WINTER RECREATIONAL DEMAND AND MULTIPLE USE IN THE REVELSTOKE/GOLDEN REGION OF BRITISH COLUMBIA

by

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ABSTRACT

The forestlands of Southeastern British Columbia are under multiple use pressures. Timber harvesting is the primary land use, but winter recreation is increasing. Questionnaire data and a Travel Cost Model were employed to determine daily consumer surplus of three recreational activities: helicopter skiing, commercial backcountry skiing and snowmobiling. Depending on which functional form is chosen, significant differences in consumer surplus calculations are apparent. Results from a simple linear program that maximizes social benefit from heli-skiing, commercial backcountry skiing and snowmobiling, suggest that commercial backcountry skiing should be favoured over the other two uses for a specified zone of conflict.

TABLE OF CONTENTS

Abstract		ii
Table of Contents		iii
List of Tables		v
Acknowledgement		vi
Chapter 1	Introduction	1
1.1	Overview	1
1.2	Background	1
1.3	Nature of Winter Recreation Conflict in Southeastern B.C.	3
1.4	Problem Statement and Thesis Outline	4
Chapter 2	Valuing Non-Consumptive Resource Uses (Recreation)	6
2.1	Multiple Use	7
2.2	Travel Cost Method	8
Chapter 3	Survey and Consumer Characterization	12
3.1	Survey Design	12
3.2	Sampling Design	14
3.3	Response Rates	15
3.4	Consumer Profiles	16
3.5	Consumer Attitudes	23
Chapter 4	The Travel Cost Model: Results for the Revelsoke/Golden Region	35
4.1	Estimation of Travel Cost Models	35
4.1.1	Functional Form	35
4.1.2	Methods	36
4.1.3	Biases	37
4.1.4	Regression Error	38
4.2	Estimates of Winter Recreation Demand in Revelstoke/Golden	39
4.3	Linear Programming Model for Allocating Winter Recreation Land Use in the Revelstoke/Golden Region	49
Chapter 5	Conclusions	54
References		56

Appendix A: Heli-skier Survey 59

Appendix B: Commercial Backcountry Skier Survey 68

Appendix C: Snowmobiler Survey 77

LIST OF TABLES

Table	3.1	Response Rates	15
	3.2	Heli-Skiing Clientele (non-day trippers)	17
	3.3	Summary Table: Heli-Skiers	18
	3.4	Commercial Backcountry Skiing Clientele	19
	3.5	Summary Table: Commercial Backcountry Skiers	20
	3.6	Characteristic Summary for Heli-Skiers, Backcountry Skiers and Snowmobilers	22
	3.7	Factors Influencing the Heli-Skiers' Choice of Area	24
	3.8	Importance of Heli-Ski Trip Features and Heli-Skiers' Perceived Conflict	26
	3.9	Factors Influencing the Backcountry Skiers' Choice of Area and the Importance of Specific Trip Features	28
	3.10	Backcountry Skiers' Perceived Conflict with Competing Uses	29
	3.11	Significance of Snowmobile Trip Features	30
	3.12	Snowmobiler Management Options	30
	3.13	Backcountry Versus Heli-Skiing in Factors Affecting the Choice of Area	31
	3.14	Backcountry Versus Heli-Skiing in Significance of Trip Features	33
	3.15	Heli-Skiers' and Backcountry Skiers' Perceived Conflict with Competing Land Uses	34
Table	4.1	Regression Results for Semilog Functional Forms and Visit Length as the Dependent Variable	41
	4.2	Regression Results for Helicopter Skiing	43
	4.3	Regression Results for Commercial Backcountry Skiing	46
	4.4	Regression Results for Snowmobiling	48
	4.5	Linear Program Assumptions	52
	4.6	Optimal Allocation of Winter Recreation Terrain, Revelstoke/ Golden Region, Participants per Week	53

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WINTER RECREATIONAL DEMAND

IN THE REVELSTOKE/GOLDEN REGION

CHAPTER 1

INTRODUCTION

1.1 Overview

Multiple-use management of British Columbia's forestland is becoming increasingly more important. As the forest is being depleted by logging, demands for other uses of the forest are increasing. A balance between uses must be determined if multiple objectives are to be satisfied. The Revelstoke/Golden (R/G) region is a prime example of an area that is in need of a multiple use strategy.

Three dominant winter recreational activities occur in the region: helicopter skiing, backcountry skiing, and snowmobiling. The majority of skiing activity in the area is commercialized. The territory is also actively logged. The recreational activities are beginning to conflict with one another as well as with timber harvesting.

1.2 Background

The Revelstoke/Golden region of British Columbia is an area rich in diversity. Majestic mountains, glaciers, river valleys, forests, high to low elevation changes, and watersheds occupy this area. The term "forests" is used to describe forest ecosystems that include soils, water, animals, micro-organisms, other plants, and of course trees. Glacier National and Mount Revelstoke National parks are located in the region. Aside from the parks, a large component of the region is part of the British Columbia (B.C.) Ministry of

Forests' Timber Supply Area. The primary land use has been commercial logging, although conflicts are apparent between logging and other uses such as wildlife habitat, recreation, and old-growth preservation. The focus of this study is land use conflicts pertaining to winter backcountry recreation. The nature of each recreational activity of concern--helicopter skiing, backcountry skiing and snowmobiling--is briefly discussed below in order to characterize winter use conflicts in southeastern British Columbia.

Helicopter skiing is a sport that involves a combination of helicopters and skiing. A week long vacation can cost skiers upwards of $4,500. Transport to the runs located on rugged mountain terrain is via helicopters with one or two guides leading groups of 8-15 people. The attraction of this sport is the deep, light and untracked snow which many find a "heavenly" experience. The area that heli-skiers can ski is limited by a permit system.

Commercial backcountry skiing is another sport that offers virgin snow as its main attraction; others include exercise and the pristine, peaceful wilderness. Helicopters take skiers to a cabin centrally located in a wilderness setting from which backcountry skiers will venture. Alpine areas are key to backcountry skiers' experiences because this is where the bowls, peaks and glaciers are located. The backcountry skier's area of use is limited by human fitness. Quite often backcountry entrepreneurs are permitted to build a cabin and operation within the boundaries of the heli-ski permit area.

Snowmobilers enjoy many of the same wilderness features that the skiers appreciate. Fuel and logging roads are the main limiting factors to the areas available to snowmobilers. Given access, snowmobilers can travel in some terrain used by the

skiers. Snowmobile trips are usually day trips as winter camping is not enjoyable or possible for prolonged periods for most snowmobilers.

1.3 Nature of the Winter Recreation Conflict in Southeastern B.C.

The dispute between Selkirk Tangier Helicopter Skiing (STHS) and Selkirk Mountain Experience (SME) is an example of an ongoing conflict in the Revelstoke/Golden area. SME is a commercial backcountry company that has been operating within the heli-ski permit area for about 8 years. Both businesses are growing enterprises. On occasion the STHS has used terrain in close proximity to SME's central cabin. Backcountry skiers are seeking a peaceful pristine wilderness experience and helicopter noise and heli-skiers can detract from that experience. Instances have occurred where terrain in close proximity to the backcountry skiers' cabin has been skied out (tracked) by the heli-skiers. This is a chronic, ongoing dispute. Another heli-ski operator in the Revelstoke region, Canadian Mountain Holidays (CMH) Revelstoke, has recently had its first verbal confrontation with backcountry skiers in the heli-ski permit area. In interviews for this study, Mr. Buck Corrigan (1994), who is the operator of CMH Revelstoke, expressed concern over the situation. However, he feels that maintaining a good working relationship with the backcountry operators and skiers is not only possible but essential for both to coexist within the same area. Without cooperation, it appears exclusivity rather than multiple use will become the norm.

Another example of the sort of conflict between skiers and snowmobilers occurred near Fernie, in southeastern British Columbia (Anthony 1993). On more than one

occasion, a group of snowmobilers ventured into a snow-cat skiing operator's permit area and tracked the fresh snow, thus making the conditions less desirable for the operator's customers. The snowmobilers feel they have as much right to the terrain as the skiers.

1.4 Problem Statement and Thesis Outline

As backcountry recreation becomes more popular, greater pressures will be forced on the limited supply of land. Conflict will occur more often with both commercial and non-commercial activities. Currently, an entrepreneur can obtain the right to operate commercially within a zone, although that privilege does not exclude non-commercial public use and sometimes does not even prohibit other commercial activities. Conflict definitely exists and will only intensify if multiple use management is not implemented and enforced.

In order to determine optimal use of forest lands, it is necessary to value activities using a common metric. One way is to calculate the consumer surplus for each recreational activity by computing a Travel Cost winter recreational demand function. The Travel Cost Method (TCM) may also aid in the efficient allocation or re-allocation of forest land, as well as provide information on potential rent increases or rent implementation. A linear programming (LP) model will apply consumer surplus results from the TCM and allocate land use according to specific constraints for the objective of maximizing net social benefit.

To obtain the data necessary for the analysis of conflicts, surveys were developed and distributed to samples of each recreational user group, as well as to commercial heli-

ski and backcountry ski operators (Cooper 1994; Kliskey 1993). Information from the travel-cost component of the survey was used to estimate consumer surpluses for heli-skiing, backcountry skiing and snowmobiling. These were subsequently used in the LP model. Chapter 2 is a literature review on multiple use and valuation techniques of non-market commodities; it is followed by Chapter 3, which discusses survey design and consumer characterization. Chapter 4 summarizes the results of the TCM and the linear program, while Chapter 5 presents the conclusions.

CHAPTER 2

VALUING NON-CONSUMPTIVE RESOURCE USES (RECREATION)

Many attempts have been made to price the preservation of environmental assets, but not one economic model is able to encompass all the use and nonuse values from non-market experiences. Resources may have nonuse value that consists of option, bequest and existence demands. A willingness to pay acting as an insurance policy to keep the possibility open of someday using the resource creates an option value. Bequest values reflect the value of knowing that wilderness will be available to future generations. The mere knowledge that wilderness exists constitutes an existence value (van Kooten 1993). Use values of non-market experiences result from either consumptive uses of a resource (i.e., fishing or hunting) or from nonconsumptive uses such as hiking, skiing or canoeing. The benefits of non-market experiences are difficult to determine, contrary to the benefits of market experiences as there are frequent and priced transactions. Harvesting of timber is a prime example since wood is bought and sold in the market place.

2.1 Multiple Use

Suppose an allocation decision is to be made for an area: either use an area, with no close substitutes, in a manner compatible with the preservation of its natural environment or produce commercial goods from this area. Will the market efficiently select between the two uses? The answer is no, mainly due to the bequest, existence and option values that are extremely difficult to measure quantitatively when no natural market exists for public goods (Cicchetti and Wilde 1992).[1] Compared to nonuse values, use values are easier to quantify. Imagine the difficulties the market has in efficiently determining the best uses of an area when many non-market and market uses exist and can co-exist in the same area. Nonuse values can be significant in the presence of the following: 1) long-term or irreversible damage to a resource occurs if the consumptive development option is chosen; 2) the resource (i.e., forest) is unique; and 3) the resource is well known (Harvard Law Review 1992). Substitutes prevent sizable nonuse values, as does a lack of knowledge about the resource. If one is unaware of a resource, he or she cannot attach a (nonuse) value to it. The Contingent Valuation Method (CVM) and the Travel Cost Method (TCM) are two economic valuation techniques that attempt to measure the benefits of public resources.

The Contingent Valuation Method directly values use and/or nonuse values of natural resources by estimating Hicksian demand. A hypothetical market is created and responses to this market are then elicited. Because individuals factor in their own

[1] John Krutilla (1967) and Burton Wiesbrod (1964) are largely responsible for early literature on nonuse values. They focused almost exclusively on option and bequest values.

perceptions in a hypothetical market, biases are difficult to avoid.

