use

While comparison of the development alternatives was inconclusive from the local viewpoint, such is not the case when the broader provincial perspective is adopted. From this point of view the estimated present value of net primary benefits under the wildlife development is more than twice as great as under agriculture ($3,783,000 vs. $1,773,000). Net secondary benefits also have a much higher present value under the wildlife development ($773,000) than they do in the case of agricultural development ($413,000). On the basis of these estimates alone the choice clearly favors the wildlife and recreational development. Consideration of additional factors associated with the preservation of rare wildlife species serves to reinforce the choice. From the provincial point of view, selection of the optimum land use is therefore quite clear -- on all counts the wildlife development appears clearly superior.

Optimum Land Use From The National Point of View

From the national point of view, choice between the alternatives is even more clear than at the provincial level. It is estimated that the present worth of primary net benefits under the wildlife development will be $6,835,000, as compared with an estimate of $1,773,000 under agricultural development. From the national perspective net secondary benefits are not important under either alternative -- $431,000 under wildlife development, $401,000 with agriculture.

Again, these estimates alone clearly indicate the wildlife and recreation development as the optimum form of land use. Preservation values associated with the wildlife development take on a greater significance at the national level than they did provincially, and international obligations to maintain waterfowl populations reinforce the choice of the wildlife alternative for development. Adopting Canada as a whole as the referent group for a decision again produces an unequivocal choice -- development of the land for wildlife and outdoor recreation is clearly the superior alternative.

Conclusions

This study embodies an innovative approach in using economic analysis to select the optimum use for undeveloped land at Creston, British Columbia. Analysis of the agricultural alternative is traditional and straightforward as the value of all output is readily measured. Analysing the wildlife and recreation development presents serious problems, however, as this represents a non-marketed form of resource use the "product" of which must be carefully defined and can only partly be valued. Despite these problems, a comparative analysis of the two alternatives has been carried out, and the results appear sufficiently reliable to indicate the optimum choice between alternatives.

In a comparative analysis of this nature, it is important to determine clearly in whose interest any development should be undertaken. To demonstrate the significance of this point the analysis in this report has been carried out from three levels -- from the point of view of the local community (Creston), the province of British Columbia and Canada.

Insofar as most of the land under study is Crown land, held in trust for the citizens of British Columbia, the net benefit accruing to the province as a whole provides the appropriate basis for decision making. On this basis, selection of the wildlife and recreational development is clearly superior. This is an important distinction, for if the land were to be developed only in the interest of the local community, the choice between the alternatives is not clear. On a purely local basis, the agricultural development appears to be of roughly equal merit when compared with the wildlife development.

When participation in development by the federal government is considered and the national point of view adopted, the wildlife and outdoor recreation development is again clearly superior.

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A P P E N D I C E S

A P P E N D I X   A

APPENDIX A

REGIONAL INCOME MULTIPLIERS

Regional income multipliers have developed from the export base thesis which assumes that the economic growth of a region depends on its earnings from export industries (by definition no region is self-sufficient). Export or basic industries sell products outside the region, or in the case of services sell to non-residents, thereby bringing new incomes to the area. Part of this new income is respent within the region and has a 'multiplied' effect on incomes. Regional income multipliers are used to estimate the effect of changes in basic industries on the total incomes within a region.

As a general rule income multipliers will vary directly with the size of the region being considered (Archibald 1967, Rosenbluth 1967). Small regions which rely heavily on imports retain little of the income which accrues to basic industries in the region and hence income multipliers are small. Conversely for larger regions with more diversified economic activity the share of income retained from basic industries is higher and the total impact on incomes is much greater.

For any region the multiplying effect of successive rounds of re-spending applies only to the fraction of expenditures that remains in the area after the first round of spending in the basic industry. This fraction, the local spending component of gross industry receipts (L), will vary between basic industries, and in this study will be estimated separately for agriculture and recreation-tourism. The size of the multiplier which acts on this local income component depends on (i) the proportion of any increase in regional incomes that is spent within the region (MPS^r), and (ii) the proportion of regional expenditure that accrues as income to residents of the region (Y^r). The formula used to determine the value of the multiplier is:

$$\frac{1}{1 - (MPS^r)(Y^r)}$$

In this study multipliers are required for two basic industries in three 'regions' corresponding to the referent groups adopted. For each of these regions the factors which determine the multiplied effect of new incomes (L, MPS^r, Y^r) will vary. Regional multipliers for the two basic industries and each of the three referent groups are derived below. When applied they must be related only to that part of output which is an export vis-a-vis the relevant region.

Regional Multipliers in Agriculture

Local Multipliers

In the Creston economy the value of MPS^r is estimated at .7 (Asimakopulos 1965) and the value of Y^r at .24 (Dominion Bureau of Statistics 1966).* The local multiplier thus has a value of 1.20. At the local level the value of L is estimated to be .9 of the initial receipts by farm enterprises. Farm operators will pay out 69 per cent of their receipts to local businesses and retain 31 per cent as payment to hired and operator's labor (Josling and Trant 1966, pp. 59-60). Since only 70 per cent of labor earnings are spent locally the total spending in Creston businesses will be equal to 90 per cent of the gross farm receipts.

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*Asimakopulos reports a proportion of income spent of .8, but since not all incomes will be spent locally this is reduced to .7 for the Creston area. It is assumed that the composition of spending is 87% on retail purchases having a 20% local income component and 13% on services with a local income component of 50%. On balance the proportion of regional expenditure which accrues as local income (Y^r) is thus .24.

The effect of the multiplier will be to further increase this local spending by 20 per cent beyond the initial round. An increase in farm receipts of $100,000 would have the following effect on Creston businesses:

initial spending by farmers and employees	$90,600,
total spending after multiplier effect (1.20)	$108,900.

Provincial Multiplier

The provincial multiplier for agriculture is estimated in the same manner as the Creston multiplier, but new values are adopted for L, MPS^r and Y^r to correspond to the new 'region' - the province of British Columbia rather than the Creston area alone. At this level L is estimated to be .94, while the product of MPS^r and Y^r is estimated to be .45 (Price Waterhouse and Company 1968), resulting in a multiplier of 1.8.

The impact on the province of British Columbia of a $100,000 increase in farm incomes at Creston would thus differ significantly from the impact on the Creston area alone. Non-farm business revenues would increase by $93,800 initially and expand to $169,000 as a result of the multiplier.

National Multiplier

Within Canada L will remain the same as it was provincially, .94, but the multiplier acting on this spending will be much higher, approximately 2.8 (Price Waterhouse and Company 1968). At this level non-farm business revenues would increase by $93,800 initially, expanding to $263,000 with the final multiplied impact.

Regional Multipliers in Recreation

Local Multiplier

Multipliers to estimate the impact of spending by tourists and recreationists are derived in the same manner as for agriculture, with the only changes being in the magnitude of L for the various regions. The value of L for the Creston economy in this case is estimated at .51. In the local economy the impact on business revenues of a $100,000 increase in spending by recreationists would develop as follows: wages and profits would account for 30 per cent of the initial spending, 70 per cent of which, or $21,000, would be spent in Creston. Of the remaining $70,000 approximately $30,000 would be spent in Creston, with $40,000 going directly to outside suppliers. The initial respending in the Creston economy would thus be roughly $51,000. The regional multiplier of 1.2 will expand this to a final impact of $61,200.

Provincial Multiplier

For the province in the case of recreation-tourism the value of L is estimated at .84 ($24,000 spent from wages and profits, $60,000 spent within British Columbia for supplies). The multiplier has the same value as that used in the case of agriculture, 1.8. At this level a $100,000 increase in recreation spending would lead to a further increase in revenues of $84,000, reaching $151,000 after successive rounds of respending.

National Multiplier

From the national perspective an initial increase in tourist revenues of $100,000 would lead to first-round respending of $97,000. Acted on by a multiplier of 2.8 this would eventually reach $272,000.

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A P P E N D I X   B

APPENDIX B

SIZE AND NUMBER OF FARMS AND PRESENT PATTERNS OF PRODUCTION, RECLAIMED LAND, CRESTON FLATS

Table B-1 gives the distribution of farms by size on presently reclaimed land on the Creston flats. A total of 19,382 acres are cultivated in 39 different holdings. The average size of farm is 497 cultivated acres.

TABLE B-1*

DISTRIBUTION OF FARMS BY NUMBER OF CULTIVATED ACRES, CRESTON FLATS

No. of Cult. Acres	No. of Farms	Total Cult. Acres	% of All Cult. Acres
1,500 or more	3	5,451	28.1%
1,000 - 1,499	1	1,024	5.3
500 - 999	10	6,424	33.2
300 - 499	10	4,066	21.0
200 - 299	6	1,310	6.7
1 - 199	9	1,107	5.7
TOTAL	39	19,382	100.0%

*Source - W. Wiebe, District Agriculturist, Creston. Data collected in survey, spring, 1968.

Not all of these holdings support a full time farm operation. Several of the smaller holdings are cropped on a share basis, or under custom agreement, the owners being employed elsewhere in the local economy. In addition several farmers who operate dairy or beef farms on the benchlands at Lister and Erickson hold land on the flats which forms a part of their farm unit. Taking these factors into consideration it is estimated that holdings on the flats form the basis of 30 farm operations, and are an important part of an additional 5 farms with land on the surrounding benchlands. Data in Table B-1 are based on acres in cultivation, and do not include farm yards, roads, ditches, etc.

Table B-2 presents the existing pattern of crop production on the Creston flats, based on seeded acreage in the spring of 1968. Grains are the most important crop, with wheat, oats, and barley accounting for 66.8 per cent of the cultivated acreage. Next in importance are clover seed and hay with 11.9 and 10.7 per cent respectively. Pasture, potatoes, summer fallow and other miscellaneous crops account for the rest of the acreage.

It is believed that this pattern of production has been consistent over the past five or six years. The acreage in seed peas has declined due to lower market prices and higher costs of production. At the same time the production of clover seed on the flats is relatively new, having been introduced only in 1962.

While the grain crops do not yield as high a return (gross or net) per acre as some of the other crops, such as clover and potatoes (see Appendix C), they have nevertheless been the dominant crop on all farms. This is likely a result of two factors: a) once accustomed to growing grain, farmers have been slow or reluctant to change to other crops, and b) growing grain minimizes the loss in times of flood. Given the flood risk, a grain crop which has very low seeding costs in comparison with a crop like potatoes, represents a much lower potential loss.

TABLE B-2*

DISTRIBUTION OF CROPS, BY SEEDED ACRES,

CRESTON FLATS, 1968

Crop	Seeded Acres	% of Total Seeded Acres
Wheat - Spring	4,044	21.0
- Winter	1,485	7.6
Oats	4,008	20.7
Barley	3,392	17.5
Clover Seed - White	2,268	11.9
- Red	40	
Hay	2,066	10.7
Pasture	951	4.9
Potatoes	425	2.2
Summer Fallow	392	2.0
Seed Peas	288	1.4
Swede Turnip Seed	5	(-)
Corn	4	(-)
Miscellaneous	14	0.1
TOTAL	19,382	100.0%

*Source: W. Wiebe - data collected in survey, spring, 1968. (-) less than one tenth of one per cent (.001).

A P P E N D I X C

APPENDIX C

THE ECONOMICS OF FARM PRODUCTION, CRESTON FLATS, 1968

Several procedures can be used to measure the profitability of agricultural enterprises on the Creston flats. Estimates can be made of the net returns from individual crops on a per acre basis, or data on farm enterprises as a whole can be analysed and converted to a per acre basis. A further check can be made by comparing such data with the rental value of farm land, or with land values when land is sold.

Net Returns Per Acre, Individual Crops

The three basic steps in this analysis include measuring per acre yields for each crop, obtaining reliable data on the prices of these crops, and measuring the costs of production.

Yields Per Acre

While crop yields may vary greatly from year to year, it is nevertheless possible to derive reliable estimates of average yields. Such estimates have been prepared for crops grown on the Creston flats, based on records of farmers who have been producing them for a number of years. These estimates represent the average per acre production which a farmer would expect in the various crops. This information has been summarized in Table C-1.

The estimated yield which would be consistently expected on an average acre, given present levels of farm management, is given in the first column. These estimates are averages of data provided by cooperating farmers, and are weighted by the number of acres of each crop grown. In the second and third columns the range of yields reported for each crop is presented.

TABLE C-1

PER ACRE YIELDS, CROPS ON CRESTON FLATS

Crop	Yield Per Acre	Lowest Estimate	Highest Estimate
Wheat - Spring	47.5 bu.	40 bu.	55 bu.
- Winter	74.5 bu.	70 bu.	80 bu.
Oats	94 bu.	80 bu.	103 bu.
Barley	62 bu.	50 bu.	73 bu.
Clover Seed	530 lbs.	500 lbs.	700 lbs.
Hay	5 ton	4 1/2 ton	5 1/2 ton
Potatoes	10 ton	10 ton	10 ton

Figures providing an 'output-per-acre' are not available for land presently used as pasture (951 acres), as the pasture forms a direct input in the production of beef. Since the summer grazing season on the reclaimed land tends to be short, and supplemental feeding is done in fall and winter, measuring output on a per acre basis is extremely difficult. Returns per acre for beef enterprises will be estimated by analysing farm operations, and converting profits to a per acre basis.

Prices Received, and Gross Returns Per Acre

Prices received for various crops fluctuate from year to year depending on general market conditions. Grain prices in 1968-69 are lower than previous years, but prices for other crops are at or near long run averages. In Table

C-2 prices received for crops in recent years are presented where reliable data could be obtained. Prices quoted for the 1968 crop are given in the first column, and prices received in previous years are in the second through fifth columns.

TABLE C-2

CROP PRICES, CRESTON

Crop	1968	1967	1966	1965	1964
			Year		
Wheat - Spring	$ 1.70 bu.	$ 1.75 bu.	$ 1.70 bu.		
- Winter	$48/T.	$48/T.	$54/T.	$54/T.	
Oats	$40/T.	$48/T.	$45/T.	$45/T.	
Barley	$36/T.	$45/T.	$43/T.	$42/T.	
Clover Seed	40¢ lb.	32¢ lb.	30¢ lb.	27¢ lb.	51¢ lb.
Hay	$24/T.	$22/T.	$22/T.	$25/T.	
Potatoes	$50/T.	(historical data inconsistent)			

On the basis of this information an average price for each crop has been derived, and these figures are presented in Table C-3. These prices represent an average of market prices in recent years. In the absence of severe changes in market conditions, they would form the basis of short term expectations for future prices. These prices are applied to the yields estimated in Table C-1, to give an estimate of the gross return per acre under each crop.

TABLE C-3

CALCULATED GROSS RETURN PER ACRE

FOR INDIVIDUAL CROPS

Crop	Price	Yield/Acre	Gross Return/ Acre*
Wheat - Spring	$ 1.72 bu.	47.5 bu.	$ 82.
- Winter	$52.50/T.	74.5 bu.	$118.
Oats	$44.50/T.	94 bu.	$ 71.
Barley	$41.50/T.	62 bu.	$ 62.
Clover Seed	36¢ lb.	530 lbs.	$191.
Hay	$23/T.	5 T.	$115.
Potatoes	$50/T.	10 T.	$500.

*These figures are rounded to the nearest dollar.

Costs of Production, and Net Returns Per Acre

The final step in this analysis involves the calculation of costs of production for the various crops, and net returns per acre. Data for these calculations were provided by cooperating farmers and are summarized in Table C-4. Costs of production in Table C-4 include all current operating cost, dyking taxes, provincial land taxes, and depreciation on machinery and equipment. Not included in these costs is the 'opportunity cost' or income foregone on money invested in machinery and equipment. Capital required for production of these crops is estimated at $100 per acre, which, if invested at 8 per cent would earn $8 per year. This expense is deducted from the current operating profit to give a measure of the true return per acre under various crops. Capitalizing this net return at 8 per cent yields a measure of the present worth of an acre of land in each crop. This is presented in the final column of Table C-4.

TABLE C-4

COSTS OF PRODUCTION, AND NET RETURNS PER ACRE

Crop	Est. Gross Ret. Per Acre	Prod. Cost Per Acre*	Net Ret. Per Acre	Net Ret., Less 8% on Capital	Present Discounted Value
Wheat - Spring	$ 82.	$ 53.	$ 29.	$ 21.	$ 262.50
- Winter	$118.	$ 88.	$ 30.	$ 22.	$ 275.00
Oats	$ 71.	$ 44.	$ 27	$ 19.	$ 237.50
Barley	$ 62.	$ 37.	$ 25.	$ 17.	$ 212.50
Clover Seed	$191.	$ 90.	$101.	$ 93.	$1,162.50
Hay	$115.	$ 87.	$ 28.	$ 20.	$ 250.00
Potatoes	$500.	$400.	$100.	$ 92.	$1,150.00

*An average cost, weighted by the number of acres of crop grown for each farmer growing a particular crop.

A wide variation in returns per acre between the various crops is noted in Table C-4. After allowing an 8 per cent return on capital as an expense, net returns range from $17 per acre in barley, to $93 per acre in clover seed. Net returns in grain and hay are grouped between $17 and $22 per acre however, while both potatoes and clover seed show net returns exceeding $90 per acre. Discounting these net returns at a rate of 8 per cent yields present values per acre which range from $212 for land producing barley to

$1,162 for land producing clover seed.

This wide variation in return under each crop, and the consequent range of present values, is more meaningful if presented in terms of an 'average' acre. This is done in Table C-5, where the returns to an 'average' acre are calculated by weighting the per acre returns under each crop by the number of acres presently in that crop. It must be noted that this data is based on information pertaining to the crops itemized in Table C-1 only, and does not include pasture, seed peas, or other miscellaneous crops as a basis for computation.

TABLE C-5

AVERAGE COSTS AND RETURNS PER ACRE, ALL CROPS

	Gross Return	Production Cost	Net Return	Net Return, Less 8% on Capital	Present Worth, @ 8%
All Seeded Acres	$106.76	$67.93	$38.83	$30.83	$385.38
All Cultivated Acres Including Summer Fallow	$104.62	$66.56	$38.06	$30.06	$375.75

When the data are presented in this manner, an 'average' acre under crop on the Creston flats is seen to yield a gross return of $106.76, and a net return of $30.83 after allowing for all costs. However, these figures are for acres <u>in crop</u> only, and do not take account of the fact that two per cent of the cultivated land is in summer fallow. Including acres in summer fallow in the calculations gives a true picture of the costs and returns on an 'average' acre. This is done in the bottom row of Table C-5, and has the effect of reducing the net return on an 'average' acre to $30.06 having a present value of $375.75.

Analysis of Farm Enterprise Data

As a second method of measuring the profitability of agricultural enterprises on the Creston flats, data on farm units taken as a whole was analysed and converted to a per acre basis. This data includes land used for pasture and summer fallow, as well as the crops analysed in Tables C-1 through C-4.

Calculations of this nature are less precise than those made on a per acre basis for several reasons. The analysis of farm units was possible only on the basis of current records, and not over a time series as was done with the analysis of individual crops. Thus unusual or non-recurring features of any one operation may bias the results. Further, many farm units include expenses and receipts associated with custom work, feedlot operations for hogs or beef, grain milling, and other associated activities which do not reflect the productivity of the land per se. Separating the returns to those associated enterprises from returns to the land is difficult, and has been done on a very arbitrary basis. Despite these qualifications to the data, they do provide a measure of per acre returns, and as such provide a check on the calculations made on the basis of individual crop analysis.

Calculations on this basis were made possible by cooperating farmers, and current operating profits per acre were calculated which ranged from $26 to $65, and averaged $36 per acre. Investment in machinery and equipment and storage facilities on these farms was estimated as closely as possible, and estimates ranged from $94 per acre to $120 per acre, with the average being $100 per acre. Allowing a charge of 8 per cent for interest on this capital introduced an additional cost of $8 per acre, which reduces the estimated net return to $28 per acre. Under these calculations the present value of an acre is $350.00 when discounted at 8 per cent.

These figures correspond quite closely to those derived earlier by analysing individual crops, where the net return on an 'average' acre was estimated to be $30.06, and the present value of an acre $375.75.

The Rental and Sale Value of Land

Rental Value

In a competitive market for the rental of farm land, rents bid for land should closely reflect its net earning power. Data pertaining to the present rental market for reclaimed land in the Creston area is sketchy, and not available from any one source. However, some information was obtained on land presently being rented, and indicated that rents vary from $13 per acre to $32 per acre.

Land under lease from the Indian band is presently sublet for $10 per acre, and in addition a direct levy to the Indian band of $3 per acre is paid, indicating a total rent of $13 per acre. In another case rental equal to $15 per acre is being paid on land rented on a sharecrop basis. Another farmer had formerly rented land for $19 per acre, but has since ceased to do so, as he felt he was only making a very slight profit after paying the rent. Land producing alfalfa is currently renting for $32 per acre, with the land owner being responsible for dyking and land taxes, thus earning a net rent of approximately $26 per acre.

With the exception of the alfalfa land, rentals for which information was obtained are generally below $20 per acre, and closer to $15 per acre. These figures are considerably below the estimated net earning power of the land, and this discrepancy merits investigation. Several possible explanations are explored below:

a) In the case of land on the Creston flats the assumption of a competitive market for land rentals is open to question. There are relatively few farm operators in the area who are in a position to bid for the rental of land, and land tends to be concentrated in large holdings (see Table B-1). Thus there is relatively little opportunity for a system of competitive bidding to draw forth the maximum rental values of land.

b) Many rents have been established over a relatively long time period, and may reflect past conditions more than those of the present.

c) Rental land tends to be devoted to grain growing, which has a lower net return than other crops such as potatoes and clover seed.

d) Rented land for which data were obtained may have soil or locational disadvantages, or for other reasons may not be typical of most farmland on the flats.

e) Rentals paid may be below net earnings by a premium to allow for the flood risk.

f) Part of the discrepancy allows for the value of the farm operator's labor input.

Rental currently being paid for alfalfa producing land is an interesting exception to the above cases. Land in alfalfa typically rents for $32 per acre, with the land-owner receiving a net per acre of approximately $26 after paying taxes. This appears to be closer to the true earning power of the land, and suggests that competition is more effective in the rental of hay land than in grain. There are several reasons why this may be so. Recent cessation of hay cutting on Crown land managed by the B.C. Forest Service has forced many beef growers in the West Creston area to look elsewhere for hay supplies, and they have been competitive in bidding for the rental of hay lands. Dairy and beef producers on the benchlands around Erickson and Lister have also been seeking additional hay supplies, and have contributed to the competitive nature of the market. Further, since this is a recent market occurrence prices paid more closely reflect current market conditions than those paid for grain land.

