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A MATHEMATICAL PROGRAMMING APPROACH TO THE ANALYSIS OF RECREATIONAL DEVELOPMENT CONFLICTS IN LAKE PLANNING

by

Virginia White Maclaren

A Thesis
presented to the University of Ottawa
in partial fulfillment of the
requirements for the degree of
Master of Planning
in
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ABSTRACT

The purpose of this thesis is to suggest a way in which planners might intervene in resource allocation in order to minimize over-use and multiple-use conflicts on lakes. The proposed approach is based on the evaluation of the 'probable consequences' of development. Evaluation is accomplished by means of a conflict index which measures the attitudes of lake users towards recreational activities and development. The index allows the planner or decision-maker to gain an understanding of the attitudes held by cottagers towards other users. This understanding can be enhanced by the use of a multiobjective programming model which facilitates the comparison of potential conflicts among lakes and has the capacity for optimizing a set of non-commensurable objectives.

The methodology is applied in a case study of the Rideau Lakes area of Eastern Ontario. A questionnaire was distributed to 474 cottage-owners and produced a 78.7% response rate. The survey is used to generate a profile of cottager characteristics and to derive the conflict indices. These are subsequently inserted as parameters into the multiobjective programming model. Three development scenarios are simulated and the planning implications of their results discussed.

RESUME

Le but de cette thèse est de proposer un moyen d'intervention que les planificateurs peuvent utiliser pour minimiser la surexploitation et les conflits d'utilisation des lacs. L'approche utilisée est basée sur l'évaluation des 'conséquences probables' qui résultent du processus de développement. L'évaluation se fait avec un indice de conflit qui mesure les attitudes par les utilisateurs du lac aux activités récréationnelles et au développement. En utilisant l'indice, le planificateur peut comprendre les attitudes des propriétaires de chalet face aux autres utilisateurs du lac. Cette compréhension peut être élaborée en utilisant le modèle de "programmation multi-objective". Ce dernier facilite la comparaison de conflits potentiels entre les différents lacs et possède la capacité de déterminer la situation optimale parmi une série d'objectifs.

La méthodologie est appliquée dans une étude de cas des Lacs Rideau (Est de l'Ontario). Un questionnaire était distribué à 474 propriétaires de chalet et 78.7% ont répondu. Le sondage est utilisé dans la construction de profils caractéristiques et dans la définition des indices de conflit. Ceux-ci sont utilisés, par la suite, comme paramètres dans le modèle de "programmation multi-objective". Trois scénarios différents sont simulés et les implications des résultats pour le processus d'aménagement sont discutées.

ACKNOWLEDGEMENTS

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Without the cooperation of the residents of Opinicon, Newboro, Indian, Benson, Clear, Mosquito and Sand Lakes, this thesis would not have been possible. I would therefore like to extend them a special vote of thanks for their participation in the study and the overwhelming response they showed to the questionnaire they were asked to complete.

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Chapter I
INTRODUCTION

Lake planning is a relatively new activity within the field of planning and has received significant attention in Canada only within the last ten years. The reasons for this include a current concern with environmental planning in general and, specifically, the existence of a planning dilemma caused by a deterioration of the recreational experience in the face of an increasing demand for water-oriented recreation. The growing importance of recreation in water useage and the diversity of and conflict in recreational activities have also contributed to the necessity for lake planning (Kuehn and Brewer, 1967).

The effect of heightened demand has been to create new and emphasize old problems of conflict among multiple uses on a lake. The intensity of use has increased in all areas. The purpose of this thesis is to suggest a way in which planners might intervene in resource allocation in order to minimize over-use and multiple-use conflicts. The particular emphasis of the thesis will be in the minimization of social as opposed to physical conflicts and in the development of a regional perspective on lake planning.

1.1 STUDY OBJECTIVES

The objectives of this thesis are three-fold:

(1) to develop a framework for the analysis of the potential conflicts that can be generated by increases in the amount and number of uses on a lake;

(2) to operationalize this framework by developing a model capable of performing at least three functions:

   i. allocating scarce resources amongst activities on a regional basis;

   ii. minimizing potential conflict amongst recreational activities for a postulated set of conflict interactions in planned development; and

   iii. utilizing environmental guidelines as development constraints on the regional lake system.

(3) to apply the framework to a case study in lake planning.

Achievement of the first objective will be accomplished through the elaboration of an approach which relies on the evaluation of the 'probable consequences' of recreational development in terms of potential conflicts which might arise. An index known as the 'conflict index' will be used to indicate the attitudes of one recreation group, cottagers, towards other lake users.

A multiobjective programming model will be developed to satisfy the requirements stated in the second objective. In this thesis, its implementation in a case study of the Ri-

deau Lakes area of Ontario will only call upon the first two functions; the third will be set within the framework of the model and its potential described but not used.

Optimization will not necessarily result in identification of a global optimum of resource allocation for the problem at hand. In fact, true 'optimal' decision-making may never be possible (Bradley, 1973). Elements of uncertainty in goal definition and in evaluation of social costs and benefits imply that the 'optimum' solution will only be a local optimum in terms of present temporal and attitudinal orientations. If goals change or social costs and benefits are respecified, new solutions may be found.

1.2 NEED FOR THE STUDY

Most research into the impact of recreational development on lakes has tended towards the investigation of physical development levels as constraints on development. This section considers the need for additional development constraints which would be analogous to thresholds of conflict. The need for a regional perspective in lake planning is also demonstrated. (1)

(1) An elaboration on the definition of conflict used in this study can be found in Chapter III, p.36.

1.2.1 Physical Development Limits Versus Social Conflict Thresholds

One of the primary problems in lake planning has been that of establishing development limits beyond which a deterioration of the environment occurs. Lake planners have wrestled with the concepts of physical and, more recently, social carrying-capacity as bases for the definition of such limits. Although the validity of existing methods has not been fully accepted, physical carrying-capacity has been applied in its various forms as a recreational activity constraint to several lake plans in Canada(1). Few plans however, have advanced beyond the physical carrying-capacity problem to a consideration of the social conflict problem, otherwise referred to as social carrying-capacity. As noted above, this problem involves negative externalities and these effects may be counteracted by the imposition of planning controls.

The physical carrying-capacity approach is dominated by the 'suitability' as opposed to the 'feasibility' concept. Land use suitability is the degree to which a unit of land can respond to specific management practices. Land use feasibility is based on the present likelihood or potential

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(1) See for example: Edmonton and Battle River Regional Planning Commission (1975); Ontario Ministry of Natural Resources (1973); and Saskatchewan Department of Environment (1976).

of a unit for development under specified socio-economic conditions (Belknap, et al. 1967). The important difference between these two concepts is the extra limitation on development imposed by the socio-economic conditions required for feasible land use. For example, a lake may be physically suitable for the development of 60 cottages and five campsites, but social conflicts may occur between the two user groups because of noise or visual pollution of the recreation environment by one group as perceived by another group. This type of conflict may even occur between cottagers themselves if cottage site developments are poorly planned. A solution to this problem might be to 'trade-off' some of the campsites to another location in return for a less conflicting activity or to eliminate the conflicting activity altogether. Resource allocation through physical carrying-capacity does not offer this alternative because it emphasizes the impact that users will have on the physical environment and not the social environment.

Development limits related to a threshold of conflict may be thought of in terms similar to those used to define physical carrying-capacity development limits. Beyond a certain threshold, there is a deterioration in the quality of the environment. Considerable progress has been made in quantifying physical thresholds of development, but very few studies have been conducted on the measurement of thresholds

and absolute values for inter- and intra-activity conflicts. One of these is a study undertaken by Bammi and Bammi (1975) which attempted to attach units of measurement to the degree of conflict which might occur among or within a set of land use activities. Their procedure for conflict evaluation was to have a group of planners and elected officials examine each selected inter- and intra-activity association on the basis of the following criteria: (1) visual and aesthetic, (2) noise and air pollution, (3) population density, (4) transportation, and (5) social and psychological factors. After a general discussion and averaging of scores, activity associations were given a value ranging from one to ten indicating the degree of potential conflict present. Activity associations which did not involve conflict were given a score of zero. The approach taken in the evaluation of activity conflicts in this thesis will be similar to Bammi and Bammi's work except that relative levels of conflict will be examined and the indices given to activity associations will be based on the attitudes of lake users, not decision-makers or planners.

The reasons for the lack of progress in the field of conflict evaluation are numerous, the most significant probably being that, while physical carrying-capacity limits are based on tangible variables, social conflict is an intangible concept and the difficulties of measuring intangibles are well known (Coomber and Biswas, 1973)

The problem of identifying and resolving conflicts when the level of conflict is unknown is greater than when one has a definite structure of measurable relationships to manipulate. If even a very crude objective methodology for the identification of potential conflicts can be developed, it will be useful to planners in that it will indicate where the greatest potentials for conflict lie and where intervention is required in order to avoid these conflicts.

1.2.2 A Regional Lake Planning Scheme

The previous section has pointed to the need for the inclusion of social conflict evaluation in lake plans. A basic premise of this thesis is that a regional perspective in lake planning can facilitate the resolution of potential social conflicts. A regional perspective is herein defined as as an awareness of the recreational capability and level of development of lakes in the vicinity of the lake under study. In other words, rather than depend on a localized knowledge to plan each lake, in isolation from others, it is suggested that each lake be planned as a functional unit in a regional lake system. One of the most important implications of 'regional' lake planning is its capability for reducing conflicts among multiple uses on lakes by activity 'trade-offs' between lakes within the confines of the physical carrying-capacity limitations (Bishop et al., 1974).

In Canada to date, the subject of regional lake planning has not received a great deal of attention. Alberta is the only province to have developed a working regional classification system for its lakes. It is based upon the physical capability concept derived from the Canada Land Inventory classification scheme. Lakes are divided into two general categories: Development and Conservation (1). A Conservation lake is one which has a very high capability for agriculture, forestry, wildlife, or ungulate production. If it does not have a high capability for these uses, it is classified as a Development lake. These two categories are further subdivided into the following groups on the basis of their capability rating: a. Provincial, b. Regional, and c. Local. Development levels are highest for the Provincial classification and lowest for the Local classification. Conservation priorities follow the same hierarchy from Provincial to Local.

This initial step at regional lake planning has resulted in the identification of areas in the province which may have an insufficient or over-abundant supply of potential development lakes, and is therefore a very useful plan-

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(1) For a full description of the classification scheme, see Alberta Land Use Forum (1974); for examples of applications of the study, see a. Edmonton Regional Planning Commission (1974, 1976), and b. Red Deer Regional Regional Planning Commission (1974).

ning tool. On the other hand, the only information known about the Development lakes is that they do not fulfill a set of highly restrictive conservation criteria. Other criteria for development, such as the potential for social conflict, are equally important and could render some 'development' lakes unsuitable for development. An alternative approach is called for.

1.3 THE STUDY AREA

The criteria for choice of an appropriate study area were minimal. The only requirements were:

i. that there be at least two residents on each of the lakes chosen;

ii. that the lakes chosen be fairly close to each other so that they could be classified as being in a 'regional system of lakes'.

A grouping of lakes in Eastern Ontario fulfilled both of these criteria. Seven lakes on the Rideau Lakes system were selected for inclusion in the study. Their location is shown in Figure 1.

The situation of the lakes with respect to the major demand centres is fairly central. They are located just off the main highway connecting Ottawa and Kingston, within two hours driving distance of both cities. They are also fairly