There are a few different types of CVM that have been employed. Open-ended, dichotomous choice, double-bounded dichotomous choice, and trichotomous choice are a few of the survey techniques used to determine willingness to pay or willingness to accept compensation for changes in the availability of a public good. Dichotomous choice models (also referred to as referendum surveys or discrete choice models) seem to be the most preferred contingent valuation model (Cameron 1988; Kristrom 1993). The valuation method that is employed in this study is the TCM. The Travel Cost Method avoids the hypothetical problem of the CVM by measuring actual consumer expenditures. This method only measures user benefits; by excluding bequest, option and existence values, the potential exists for underestimation, however.

2.2 Travel Cost Method

The TCM indirectly measures use values of non-market experiences by determining actual expenses incurred by travelling to and from a recreation site, plus expenses incurred during the stay less average spending if the trip were not taken. The TCM was first proposed by Hotelling in 1947. In 1959, Clawson was the first to use and apply a TCM that he developed independent of Hotelling (van Kooten 1993). Since this time the Travel Cost Method has developed continually to better determine accurate and unbiased values.

Using expenditures on fishing trips as an example, Bowes and Loomis (1980) show that an increase in travel costs can be considered equivalent to an increase in prices

provided fishing trips are a non-essential commodity. This also suggests that travel costs can be combined with prices (i.e., entry fees or adventure fees) to form an overall price. Quantity is represented by the number of visits to the site or by the number of days spent recreating at the site. The uncompensated or Marshallian demand function, from which consumer surplus can be calculated, is derived from the use of distances travelled, expenses incurred by those consumers using the resource of concern, incomes, education, and site characteristics and substitutes (van Kooten 1993).

Adamowicz (1992) suggests three variations of the Travel Cost Method: the basic TCM, the Discrete Choice Model, and the hedonic TCM. The Discrete Choice Model is useful for alterations in site characteristics or quantities.

The hedonic Travel Cost Method attempts to measure quality effects that are of specific interest to this study as recreationists may quantitatively prefer experiences with existing competitive uses barred. The hedonic TCM is similar to the hedonic price method, but property values are replaced by travel costs (Johansson 1987). Using a numerical scale, a value to each relevant site characteristic can be determined. Basically, shadow prices (implicit values) of each site characteristic can be produced by regressing cost incurred by the recreator against each attribute (Pearse 1989). Some of the information extracted from recreationists will be quite useful in this method. According to Brown and Mendelsohn (1984), the basic TCM is able to measure the value of the Colorado River; however, the hedonic TCM can value the River's scenic quality, congestion, fish density and/or water quality. Although time consuming, the basic TCM can also account for quality changes. If the demand equation is estimated with and

without a proposed modification in site quality, the calculated difference would be equal to the net benefit or cost of the change. Limitations are quite evident when using the basic TCM to measure quality changes.

The basic TCM uses travel costs as a proxy for the price of a recreational site visit. This method estimates the value of a specific site. The estimated TCM demand equation is more extensive than merely relating price and quantity. Income, education, price and site characteristics may have profound influences on demand. The Travel Cost Method works best when (1) the choice of site is fixed but visit length changes, (2) there are large travelling distances to the site, and (3) people stay shorter or longer due to quality changes (van Kooten 1993). The basic TCM will be sufficient for the current purpose of developing recreational demand functions so that consumer surpluses can be calculated.

Travel costs do not measure values recreationists derive from an opportunity, but rather the willingness of consumers to pay for access to an opportunity (Rosenthal, Loomis and Peterson 1984). The net economic value of an existing site can be determined, but should be considered a lower bound to the actual or true value. There are five major uses of the Travel Cost Method:

1. to determine net economic value of existing sites,
2. to determine net economic value of modifying a site,
3. to determine net economic losses from loss of or damage to a site,
4. to predict recreationists' behaviour, and
5. to forecast changes in the use of a recreation site resulting from charging or

changing fees.

The TCM makes explicit assumptions about individuals' behaviours and perceptions. Actual expenditures are measured, whereas the Contingent Valuation Method depends on individuals to factor in their own perceptions in a hypothetical market.

CHAPTER 3

SURVEY AND CONSUMER CHARACTERIZATION

3.1 Survey Design

In early 1993 questionnaires were developed for and distributed to snowmobilers, backcountry skiers and helicopter skiers in the Revelstoke/Golden region of British Columbia. The questionnaire study focussed on multiple use issues, not non-market estimation. Survey design and follow-up were limited by finances, political sensitivity and personnel.

The surveys were designed to elicit demographic, attitudinal and behavioral information from the participants in each of the three activities. The survey was developed by individuals in the Forest Economics and Policy Analysis Research Unit at the University of British Columbia and the department of Resource Management and Environmental Studies at U.B.C. (Cooper 1994; Kliskey 1993). Executive members of the British Columbia Snowmobiling Federation (BCSF) provided input into the development of the snowmobile questionnaire. Surveys for each activity were pre-tested using recreationists (skiers and snowmobilers), biologists and economists.

The surveys contain 4 sections: (1) General Recreating Information, (2) Recreating in the Revelstoke/Golden Region, (3) Expenditures and (4) Demographics. The structure of each section is summarized below. The heli-skier, backcountry skier and snowmobiler surveys are found in Appendices A, B and C, respectively. The heli-skier survey was also

translated into German as interviews with heli-ski operators indicated that their clientele was primarily German or American. Respondents were given a choice between an English or German survey (see also Cooper 1994).

(1) General Recreating Information

This section elicited information about the respondent's skiing or snowmobiling experience and ability, as well as alternative skiing locations and frequency of the activity. Respondents were asked about other forms of outdoor recreation they took part in. The skier survey also elicited information on the distance skied, duration of stay and the number of days spent recreating in the R/G region. The snowmobiler survey elicited this information in section 2. The survey of heli-skiers and backcountry skiers contained a question on how specific factors affected the choice of area in which to recreate. Respondents were given a choice from 0 (not at all important) to 5 (extremely important).

(2) Recreating in the Revelstoke/Golden Area

This section attempted to elicit information about what features were important for the recreational experience. The survey contained environmental and social features for which respondents were given a choice of 0 (not at all important) to 5 (extremely important). The scale for the snowmobilers differed slightly (a 1 to 5 scale). The skiers' survey dealt with multiple use and conflict issues, which were addressed in section 3 of the snowmobilers' survey.

(3) Expenditures

Travel costs, on-site expenditures and equipment expenses were the focus of the expenditure section. The surveys also contained a question on weekly at home expenditures for food, beverages and entertainment. This section was essential for the development of a travel cost model.

(4) Demographics

Age, gender, household size, marital status, education, income and residence were elicited in section 4. Some of this information was also essential in developing a TCM.

3.2 Sampling Design

Survey distribution was achieved by several methods. The skiers' questionnaires were distributed through some of the major operators in the region. Members of the BCSF who snowmobiled in the study area were sent a copy of the questionnaire (Kliskey 1993). The BCSF provided address labels of members of snowmobile clubs in the region. Other clubs throughout B.C. and Alberta were also sent bundles of surveys to distribute. Surveys were also distributed through motels in R/G. Finally, a small number of snowmobile surveys were placed on vehicle windows at popular snowmobile runs in the region.

3.3 Response Rates

The survey response rates from each activity varied substantially. Based on the number of surveys distributed, the commercial backcountry skiers responded at a 75% rate, heli-skiers at a 58% rate and snowmobilers at a 23% rate. The low response rate for snowmobilers was to be expected given the method of distribution with no guarantee that surveys even reached their intended audience. Surveys were most carefully completed by the backcountry skiers. Of the surveys returned, 54% of the snowmobilers', 73% of the backcountry skiers' and 50% of the heli-skiers' surveys were usable for travel cost analysis. The high rate of return demonstrated by the backcountry skiers suggests that they are the most aware and have the most to lose in land use disputes. Table 3.1 summarizes the survey response rates.

Table 3.1: Response Rates

	Heli-skiing	**Backcountry**	**Snowmobiling**
Usable Return (of surveys distributed)	73 (29%)	93 (55%)	97 (12%)
Survey Return	145 (58%)	128 (75%)	181 (23%)
Surveys Distributed	251	170	800

Of the respondents, 88% of snowmobilers belonged to a snowmobile club. Also, 33.5% of snowmobile respondents indicated that they live within the R/G region. The vast majority of the skiers reside outside the study area.

3.4 Consumer Profiles

Heli-Skiers (non-daytrippers)

Generally, this sport is dominated by married men over 35 years of age who are advanced skiers earning in excess of $100,000. The mean income for the heli-skiers surveyed was $186,000. There were few low income earners participating in this activity (5% earned less than $40,000). Ages of heli-skiers ranged from 21 to 70, while their years of education ranged from 8 to 21 years. The mean number of years of schooling was slightly over 17 indicating a university degree on average. The mean age was near 42 years, with 79% of respondents over the age of 34. Only 13% of respondents were female. This result certainly has little to do with fitness as proved by a higher female participation rate in the more physically demanding backcountry skiing. As more women attain upper management or high income positions, the consumer profile will be more influenced by increased female participation. Respondents who were married accounted for 68% of responses, while singles represented 23% and divorced individuals 9%.

In 1979, U.S. skiers accounted for 54% of the B.C. heli-ski market, while Europe and Canada accounted for 31% and 14%, respectively (Ski Consultants 1980). In 1993, the two major heli-ski markets were the U.S. and Europe, more specifically Germany and Switzerland, accounting for 88% of the multi-day vacation market. The Europeans surpassed the Americans by about 10 percentage points, while the market accounted for by Canadians is only about 5%. A breakdown of survey and industry clientele is provided in Table 3.2.

Table 3.2 : Heli-Skiing Clientele (non-day trippers)[a]

Company	Europe	USA	Canada	Other	TOTAL
CMH:					
Customer Base	40%	45%	5%	10%	100% (4000)
Surveys	27%	58%	3%	5%	93% (64)
Selkirk/Tangier:					
Customer Base	80%	15%	5%	---	100% (1000)
Surveys	80%	17%	1%	---	98% (81)
Mike Wiegle:					
Customer Base	50%	41%	6%	3%	100% (1000)
Surveys	---	---	---	---	---
Total Customer					
Base	49%	39%	5%	7%	100%
Surveys	56%	35%	2%	2%	95%

[a] Number of customers or survey respondents are in parentheses.

There were definitely some profile differences between the two major groups. The Europeans earned significantly less than the Americans, although a large number of the Europeans failed to respond to the income question. Median income categories were used because of the high number of responses in the unbounded highest income category. The Americans also tended to be 5 to 6 years older, and had 1 more year of education. The Swiss and Germans stayed on average 9 days and skied slightly over 7 days, while the Americans skied 8 of 9.5 days spent in the heli-ski area. Table 3.3 summarizes the general characteristics of the heli-skiers surveyed.

Table 3.3: Summary Table - Heli-Skiers[a]

ITEM	All (73)	Swiss/German (28)	U.S.A. (38)
Income	$140-180,000	$60-100,000	>$180,000
Age	42.55	38.36	43.97
Education	17.37	16.68	17.84
Household Size	2.66	2.54	2.74
Experience	26.41	29.36	24.58
Stay Length	8.97	7.50	9.59
Ski Days	7.23	5.32	7.95
Est. Price/day[b]	$765.09	$704.05	$828.47
Home Spend/day[c]	$30.69	$36.38	$28.35

[a] Number of respondents are in parentheses.
[b] Estimated price per day is a calculation based upon the respondents estimated price of his/her entire trip divided by the respondents length of stay.
[c] Home spending per day is the amount that the respondent would have spent if he/she had not taken the trip.

Commercial Backcountry Skiers

More U.S. backcountry skiers responded to the survey (48%) than the industry average of 38%. Canadians accounted for 44% of responses, well below the reported industry skier participation average of 60%. Comparisons are summarized in Table 3.4.