Sale Value

The price paid for land in a competitive market should reflect the discounted value of its future stream of net earnings. While this would hold in a competitive market, the land market on the Creston flats does not appear to be effectively competitive. Land changes hands infrequently, and market values are not clearly established. Persons queried about the value of land generally felt it to be worth from $250 to $350 per acre. Assuming a discount rate of 8 per cent this reflects a net earnings stream ranging from $20 to $28 per acre. These figures correspond fairly closely with calculations made earlier on an individual crop basis.

A farm on the flats currently offered for sale is quoted at approximately \$400 per acre, and a recent sale was reported with a value of approximately \$325 per acre. It is difficult to determine whether these prices are based on the current earning power of the land alone, or include a speculative premium due to the impending influence of the Libby Dam. In any case, prices in the region of \$250 to \$400 per acre, given an imperfect market and the existence of uncertainty, are not inconsistent with the earlier calculations on individual crops and farm enterprises.

Summary

It has been the purpose of this appendix to shed some light on the economics of agricultural production on reclaimed lands on the Creston flats. Individual crops were investigated, on a per acre basis, and it was concluded that an 'average' acre on the Creston flats had a net earning power of \$30.06 per year. Discounted at 8 per cent this indicates a present value, per acre, of \$375.75.

These calculations were checked against an analysis based on complete farm units which indicated a net return of approximately \$28 per acre. A further check included a brief investigation of the rental and sale value of reclaimed land. These results, although tending to support the earlier findings, were inconclusive due to the scarcity of reliable data.

It is concluded that under present cropping practices and levels of farm management an 'average' acre of reclaimed land on the Creston flats has an annual net earning power of \$30.06 and a present discounted value of \$376.

The preceding calculations of net returns per acre included as costs, non-cash charges to cover depreciation and interest on average investment in equipment and buildings. No charges were deducted to cover the value or "opportunity-cost" of the farm operator's own labor input.

The net return per acre of $30.06 thus represents the combined earnings of the land and the farm operator's labor. This is the normal measure of financial return or profit used by farm operators. In determining the earning power or value of the land alone, a further deduction must be made to account for the value of the operator's labor.

Imputing a value to operator's labor is difficult. The value which is sought should measure the income which a farm operator could earn if he were alternatively employed. This is difficult to estimate, and at Creston will vary greatly on a per acre basis, depending on the size of the farm operation.

One method of approximation is to estimate the average number of hours of operator's time per acre, and charge for this time at an hourly rate. Assuming an hourly rate of $2.50 and an annual input, on the average, of 1.5 hours per acre, this introduces an additional charge of $3.75 per acre.*

Deducting this cost reduces the net return per acre to $26.31, and the present value of an acre of land to $329, as compared to $30.06 and $376 when no allowance is made for the operator's labor input. The differences in these figures should be stressed. Net earnings of $30.06

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*It is assumed that farmers could earn $2.50 per hour if they were not farming. The estimate of 1.5 hours per acre is an average for all farms. On farms of 2,000 acres and more this probably overstates the input, while on farms under 1,000 acres it may be an under-estimate.

per acre represents the return to land and labor. Earnings of $26.31 are the return to land alone.

The latter figure, $26.31 per acre, equivalent to a present value of $329, will be used in this study. The object of our analysis is to estimate the net productivity of land under agricultural production. This measure must be "net" of the value of all inputs, and the value of the farm operator's labor cannot be excluded from the cost of inputs.

APPENDIX D

APPENDIX D

RECLAMATION COSTS FOR AGRICULTURE

Reclamation Costs: An Overview

At present 21,000 acres of land have been reclaimed and are farmed in the Kootenay River floodplain at Creston. The 15,000 acres which remain unreclaimed are physically similar to those which are now being farmed. Reclamation of these lands for agricultural purposes is feasible from a purely technical point of view, and in the case of Duck Lake the unreclaimed land is already protected from the Kootenay River by dyke.

In estimating reclamation costs there will be substantial differences in cost depending on whether reclamation is done by local contractors or dyking districts, or by outside contractors. Local dyking districts have done all the reclamation in the area to date, have sufficient machinery and equipment to undertake further reclamation, and enjoy a distinct cost advantage over outside contractors.

It is estimated that if reclamation work is contracted locally, it can be done for between 1/3 to 1/2 the cost of having the work done by outside contractors. Local contractors (dyking districts) are experienced at building dykes in the area, and this alone gives them a distinct advantage over outside contractors. They already have all the necessary equipment for reclamation, and it is essentially on-site. Furthermore, local contractors enjoy a significant advantage in labor costs. By using local labor (farm employees during the winter months when farm demands are slack), labor costs are reduced below those faced by outside contractors hiring union workers.

Figures supplied by the United States Fish and Wildlife Service* support this argument. While pointing out that costs vary depending on materials, distance to haul, specifications of dyke, etc., the following figures are applied as general guides for reclamation costs:

> If the Fish and Wildlife Service undertakes the work using their own equipment, dirt can be moved and dykes built for approximately 20¢ per cubic yard.
>
> If work is done by contract, costs are 75¢ per cubic yard, provided mats are not required under draglines; if mats are used under draglines, costs are approximately 90¢ per cubic yard.

Due to the differences in the cost of both capital and labor between Canada and the United States, these figures cannot be assumed to represent the actual cost of dyke construction at Creston. They are useful however insofar as they illustrate the significant variation in costs which can be expected depending on who carries out reclamation work.

Reclamation Costs, Creston

In the past dykes have been constructed in the Creston area for as little as 18¢ per cubic yard, although average costs have been approximately 27¢ per cubic yard.** There have been no major reclamation projects in recent years however and it is estimated that current costs for dyke construction

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*In a letter to Dwight Moore, Supervisor, Creston Valley Wildlife Management Area.

**Source: Mr. V. Mosher, P. Eng, engineer in charge of reclamation.

are 80¢ per cubic yard.*

In the following estimates it is assumed that material for the construction of dykes will be obtained on-site, and no hauling charges will be incurred. Dirt will be dredged from outer perimeters and pulled back into each unit to build dykes. For agricultural reclamation a dyke with a 10 foot width at top and a 3 to 1 slope is assumed. This meets the specifications of both the International Joint Commission and International Power and Engineering Consultants Ltd. (IPEC).

Clearing the river bank in preparation for dyking can be an additional cost. In most areas the river banks are built up in natural levees, and support a heavy growth of cottonwood trees. These trees and their roots must be removed to prepare for coring and construction of dykes. Assuming that a strip 132 feet wide must be cleared, it will be necessary to clear 16 acres per mile of dyke. Cost of clearing is estimated at $500 per acre, or $8,000 per mile. In some areas the growth of trees is light and clearing costs may be lower, but this figure is used as an average cost.

Pumping and Maintenance

Maintenance costs on the reclaimed land include the repair and maintenance of dykes and ditches and pumping of seepage and runoff. These costs are currently approximately $3 per cultivated acre, although they vary between dyking districts. Maintenance work is carried out by the respective dyking districts and financed by a per acre tax on reclaimed land.

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*Dykes recently constructed by the C.V.W.M. Authority have varied in cost from 60¢ to $1.00 per cubic yard, 80¢ per cubic yard is used here as an average cost.

Maintenance costs will be considered in estimating future reclamation costs. Maintenance costs have already been included in estimating the net earning power of land under agriculture (Appendix C) and to include them again would be double-counting.

Net Reclaimable Area

An additional consideration involves the loss of land to dykes, ditches, and roads. Persons experienced in reclamation at Creston* estimate that this loss will be approximately ten per cent of the gross area of any unit being reclaimed. After reclamation 90 per cent of the land area will be available for cultivation.

Libby Dam

A critical matter which will affect both the type and cost of dyke construction is the effect of the Libby Dam on the annual freshet of the Kootenay River. Currently under construction at Libby, Montana (upstream from Creston) the primary function of Libby Dam is hydro-electric power generation. However, an important secondary function will be the provision of flood control for reclaimed land in the Kootenay River floodplain. Management for flood control in the United States will provide similar benefits for farmland on the floodplain at Creston.

Much of the effectiveness of Libby Dam for flood control will depend on how it is used to meet power requirements. For this reason there is a possibility that a second dam may be constructed downstream from Libby Dam to regulate stream flow. This dam would control rapid fluctuations in river

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*Messrs. A. Staples, W. Piper Jr., and V. Mosher.

flow which could result from periods of peak drawdown on the Libby reservoir.

To date the best estimates available indicate that the effect of Libby Dam will be to reduce the high water level at times of peak runoff by about ten feet. The estimated high and low water levels at various points from the United States border to Kootenay Lake are presented in Table D-1.

TABLE D-1

ESTIMATES OF KOOTENAY RIVER LEVELS

AFTER LIBBY DAM

Location	High Water		Low Water	
	100% of time below	90% of time below	100% of time above	90% of time above
	(elevation in feet above sea level)			
Porthill (U.S. border)	1756.6'	1752.6'	1738.6'	1739.6'
Goat River	1755.0	1751.7	1738.4	1739.4
Creston Ferry	1754.9	1751.6	1738.4	1739.4
Corn Creek	1753.9	1750.9	1738.3	1739.3
Kuskanook (Kootenay Lake)	1752.0	1750.0	1738.1	1739.1

These estimates are based on work done by the Water Rights Branch, Department of Lands, Forests and Water Resources, Victoria, and presented in correspondence to Dr. J. Hatter, Director, Fish and Wildlife Branch, April 15, 1969. The estimates as presented are amended in accordance with a later letter to D.D. Moore, Supervisor, Creston Valley Wildlife Management Area.

There is a slight drop in elevation moving north from Porthill to Kuskanook. After Libby Dam construction of dykes with a two foot leeway or freeboard would require a dyke of 1759' elevation on the Indian Reserves.

Further north at Six Mile Slough a dyke of elevation 1754' would be sufficient. To deal with historic river levels dykes on reclaimed land in the south are presently built to an elevation of 1770', while those at Duck Lake, in the north, are built to 1764'.

The impact of Libby Dam will thus be to greatly reduce dyking requirements and costs compared to those incurred in the past.

Reclamation Costs for Individual Areas

The Indian Reserves

The combined area of Indian Reserves 1, 1A and 1B is estimated at 3,000 acres (see Map). Until recently most of this land presented the potential for agricultural reclamation, and previous estimates of the costs of reclamation were based on developing the entire area.* With any reclamation plan the most difficult aspect is the control of the Goat River which flows into the Kootenay River and forms the northern boundary of Reserve 1B. The banks of the Goat are low and irregular, and levees are poorly formed. Soils in this area are very porous and deep coring under dykes would be necessary to prevent seepage. Despite these problems previous reclamation plans envisaged development of the entire area of these Indian Reserves.

Within the last two years however the problems associated with the Goat River have become far more serious. The Department of Highways has diverted a major part of the flow of the Goat River into a more southerly

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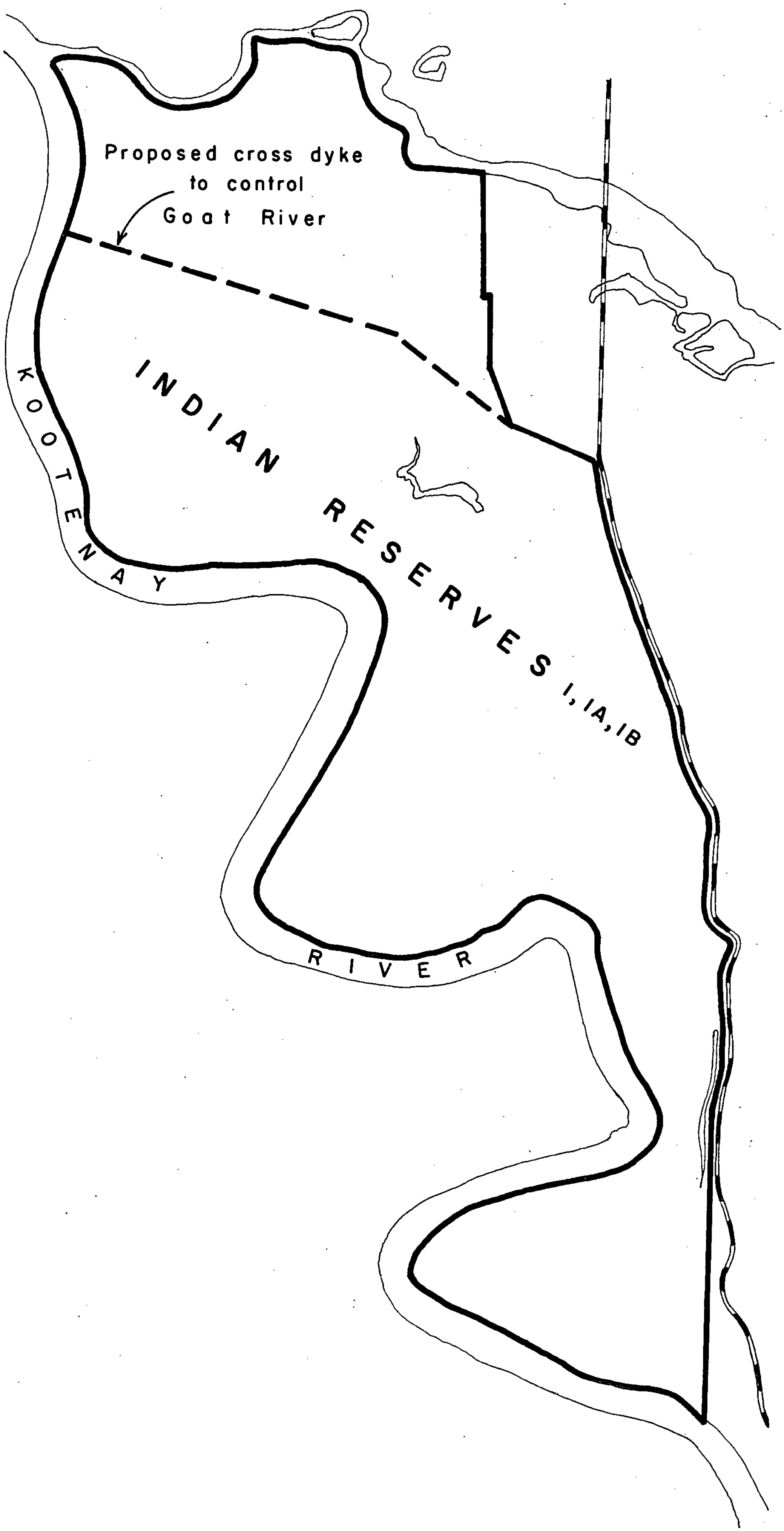
*Reference here is to an independent and intensive study by Wm. Piper Jr., of Creston 1964-1965, and to estimates conveyed to Dr. W.J.D. Stephen of the Canadian Wildlife Service by Underwood McLellan and Associates of Edmonton, January 29, 1968.


Proposed cross dyke
to control
Goat River
INDIAN RESERVES I, IA, IB
KOOTENAY
RIVER

channel where it crosses the highway to the east of Reserve 1B. This has resulted in serious channelization and erosion throughout the northern half of Reserve 1B.

As a result of this diversion of the Goat River any development plan being prepared at present would not consider this portion of the Indian Reserves as a potential area for agricultural reclamation. The additional problems created by having two branches of the Goat River to contain, severely channeled and eroded land, plus the repercussions which any development would have on private land to the east, have rendered this area unattractive for further agricultural reclamation. The alternative would be to construct a dyke across Indian Reserve 1B to the south of the area affected by the Goat River, as indicated with a dotted line on the map. This would preclude approximately 700 acres from development but is the only feasible alternative, given recent diversion of the Goat River.

For reasons given above the reclamation plan considered in this study is based on an area of 2,300 acres only. After dykes, roads, and ditches are built it is assumed that 90 per cent, or 2,070 acres could be put into agricultural production. Estimates of dyke requirements and costs are based on Kootenay River levels as given in Table D-1

Dyke requirements along the Kootenay River, which forms the western boundary of the reserves, will be minimal. The Kootenay River will not exceed 1756.6' at the south end of the Indian Reserves (Porthill) or 1755.0' in the north (Goat River). Allowing a two foot freeboard on dykes in this area requires a top elevation of 1759' in the south, falling to 1757' at the northern end.

At present the riverbank in this area is consistent at elevations between 1760' and 1762', with small gaps in only three places. With the exception of these gaps the natural levee is broad and well established and with gaps filled in would serve as a more than adequate dyke with a leeway of 6 to 8 feet above maximum river levels. Dyking costs along the Kootenay River would thus be minimal - consisting only of the cost of filling the gaps in the levee - at the most $10,000.*

A second dyke will be required across the north of this area to contain the Goat River. The required dyke, as outlined earlier, will be about 9,000 feet long with a top elevation of 1758' at its eastern end, falling to 1757' at the west end. Construction of this dyke will require approximately 36,000 yards of fill, costing approximately $36,000.**

Additional costs for internal ditching and installation of pumps, approximately $30,000, brings the total capital costs of reclamation to $76,000. On a per acre basis, with 2,070 cultivable acres, this amounts to $37.

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*Under historic conditions there have been problems in some areas where water has seeped through porous soil under dykes and saturated soils in low lying areas of reclamation units. Seepage is prevented by "coring" or digging a trench into the porous soil under the dyke and refilling with non-porous material. While seepage problems might have been expected were the Indian Reserves reclaimed under historic conditions, they are not likely to occur after Libby Dam. Kootenay River levels will only be above the lowest areas in the Indian Reserves by about 4 feet and pressure would be insufficient to cause seepage. It is assumed therefore that there will be no costs for coring along the Kootenay River.

**Costs of $1 per yard are assumed after considering the need to haul fill and the distances involved. A similar although much shorter dyke constructed recently in the southern part of the Indian Reserves had costs of $1 per yard.

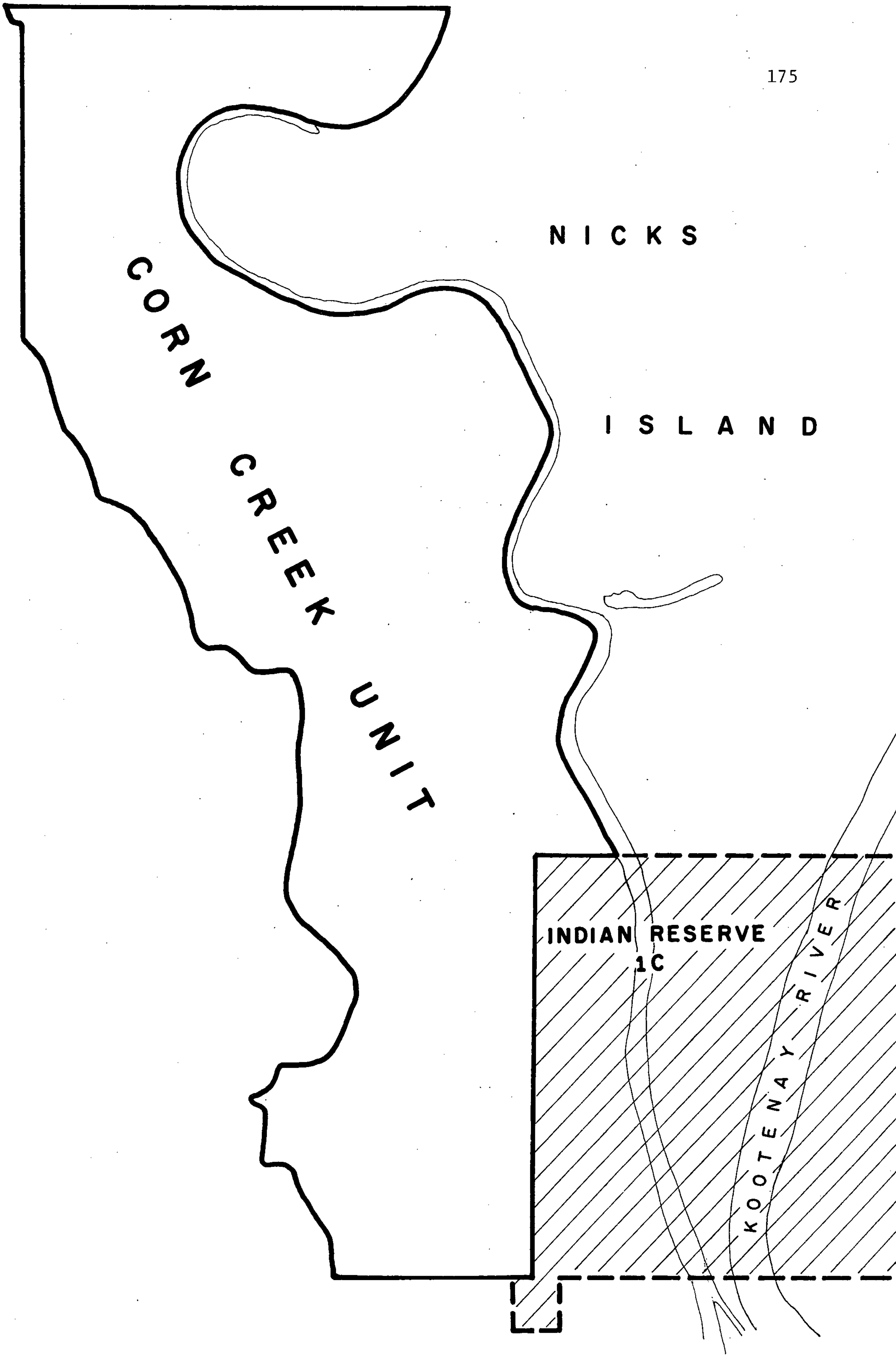
The Corn Creek Unit

There are approximately 1,400 acres in the Corn Creek unit up to elevation 1758' and terminating at Summit Creek in the north. The cost of reclaiming this area depends on the methods used to control Summit Creek in the north, and Corn Creek in the south. These streams enter the area from the mountains to the west, and meander extensively through the floodplain, with a considerable streamflow during spring runoff. Both of these streams would have to be controlled, and it is assumed that canals would be dug to carry them across the floodplain to the Kootenay River.* In addition to controlling Corn and Summit Creeks the canal banks would act as dykes against the waters of the Kootenay River.

There are two alternatives for controlling Corn Creek. These alternatives depend on whether that portion of Indian Reserve 1C which lies on the west bank of the Kootenay River can be included in the reclamation unit. There are approximately 200 acres in this portion of Indian Reserve 1C; 100 acres at the south end of Nick's Island, outside the dyking district, and an additional 100 acres on the west bank of the Old Kootenay Channel.