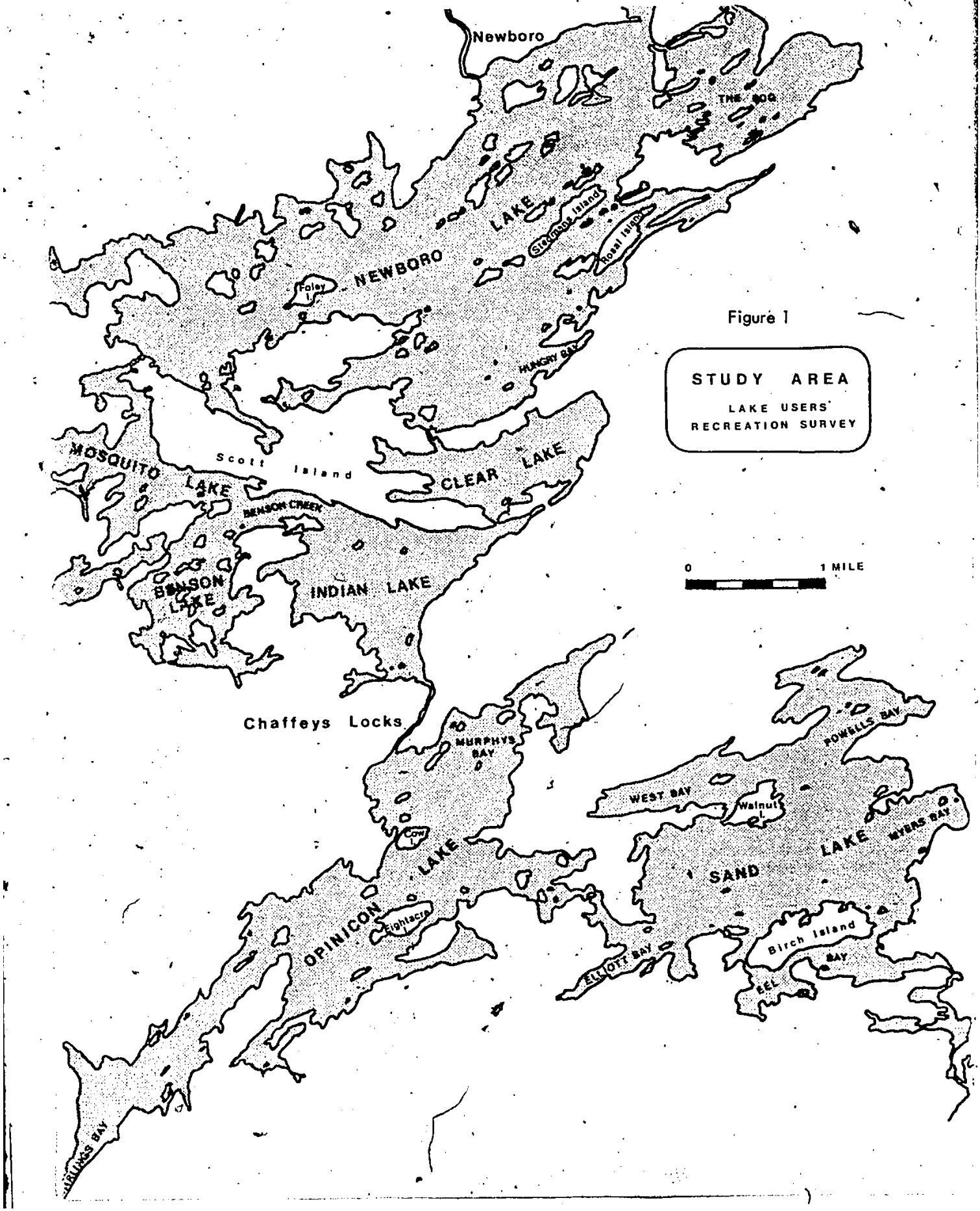


Figure 1

STUDY AREA

LAKE USERS' RECREATION SURVEY

close to the United States border and have thus attracted a large number of American residents. The names of the lakes and the number of residences found on each of them are given in Table 1.

TABLE 1

Number of Residences on Study Lakes

Lake	Number of Residences
Opinicon	136
Indian	90
Newboro	68
Benson	18
Clear	21
Mosquito	4
Sand	137
Total	474

One of the most significant characteristics about the lakes is that five of them are located on the Rideau Canal and are consequently exposed to a large transient population of canal users. This presents the opportunity for examining the impact of canal traffic levels on the population of the affected lakes.

1.4 STUDY OUTLINE

Most methods being used to evaluate the social quality of the recreational environment today are based on the concept of social carrying-capacity. This concept is reviewed in Chapter II.

The advantages and disadvantages of social carrying-capacity methods are analysed and used as input for an alternative approach developed in Chapter III. This approach is based on the analysis of potential conflicts and involves the creation of a measurement instrument known as the 'conflict index'. With the use of this index, the planning objective of minimizing social conflict among lake users can be expressed in a quantitative manner. This chapter also searches for a means whereby the conflict objective may be integrated into a model with other non-commensurable planning objectives, such as minimization of economic cost. The investigation takes the form of a discussion of the theory of multiobjective analysis and proceeds into the examination of selected multiobjective techniques in Chapter IV. The construction of a recreational development model based on the method of multiobjective programming is traced from its simplest formulation. The foundation of the programming model is shown to be that of integer linear programming.

Chapter V follows with a presentation of the method of data collection used and its results. The formation of the conflict indices and the calibration of the recreational development model are discussed in Chapter VI. The conflict indices are used as model parameters and the model is then tested for sensitivity to changes in the parameters for two development scenarios: i. an increase in canal traffic, and ii. an increase in the number of cottages on the lakes.

The planning implications of the recreational development model are discussed in Chapter VII and a number of suggestions made for further research.

Chapter II

TRADITIONAL APPROACHES TO MEASURING THE QUALITY OF THE RECREATIONAL EXPERIENCE

There has been much discussion in the literature on the subject of recreation carrying-capacity (Bury 1976; Chubb and Ashton, 1969; Greist, 1976; Fisher and Krutilla, 1972; Tivy, 1972). Current definitions of carrying-capacity are often contradictory, but for the purposes of this study, it will be defined as:

> "... that character of use that can be supported over a specified time by an area developed at a certain level, without causing excessive damage to either the environment or the experience of the visitor (Lime and Stankey, 1971)".

The limit beyond which damage will occur to the natural environment is known as the ecological or <u>physical carrying capacity</u>. The limit beyond which the recreational experience of the visitor or user deteriorates may be defined as <u>social carrying-capacity</u>. The measurement and evaluation of both types of capacities is an extremely difficult task because of their multi-dimensional and interactive nature. Physical carrying-capacity parameters are usually more amenable to estimation than social carrying-capacity parameters because they are based on the measurement of quantifiable natural processes. Social carrying-capacity parameters are

most often based on intangible factors such as social values or norms. Both physical and social carrying-capacity measurements have been and still are plagued by the problem of ascertaining suitable criteria to determine capacity limits. The problem is reflected in the literature by a diversity of methodological approaches and a constant inability to integrate the multidimensional nature of the subject into one or a set of relative measures suitable for use by policy- or decision-makers.

The concern of this study is most closely related to social carrying-capacity but the components of physical carrying-capacity will also be referred to briefly in order to distinguish them from aspects of social carrying-capacity. Physical carrying-capacity is a function of a number of variables, including geology and soils, topography, vegetation, climate, water, and fauna and flora (Chubb and Ashton, 1969). The principal component of social carrying-capacity is attitude or social behavior of the recreationist (Chubb and Ashton, 1969). The interactive effects of both physical and social components must be incorporated into any model of recreational carrying-capacity, otherwise the model will have limited applicability for planning purposes.

2.1 THE ESTIMATION OF SOCIAL CARRYING-CAPACITY LIMITS

The dominant theme of social carrying-capacity models relates to user satisfaction. The objective of most models is to maximize total user satisfaction or utility gained from the recreational experience. An important consideration which some models fail to account for is the negative effect that congestion externalities or crowding have on user satisfaction. To what extent will new recreational development on a lake, with its accompanying increase in activity levels, adversely affect the satisfaction experienced by current users of the lake? Will a gain in satisfaction on the part of the new users be offset by any loss of satisfaction incurred by the current users? These are questions which existing carrying capacity methods have attempted to answer - with varying degrees of success.

Social carrying-capacity models based on use intensities alone probably overestimate satisfaction levels. They are only measuring one dimension of the experience. In their critique of the satisfaction model, Heberlein and Shelby (1977) give an example of what might happen if the objective of maximizing user satisfaction, based on use levels were to prevail in all cases. They cite the possibility of a Grand Canyon Parkway which would seek to increase the aggregate level of satisfaction among Grand Canyon users. Those dissatisfied with the experience would be displaced to

another area and the Grand Canyon experience redefined in terms of higher contact rates. A complicating element of this situation is that the displaced visitors would not be able to find a suitable site to substitute for the one they are foregoing at the Grand Canyon - it is a unique resource. Non-substitutability or even a scarcity of resources affects displacement facility and tends to be reflected in lower levels of aggregate user satisfaction.

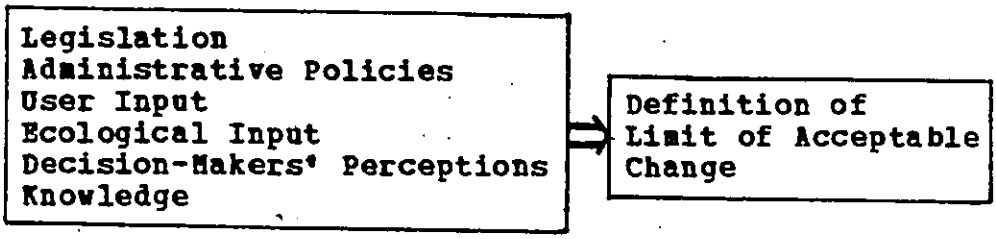
The literature reviewed in this section examines the use-intensity model and some of the developments which have occurred in social carrying-capacity as it has advanced beyond the use-intensity approach.

Most research to date on social carrying-capacity has been focused on the wilderness recreational environment. In one of the earliest works in the field, Lucas (1964) found that use levels affected the satisfaction levels of some recreationists more than others. Canoeists were found to be more sensitive to levels of use and development than were motorboaters. Lucas stressed that the type of travel chosen did not imply that type of recreation causes differences in wilderness perception. Rather, the method of travel was found to be a fairly good indication of the abilities and values held by the recreationist. This early work gives the first intimations of the multidimensional nature of satis-

faction and the existence of different activity groups within the recreation population. Satisfaction is not only a function of recreation use levels but also of the character of the recreationist himself.

Stankey (1973) proposed a model of wildernes carrying-capacity based on limits of acceptable change in the ecological and social qualities of a recreation area. His approach arose out of a dissatisfaction with traditional carrying-capacity models which were based on use intensities and attempted to establish absolute capacity limits (Wagar, 1968). The deficiency of the absolute limit was that it did not consider the effects of management practices in moderating increasing use pressures. As an alternative, he suggested the use of relative limits known as 'limits of acceptable change'.

The process which leads to a definition of acceptable change is shown in Figure 2 . Stankey focused on the relationship between legislation and use input in his study. Legislation, by defining a wilderness area, sets up a certain criteria upon which to base the degree of conformance or non-conformance of visitor attitudes with the wilderness experience.



* Adapted from Stankey (1973, p.3)

Figure 2: Process for Defining Limits of Acceptable Change (*)

Using Likert scaling techniques, Stankey constructed a set of 'satisfaction' curves reflecting degree of satisfaction or dissatisfaction expressed by a percentage of respondents in a study area with different levels of use (as measured by number of encounters with other parties). Stankey found that satisfaction generally declined with increases in amount of use and that degree of satisfaction was affected by the type of use enountered.

In order to facilitate inter-group comparisons, visitors were classified into four groups on the basis of a summed 'purism' score . The score was derived from a 14-item 5-point scale which measured visitors' responses according to the degree of agreement or disagreement with the objectives of the United States Wilderness Act. Those who scored high on the scale were labeled 'purists' and those who scored low, 'non-purists'. It was discovered that the 'strong purists' possessed similar value orientations in

each of the four areas studied, but that the search for a universal measure of carrying-capacity was blocked by the existence of offsetting high and low satisfaction levels across all users. All 'purism' groups were in agreement that the presence of litter on trails was a more serious source of dissatisfaction than experiencing too many encounters with other parties. This provided evidence for the existence of a value hierarchy of negative or positive stimuli with respect to the generation of user satisfaction.

James' (1970) objective in developing a carrying-capcity measure was to find a suitable instrument for evaluating optimum development of a project from an economic viewpoint. He defined recreational carrying-capacity as a willingness to tolerate crowding. Carrying-capacity was measured as an instantaneous carrying-capacity (ICC) or maximum number of visitors willing to use a recreational activity area simultaneously. The sum of ICC's or total capacity of all activity areas (C) can be represented as follows:

$$C = 2.0 \sum_{i=1}^{n} U_i \cdot A_i$$

where U_i = activity coefficient for activity i (users per acre) measured at the peak level of use;

A_i = area occupied by activity i;

n = number of activities;

2.0 = multiplier accounting for sightseers or other visitors who use a site without participating in an activity.

This formulation of recreational carrying-capacity is, as the author himself concedes, a somewhat arbitrary one, meant primarily as an instrument for assessing the effect of capacity on annual visitation. No justification is given for the use of a multiplier in the model with a value of two. The model's usefulness for assessing social carrying-capacity is also limited by the fact that peak visitation rates are used as surrogate measures of capacity limits. The degree of presence or absence of satisfaction is not considered important because it is assumed that if the visitor is there, he is satisfied with that level of activity or crowding. However, it is quite possible that there may be visitors at the site who are not satisfied with their experience, especially if they are among the first arrivals. This dissatisfaction may lead to the initiation of conflict situations and management problems.

The Fisher and Krutilla (1972) model of resource allocation is based on an economic efficiency criterion. The need for optimal social carrying-capacity is stipulated if the value of an area of wilderness or low density recreational use facilities is to be maximized. The economic evaluation of an area can proceed if costs and benefits of project development can be estimated. The dollar value of a wilderness resource can be estimated by comparing its value at a maximum intensity of use (optimum carrying-capacity) to

the value which would be foregone by precluding a high density development on the site. The optimum capacity limit will be determined, to a large extent, by congestion externalities which would occur when the level of use is associated with impingements on the solitude and privacy of users. Crowding would lead to a deterioration in quality of the recreational experience and hence to a decrease in levels of aggregate satisfaction. This assumes that the desired objective of wilderness experience seekers is solitude and that, consequently, the level of satisfaction or utility they gain from the wilderness experience is a direct function of the number of human contacts in the wilderness.

Satisfaction or utility levels in the model are expressed by willingness-to-pay for the recreational experience at different levels of use intensity. Aggregate satisfaction can be measured as the area under an imputed demand curve for the resource. This area has the special characteristic that it accounts for congestion costs and can therefore be an indicator of optimal capacity.