Table 3.4 : Commercial Backcountry Skiing Clientele[a]

Company	Canada	U.S.A.	Europe	Other	Total
Selkirk Mtn.Exp	50%	45%	5%	-----	100% (218)
Surveys	28%	67%	2%	2%	99% (46)
Purcell	60%	38%	1%	1%	100% (247)
Surveys	62%	35%	4%	-----	101% (26)
Nordic Ski Inst.	90%	18%	-----	2%	100% (200)
Surveys	78%	19%	-----	-----	97% (26)
Golden Alpine	50%	48%	2%	-----	100% (215)
Surveys	23%	43%	3%	27%	96% (30)
Total Customer Base	62%	38%	2%	1%	101% (880)
Surveys	44%	45%	2%	7%	98% (128)

[a] Number of respondents or customers are in parentheses.

The median income of backcountry skiers was between $60,000 and $100,000. The majority of skiers (61%) earned between $40,000 and $100,000. This sport appears to be a more affordable form of skiing than helicopter skiing. Means for age and education were 41 and 17.5 years, respectively. Gender dominance of the backcountry skier sample was not nearly as prevalent as in the heli-ski sample. The gender makeup for the commercial backcountry skiers was 66% male and 34% female. The average reported ability of these skiers was between intermediate and advanced. Generally

backcountry skiers stayed for 7.5 days and skied 6.5 days. Of those who responded to the question on marital status, married or common law skiers accounted for 66% of responses.

Canadians and Americans accounted for 92% of responses. Median values are used to determine the income values. American participants tended to earn more than Canadians. Canadians were on average 2 to 3 years older and had a year less of education. The Americans stayed and skied a half day more than their Canadian counterparts, and had slightly more backcountry skiing experience. Some of the backcountry skiers' general characteristics are presented in Table 3.5.

Table 3.5: Summary Table - Commercial Backcountry Skiers[a]

ITEM	Both (93)	Canada (43)	U.S.A. (50)
Income	$60-100,000	$60-100,000	$100-140,000
Age	40.77	42.23	39.52
Education	17.48	16.98	17.92
Household Size	2.46	2.60	2.34
Experience	10.94	10.65	11.18
Stay Length	7.50	7.19	7.77
Ski Days	6.49	6.31	6.64
Est. Price/day[b]	$223.99	$170.43	$267.22
Home Spend/day[c]	$18.68	$17.64	$19.57

[a] Number of respondents are in parentheses.
[b] Mean estimated price per day is a calculation based upon the respondents estimated price of his/her entire trip divided by the respondents length of stay.
[c] Home spending per day is the mean amount that the respondent would have spent if he/she had not taken the trip.

Snowmobilers

The snowmobilers in the Revelstoke/Golden region originate from British Columbia and Alberta. Average incomes were between $40,000 and $50,000, which is significantly lower than the incomes of the skiers. For comparative purposes, the median was used to determine average income. Snowmobilers tend to be younger than skiers by 5 to 7 years and have less education by 4 to 5 years. Their household sizes on average were larger (2.9 compared to heli-skiers at 2.7 and backcountry skiers at 2.5). Of the respondents, 80% spent 1 to 2 days snowmobiling per visit to the Revelstoke/Golden area. Approximately 35% of the respondents resided in the R/G region and 88% were snowmobile club members. Over 90% of the responses were from males. Table 3.6 provides a summary of characteristics for the snowmobilers as well as a comparison of characteristics among the three recreational activities.

Table 3.6: Characteristic Summary for Heli-Skiers, Backcountry Skiers and Snowmobilers.

ITEM	Heli-Skiers	Backcountry Skiers	Snowmobilers
Income	$140-180,000	$60-100,000	$40-50,000
Age	42.55	40.77	36.91
Education	17.37	17.48	12.71
Household Size	2.66	2.46	2.92
Experience (years)	26.41 (downhill)	10.94 (backcountry)	15.67
Stay Length	8.97	7.50	2.70
Ski Days	7.23	6.49	2.43
Price (less home spending)[a]	$765.09/day	$223.99/day	$173.43/day
Home Spend/day[b]	$30.69/day	$18.68/day	$10.00/day
Gender: Male Female	87% 13%	66% 34%	90% 10%
Marital Status Married Single Divorced	 (m)68% (s)23% (d) 9%	 (m)66% (s)32% (d) 2%	 n/a n/a n/a

[a] Estimated price per day is a calculation based upon the respondents estimated price of his/her entire trip divided by the respondents length of stay.

[b] Home spending per day is the amount that the respondent would have spent if he/she had not taken the trip.

3.5 Consumer Attitudes

This section examines consumer attitudes as determined by survey questions regarding the choice of recreation area, significance of vacation features and perception of conflict. The choice questions were concerned with the importance of various factors in selecting a vacation area. Respondents could choose from 0 (not at all important) to 5 (extremely important). A similar scale was used to extract information on the level of importance of specific features to the skiing/snowmobiling experience. The degree of impact that other users had on the quality of the skiing experience was sought via the conflict question. Responses to the conflict question ranged from +3 (greatest positive impact) to -3 (greatest negative impact). A response of zero was considered a neutral reply (i.e., no conflict).

Heli-skiers

The most important factors influencing the choice of heli-ski area, in decreasing order of significance, were: qualification of the guides, safety record of the operator, type of terrain, type of accommodations and wilderness setting, where wilderness setting was not defined for the participants. Proximity to place of residence, advertising, access to business services and the desire to visit British Columbia had little influence on the choice of area. The Swiss and Germans were inclined to be more price sensitive than the Americans. Not surprisingly, price was not of primary importance to either the Americans or the Europeans. The responses to this question are quantified in Table 3.7.

Table 3.7: Factors Influencing the Helicopter Skiers' Choice of Area[a]

Factors influencing choice of site[b]	All (114)	Swiss/German (67)	U.S.A (34)
Guides	4.6	4.6	4.6
Safety	4.6	4.6	4.4
Terrain	4.4	4.5	4.1
Accommodation	3.9	4.0	3.6
Wilderness	3.9	3.8	4.0
Group Sizes	3.7	3.7	3.6
Price	3.6	3.8	3.3
Recommendation	3.5	3.6	3.2
British Columbia	2.6	2.3	2.9
Business	2.3	2.5	2.0
Advertising	2.1	1.9	2.2
Proximity	1.4	1.3	1.3

[a] Number of respondents are in parentheses.
[b] A scale of 0 (not at all important) to 5 (extremely important) is used

By far the most significant feature of a helicopter skier's experience was skiing untracked powder. This was followed by the opportunity to ski in a natural setting, to relax and to ski steep slopes. The Americans stressed tree skiing and skiing long runs much more than did the Europeans. The Swiss and Germans enjoyed above treeline skiing and flying in a helicopter significantly more than the Americans. A long steep run of untracked powder in a natural setting describes the ideal heli-ski run. Generally, Americans would prefer this run to be through trees, whereas the German and Swiss skiers would choose to ski above the treeline on the glaciers and in the open bowls.

Heli-skiers felt that logging and snowmobiling slightly degraded the heli-ski

experience (mean responses were -1.1 for both activities). The Americans perceived significantly greater conflict between their activity and snowmobiling and logging than did the Swiss and Germans. Perhaps this is because Europeans are more accustomed to crowded conditions, with land-use conflicts in recreational areas a way of life. Canadians and Americans are going through similar environmental concerns, and thus, they are more likely aware of and exposed to the types of conflicts occurring in British Columbia. Table 3.8 provides the mean responses to the "features and conflict" portions of the questionnaire.

Table 3.8: Importance of Heli-Ski Trip Features and Heli-Skiers' Perceived Conflict[a]

Importance of Trip Features[b]	**All (116-128)**	**Swiss/German (72)**	**U.S.A. (30-42)**
Untracked Snow	4.9	4.8	4.9
Natural Setting	4.2	4.2	4.2
Relaxing	4.0	4.1	3.8
Steep Slopes	4.0	3.9	4.1
Long Runs	3.8	3.5	4.2
Above Treeline	3.7	3.8	3.4
Tree Skiing	3.5	3.0	4.2
Sense of Adventure	3.2	3.0	3.5
Shape/Fitness	3.2	3.1	3.3
Socializing	2.9	2.7	3.0
Flying in a Heli	2.9	3.2	2.4
Small Groups	2.8	2.7	2.9
Remoteness of lodge	2.3	2.1	2.2
Viewing Wildlife	2.2	2.2	2.1
Exposure to Risk	2.2	1.9	2.3
Access to tel.,fax	2.2	2.4	2.1
Perceived Conflict with Competing Uses[c]	**All (128)**	**Swiss/German (65)**	**U.S.A. (50)**
Snowmobiling	-1.1	-0.8	-1.52
Logging	-1.1	-0.8	-1.52
Backcountry Skiing	0.5	0.2	0.9
Wildlife	0.8	0.1	1.7

[a] Number of respondents are in parentheses. A range occurs because some respondents skipped some of these questions.

[b] A scale from 0 (not at all important) to 5 (extremely important) is used.

[c] A scale from +3 (greatest positive impact) to -3 (greatest negative impact) is used.

Backcountry Skiers

When backcountry skiers select an area to ski, wilderness setting is the most important factor, followed by terrain and accommodations. Proximity to their residence, advertising, return visits and a desire to visit B.C. have little influence. When Canadians and Americans are separated, the ordering of the most important factors did not change. A summary of the replies to these three questions is found in Tables 3.9 and 3.10.

The most important features of a backcountry ski experience are the natural surroundings, untracked snow, relaxation, adventure, long runs, above treeline skiing and improved fitness. Above treeline skiing and long runs are preferred over tree skiing and skiing the steeps. The majestic scenery is mainly visible from the glaciers and open bowls. Again, separating the Americans and Canadians produced no significant differences. The ideal backcountry run entails a long untracked powder run with most of the skiing above treeline, but finishing off in the trees.

Backcountry skiers felt strongly about impacts other users had on the quality of their experience. Responses to the questions concerning perceived conflicts were of the same format as for the heli-skiing survey (-3 to +3). Snowmobiling led the way with the highest negative impact on backcountry skiers (-2.5), followed by logging (-2.1) and heli-skiing (-1.8). Wildlife conservation produced a positive impact (+2.2). Slight differences were evident between the Americans and Canadians.

Table 3.9: Factors Influencing the Backcountry Skiers' Choice of Area and the Importance of Specific Trip Features[a]

Factors Influencing Choice of Site[b]	**All (107)**	**Canada (46)**	**U.S.A. (49)**
Wilderness	4.8	4.8	4.8
Terrain	4.5	4.4	4.6
Accommodation	3.9	3.8	4.0
Recommendation	3.0	2.8	3.0
B.C.	2.8	2.4	3.0
Return	2.6	3.3	2.5
Advertising	2.1	2.0	2.2
Proximity	1.8	2.4	1.8
Importance of Trip Features[b]	**(123)**	**(52)**	**(56)**
Natural	4.9	4.8	4.9
Untracked	4.7	4.7	4.7
Relax	4.5	4.5	4.5
Adventure	4.3	4.3	4.5
Long Runs	4.2	4.2	4.3
Above Treeline	4.1	4.2	4.1
Shape	4.1	4.1	4.1
Small Groups	3.7	3.6	3.7
Steep	3.5	3.4	3.7
Tree Skiing	3.4	3.4	3.3
Wildlife	3.4	3.7	3.1
Social	3.3	3.5	3.2
Risk	2.6	2.6	2.9

[a] Number of respondents are in parentheses.

[b] A scale from 0 (not at all important) to 5 (extremely important) is used.

Table 3.10: Backcountry Skiers' Perceived Conflict with Competing Uses[a]

Perceived Conflict with Competing Uses[b]	All (124)	Canada (54)	U.S.A. (55)
Snowmobiling	-2.5	-2.5	-2.5
Logging	-2.1	-2.3	-1.9
Heli-Skiing	-1.8	-1.7	-2.0
Wildlife Conservation	2.2	2.4	2.2

[a] Number of respondents are in parentheses.
[b] A scale from +3 (greatest positive impact) to -3 (greatest negative impact) is used.