If it were possible to include this portion of Indian Reserve 1C in the Corn Creek area, the simplest approach would be to extend the dyke along the eastern side of the Island to a point near the southern tip. A fill dyke could then be placed across the Old Kootenay Channel; Corn Creek would be most effectively controlled by digging a canal which would carry it east

*This has recently been done with Summit Creek as part of a development program for Leach Lake. Summit Creek was diverted into a canal which enters the Kootenay River north of the Nick's Island dyking district at a cost of approximately $150,000.


NICKS
ISLAND
CORN CREEK UNIT
INDIAN RESERVE
1C
KOOTENAY RIVER

from the point where it enters the floodplain, to enter the Old Kootenay Channel just south of the proposed fill dyke. This altnernative would bring an additional 200 acres into the area, bringing the total acreage to approximately 1,600 acres.

If these portions of Indian Reserve 1C were not included in the reclamation project, the alternative would be to place a fill dyke across the Old Kootenay Channel just north of Indian Reserve 1C, and adjoining the existing dyke at that point. Corn Creek could then be confined to a canal which would skirt the Indian Reserve and enter the Old Kootenay Channel south of the proposed crossdyke.

An important assumption in both of these alternatives is that any new dykes could be joined to the existing dykes of the Nick's Island Dyking District which lies to the east of the Corn Creek area. This would eliminate the need to construct a dyke along the eastern boundary of the Corn Creek unit, and by combining with the Nick's Island Dyking District, annual maintenance costs could be reduced.

Whether Indian Reserve 1C is included in this reclamation or not, the cost of controlling Corn Creek will be approximately equal. The advantage of including Reserve 1C in the reclamation area lies in increasing the area of cultivable land and significantly reducing per acre reclamation costs.

With control of both Corn and Summit Creeks the dykes thrown up to contain streamflow would also serve as barriers to high water from the Kootenay River. Pressure from the Kootenay would be light however, given the river levels of Table D-1. Most of the land within the Corn Creek unit lies between 1752'-1754'; the Kootenay River is not expected to exceed 1753.9' at its maximum in the Corn Creek area, and 90 per cent of the time will be below

1750.9'. To be effective against the Kootenay River dykes would have to be built to an elevation of 1756', and any dykes built to control Corn or Summit Creeks would exceed this elevation.

The cost of diverting and channelization for both streams is estimated to be $300,000.* If the Corn Creek area were reclaimed independent of any work in Leach Lake (immediately to the north) then the entire cost of controlling both streams would be attributable to the Corn Creek reclamation. If reclamation of Corn Creek were carried out in conjunction with development of Leach Lake however only one-half of the cost of Summit Creek control would be charged to the Corn Creek area. Thus capital costs for control of these two major streams could be either $300,000, or $225,000, depending on whether or not a joint reclamation of Leach Lake were undertaken.

In addition a peripheral ditch would be required along the western edge of the unit to collect the runoff from several small streams draining the adjacent benchlands. Cost of this ditch, plus necessary internal ditching, and the installation of limited pumping capacity would be $50,000 at the maximum. The total capital cost of reclaiming this unit would thus vary from $275,000 to $350,000 depending on the status of Leach Lake development.

If the portion of Indian Reserve 1C discussed above is included in this area, 1,440 acres would be cultivable after reclamation. If Indian Reserve 1C is not included, 1,260 acres would be available. Estimated capital costs per acre vary from $191 to $278, as summarized in Table D-2.

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*Work presently underway to control Summit Creek is expected to be completed for $150,000. Control of Corn Creek would cost approximately the same amount.

TABLE D-2

ESTIMATED TOTAL AND PER ACRE RECLAMATION COSTS,

CORN CREEK AREA

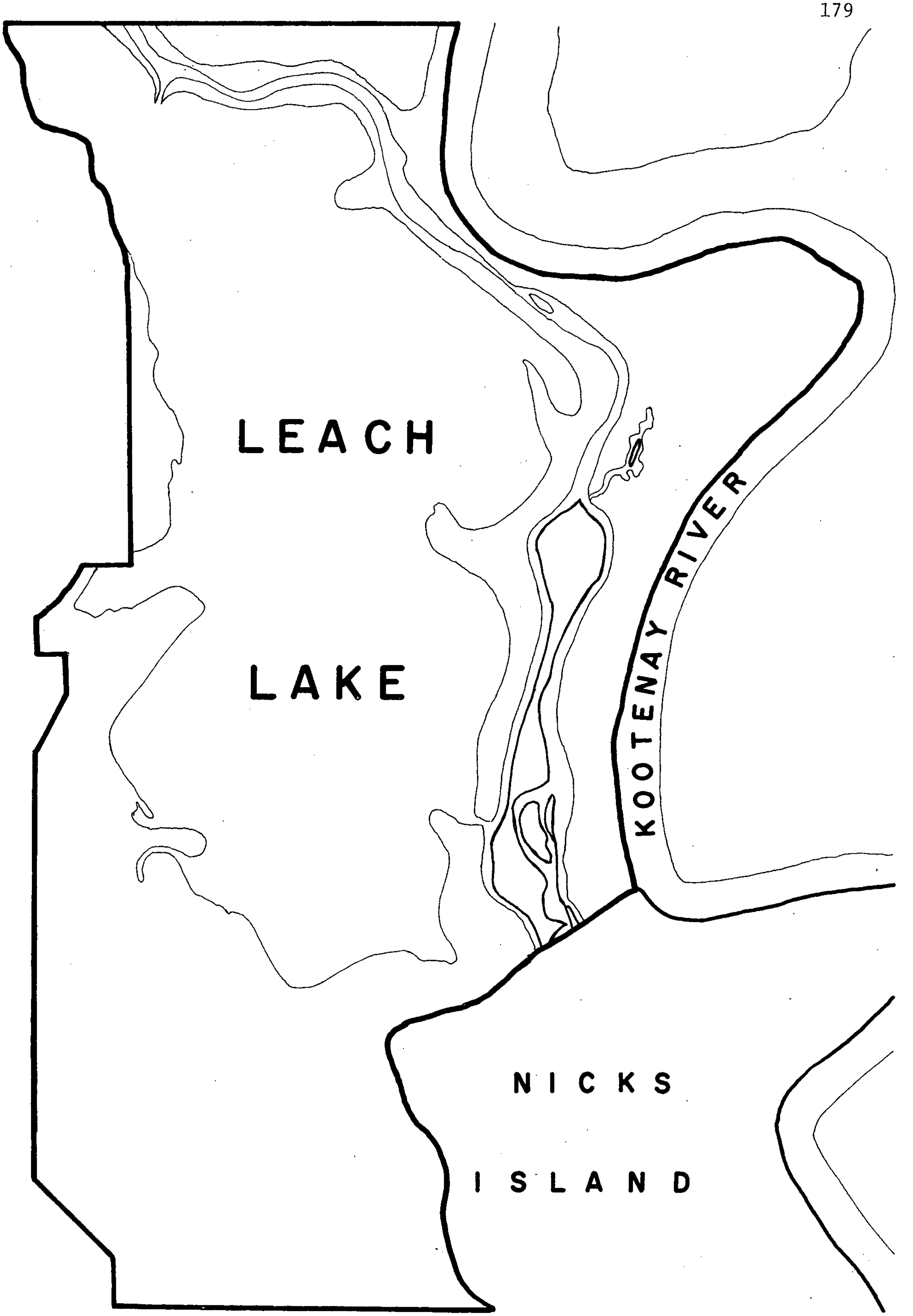
	Capital Costs	Per Acre Costs	
		I.R. 1C Included (1,440 Acres)	I.R. 1C Excluded (1,260 Acres)
Reclamation Independent of Leach Lake	$350,000	$243	$278
Reclamation in Conjunction with Leach Lake	$275,000	$191	$218

The Leach Lake Unit

There are approximately 2,900 acres in this unit which would yield 2,600 cultivable acres after reclamation.

As with the Corn Creek area, the future course of Summit Creek is important, as it forms the southern boundary of the Leach Lake unit. Again it is assumed that Summit Creek is taken directly across the floodplain to the Kootenay River by digging a canal, and in this case the north dyke of the canal will form the dyke for the south end of the area. The cost of controlling Summit Creek in this manner is approximately $150,000. If reclaimed in conjunction with Corn Creek only one half of this, $75,000, would be attributed to Leach Lake reclamation costs.

The Leach Lake area is bounded by the Kootenay River for 6 miles on the west and north. After Libby Dam the Kootenay River will not exceed 1753.9' in this area (reading given for Corn Creek which is upstream from

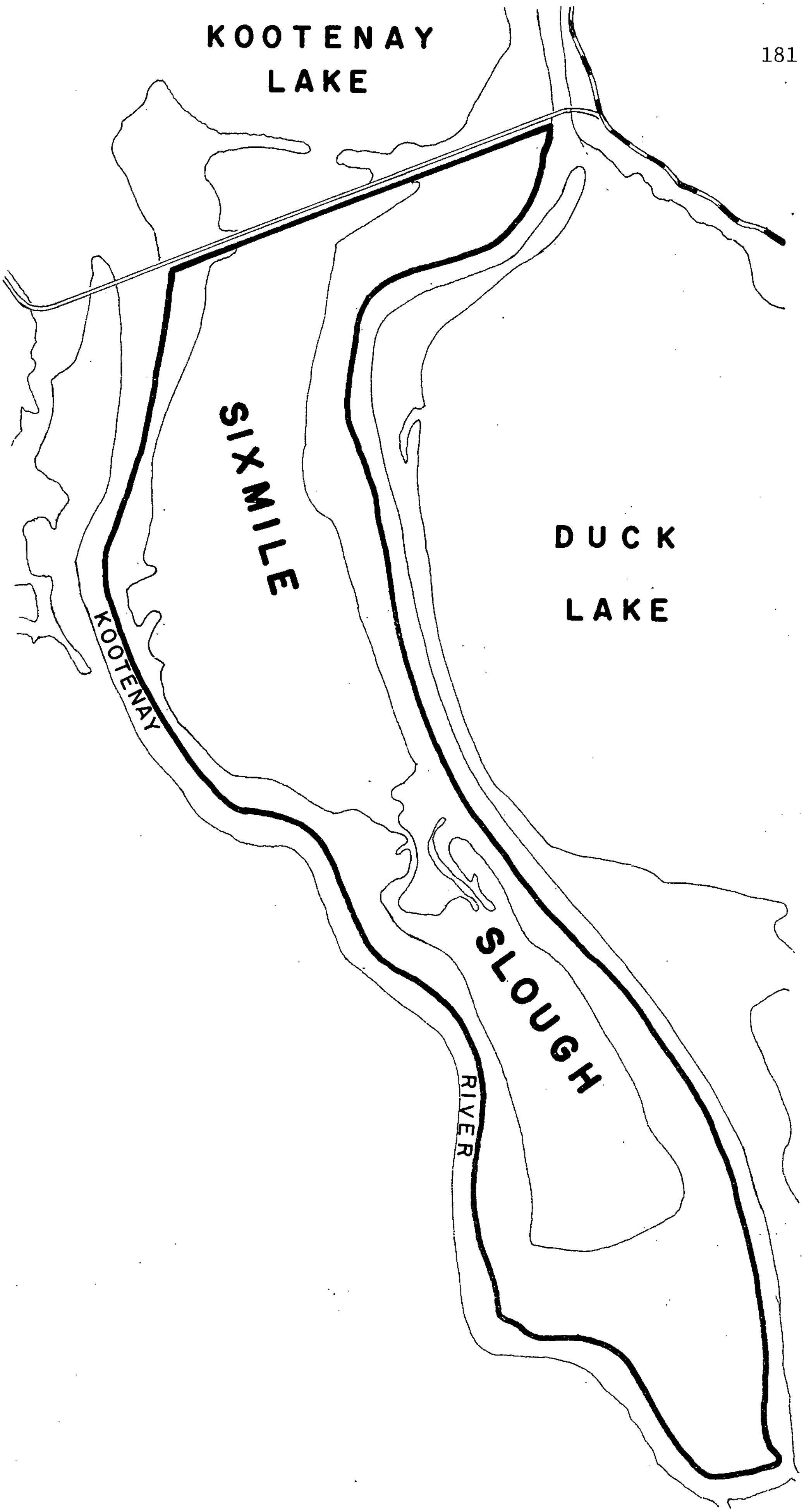

LEACH
LAKE
KOOTENAY RIVER
NICKS
ISLAND

Leach Lake). For agricultural purposes dykes would have to crest no lower than 1755.9', allowing a two foot freeboard. Throughout most of the area at present the natural riverbank and levee has an elevation varying from 1758' to 1760' and dyking would not be required. The only exception is in the extreme north west edge of the area where there is a break in the levee for 1/4 mile. This would require dyke construction, and there are several other areas where irregularities in the levee may have to be straightened as well as one area where severe bank erosion would have to be arrested. A liberal estimate of the cost of these works would be $25,000. Ditching within the unit and installation of a pump to handle internal drainage, including small creeks from the benchlands in the west, would cost an additional $70,000. Total reclamation costs would thus be $170,000 if work is carried out in conjunction with Corn Creek reclamation, $245,000 if carried out independently. Per acre costs would vary from $65 to $94.

Six Mile Slough

The Six Mile Slough area is an island bounded by the east and west channels of the Kootenay River immediately south of Kootenay Lake. At the north end of the area the Canadian Pacific Railway embankment provides a barrier to the waters of Kootenay Lake. Estimates place the area up to the 1758' contour at 2,650 acres.

At the north end of this unit (Kuskanook) the Kootenay River will not exceed 1752.0' after Libby Dam, while in the south, a distance of six miles, it could be expected to reach 1753'. Effective protection for agriculture would require a dyke built to top elevation of 1755' in the south, falling to 1754' in the north.


KOOTENAY
LAKE
SIXMILE
SLOUGH
DUCK
LAKE
KOOTENAY
RIVER

At present the periphery of the unit is consistent between elevations 1756' to 1758' along the east side. Elevations along the west side of the unit are also from 1756' to 1758' except for approximately 3,000 feet in the north end where the elevation is only 1754', and 1,000 feet where it is only 1752'. There is also a very short break in the levee on the west side where water flows out of the area when the Kootenay River is low. Across the north end of the unit elevations are generally low (1744' to 1752'). The C.P.R. railway embankment forms the northern boundary of the unit and acts as a barrier to Kootenay Lake. While it would protect the unit from wind and wave erosion, it is constructed of quarried rock and would not prevent water seepage.

Effective protection of the unit for agricultural purposes would require closing the small gap on the west side, raising 1,000 feet of the levee by two feet to elevation 1754', and building a dyke across the north end of the unit inside the railway embankment.

Cost of building the dyke across the north end of the unit to a crest elevation of 1754' is estimated at $55,000.* Cost of raising 1,000 feet of levee on the west by two feet and closing the narrow gap in the levee is estimated at $12,000. The cost of internal ditching and installation of pumping capacity would be minimal as the area is an island and does not have any mountain runoff to pump. The area slopes consistently toward the centre so that any drainage system could take advantage of the natural drainage which exists. The cost of ditching and installation of necessary pumping capacity is estimated at $30,000.

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*68,740 cubic yards of fill, at 80¢ per cubic yard.

Total reclamation costs are thus in the order of \$100,000, equal to \$42 per acre for 2,400 cultivable acres.

An important additional cost is involved in planning to reclaim and farm Six Mile Slough. This involves the provision of access to the area. The area is an island and at present has no road access. Access in the past has been by means of a small private ferry which is used mainly to transport livestock to the area for summer grazing.

This ferry would not provide adequate access to the area if it were being farmed intensively. A Bailey bridge adequate to carry farm trucks and machinery would cost approximately \$75,000, or a small cable ferry could be installed. While the initial cost of the ferry might be less than that of the bridge annual operating and maintenance costs would probably make it a less desirable alternative than a bridge in the long run. It is assumed here that access is provided by means of a bridge at a cost of \$75,000. This has the effect of increasing capital costs to \$175,000, or \$73 per acre.

Duck Lake

Unlike the other areas of unreclaimed land, Duck Lake is already protected by dyke from the Kootenay River as it lies within the Duck Lake Dyking District. Duck Lake lies at the north end of the Dyking District and is used to store the spring runoff of Duck Creek which enters the flood-plain at Wynndel. Duck Lake is separated from the cultivated land in the District by a cross dyke with a crest elevation of 1752.0'. Water level fluctuations within the lake are presently kept within six feet (El. 1742' to El. 1748') by outlet pumps at the north end of the lake which pump the stored water into Kootenay Lake.

Planimetry estimates place the total area of unreclaimed land up to the 1758' contour at 4,671 acres. However, not all of this land is potentially arable. Persons farming in the Duck Lake Dyking District estimate that only about 3,000 acres of this land would be suitable for farming. The rest of the land is felt to be too low, and to have such a heavy clay soil that it would not be suitable for cultivation.

The major problem in reclaiming further land in this area will be the control of Duck Creek. This would be best achieved by constructing a control dyke along the eastern edge of the area, commencing at the point of the existing cross dyke. This dyke would prevent the waters of Duck Creek from inundating further reclaimed land. An east to west cross dyke would then be necessary at the north end of further reclaimed land.

Construction of such a control and cross dyke would be relatively inexpensive, as the dykes would not have to withstand the pressure of the Kootenay River, and no preparatory clearing would be required. It may be necessary however to rip-rap the dyke facing on the remaining unreclaimed area to prevent wave erosion. In all between 3.5 and 4 miles of dyke would be required, costing an estimated $80,000.

Additional pumping capacity would be required to pump the runoff from Duck Creek into the Kootenay River. Based on the cost of new pumps currently being installed by B.C. Hydro,* this would require a capital outlay of $160,000.

With these estimates, the total capital cost of reclaiming an additional 3,000 acres in Duck Lake is placed at $240,000; $80,000 for

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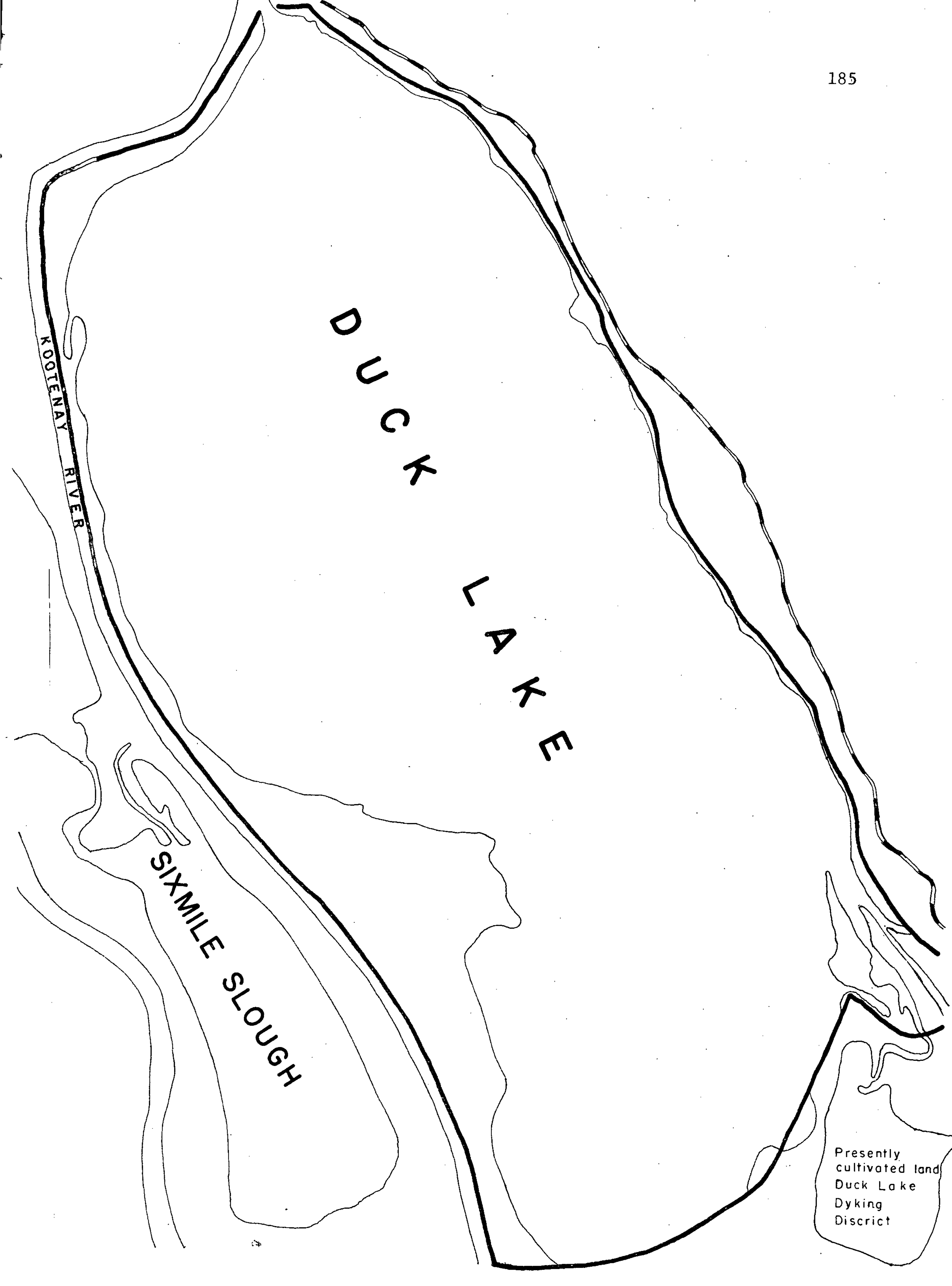
*Two electrically powered 150 h.p. 30 in. pumps, each having a capacity of 30,000 gallons per minute.


DUCK LAKE
KOOTENAY RIVER
SIXMILE SLOUGH
Presently cultivated land Duck Lake Dyking Discrict

dyking, and $160,000 for pumps. This involves an initial capital outlay of $80 per acre.

It has been suggested as an alternative to this reclamation plan that further reclamation in Duck Lake could be achieved without the construction of new control or cross dykes. This alternative assumes that the installation of additional pumping capacity will make it possible to reclaim more land simply by lowering the level of Duck Lake. If this were so, and an additional 3,000 acres reclaimed, then the initial capital outlay would be reduced to $160,000 or $53 per acre. It is doubtful that this is a realistic alternative however, as it is felt that cross and control dyking would be required to control the flow of Duck Creek, and to protect additional reclaimed land from the remnant of Duck Lake.

Summary of Estimated Reclamation Cost for Individual Areas

The preceding estimates of reclamation costs for individual areas are assembled and summarized in Table D-3. Capital costs per acre vary from a low of $37 in the Indian Reserves to a high of $218 for the Corn Creek Unit (I.R. 1C excluded).