The model represents a significant advance in the quantitative evaluation of carrying-capacity in that ratio units of measurement ($) are the evaluative units. This means that: a. there are no restrictions on data manipulation (eg. addition, division); b. aggregate measures of satisfac-

tion can be calculated; and c. comparison with pure economic costs and benefits is facilitated. The two serious drawbacks of the model are the assumptions that all individuals value solitude equally and that willingness-to-pay is an accurate measurement of personal economic value. Doubts are thrown on the first assumption by the fact that user attitudes appear to change over time and that new visitors to the wilderness may not incur the same congestion costs as those who are already on the site. As Lucas and Stankey have already noted, this may be caused by the existence of a value hierarchy among visitors to the same recreational environment. The second assumption is queried by the authors themselves who note that there may be a tendency for visitors to over- or underestimate their true valuations of a particular recreational experience.

One study which has attempted to evaluate social carrying-capacity for the cottaging experience is Barber's (1977) cross-sectional investigation into social carrying-capacity on two lakes in Northern Ontario. Barber states that:

> "...one of the primary objectives of any recreation management plan is to optimize user satisfaction with minimum environmental degradation. (p.22)

To this end, he devises social carrying-capacity indices which are meant to complement the physical carrying-capacity indices used by the Ontario Ministry of Natural Resources. The capacity limits were calculated by summing the degrees

of response to 13 attitude statements formulated in the semantic differential style. The scores across all 13 items were summed to produce individual attitude scores. Individuals in the study were then arbitrarily classified into three development groups on the basis of their score. Over a possible range of 13 to 65, a score of less than 39 indicated a perception of underdevelopment; a score of 39 indicated satisfaction with present levels of development; and a score of over 39 indicated a situation of overdevelopment. A further analysis involved summing scores across individual items to find aggregate response levels and thus to identify potential areas of controversy or what, in this study, are termed potential conflicts. Again, an arbitrary level was set as being the social carrying-capacity limit or the limit at which half of the respondents experienced a decrease in their satisfaction with the cottaging experience.

Barber emphasizes that the calculated capacity limits are only relative measures and are therefore best used as indicators of areas of dissatisfaction.

The merit of Barber's study is that it shows the relative performance of a number of social carrying-capacity indicators as opposed to absolute performance measures. The validity of absolute measures, when calculated on the basis of most types of attitude scales, is questionable. The new

problem created by this approach is that of finding a base or method of comparison between different attitude statements. This is a function of the multidimensionality of satisfaction, the solution to which, Barber suggests, is to weight the attitude statements according to their degree of importance in the aggregate satisfaction score. This, in turn, raises the question of how importance can be evaluated.

The social carrying-capacity methods reviewed to this point have all had a common goal: to maximize satisfaction. This goal cannot be attained by a simple decrease in activity or development. Other factors are present which may lead to false conclusions about satisfaction levels. These factors will be elaborated upon in the following pages.

2.2 SATISFACTION: PROBLEMS OF MEASUREMENT

There are a number of analytical problems associated with the use of satisfaction as an indicator of social carrying-capacity (Heberlein and Shelby, 1977). The most serious of these is that of measurement.

By the use of dollar values as a surrogate measure of satisfaction, Fisher and Krutilla (1972) attempted to circumvent the measurement problem. Most studies have used

psychological attitude measurements of satisfaction which are, at best, of an ordinal nature. The only type of transformations which may be peformed on ordinal variables are those which are monotonic, meaning that the order of the variables is maintained (Siegel, 1956). The implication of monotonicity is that the calculation of aggregate measures of satisfaction becomes quite difficult (Heberlein and Shelby, 1977; Bogotta, 1968; Labovitz, 1967) if not impossible (Greist, 1976; Stankey, 1973). If an aggregate measure of satisfaction cannot be calculated, then one cannot determine whether or not satisfaction is being maximized and, therefore, what the capacity limit is.

Aggregating preferences across individuals is a problem which has deep roots in welfare economics (Fisher and Krutilla, 1972; Arrow, 1963). Not all individuals have the same expectations about the wilderness experience and would not derive equal utility from equally satisfying experiences. For instance, two individuals may indicate a 100% degree of satisfaction with the same recreational experience, but one individual may have been expecting the visit to fulfill a lower set of expectations than was the other individual. The amount of satisfaction expressed is the same yet the amount of utility gained is not. The problem arises of how to account for this disparity in the aggregate measure.

2.3 ATTITUDES AND BEHAVIOUR

A review of the social carrying-capacity literature would not be complete without a brief examination of the two principal components of social carrying-capacity models - attitudes and behaviour. These are factors which have too often been ignored or treated superficially by carrying-capacity model builders, with the result that problems of satisfaction multidimensionality may invalidate the outcomes of their models.

One of the reasons that social carrying-capacity models have been developed as a planning tool is that they can be employed to facilitate the prediction of behaviour or reactions to proposed developments. This assumes that attitudes are efficient predictors of behaviour. It has become increasingly evident that attitudes are only imperfect predictors of behaviour (O'Riordan, 1974; Heberlein, 1973; Wicker, 1969). The reasons for this are numerous. Attitudes are susceptible to changes and during the period of time between which an attitude is measured and the associated behaviour takes place, intervening variables may have developed which cause a change in attitude at the moment of action. These variables include habits, norms and other attitudes that are not directly related to the attitude object in question. The attitude change may be a temporary or permanent one. Theories of attitude change have been reviewed extensively

by McGuire (1968) and Triandis (1971). In essence, the conclusion arising from these reviews is that the attitude-behaviour mechanism runs on a circular path wherein attitudes predispose people to a certain behaviour which may, in turn, change attitudes as people develop new ones to justify their previous behaviour (if the behaviour was inconsistent with their attitudes). This is one of the factors which may have accounted for the discrepencies between attitudes and behaviour in past studies. Another is that measurements of attitudes have often tested an individual's attitude towards general and conceptual problems while testing behaviour in relation to specific and actual situations. It can be imagined that such tests would lead to poor correlations between attitude and behaviour.

In summary, attitudes are only one of several components which influence behaviour. Others may be unknown or not as easily quantifiable. That is why attitudes have been the most common instruments of prediction and will remain so until the attitude-behaviour mechanism is more fully understood. The reliability of behaviour-predicting models based on attitudes may be increased by ensuring that attitude measurements are directly related to the behaviour in question and not to a multitude of behaviour patterns.

2.4 SUMMARY AND CONCLUSION

This review of social carrying-capacity methods has highlighted some of the theoretical, methodological, and operational problems involved in finding a suitable measure of capacity. Several authors have shown that satisfaction has a multidimensional nature, depending not only on levels of use but also type of use encountered, duration of encounters, expectations, and previous recreational experiences. The amount of satisfaction gained when based solely on levels of use is very often obscured by these variables.

Social carrying-capacity limits can only be regarded as indicators of relative and not absolute levels of satisfaction. The 'relativity' of satisfaction scores derives from some of the characteristics of the model related to its ordinal nature. On the strength of ordinal satisfaction measures, one cannot aggregate satisfaction across a number of individuals to give an absolute measure. The most one can say is that a percentage of the population experienced decreased satisfaction under conditions of increased use. Satisfaction scores are also relative because attitudes may change with exposure to higher intensities of use.

The hurdles in the path of social carrying-capacity modelling suggest the need for an alternative approach to the

evaluation of the social quality of the recreational experience. Clues for the development of this new approach are found in Stankey's concept of "acceptable change". Instead of defining absolute limits to development, the acceptable change concept elaborates on the probable consequences of development. Methodologies which examine consequences are to be preferred to those which state limits because it should not be the planner's decision as to how far development should be allowed to increase, but the decision-maker's. The development of a 'capacity' model which allows the decision-maker to examine trade-offs of alternative development plans should be the objective of research into social quality modelling.

The limitation of 'capacity' modelling related to the problem of measuring aggregate satisfaction has not been effectively solved. This limitation is among those arguing for the creation of a new method for comparing alternative development plans. The new method would not have to be based on aggregate satisfaction measures if only indications of the consequences of development were required by the decision-maker. Aggregate satisfaction modelling is seen as one route which social evaluation can take, and probably, in the long run, the most efficient one. In the interim, however, 'consequence' modelling can provide decision-makers with valuable information on development options.

A third limitation of some social carrying capacity models is their inability to integrate with physical-carrying capacity models because of their non-commensurability. This is a very important limitation and must be overcome by any alternative model.

Finally, a problem which was encountered by several model-builders was that of multidimensionality. Considerable evidence has shown that satisfaction with the recreational experience is a multidimensional concept and cannot be accounted for by the measurement of a single object or activity. New methods of analysis would have to be capable of considering the impact of several activities at one time.

In conclusion, it is suggested that the solution to some of these limitations may be to alter the direction of the approach taken to social carrying capacity. A promising avenue of development lies in the formulation of a model based on Stankey's concept of 'probable consequences'. This avenue will be explored in the following chapters.

Chapter III

AN ALTERNATIVE APPROACH

In the preceding chapter, it was suggested that an alternative method of measuring the social qualities of the recreational experience would be that of evaluating the probable consequences of development rather than attempting to ascertain limits to development. The primary reason for this was the fact that progress in the formulation of carrying-capacity models using limits has been hampered by numerous obstacles which have yet to be circumvented. This chapter will elaborate upon a methodology based on the 'probable consequences of development' which has the capacity for considering the impact of not only physical carrying-capacity on a social quality indicator, but also of accessibility and development costs. It does not set any limits to development but rather outlines the probable consequences of increasing recreational activity or development levels. The result obtained from this approach does not claim to offer an 'optimum' solution for development. It simply presents the decision-maker with a comparative analysis of a set of pre-specified alternative plans.

The first step in the elaboration will be to discuss the rationale and assumptions behind the probable consequences approach. This will be followed by the formulation of a measurement of the social quality of the recreational experience, phrased in terms of probable consequences. The measurement will be referred to as a conflict index. The third step will be to ensure that this measurement can be integrated into a model containing physical carrying-capacity and any other desired constraints. To this end, the theoretical constructs of a family of techniques known as multiobjective analysis will be discussed.

3.1. CONFLICT AND PROBABLE CONSEQUENCES

The organizing framework behind the present analysis of lake-use conflicts is derived from the assumption that the probable consequences of development may include the initiation or aggravation of conflicts among lake users. Some forms of development may have less potential for generating conflicts than others. In addition, some lakes may be more susceptible to conflicts because of their present use patterns. The evaluation of probable consequences is an important element in the formulation of alternative plans.

The generation of either potential conflict or peaceful coexistence among users of a lake is postulated as being a function of both the total number and different types of us-

ers present. On-lake uses may include such activities as sport fishing, commercial fishing, boating, swimming and bathing. Lakeshore uses may include commercial land use, residential land use (cottages and urban residential land use), industrial land use, forestry, agriculture, mining, and open space. All uses are associated with the consumption of natural resources. The need for intervention by the planner in the allocation of resources to specific uses or a combination of uses becomes apparent when the property rights of these resoures are examined. Two forms of relevant resource ownership are those of <u>common property</u> and the <u>private good</u>. A pure private good has been defined as follows by Evans (1970):

> -... a good is a pure private good in respect of a consumer if an increase in his consumption of the good changes his utility level but does not alter the utility level of anyone else. (p.81)

Evans also recognizes the private good 'with externalities'. In this case, consumption of the private good by an individual may change the utility level of other individuals. The predominant externality or effect on other individuals associated with the use of the privately-owned car is that of environmental pollution. In contrast to the private good is common property. This form of ownership may perhaps best be explained by comparing it to the definition of a <u>public good</u>:

> -... a good which all enjoy in common in the sense that each individual's consumption of such a good leads to no subtraction from any other individual's consumption of that good. (Samuelson, 1954, p.387)

In a water-oriented environment, an example of a public good might be that of a shoal marker. All users of the lake may take advantage of the protection it affords yet the use of the shoal marker by one individual will not deprive another individual of its use. On the other hand, the use of common property by an individual may result in a decrease in consumption by another user. Water and some portions of land (eg. public parks) around a lake are examples of common property. The use of the water surface by motorboaters may detract from the cottager's enjoyment of the recreational experience.

A private good owner may prefer extermination of resources to conservation on the basis of maximization of profits to be derived from utilisation of the resource (Clark, 1973). Common property goods have a procurement cost of almost zero and there is no market mechanism to control negative effects between users. Without controls, the characteristics of these two forms of property ownership give rise to overexploitation of resources and the indiscriminant production of residuals (Bower, 1971).

A by-product of overexploitation is conflict. Definition of a conflict has been dealt with at length by Boulding (1963) who surmises that:

> Conflict ... is a situation in which the parties are aware of the incompatibility of potential future positions and in which each party wishes to

> occupy a position that is incompatible with the wishes of the other (p.5)

Conflict occurs when negative effects or externalities have reached a certain threshold beyond which the incompatibility of the two parties in competition for the same resource results in the potential conflict becoming an actual conflict. With specific reference to recreational activities, the probability of conflict occurring has been postulated as being proportional to the degree of change in the recreation ownership or element structure (Harrison, 1977). This suggests that changes in ownership or structural patterns of a lake will produce certain consequences which may find expression as social conflicts. The conflict evaluation methodology proposed in this study is meant to give an indication of the social quality of the recreational experience phrased in terms of potential conflicts that might arise.