Snowmobilers

The most desirable attributes for snowmobilers were scenery, snow conditions, alpine areas, untracked snow, access, terrain and wilderness. Commercial snowmobiling and hunting were least desirable. Interestingly, alpine snowmobiling was found to be more desirable than forested snowmobiling. This is in part why conflicts between skiers and snowmobilers will continue unless the lands can be exclusively allocated amongst competing users.

Snowmobilers were asked about conflict in a different manner than were the skiers because the B.C Snowmobiling Federation did not approve of the initial proposed format. Subjects were asked to rank 7 management options from most to least important. Management options of "no heli-skiing", "no backcountry skiing" and "no logging" were least important; however, the management option of "more logging roads" was most important. This is an expected result, as an extended logging road network would provide greater access for the snowmobilers. A "No user fee" management option was next in order of importance. Tables 3.11 and 3.12 provide a summary of results for the desirable

attributes and the perception of conflict, respectively.

Table 3.11: Significance of Snowmobile Trip Features

Desirable Features	Neutral Features	Undesirable Features
Closeness to Home	Wildlife Viewing	Hunting Opportunities
Challenging (terrain)	Amenities	Commercial Snowmobiling
Scenic Views	Logging Roads	
Solitude	Groomed Trails	
Wilderness Experience		
Variety of Terrain		
Steep Slopes		
Snow Conditions		
Access to Snowmobile Area		
Open Alpine Areas		
Unploughed Roads		
Untracked Snow		
Remote from Civilisation		

Table 3.12: Snowmobiler Management Options

Management Option/Statement	Mean Rank of Importance on a Scale of 1-7 (1 is most important)
More Logging Roads Developed	3.5 (30% ranked this a 1)
No User Fee Charged	3.6 (30% ranked this a 1)
More Wildlife Visible	3.7
More Wildlife Habitat Protected	3.8
No Logging Permitted	4.3
No Heli-skiing Permitted	4.6
No Backcountry Skiing Permitted	4.6

Heli-Skiing, Backcountry Skiing and Snowmobiling

In the selection of a recreation area, the most significant difference between heli-skiers and backcountry skiers was the desire to be in a wilderness setting. On a scale of 0 (least important) to 5 (most important), the average heli-ski score was 3.9 compared to an average backcountry score of 4.8. A friend's or acquaintance's recommendation or endorsement of an area had statistically greater importance for a heli-skier (3.5) than a backcountry skier (3.0). Table 3.13 presents a more complete comparison of the choices.

Table 3.13: Backcountry Versus Heli-Skiing in Factors Affecting the Choice of Area[a]

Factors Affecting Choice of Site[b]	**Heli-Skiing (114)**	**Backcountry Skiing (107)**
Guides	4.6	N/A
Safety	4.6	N/A
Terrain	4.4	4.5
Accommodation	3.9	3.9
Wilderness	3.9	4.8
Group Sizes	3.7	N/A
Price	3.6	N/A
Recommendation	3.5	3.0
B.C	2.6	2.8
Business	2.3	N/A
Advertizing	2.1	2.1
Proximity	1.4	1.8
Return	N/A	2.6

[a] Number of respondents are in parentheses.
[b] A scale of 0 (not at all important) to 5 (extremely important) is used.

The most important features of the heli-ski experience, in descending order of

importance, were skiing untracked snow, enjoying a natural setting, relaxing, and skiing steep slopes. The most important features for backcountry skiers, in descending order of importance, were enjoying a natural setting, skiing untracked snow, relaxing, pursuing adventure, skiing long runs, skiing above treeline, and improving physical fitness. Backcountry skiers stressed significantly more than heli-skiers the importance of the following factors: a natural setting, relaxation, a sense of adventure, improved fitness, skiing in small groups, and the opportunity to view wildlife. Skiing steep slopes was significantly more important to heli-skiers. The features for the heli-skiers and backcountry skiers are summarized in Table 3.14. It was difficult to compare the skiing results with the snowmobiling results because of different questionnaire formats. However, it was evident that the snowmobilers stressed many of the same attributes that the skiers stressed. For instance, untracked snow, wilderness environment, alpine areas and terrain were all highly desirable attributes.

Table 3.14: Backcountry versus Heli-Skiing in Significance of Trip Features[a]

FEATURES[b]	Heli-Skiing (116-128)	Backcountry Skiing (123)
Untracked Snow	4.9	4.7
Natural Setting	4.2	4.9
Relaxing	4.0	4.5
Steep Slopes	4.0	3.5
Long Runs	3.8	4.2
Above Treeline	3.7	4.1
Tree Skiing	3.5	3.4
Sense of Adventure	3.2	4.3
Shape/Fitness	3.2	4.1
Socializing	2.9	3.3
Flying in a Heli	2.9	N/A
Small Groups	2.8	3.7
Remoteness of lodge	2.3	N/A
Viewing Wildlife	2.2	3.4
Exposure to Risk	2.2	2.6
Access to tel.,fax	2.2	N/A

[a] Number of respondents are in parentheses. A range occurs because some respondents skipped some questions.
[b] A scale of 0 (not at all important) to 5 (extremely important) is used.

A backcountry skier's quality of experience was most threatened by snowmobiling, then by logging and finally by heli-skiing. Snowmobiling and logging detracted equally from the quality of a heli-skier's experience; however, backcountry skiing was viewed as having a neutral to slightly positive impact. The snowmobilers' responses to perceived conflict showed that management options of excluding heli-skiers, backcountry skiers or

logging were definitely a low priority. Table 3.15 below shows the extent of perceived conflict.

Table 3.15: Heli-Skiers' and Backcountry Skiers' Perceived Conflict with Competing Land Uses[a]

IMPACT OF	IMPACT ON	
	Heli-Skiing	**Backcountry Skiing**
Heli-Skiing	-----	-1.8
Backcountry Skiing	0.5	-----
Snowmobiling	-1.1	-2.5
Logging	-1.1	-2.1

[a] A scale from +3 (greatest positive impact) to -3 (greatest negative impact) is used.

Over time, with no provision for exclusive land use, backcountry skiing will tend to be displaced by heli-skiing and snowmobiling in regions where use conflicts occur. Eventually heli-skiers will also be displaced. Ultimately, with no exclusive land use rights, timber harvesting and snowmobiling will be the dominant and possibly only remaining activities. Both skiing activities could tolerate selective logging in areas. Selective logging can actually extend heli-ski runs and reduce, if not eliminate, aesthetic scarring.

CHAPTER 4

THE TRAVEL COST MODEL: RESULTS FOR THE REVELSTOKE/GOLDEN REGION

4.1 Estimation of Travel Cost Models

In this chapter, a travel cost model is estimated for the three winter recreation activities described in the previous chapter. Estimates of economic surpluses are provided for each of the activities and these are subsequently used in a land allocation, linear programming model. However, we begin reviewing estimation of travel cost models.

4.1.1 Functional Form

The choice of functional form to be used in a TCM is somewhat of an arbitrary process, as theory provides little guidance in this area (Kealy and Bishop 1986). The linear, semilog, log-log, and quadratic models have been used in past non-market valuation studies (Luzar, Hotvedt and Gan 1992). Semilog models seem to be commonly used as they statistically fit the data well (Adamowicz, Fletcher and Graham-Tomasi 1989). Adamowicz, Fletcher and Graham-Tomasi (1989) suggest that "if two forms are relatively similar regarding overall fit (judged via t- and F-statistics), but one has a smaller variance of the associated welfare measure, that form should be selected"(p.420). Both linear and semi-log functional forms are applied in this study.

4.1.2 Methods

The most recent literature advocates the use of maximum likelihood estimation (MLE) rather than ordinary least squares (OLS) to determine use values. These two methods are the only relevant choices for on-site surveys (Smith 1988). It is suggested that OLS estimation leads to biased coefficient estimates when truncated and/or censored data are encountered. Truncated data are common to on-site surveys since only information for users is obtained. Information on nonparticipants is not available through these types of surveys (Smith 1988). Censored data occurs when the dependent variable, the number of trips taken, can only take on nonnegative values. The OLS (normally distributed error term) implies that the dependent variable can range from $+\infty$ to $-\infty$. Without information on both nonusers and users for recreation data, it is recommended by Fletcher, Adamowicz and Graham-Tomasi (1990) to use maximum likelihood estimation. However, Balkan and Kahn (1988) found that there was little difference in estimated consumer surpluses between the two methods. When quality changes of recreational activities were valued, OLS and MLE gave significantly different results. Another study by Kealy and Bishop (1986) found that OLS produced a consumer surplus 3.5 times larger than MLE. Maximum likelihood estimation requires an assumption to be made regarding the distribution of the errors. Since both methods are imperfect, ordinary least squares is used in this study because of its simplicity. Residual plots were performed for each activity and the errors characterized a normal distribution, supporting the use of OLS.

4.1.3 Biases

In the TCM, time costs, multi-destination trips and substitute difficulties may occur. Failure to include cost of travel time can result in the underestimation of site value (Gunton 1991). Recreationists include travel time and on-site time in the decision for recreational consumption as there is an associated opportunity cost. Clearly, the value of time is at most equal to the recreationist's wage rate and at minimum zero. Cesario (1976) suggests that time costs should be between a quarter to a half of wage rates based on recreational travel time; as well, he indicates that the shadow price of travel time will likely be much lower than the wage rate. There is no convincing evidence that households consider work travel time and recreational travel time as equivalent commodities (Johansson 1987). There is a great deal of uncertainty when including time. It is evident that including time will increase the estimated value of the recreational site, but it is not clear whether including or excluding time results in a model that is closer to the true behavioral model (Fletcher, Adamowicz and Graham-Tomasi 1990). Information on the types of travel time (which will likely result in different opportunity costs of time) is necessary before time is included in the model. For instance, an individual vacationing on a paid holiday or a weekend will likely perceive the value of time differently than an individual taking unpaid time off work. The difficulty with including time value is the level of subjectivity involved in determining its value. Time is not accounted for in this study.

Substitute sites can create another problem, namely, site value overestimation, if they are not properly represented in the model (Seller 1985). Rosenthal (1987) found that

travel cost models yield higher per person consumer surplus estimates when substitute prices were omitted. If substitutes exist and are not considered, missing variable bias will exist (Seller 1985). One way around this problem is to develop a regional study that will estimate benefits for a group of sites or to include a substitute variable in the demand equation.

Multidestination trips produce the expected difficulty of efficiently allocating expenses. Removing these observations from the analysis is the easiest way to resolve the problem, as long as the number of multidestination observations are small. Another potential bias is the assumption that the independent travel cost variable is assumed to be exogenous, when it actually may be endogenous. A factor in determining where a recreationist resides may be the proximity to recreational opportunities (Parsons 1991).

4.1.4 Regression Error

According to Bockstael and Strand (1987), there are three main types of regression errors common to recreational demand models: omitted variables, human indetermination and measurement error. Omitted variables refer to factors not included in, but influential for, the determination of recreational demand. The factor could be an unmeasured or neglected socioeconomic variable. Inherent randomness in human preferences describes human unpredictability. An example of measurement error is the imperfect recall of a recreationist's travel expenses. The consumer surplus will vary depending on the error assumption. Random preferences or measurement error would likely lead to a smaller consumer surplus than omission of a variable (Bockstael and Strand 1987). If all

regression error is assumed to be the result of omitted variables and either human unpredictability or measurement error is present, then the possibility of upward bias exists. A reduction in the error variance in the regression and information on the source of error can improve consumer surplus estimates (Bockstael and Strand 1987).