This wide variation in costs between areas can be attributed to differences in the size and physical aspects of the areas. Per acre costs in the Corn Creek area are far in excess of those for other areas. The Corn Creek area is the smallest reclamation unit being considered, and the need to control the runoff from Summit and Corn Creeks makes it relatively very costly. Per acre costs for the other areas are more uniform, as they

TABLE D-3

SUMMARY OF ESTIMATED RECLAMATION COSTS FOR INDIVIDUAL AREAS*

AREA AND ESTIMATES	ACRES IN CULTIVATION AFTER RECLAMATION	CAPITAL COSTS TOTAL	CAPITAL COSTS PER ACRE	COST OF INITIAL SOIL PREPARATION ($10/ACRE)	TOTAL COST (SUM OF CAPITAL COSTS PLUS INITIAL SOIL PREPARATION) Total Area	TOTAL COST Per Acre
1. INDIAN RESERVES 1, 1A, 1B	2,070	$76,000	$ 37	$20,700	$ 97,000	$ 47
2. CORN CREEK UNIT						
Indian Reserve 1C Included	1,440	275,000	191	14,400	289,400	201
Indian Reserve 1C Excluded	1,260	275,000	218	12,600	287,600	228
3. LEACH LAKE	2,600	170,000	65	26,000	196,000	75
4. SIX MILE SLOUGH	2,400	175,000**	73	24,000	199,000	83
5. DUCK LAKE	3,000	240,000	80	30,000	270,000	90

*The capital costs summarized here for both Corn Creek and Leach Lake assume that development of these two areas would be undertaken in conjunction.

**Includes cost of bridge access to area.

are generally twice as large as the Corn Creek unit and do not face the same internal drainage problems.

Cost of Initial Soil Preparation

In addition to these direct capital costs for reclamation there will be an initial cost in preparing the soil for cultivation. This will include such things as burning off marsh vegetation, brush and tree removal, and the first soil breaking. For most areas these costs will be low. The land that has been in marsh and overlain with water supports relatively little vegetation. If the areas are dried out and most of the vegetation burned off there would be little involved in the initial plowing and disking. In some areas brush and tree removal may add to these expenses.

In estimating these costs we must consider the extent to which they represent costs in excess of normal cultivating costs. Even on cropland that has been in cultivation for some time there is an annual expense for plowing and cultivating. Initial soil breaking costs should be considered as a separate expense only to the extent that they exceed normal cultivation costs.

With this in mind initial soil preparation costs are estimated to average $10 per acre for further reclaimed land at Creston. These costs are included in Table D-3 in the summary of overall reclamation costs.

A P P E N D I X E

APPENDIX E

QUALIFICATIONS TO BASIC FEASIBILITY ANALYSIS FOR AGRICULTURE

This appendix discusses several important factors which might bear on the feasibility of further investment in agricultural reclamation on the Creston flats.

Increased Dyke Erosion by the Kootenay River

With Libby Dam protection the Kootenay River will not reach the flood peaks which it has in the past, but it will remain at high levels for a longer time due to the gradual release of the runoff. Libby Dam will reduce the sediment load of the Kootenay River and this may result in accelerated erosion below the dam due to the increased carrying capacity of the river. At present no studies have been undertaken which give any indication of the probable magnitude of increased erosion. We are dealing in conjecture in trying to assess the impact which this may have on further reclamation projects.

Two problems could result from the Kootenay River being at high levels for a prolonged period. One involves increased water seepage and the other increased erosion. The probability of serious crop damage as a result of seepage appears relatively low. With Libby Dam the river levels will not be high enough, relative to the land being cropped, to create sufficient pressure to cause extensive seepage. While this remains little more than a guess, we will discount at this point the probability of increased water seepage following Libby Dam.

Of more consequence is the question of increased erosion due to the reduced sediment load of the Kootenay River. If this should prove to be serious it may require extensive rip-rap along the outer side of dykes. Rip-rap would have to be hauled to the site and would be very expensive. This could be a significant factor in affecting the feasibility of further reclamation. Areas which do not require a dyke may still have to be cleared and the banks graded for the placement of rip-rap, an expense which would not otherwise be incurred.

It is impossible to do anything other than qualify the earlier feasibility estimates to allow for the probability of this expense. There is no substantive information on which to base estimates. Duck Lake can be excepted from such qualification, as further reclamation in this area would not require additional protection against the Kootenay River. For the other areas rip-rap costs could be considerable and would reduce the level of net benefit to be expected from reclamation. However, for all areas except Corn Creek reclamation appears very favorable and the "erosion threat" can only be taken as a limited qualification to the basic feasibility estimates.

Kootenay Lake Levels After Libby Dam

Another "variable" which may bear on the long run feasibility of agricultural reclamation is the level of Kootenay Lake. At present the levels of Kootenay Lake are controlled within limits by West Kootenay Power and Light Company's dam at Bonnington Falls. The maximum authorized storage level of the lake is 1745.32' although flood peaks of course exceed this. The levels of Kootenay Lake have a significant effect on the water level in the Kootenay River immediately south of the lake, and hence on the unreclaimed land in the floodplain.

After Libby Dam it is expected that the flood peaks on Kootenay Lake will be reduced as a consequence of the reduced peak on the Kootenay River. Studies indicate that flood peaks on Kootenay Lake would not exceed 1752.0' after Libby Dam.* On the basis of this information it appears that the levels of Kootenay Lake will not have any adverse effects on the level of Kootenay River or the feasibility of further reclamation in the floodplain.

It has been suggested that after the completion of Libby Dam the Water Rights Branch and the International Joint Commission may be asked to authorize a two foot increase in the maximum storage level of Kootenay Lake. If this increase is authorized it will have little impact on reclamation. The critical period for reclamation projects is the annual freshet when river and lake levels are at a peak far in excess of the authorized levels for storage. Increasing the authorized storage level will have little effect during this critical period, and during the rest of the year lake levels will still be too low to have any adverse effect.

Again we are dealing in conjecture, as a decision on this matter is not expected until Libby Dam has been in operation, and there is no indication as to whether or not increased storage would be authorized. In

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*Computer studies by the U.S. Army Corps of Engineers for each flood season of the years 1928-1958 indicate that the highest level of Kootenay Lake would have been El. 1752.0' on the 18th and 19th of July, 1954 with Libby Dam regulation. While higher levels could occur the probability is very small. SOURCE: Contained in a letter from the Water Rights Branch, Victoria, B.C., to D.D. Moore, Supervisor, Creston Valley Wildlife Management Area.

any case it appears unlikely that increased storage would have any adverse effect on the feasibility of further reclamation.

Variation in Soil Capabilities

The estimated returns from further reclamation are based on a study of farms on presently reclaimed lands. Applying these estimates to further reclamation assumes, as discussed earlier, uniform productivity and capability of soils. This is felt to be a reasonable assumption as the presently reclaimed land encompasses the same type of soils as would be expected on further reclamation projects. This assumption too should be questioned - although to do so is difficult as there have been no comprehensive soil studies made on the Creston flats.

Observations by persons familiar with the undeveloped areas indicate that there is a considerable variation between the soils of the unreclaimed areas. It is generally agreed that the soil in the Indian Reserves is the most fertile in the valley and would be considerably above average in productivity. In the Corn Creek unit large areas of poor sandy soil are encountered and the soils are probably below average in productivity.

Soils in the Leach Lake unit probably are close to average in productivity. At the south end of the unit they are fairly well built-up while in the north they have remained covered by the shallow waters of Leach Lake. Soils at the bottom of Leach Lake are at approximately the same elevation as those now farmed on the Duck Lake Dyking District.

Again in the Six Mile Slough area soils would be close to average in productivity. At the south and around the perimeter of the area soils tend to be well developed, while in the center they are lower and covered by water.

Low productivity soils would be encountered in further reclamation of Duck Lake. The soils here are low and tend toward a heavy clay which is not well suited to grain crops. They are adaptable however to crops such as clover seed, and could probably be improved considerably by tilling and legume crops.

These discussions indicate that we might expect soil capabilities to be above average on the Indian Reserves, approximately average in Leach Lake and Six Mile Slough, and below average in the Corn Creek and Duck Lake units. Such assessments are really little more than conjecture as there have been no rigorous studies of the soils in the area which would substantiate them. We would expect soil capability to have an adverse effect on the feasibility of further reclamation only in the Corn Creek and Duck Lake areas. In the Duck Lake area the net benefit and benefit cost ratios are both high, and while a lower productivity might reduce these estimates it would not alter the basic conclusion regarding feasibility.

Sensitivity to Changes in the Discount Rate

Selection of the appropriate discount rate for benefit cost analysis has received considerable attention (McKean 1958, Marglin 1963). The problem is to identify the appropriate borrowing or lending rate for the agency whose point of view is adopted in the analysis.

This is difficult in the present analysis, as benefits and costs are being compared from the point of view of three "referent groups" - the Creston area, the province of British Columbia, and Canada. Furthermore the overall analysis involves two different types of projects, agriculture and wildlife development. Agricultural development is essentially a private undertaking the benefits of which accrue to those undertaking the development. Wildlife development is a public investment, the benefits of which will accrue to a much broader group of people than agricultural benefits. Nevertheless both farmers and persons who will benefit from wildlife development are members of the various referent groups, and benefits which accrue to them must be considered benefits to the referent groups.

Considering these factors, selecting an appropriate interest rate for use in this study is very difficult. So that the respective benefits and costs of the development alternatives can be properly compared the same interest rate should be used throughout.

Selection of the proper "social discount rate" is largely a political decision. In the absence of direct political guidelines it has been the custom in the past to adopt the interest rate paid by the relevant government on long term bonds. At the present time the yield on various long term government bonds runs from 7 to 8.4 per cent. A rate of 8 per cent is used in this study to discount future benefits from both agricultural and wildlife development. This is felt to be a satisfactory approximation of the yield on government bonds, and in the case of agriculture corresponds to the rate at which loans for land purchases are made by the federal government under the Farm Improvement Loans Act.

We must recognize however that the result of a benefit cost analysis will be altered if different discount rates are adopted. The higher the rate used, the more severely are future values reduced in calculating their present values. For projects such as agricultural reclamation where costs are incurred over a short initial time and benefits accrue over a long time period lower discount rates will enhance feasibility while higher rates will reduce it.

To ensure that the basic feasibility conclusions are independent of the choice of discount rate it is customary to test the sensitivity of the results to changes in this rate. Discount rates of 6 and 10 per cent are used here to test the sensitivity of the benefit cost comparisons for agriculture.

Six Per Cent Discount Rate

With a discount rate of 6 per cent the present value of benefits will be substantially higher than calculated earlier with a rate of 8 per cent. The present value of the net annual earnings per acre ($26.31) when discounted at 6 per cent is $438, compared with $329 when the rate is 8 per cent. Discounting this value to account for the time elapsed between reclamation and the first harvest results in a per acre value of $413. This has the effect of greatly increasing both the net benefit and the benefit cost ratios, as summarized in Table E-1.

Ten Per Cent Discount Rate

The present value of net benefits per acre is $263 using this discount rate and it is further discounted to $239 to allow for the one year lag between reclamation and harvests. Net benefits, and benefit cost ratios are lower with this discount rate than with 8 per cent. In the case of the Corn Creek unit a discount rate of 10 per cent renders the project marginal at best. Net benefits and benefit-cost ratios are so low that this unit presents a very unattractive investment opportunity.

TABLE E-1

THE EFFECT OF SELECTED DISCOUNT RATES ON

BENEFIT COST RESULTS IN AGRICULTURE

Area	6 Per Cent		8 Per Cent		10 Per Cent	
	Net Benefit (B-C)	Benefit-Cost Ratio (B/C)	Net Benefit (B-C)	Benefit-Cost Ratio (B/C)	Net Benefit (B-C)	Benefit-Cost Ratio (B/C)
1. Indian Reserves (2,070 Acres)	$758,000	8.8:1	$534,000	6.5:1	$398,000	5.0:1
2. Corn Creek Unit						
i (1,440 Acres)	306,000	2.1:1	150,000	1.5:1	55,000	1.2:1
ii (1,260 Acres)	233,000	1.8:1	97,000	1.3:1	14,000	1.05:1
3. Leach Lake (2,600 Acres)	878,000	5.5:1	597,000	4.0:1	425,000	3.2:1
4. Six Mile Slough (2,400 Acres)	792,000	5.0:1	533,000	3.7:1	375,000	2.9:1
5. Duck Lake (3,000 Acres)	969,000	4.6:1	645,000	3.4:1	447,000	2.7:1

Summary

The preceding calculations, summarized in Table E-1, have shown the benefit cost comparisons for further agricultural development to be insensitive to changes over a broad range in the interest rate. While the low rate of 6 per cent substantially improved the feasibility and the high rate of 10 per cent substantially reduced it, in only one case (Corn Creek) was the feasibility of reclamation refuted. Since the results of the benefit cost analysis are not sensitive to the discount rate over such a broad range the earlier estimates of feasibility based on an 8 per cent rate are accepted.

Changes in Crop Practices and Managerial Intensity After Libby Dam

Using present farm returns on the Creston flats to estimate returns from further reclamation assumes that cropping practices and managerial intensity will be the same after Libby Dam. At the present time grain crops account for two-thirds of the seeded acreage on the reclaimed land. While grain does not yield as high a return (gross or net) per acre as other crops, such as clover and potatoes, it has been the dominant crop on all farms. The dominance of grain is due to a large extent to the flood risk from the Kootenay River. Given the possibility of annual floods, grain crops which have very low seeding costs in comparison with other crops, represent a much lower potential loss.

With this flood risk removed by Libby Dam there may be a significant change in crop practices. Farmers could move into irrigated crops and follow more intensive management practices. There is also a possibility that dairy farms could be established on the flats, as the Creston area at present imports large quantities of milk.

A trend away from grain crops could thus follow the completion of Libby Dam. As a consequence the gross return per acre of cultivated land may rise substantially and there would also be an increase in net returns. It is not clear that net returns would rise in direct proportion to gross returns however.

A review of irrigation systems and intensive crop practices in similar areas of Washington and Idaho,* to the south of Creston, reveals that net incomes are not greatly increased by more intensive farming practices (U.S. Dept. of Agriculture 1964; Washington State University 1967). It was found for instance, that on irrigated crops the irrigation system had to be designed carefully for both the climate, soil, and crop to be grown - introducing large capital costs. Irrigated crops also require a significant increase in labor input, a factor which is often overlooked (Johnson 1969).

One drawback to the introduction of more intensive crops on the Creston flats is the relative isolation of the Creston area with respect to markets. In the Washington and Idaho studies referred to above the crops produced enjoyed relatively good access to large markets. For Creston crops the main British Columbia market would be the Lower Mainland which involves a high transport cost. (At present it is cheaper to import hay into the Lower Mainland from eastern Washington than from Creston).

Another problem associated with the introduction of more intensive cropping is that farm units would become much smaller than they are at present. This has the effect of decreasing the efficiency which is presently realized from the large scale use of machinery and equipment.

Despite these problems, a major shift in the pattern of production on the Creston flats can be expected after Libby Dam is completed. At the same time higher gross returns and more intensive management are not a guarantee of proportionate increases in net returns.

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*Due to the differences in the price and income structures between these areas and British Columbia the results are of course not directly comparable. They do however indicate the general relationship which might be expected, and are based on farming in areas which resemble Creston more than any areas in British Columbia.

In light of the uncertainties surrounding future production on the Creston flats it is difficult to estimate the impact which changes may have on the feasibility of further reclamation. The only reliable basis for any estimates is the data pertaining to present returns. As a liberal assumption these returns are increased by 20 per cent to allow for changes in crops and management after Libby Dam. This has the effect of increasing the net return per acre from $26.31 to $31.57. The present value per acre, after allowing a one year time lag, is increased to $366 from the former estimate of $305.

Under this assumption both the benefit cost ratios and the net benefit estimates are significantly increased. Table E-2 summarizes these

TABLE E-2

BENEFIT COST COMPARISONS, ASSUMING A 20 PER CENT INCREASE IN NET EARNINGS PER ACRE

Area	Net Benefit (B-C)	Benefit Cost Ratio (B/C)
1. Indian Reserves	$660,000	7.8:1
2. Corn Creek		
Including I.R. 1C	238,000	1.8:1
Excluding I.R. 1C	174,000	1.6:1
3. Leach Lake	756,000	4.9:1
4. Six Mile Slough	679,000	4.4:1
5. Duck Lake	828,000	4.1:1

estimates. These calculations can reasonably be regarded as establishing an "upper limit" to the benefit cost comparisons for agriculture. They assume a 20 per cent improvement over present net earnings, and furthermore assume this improvement could be realized immediately after reclamation. This latter is a generous assumption, as in fact we would expect such an improvement to be realized over a number of years, and the force of discounting would reduce the net benefits below the estimates in Table E-2.

Long Run Trends in the Prices of Agricultural Output

At present grain crops account for approximately 67 per cent of the cultivated acreage on the Creston flats (Table B-2). Most of this crop is sold on the B.C. feed grain market, as Creston growers have limited quotas on delivery of grain to the Canadian Wheat Board. This concentration on grain production makes the farm economy particularly vulnerable to changes in the price of grain.

Canada, like all wheat exporting nations, currently faces a serious surplus problem, and grain prices are depressed. While there have been surplus problems in the past, the underlying causes have been of a short-run nature and markets have eventually been cleared. The present outlook, however, is much more severe.

Present wheat surpluses are expected to continue, as wheat exporting nations increase production while world wheat markets shrink. This expectation of persistent surpluses is based on several recent changes in the world wheat market (Huff 1969).

> "These include: (1) dramatic wheat production increases in Less Developed Countries; (2) substantially increased output in large wheat exporting countries outside of North America - namely

> Australia, Argentina, the USSR and France; (3) changes in the U.S. policy regarding its food aid and its farm support programs; (4) increased impact of restrictive trade policies; and (5) technological developments in the baking industry which have allowed a higher percentage of soft wheat to be mixed with hard wheat for breadmaking."

Factors 1, 2 and 5 above cannot be regarded as short-run phenomena, and they are of serious consequence to Canada's expectations for future wheat exports. The consequences of this are far-reaching. "... not only have rapid increases in world wheat production fouled up the world wheat market, but there is evidence that it has also begun to spill over into the world feed grains market." (Goodman 1969)

A recent paper by the Federal Task Force on Agriculture (1969) suggested that wheat production in Canada should be reduced by 9 to 11 million acres. This paper implied that the acreage removed from wheat could or should be re-allocated to the production of feed grains. It was recognized in the paper that export markets would have to be developed either for feed grains and/or for livestock to accommodate this adjustment.

Any adjustments of this nature which increase the production of feed grains within Canada will have serious consequences for grain prices received by Creston growers. Feed grain prices are already depressed by the current wheat surpluses. A major increase in production on the Canadian prairies can only depress prices further.

With so many uncertainties it is pointless to try to estimate future grain prices at Creston, or the effect on the feasibility of further reclamation. However, if the shift in cropping practices postulated after completion of Libby Dam does not occur it seems safe to say that the long run expectations are for net earnings in Creston flats agriculture to be lower.

This is a significant factor, and could play a very important role in changing the feasibility of further agricultural reclamation projects.

Time Elapsed Between Reclamation and Crop Production

Present value calculations have assumed a continuous stream of annual benefits beginning one year after the initial reclamation costs. This is not an unreasonable assumption after the completion of Libby Dam. With the very low levels of the Kootenay River dyking would take little time and internal drainage could be completed easily. Where reclaimed areas dried out quickly and no problems were encountered in breaking ground crops could be seeded and harvested well within this time. Under ideal conditions it is conceivable, although unlikely, that a first crop could be taken off less than a year after reclamation began.

Alternatively there could be as much as a two year lag between reclamation and the first harvest of any consequence. This could occur if difficulties were encountered in breaking ground or if the initial crop was not well established. (It is assumed for simplicity that the first year crop would yield a sufficient return to cover variable costs only). In such a case the annual benefit stream would not begin until two years after the initial reclamation costs. With the force of discounting, this two year lag further reduces the present value of the benefit stream. The effect on the benefit cost ratios and net benefit calculations for each area is summarized in Table E-3.

TABLE E-3

BENEFIT COST COMPARISONS WITH A

TWO YEAR TIME LAG

Areas	Benefits Minus Costs (B-C)	Benefit-Cost Ratio (B/C)
1. Indian Reserves	$487,000	6.0:1
2. Corn Creek		
I.R. 1C Included	117,000	1.4:1
I.R. 1C Excluded	68,000	1.2:1
3. Leach Lake	537,000	3.7:1
4. Six Mile Slough	478,000	3.4:1
5. Duck Lake	576,000	3.1:1

Comparison of the results summarized in Table E-3 with those of Table 2 in Chapter Four reveals that both net benefits (B-C) and benefit cost ratios are reduced considerably by the effect of an additional year's time lag. Even with this additional lag, and excepting the Corn Creek Unit, benefit cost ratios are favorable and the present value of net benefits remains substantial. Net benefits are reduced by approximately 9 per cent for individual reclamation units, and with the exception of the Corn Creek area all benefit cost ratios are above 2.0:1.

These calculations provide an interesting check to those presented in Table 2. It is felt that the assumption of a one-year lag on which Table 2 is based is valid. However even if this assumption should prove to be false the results in Table 4 illustrate that there is little impact on the overall economic feasibility of reclamation.

Feed Freight Subsidies and the Appropriate Measure of Benefit

A final qualification is introduced by considering the provincial feed freight subsidy paid on grain shipped from Creston. Feed grain grown at Creston does not qualify for freight subsidy under the federal government's Livestock Feed Assistance Act. This places Creston grain at a disadvantage in British Columbia markets where feed grain from the prairie provinces receives federal freight subsidy. In an attempt to offset the negative effect on Creston grain of the federal policy the British Columbia government has instituted its own feed grain freight assistance for Creston grain.

While the provincial assistance was initially effective, changes in the federal policy in 1968 put Creston grain in a particularly difficult marketing position, even with provincial freight assistance. Negotiations have been undertaken by both the federal and provincial governments to try to resolve the problems created by the federal policy, but little progress has been made. The future level of provincial subsidy payments is therefore a clouded issue, which makes analysis of its impact on feasibility little more than conjecture.

Any freight assistance paid on the movement of Creston grain must be considered in analyzing the costs and benefits of further agricultural reclamation. At present the federal freight assistance directly reduces the price Creston growers receive for their grain, and the provincial assistance has been introduced to offset this discrimination.

It is important to determine who benefits from this assistance. Livestock feeders in British Columbia do not benefit, because without Creston grain they can easily obtain grain at the same price from other areas. The transport sector, which moves Creston grain under provincial assistance, would move grain from other areas in the absence of the provincial program. While there may be some relocation of transport activity, there is no net benefit to the transport sector from the provincial assistance.