Planned intervention in resource allocation should occur before and not after the conflicts become apparent. The indices developed in the next section have been designed as aids in the intervention process.

3.2 THE CONFLICT INDEX

The social quality measurement technique proposed is that of an index which will be referred to as the conflict

index (CI). This index will measure the amount of 'potential conflict' that exists between one lake user group and all others as demonstrated by the first group's attitudes towards recreational activity and development levels on the lake. A high conflict index will indicate a high probability for the occurence of conflict with increases in activity or development levels. No attempt will be made to define the threshold on the index at which potential conflicts develop into real conflicts because criteria for determining these thresholds are variable. The value of the index lies in its capacity to quantify the relative differences in conflict levels. Examples of user groups include both permanent resident and non-permanent resident home owners, day campers, farmers, and canal users. Only home owners will be examined in this study and will be referred to as the cottaging user group. Each cell in the vector matrix of CI's will therefore contain a measure of the recreational 'conflict' perceived by the cottaging user group. This conflict is assumed to be generated by the existence of an activity or development on the lake.

3.3 ATTITUDE MEASUREMENT

3.3.1 The Rating Scale

The measurement of something as complex as human attitudes is a very difficult task. There is an abundant literature available on the techniques available and pitfalls involved (Moser and Kalton, 1971; Oppenheim, 1966; Lemon, 1973). One of the simplest techniques is that of the rating scale which attempts to assess individual attitudes by asking respondents to express their attitudes towards an item statement in terms of a categorical rating. The range of the scale is usually between two extreme positions such as 'strongly agree' and 'strongly disagree' or 'best' and 'worst'. In between these two extremes, there are usually five to seven intermediate positions.

The thirteen rating scales used in this study are of of the strongly agree/disagree type with seven categories of response. Each rating scale measures the attitudes of cottagers towards a given recreational activity or development on the lake.

The conflict indices will be formed by taking the median scores of the rating scales for each activity. The median is defined as that value which divides the total distribution of values in half. In other words, half of the cottagers will agree or disagree with the attitude item being scaled more strongly than that value represented by the median

score; half will agree or disagree less strongly than the median score. The average or mean score of all cottagers on the individual rating scales will not be used because of the fact that rating scales produce only ordinal units of measurement. Siegel (1956) notes that the most suitable statistic for describing central tendency of ordinal measures is the median because it is not affected by changes in values of scores below and above it. Scores will not be weighted for the number of respondents because it is felt that a high conflict index for a lightly populated lake is just as important as one for a heavily populated lake. (1)

The advantage of rating scales over other alternative measurement techniques lies in their simplicity of construction and comprehension. The main disadvantage of rating scales is that they scale attitudes only on the basis of a single item and may thus be unreliable. This problem can be partially overcome or avoided by the use of non-ambiguous item statements and related attitude statements or scales which can help to substantiate the rating scale scores. A solution to the first problem can be accomplished by means of a pretest on the rating scale statements. The second can be overcome by the use of another scale such as the Likert scale to verify the reliability of the rating scales.

(1) In some cases, it may be desirable to use a weighting scheme. The decision to do so would depend on the expressed goals of the study.

3.3.2 The Likert Scale

The Likert scale in this study will perform a dual function. It will be used not only as a validation instrument for the rating scales, but also as an instrument for measuring cottagers' attitudes towards recreational development in general. Internal consistency checks of the scale will determine which rating scales are reliable measures of development.

The construction of Likert scales involves the combination of a number of rating scales into one scale by means of adding the individual rating scale scores into a total score. For this reason, they are often called "summated" rating scales (Moser and Kalton, 1971).

Likert scales differ from rating scales in that they attempt to measure attitudes towards more than one specific object and thus to locate an individual along an attitude continuum. For instance, a Likert scale constructed to measure attitudes towards education might include items on educations's importance for personal fulfillment and as a learning method, its desirability, its financing and its practicality. The probability that respondents will endorse items or express favourable attitudes towards items is assumed to increase as the respondents move along the attitude continuum. Empirical evidence has shown that although these

probabilities do increase from left to right along the continuum, their traces are irregular; however, they tend to sum to a more regular linear form (Figure 3), thus providing the basis for the assumption in Likert scaling that the sum of the respondent's items scores is linearly related to his position on the attitude continuum (Lemon, 1973).

The use of a more sophisticated index than that based on the median is not warranted at this time because the degree to which an increase in activity levels will prompt a change in response distributions is unknown. Only longitudinal research will help to clarify this matter and perhaps to identify whether or not there are 'thresholds' of development beyond which the attitudes of respondents take quantum jumps to higher levels of conflict.

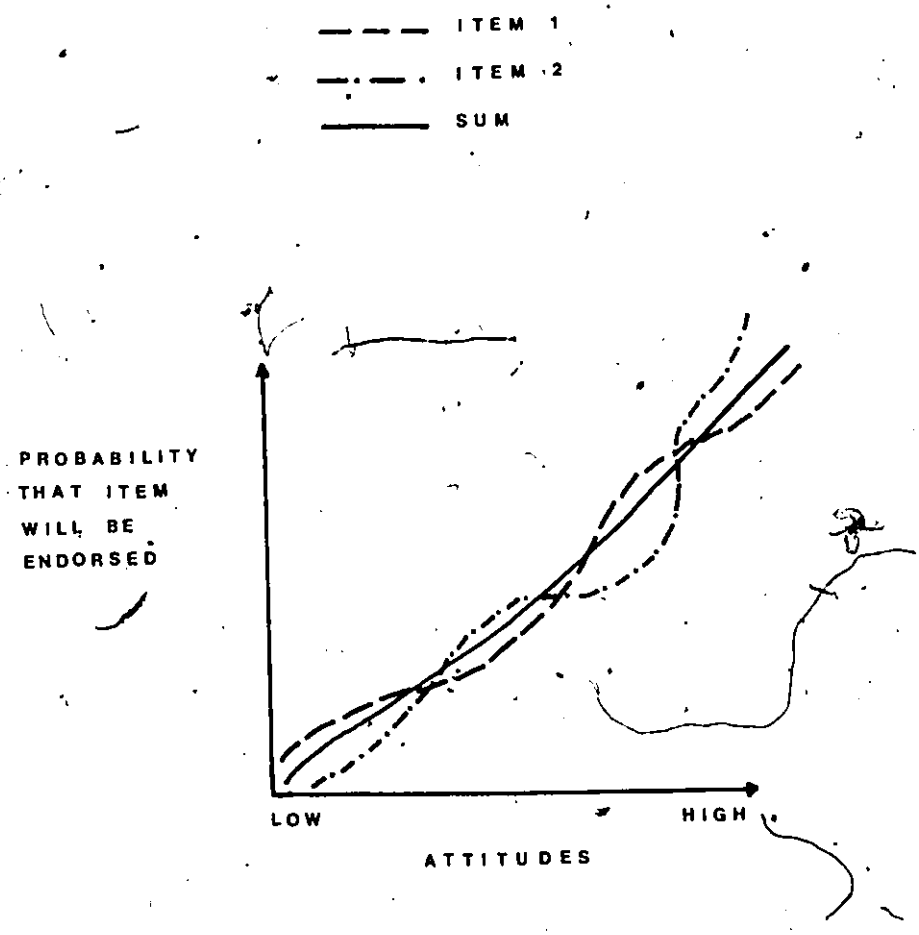


Figure 3: Attitudes and Item Endorsement

3.4 MULTIOBJECTIVE ANALYSIS

The next step in the proposed methodology is to find a means of integrating the proposed social quality measure with, most importantly, the physical quality measure, and also with other constraints and criteria, as needed. This can be accomplished by the use of a method known as multiobjective analysis, which attempts to reconcile conflicting and often non-commensurable objectives such that an optimum development solution can be found among a set of alternative plans. Possible objectives to be included in the multiobjective analysis would be:

i. maximization of the social quality of the recreational experience (measured by an abstract index);
ii. maximization of the physical quality of the recreational experience (measured in user days;
iii. minimization of development cost (measured in dollars); and
iv. maximization of accessibility (measured in miles/kilometres or as an abstract index).

The conceptual basis of multiobjective analysis lies in welfare economics (Maas et al., 1962; Major, 1969; Marglin, 1967) and is best explained by the example shown in Figure 4 (1). The two noncommensurable objectives being compared are environmental quality (on the horizontal axis) and national income (on the vertical axis). The net benefit transformation curve, TC, represents the boundary

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(1) adapted from Bishop et al. (1976).

set of feasible plan alternatives; these alternatives are the different combinations of national income (NI) and environmental quality (EQ) which can be achieved with a given set of resources. Any point inside the curve represents a feasible plan but is less efficient in terms of output than any point on the TC. For example, point D is feasible but worse than point E because DE additional environmental quality benefits can be accrued by moving from D to E without a loss in national income.

Not all points on the transformation curve are equally preferable in a multiobjective sense. A portion of the curve can be eliminated from further consideration by examining the optimality conditions for the single objectives of national income and environmental quality. For the first objective, point A represents the optimal alternative which maximizes net benefits and point B is the equivalent alternative for maximizing environmental quality. Returning to the multiobjective nature of the problem, it can be seen that any movement on the TC between points A and B results in a transfer of benefits from one objective to the other. This portion of the curve is known as the <u>non-inferior set</u> In a purely physical sense, none of the alternatives in the non-inferior set has advantage over any other. Once the non-inferior set has been defined, selection of a socially optimal af-

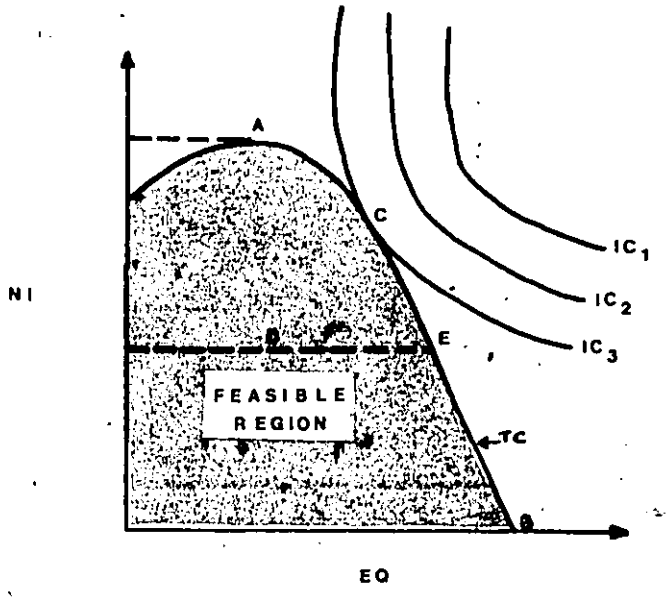

Figure 4: Representation of Multiobjective Planning Space

ternative requires that society's preferences between the two objectives be defined. These preferences may be represented by social welfare functions or the family of indifference curves, IC. The further an indifference curve lies from the origin, the higher the level of social welfare it represents. The optimal alternative occurs at the point of tangency of the highest obtainable indifference curve and the non-inferior set. In Figure 4, this point is found at C and represents the relative marginal trade-off of net benefits towards one objective for the other.

The usefulness of multiobjective analysis for the evaluation of the probable consequences of development can be seen when the objectives of the problem become the minimization of potential conflicts. Minimization of the potential conflict arising from one activity may produce repurcussions among other activities. The form of these repurcussions can best be examined within the framework of multiobjective analysis. The non-inferior solution set will define superior development alternatives from among a set of feasible alternatives. However, it will most probably not result in the selection of just one alternative as the optimal one.

The main barrier facing multiobjective analysis is that of forming the indifference curve. This task is very com-

plex and the difficulties associated with it have already been referred to in Chapter II (p.26). This has resulted in the development of two divergent approaches to the problem.

The first involves the use of computational techniques which attempt solely to define the non-inferior set. Any further decisions about optimal alternatives must be made through the political process. The rationale for this approach is that it is not the role of the planner, when faced with a complex situation of interacting social forces, to interpret society's preferences but simply to reduce the number of feasible alternatives in the most objective manner possible.

The second approach maintains that even the non-inferior set may be too complex for subjective analysis by decision-makers and further quantification or weighting of criteria is necessary. However, as noted by Freeman and Haveman (1970), this may not always be possible because of the difficulties associated with determining optimal weights.

The first approach is the one that will be followed here. If it is discovered that an overwhelming number of alternatives are being derived for the non-inferior solution set, the second approach will be reconsidered. Suitable

techniques for formalizing the approach will be reviewed in the next chapter.

Chapter IV

MULTIOBJECTIVE ANALYSIS AND MATHEMATICAL PROGRAMMING

In the preceding chapter, it was suggested that a conflict index used in combination with the set of techniques known as multiobjective analysis could act as a suitable vehicle for the analysis of the probable consequences of recreational development. There are a large number of techniques available to operationalize multiobjective analysis, but only one possesses several advantages which the others do not. In this chapter, the formulation of a recreational development model will be followed from selection of a multiobjective technique through to the definition of the multiobjective model.

4.1 MULTIOBJECTIVE TECHNIQUES

The development of multiobjective techniques in the past few years has been rapid with the trend being towards computer-based comprehensive models. A general classification of the methods available is described below (1).