4.2 Estimates of Winter Recreation Demand in Revelstoke/Golden

Two functional forms (linear and semi-log) were examined for the three recreational demands: heli-skiing, backcountry skiing and snowmobiling. For each functional form, two variations of the regression model were used--one with "user-days-recreating-in-the-relevant-activity-per-visit" as the dependent variable, the other with "days-spent-in-the-area" as the dependent variable. The dependent variables were regressed on price and several socioeconomic variables--income, age, education, experience and household size. While price was forced into the regression, the other variables were included in a stepwise fashion (White *et al.* 1990, p.61). The semilog model with visit length as the dependent variable was the model of choice for each activity because of its slightly superior statistical fit across activities. The semi-log models typically fit the data best according to the F-statistics, t-statistics, R^2 and variances. Table 4.1 compares results from each activity's semi-log model (visit length as the dependent variable). Regression results for all functional forms are found in Tables 4.2, 4.3 and 4.4 for heli-skiing, backcountry skiing and snowmobiling, respectively. The income variable used for skiing was the midpoint of the income category selected by the respondent, except for the highest income category which was unbound. The other six

category midpoints were graphed and the projected range for category seven was between $200,000 and $300,000. Because of the wealth involved in this activity, $270,000 was subjectively chosen for the seventh category. The heli-ski industry is much more influenced by the seventh income category than is the commercial backcountry ski industry.

Table 4.1: Regression Results for Semi-log Functional Forms and Visit Length as the Dependent Variable[a]

Explanatory Variables	Helicopter Skiing	Commercial Backcountry Skiing	Snowmobiling
Price[b]	-0.00102 (-15.18)	-0.00045 (-5.23)	-0.000514 (-0.88)
Income	0.00081 (9.64)		0.00514 (1.81)
Experience	-0.00608 (-8.59)	0.00318 (3.43)	
Age	0.00565 (4.73)	-0.00759 (-3.71)	0.01029 (2.19)
Education		0.02044 (2.42)	0.0776 (2.62)
Constant	2.573 (79.52)	1.9662 (12.04)	-0.5324 (-1.18)
R^2 R^2 adjusted	0.89 0.88	0.41 0.38	0.12 0.08
F-statistic	143.23	14.80	3.15
Error Sum of Squares	69.91	3.06	24.10
Error Mean Square	0.98	0.04	0.26
Consumer Surplus[c]	$980/day	$2,212 per day	$1,946/day

[a] t-statistics are in parentheses.
[b] Price as calculated in Chapter 3.
[c] Consumer surplus is estimated as the area under the estimated demand function using equation (4.2).

For each of the three groups, the final sample size used in the Travel Cost analysis was smaller than the original number of responses. This occurred because observations with inconsistencies (e.g., number of trips to the Revelstoke/Golden region exceeded the total number of trips), too many unanswered questions and outliers (e.g.,

expenditures too high or low) were eliminated.

Consumer surpluses were calculated for both linear and semi-log models under the assumption of omitted variables, as follows (Adamowicz, Fletcher and Graham-Tomasi 1989):

$$\textit{linear} \qquad CS = Q^2/(-2\beta) \qquad (4.1)$$

$$\textit{semi}\text{-log} \qquad CS = Q/(-\beta) \qquad (4.2)$$

where Q is the actual length of stay or the number of days spent recreating in the specific activity, β is the price coefficient from the estimated travel cost demand, and CS is consumer surplus.

Heli-Skiing

The helicopter skiing TCM results involved price, income, experience and age as significant variables. The coefficient on experience was negative while age was positive. The spending of money does not rely solely on income earned. A factor that plays a large role in quantity of disposable income would be the level of a respondent's financial security (e.g., savings, investments and mortgage payments). Age is an indicator of financial security. Heli-skiing is mainly an activity for the financially secure because of the expense involved. Income also had a significantly positive effect on the length of stay. The physical requirements of heli-skiing are not nearly as great as those for backcountry skiing. The more experienced skiers were inclined to opt for shorter heli-ski

vacations than those with less experience. Experience was measured by the average number of days the respondent engaged in downhill skiing per year.

For the semi-log function, the daily consumer surplus for the heli-skiers was $980. However, all the models were significant, with large differences in calculated consumer surpluses. Table 4.2 summarizes the regression results.

Table 4.2: Regression Results for Helicopter Skiing[a]

Explanatory Variables	Dependent Variable SKI DAYS		Dependent Variable VISIT LENGTH	
	Linear	**Semi-log**	**Linear**	**Semi-log**
Price	-0.01095 (-21.32)	-0.00076 (-31.69)	-0.0106 (-8.52)	-0.00102 (-15.18)
Income	0.008923 (10.22)		0.00745 (4.61)	0.00081 (9.64)
Experience	-0.07766 (-14.65)		-0.06512 (-8.50)	-0.00608 (-8.59)
Age	0.11170 (10.37)		0.051534 (3.11)	0.00565 (4.73)
Constant	12.8 (23.24)	2.5408 (134)	14.355 (22.49)	2.573 (79.52)
R^2 R^2 adjusted	0.92 0.92	0.93 0.93	0.80 0.79	0.89 0.88
F-statistic	211	1004.19	70.24	143.23
Error Sum of Squares	68.97	69.83	46.74	69.91
Error Mean Square	0.97	0.94	0.66	0.98
Consumer Surplus	$328/day	$1,316 per day	$420/day	$980/day

[a] t-statistics are in parentheses.

Heteroskedasticity was apparent in a residual plot from the initial OLS and was confirmed by the Goldfeld-Quandt procedure. Heteroskedasticity was corrected by using transformed data via the GLS procedure in SHAZAM (White *et al.* 1990). The data was transformed by the use of the residuals squared from the original OLS as the Omega variance matrix. Multicollinearity was examined for all variables using pairwise and auxiliary regressions and was found not to be a problem.

Due to format and distribution errors and the need for two languages, six variations of the survey were distributed. Many of the Europeans responded to the German surveys as did some Canadians. Unfortunately some of the questions were not properly translated. For instance, the English survey asked about length of stay in the heli-ski area, but the German survey asked about the length of the respondent's ski holiday. The Europeans likely included travel time in their response. To account for this discrepancy, days were subtracted according to the difference between vacation days and skiing days. American responses to the income and expense questions were assumed to be in U.S. dollars unless otherwise stated. The U.S. responses were converted to Canadian currency using a divisor of 0.75. The Europeans were assumed to have responded in Canadian dollars unless otherwise indicated.

The survey design certainly had its weaknesses. Too much was being attempted for one survey. This is evident in some of the comments returned by respondents. Respondents were displeased with questions relating to wildlife and budget allocation, as well as the contingent valuation questions. Unfortunately, much of the information necessary for the TCM component followed these questions.

Backcountry Skiing

Price and age were significant negative variables in the TCM for commercial backcountry skiing; that is, days spent skiing varied inversely with price and age. The response to price change was obvious. It is likely that because of the physically demanding nature of this sport, age had an inverse relation to the length of the ski vacation. Education and experience (as measured by the historic average days per year spent in the activity) were significant positive variables. The more experienced backcountry skiers travelled more efficiently and skied further and longer. As the number of years of formal education increased so did the length of the ski vacation. Income was not a significant factor in the models. This may be a result of the rather limited length of stay and the above average incomes earned by those involved in this activity.

Consumer surplus was estimated to be $2,212 per day, but large differences in consumer surplus are apparent between the semi-log and linear functional forms. Similar to heli-skiing, consumer surplus from the linear model was significantly larger than from the semi-log model. Both models were statistically significant. Results are summarized in Table 4.3.

Table 4.3: Regression Results for Commercial Backcountry Skiing[a]

Explanatory Variables	Dependent Variable SKI DAYS		Dependent Variable VISIT LENGTH	
	Linear	Semi-log	Linear	Semi-log
Price	-0.00177 (-3.48)	-0.00033 (-4.73)	-0.00251 (-4.28)	-0.00045 (-5.23)
Income				
Experience	0.0217 (3.82)	0.00217 (2.15)	0.02477 (3.94)	0.00318 (3.43)
Age	-0.03385 (-2.66)	-0.00920 (-3.69)	-0.04488 (-3.24)	-0.00759 (-3.71)
Education			0.11004 (1.92)	0.02044 (2.42)
Constant	7.86 (14.23)	2.2095 (23.09)	7.374 (6.66)	1.9662 (12.04)
R^2 R^2 adjusted	0.34 0.31	0.40 0.38	0.36 0.33	0.41 0.38
F-statistic	14.62	14.46	12.12	14.80
Error Sum of Squares	123.30	3.24	140.50	3.06
Error Mean Square	1.43	0.04	1.65	0.04
Consumer Surplus	$1,828 per day	$2,994 per day	$1,478 per day	$2,212 per day

[a] t-statistics are in parentheses.

Heteroskedasticity was tested by the residual plots and the Goldfeld-Quandt test, and was found not to be a problem. Pairwise correlations and auxiliary regressions indicated multicollinearity was not a problem.

Problems were evident with the commercial backcountry skiing survey design. Survey respondents expressed frustration with the survey length and with some of the

questions. Only English surveys were distributed and all the surveys were identical. Also, the contingent valuation question was not useful because of its inherent bias. This question biased the respondent by providing an estimate of what recreationists in another activity pay the government.

Snowmobiling

For snowmobiling, price was negative in all models, but insignificant in three. Price remained in the model because of its theoretical significance. Coefficients on income, age and education were all positive and significant. As age and/or education increased so did the length of vacation. Unlike with the skiing models, education was significant in the snowmobiling model. Age had a similar effect on snowmobiling as on heli-skiing. This might have to do with financial security and the availability of leisure time. About 33% of respondents live within the R/G region. Local respondents are excluded from the TCM analysis as they have small travel distances and costs, conditions under which the TCM does not work well.

Heteroskedasticity and multicollinearity were not a problem in the snowmobiling model. All models were statistically significant. The consumer surplus for the linear model with "days snowmobiling" as the dependent variable was estimated to be $323 per day. Similar to the skiers' consumer surpluses, the snowmobilers' consumer surpluses calculated from the semi-log functional form were much greater than for the linear functional form.

Table 4.4: Regression Results for Snowmobiling[a]

Explanatory Variables	Dependent Variable Days Snowmobiling		Dependent Variable Visit Length	
	Linear	**Semi-log**	**Linear**	**Semi-log**
Price	-0.00376 (-2.28)	-0.00096 (-1.91)	-0.00282 (-1.45)	-0.00051 (-0.88)
Income		0.00809 (2.67)		0.00523 (1.81)
Age	0.02697 (1.65)		0.03478 (2.20)	0.01029 (2.19)
Education	0.2493 (2.56)	0.0776 (2.62)	0.221 (2.28)	0.06548 (2.27)
Constant	-1.001 (-0.67)	-0.5108 (-1.26)	-0.8665 (-0.58)	-0.5324 (-1.18)
R^2 R^2 adjusted	0.11 0.08	0.17 0.14	0.09 0.06	0.12 0.08
F-statistic	3.94	6.39	3.20	3.15
Error Sum of Squares	283.50	27.23	276.98	24.10
Error Mean Square	3.05	0.29	2.98	0.26
Consumer Surplus	$323/day	$1041/day	$479/day	$1946/day

[a] t-statistics are in parentheses.

4.3 Linear Programming Model for Allocating Winter Recreation Land Use in the Revelstoke/Golden Region[2]

In this section, a simple linear program will be used to find an optimal allocation of conflicting land uses. The resource scarcity of concern is prime terrain for helicopter skiing, backcountry skiing and snowmobiling. The problem must be formulated in a way that allows the computer to recommend which group should have access to prime terrain. For the LP to work, the program must be able to optimize the result of an objective function. Minimizing the impact or damage from each activity is a possible objective function; however, the function of primary concern in this analysis is the maximization of social benefits derived from winter recreation activities. Since the constraints and objective function are based on the number of participants enjoying each activity, the optimal allocation will be expressed in terms of the number of individuals per week per activity.

The linear programming formulation is as follows:

Maximize $C_1X_1 + C_2X_2 + C_3X_3$

Subject to:

1.	$0.87X_1 +$	$1.5X_2 +$	$2X_3$	$\leq$	30
2.	$0.87X_1$			$\leq$	30
3.		$1.5X_2$		$\leq$	30
4.			$2X_3$	$\leq$	15
5.	X_1			$\leq$	90
6.		X_2		$\leq$	20
7.			X_3	$\leq$	45
8,9,10. and	X_1, X_2, X_3	$\geq$	0.		

where C_i represents the consumer surplus of activity i (i=heli-skiing, backcountry skiing,

[2]The linear program used in this study was developed in conjunction with Michael Walsh.

snowmobiling), and X_i represents the number of individuals partaking in activity i. The number of heli-skiers, backcountry skiers and snowmobilers is represented by X_1, X_2 and X_3, respectively.