Provincial assistance does, however, have a direct effect on the price Creston growers receive for their grain. The price received per ton will be increased by the amount of the freight assistance. Thus, given the discriminatory impact of the federal program, provincial assistance on the shipment of grain from Creston represents a direct subsidy to Creston grain growers.

Treatment of this subsidy in calculating benefits and costs will differ depending on the framework, or the 'referent group' being adopted. From the purely local point of view, (the Creston area economy), this subsidy represents a net benefit. It is a transfer of funds from the general revenue of the province to Creston grain growers. Thus in calculating the benefit of agricultural output the total price received for grain will be the appropriate measure of benefit.

If the analysis is being conducted from the point of view of the province of British Columbia however, this treatment of the subsidy is inappropriate. In this case the subsidy simply represents a transfer of funds within the province, (from general revenue to Creston grain growers), and there is no net gain to British Columbia. In calculating the benefits to British Columbia from agricultural output the amount of the subsidy should be subtracted from the market value of grain to yield the benefit attributable to production in the area.

Similarly, if the analysis is conducted from the broader point of view of Canada as a whole, the amount of any subsidy paid must be deducted from the market value of grain to yield the benefit attributable to production in the area.

Few definite conclusions can be reached concerning the magnitude of such subsidy payments in the future. The amount paid in subsidy in any one year will depend on the prevailing rate of subsidization, a matter which is presently very unsettled, and the amount of grain shipped which qualifies for subsidy. Attempting to predict either of these factors over any length of time would involve extremely tenuous assumptions. Some rather crude estimates of subsidy payments can be made however, based on payments made in the past.

During the 1967-68 fiscal year a total of $24,000 was paid in subsidy on the movement of grain from Creston. This is equivalent to approximately $1.14 per acre of cultivated flatland. If an additional 11,500 acres are brought into cultivation, and if the same relationship holds, annual subsidy payments would be approximately $13,000.

If subsidy payments continue at previous levels, then the appropriate procedure to allow for these payments is to deduct the present value of such payments from the estimated present value of primary benefits. While this is admittedly a very imprecise means of estimating future subsidy payments, the calculations have been performed and are summarized in Table E-4.

Taking the freight subsidy into account in this manner has little effect on the overall feasibility of reclaiming any area. Net benefits are

TABLE E-4

REDUCTION IN PRIMARY BENEFITS TO ACCOUNT FOR FREIGHT SUBSIDY

Area	Net Benefits before Accounting for Subsidy (B-C) (See Table 2 Chapter IV)	Present Worth of Estimated Subsidy Payments	Net Benefits after Accounting for Subsidy	Benefit-Cost Ratio after Accounting for Subsidy
1. Indian Reserves	$534,000	$29,000	$505,000	6.2:1
2. Corn Creek*	150,000	20,000	130,000	1.4:1
3. Leach Lake	597,000	36,000	561,000	3.9:1
4. Six Mile Slough	533,000	34,000	499,000	3.5:1
5. Duck Lake	645,000	42,000	603,000	3.2:1

*For the Corn Creek unit it is assumed that I.R. 1C is included in reclamation.

reduced, and benefit cost ratios lowered slightly, but as before reclamation appears to be economically feasible. While the method used to estimate the future value of subsidy payments is admittedly very crude, the above comparisons of benefits and costs are appropriate if the analysis is being conducted from the point of view of the province as a whole. The comparisons in Chapter IV (Table 2) on the other hand would be appropriate only if the analysis is being conducted from the point of view of the local economy.

For both the provincial and national referent points allowing for this feed freight assistance reduces both the net benefits and the benefit cost ratios, so that the estimates of Chapter IV (Table 2) exaggerate the true level of net benefits. But the means of predicting future subsidy payments are so uncertain that these qualifications are just as well ignored - they do not affect the results of the benefit cost comparison of Table 2 beyond a range of error which would be expected in any case.

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APPENDIX F

APPENDIX F

RECREATIONAL USE OF THE CRESTON FLATS: THE CASE OF BIRD HUNTING DURING 1968

Bird hunting on the Creston flats is an important recreational pursuit for many hunters. Upland birds which are hunted include pheasants and doves, while waterfowl hunters pursue Canada geese and a wide variety of ducks. Hunting is done on both the unreclaimed Crown land, and on private reclaimed farm lands. A mail survey of hunters was conducted to determine the amount of recreational use made of this area during the 1968 hunting season. The procedure adopted for the survey, and the results obtained, are presented in this appendix.

Sampling Procedure

Identifying the 'Population' of Hunters

The first problem encountered in surveying Creston flats bird hunters is the enumeration or identification of the hunters. Two sources of identification were available, neither of which was wholly satisfactory in providing a complete enumeration.

The first means of hunter identification was data collected in road checks of hunters during the season. These checks were carried out by the Regional biologist and his staff, and were intended primarily to provide information on the species composition, age, and sex distribution of the waterfowl harvest. The names and addresses of hunters checked were recorded, and made available for sampling purposes. These did not provide a satisfactory enumeration of hunters for two reasons. The road checks were not carried out on a systematized sampling basis with respect to days in the hunting season, but were concentrated on weekends, and especially weekends at the beginning of the hunting season. In addition personnel constraints were such that checkpoints were established where the greatest number of hunters could be interviewed. Thus hunting activity in many areas of the flats, notably on private, land went unchecked, while in other areas, mainly Crown land, it was checked more regularly. For these reasons names and addresses of hunters obtained at road checks did not form a satisfactory basis for enumeration of the hunter population, although they were useful in the sampling procedure, as is explained below.

A more nearly complete enumeration of hunters was available from the Canadian Wildlife Service's records of purchasers of migratory game bird hunting permits. All persons hunting migratory birds in Canada are required to purchase these permits in addition to regular provincial hunting licenses. These permits are purchased at post offices, and the Canadian Wildlife Service keeps a complete record of all permits sold, both by residence of purchaser, and place of purchase. This information is available on a retrieval system, and provided the most satisfactory enumeration of hunters available.*

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*There is one shortcoming in using this information as an enumeration of bird hunters however. Migratory bird permits are required only to hunt migratory species such as ducks, geese, doves, and pigeons. Persons hunting non-migratory birds such as pheasants are not required to purchase the permit. Thus to the extent that any persons hunted <u>only</u> pheasants on the Creston flats, and did not buy a migratory bird tag, they would not be listed in the enumeration. This is of little consequence in practice, however. It can be reasonably assumed that few if any persons would hunt exclusively for pheasants on the Creston flats. Indeed experience indicates that many hunters automatically purchase the migratory bird permit in addition to required provincial licences, although they do not actually hunt migratory birds.

To use this information effectively the hunters were stratified according to area of residence. Three residence areas were established:

A) local hunters - residents of Creston and other small communities in close proximity to the hunting area.

B) non-local hunters - residents of British Columbia or Alberta from points outside the local area. This category included such population centres as Cranbrook, Calgary, Trail, Nelson, Castlegar, etc.

C) foreign hunters - hunters from outside of Canada - in this case all foreign hunters came from the United States.

Local hunters. It was assumed that local hunters would purchase their migratory bird permits at their place of residence.* The population of local hunters was identified from all those persons purchasing migratory bird permits at post offices in the local area. A total of 322 local hunters were identified in this manner and were assumed to represent all the local hunters who would be licenced to hunt birds on the Creston flats.

Non-local hunters. Identifying the population of non-local hunters proved to be an intractable problem. Road check data provided the names and addresses of some non-local hunters, but, as discussed, could not identify all non-local hunters. Similarly a few non-local hunters purchased migratory bird tags in the Creston area and could be identified. But to accurately enumerate all non-local hunters who hunted on the Creston flats would have required a survey of all migratory permit holders in British Columbia and

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*It is acknowledged that some local hunters may have purchased these permits outside of the local area. This is felt to be unlikely in the case of local residents, and is felt to be insignificant for the purposes of this survey. In any case a thorough search of all local residents buying permits outside the local area would have been prohibitive in terms of both time and money.

parts of Alberta. This would have been prohibitively expensive and time consuming.

Thus the population of non-local hunters could not be identified. Names and addresses obtained in the road checks, and from records of non-local hunters purchasing migratory bird permits in the Creston area, (a total of 161) were used in the survey of hunters. Estimating the total number of non-local bird hunters on the Creston flats is done in a rather crude fashion, as is explained later.

Foreign hunters. Very few non-Canadians come to the Creston area to hunt birds. Those who do must purchase both a British Columbia hunting licence, and a migratory bird permit. It was assumed that any non-Canadian coming to the Creston area to hunt birds would purchase his licence in the Creston area. Under this assumption a population of 28 foreign hunters was identified from records of migratory bird permit sales in the Creston area.

The Sample of Hunters

Since it was felt that the population of both local and foreign hunters had been identified accurately, and in view of their relatively small number, (322 and 28 respectively), a 100 per cent sample was used for the mail survey. Although the non-local population was not identified, 161 names and addresses were available. Since this number was also small, a 100 per cent sample was employed.

All hunters were mailed a questionnaire asking for information on their bird hunting activities on the Creston flats during the 1968 hunting season. A letter of explanation and a stamped return envelope were included. A total of 511 questionnaires were mailed.

Response

The response to the survey is summarized below in Table F-1. Of the 511 questionnaires sent to hunters, 8 were returned undelivered by the post office. With 503 hunters thus receiving the questionnaire, a total of 245 replies were received. This represents a rate of response of 48.7 per cent from those who actually received the questionnaire, and 47.9 per cent of all hunters on the mailing list.

TABLE F-1

SUMMARY OF RESPONSE TO MAIL QUESTIONNAIRE

	Local	Non-Local	Foreign	All Hunters
No. of Hunters Enumerated	322	161	28	511
Questionnaires Undelivered	3	4	1	8
No. of Hunters Receiving Questionnaire	319	157	27	503
No. of Respondents	149	80	16	245
Respondents as Per Cent of Recipients	46.7%	50.9%	59.3%	48.7%

Findings of the Survey

The Number of Hunters and Hunter Days of Recreation

All hunters were asked if they hunted migratory game birds (ducks, geese, or mourning doves), or pheasants in the Creston flats area during the 1968 hunting season. Responses indicated that 19.6 per cent of all those enumerated did not hunt on the Creston flats, while 80.4 per cent did hunt.

Among the local hunters 24.8 per cent did not hunt birds on the Creston flats, while 13.8 per cent of the non-local hunters did not hunt. All of the foreign hunters on the other hand indicated that they did hunt on the Creston flats in 1968. This data is used to estimate the total number of bird hunters and hunter days of recreation on the Creston flats in 1968.

Local hunters. Of the 322 local hunters licenced to hunt birds on the Creston flats, 24.8 per cent, or 80 hunters did not do so.* The number of local hunters hunting birds on the flats in 1968 is thus estimated to be 242. Analysis of responses indicates that each of these hunters spent an average of 12.6 days hunting, or a total of 3,049 hunter days. The average duration of a days hunt was reported to be four hours.

Non-local hunters. Estimating the total number of non-local hunters can only be done on a rather conjectural basis. As discussed earlier, it was not possible to identify satisfactorily the population of non-local hunters for sampling purposes. For this reason the proportion of non-local hunters who reported that they did not hunt on the Creston flats (13.8 per cent) could not be applied to a total population figure to estimate the number of hunters. Instead an arbitrary procedure has been adopted, using as a partial guideline the ratio of non-local to local hunters in road-check information.

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*Having 24.8 per cent of those eligible reporting that they did not hunt birds near Creston may appear rather high, but is probably quite reasonable. Many local area residents have stopped hunting the flats area in recent years as pheasant hunting has become increasingly poor. The tendency for many of them is to make one trip a year to Alberta for bird shooting, while much of the hunting done in British Columbia is for big game. The nearby East Kootenay region provides some of the finest big game hunting in North America, and local bird hunting tends to be overshadowed by this.

Road-check data were available for both the 1967 and 1968 hunting seasons. During the 1967 season the ratio of non-local to local hunters passing through road checks was 1.28:1, while the ratio in 1968 was 1.65:1. In the absence of a systematic sampling procedure for conducting these road-checks, little can be concluded from these ratios except that for the time and place on which the road-checks were made they represent the ratio of non-local to local hunter activity. Using these ratios to estimate the total number of non-local hunter days during 1968 infers that the times and places at which road-checks were conducted present an unbiased sample of the season-long hunting activity. There are several reasons to believe that this is not true, and they will be discussed shortly.

It is felt that these ratios can be used however to indicate an 'upper limit' to the number of days of use by non-local hunters. Applying these ratios to the number of hunter days of use by local hunters in 1968 yields a range of estimates for non-local hunter days from 3,903 to 5,031. These estimates are summarized in Table F-2.

TABLE F-2

NON-LOCAL HUNTER DAYS AS ESTIMATED FROM ROAD CHECK RATIOS

	Ratio	Estimate
(1967)	1.28:1	3,903 Hunter Days
(1968)	1.65:1	5,031 " "
(1967 + 1968)	1.40:1	4,269 " "

This method of estimating the number of non-local hunter days incorporates a significant upward bias for two reasons. Road-checks were held on weekends, and especially weekends early in the season. Most of the non-local hunting pressure in the area came on weekends, while local residents spread their hunting activity more evenly through the week. For this reason the road-check data would tend to overstate the true ratio of non-local to local hunting activity. As a second factor, road-checks were almost exclusively oriented to hunters on Crown land. A much higher proportion of non-local hunters hunted on Crown land than did local hunters who had better access to hunting on private land. For these reasons it is felt that the estimates presented above significantly overstate the number of hunter days of use by non-local hunters, and that it would be unreasonable to assume that the number of days of use could have exceeded any one of these estimates.

A more appropriate ratio, involving a large element of personal judgment, is thought to be in the order of 1:1. While non-local hunters might exceed local hunters on weekends, local hunting activity through the week, and late in the season, would bring the total activity to approximately equal levels. Non-local hunters are estimated therefore to have spent 3,050 days hunting birds on the Creston flats in 1968. Hunters returning questionnaires indicated that they spent an average of 7.8 days hunting on the flats, averaging five hours per day. It is thus estimated that a total of 391 non-local hunters hunted birds on the Creston flats in 1968.

Foreign hunters. A total of 28 foreign hunters were licenced to hunt on the Creston flats in 1968. Responses to the survey indicated that all 28 foreign hunters did hunt birds on the flats. Foreign hunters averaged 9.1* days of hunting each, for a total of 254 hunter days of use. For these hunters the average days hunt lasted for 4.4 hours.

Summary. The estimates of hunting activity on the Creston flats in 1968 are presented in Table F-3. In all a total of 661 hunters spent 6,353

TABLE F-3

SUMMARY OF HUNTING ACTIVITY -
CRESTON FLATS, 1968

	Local Hunters	Non-Local Hunters	Foreign Hunters	All Hunters
Number of Hunters	242	391	28	661
Number of Days Hunting	3,049	3,050	254	6,353
Av. No. of Days Per Hunter	12.6	7.8	9.06	9.61
Av. No. of Hours Per Day	4.06	5.40	4.40	4.70

days hunting birds on the Creston flats. This was an average of 9.6 days per hunter, with each hunter-day averaging 4.7 hours.

* The average number of days spent hunting by foreign hunters exceeds the average of non-local hunters. This can be explained by the presence of a duck-hunting club whose members are all from the United States. This club owns a cabin in the Creston area and the members make a fairly substantial amount of use of their facilities. They accounted for 14 of the 28 foreign hunters in 1968, and as a consequence the average number of hunter days is relatively high for this group.

The Distribution of Hunting Activity

Bird hunting activity on the Creston flats took place either on unreclaimed Crown land (Duck Lake, Leach Lake, Six Mile Slough, and the Corn Creek Slough), on private farm land (reclaimed), or on Indian Reserves 1, 1A and 1B. Crown land supported by far the most hunting activity, with a total of 4,687 hunter days, 73.9 per cent of the total. Private farm land accounted for 1,551 days, 24.4 per cent of the total, while the Indian reserves accounted for only 105 hunter days, 1.7 per cent of the total. This information is broken down by the origin of hunters in Table F-4.

TABLE F-4

DISTRIBUTION OF BIRD HUNTING ACTIVITY

	PLACE OF HUNTING ACTIVITY (Hunter Days)		
Origin of Hunters	Crown Land	Private Farm Land	Indian Reserve
Local	2,055	906	88
Non-Local	2,394	641	15
Foreign	248	4	2
TOTAL HUNTER DAYS	4,697	1,551	105

Hunting on Crown and Private Land. The number of hunter-days spent on Crown land is more than three times as great as that on private land, although the amount of reclaimed farm land is greater than the amount of Crown land.

This concentration of hunters on Crown land is a result of several factors. The grain harvest was very late in 1968 and prevented hunting on much private land. In addition, many farmers prohibit hunting on their land. Finally, even where land is not posted to prevent hunting, most landowners live in the town of Creston, and locating the owner of land to ask permission to hunt is very difficult. For these reasons hunters tend to exert heavier pressure on the Crown land, especially non-local hunters who are severely handicapped in getting access to hunt on private land.

Hunting on the Indian Reserves. While hunting is permitted on the Indian Reserves, hunters are required to purchase either a $3 daily permit, or a $20 seasonal pass, in addition to their regular licence and migratory bird permit. Twenty-nine hunters purchased daily permits in 1968, while 6 purchased season passes. These hunters spent a total of 105 hunter days on the Indian Reserves in 1968 - far below the area's capacity for bird hunting.

It is felt that the price of hunting privileges on the reserve is not responsible for the very light hunting pressure. A more likely factor is the fact that very few persons seem to be aware that they can get permission to hunt there. Even when persons became interested in acquiring a permit, the sales and administration was so awkward in 1968 that many simply gave up in frustration and hunted on the Crown land. Thus while the hunting pressure on the Indian Reserves is negligible when compared with that on Crown and private land, this should not be interpreted as an indication of the area's capacity. Rather it is a result of the awkward administrative system under which hunting privileges are made available.

<u>Spending by Creston Flats Bird Hunters</u>. To provide a measure of the economic impact of bird hunting on the local economy, and within British Columbia in general, hunters were asked to estimate their expenditures in connection with hunting on the Creston flats. The estimated total and average expenditures are presented in Table F-5. Local hunters spent an

TABLE F-5

EXPENDITURE BY HUNTERS FOR BIRD HUNTING ON THE CRESTON FLATS, 1968

Type of Expenditure	Local Total	Local Av.	Non-Local Total	Non-Local Av.	Foreign Total	Foreign Av.	All Hunters Total	All Hunters Av.
	ORIGIN OF HUNTERS							
Food & Meals	$1,774	$7.33	$8,078	$20.66	$2,119	$75.67	$11,971	$18.11
Alcoholic Beverages	426	1.76	2,100	5.37	1,325	47.33	3,851	5.83
Accommodation	356	1.47	2,362	6.04	164	5.87	2,882	4.36
Travel Expenses	2,928	12.10	9,333	23.87	1,073	38.33	13,334	20.17
Hunting Equipment & Miscel. Supplies	8,216	33.95	16,094	41.16	1,004	35.87	25,314	38.30
Total of All Expenses	$13,700	$56.61	$37,967	$97.10	$5,685	$203.07	$57,352	$86.77
Amount Spent Per Day Hunting	$4.49		$12.45		$22.38		$9.02	

average of \$56.61 for their bird hunting, non-local hunters averaged \$97.10, and foreign hunters \$203.07. Total spending by all hunters came to \$57,352, representing an average of \$9.02 per day spent hunting. Spending per hunter day ranged from a low of \$4.49 for local hunters to \$22.38 for foreign hunters.

The expenditures summarized in Table F-5 do not include the costs of hunting licences and migratory bird permits. Since hunters may hunt other areas and other game with these basic licences the cost of licences cannot be attributed solely to hunting in the Creston area.

Licence expenditures which are appropriately attributed to hunting at Creston include permit fees charged for hunting on the Indian Reserves. These fees totaled \$207 during 1968. In addition it was determined that 20 of the 28 foreign hunters did no hunting in British Columbia other than their bird hunting at Creston. Therefore the licence and migratory bird permit expenses of these hunters (\$540) can also be included as directly attributable to bird hunting on the Creston flats. The addition of these expenses brings the total expenditure for hunting to \$58,099.

Not all of this money was spent in the Creston area, or in British Columbia. Hunters reported spending a total of \$41,543 in the Creston area (72.4 per cent of the total), and \$56,467 in British Columbia (98.4 per cent of the total). A more detailed presentation of the distribution of this spending follows in Table F-6.

TABLE F-6

GEOGRAPHICAL DISTRIBUTION OF SPENDING FOR BIRD HUNTING ON THE CRESTON FLATS

Location of Spending	ORIGIN OF HUNTERS Local	Non-Local	Foreign	All Hunters
Creston Area	$13,499	$23,244	$4,800	$41,543
British Columbia	13,700	37,967	4,800	56,467
Total Spending	$13,700	$37,967	$5,685	$57,352

The Value of Bird Hunting on the Creston Flats

It is a commonly held fallacy that the value of a recreational experience such as hunting can be measured by the amount hunters spend in their hunting pursuits. It would be equally valid to claim that the value of a loaf of bread is what it costs you to go to the store to get it - not the price which you pay for the bread. If outdoor recreation is considered as a consumption good in the same way that a loaf of bread is considered as a consumption good, then the only significant distinction between them in terms of their value to the consumer is that he has to express that value by being willing to pay a price for the bread, while he consumes his outdoor recreation free of charge.* Thus while the data on hunters' spending presented above indicates the cost of this recreation and its economic

*This is not quite true, as hunters do pay a nominal fee for hunting licences. These licence fees generally do little more than cover management and regulation costs, however, and are not levied in direct relation to the amount of game or recreation consumed.

impact, it does not measure the value of the hunting experience itself.

Attempts to estimate the value of non-priced recreational opportunities have received a good deal of attention recently, and have generally taken one of two main approaches (Knetsch and Davis 1966, Pearse and Bowden 1969). In the indirect approach efforts are made to estimate the value of the recreational experience by using the indirect evidence of hunters' expenditures. The direct approach on the other hand attempts to estimate this value by asking recreationists what they would be prepared to pay if prices were in fact charged for recreational opportunities. Both approaches rely on a series of assumptions regarding the rational-choice process of the recreationist, and the many pitfalls have been discussed extensively in the literature.