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(1) The structure and content of this section on multiobjective techniques have been taken almost entirely from the excellent review by Bishop et al. (1976).

4.1.1 Visual Techniques

These techniques received substantial exposure with the work of McHarg (1968). The procedure for multiobjective analysis is to shade areas on a series of maps to represent the relative need for the achievement of economic, social and environmental objectives over a selected area. The spatial constraints on various projects show up as darker areas when the desirability maps are overlaid. The main drawback to this method and the next two methods is that they result in aggregation of data and may thus obscure serious constraints and tradeoffs. The main advantage of visual techniques is that they are relatively easy to manipulate and understand.

4.1.2 Rating and Ranking Methods

These methods are not restricted to spatial analysis as are visual techniques, but can be used to compare plans which are aspatial. Rating methods use a plus and minus scale to evaluate the degree to which alternative plan objectives are fulfilled (Carter et al., 1972). The plans are then ordered on the basis of a comparison of their ratings. The ranking method ranks alternatives along a continuum according to their achievement of a number of objectives. No 'optimum' alternative is derived from this method but the results are submitted to decision-makers for analysis.

4.1.3 Matrix and Linear Scoring Methods

These techniques (Leopold et al., 1971) imply both a preference weighting (w_{ip}) and an impact (b_{ip}) measure such that the sum of the scores is maximized as follows:

$$\text{Max} \sum_{p=1}^{n} w_{ip} \, b_{ip} \; ; \quad i = 1, 2, \ldots n$$

where i = an index of alternatives

The main criticism of these techniques is that the weighting computations involve aggregation and therefore loss of detail.

4.1.4 Tradeoff Displays and Analysis

Instead of using preference weightings for evaluating impacts, this procedure requires that the decision-maker be directly involved in the assessment of possible objective trade-offs between alternatives (Bishop, 1972). The advantage of tradeoff displays is that they permit a disaggregation of data during the decision-making process; however, this advantage is often outweighed by the fact that the decision-maker must devote a large amount of time to making pairwise comparisons before a decision is reached.

4.1.5 Multiobjective Programming

This technique allows the decision-maker to consider disaggregated data in a comprehensive manner and also demands only a minimum amount of input on his part. This, of course, should be the objective of any multiobjective analysis i.e. , to reduce the number of alternatives which are submitted to the decision-maker for final consideration. These two factors single out multiobjective programming from other multiobjective forms of analysis as being particularly suited to the integration of the objectives listed at the beginning of this section. As will be noted later on, it is almost impossible to reduce the number of development alternatives to one because aggregate social preferences cannot be satisfactorally measured. Multiobjective programming allows the net benefit transformation curve to be quantified because it is an optimization procedure . Generation of this curve is actually a linear programming problem with multiple objectives. The general framework of the model proposed for multiobjective analysis of recreational development will be based on multiobjective programming. Its formulation will be discussed in the next section.

4.2 MATHEMATICAL PROGRAMMING FOUNDATIONS OF THE MODEL

This section will examine the formulation of the multiobjective programming model and suggest why other less powerful forms of mathematical programming are not suited to the problem of minimizing potential conflicts. Three forms of mathematical programming - linear programming, integer programming, and multiobjective programming - will be reviewed. All are theoretically capable of minimizing conflict (because of their optimizing function), but it will be shown that only multiobjective programming can handle the complexities of the problem at hand. This review will also aid in developing the structural form of the model.

4.2.1 The Linear Programming Model

The proposed multiobjective framework for analysis of potential conflicts is derived from the basic linear programming model with a number of modifications. Linear programming is one of a group of analytical techniques which are part of an approach to problem solving known as operational analysis (Bailey and Feder, 1973). The operational criterion for the attainment of objectives in this type of analysis is efficiency, meaning the employment of the minimum amount of resources needed for the fulfillment of objectives. Linear programming uses a mathematical model to op-

timize the allocation of limited resources among competing activities under a given set of constraints. Usually, optimization refers to the minimization or maximization of a dollar value, but it may also have other applications such as the minimization of travel distance in transportation planning. The use of linear programming in land use studies has been proposed (Menchik, 1973; Pearl, 1974; Peng, 1975) and actually applied in the formulation of tourism (Swart et al., 1974), recreation (Meir, 1968; Tadros and Kalter, 1971; Saitta and Schmedemann, 1972), urban land use (Czamanski, 1973; Day, 1973) and general land use allocation models (Auger, 1973; Manning, 1971).

The standard forms of all mathematical programs in this thesis will follow the format suggested by Hillier and Lieberman (1974). For the linear programming model, this is as follows:

$$\text{Max } Z = c_1 x_1 + c_2 x_2 + \ldots c_n x_n$$

subject to the following restrictions:

$$a_{11} x_1 + a_{12} x_2 + \ldots a_{1n} x_n \leq b_1$$

$$a_{21} x_1 + a_{22} x_2 + \ldots a_{2n} x_n \leq b_2$$

$$\vdots$$

$$a_{m1} x_1 + a_{m2} x_2 + \ldots a_{mn} x_n \leq b_m$$

and $x_1 > 0, x_2 > 0, \ldots x_n > 0$

where x_j = level of activity j

c_j = increase in Z that would result from a unit increase in x_j

b_i = amount of resource i available for allocation

a_{ij} = amount of resource i used for each unit of activity j.

The restrictions are known as constraints and the function being maximized is referred to as the objective function. The input constraints, c_j, a_{ij}, and b_i are the parameters of the model and the x 's are known as the decision variables. In order to minimize an objective function, only a few changes in notation are necessary:

$$\text{Min } Z = c_1 x_1 + c_2 x_2 \ldots + c_n x_n$$

subject to:

$$a_{i1} x_1 + a_{i2} x_2 + \ldots a_{in} x_n > b_i$$

Figure 5 illustrates the linear programming formulation in graphic form. The shaded region, ABCDE, is the feasible region in which all the constraints of the probelm are satisfied. An optimal solution is the point in the feasible region for which the objective function, $Z = \sum c_j x_j$, attains its most favourable value. In this example, the value is located at point C.

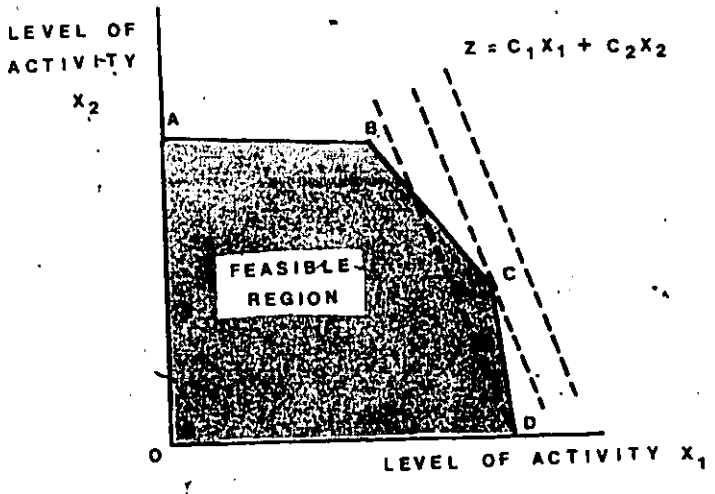

Figure 5: Graphic Presentation of the Linear Programming Problem

In the present study, the concern is not with maximization or minimization of a dollar value but with the minimization of potential conflicts between cottagers and recreational developments or activities. The linear programming model would seem to hold promise as a method for achieving this objective. The c_j or activity parameters for this problem can be designated as measures of interactivity conflict and the decision variables would be used as measures of the amount of activity 'j' permitted on the lakes. The measurement unit would be that of the user day. This unit refers to the impact made on the lake by one user anytime in one day (engaged in any activity) (Ontario Ministry of Natural Resources, 1976). In order to encompass all activities in the optimization routine, there would have to be j x k decision variables where k equals the number of lakes in the study. Possible constraint functions include non-negativity constraints and physical carrying-capacity constraints, but these will be set aside for the moment.

The linear programming formulation of the recreational development model is a precursor to the multiobjective formulation. It lacks a number of possible system constraints such as travel distance and development cost because neither can be measured in the amount of activity allowed (ie. in user days). The present formulation also violates several assumptions of the linear programming model. The assumption

of additivity, as implied in the name of the method - linear programming - means that there are no interactions between activities and that therefore, for any and all activities (x_1, x_2, ... x_n), the total useage of each and all resources is equal to the sum of the quantities generated by each activity alone. In this study, the exact correlations between activities are unknown, but are suspected to be complex and non-linear (1). The additivity assumption is therefore violated. A mathematical programming method which does not assume an additivity constraint is that of non-linear programming. This method, however, does require that the exact form of the non-linear relations between variables be known and quantifiable. Since this is not the case in this study, non-linear programming is not a suitable alternative.

A second assumption of linear programming is that of divisibility. It is assumed that the measurement units of the decision variables are divisible into fractional levels, but in this case, the addition of one cottage to a lake may add on at least 200 user days, a value which is not divisible.

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(1) The basis for this lies in the fact that some activities (eg. waterskiing) are subsets of other activities (eg. motorboating), thus resulting in a great deal of interaction.

A third assumption of the linear programming model is that all parameters are known constants. This assumption is more than likely violated by the conflict parameters. In fact, the conflict parameters are meant to indicate the relative probability with which conflicts between cottagers and recreational development activities are likely to occur on the basis of present conditions. Since the model is being used to predict the impact of recreational development, a certain amount of uncertainty in the parameters must be assumed. This problem is not critical in that it can be accommodated by conducting a thorough sensitivity analysis on the parameters to determine those parameters which are very sensitive to changes in their values (ie. sensitive in the sense that a minor change in the parameter will cause another optimal solution to be chosen).

The most serious mathematical assumption violated by the present formulation of the model is found in the mathematical properties of the conflict parameters. Linear programming obviously asssumes a high level of measurement, which is at least interval, because of the numerous transformations conducted on the variables during the solution process. As was mentioned earlier in Chapter II (p.26), attitude scaling has not yet effectively progressed beyond the ordinal level of measurement. This implies that the attitude-based conflict parameters will have very little meaning

beyond that which is attached to their relative rankings. Any transformation involving these parameters and the activity decision variables which does not preserve the order of scores on the scale will be very difficult to interpret. Wilson (1971) summarizes the problem of using ordinal variables in models which require variables of at least interval measurement:

> -... when only ordinal measurements are possible, only very weak conclusions, if any, can be drawn from the data relative to a proposed model. (p.432)

4.2.2 The Integer Linear Programming Model

Violation of the additivity and measurement assumptions can be avoided by reformulating the model for individual activities (ie. for one activity at a time) and by using an integer linear programming approach. In the binary integer programming problem, the decision variables assume the values of either 1 or 0, meaning that some action will occur ($x=1$) or will not ($x=0$). A convenient formulation of the model is as follows (Hillier and Lieberman, 1974):

$$\text{Min } Z = \sum_{j=1}^{n} c_j x_j$$

subject to:

$$a_{ij} x_j > b_i \quad \text{for } i = 1, 2, \ldots n$$

and $x_j = 0$ or 1 for $j = 1, 2, \ldots n$

where x_j = presence or absence or an activity on lake j.

The solution to the program will be the minimum conflict value for a selected activity among all the lakes. This approach solves the problem of additivity in that only one activity is included in the objective function, thus eliminating the possiblity of error arising from interactivity correlations. The measurement problem has also been handled in this formultion of the model. The conflict parameters are not involved in any transformation other than to state their presence or absence in the optimum solution.

Although this reformulation solves two problems, it also produces two. The first is that the model can only minimize potential conflicts for one activity at a time, ie. between cottagers and a single activity on each of the lakes. The second problem is that the units of measurement represented by the decision variables are no longer user days and are therefore not commensurable with the physical carrying-capacity units of measurement. This excludes the possibility of including physical development limits in the model.

4.2.3 The Multiobjective Model

The method which presents itself as a solution to both of these problems is multiobjective programming. Its capacity to optimize a set of objectives instead of just one and to handle non-commensurable objectives provides the most efficient framework for analysis of the conflict problem.

The general form of the multiobjective model has been taken from Cohon and Marks (1973) and translated into the format used in this paper:

$$\text{Min } Z_k = \sum_{j=1}^{n} c_{jk} x_{jk} \quad \text{for } k = 1, 2, \ldots p$$

subject to:

$$a_{ijk} x_{jk} \geq b_{ik} \quad \text{for } i = 1, 2, \ldots m \text{ and } k = 1, 2, \ldots p$$

The optimum value, Z_k, is no longer a scalar as it was in the linear programming problem, but a vector (p x 1). The solution to the multiobjective problem is found via the generation of the non-inferior set. This is accomplished by transforming the vector objective function back into a scalar objective function. The result is a point in the non-inferior set. Other points in this set are found by systematically varying the transformation parameters. There are numerous transformation techniques in use, but the most suitable for deriving solutions to the conflict problem is the

ε-constraint method (Haimes et al., 1975). This method replaces the vector objective function with one of the member scalar objective functions and denotes the rest as constraints on this objective function. The constraints are maximum allowable levels for the p-1 objectives. The preferred solution is found by solving for the objective function, subject to all of the constraints. Maximum allowable values ($\varepsilon_1, \varepsilon_2, \ldots \varepsilon_n$) are seldom definitive or absolute in real life; the constraint method can therefore be used to generate the non-inferior set by varying the values of the ε's.