Objective Function

The model will attempt to determine the best utilization of prime terrain by maximizing net social benefit, subject to constraints outlined below. Social benefit is measured by the consumer surpluses in each of the activities.

Constraints

The LP model contains 10 constraints, three of which are non-negativity constraints. The focus of the constraints is on the two limiting factors, which are the amount of prime terrain available and the number of skiers and snowmobilers that an area can support in a given week. Conflict occurs because the prime areas for each activity overlap. As indicated earlier, the entire backcountry operating area is within the heli-ski area; thus, there is conflict between these two activities.

The first constraint describes the situation that arises when all three groups attempt to access the same area. The principle used is that if some portion of the total conflict area is being utilized for an activity, it is unavailable for the other groups for the remainder of the week. The size of terrain to be allocated is 30 square kilometres. This is the stated amount of skiable terrain that the Selkirk Mountain Experience backcountry ski operator considers prime. This area constitutes the entire zone of conflict among

winter recreation activities. The coefficients for each variable are the amount of terrain each activity requires per person. These coefficients are estimates derived from information obtained from the snowmobiling survey and a separate commercial operator survey (Cooper 1994; Kliskey1993). The next three constraints (2,3 and 4) deal with the amount of terrain considered prime for each activity. Heli-skiers and backcountry skiers both consider 100% of the skiable terrain to be prime. Snowmobilers likely would not be able to snowmobile on much of the skiable terrain, so it is assumed that 50% of the skiers' prime terrain can be classified as prime for snowmobilers (hence 15 km^2 is the area considered premium terrain by snowmobilers).

Constraints 5, 6 and 7 are based on the number of clients or participants that each of the three activities can support in a given week, ignoring the terrain limitations addressed by the previous three constraints. Again, participation numbers were derived from a separate commercial operator survey (Cooper 1994) and the snowmobile survey (Appendix C). Total participants per week is calculated by multiplying groups per week by the size of the groups. Table 4.5 summarizes the assumptions made to construct the constraints.

Table 4.5: LP Assumptions

	Heli-Skiing	Backcountry Skiing	Snowmobiling
Consumer Surplus[a]	$980	$2,212	$1,946
Available Terrain	30 km^2	30 km^2	30 km^2
Premium Terrain	100%	100%	50%
Max. Group Size	15	20	9
Max. Groups per Week	6	1	5
Prime Area per Client per Day	0.87 km^2	1.5 km^2	2 km^2

[a] Using semi-log functional form.

Optimization Results

When the calculated consumer surpluses from the same functional forms across activities were used, the allocation decision favoured backcountry skiing. While the value of the optimal solution varies according to the assumptions employed, the decision to allocate all the conflict zone to the backcountry skiers turns out to be robust. Table 4.6 summarizes the optimization results.

Table 4.6: Optimal Allocation of Winter Recreation Terrain, Revelstoke/Golden Region, Participants per Week

	Heli-Skiers	Backcountry Skiers	Snowmobilers	Objective Function Value
Number of Participants	0	20	0	
Consumer Surplus(CS)	$980	$2,212	$1,946	$44,240 daily
Allowable Min CS	0	$1,690	0	
Allowable Max CS	$1,283	infinite	$2,949	

The allowable minimum and allowable maximum in Table 5.7 indicate how much the consumer surplus can vary before altering the optimal solution. Shadow prices obtained from the dual define the value increase in the objective function for each unit increase in the constraint. The shadow price for an extra km^2 of land was calculated to be $1,475 per day. The shadow prices can have important implications on forestry decisions. If the value of harvesting timber by means of clearcutting in this km^2 does not equal the shadow price for recreation then preserving this area from clearcutting would be an obvious choice. Emphasis should not be placed on the results, but rather the application. Linear programming can be a useful tool in resolving multiple use conflicts.

CHAPTER 5

CONCLUSIONS

Consumer surplus for each of the three activities was calculated using travel cost models. Large variations in consumer surplus between functional forms were found. The choice of functional form can significantly effect benefit estimates. The calculated consumer surpluses were $980, $2,212 and $1,946 per day for heli-skiing, commercial backcountry skiing and snowmobiling, respectively, when the semi-log functional form was used, and $420, $1,478 and $479 per day when the linear functional form was used. The semi-log functional form consistently resulted in lower calculated consumer surplus values. Theory provides little guidance in the selection of functional form. The price variable was insignificant only in the snowmobiler model. The price coefficients for all three activities were near zero, and that could result in instabilities as shown by Adamowicz, Fletcher and Graham-Tomasi (1989).

There appears to be great potential for rent capture in heli-skiing, commercial backcountry skiing and snowmobiling. Over 90% of the heli-ski market consists of foreigners, whereas the majority of commercial backcountry skiers and snowmobilers are Canadian. Canadian content should be an important consideration when dealing with public land use issues. A more appropriate measure for maximizing the net social benefit in British Columbia might possibly be to focus on producer surplus rather than consumer surplus when considering heli-skiing. It is likely that the use of producer surplus values would reinforce the earlier result of allocating territory to commercial backcountry skiers.

Multiple use management of forests in British Columbia is at an elementary stage. This is especially apparent in the Revelstoke/Golden region where conflict amongst uses, specifically recreation, timber harvesting and wildlife, is evident and growing. Markets alone are inadequate to make efficient allocation choices when dealing with non-market and market uses of public resources. The common goal of multiple use management of public forestland should be to maximize the public benefit. One such benefit of increasing importance is recreation. Helicopter skiing, commercial backcountry skiing, snowmobiling and clearcut logging are incompatible activities on shared land. Exclusive rights for land use seems to be a necessity in the Revelstoke/Golden region of British Columbia.

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APPENDIX A: Heli-skier Survey

The University of British Columbia

SURVEY

HELICOPTER SKIING IN BRITISH COLUMBIA

This survey is being conducted by the University of British Columbia Resource Management Science Department and the Forest Economics and Policy Analysis Research Unit. The purpose of the survey is to:

- identify interactions among different resource-based activities in the Revelstoke/Golden area, including heli-skiing, backcountry skiing, snowmobiling, logging and wildlife conservation
- determine the extent to which different uses are compatible or conflicting
- evaluate the actual and potential economic contributions of these activities to the regional and provincial economies.

Additional questions are asked about your background in order to allow the researchers to determine the representativeness of the sample as well as to allow for generalizations to be made about the participants in different activities.

Please answer all questions to the best of your ability.
Seal the completed survey in the envelope provided
and return it to the heli-ski operator.

ANSWERS PROVIDED WILL BE KEPT IN STRICT CONFIDENCE

HELICOPTER SKIING IN BRITISH COLUMBIA

SECTION 1: BACKGROUND

In this first section, we would like to find out a little about your skiing experience.

1.How many years have you been skiing?

[ ] Years

2. What is the average number of days which you downhill ski each year (excluding heli-skiing)?

[ ] Days per Year

3. How would you describe your skiing ability?

BEGINNER		INTERMEDIATE		ADVANCED	

4. If you have been heli-skiing before, where have you gone on previous trips? And how many times have you heli-skied in each location?

LOCATION	# OF TRIPS
British Columbia	
Elsewhere in Canada	

LOCATION	# OF TRIPS
United States	
Europe	

LOCATION	# OF TRIPS
New Zealand	
Other	

5. If you have been helicopter skiing in BRITISH COLUMBIA on previous occasions, which heli-skiing operator(s) have you skied with IN THE PAST? And how many times have you visited each area?

OPERATOR	# OF TRIPS
CMH Adamants	
CMH Bobbie Burns	
CMH Bugaboos	
CMH Cariboos	
CMH Galena	
CMH Gothics	

OPERATOR	# OF TRIPS
CMH Monashees	
CMH Revelstoke	
CMH Valemount	
Great Canadian Heliskiing	
Kootenay Heliskiing	
Mike Wiegele Heliskiing	

OPERATOR	# OF TRIPS
Purcell Helicopter Skiing	
R. K. HeliSkiing	
Selkirk Tangiers HeliSkiing	
Tyax HeliSkiing	
Tyax Lodge HeliSkiing	
Whistler HeliSkiing	

6. How important were the following factors in your choice of THIS AREA on this trip?

FACTORS	Extremely Important				Neutral	Not At All Important
Type of accommodations	5	4	3	2	1	0
Type of terrain	5	4	3	2	1	0
Safety record of the operator	5	4	3	2	1	0
Size of ski groups	5	4	3	2	1	0
Price of the package	5	4	3	2	1	0
Proximity to your place of residence	5	4	3	2	1	0
Desire to be in a wilderness setting	5	4	3	2	1	0
Desire to visit British Columbia	5	4	3	2	1	0
Access to business services (phone, fax)	5	4	3	2	1	0
Qualifications of the guides	5	4	3	2	1	0
Recommendation from friend	5	4	3	2	1	0
Advertising or promotional materials	5	4	3	2	1	0
Other (specify)	5	4	3	2	1	0

7. What was (is) the total length of your stay in this heli-ski area? And how many days did you (will you) actually heli-ski?

[ ] Days in the Area

[ ] Days Spent Heli-Skiing

8. How many vertical feet have you skied, or will you ski, during your stay?

[ ] '000 Vertical Feet

9. Besides heli-skiing, which of the following activities did you participate in during your stay in this area? And how many days did you spend on each activity?

ACTIVITY	# OF DAYS
Backcountry Skiing	
Snowmobiling	

ACTIVITY	# OF DAYS
Downhill Skiing	
Viewing Wildlife	

ACTIVITY	# OF DAYS
Cross Country Skiing	
Other (specify)	

SECTION 2: OPINION QUESTIONS

In this section, we would like to get your personal opinion about some of the features which affect the quality of your heli-ski experience in British Columbia.

1. How important to you are the following features of your heli-skiing vacation experience? *(Please circle the number that best represents the importance of each feature.)*

FEATURES	Extremely Important		Neutral		Not At All Important	
Skiing untracked powder	5	4	3	2	1	0
Skiing above the treeline	5	4	3	2	1	0
Skiing in the trees	5	4	3	2	1	0
Skiing steep slopes	5	4	3	2	1	0
Skiing long runs	5	4	3	2	1	0
Skiing in small group (less than 6 people)	5	4	3	2	1	0
Opportunity to view wildlife	5	4	3	2	1	0
Meeting people/socializing	5	4	3	2	1	0
Enjoying the natural setting	5	4	3	2	1	0
Opportunity to relax/get away from work	5	4	3	2	1	0
Improving your physical condition	5	4	3	2	1	0
Flying in a helicopter	5	4	3	2	1	0
Sense of adventure	5	4	3	2	1	0
Exposure to risk	5	4	3	2	1	0
Remoteness of the lodge (if applicable)	5	4	3	2	1	0
Access to telephones, faxes etc.	5	4	3	2	1	0
Other (specify)	5	4	3	2	1	0
Other (specify)	5	4	3	2	1	0

2. Conflicts over the use of heli-skiing areas by other users are bound to arise. To obtain some idea of your impressions about these conflicts, please circle the response which best describes your impresseion of the degree of impact the following activities have on the QUALITY of heli-skiing in this area. *(Please indicate whether an activity has POSITIVE impact, NEGATIVE impact or no impact (NEUTRAL).)*

	Positive Impact			Neutral			Negative Impact
Backcountry Skiing	+3	+2	+1	0	-1	-2	-3
Snowmobiling	+3	+2	+1	0	-1	-2	-3
Logging	+3	+2	+1	0	-1	-2	-3
Wildlife Conservation	+3	+2	+1	0	-1	-2	-3

3. Currently, heli-ski operators pay $4 per day for each skier in order for you to have the right to ski on government lands. If this amount was increased, what is the MAXIMUM amount you would be willing to pay PER DAY (in addition to your package price) to enable you to heli-ski in this region? *(Please check the amount you would be willing to pay per day.)*

Would not pay more (Would ski somewhere else.)		Would pay $25 - $50 per day	
Would pay less than $10 per day		Would pay $50 - $100 per day	
Would pay $10 - $25 per day		Would pay more than $100	

4. How much MORE would you be willing to pay per day if the following statements were true? *(Please circle the ADDITIONAL amount you would be willing to pay.)*

	ADDITIONAL AMOUNT WILLING TO PAY					
No logging is permitted in the heli-skiing area.	$0	<$10	$10-$25	$25-$50	$50-$100	> $100
No snowmobiling is permitted in the ski area.	$0	<$10	$10-$25	$25-$50	$50-$100	> $100
No backcountry skiing is permitted in the ski area.	$0	<$10	$10-$25	$25-$50	$50-$100	> $100
More wildlife is seen while skiing.	$0	<$10	$10-$25	$25-$50	$50-$100	> $100
More wildlife habitat is protected.	$0	<$10	$10-$25	$25-$50	$50-$100	> $100

5. We would like to have an idea about the importance of wildlife to heli-skiers. If you had control of the government's budget for wildlife preservation, how do you think the budget should be divided among the following categories in terms of percentage? (The numbers should add up to 100%.)