In this study the direct approach was employed in asking hunters what it was worth to them, per day spent hunting, to hunt on the Creston flats. While not a particularly rigorous application of the direct approach, (Pearse and Laub 1969, pp. 23-4, 47-52), it provides at least a general indication of the value of the hunting activity. It is perhaps most interesting from the point of view of game management in indicating that many hunters would be willing to pay for their hunting opportunities.

A total of 142 hunters replied to the question on how much they valued a day spent hunting on the Creston flats. Their responses are summarized in Table F-7.

There are many problems in interpreting these responses. One of the first problems involves the treatment of those hunters who did not respond to the question. On almost all questionnaires returned and analyzed the questions relating to hunting activity and associated expenditures were completed in full. Only 142 of the 195 respondents replied to the question concerning the value of a day spent hunting however. Whether the 53 respondents who didn't answer felt that the hunting was worth nothing, whether the question was too hypothetical for them to bother with, or whether they refused to answer out of fear that a pricing system might actually be introduced, cannot be known. With no way of testing these various possibilities, it is assumed that those who did not answer the question are represented fairly by those who did.

TABLE F-7

THE VALUE OF A DAY SPENT HUNTING ON THE CRESTON FLATS - HUNTERS' RESPONSES

	Number of Hunters			
Value of a Day Spent Hunting	Local Hunters	Non-Local Hunters	Foreign Hunters	All Hunters
$0.0	22	15	3	40
$ 0.01 - 2.50	29	13	-	42
$ 2.51 - 5.00	21	8	2	31
$ 5.01 - 10.00	9	5	2	16
$10.01 - 20.00	5	7	-	12
$20.01 - 50.00	-	-	1	1
Total Hunters	86	48	8	142
Av. Value of a Day Spent Hunting	$3.57	$5.16	$7.99	$4.51

A similar problem arises with the interpretation of those 42 responses which indicated a value of zero for a day spent hunting. This may include a number of hunters who felt that the hunting at Creston was particularly poor and not worth anything. (24 per cent of all hunters rated the hunting as poor). It may also include hunters for whom the hunting does have a value but who won't reveal it for fear that a pricing system may be introduced, and it will include hunters who feel that the right to hunt is something which they should not be required to pay for. It would also be a rational response for a hunter who had hunted so much that the marginal value (value of an extra unit) of a days hunting was in fact zero. However, most hunters would be expected to indicate the average value of a days hunting, not the marginal value.

In any case, we have no basis for imputing any of the above motives to those who indicated that the hunting was of zero value. Little can be done except to accept the hunters' evaluations as correct. This must, however, be reconciled with the fact that all hunters did incur some positive costs to hunt on the Creston flats. At first glance it appears to be irrational for a hunter to incur positive costs in order to partake of a recreational experience which has no value to him. The nature of hunting, however, is such that a person must be willing to incur most costs before he actually begins to hunt. Thus spending is largely based on the subjective, or expected value of the hunting experience. For many hunters, however, the objective or after-the fact evaluation of their hunting experience may be far less than what they had expected. This provides one possible explanation for hunters who felt the Creston flats hunting to be of zero value, but still incurred positive costs to hunt.

Not all hunters felt the hunting to be of zero value and their various evaluations of a days hunting were presented in Table F-7. For local hunters the average value of a day spent hunting was $3.57 (including hunters who reported zero value), for non-local hunters $5.16, for foreign hunters $7.99, and for all hunters combined $4.51.*

Using these figures as a measure (if not precise, certainly very plausible)** of the value a hunter places on a days hunting on the Creston flats, it is possible to estimate the total value of bird hunting during the 1968 hunting season. These estimates are presented in Table F-8. The total value of hunting is estimated at $28,652, of which $26,623 (93.0 per cent) was the value received by British Columbians, and $2,029 the value received by American hunters. Thus bird hunters on the Creston flats in 1968 placed a value of $28,652 on their hunting experiences, over and above the $57,352 they spent on their hunting trips.

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*Averages weighted by the number of days spent hunting by each hunter at the value per day declared, (including hunters declaring a zero value).

**These are most likely conservative estimates of value. Golfing and skiing are comparable forms of outdoor recreation in which participants generally acquire expensive and elaborate equipment and often travel long distances at ungodly hours to enjoy their sport. Skiers pay daily fees of from $5 - $10, while golfers commonly pay $5 per day in green fees. The estimates of value for a hunter day certainly compare reasonably with these daily costs in sports where participants are required to pay for their recreation opportunities.

TABLE F-8

THE VALUE OF BIRD HUNTING ON THE CRESTON FLATS

IN 1968 HUNTERS' EVALUATIONS

	No. of Days Hunting	Average Value Per Day	Total Value
Local Hunters	3,049	$3.57	$10,885
Non-Local Hunters	3,050	5.16	15,738
Foreign Hunters	254	7.99	2,029
All Hunters	6,353	4.51	28,652

Increased Hunting Under Improved Conditions, and Hunters' Willingness to Pay

Bird hunting at Creston was not exceptionally good during the 1968 season (24 per cent of hunters rated it as poor, and 40.5 per cent as only fair). In spite of this a total of 6,353 hunters days of recreation were taken by 661 hunters during the season. Efforts are presently being made under the Creston Valley Wildlife Management Area Act to improve the habitat on the Crown land for waterfowl nesting, and also to improve the quality of hunting.

Improving the quality of hunting will have two implications for the level of utilization. Hunters who already hunt in the area can be expected to increase their hunting activity. In addition, persons who do not hunt in the area at present may be attracted to it. This group might include for example hunters from Trail who ordinarily make a trip to Alberta for bird hunting.

An unregulated increase in hunting pressure can easily have the effect of negating any efforts to improve hunting quality. A significant influx of hunters can lead to crowded hunting conditions, poor shooting practices, and actually fewer birds bagged per hunter than formerly (Anderson 1961, Bednarik 1961). To counter this effect it may be necessary to regulate hunting pressure by the use of a daily permit or fee system. To throw some light on the problems which may arise in future management of the area, hunters were asked how many more days they would hunt in the area if hunting quality were significantly improved. They were also asked how much they would be willing to pay, per day spent hunting, if required to do so under a permit system of regulating hunting pressure.

Increased utilization in the order of an additional 6,000 hunter days could be expected from hunters who already hunt in the area if the hunting quality were significantly improved. Not all hunters would increase their use of the area however, but those who would not were a small minority in all three groups of hunters. Seventy-seven per cent of the local hunters, 83 per cent of non-local hunters, and 73 per cent of foreign hunters would increase their hunting, as presented in Table F-9.

This represents a significant increase in hunting pressure, and is almost equal to the amount of use on the area at present. Furthermore this represents increased use by those who hunt the area already, and does not take account of additional pressures which could come from new hunters being attracted to the area. Faced with an influx of new hunters and increased use by existing hunters it appears likely that a means of rationing access and controlling hunters will be required to maintain a satisfactory level of hunting quality. Selling hunting permits on either a daily or a seasonal basis is an efficient and simple means of rationing access and controlling hunters. A local precedent has already been set by the selling of seasonal and daily hunting permits on the Indian Reserves at Creston, although this has not attracted a large number of hunters in the past, due to poor management.

TABLE F-9

INCREASED UTILIZATION IN RESPONSE TO INCREASED HUNTING QUALITY

	No. of Hunters Increasing Use	Average Increase Per Hunter (Days)	Total Increase (Days)
Local Hunters	186	12.0	2,232
Non-Local Hunters	324	10.8	3,499
Foreign Hunters	20	12.7	254
All Hunters	530	11.3	5,985

Willingness to pay for significantly improved hunting was expressed by 80.6 per cent of the hunters who answered the question on this matter, and ranged from a low of $0.50 per day to $40.00 per day. A total of 144 persons responded to this question, and their responses are tabulated in Table F-10.

As with the earlier question in which hunters were asked what value they placed on a day's hunting, not all respondents answered the question dealing with their willingness to pay for hunting in the future. Of those who did answer, 19.4 per cent indicated that they would not pay any positive price. The same problems arise in interpreting the response to both questions. In the case of the question dealing with hunters' willingness to pay for future hunting opportunities, it will be assumed that the question was understood, and that response to it fairly represents hunters' willingness to pay.

TABLE F-10

WILLINGNESS TO PAY, PER DAY, FOR IMPROVED HUNTING

Daily Fee	Local Hunters	Non-Local Hunters	Foreign Hunters	All Hunters
$0.0	16	9	3	28
$ 0.01 - 2.50	22	9	-	31
$ 2.51 - 5.00	28	8	2	38
$ 5.01 - 10.00	9	8	2	19
$10.01 - 20.00	10	13	1	24
$20.01 - 50.00	1	1	2	4
Total No. of Hunters	86	48	10	144

Among local hunters 81 per cent indicated that they would be prepared to pay a positive price for hunting opportunities, and the average price indicated was $6.43 per day. Similarly, an average price of $9.96 was indicated by 81 per cent of non-local hunters, while a price of $13.66 was average for the 70 per cent of foreign hunters willing to pay to hunt.

Treatment of these average prices requires caution. The presence of a few hunters who would be willing to pay relatively high prices has the effect of raising the average price to a level above what most hunters would be willing to pay. It is also easy to slip into the error of assuming that if the average price were charged all hunters would be willing to pay it and hunt. This is not true, as an examination of the data in Table F-10 will reveal.

A further problem in interpreting such prices is that hunters have not indicated how many days they would hunt at the prices they would pay. For these reasons data of this nature cannot be relied on for accurate predictions of future permit sales, or expectations of total revenue.

There are two interesting aspects to such data. Probably the most important is the evidence that most hunters (81 per cent) would be willing to pay for hunting opportunities, especially if the quality of hunting could be improved or at least maintained through regulation and control of the number of hunters. A second important feature is that such data does give an indication of what order of prices would be acceptable to most hunters, and how high it would be necessary to raise prices to control the number of hunters. From the data in Table F-10 it appears that a daily fee in the order of \$2 - \$3 would have the desired effect of eliminating some hunters, but would still be acceptable to most.

Summary

A mail survey was conducted to obtain information on bird hunters using the Creston flats area during the 1968 hunting season. While some sampling problems were encountered it was possible to make reasonable estimates of the number of hunters using the area and their hunting activity.

It is estimated that a total of 661 bird hunters used the Creston flats during 1968. Of these, 242 were hunters from the immediate area, 391 were non-local hunters from other areas in British Columbia, and 28 were foreign hunters from the United States. Bird hunters spent a total of 6,353 hunter days on the Creston flats, with the average hunter day being 4.7 hours long. The harvest of birds included 8,929 ducks, 543 geese, 172 pheasants and 755 doves. To obtain this harvest hunters spent a total of $58,100, averaging $88 per hunter, and $9 per day spent hunting.

Bird hunting on the flats did not rate very highly with hunters as a whole. Hunting was rated as poor by 24 per cent of the hunters and as only fair by 40 per cent. Despite this, most hunters felt the hunting had been of value to them, and for those willing to indicate its value, a day spent hunting had an average value of $4.50. On this basis, hunters enjoyed $28,652 worth of hunting in 1968, over and above the $57,352 they spent on hunting.

Efforts are currently underway to improve the waterfowl habitat and hunting quality on Crown land at Creston. Most hunters (80 per cent) indicated that they would hunt more in the area if hunting were significantly improved, and indicated that they would approximately double the total hunting pressure. Maintaining hunting quality in the face of significant increases in hunting pressure often requires means of regulating or controlling the number of hunters and their distribution. On the evidence of responses to the questionnaire, about 80 per cent of the hunters would be willing to pay for daily permits to hunt on the Creston flats. It would appear that a daily fee in the order of \$2 - \$3 would be effective in limiting hunting pressure, but would still be acceptable to most hunters.

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A P P E N D I X   G

APPENDIX G

ESTIMATED UTILIZATION OF RECREATION FACILITIES

There have been many attempts to forecast the aggregate demand for outdoor recreation in recent years. Key variables which have been identified as primarily responsible for the rapid growth in recreation demand are population size, per capita disposable income, mobility, and per capita leisure time (U.S. Dept. of Interior 1962, 1967).

Even the most careful forecasts at the aggregate level have proven wrong in the past, as demand (measured by participation rates) has consistently outstripped predictions (Clawson and Knetsch 1966). The weakness in these forecasts has in part been due to an inability to separate the effect of increases in the supply of outdoor recreation areas from observed increases in participation, and in part due to the lack of a rigorous theory of demand as distinguished from observed participation rates. Whatever the predictions for future aggregate demand, the consensus is that the present upward trend will continue for some time, but that it cannot continue idefinitely as this would lead to absurd attendance rates in the future.

While attempts to predict aggregate participation or demand have encountered many difficulties, far more serious problems occur in attempting to predict attendance or demand for individual recreation facilities. This is particularly true when dealing with a new recreation facility where estimates cannot even be based on a past trend or level of use.

In such a case (the case at Creston, except that we do have a base in the case of hunters and fishermen) a useful approach is to obtain data from other similar recreation sites and localities in what has been termed the "geographical analog" method. This approach is most successful when dealing with a homogeneous type of recreation where reasonably similar sites and locations can be found. In an attempt to apply this method to reservoir based recreation in the United States, however, it was found that the data requirements could not be satisfied, the authors concluding that the available data "... do not warrant elaborate statistical or mathematical treatment, which would tend to produce a spurious precision and needless refinement on many aspects,....." (Ullman and Volk 1962).

When these conclusions can be arrived at in the United States where there is a wealth of aggregate attendance data for reservoir sites, they are even more applicable to any similar attempts in Canada. Aside from limited data on the activities of fishermen and hunters there is a paucity of data on the participation in non-consumptive forms of outdoor recreation. This factor alone makes it ridiculous to attempt a sophisticated means of predicting attendance at Creston, in addition to the almost intractable problem of finding a suitable 'analog' on which to base prediction.

The only feasible approach which remains in estimating future attendance at Creston is referred to by Clawson and Knetsch as the judgment approach (Clawson and Knetsch 1966).

> "To arrive at a judgment of future demands for outdoor recreation activities of particular kinds, or for kinds of areas, or in total, the following factors seem relevant: (1) historical and recent past trends in usage of a particular area of activity, and the reasons behind such trends, as far as one can conjecture or measure them; (2) probable future desires of average people for the recreation activity or area, as far as one may guess them; (3) probable future capacity of average people to enjoy the recreation activity or area; in particular, their ability to afford the time and money that such recreation will require for its enjoyment; and (4) the capacity or supply of areas on which the desired activity can be carried on."

In using this approach we can benefit greatly by considering each type of recreational participation independently.

Warmwater Sportfishing

Warmwater sportfishing will be restricted to the waters of Duck Lake. The capacity of Duck Lake to support fishermen is essentially complete at present - the greatest obstacle to utilization being a lack of access for fishermen and boats. Access construction and the installation of launching ramps will be among the initial development steps for this area, and access to permit full utilization of the lake's fishing capacity should be completed by 1972.

The final capacity of Duck Lake's warmwater sportfishery is estimated to be 10,800 fisherman days per year. Present utilization totals approximately 700 days per year - almost exclusively by local area residents who tend to be either advanced in age or very young. Preference for this fishery among these age groups is explained by several factors. Duck Lake is close to the town of Creston, the fishery does not require elaborate or expensive gear, fish are easily caught, and for those going out in boats it is relatively safe. For these reasons this fishery tends to appeal to the very young and the very old. It is estimated that utilization by local area residents will increase substantially when obstacles to access are removed, growing at a relatively slow rate after the initial expansion.

This fishery will have little appeal for fishermen in the intermediate age categories between the very young and the very old. For these fishermen the Duck Lake fishery is overshadowed by the vastly more attractive sportfishery of Kootenay Lake, immediately to the north of Duck Lake. This lake contains one of British Columbia's most productive fisheries, and offers a wide variety of catch. The fishery of Duck Lake will have little attraction for fishermen whose age and income are such that fishing in Kootenay Lake is a relevant alternative.

Thus the 'market' of local area residents which this fishery will reach will be limited in scope - essentially those who are unable to fish the more attractive Kootenay Lake. Prospects for increased use by local area fishermen therefore appear slight, except for one significant factor. There is considerable evidence that the problems associated with access to the area have been 'bottling up' a significant demand in the past. Provision of access would remove this obstacle and could lead to a four to five fold increase in fishing activity over a very short time span. This utilization would then be expected to level off and increase at a rate of about 4 per cent per year.*

There is one other 'market' which this fishery may serve, and this would consist of non-local summer visitors, mainly as family groups. In a recent study of fishing on Kootenay Lake it was noted that fishing trips by local residents were highly repetitive short trips which typically involved only the enthusiastic fisherman in a family. Non-residents on the other hand were generally visiting Kootenay Lake as part of an annual vacation involving a major commitment in travel and frequently participation by the whole family (Pearse and Laub 1969).

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*Sales of resident fishing licences in the local area grew at a rate of 4% per year from 1962 to 1967. There is no breakdown on the distribution of these sales by age group, and in any case persons under 18 years of age do not require a fishing licence. It is assumed that the normal rate of growth for fishermen interested in Duck Lake is the same as that for regional licence sales.

The relatively inexpensive equipment, high degree of safety and high level of success to be expected from the Duck Lake fishery will have a strong appeal for "family fishing," especially for families with young children. These fishermen can be expected to take advantage of the fishing opportunities in conjunction with summer visits to observe waterfowl and other birds in the area. Major utilization by these fishermen could be expected following development of the overall wildlife habitat. For the sake of simplicity it will be assumed that utilization by non-local fishermen begins in 1974 with 1,000 fisherman days of use. Growth in use at an annual rate of approximately 20 per cent is expected thereafter.

While the arbitrariness of these estimates is recognized, they are thought nevertheless to be reasonable. Utilization would increase each year until 1984 when the capacity of the lake would be reached. These estimates are summarized in Table G-1. The final column in Table G-1 presents the amounts by which utilization is increased over what it would be without development. These are the increases or benefits attributable to development and they are derived under the assumption that without development present use of 700 days would grow at a rate of 4 per cent annually.

TABLE G-1

ESTIMATED UTILIZATION, WARMWATER

SPORTFISHERY, DUCK LAKE

Year	Local Area Residents	Non-Local	Total	Increased Utilization as a Result of Development
		(fisherman-days)		
1970	700	-nil-	700	-nil-
71	1,600	-nil-	1,600	870
72	2,600	-nil-	2,600	1,840
73	3,500	-nil-	3,500	2,710
74	3,640	1,000	4,640	3,820
75	3,786	1,200	4,986	4,136
76	3,940	1,440	5,380	4,495
77	4,100	1,730	5,830	4,910
78	4,270	2,080	6,350	5,390
79	4,440	2,500	6,940	5,940
1980	4,620	3,000	7,620	6,580
81	4,800	3,600	8,400	7,320
82	5,000	4,320	9,320	8,200
83	5,200	5,200	10,400	9,235
84	5,400	5,400	10,800	9,590

CAPACITY REACHED IN 1984, CONSTANT UTILIZATION THEREAFTER

Waterfowl and Upland Bird Hunting

The footing is soundest when forecasting utilization of the area for waterfowl and upland bird hunting. Appendix F summarizes the results of a survey of hunters using the area during the 1968 season, and provides much of the basic data for forecasts of future use.

Development to capacity for hunters can be expected before all capital costs are incurred. By 1976 87 per cent of all capital expenditures will have been completed, including all major basic structures. Expenditures from 1977 through 1982 will be in the nature of small improvements and will have little significance in increasing the area's capacity for hunting. It is therefore assumed that hunting capacity reaches its maximum in 1977, lagging one year after the total expenditures incurred up to 1976.

Present use of the unreclaimed land by hunters totals 5,000 days per year, with an additional 1,500 days of hunting on private land. With development of the habitat and increased numbers of birds available, the maximum capacity will be available by 1977 at a level of 10,000 hunter days per year on Crown land and 5,000 per year on private land.

In predicting increased utilization it is asserted that hunters will constantly press on the capacity of the habitat. The capacity for hunting will be fully utilized as soon as it becomes available. This assertion is defended by the following arguments: there is at present a significant latent demand for increased hunting opportunities among those hunters who already hunt on the Creston flats. Present users have indicated that they would probably expand use of the area by 6,000 hunter days per year if opportunities were available (Appendix F). This represents almost a doubling of present use without expanding to a new 'market' or population of hunters.

Significant pressure can also be expected by hunters from nearby population centres (Trail, Nelson and Cranbrook) who do not hunt on the Creston flats at present. With few opportunities for high quality bird hunting nearby in British Columbia many persons from these areas have been making extended annual trips to Alberta. The availability of quality hunting opportunities as close as Creston would attract a large number of these hunters for hunting trips of short duration.

Additional pressure can be expected from residents of other areas in British Columbia, notably the Lower Mainland. Bird hunters in the Lower Mainland have experienced a marked decline in the availability of hunting opportunities in the past decade as bird habitat has been eroded by other land uses. Many hunters in this area have more or less abandoned bird hunting in British Columbia and participate instead in an annual exodus to Alberta. Diversion of even a small fraction of these hunters to Creston would have the effect of pushing the demand for hunting opportunities beyond the capacity of the area.

Predictions of utilization by hunters therefore coincide with the establishment of capacity and are summarized in Table G-2. While the total capacity of the area will be 15,000 hunter days per year, the area presently supports 6,500 days. Only the increase in capacity and use, as summarized in the last column of Table G-2, should be attributed to the proposed development. Maximum capacity would be realized in 1977 and utilization would remain constant thereafter.

TABLE G-2

ANNUAL INCREASE IN HUNTING CAPACITY

AND UTILIZATION

Capacity and Utilization in Hunter-Days

Year	Crown Land	Private Land	Total	Annual Increase	Total Increase Over Present
1970	5,000	1,500	6,500	-nil-	-nil-
71	6,050	2,235	8,285	1,785	1,785
72	6,300	2,410	8,710	425	2,210
73	6,550	2,585	9,135	425	2,635
74	7,850	3,495	11,345	2,210	4,485
75	8,600	4,020	12,620	1,275	6,120
76	9,350	4,545	13,895	1,275	7,395
77	10,000	5,000	15,000	1,105	8,500
MAXIMUM CAPACITY REALIZED IN 1977, CONSTANT THEREAFTER					

Hiking, Nature Study, Bird Watching,

and Photography

The estimated establishment of capacity for these pursuits is summarized in Table G-3. The estimates in this table assume capacity to be established in direct proportion to capital expenditures, with a one-year lag. Estimating the timing of 'capacity availability' in this manner is a straightforward matter.