With the imposition of the binary restrictions, the form of the model will be as follows:

$$\text{Min } Z = \sum_{j=1}^{n} c_{j1}\, x_{j1}$$

subject to:

$$c_{ijk}\, x_{jk} < \varepsilon_i, \quad k = 2, 3, \ldots p; \quad i = 1, 2, \ldots m$$

and $$x_{jk} = 1 \text{ or } 0, \quad j = 1, 2, \ldots n$$

where x_{jk} = level of future development of activity k on lake j;

$x = 0$: no development,
$x = 1$: development.

c_{jk} = conflict index for activity k on lake j

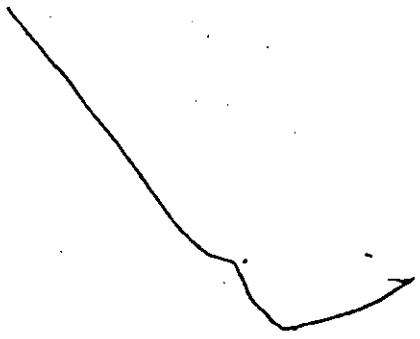
ε_i = maximum allowable conflict index value for activity i

n = total number of lakes

m = total number of activities

p = total number of objective functions

The interesting characteristic of this model is that it can act as a general framework for analysis of not only activity conflicts but also of other objectives such as minimization of development cost and maximization of accessibility. These latter factors are particularly important in the development of remote northern lakes. Their impact can be incorporated within the multiobjective problem by use of mixed integer programming which can handle both integer and non-integer variables. The scope of the present study calls for the simple analysis of conflicts and will therefore be restricted to the optimization of activity objective functions.



Chapter V

DATA COLLECTION PROCEDURE AND RESULTS

The preceding chapter of this thesis presented a multi-objective model of recreational activity and development conflicts from which, it was suggested, optimal solutions for achieving planning objectives could be achieved. This chapter will describe the survey procedure used for data collection and lay the groundwork for development of the model parameters. The success of the survey will be measured in terms of the presence or absence of bias in the results. A number of important variables will then be described and compared for each of the lakes in the Rideau Lakes study area order to establish a general profile of cottager characteristics for the study population.

5.1 SURVEY PROCEDURE

5.1.1 Target Population

The first step in the survey was to decide on whether to use a sample survey or census of the population in the study area. The target population was all home owners on the study lakes. For the purposes of this research, both

permanent and non-resident residents owning homes were defined as cottage owners.

An examination of the cottaging population by means of a search through local assessment records for each of the seven study lakes revealed that no lake had more than 131 cottages on it and some had fewer than 20 (see Table 1). A population census was opted for on the basis of the small total population (474 residences) and the lack of a data base from which establish the criteria for selecting a stratified random sample.

5.1.2 Survey Method

The most frequently used survey methods are mail questionnaires and interviews. Both methods have their advantages and disadvantages and these will be reviewed before noting the method selected.

Mail questionnaires require less time and expense to administer than interviews, but this advantage is counteracted by the fact that they must meet a number of strict criteria for successful use and often result in very low response rates. Many mail questionnaires have obtained response rates as low as 10 - 15% (Moser and Kalton, 1971) and

have therefore been criticized as being a highly unsatisfactory research tool (Kish, 1965). On the other hand, new techniques of response maximization have had considerable success in producing higher response rates (Scott, 1961; Filion, 1975).

Two of the main restrictions on mail questionnaires are length and complexity of the topic under investigation (Filion, 1975). The body of the questionnaire must be short enough that the respondent is not discouraged from answering. This requires that the researcher expend considerable effort on the construction of the questionnaire in order to minimize completion time. All questions should be clearly understandable (Moser and Kalton, 1971). There is no chance for recourse to the interviewer for explanation and, as a result, poorly formulated questions may be skipped over or badly answered.

The main advantage of the interview, as mentioned previously, is the high response rates that may be expected. Moser and Kalton (1971) have found that on an average interview survey, a 75 - 90% response rate can be expected. Other advantages include the ability to supplement respondents' answers with observational data, and to clarify answers or ask supplementary questions.

A limitation of the interview is the number of people that can be contacted. Besides the amount of time involved, the field worker is restricted by the fact that he should not attempt to conduct more than 30-50 personal interviews per day because boredom with the task may introduce possible inaccuracies into the responses (Dixon and Leach, 1976). Furthermore, answers to interviewing surveys may be subject to interviewer bias.

The primary argument in favour of the mail questionnaire over the interview as a survey method in the study was accessibility to interview subjects. Through a preliminary examination of local assessment roles and through discussion with local residents, it was discovered that many cottagers on the lakes in the study area were second homeowners whose permanent residences were located at considerable distances from their cottage site. As a result, they tended to be infrequent visitors to their cottages. This raised the possibility of very low response rates with the interview technique, or at least the necessity for an inordinate amount of time to be spent on contacting 'not-at-homes'. The capacity of mail questionnaires to reach a widely dispersed population coupled with the accessibility problem prompted its choice for use in the survey.

5.1.3 Questionnaire Design

The success of a mail questionnaire depends to a great extent on the efficiency and attractivity of its design. General design guidelines were found in Moser and Kalton (1971) and Oppenheim (1966). The structural development of the questions themselves was aided by a 1977 survey conducted for a study on lakeshore capacity by the Ontario Government (1). Finally, the layout of the questionnaire was largely inspired by the most recent versions of the Canadian Migratory Game Bird Harvest Survey (2).

After a pilot study of 20 cottagers, the survey questionnaire was revised and shortened such that, in its final form, it contained 20 questions divided among four sections. The first part asked for information on ownership (Q.I.1-2), residence (Q.I.3), cottage use (Q.I.4-7), facilities (Q.I.8) and location with respect to other cottages (Q.I.9-11). This section was designed to establish background information for the purposes of investigating non-response bias and the eligibility of the respondent in the study (ie. only cottage owners were included). Part two dealt with cottage use and activity participation. These questions are important with respect to the attitudes displayed by cottagers

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(1) produced by the Local Planning Policy Branch, Ontario Ministry of Housing, Toronto.
(2) produced by the Biometrics Section, Canadian Wildlife Service, Environment Canada, Ottawa.

towards the activity conflicts measured in Part III. Unfortunately, detail on activities and use had to be sacrificed for generalities because of the danger of discouraging the respondent from completing his answers. Based on the Likert scaling technique, the first question in Part III formed a 13-item scale of activity conflicts from which the conflict indices were to be derived. The second question in this section attempted to establish satisfaction and importance levels for a number of criteria related to the cottaging experience but not directly concerned with activity participation. The next question dealt with attitudes towards future development. This question was meant to act as verification of the attitudes expressed earlier in Question 1, Part III. If cottagers obtained high conflict scores, they were also expected to display opposition to future development. Part IV asked for the cottagers' opinions on the need for a lake plan (Q.IV.1) and public participation (Q.IV.2), and the location of their cottage (Q.IV.4). An open-ended question for comments (Q.IV.3) was also included.

5.2 QUESTIONNAIRRE MAILINGS AND RETURNS

The first set of questionnaires was sent out on February 17, 1978, and included self-addressed, stamped return envelopes. A follow-up letter was mailed approximately four

weeks later. Copies of both the questionnaire and follow-up letter can be found in Appendix A. The delay in sending out the follow-up letter was occasioned by the time expected for the questionnaire to be delivered and returned, in some cases up to 8 days. A second set of questionnaires was sent out March 14 after it was discovered that there had been some unidentified entries in the assessment roles. The return dates and places of origin were noted upon receipt of the returned questionnaires.

TABLE 2

Questionnaire Return Rates by Lake

Lake	No. of Questionnaires Mailed	Useable Returns	Return Rate
Opinicon	136	84	61.8%
Indian	90	77	85.6%
Newboro	68	52	76.5%
Benson	18	15	83.3%
Clear	21	15	71.4%
Mosquito	4	4	100.0%
Sand	137	106	77.4%

The number of questionnaires mailed and usable return rates for each lake are shown in Table 2. Only twenty of the 474 questionnaires sent out were found to be unusable when returned. The remaining 353 returns yielded an overall response rate to the surveyof 78.7%. The lowest return rate occurred on Opinicon Lake (61.8%) and the highest on Mosquito Lake (100.0%).

5.3 NON RESPONSE BIAS

Although a fairly high response rate of 78.7% was achieved in this study, the question of bias being present in the results because of non-reponse cannot be overlooked. If non-respondents differ from respondents in a survey, estimates of population parameters may be in error. Almost all surveys incur a certain amount of non-reponse and, as a result, some well developed techniques have been evolved to deal with the problem. A number of these have been reviewed and classified by several authors (1). Two of the three most commonly used methods rely on the existence of 'known' values for population socio-economic or demographic variables against which to compare the survey results. When these statistics are not available, as is the case in this study, a third method, based on the analysis of follow-ups

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(1) see, for example, Armstrong and Overton (1977); Filion (forthcoming, 1979).

is suggested. This method has been used successfully in estimating non-response bias (Filion, 1975; Armstrong & Overton, 1977). It has a distinct advantage over estimating techniques based on 'known' values in that it can measure non-response bias for all items in the survey and not only those for which values are known.

Follow-up methods are based on the assumption that late respondents are more likely to be representative of non-respondents than early respondents (Pace, 1939). Non-response bias may therefore be corrected by using the follow-ups to weight the population estimates. Some methods accomplish this with a linear extrapolation of percentage responses in each wave, including the first initial mailing wave. Others, such as the correction method used here, only attribute the characteristics of respondents from the follow-ups alone to non-respondents (Filion, forthcoming, 1979). Population parameters (M) may be estimated as follows:

$$M = \frac{n\bar{y}_1 + (N - n)\bar{y}_2}{N}$$

where N = population size
n = size of response to first wave
$\bar{y}_1$ = value of characteristic for wave I
$\bar{y}_2$ = value of characteristic for wave II

An initial testing on the reliability of this method was done on a 'known' population parameter: the proportion

of Americans and Canadians in the study. Table 3 shows the results of applying the correction method to the survey results. The total proportion of Canadian respondents in the survey was found to be 60.6%. This compared to a 'known' population proportion of 62.7%. Using the proportion of Canadian respondents in Wave II as being representative of the proportion of non-responding Canadians, a corrected population proportion of 61.3% was found. Although this proportion underestimated the population parameter by 1.4%, it represented an improvement in the right direction of the estimated value based on the survey results alone. The difference of 2.1% between the population parameter and the survey results was not considered large enough to have introduced serious bias into the study.

TABLE 3

Estimates of Canadian and American Population Parameters and Corrections for Non-response Bias

Country	Wave I	Wave II	Total Response Proportion	Corrected Proportion Estimate	'Known' Population Proportion
Canada	60.4% (177)	61.7% (37)	60.6% (214)	61.3% (291)	62.7% (297)
United States	39.6% (116)	38.3% (23)	39.4% (139)	38.7% (183)	37.3% (177)
Total	100.0% (293)	100.0% (60)	100.0% (353)	100.0% (474)	100.0% (474)

The results of applying the non-response estimation technique to five other variables is shown in Table 4. The largest percentage difference between the total response population estimates and corrected estimates is 4.46% for travel time. The average travel time for respondents in Wave I was six hours and five minutes; for respondents to Wave II, it was four hours and forty-five minutes. The existence of possible bias in this variable is acknowledged, but since the variable is not a critical one in the study, it was not considered necessary to weight all results to account for the bias.

The critical variables of the study are those related to the measurement of attitudes. In Table 4, the variable which represents the summed attitude scores is an attitude variable and must be examined closely for non-response bias. The results indicate that there is only a 1.95% difference between the total response value and the estimated population value. It was felt that this difference was not sufficiently large to warrant weighting of the data. All other variables examined had very little bias among respondents.(1)

(1) Another form of non-response bias, item non-response, was also investigated and not found to be serious.

TABLE 4

Estimates of Non-response Bias for Selected Variables

Variable	Proportion/Mean (n=293) Wave I	(n=60) Wave II	Total Response	Corrected	Percentage Difference
Principal Residence (1)	6.0%	9.0%	6.5%	7.2%	0.7%
Cottage Owned (2)	13.15	12.80	13.09	13.10	0.01%
Activity Days (3)	86.47	87.88	86.71	87.56	0.97%
Attitude Scores (4)	46.36	49.30	46.86	47.79	1.95%
Travel Hours (5)	6.09	4.75	5.86	5.61	4.46%

(1) Cottage is principal residence.
(2) Number of years cottage has been owned.
(3) Number of days cottage is used during the year.
(4) Likert scale scores.
(5) Travel time from principal residence to cottage.

5.4 COTTAGER PROFILES

The objective of this section will be to summarize a number of the variables used in the survey in order to provide a general profile of cottager characteristics on the study lakes. All descriptions are based on the raw data presented in the tables in Appendix B.