BENEFITS	% OF BUDGET
Preserve large mammals (deer, bear, etc.) and their habitats	%
Preserve small mammals (squirrels, marmots, etc.) and their habitats	%
Preserve birds and their habitats	%
Preserve other species and their habitats	%
TOTAL BUDGET	100%

6. Given a budget for the preservation of large mammals and their habitats, what percentage of the budget should be allocated to the following species. (The sum should add up to 100%.)

SPECIES	% OF BUDGET
Caribou (which requires unlogged forests)	%
Grizzly Bear	%
Elk/Deer/Moose (hunted species)	%
All other large mammals (e.g. goats, lynx, etc.)	%
TOTAL	100 %

SECTION 3: WHAT ARE YOUR EXPENSES?

We are interested in knowing how valuable heliskiing and other outdoor recreational activities are to those who participate in these activities and make use of publicly-owned land. In this section, we are attempting to determine how much you spent on these four categories of costs: (1) the purchase cost of your ski equipment , (2) transportation and living costs to get to the heli-ski area, (3) on-site costs incurred while heli-skiing, and (4) the expenses which you would have incurred had you stayed home.

How much did you spend on each of the following categories? Please provide the best answer you can, even if these are approximate estimates of the actual expenses you incurred.

1. What was your approximate purchase price of :

Ski equipment	$
Ski clothing	$
Other equipment related to heli-skiing	$

2. How often do you purchase the following items for downhill skiing?

•Ski equipment (skis, boots, poles) - Every [ ] Years

•Ski clothing - Every [ ] Years

3. Travel Expenses for Heli-Ski Vacation

Airfare	$
Ground transportation (e.g. car, bus, train)	$
Private automobile (gasoline, oil, reparis)	$
Accommodation (enroute to destination)	$
Food and beverages	$
Miscellaneous (e.g. film, souvenirs etc.	

2. While in the heli-skiing area, how much did you spend on each of the following items over and above the price you paid for your heli-ski package?

EXPENSES	SPENT IN HELI-SKI AREA
Accommodation	$
Food and beverages	$
Entertainment	$
Ski equipment rental or purchases	$
Souvenirs, camera supplies etc.	$
Purchase of extra vertical footage	$
Other (specify)	$

3. How much do you normally spend on food, beverages and entertainment (e.g. going out for the evening) when you are at home?

$ ____

4. Approximately how much will this heli-ski trip cost you INCLUDING EVERYTHING?

$ ____

SECTION 4: PERSONAL INFORMATION

In this section, we would like to find out more about people who go heli-skiing, so we would like to know more about you..

1. How old are you? ____

2. Are you: Male ☐ Female ☐

3. Including yourself, how many people are there in your household? ____

4. Are you:

	Single
	Married or Common-law
	Divorced

5. How many people came with you on this trip? [ ]

6. How many years of school have you completed? (Please circle the number of years.)

Grade School								High School				College/University				Graduate School				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21+

7. Near what city or town do you presently reside?

Town/City	Province/State	Country

8. What was the approximate gross (before tax) income of your household in 1992?

	Less than $20,000		$40,000 - $60,000		$100,000 - $140,000
	$20,000 - $40,000		$60,000 - $100,000		$140,000 - $180,000
					More than $180,000

SECTION 8: ADDITIONAL COMMENTS

If you have any comments about this survey or if you feel there are some issues which we have not addressed, please use the space on this page and on the back of this page to make your comments.

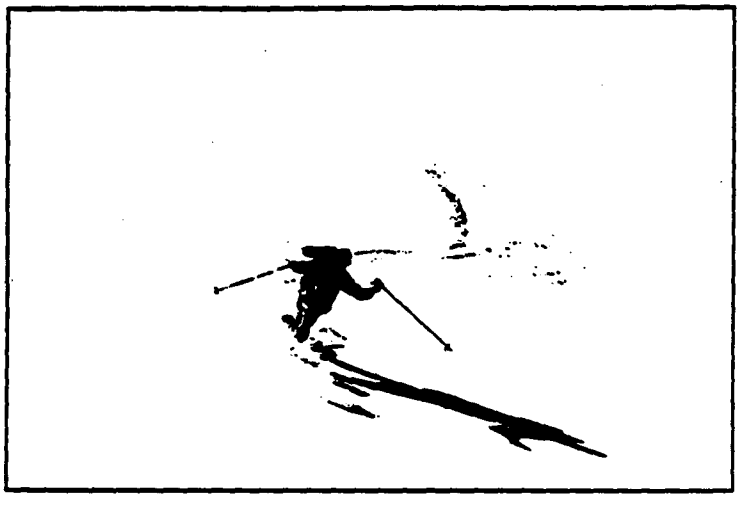
THANK YOU FOR TAKING THE TIME TO COMPLETE THIS SURVEY.

APPENDIX B: Commercial Backcountry Skier Survey

The University of British Columbia

SURVEY

COMMERCIAL BACKCOUNTRY SKIING IN BRITISH COLUMBIA



This survey is being conducted by the University of British Columbia Resource Management Science Department and the Forest Economics and Policy Analysis Research Unit. The purpose of the survey is to:

- identify interactions among different resource-based activities in the Revelstoke/Golden area, including backcountry skiing, heli-skiing, snowmobiling, logging and wildlife conservation
- determine the extent to which different uses are compatible or conflicting
- evaluate the actual and potential economic contributions of these activities to the regional and provincial economies.

Additional questions are asked about your background in order to allow the researchers to determine the representativeness of the sample as well as to allow for generalizations to be made about the participants in different activities.

Please answer all questions to the best of your ability. Seal the completed survey in the envelope provided and return it to the backcountry ski operator.

ANSWERS PROVIDED WILL BE KEPT IN STRICT CONFIDENCE

BACKCOUNTRY SKIING IN BRITISH COLUMBIA

SECTION 1: BACKGROUND

In this first section, we would like to find out a little about your backcountry skiing experience.

1. How many years have you been participating in backcountry skiing?

   [ ] Years

2. How would you describe your skiing ability? (Please mark choice.)

BEGINNER		INTERMEDIATE		ADVANCED	

3. What is the average number of days which you backcountry ski each year ?

   [ ] Days per Year

4. How many times per year do you go on a multi-day trip?

   [ ] Times per Year

5. What is the average length of a typical multi-day trip?

   [ ] Days

6. In the past, where have you gone on multi-day backcountry trips? And how many trips have you made to each location?

LOCATION	# OF TRIPS
Revelstoke/Golden area	
Elsewhere in B.C.	
Elsewhere in Canada	

LOCATION	# OF TRIPS
United States	
Europe	
Other (specify)	

7. How important were the following factors in your choice of THIS AREA on this trip?

FACTORS	Extremely Important			Neutral		Not At All Important
Return trip/ been here before	5	4	3	2	1	0
Type of accommodations available	5	4	3	2	1	0
Type of terrain	5	4	3	2	1	0
Proximity to your place of residence	5	4	3	2	1	0
Desire to be in a wilderness setting	5	4	3	2	1	0
Desire to visit British Columbia	5	4	3	2	1	0
Recommendation from friend	5	4	3	2	1	0
Advertising or promotional materials	5	4	3	2	1	0
Weather and snow conditions	5	4	3	2	1	0
Other (specify)	5	4	3	2	1	0

8. What was (is) the total length of your stay in the Revelstoke/Golden area?

[ ] Days

9. How many days were (will be) actually spent backcountry skiing?

[ ] Days

10. What percentage your skiing will be done OUTSIDE of Mount Revelstoke National Park and Glacier National Park?

[ ] %

10. On average, how many kilometres do you ski each day ?

[ ] Kilometres

11. How many vertical feet have you skied, or will you ski, during your stay?

[ ] '000 Vertical Feet

12. Besides backcountry skiing, which of the following activities did you participate in during your stay in this area? And how many days did you spend on each activity?

ACTIVITY	# OF DAYS
Heli-Skiing	
Snowmobiling	

ACTIVITY	# OF DAYS
Downhill Skiing	
Viewing Wildlife	

ACTIVITY	# OF DAYS
Cross Country Skiing	
Other (specify)	

SECTION 2: OPINION QUESTIONS

In this section, we would like to get your personal opinion about some of the features which affect the quality of your backcountry ski experience in British Columbia.

1. How important to you are the following features of your backcountry skiing vacation experience? *(Please circle the number that best represents the importance of each feature.)*

FEATURES	Extremely Important		Neutral			Not At All Important
Skiing untracked powder	5	4	3	2	1	0
Skiing above the treeline	5	4	3	2	1	0
Skiing in the trees	5	4	3	2	1	0
Skiing steep slopes	5	4	3	2	1	0
Skiing long runs	5	4	3	2	1	0
Skiing in a small group (less than 6 people)	5	4	3	2	1	0
Opportunity to view wildlife	5	4	3	2	1	0
Meeting people/socializing	5	4	3	2	1	0
Enjoying the natural setting	5	4	3	2	1	0
Opportunity to relax (get away from work)	5	4	3	2	1	0
Improving your physical condition	5	4	3	2	1	0
Sense of adventure	5	4	3	2	1	0
Exposure to risk	5	4	3	2	1	0
Access to telephones, faxes etc.	5	4	3	2	1	0
Other (specify)	5	4	3	2	1	0
Other (specify)	5	4	3	2	1	0

2. Conflicts over the use of wilderness areas by different recreational users are bound to arise. To obtain some idea of your impressions about these conflicts, please circle the response which best describes your impresseion of the degree of impact the following activities have on the QUALITY of backcountry skiing in this area. *(Please indicate whether an activity has POSITIVE impact, NEGATIVE impact or no impact (NEUTRAL).)*

	Positive Impact			Neutral			Negative Impact
Helicopter Skiing	+3	+2	+1	0	-1	-2	-3
Snowmobiling	+3	+2	+1	0	-1	-2	-3
Logging	+3	+2	+1	0	-1	-2	-3
Wildlife Conservation	+3	+2	+1	0	-1	-2	-3

3. Currently, some resource users pay a fee for the right to use government lands for commercial recreation purposes. For example, heli-ski operators pay $4 per day for each skier who uses their area. If a similar system was put in place to charge backcountry skiers a user fee, what is the MAXIMUM amount you would be willing to pay PER DAY to enable you to ski in this region? *(Please check the amount you would be willing to pay per day.)*

Would not pay (Would ski somewhere else.)		Willing to pay $25 - $50 per day	
Willing to pay less than $10 per day		Willing to pay $50 - $100 per day	
Willing to pay $10 - $25 per day		Willing to pay more than $100	

4. How much MORE would you be willing to pay per day if the following statements were true? *(Please circle the ADDITIONAL amount you would be willing to pay per day)*

	ADDITIONAL AMOUNT PER DAY					
No logging is permitted in the area.	$0	<$10	$10-$25	$25-$50	$50-$100	> $100
No snowmobiling is permitted in the area.	$0	<$10	$10-$25	$25-$50	$50-$100	> $100
No heli-skiing is permitted in the area.	$0	<$10	$10-$25	$25-$50	$50-$100	> $100
More wildlife is seen while skiing.	$0	<$10	$10-$25	$25-$50	$50-$100	> $100
More wildlife habitat is protected.	$0	<$10	$10-$25	$25-$50	$50-$100	> $100

5. We would like to have an idea about the importance of wildlife to backcountry skiers. If you had control of the government's budget for wildlife preservation, how do you think the budget should be divided among the following categories in terms of percentage? (The numbers should add up to 100%.)