But estimating utilization of the area for these activities is the most difficult aspect of the entire study. While the greatest capacity will be in

TABLE G-3

ANNUAL INCREASE IN CAPACITY - HIKING, NATURE INTERPRETATION, BIRD WATCHING, PHOTOGRAPHY

Year	Increase in Recreation-Day Capacity		Total Recreation-Day Capacity	
1971	45,000	rec'n-days	45,000	rec'n-days
72	12,500	"	57,500	"
73	10,000	"	67,500	"
74	57,500	"	125,000	"
75	32,500		157,500	"
76	32,500	"	190,000	"
77	27,500	"	217,500	"
78	12,500	"	230,000	"
79	5,000	"	235,000	"
80	5,000	"	240,000	"
81	5,000	"	245,000	"
82	2,500	"	247,500	"
83	2,500	"	250,000	"

MAXIMUM CAPACITY REALIZED IN 1983, CONSTANT THEREAFTER

terms of such recreation, we have the least information in regard to it. To formulate any estimates it is necessary to first consider broad aggregate factors which are operative in the utilization of outdoor recreation facilities and then turn to particular forces which may be operative at Creston.

The first observation is of course the rather trite fact that demand for all forms of outdoor recreation, as evidenced by participation, is growing at consistently high rates. Unfortunately there are few statistics which document the participation in non-consumptive wildlife recreation in Canada. Reliable statistics are available in the United States, however, and they indicate that except for boating and fishing at reservoir sites the fastest growth in outdoor recreation since World War II has been in the use of national wildlife refuges, where attendance has grown at a rate of 12 per cent annually (Clawson 1963). There is speculation that the rate of increase in such activities in Canada today exceeds the American experience. Comparing the rate of increase in national parks attendance for the two countries supports this speculation. Attendance at Canada's national parks has increased at an average rate of 12 per cent as compared with 8 per cent in the United States (Brooks 1962).

At a more regional level, a study of the recreation and tourist industry potential in the pacific northwest area of the United States predicts that recreation participation will be four times greater in the year 2000 than it was in 1960 (U.S. Dept. of Interior 1967). The same study notes that the rate of visitation growth in the Pacific Northwest exceeds the national rate of growth for many, if not all, comparable facilities.*

While comparable regional statistics are not available for British Columbia we can note that the same underlying factors are operative here -

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*Review of the data in Appendix E of the above report reveals an annual growth of from 10% - 20% for selected types of outdoor recreation.

an expanding economy, high per capita incomes, increased mobility through improved transportation routes, and increased leisure time per capita. All of these factors give rise to a rapid rate of growth in participation in outdoor recreation.

Reviewing these broad aggregates does little more than dramatize the dynamic state of outdoor recreation participation. Such figures are of little help in estimating attendance at the particular recreation site which would be created on the Creston flats.

For some insights into this matter, the experience with similar facilities elsewhere is helpful. An informative analogy can be drawn from the experience at Wisconsin's Horicon Marsh. This provides a good example of the way in which waterfowl will respond to habitat conditions, and people in turn will respond to the presence of wildlife. Extensive habitat development was undertaken at the 30,000 acre Horicon Marsh Wildlife Area and National Wildlife Refuge in the late 1950's (Keith 1964, Clement 1964). A dramatic buildup in the number of Canada geese using the habitat soon followed. In 1960 41,500 persons came to the area to watch the geese during the fall (a six week period from October to November). The ranks of bird watchers grew to 75,800 in 1961, and by 1963 had reached 202,500. This area is admittedly much closer to large population centers than Creston, but at the same time it should be noted that the utilization recorded is for a six week period only.

After reviewing the Horicon Marsh experience it is easy to become optimistic about high levels of utilization at Creston achieved over a very short time span. It is sobering therefore to reflect on what few statistics are available on park oriented recreation in British Columbia. In 1968 the number of people attending nature interpretation programs, (visiting nature houses, going on conducted nature walks, and self-guiding nature trails) totaled 182,000 by actual count (Department of Recreation and Conservation 1969). It is impossible to know how many other people may have used the same facilities in an informal fashion, but this figure points out the importance of location with respect to population centers in determining the use of any area.

At the same time British Columbia has experienced some notable responses to new (although not wildlife-oriented) recreation facilities. Reconstruction of Barkerville in the Cariboo, and Fort Steele in the East Kootenays are cases in point. Both of these sites are still undergoing development, with Fort Steele being the most recently undertaken. Visitors to Fort Steele numbered 13,000 in 1965, 56,000 in 1966, 100,000 in 1967, and 107,000 in 1968. This is a case of recreational response following directly on the creation of a recreation site.

This more specific review of experience with selected recreation sites yields a better perspective on the utilization which might be expected at Creston, but it still does not answer the question of how much use to expect. In taking the final step and making some 'judgment' estimates it is helpful to refer to the guidelines quoted earlier.

The first point calls for an examination of past utilization trends in the relevant activity. While these trends cannot be identified specifically in British Columbia, utilization is obviously increasing rapidly. The second guideline calls for reference to the probable future desires of average people for the recreation activity. Again 'judgment' would point to a strong upward trend in peoples' desires for this kind of recreation activity. There is at present an increasing appreciation and interest in preservation of the natural environment, particularly among the young.

The third point to be considered is the capacity of average people to enjoy the recreation activity or area, particularly their ability to afford the time and money required for participation. Once more the non-consumptive forms of recreation associated with wildlife development at Creston rate highly. The area is easily accessible by car, costs of participating in the recreation are minimal, and the on-site time commitment can be as long or as short as participants desire. Final cognizance is to be taken of the cpacity or supply of areas which can support the recreation activity. In this regard the opportunities created at Creston will be unequalled elsewhere in British Columbia. At the same time, however, the abundance of other types of outdoor recreation activity in British Columbia must be recognized.

Considering these and other underlying forces estimates have been made of the extent of utilization which could be expected by persons interested in hiking, nature interpretation, bird watching, and photography. These estimates are summarized by year in Table G-4. In preparing these estimates it was considered unreasonable to expect initial attendance at Creston to exceed that recorded at such well publicized and popular attractions as Barkerville and Fort Steele. If the patterns observed at other recreation sites in British Columbia are repeated we would expect a strong upsurge of new interest after the initial development, followed by a gradual stabilization of growth in attendance at a rate of 5 to 10 per cent a year. This is reflected in the estimates of a strong increase in attendance through 1977 with a slower and more stable rate of growth thereafter. The area's capacity to support such recreation would not be reached until 1985 and would have to be stabilized at that level by some means of

TABLE G-4

ESTIMATED UTILIZATION, HIKING, NATURE INTERPRETATION

BIRD WATCHING AND PHOTOGRAPHY

Year	Recreation-Days	Year	Recreation-Days
1971	5,000	1980	192,000
72	10,000	81	205,000
73	20,000	82	219,000
74	85,000	83	232,000
75	120,000	84	246,000
76	130,000	85	250,000
77	150,000		
78	165,000		
79	178,000		

CAPACITY OF AREA REACHED BY 1985, CONSTANT USE THEREAFTER

control beyond 1985. The slow rate of growth predicted from 1977 through 1985 is a reflection of the fact that such visits are not highly repetitive for most individuals. It is also important to estimate the extent of this use which will be taken by persons from the various referent groups. Some insights into the extent of use by British Columbians can be gained by examining statistics on park attendance in British Columbia. Over the four camping seasons from 1965-68, only 60.6 per cent of campers have been from British Columbia. These proportions vary widely throughout the province. In the Kootenay region the per cent of British Columbia users tends to be much lower due to the proximity to Alberta, and the great attraction of the National Parks in drawing visitors from the United States. For selected campgrounds in the Kootenays these proportions in 1968 were:

	B.C. %	Canada %	U.S.A. %
Champion Lakes	49.2	37.1	13.7
Lockhart Beach	42.0	31.8	26.2
Jimsmith Lake	32.5	41.0	26.5
Mount Fernie	20.5	58.0	21.5
Moyie Lake	30.8	40.0	29.2
Wasa Lake	33.7	54.5	11.8
Yahk	31.7	43.7	24.6

Source: Parks Branch, Department of Recreation and Conservation.

As one goes further east in British Columbia, more campground users come from elsewhere in Canada and the United States than from British Columbia.

These figures reflect campground users only, not total tourist traffic, and as such provide only a rough guide to the relative distribution of non-consumptive recreational visitors. They do, however, give an interesting insight into the extent to which free public facilities may be utilized by non-British Columbians. After reviewing these data it is estimated that 3 per cent of the use for non-consumptive recreation will be taken by local area residents, 35 per cent by British Columbians from outside the local area, and 40 per cent by Canadians from outside British Columbia. The total use by British Columbians is thus 38 per cent and by Canadians 78 per cent.

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A P P E N D I X H

APPENDIX H

PRESENT VALUE CALCULATIONS

BENEFITS FROM HUNTING, FISHING, NON-CONSUMPTIVE RECREATION, AGRICULTURE AND TRAPPING

In this appendix unit values are applied to the various types of recreational utilization estimated in Appendix G to determine the value of the recreation realized each year until the area's capacity is fully exploited. It is assumed that utilization remains constant once the capacity limits of various forms of recreation are reached. Therefore, in Table H-1 for example, it is assumed that the annual value of benefits from

TABLE H-1

PRESENT VALUE OF BENEFITS FROM FISHING

Year	Value in Year	Value in 1970	Year	Value in Year	Value in 1970
1971	$3,480	$3,220	1981	$29,280	$12,555
72	7,360	6,310	82	32,800	13,020
73	10,840	8,600	83	36,940	13,580
74	15,280	11,230	84	38,360	163,250
75	16,544	11,260	.	"	
76	17,980	11,330	.	"	
77	19,640	11,460	.	"	
78	21,560	11,650	.	"	
79	23,760	11,890	.	"	
1980	26,320	12,190	.	"	
PRESENT VALUE, 1970.......					$301,545

fishing will remain constant at $38,000 after 1984, and the present value in 1970 of this constant stream of benefits is $163,000.

The value of these benefit streams is discounted back to present values in 1970, a discount rate of 8 per cent being adopted. The unit values employed are $4 per day for fishing, $8 per day for hunting, and $5 per day for non-consumptive recreation. Derivation of these unit values is discussed in Appendix I.

TABLE H-2

PRESENT VALUE OF BENEFITS FROM HUNTING

Year	Value in Year	Value in 1970
1971	$14,280	$13,220
72	17,680	15,160
73	21,080	16,730
74	38,760	28,500
75	48,960	33,320
76	59,160	37,280
77	68,000	496,000
.	"	
.	"	
.	"	
PRESENT VALUE, 1970..		$640,210

It is planned that about 30 per cent of the area, or about 3,500 acres, could be developed for agricultural production complementary to wildlife management. Under ordinary agricultural management this would be expected to yield a net benefit of $26 per acre (Appendix C). However, it is expected that there will be a sharecropping agreement in this instance,

TABLE H-3

PRESENT VALUE OF BENEFITS FROM NON-CONSUMPTIVE RECREATION

(HIKING, NATURE INTERPRETATION, BIRD WATCHING AND PHOTOGRAPHY)

Year	Value in Year	Value in 1970	Year	Value in Year	Value in 1970
1971	$25,000	$23,150	1981	$1,025,000	$439,620
72	50,000	42,860	82	1,095,000	434,710
73	100,000	79,380	83	1,160,000	426,420
74	425,000	312,375	84	1,230,000	418,690
75	600,000	408,300	85	1,250,000	5,320,000
76	650,000	409,560	.	"	
77	750,000	437,550	.	"	
78	825,000	445,660	.	"	
79	890,000	445,180	.	"	
1980	960,000	444,580	.	"	
PRESENT VALUE, 1970..					$10,088,000

with the 'landlord's' share of roughly one-third left as feed and cover for wildlife. Under such an arrangement net benefit is actually realized on only two-thirds of the acreage - on the rest the cost of seed, fertilizer, and cultivation becomes a cost of game management. For this reason calculations of the net benefit from agricultural production will be taken on only two-thirds of the total farmed area, or 2,300 acres. Calculations of net value on this basis are summarized in Table H-4. For these calculations it is assumed that agricultural development takes place in proportion to total capital expenditure, with a one year time lag.

TABLE H-4

PRESENT VALUE OF NET BENEFITS FROM AGRICULTURAL PRODUCTION

Year	Value in Year	Value in 1970	Year	Value in Year	Value in 1970
1971	$10,800	$10,000	1979	$56,000	$28,000
72	13,800	11,800	1980	57,500	26,600
73	16,200	12,900	81	58,600	25,000
74	30,000	22,000	82	59,200	23,500
75	37,700	25,700	83	59,800	275,000
76	45,500	28,700	.	"	
77	52,000	30,400	.	"	
78	55,000	29,700	.	"	
PRESENT VALUE, 1970					$549,300

Values from trapping will not be large, and will reach a maximum in 1983 when the net benefit will be $4,000. Table H-5 summarixes the present value calculations.

TABLE H-5

PRESENT VALUE OF NET BENEFITS FROM TRAPPING

Year	Value in Year	Value in 1970	Year	Value in Year	Value in 1970
1971	$ 720	$ 670	1979	$3,760	$1,880
72	920	790	1980	3,840	1,780
73	1,080	860	81	3,920	1,680
74	2,000	1,470	82	3,960	1,570
75	2,500	1,710	83	4,000	18,400
76	3,040	1,920	.	"	
77	3,480	2,030	.	"	
78	3,680	1,990	.	"	
PRESENT VALUE IN 1970..					$36,750

The summary of all present values expected from the wildlife development project is presented in Table H-6. Net annual benefits are discounted

TABLE H-6

SUMMARY OF ALL PRESENT VALUES, 1970

Fishing	$301,000
Hunting	640,000
Non-Consumptive Recreation	10,088,000
Agricultural Production	549,000
Trapping	37,000
PRESENT VALUE OF ALL BENEFITS...........	$11,615,000

to present values in 1970 using a discount rate of 8 per cent. Overall, present values totalling $11,615,000 are estimated.

APPENDIX I

APPENDIX I

UNIT VALUES FOR OUTDOOR RECREATION IN RESOURCE DEVELOPMENT PROJECTS

Planners dealing with natural resource development face the problem of placing a value on the recreational use of resources. Recent progress in this field has included a clarification of the nature of the 'product' produced in recreation, and recognition of the need for an acceptable evaluation of this product. Only when recreation is valued on the same basis as other uses of natural resources can the optimum pattern of resource use be specified.

The Recreation Product

The primary benefits from recreation areas are those accruing directly to users of the area. Such enjoyment has economic value in the same sense as the enjoyment arising from conventionally marketed goods or services such as food or clothing. However in the case of most public outdoor recreation, opportunities are supplied free of charge to consumers and we lack conventional market indicators of the value of the resource in this use.

Thus the basic problem in dealing with recreation as an output of resource employment is a measurement problem. We lack clear expressions of economically meaningful values which can be attributed to resources used for recreation. But the absence of market prices does not mean that there are no values created by this use of resources. Economic values which are relevant to resource allocation decisions and directly comparable to values imputed to other resource uses are produced. The problem lies not in an absence of values but in the absence of a direct measure of value.

Placing a Value on Recreation

Economic values are measured basically by what people are willing to give up or sacrifice in order to enjoy a particular product or service. A relevant economic measure of recreation values is therefore the willingness on the part of consumers to pay for outdoor recreation services. These values are inherently the same as those established for other commodities which consumers must pay for - but in the case of recreation no prices have been established to measure these values.

To overcome this problem the value of recreation can be estimated from a demand curve constructed to indicate what consumers would pay for various units of recreation output rather than go without them. The measure of total user benefit is equivalent to the total area under the demand curve (the sum of the maximum prices which various users would pay for the various units of recreational output from the resource). This is also referred to as "consumer's surplus" and measures the total economic worth to society of the recreational services provided by a particular area.

This use of the total area under the demand curve as a measure of value differs from the common use of the demand curve for privately produced goods and services. For privately produced goods and services the total value is typically a single value or price per unit multiplied by the total number of units. This measure is appropriate for most privately produced goods (shoes for example) where contemplated increases or decreases in production are small relative to total output and have no influence on the market price charged for all units of output.

The production from outdoor recreation areas usually occurs in large "lumps" however (non-consumptive recreation at Creston for example), and is usually immobile. These features of "lumpiness" and immobility mean that the production, while possibly not large in relation to total national output, is large relative to the market served. Were the product a normally marketed good its addition to or subtraction from the market would have a significant effect on the price charged. For this reason the appropriate measure of value of recreation produced is the total area under the demand curve, rather than a unit price applied to the total output.

While this may be theoretically satisfying it is hardly practical. In practice it would require the construction of a demand curve for each area or resource so that its value could be imputed. Construction of such demand curves may be difficult and is time consuming. Furthermore, where demand curves are derived from travel cost information they introduce a conservative bias into the evaluation by overlooking the cost of time spent in travel. By ignoring this factor the demand curve underestimates the actual demand for a given resource and hence the value imputed to the resource when used for recreation.

Some Practical Approaches to Recreation Evaluation

The evaluation procedure outlined above is difficult to put into practice, and there is a danger that the demand curve employed will incorporate a conservative bias. These difficulties have resulted in other methods being used to measure the value of recreation produced on resource sites. Some of these methods are patently incorrect and will not be discussed. A method which has practical applicability however is that of applying a unit value to the amount of recreation produced.

This procedure of adopting a unit value has serious shortcomings as discussed above. It is commonly adopted as the only practical and workable alternative for recreation evaluation. As such it is useful provided that its shortcomings are kept in mind and if efforts are made to modify the unit value selected to meet specific situations.

The first problem in using this approach is the selection of an appropriate unit value. The most common procedure is to relate the unit value chosen to prices charged at privately owned recreation areas. This method is used in the United States by various federal agencies concerned with the use and development of water and related land resources (United States Government 1962).

The American practice is to adopt a schedule of values which can be applied to the recreation product. The schedule incorporates a range of values to allow flexibility in selecting a unit value for recreation on particular sites. General recreation activities which attract "the majority of outdoor recreationists and which, in general, require the development and maintenance of convenient access and adequate facilities" are given unit day values from $0.50 to $1.50 per day. Specialized recreation days "for which opportunities, in general, are limited, intensity of use is low, and which often may involve a large personal expense by the user" are given unit values from $2.00 to $6.00.

These unit values are intended to measure the amount that users would be willing to pay if payment were required. They are set forth as interim statements of recreation benefit analysis "pending the development of improved pricing and benefit evaluation techniques."

This method is sound in so far as it relates the willingness of users to pay for the privilege of using a resource to the value of that resource use. The actual units selected are open to question however - they simply reflect "the consensus judgment of qualified technicians." Insofar as they are based on charges at similar private areas they should be examined critically. The prices paid at private outdoor recreation areas are affected by the existence of virtually free public areas. Charges levied at private recreation areas may not reflect the total value of recreational experience so much as the value of benefits in excess of those available free at public areas. Prices paid at private recreation areas probably are simply a bonus or premium paid for a better natural resource, better facilities, or lack of crowding. It is precisely because private areas are not fully comparable to public areas that users are willing to pay fees or charges. Applying these fees or charges to public recreation risks a serious understatement of the true value of the recreation.

In any case selection of a unit value for a day of recreation remains a matter of educated guessing and personal judgment. Once a unit value is selected the next problem is estimating the appropriate number of recreation days. The number of recreation days taken at a zero charge will be larger than the number at some fixed price. Multiplying the value per day by the number of recreation-days at a zero charge will result in an overestimate of the amount which would actually be paid if prices were charged.

This is not a serious shortcoming, however, as the purpose in evaluating recreation is to measure its total contribution to welfare or value. As long as a zero pricing policy remains in effect the actual value of the resource in use will exceed what would be paid if prices were charged. This is because a payment required for goods or services which have traditionally been enjoyed free tends to cause a deterioration in the individual's standard of living and reduce his total consumption of goods and services. So long as a resource is supplied free of charge it represents a greater addition to total welfare than when other goods or services must be sacrificed for it.

As a result of these countervailing factors it seems reasonable to adopt a unit value per recreation day and apply it to total recreation consumed at zero price. While this would only by coincidence yield an estimate of value equal to the area under the demand curve for that resource it must be accepted as the only practical and satisfactory approximation.

Adoption of Unit Values for Recreation, Creston

Estimating the value of non-priced recreation at Creston is very difficult. Aside from the study of waterfowl hunters reported in Appendix F there are no detailed studies of the demand for the recreation opportunities which will be created, and such studies would be a major undertaking in themselves. Furthermore there are no comparable private outdoor recreation areas which could be used to provide rough guidelines in the selection of unit values.

As an alternative it is necessary to impute unit values for the various types of recreation days using personal judgment and taking account of the pertinent factors and determinants of demand for the Creston area. These values can be applied to the annual number of user-days to yield an estimate of the annual value of the resource for recreation.

There have been several studies of the demand for fishing and hunting in British Columbia which have attempted to measure the value of a recreation day. A review of these studies is useful in establishing the relevant range of values which could reasonably be adopted at Creston.

A study of big game hunters in the East Kootenay area revealed that the non-priced or primary value of a hunting trip for the average hunter was \$197, equal to \$20.50 per hunter day (Pearse and Bowden 1966, Pearse 1968). In a recent study of sportfishermen on Kootenay Lake a value of roughly \$6.50 per resident angler day was established (Pearse and Laub 1969). The study of Creston bird hunters reviewed in Appendix F revealed an average value of \$4.50 per hunter day, given present hunting quality. Hunters indicated a willingness to pay more for improved hunting, averaging roughly \$8 per day (\$6.43 for local hunters, \$9.96 for non-local hunters, and \$13.66 for foreign hunters).

The per day values estimated for big game hunters appear unreasonably high to transpose to Creston recreationists. Marsh and reservoir visitors are probably much more casual in their pursuits than the intense and somewhat esoteric hunters of East Kootenay big game. On the average they probably do not value their recreation experience as highly as a big game hunter. The other studies provide more comparable estimates, indicating a value in the order of \$4 to \$8 per day of recreation.

In adopting values for the individual types of recreation it will be assumed that a hunter-day under improved conditions has a value of \$8 as indicated by hunters. We expect unit values for the warmwater sportfishery and non-consumptive forms of recreation to be lower. Considering the repetitive nature of the sportfishing done in Duck Lake and the fact that the species caught are not highly prized a value of \$4 per fisherman day seems appropriate.

Persons partaking of non-consumptive forms of recreation will form a more representative cross section of the public than either hunters or fishermen. In this regard we note both the very high quality recreational experience which will be available at Creston, and the general affluence of British Columbians. Considering that visits to the area will be relatively non-repetitive for most individuals a value of \$5 per recreation day is adopted for activities such as hiking, nature interpretation, bird watching and photography.

REFERENCES, APPENDIX I

Pearse, Peter H. and Gary Bowden. 1966. Big game hunting in the East Kootenay. Vancouver, Price Printing.