5.4.1 Length of Ownership

According to the variable, 'average number of years cottage has been owned', the 'oldest' lake in the region is Newboro Lake. The average number of years cottage occupants have been on the lake is 17.6 years, compared to 13.8 and 13.1 years for its nearest rivals, Opinicon and Sand Lakes respectively. Mosquito Lake is by the far the 'youngest' lake with average length of ownership being 4.7 years. Both Indian and Clear Lakes fall somewhere in the middle range at 11.35 and 11.0 years respectively.

5.4.2 Principal Residence

For the overwhelming majority of the respondents, their lake residence was not their principal residence. The proportion of principal residences on each lake ranged from a high of 10.4% on Sand Lake to a low of 0.0% on Mosquito and Clear Lakes.

5.4.3 Travel Time

The average amount of time used in travelling to the cottages varies considerably among the lakes from a high of nine and a half hours for cottagers on Indian Lake to a low

of two and a half hours for cottages on Benson, Clear and Mosquito Lakes.

5.4.4 Most Recent Use of Cottage

A high proportion of the cottages on the study lakes were used in 1977. Only nine of the 474 respondents did not use their cottages in that year. On Newboro, Benson, Clear and Mosquito Lakes, all cottages were used at least once during the year. The reasons given by non-users for their absence from the lake included:

a. 'Built another cottage'.

b. 'Fishing no good'.

c. 'Illness'.

d. 'No time'.

5.4.5 Cottage Facilities and Equipment

A brief survey of the distribution of facilities possessed by cottagers in the study area shows that there does not appear to be any major differences among the lakes (Appendix B, Table 19). Table 5 lists the proportions of respondents indicating that they had the facility listed. There is no set pattern for the distribution of primitive

versus modern facilities on the lakes, although a few exceptions do emerge. A larger proportion of the cottages on Newboro (17.6%) and Benson (18.8%) Lakes have hand-powered pumps than the average (6.8%). Newboro and Mosquito Lakes both have slightly higher percentages of cottagers without telephones, direct road access or heating systems. The largest number of motorboats with engines over 80 horsepower are found on Indian Lake. Over 50% of the cottagers on all lakes had motorboats with at least a 25 horsepower engine.

TABLE 5

Proportion of All Respondents Having Selected Facilities or Equipment
(n=353)

Facility	Proportion	Facility	Proportion
electricity	86.1%	holding tank	8.8%
cold running water	82.7%	hand-powered pump	6.8%
indoor toilet	82.7%	air conditioning	2.3%
septic tank	79.3%	connection to sewage system	0.9%
pressurized water	76.4%		
hot running water	75.9%		
bathtub/shower	73.0%		
direct road access	67.6%		
leaching bed	65.9%		
telephone	51.1%		
heating system	38.4%		
outdoor privy	27.0%		
clotheswasher	19.9%		
propane	16.8%		
dishwasher	13.4%		

Equipment	Proportion
boat dock	83.2%
engine up to 25 hp.	57.1%
canoe	56.0%
waterskies	48.0%
engine 25 to 80 hp.	41.8%
sailboat	26.4%
engine over 80 hp.	15.6%

5.4.6 Nearest Neighbours

Only 26 or just over 5% of the 474 cottagers in the study area did not have other cottagers as neighbours on both sides. The different land use types found next to cottages on the lake were as follows;

a. Marina
b. Trailer Park
c. Farm
d. Camp
e. Resort
f. Biology Station

5.4.7 Frequency of Cottage Use

On the average, the number of days that cottages were used over the year was highest on Benson Lake (122 days). Cottages on both Indian (111 days) and Sand (111 days) also experienced a relatively high proportion of use. The remaining four lakes - Opinicon, Newboro, Clear and Mosquito - ranged in use from 70/to 75 days per year.

July was found to be the most popular month followed closely by August. As can be expected in a situation where, for the majority of the population, the residences on the lakes are second homes, the cottages were least frequented during the winter.

5.4.8 Participation in Recreational Activities

Details on frequency of cottager participation in fourteen recreational activities were collected in Question II.3. Respondents were asked to rank their frequency of participation in all activities on a four-part scale ranging from 'never' to 'most frequently'. There were numerous ties among the rankings because respondents were allowed to give equal ranks to several or even to all activities. The ranking of the recreational activities which were most frequently participated in is shown in Table 6. The dominance of the summer-oriented activities is evident. On five lakes, swimming and sunbathing were found to be most popular, while motorboating ranked first on three lakes. Hiking, which ranked closer to third or fourth on most lakes, was allocated to the first rank along with swimming and sunbathing on Benson Lake. Respondents on Benson Lake also showed a strong predeliction for 'other' activities of which the most popular was gardening, followed by 'relaxing', and 'working on the house'.

5.4.9 Importance and Satisfaction Criteria

In this question, the cottagers ranked a number of criteria in terms of how important they felt they were in choosing a location for their cottage. They also specified

TABLE 6

Most Popular Recreational Activities

Opinicon	Indian	Newboro	Benson
swimming sunbathing 70.2% (59)	swimming sunbathing 67.5% (52)	motorboating 67.3% (35)	swimming sunbathing hiking 66.7% (10)
motorboating canoeing 57.2% (43)	motorboating 59.7% (46)	swimming sunbathing fishing 54.6% (31)	other 53.3% (8)
fishing 48.8% (41)	fishing 40.3% (31)	hiking 23.1% (12)	motorboating 46.7% (7)

Clear	Mosquito	Sand
motorboating 80.0% (12)	motorboating swimming sunbathing 75.0% (3)	swimming sunbathing 62.3% (66)
swimming sunbathing 53.3% (8)		motorboating 48.1% (51)
fishing 46.7% (7)		fishing 31.1% (33)

how well the present site of their cottage satisfied their expectations for these criteria. The scales used to evaluate both importance and satisfaction had seven categories of response. The two extrema of the importance scale were 'not important' and 'extremely important'; the two extrema of the satisfaction scale were 'not at all' and 'extremely well'.

Analysis of the response distributions indicated that the extrema of the scales had probably been placed too far apart. Very few respondents found a criterion to be less than 'fairly important' for choosing their cottage. In the same vein, very few respondents indicated that their present site fulfilled their expectations to a less than 'adequate' degree.

The majority of cottagers on all seven lakes agreed that six of fourteen importance criteria were extremely important. These included: (1) peace and quiet, (2) good view, (3) privacy, (4) good swimming, (5) lake frontage and (6) good water quality. Close to a majority felt that (1) large lots, (2) good price for lot, (3) good price for cottage and (4) size of the lake were also extremely important. Three criteria were found to have been allocated more or less evenly between 'fairly important' and 'extremely important': (1) not too far from permanent residence, (2) close to a provision centre and (3) good road access. One final criterion, 'close to friends', received the lowest importance evaluation. The majority of respondents felt that it was either 'fairly important' or 'not important'.

The satisfaction scale performed little better than the importance scale in that it produced a similar 'bunched'

distribution of respondents along the response continuum. Four of the fourteen criteria were agreed upon by the majority of cottagers as having fulfilled their expectations 'extremely well'. These were: (1) peace and quiet, (2) good view, (3) privacy and (4) size of lake. The lake frontage criterion had the same type of placement except on Benson Lake where only 46.7% of the cottagers agreed that it had performed extremely well.

For all lakes, a criterion which showed considerably less consistency than other criteria in the response categories was that of 'good swimming'. A strong majority of respondents on Indian Lake (70.1%) and Clear Lakes (73.3%) felt that this criterion had been fulfilled extremely well by their lakes. Only 33.3% of the respondents on Benson Lake held the same views. On the other four lakes, both the 'adequately' and 'extremely well' response categories were selected by approximately 40-50% of the cottagers.

Responses to all other criteria were fairly evenly distributed between 'extremely well' and 'adequately'.

5.4.10 Tolerance for Development

Question structure may again have been a problem in this set of questions. Consistently, fewer than 6.0% of the cottagers on all lakes were willing to accept any type of development 'as a neighbour'. The other response categories they were faced with were: a. 'within line of sight'; b. 'on lake but not in sight'; and c. 'not on lake at all'. The exception to this was development involving one new cottage. Up to 40.0% of the respondents on one lake, Benson, felt that this form of development would be tolerable.

The purpose of these questions was to ascertain what forms of development might encounter the most amount of opposition. The weakness of the questions is that they do not specify the meaning of tolerance. This and the connotations of the word 'development' may have resulted in the indiscriminant checking of the 'not on the lake at all' box. Although only two of the development types, cottage subdivisions and trailer parks, were placed in this category by the majority of respondents, all other developments were also characterized by a strong degree of opposition.

Most people felt that they would not tolerate the existence of provincial parks, private campgrounds or public picnic grounds on their lakes, but a strong minority did not mind having the developments on their lake as long as they

were out of sight of their cottage. The same sort of reaction was displayed towards the possibility of having ten new cottages or a tourist lodge on the lake. The difference was that, in some cases, the majority of the cottagers were in accordance with the 'on lake' category. Finally, opinions about two development types, youth camps and public access points, were found to be fairly evenly distributed between the two categories.

5.4.11 Participation in Lake Planning

On all lakes except Mosquito, the only group that was ranked first by more than 50% of the respondents as a participant in lake planning was the cottage-owner group. The second ranking group on six lakes and the first ranking group on Mosquito Lake was the property-owner group. The cottage-owner group is actually a subset of this group as, in turn, this group is a subset of the 'all lake users' group. However, 'all lake users' were ranked of most importance in the planning process less than 10% of the time on all lakes except Mosquito. The poor placing of this group is best illustrated by the number of times it was not given a ranking at all and thus deemed ancillary to the planning process (Table 7). On each lake, over 70% of the respondents indicated that 'all lake users' should not be included in the planning process. Federal government agencies also fared poorly in the ranking of planning participants. Fifty

percent or more of the respondents on each lake were against the participation of the federal government.

TABLE 7

Groups Which Were not Ranked as Planning Participants

Group	Opinicon	Indian	Newboro	Benson	Clear	Mosquito	Sand
Cottage Owners	10.7% (9)	5.2% (4)	11.5% (6)	13.3% (2)	6.7% (1)	25.0% (1)	11.9% (12)
Property Owners	15.5% (13)	15.6% (12)	11.5% (6)	13.3% (2)	20.0% (3)	25.0% (1)	12.3% (13)
All Lake Users	75.0% (63)	80.5% (62)	78.8% (41)	80.0% (12)	86.7% (13)	75.0% (3)	73.6% (78)
Local Governments	33.3% (28)	36.4% (28)	21.2% (11)	33.3% (5)	33.3% (5)	50.0% (2)	30.2% (32)
Provincial Government	38.1% (32)	40.3% (31)	19.2% (10)	26.7% (4)	46.7% (7)	75.0% (3)	35.8% (38)
Federal Government	64.3% (54)	63.6% (49)	61.5% (32)	53.3% (8)	73.3% (11)	75.0% (3)	49.1% (52)

5.5 SUMMARY AND CONCLUSIONS

The survey methodology used in this study was found to be relatively successful in that almost 79% of the population surveyed replied to the questionnaire. However, a high response rate does not necessarily preclude the existence of non-response bias. This problem was explored and not found

to be serious enough to warrant major corrections to the data obtained. This chapter concluded with a description of selected characteristics displayed by the cottaging population on the study lakes. The sixth chapter of this thesis will consider the implications of recreational development on lakes in the study region by formulating a set of conflict indices and using them as parameters in a multiobjective recreational development model.

Chapter VI

FORMULATION OF THE CONFLICT INDICES AND MODEL CALIBRATION

In the preceding chapter, selected results of the questionnaire survey were discussed in order to ascertain if there was any non-response bias in the returns and to investigate some of the profile characteristics displayed by cottagers in the study area. The results of the non-response bias analysis having shown no appreciable bias in the returns, it is now possible to proceed with the calculation of population parameters for the recreational development model.

The first step involves testing for how effective the attitude statements used in the survey were in placing individuals along the attitude continuum. The purpose in verifying the attitude statements will be to ensure that the scores from individual responses indicated measurement of common attitudes. This will be accomplished by means of the method explained in the first section of the chapter. The next step in calculating the parameters of the model will be to derive the conflict indices from the attitudes expressed by cottagers towards activity and development levels. The conflict indices will then be inserted into the model and the model calibrated.

6.1 ITEM ANALYSIS

The attitude statements in this study were constructed by means of the Likert scaling method. A common technique used for verifying the internal consistency of Likert scales is that of 'item analysis'. There are two approaches currently in use. One is to correlate the scores of individuals on each of the attitude statements or items with their total scores. Those statements which do not have reasonably high correlations are eliminated from the scale (Peters & Van Voorhis, 1940). Another approach is to test how well each item distinghishes between the attitude scores of individuals having total scores in the top and bottom 25% of the sample (Edwards, 1957). Both approaches have been shown to yield similar results (Murphy & Likert, 1937). For verification of the Likert scale in this study, the second approach was applied and the Kolmogorov-Smirnov test (1) was used to test for differences between the upper and lower groups. The attitude statements of the items (2) tested are

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(1) When the research involves two separate and independent samples, testing is made on the basis of 'D', the maximum deviation between two observed cumulative frequency distributions. This value is then compared to the known sampling distribution (Massey, 1951) to discover the probabilities associated with a value as large as D occuring under the null hypothesis (H (0): the two groups come from the same population) (Siegel, 1956).