BENEFITS	% OF BUDGET
Preserve large mammals (deer, bear, etc.) and their habitats	%
Preserve small mammals (squirrels, marmots, etc.) and their habitats	%
Preserve birds and their habitats	%
Preserve other species and their habitats	%
TOTAL BUDGET	100%

6. Given a budget for the preservation of large mammals and their habitats, what percentage of the budget should be allocated to the following species. (The sum should add up to 100%.)

SPECIES	% OF BUDGET
Caribou (which requires unlogged forests)	%
Grizzly Bear	%
Elk/Deer/Moose (hunted species)	%
All other large mammals (e.g. goats, lynx, etc.)	%
TOTAL	100 %

SECTION 3: WHAT ARE YOUR EXPENSES?

We are interested in knowing how valuable backcountry skiing and other outdoor recreational activities are to those who participate in these activities and make use of publicly-owned land. In this section, we are attempting to determine how much you spent on these four categories of costs: (1) the purchase cost of your ski equipment , (2) transportation and living costs to get to the ski area, (3) on-site costs incurred while backcountry skiing, and (4) the expenses which you would have incurred had you stayed home.

How much did you spend on each of the following categories? Please provide the best answer you can, even if these are approximate estimates of the actual expenses you incurred.

1. What was your approximate purchase price of :

Ski equipment	$
Ski clothing	$
Camping equipment (if applicable)	$
Other equipment e.g. pieps, probe etc.	

2. How often do you purchase the following items?

•Ski equipment (skis, boots, poles)	-	Every		Years
•Ski clothing	-	Every		Years
•Camping equipment	-	Every		Years
•Backcountry safety equipment	-	Every		Years

3. Travel Expenses for Backcountry Ski Vacation

Airfare	$
Ground transportation (e.g. car, bus, train)	$
Private automobile (gasoline, oil, repairs)	$
Accommodation (enroute to destination)	$
Food and beverages	$
Miscellaneous (e.g. film, souvenirs etc.)	

4. While in the backcountry skiing area, how much did you spend on each of the following items?

EXPENSES	SPENT IN SKI AREA
Accommodation	$
Food and beverages	$
Entertainment	$
Ski equipment rental or purchases	$
Souvenirs, camera supplies etc.	$
Other (specify)	

5. How much do you normally spend on food, beverages and entertainment (e.g. going out for the evening) when you are at home?

$ _____ Per Week

6. Approximately how much will this backcountry ski trip cost you INCLUDING EVERYTHING?

$ _____

SECTION 4: PERSONAL INFORMATION

In this section, we would like to find out more about people who go backcountry skiing.

1. How old are you? ☐

2. Are you: Male ☐ Female ☐

3. Including yourself, how many people are there in your household? ☐

4. Are you:

☐	Single
☐	Married or Common-law
☐	Divorced

5. How many people came with you on this trip? ☐

6. How many years of school have you completed? (Please circle the number of years.)

Grade School								High School				College/University				Graduate School				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21+

7. Near what city or town do you presently reside?

Town/City	Province/State	Country

8. What was the approximate gross (before tax) income of your household in 1992?

☐	Less than $20,000	☐	$40,000 - $60,000	☐	$100,000 - $140,000
☐	$20,000 - $40,000	☐	$60,000 - $100,000	☐	$140,000 - $180,000
				☐	More than $180,000

SECTION 8: ADDITIONAL COMMENTS

If you have any comments about this survey or if you feel there are some issues which we have not addressed, please use the space on this page and on the back of this page to make your comments.

THANK YOU FOR TAKING THE TIME TO COMPLETE THIS SURVEY.

APPENDIX C: Snowmobiler Survey

SECTION 1: BACKGROUND INFORMATION

1. How many years have you been snowmobiling? _____ year(s)

2. How would you describe your snowmobiling ability? (Please mark one)

   _____ beginner _____ intermediate _____ experienced

3. On average, how many snowmobiling trips do you take each year? _____ trips

   How many of these are in the Revelstoke/Golden area? _____ trips

4. Are you a member of a snowmobile club? (Please circle one)

   YES NO

5. What other forms of outdoor recreation do you participate in? (Please check categories)

   ____ backcountry skiing ____ downhill skiing ____ snowboarding

   ____ cross-country skiing ____ heli-skiing ____ mountaineering

   ____ hunting ____ fishing ____ horseback riding

   ____ trail biking ____ four-wheeling ____ climbing

   ____ day-hiking ____ back-packing ____ mountain biking

   ____ boating ____ kayaking ____ canoeing

   ____ Others (Please specify _____)

SECTION 2: SNOWMOBILING IN THE REVELSTOKE/GOLDEN AREA

Please answer the following questions based on your snowmobiling trips in the Revelstoke/Golden area.

1. Who else do you usually snowmobile with? (Please mark one or more)

____ no one else ____ your friends

____ your family ____ members of your club

2. If you snowmobile with others, how many other people do you usually ride with, and how many other snowmobiles are in your group ?

_____ people _____ snowmobiles

3. What is the usual duration of your snowmobile visit in the Revelstoke/Golden area, or else, please indicate if you live in the area? (Please mark one.)

____ 1 day or less ____ 2 days ____ 3 days

____ more than 3 days (please specify how many: _____ days)

____ live in the area

4. What length of time do you usually snowmobile for? (Please mark one.)

____ 1/2 a day or less ____ a full day ____ 2 days

____ more than 2 days (please specify how many: _____ days)

5. What distances do you usually cover when snowmobiling ?

a) On your usual type of trip (i.e. round trip)?

_____ km or _____ miles

b) The maximum distance you would venture on a snowmobile from your point of entry (i.e. nearest road) ?

_____ km or _____ miles

c) The total distance covered in a full season ?

_____ km or _____ miles

6. What proportion of your snowmobiling trips are done in the following types of outdoor recreation areas? (these areas are recreation opportunity categories used by the BC Forest Service)

PRIMITIVE: more than 8 km (5 miles) from a road on which a highway vehicle can be driven; a natural environment; minimal evidence of human use. _____ %

SEMI-PRIMITIVE: less than 8 km (5 miles) from a road on which a highway vehicle can be driven; a natural appearing environment; some evidence of human use. _____ %

ROADED RESOURCE: accessible by a highway vehicle but with a natural environment and no more than moderate evidence of human use. _____ %

RURAL: accessible by a highway vehicle, a substantially modified environment and extensive evidence of human use. _____ %

TOTAL 100 %

7. How desirable or undesirable, to you, are the following features of snowmobiling in the Revelstoke/Golden area ? (Please circle the number that best represents your response to the statement indicated)

	Desirable		Neutral		Undesirable
Close to home	5	4	3	2	1
Challenging conditions	5	4	3	2	1
Wildlife viewing	5	4	3	2	1
Scenic views	5	4	3	2	1
Solitude	5	4	3	2	1
Hunting opportunities	5	4	3	2	1
Wilderness experience	5	4	3	2	1
Amenities (e.g. cabins)	5	4	3	2	1
Variety of terrain	5	4	3	2	1
Steep slopes	5	4	3	2	1
Snow conditions	5	4	3	2	1
Access to snowmobile area	5	4	3	2	1
Logging roads	5	4	3	2	1
Forested environments	5	4	3	2	1
Open alpine environments	5	4	3	2	1
Groomed trails	5	4	3	2	1
Unploughed roads	5	4	3	2	1
Untracked snow	5	4	3	2	1
Remote from civilization	5	4	3	2	1
Commercial snowmobiling	5	4	3	2	1

SECTION 3: WHAT IS YOUR EXPENDITURE ON SNOWMOBILING ?

1. If you had to travel to the Revelstoke/Golden area for snowmobiling please answer the following question, otherwise go directly to the next question (question 2).

   How much did you spend travelling to the area ?

   $ _____ Transportation (gas, oil, car rental, bus fares, etc.)

   $ _____ Food en route

   $ _____ Accommodation en route

2. How much do you usually spend on the following items during your average snowmobiling trip?

   $ _____ Food (groceries, meals, beverages)

   $ _____ Accommodation (campgrounds, lodges, motels)

   $ _____ Transport to snowmobile area or trail (gas, oil)

   $ _____ Running costs of snowmobile (gas, oil, repairs, snowmobile rental)

   $ _____ Other (Please specify: _____)

   What do you normally spend on food, beverages and entertainment (e.g. go out for an evening) if you are at home?

   $ _____ per week

3. For the following items of equipment could you please indicate whether you own one, what year it is, when you purchased it, its approximate purchase price, and the proportion of its use which is for snowmobiling ?

	Own		Year of machine	Years Owned	Purchase Price	Proportion of use for snowmobiling
Snowmobile	YES	NO	19___	_____	$ _____	
Truck	YES	NO	19___	_____	$ _____	_____ %
Camper	YES	NO	19___	_____	$ _____	_____ %
Trailer	YES	NO	19___	_____	$ _____	_____ %

4. How much do you spend on other equipment used for your snowmobiling trips?

$ _____ Maintenance of machine (per year)

$ _____ Special clothing (per year)

$ _____ Ski equipment (per year) e.g. skis, poles.

$ _____ Camping equipment (per year) e.g. tent, pack, cooker.

$ _____ Other (Please specify: _____)

5. Given the recent restrictions on snowmobiling in other parts of Canada, a possible mechanism to ensure access to snowmobiling in the Revelstoke/Golden area at existing levels of use is through the purchase of permits (similar to hunting permits). The revenue from permits would go into a snowmobiling enhancement fund for the purpose of maintaining snowmobiling facilities. What is the MAXIMUM amount you would be willing to pay PER SEASON for such a permit? (please mark the amount you would be willing to pay per season)

____ $0 per season
____ $1 per season
____ $5 per season
____ $10 per season
____ $25 per season
____ $50 per season
____ $100 per season
____ $250 per season
____ $500 per season
____ $1000 per season
____ over $1000 per season

6. Please rank from 1 to 7 each of the following statements in terms of their importance to your snowmobiling activity. Rank the most important statement 1 and the least important statement 7.

a) No logging was permitted ____

b) No heliskiing was permitted ____

c) No backcountry skiing was permitted ____

d) More wildlife was visible ____

e) More logging roads were developed ____

f) More wildlife habitat is protected ____

g) No user fee was charged ____

7. We would like to have an idea about the importance of wildlife to snowmobilers. If you had control of the government's budget for wildlife preservation how do you think the budget should be divided among the following categories in terms of percentage ?

BENEFITS:	% of budget
Preserve large mammals (deer, bear, etc.) and their habitats	____ %
Preserve small mammals (squirrels, marmots, etc.) and their habitats	____ %
Preserve birds and their habitats	____ %
Preserve other species and their habitats	____ %
TOTAL BUDGET	100 %

8. Given a budget for the preservation of large mammals and their habitats, what percentage of the budget should be allocated to the following species. (The numbers should add up to 100%.)

EITHER: ____ All species should be given equal treatment

OR: I would allocate the budget as follows: (The numbers should add to 100%.)

SPECIES	% of budget
Caribou (which require old growth forest)	_____
Grizzly Bear	_____
Elk/Deer/Moose (big game species)	_____
All other large mammals (e.g. goats, lynx, etc)	_____
TOTAL	100 %