Pearse, Peter H. 1968. A new approach to the evaluation of non-priced recreational resources. Land Economics. Vol. XLIV, No. 1, 87-99.

____________ and M. Laub. 1969. The value of the Kootenay Lake sport fishery. Department of Recreation and Conservation, Victoria, B.C.

United States Government. 1962. Policies standards and procedures in the formulation, evaluation, and review of plans for use and development of water and related land resources. Report by the President's Water Resources Council, 87th Cong., 2nd Sess., S. Doc. 97.

APPENDIX J

APPENDIX J

THE PRESENT VALUE OF COSTS FOR WILDLIFE AND OUTDOOR RECREATION

Habitat Improvement Costs by Area

Habitat improvement plans have been worked out for each of the unreclaimed areas (Moore 1969). The costs and timing of the proposed developments are summarized here for each area in turn, and the present value of capital and maintenance costs calculated for 1970 with a discount rate of 8 per cent. With the exception of the development at Duck Lake, some aspects of the Leach Lake development, and Indian Reserve 1A, the major capital expenditures will not be incurred until 1973 when full control over the Kootenay River is realized through Libby Dam.

Indian Reserves 1, 1A, and 1B

Two developments are planned for the Indian Reserve lands. Reserve 1A will be developed in a pilot project designed to improve both the waterfowl harvest and grazing and will be operated as a separate unit. Reserves 1 and 1B will be developed jointly as an integrated management unit.

The capital cost of developing Reserve 1A will be \$20,000, and annual maintenance costs are estimated at \$1,500. Development of this area is expected to be finalized in 1970 as the elevations in this section of the Indian Reserves are such that dyking requirements will not be materially affected by Libby Dam. The present value of capital costs for Reserve 1A is thus \$20,000 while the present value of maintenance costs is \$18,750.

The development of Reserves 1 and 1B involve a much larger undertaking. Total capital costs are estimated at $340,000 and maintenance costs are expected to stabilize at $8,000 annually after 1977. Present value calculations are summarized in Table J-1.

TABLE J-1

INDIAN RESERVES 1, 1B - PRESENT VALUE OF COSTS

Year	Capital Cost	Value in 1970	Operating and Maintenance Costs	Value in 1970
1973	$67,000	$53,200	--	
74	50,000	36,750	$1,600	$1,200
75	50,000	34,000	2,700	1,800
76	50,000	31,500	4,000	2,500
77	50,000	29,200	5,000	2,900
78	50,000	27,000	6,300	3,400
79	23,000	11,500	8,000	50,000
.			"	
.			"	
.			"	
TOTAL	$340,000	$223,150		$61,800

Corn Creek

Total capital costs for the Corn Creek area are estimated at $126,000 with annual maintenance costs reaching a maximum of approximately $6,500 in 1980. Table J-2 summarizes the present value calculations.

TABLE J-2

CORN CREEK - PRESENT VALUE OF COSTS

Year	Capital Cost	Value in 1970	Operating and Maintenance Costs	Value in 1970
1973	$15,000	$12,000	$ -	$ -
74	20,000	14,700	2,100	1,500
75	20,000	13,600	3,300	2,200
76	12,500	7,900	4,000	2,500
77	12,500	7,300	4,700	2,700
78	12,500	6,700	5,500	3,000
79	12,500	6,300	6,200	3,100
1980	12,500	5,800	6,500	3,000
81	8,500	3,600	6,500	35,000
.			"	
.			"	
.			"	
TOTAL	$126,000	$77,900		$53,000

Leach Lake

Initial capital developments are being undertaken on the Leach Lake unit in 1970 consisting of work on Summit Creek. This work is being undertaken at this time so that final completion can be achieved swiftly in late 1972 when Libby Dam becomes effective. Total capital costs are expected to be $375,000, with annual maintenance costs probably as high as $12,000. The present value calculations are presented in Table J-3.

TABLE J-3

LEACH LAKE - PRESENT VALUE OF COSTS

Year	Capital Cost	Value in 1970	Operating and Maintenance Costs	Value in 1970
1970	$110,000	$110,000	$ -	$ -
71	20,000	18,500	5,000	4,600
72	150,000	128,600	5,000	4,300
73	55,000	43,700	5,000	4,000
74	40,000	29,400	7,500	5,500
75			10,000	6,800
76			10,000	6,300
77			12,000	87,500
78			"	
79			"	
.			"	
.			"	
.			"	
TOTAL	$375,000	$330,200		$119,000

Six Mile Slough

Total capital costs for on-site development of the Six Mile Slough area are estimated at $151,000. Additional costs will be necessary to provide access to the area. In dealing with agricultural development it was assumed that such access would cost approximately $75,000 (Appendix D) and the same cost will be assumed here. Annual maintenance costs would be in the order of $7,000. The present value calculations summarized in Table J-4 assume that access is provided in the initial year of development and on-site capital costs commence the following year, 1974.

TABLE J-4

SIX MILE SLOUGH - PRESENT VALUE OF COSTS

Year	Capital Cost	Value in 1970	Operating and Maintenance Cost	Value in 1970
1973	$78,000	$62,000	$ -	$ -
74	20,000	14,700	1,800	1,300
75	10,000	6,800	2,600	1,800
76	10,000	6,300	3,500	2,200
77	20,000	11,600	5,000	2,900
78	25,000	13,500	7,000	47,300
79	25,000	12,500	"	
1980	18,000	8,300	"	
81	17,000	7,300	"	
82	14,000	5,600	"	
.				
.				
TOTAL	$237,000	$148,600		$55,500

Duck Lake

Duck Lake development will commence in 1970 as the area is already protected by dyke from the waters of the Kootenay River. Present plans call for a total capital outlay of $663,000 over six years, with annual maintenance costs expected to reach a maximum of $17,500. Present value calculations are presented in Table J-5.

TABLE J-5

DUCK LAKE - PRESENT VALUE OF COSTS

Year	Capital Cost	Value in 1970	Operating and Maintenance Cost	Value in 1970
1970	$300,000	$300,000	$9,500	$9,500
71	83,000	76,800	12,200	11,300
72	80,000	68,600	14,700	12,600
73	80,000	63,500	17,000	13,500
74	60,000	44,100	17,500	161,000
75	60,000	40,800	"	
76			"	
77			"	
78			"	
79			"	
80				
.				
.				
TOTAL	$663,000	$593,800		$207,900

Capital Costs Associated with Wildlife Development

The costs discussed above have been for direct habitat improvement and control. Present plans also call for major capital outlays to construct an administrative centre and develop a campground where Summit Creek enters the floodplain.

Administrative Centre

It is expected that the administrative centre will be built in 1972, at a cost of approximately $200,000. Maintenance and operating costs are expected to be $6,000 annually. The present values of these costs in 1970 are $171,000 and $64,000 respectively.

Summit Creek Park

At present development plans call for the Parks Branch of the Department of Recreation and Conservation to develop a campground on Summit Creek at the western edge of the floodplain. The maximum capacity would be 200 camp units at full development. Capital cost of constructing the campground is estimated at $382,000 with annual maintenance costs in the order of $12,000.

The appropriate treatment of these costs is not clear at present. It is expected that the campground will provide accommodation for visitors to the wildlife development. At the same time it would be unreasonable to expect that all campground users will be visitors interested in wildlife. Similar campgrounds throughout British Columbia are consistently filled to capacity during the tourist season. It can easily be argued that a campground at Summit Creek would also be used to capacity even if there was no wildlife development.

As a preliminary position it is argued here that the costs of constructing and maintaining this campground do not represent costs attributable to the wildlife development _per se_. The campground does not contribute to wildlife habitat or production, rather it serves a completely separate function in providing accommodation for campers, and there is no guarantee that all campers would visit the wildlife development. The costs of developing campgrounds of this nature are more appropriately set off against the 'value' of providing camping space, not the value of producing wildlife.

Of these two additional capital costs, the Administrative Centre and Summit Creek Park, only the costs of the Administrative Centre will be included in the analysis of the costs of wildlife development.

Management Costs: Salaries and Personnel

The costs enumerated above have included capital and maintenance costs for the planned development of each area or unit. The final costs to be considered are those of salaries for full and part time staff. When fully operative it is expected that staff will consist of a supervising biologist, a foreman-manager, 3 full-time employees and a secretary. In addition at least 3 part-time employees would be required in the summer months. Annual salary costs would thus be in the order of $75,000, although this level of annual costs would not be reached until approximately 1976. Estimates of the annual salary costs, and their present values in 1970 are given in Table J-6.

TABLE J-6

SALARY COSTS - PRESENT VALUE

Year	Annual Salaries	Value in 1970
1970	$30,000	$30,000
71	37,000	34,000
72	44,000	38,000
73	56,000	44,000
74	65,000	48,000
75	70,000	48,000
76	75,000	591,000
.	"	
.	"	
.	"	
TOTAL		$833,000

Summary, The Present Value of Costs for Wildlife and Outdoor Recreation Development

Table J-7 presents a summary of the costs of the proposed development for wildlife and outdoor recreation. Total capital outlays are estimated at $1,961,000, but because these outlays will be spread from 1970 through 1982 the present value of capital costs in 1970 is only $1,565,000. The present value (1970) of annual maintenance costs which will be incurred through perpetuity is estimated at $581,000, while the present value of salary expenses will approximate $833,000.

TABLE J-7

SUMMARY OF PRESENT VALUES - COST OF WILDLIFE AND OUTDOOR RECREATION DEVELOPMENT

Item	Total Capital Outlays	Present Value of Capital Costs	Present Value of Operating and Maintenance
Indian Reserve 1A	$20,000	$20,000	$19,000
Indian Reserves 1, 1B	340,000	223,000	62,000
Corn Creek	126,000	78,000	53,000
Leach Lake	375,000	330,000	119,000
Six Mile Slough	237,000	149,000	56,000
Duck Lake	663,000	594,000	208,000
Administrative Centre	200,000	171,000	64,000
	$1,961,000	$1,565,000	$581,000
Salaries..			833,000
Present Value of Capital Costs..........		$1,565,000	
Present Value of Annual Costs..............................			$1,414,000

It is worth noting that the present value of annual costs - salaries and maintenance - together total $1.4 million, almost as much as the present value of capital costs. It is important to include these costs in this form as they are often overshadowed by the more obvious and immediate capital costs.

REFERENCE, APPENDIX J

Moore, Dwight D. 1969. A development plan for the Indian Reserve Lands 1, 1A and 1B and the Creston Valley Wildlife Management Area. mimeo report, Creston.

A P P E N D I X   K

APPENDIX K

THE EFFECT OF ALTERNATE DISCOUNT RATES ON THE BENEFIT COST ANALYSIS, WILDLIFE DEVELOPMENT

As pointed out in the main text, the discount rate can have a significant effect on the outcome of a benefit-cost analysis. Future costs and benefits are discounted at 8 per cent throughout this study as this is felt to be a satisfactory approximation of the real social discount rate. To test the sensitivity of the analysis of the wildlife development to the discount rate this appendix carries out the benefit cost comparisons with alternative rates of six and ten per cent.

Six Per Cent Discount Rate

With a discount rate of six per cent the present value in 1970 of all benefits is \$16,524,000, while the present value of costs is \$3,595,000. On the basis of an overall comparison net benefits are then \$12,929,000, the benefit cost ratio 4.6:1.

The figures which provide the basis for this comparison are summarized in Table K-1. Distributing these costs and benefits among the appropriate referent groups the results of the benefit-cost comparisons are as summarized in Table K-2.

TABLE K-1

COSTS AND BENEFITS FROM PROPOSED WILDLIFE DEVELOPMENT, 6 PER CENT DISCOUNT RATE (PRESENT VALUES, 1970)

DEVELOPMENT COSTS			
Present Value of Capital Costs:			
I.R. 1A	$20,000		
I.R. 1, 1B	247,000		
Corn Creek	87,000		
Leach Lake	340,000		
Six Mile Slough	166,000		
Duck Lake	609,000		
Administrative Centre	178,000		
Total Capital Costs		$1,647,000	
Present Value of Maintenance Costs:			
I.R. 1A	$25,000		
I.R. 1, 1B	92,000		
Corn Creek	78,000		
Leach Lake	167,000		
Six Mile Slough	82,000		
Duck Lake	279,000		
Administrative Centre	89,000		
Total Maintenance Costs		812,000	
Present Value of Salary Expenses		1,136,000	
Present Value of All Costs			$3,595,000
BENEFITS FROM DEVELOPMENT			
Fishing		$443,000	
Hunting		910,000	
Non-Consumptive Recreation		14,337,000	
Agriculture		782,000	
Trapping		52,000	
Present Value of All Benefits			$16,524,000

TABLE K-2

COMPARISON OF BENEFIT COST ANALYSIS FOR VARIOUS REFERENT GROUPS (PRESENT VALUES 1970, 6 PER CENT DISCOUNT RATE)

	British Columbia	Canada	All Participants (includes non-Canadians)
Present Value of Benefits (B)	$7,480,000	$13,281,000	$16,524,000
Present Value of Costs (C)	$1,761,000	$ 3,089,000	$ 3,595,000
Net Benefits (B-C)	$5,719,000	$10,192,000	$12,929,000
Benefit Cost Ratio (B/C)	4.2:1	4.3:1	4.6:1

Ten Per Cent Discount Rate

With a ten per cent discount rate the present value in 1970 of all benefits is $8,193,000, while the present value of costs is $2,580,000. On an overall comparison net benefits are $5,613,000 and the benefit cost ratio is 3.2:1.

Table K-3 summarizes the figures which provide the basis for calculations with a ten per cent discount rate. The results of the benefit-cost comparisons for the appropriate referent groups are summarized in Table K-4.

TABLE K-3

COSTS AND BENEFITS FROM PROPOSED WILDLIFE DEVELOPMENT, 10 PER CENT DISCOUNT RATE (PRESENT VALUE, 1970)

DEVELOPMENT COSTS			
Present Value of Capital Costs:			
I.R. 1A	$20,000		
I.R. 1, 1B	202,000		
Corn Creek	70,000		
Leach Lake	321,000		
Six Mile Slough	134,000		
Duck Lake	580,000		
Administrative Centre	165,000		
Total Capital Costs		$1,492,000	
Present Value of Maintanance Costs:			
I.R. 1A	$15,000		
I.R. 1, 1B	45,000		
Corn Creek	39,000		
Leach Lake	91,000		
Six Mile Slough	40,000		
Duck Lake	155,000		
Administrative Centre	50,000		
Total Maintenance Costs		435,000	
Present Value of Salary Expenses		653,000	
Present Value of All Costs			$2,580,000
BENEFITS FROM DEVELOPMENT			
Fishing		$221,000	
Hunting		483,000	
Non-Consumptive Recreation		7,047,000	
Agriculture		414,000	
Trapping		28,000	
Present Value of All Benefits			$8,193,000

TABLE K-4

COMPARISON OF BENEFIT COST ANALYSIS FOR VARIOUS REFERENT GROUPS (PRESENT VALUES 1970, 10 PER CENT DISCOUNT RATE

	British Columbia	Canada	All Participants (includes non-Canadians)
Present Value of Benefits (B)	$3,747,000	$6,599,000	$8,193,000
Present Value of Costs (C)	$1,289,000	$2,125,000	$2,580,000
Net Benefits (B-C)	$2,458,000	$4,474,000	$5,613,000
Benefit Cost Ratio (B/C)	2.9:1	3.1:1	3.2:1

APPENDIX L

APPENDIX L

ESTIMATED GROSS BUSINESS REVENUES RESULTING FROM SPENDING ASSOCIATED WITH PROPOSED WILDLIFE DEVELOPMENT

Spending by Hunters

In 1968 local hunters spent $4.50 per day for hunting on the Creston flats. Non-local hunters from elsewhere in British Columbia spent $12.50, of which $7.60 was spent in the Creston area (see Appendix F). It is assumed that in the future hunting will be divided equally between these groups of hunters and that local hunters will spend $5 per day spent hunting (all spent in Creston economy) while non-local hunters will spend $13 per day of hunting ($8 locally, $5 elsewhere in British Columbia).

Spending by hunters attributable to development of the habitat is estimated as follows.

TABLE L-1

SPENDING BY HUNTERS

Year	Spending in Creston Area	Spending in British Columbia
1971	$11,650	$16,000
72	14,350	20,000
73	17,150	24,000
74	31,500	44,000
75	39,800	55,000
76	48,100	67,000
77	55,300	76,000

CAPACITY REACHED IN 1977, CONSTANT SPENDING THEREAFTER

Spending by Fishermen

Spending by fishermen will be much lower than that by hunters - participation in the sport is much less costly, and the age and income levels of most participants precludes a high level of spending. We estimate that local fishermen will spend $2 per day spent fishing, non-local fishermen $4 per day.

TABLE L-2

SPENDING BY FISHERMEN

Year	Spending	Year	Spending
1971	$1,740	1979	$16,200
72	3,680	80	18,400
73	5,400	81	21,000
74	9,300	82	24,000
75	10,300	83	28,000
76	11,400	84	29,000
77	12,700	.	"
78	14,300	.	"

UTILIZATION AND SPENDING CONSTANT AFTER 1984

Under the assumption that non-local hunters coming to the area were on single-purpose trips we included under expenditures in British Columbia their spending outside of the Creston area. This will not be done for fishing however. We assume that no non-local fishermen make single-purpose trips to fish Duck Lake. Thus only their spending while fishing at Creston is relevant. Spending en route to Creston is not included, as this travel is assumed to be a purpose in itself. Spending estimates are summarized in Table L-2, based on a weighted average of spending by local and non-local fishermen.

Spending by Non-Consumptive Recreationists

Spending by this type of recreationist will vary greatly depending on their point of origin. The cost of participation for local residents will be very low - a cost of $1 per day is assumed to cover travel costs and some incremental equipment expenses. For recreation-days by British Columbians from outside the local area spending of $6 per day is assumed, and for spending by non-British Columbians $7.50 per day.*

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*These estimates are derived from a review of findings concerning expenditures by visitors to British Columbia and other areas. A 1963 study of summer visitors to British Columbia (B.C. Government Travel Bureau 1963) found the average expenditure per visitor day to be $6.40 for all types of visitor activity. Figures available on expenditures by park and campground users in Oregon are much lower, indicating an average of $2.75 per visitor day (Oregon State Parks Branch, 1965). These figures cover only campground and park users and thereby exclude tourists who would spend heavily on motels, hotels, and restaurants. They are also restricted to expenditures within 25 miles of the campground.

Recent studies of non-resident fishermen in British Columbia indicate a much higher level of spending. Non-resident fishermen on Kootenay Lake spent $14.50 per day (Pearse and Laub 1969). On a province-wide basis non-resident fishermen spend $16.00 per day spent in British Columbia (study forthcoming on non-resident fishermen in British Columbia for the B.C. Fish and Wildlife Branch).

Per day expenditures by fishermen tend to be high as travel costs are prorated on the basis of the number of fishermen in a party. For non-consumptive recreation it will be more common for all party members to participate, thus lowering costs per recreation day considerably. British Columbia residents are assumed to spend less per day than others as they may make proportionately more one-day trips to the area, not incurring lodging expenses. Other visitors are assumed to spend $7.50 per day, an upward revision of the 1963 visitor day figure.

Total spending in the Creston area by these recreationists is summarized in Table L-3. (These estimates are weighted by the number of days of recreation taken by each group of recreationists.) As with the fishermen it is assumed that visitors to the Creston area are on multi-purpose trips and therefore include only their spending while at Creston. Travel elsewhere in British Columbia is assumed to have purpose in itself and these expenditures are excluded.

TABLE L-3

SPENDING BY NON-CONSUMPTIVE RECREATIONISTS

Year	Spending	Year	Spending
1971	$34,000	1981	$1,391,000
72	68,000	82	1,487,000
73	135,000	83	1,574,000
74	580,000	84	1,667,000
75	814,000	85	1,694,000
76	881,000	.	"
77	1,017,000	.	"
78	1,120,000	.	"
79	1,204,000	.	"
1980	1,301,000	.	"

CAPACITY UTILIZATION BY 1985, CONSTANT SPENDING THEREAFTER

Spending Generated by Farming and Trapping

In addition to recreational spending utilization of the area for agriculture and trapping will generate business revenues. (Trapping is inconsequential, gross revenues being only $5,000/year). These revenues will be at two levels, first the receipts of farmers and trappers themselves as businessmen, secondly the receipts of other Creston businesses as a result of spending by farmers and trappers. The amounts of these receipts are estimated in Table L-4. The relationship between gross receipts of

TABLE L-4

SPENDING GENERATED BY FARMING AND TRAPPING

Year	Gross Receipts of Farmers and Trappers	Initial Gross Receipts of Creston Businesses
1971	$44,000	$40,000
72	56,000	51,000
73	66,000	60,000
74	123,000	111,000
75	154,000	139,000
76	186,000	168,000
77	213,000	193,000
78	225,000	204,000
79	230,000	208,000
80	235,000	213,000
81	240,000	217,000
82	243,000	220,000
83	245,000	222,000

FULL UTILIZATION BY 1983, REVENUES CONSTANT THEREAFTER farmers and trappers, and receipts of Creston businesses which is presented here is discussed in Appendix A.

Combined Spending by All Users

The combined effect of this spending by all forms of recreationists is summarized in Table L-5. This table summarizes expenditures in the

TABLE L-5

COMBINED BUSINESS REVENUES RESULTING FROM SPENDING ASSOCIATED WITH PROPOSED WILDLIFE DEVELOPMENT

Year	Gross Receipts of Farmers and Trappers	Gross Receipts of Creston Businesses
1971	$44,000	$87,000
72	56,000	137,000
73	66,000	218,000
74	123,000	732,000
75	154,000	1,003,000
76	186,000	1,109,000
77	213,000	1,278,000
78	225,000	1,394,000
79	230,000	1,484,000
1980	235,000	1,588,000
81	240,000	1,684,000
82	243,000	1,786,000
83	245,000	1,879,000
84	"	1,973,000
85	"	2,000,000

RECEIPTS MAXIMIZED IN 1985, CONSTANT THEREAFTER

Creston area only, omitting those expenditures elsewhere in British Columbia which were given in the final column of Table L-1.

REFERENCES, APPENDIX L

British Columbia Government Travel Bureau. 1963. Visitors '63 a study of visitors to the province of British Columbia, Canada, in the summer of 1963. Victoria, Queen's Printer.

Oregon State Parks Branch. 1965. The state park visitor in Oregon. Portland, Oregon.

Pearse, Peter H. and M. Laub. 1969. The value of the Kootenay Lake sport fishery. Department of Recreation and Conservation, Victoria, B.C.