(2) Each attitude statement represents an item. For example, attitude statement one in Table 8 represents the item for waterskiing. Each item will hereafter be referred to in the tables by an abbreviation which is underlined in Table 8.

shown in Table 8. Statements 2, 4, 5, and 13 were negatively-phrased statements in the questionnaire and have been transformed into positive statements in the table to facilitate comparison with other statements. The distribution of scores along the scale has also been reversed.

Table 9 presents the results of the Kolmogorov-Smirnov test on combined attitude scores and for individual lake attitude scores of the four largest lakes.

All statements submitted to the Kolmogorov-Smirnov test were deemed unsatisfactory for distinguishing between upper and lower attitude score groups if the level of significance for the D-statistic fell below .05. Looking first at the statistics for all study lakes combined, it can be seen that only one statement does not produce significant results at the 0.05 level. This is the one dealing with canoeing activities on the lakes (Statement 12). The most probable reason for its having had low distinguishing powers is that a very low conflict level has been perceived by all cottagers for the activity. This hypothesis is borne out by the distribution of conflict indices for the item (Table 59, Appendix B). Fully 88% of the respondents had Conflict Indices for canoeing activities of less than or equal to two. The statement was therefore removed from the scale for future calculations.

TABLE 8

Questionnaire Attitude Statements

Statement 1:	Waterskiing interferes too much with other activities on the lake.
Item:	Number of Waterskiers.
Statement 2:	The lake is not big enough to accomodate a much higher level of motorboating activity.
Item:	Number of Motorboaters.
Statement 3:	There are too many cottages on the lake.
Item:	Number of Cottages.
Statement 4:	Canal traffic passing through the lake seems to have increased since last year.
Item:	Number of canal users.
Statement 5:	The quality of fishing on the lake is unsatisfactory.
Item:	Quality of fishing.
Statement 6:	Shouting and loud noises from other lake users is a problem.
Item:	Noise.
Statement 7:	There is a need for the number of sailboats on the lake to be controlled.
Item:	Number of sailboats.
Statement 8:	The quality of the water in the lake for swimming could be better.
Item:	Swimming quality.
Statement 9:	There should be a speed limit or size of engine limit on motorboats.
Item:	Boat speed limits.
Statement 10:	There are too many people using the lake.
Item:	Number of people.
Statement 11:	There should be restrictions on where non-local boats may cruise or land.
Item:	Boat cruising regulations.
Statement 12:	Canoeists interfere with my enjoyment of lake.
Item:	Number of canoeists.
Statement 13:	The lake is not as pleasant for recreation now as it was when I first bought my cottage.
Item:	Lake not as pleasant.

TABLE 9

D-statistic for significant Differences between Highest and Lowest Scoring Groups for Each Attitude Item

	Opinicon (n=17)	Indian (n=18)	Newboro (n=13)	Sand (n=25)	All (n=94)
Statement 1	.882*	.666*	.615*	.920*	.693*
Statement 2	.706*	.389*	.385*	.440*	.514*
Statement 3	.764*	.444*	.615*	.560*	.542*
Statement 4	.276	.556*	.378**	.080	.285*
Statement 5	.588*	.389*	.231*	.680*	.416*
Statement 6	.588*	.778*	.615*	.680*	.631*
Statement 7	.294	.333**	.539*	.360*	.291*
Statement 8	.529*	.667*	.539*	.760*	.576*
Statement 9	.765*	.667*	.769*	.720*	.639*
Statement 10	.824*	.778*	.615*	.840*	.767*
Statement 11	.706*	.222**	.462*	.520*	.500*
Statement 12	.177	.242	.091	.280**	.138
Statement 13	.941*	.889*	.769*	.760*	.757*

* Significant at .01
** Significant at .05

Returning to the combined lakes (All Lakes) column of Table 9, further examination reveals that the D-statistics for Statements 4 and 7, on canal traffic and sailing activity levels respectively, are considerably lower than the re-

maining 10 statements. Although significant at the 0.01 level, both suggest the presence of low scores on the individual lakes. The D-statistics for statement 4 on Lakes Opinicon (0.276) and Sand (0.080) and for Statement 7 on Lake Opinicon (0.294) have, in all three cases, levels of significance below 0.05. Since the purpose of this study is to compare attitudes towards activity levels for each lake, it was felt that the presence of inconsistent statements in the scale for any lake would detract from the reliability of the conflict indices. Consequently, Statements 4 and 7 were also removed from the scale. No further removals were considered necessary because testing on all other statements produced significant results.

Three lakes, Clear, Benson and Mosquito, have had their items excluded from the Kolmogorov-Smirnov analysis because of their low population sizes. The 25% of population groups being compared for Benson and Clear Lakes only had three cases each, thus making it difficult to infer statistically significant results. The situation for Mosquito Lake was even worse. Instead of eliminating these lakes from further analysis entirely, it will be assumed that those items which were found to have good distinguishing powers on the other lakes combined, would also be suitable for application to the three smaller lakes.

6.2 RECREATIONAL DEVELOPMENT SCALE

This scale was formed for the purposes of validating the rating scale item scores and for measuring the attitudes of the cottagers towards recreational development in general. Using the Likert scaling technique, scores were summed for all items into a total score for each individual. The total score represents the location of individuals along what will be referred to as the 'recreational development' attitude continuum.

The scores may range from a low of 10 for 'strongly disagree' responses to every statement by an individual to a high of 70 for 'strongly agree' responses to every statement. The range of scores is determined by the number of items in the scale (10) and the total number of categories for each item (7). An individual having a score of six on every item would be assigned an overall development score of 60. The higher the total score, the greater the assumed degree of resistence to development will be. High scores imply areas of high potential conflict. No absolute values should be attached to this scale. In other words, a total score over 35 does not imply vehement resistence to recreational development, nor does a score under 35 mean that individuals will not oppose recreational development. What the scores are meant to indicate is a relative ranking of individual attitudes towards recreational development. When the

combined distribution of individual scores for each of the lakes is compared, one lake or several lakes may dominate by showing skewed distributions towards the left-hand side of the attitude continuum. The dominating element in this case refers to those lakes on which it is predicted that development will generate the relatively least amount of potential conflict.

The output from the recreational development scale is an indication of potential conflicts that may be generated by recreational development in general. For indications of potential conflict that may be generated by increases in specific activity or development levels, the measurements used are the conflict indices. These are discussed in the next section.

The distribution of recreational development scale values for all lakes and for the combined scores is shown in Table 10. Frequency distributions of scores on three of the largest lakes, Opinicon, Newboro and Sand, tend to be normally distributed. Benson and Indian Lakes exhibit similar distributions except for a slight depression at the peak. Clear and Mosquito Lakes have distributions quite distinct from those on the other lakes, with no clear pattern emerging.

TABLE 10

Development Scale Scores

Lake	Score							
	10-17	18-26	27-35	36-44	45-53	54-62	63-70	no response
Opinicon	1.2% (1)	7.0% (6)	21.4% (18)	29.8% (25)	28.6% (24)	10.7% (9)	1.2% (1)	-
Indian	-	6.5% (5)	29.9% (23)	26.0% (20)	32.5% (25)	5.2% (4)	-	-
Newborg	-	7.7% (4)	32.7% (17)	32.7% (17)	15.4% (8)	11.4% (6)	-	-
Benson	-	-	33.3% (5)	26.7% (4)	33.3% (5)	6.7% (1)	-	-
Clear	13.3% (2)	6.7% (1)	20.0% (3)	6.7% (1)	46.7% (7)	6.7% (1)	-	-
Mosquito	50.0% (2)	-	25.0% (1)	25.0% (1)	-	-	-	-
Sand	0.9% (1)	12.3% (3)	24.5% (26)	32.1% (34)	19.8% (21)	6.6% (7)	2.8% (3)	0.9% (1)

6.3 THE CONFLICT INDEX

An examination of the internal consistency of the attitude scale has resulted in some attitude statements being eliminated from the scale. Further analysis then produced a set of recreational development scores based on the revised 10-item attitude scale. This scale will now be broken down into its individual rating scales and each used to produce a

conflict index for a particular recreational activitiy or development. Once the conflict indices are defined, the framework for a vector of interactions between cottagers and each item on the 10-item scale can be developed.

The frequency distributions of scores on the rating scales for each item are shown in Appendix B, Tables 40 to 52. The possible range of scores for an individual on each rating scale may be from one to seven. A score of one indicates favourable attitudes towards the item in question and a score of seven indicates a very unfavourable attitude. From all the responses received, it is possible to define a median score whose value will also vary between one and seven. The calculated values of these median scores, which will be referred to as the conflict indices, are shown in Table 11. High conflict indices indicate high potentials for conflict with the item in question and low conflict indices imply low potentials for conflict.

The conflict index for item 2, motorboating activity levels, has the highest index across all lakes and therefore suggests that it should be an area of concern in future development. Further examination of the row entries in Table 11 reveals that noise levels have the lowest conflict indices and do not appear to offer much scope for immediate conflict. The conflict indices for all other items range

TABLE 11

Study Lake Conflict Indices

Item	Opinicon (n=84)	Indian (n=77)	Newboro (n=52)	Benson (n=15)	Clear (n=15)	Mosquito (n=4)	Sand (n=106)
Waterskiers	3	2	2	4	3	1.5	2
Motorboaters	6	6	6	7	7	4	6
Cottages	3	4	3	3	4	3	4
Fishing	5	4	6	4	6	2.5	4
Noise	2	2	2	2	2	1	2
Swimming	5	3	5	5	2	3.5	4
Speed Limits	5	6	4	6	4	2	5
People	3	3	3	3	4	1	3
Cruising	5	5	4	4	6	3	5
Pleasant	3	3	3	2	2	1.5	2

between these two extremes. Within the column entries, one lake, Mosquito, stands out as having the lowest conflict indices. Nine of its ten confict indices are lower than those on other lakes.

The next stage in the analysis of potential conflicts is to integrate the conflict indices into the multiobjective model presented in Chapter IV. This will require that the parameters of the objective functions in the model assume

the values of the conflict indices for their respective activities and lakes. The dominance of low-scoring lakes and the importance of high-scoring items will become evident in deriving solutions to the model. Lakes with low conflict indices should make the most frequent appearances in the solution sets. The effect of high scoring items in the model will be to make the items very sensitive to changes in their conflict indices for each lake. A parameter that is very sensitive implies that even a small change in its value will tend to change the outcome of the solution process. This means that solutions based on sensitive parameters should be evaluated with care.

6.4 THE MULTIOBJECTIVE RECREATIONAL DEVELOPMENT MODEL

The implications of the conflict indices for future development are demonstrated in the multiobjective model by selecting development alternatives from the innumerable alternatives that are possible and submitting them to the modelling process. The development alternatives or scenarios are formulated by including in the model all possible activities, as represented by their conflict indices, that they might be associated with in the proposed recreational development. The number of activities included in the development alternatives is restricted by the fact that only ten

sets of conflict indices are available for each of the lakes.

Three scenarios are developed in this study and sensitivity analyses performed on the results obtained. Only optimal solutions are presented in the results because of space restrictions, but in cases where information on the relative impacts of development on all lakes is required, such as for the ranking of optimal solutions at a given constraint level, the non-optimal solutions can also be included for appraisal.

The non-inferior set (Z) represents the set of all feasible optimal solutions to the model. It has been divided into seven subsets, representing the seven possible values of the system constraints (ε 's). The convention used here for interpreting the non-inferior set will be that the subsets of the set are ordered from left to right within the set such that the solution subsets for the weakest constraint levels are found first, followed by increasingly stronger constraint subsets. The maximum number of subsets in the solution set is seven because the constraint levels only range from one to seven.

High-valued constraint levels in the model represent the weakest constraint levels. In other words, when the

constraint levels for all activities are set at seven, no lake will be excluded from the solution set because of elimination by the constraint function. A lake is considered 'constrained' for an activity if its conflict index for that activity is greater than the constraint level. If its conflict index is less than or equal to the constraint level, it is not affected by the constraint function. Since the highest possible value for a conflict index is seven, no lakes are constrained when there is a constraint level of seven. However, the lake may still be eliminated from the solution set in this case if it does not survive the minimization of the objective function

For the sake of brevity in presentation, constraint levels for which optimal solutions are not found will not be included in the set and all lake names will be shortened to the first letter in the name (1). The method used for solving the non-inferior set was to decrease all constraint levels at a rate of one unit per iteration until no further solutions to the model could be found.

All variable coefficients (conflict indices) and constraint parameters (ε's) were submitted to a sensitivity

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(1) Opinicon Lake = (O); Indian Lake = (I); Newboro Lake = (N); Benson Lake = (B); Clear Lake = (C); Mosquito Lake = (M); Sand Lake = (S).

analysis in order to verify the stability of the optimal solutions under conditions of uncertainty. As in most programming models, the parameters of the development model are not known constants but estimates. It is therefore recommended by several sources that mathematical programming solutions be used for decision-making only after the consequences of changing the model parameters have been examined (Hillier & Lieberman, 1974). Changes in some parameters may result in the creation or elimination of optimal solutions. The important question is how big the changes must be before new solutions are produced. In this study, each parameter was alternatively increased and decreased by a unit of one while all other parameters remained the same. In many cases, this did not result in a change of any of the optimal solutions in the non-inferior set, but it was felt that testing of a 15% uncertainty level would be sufficient to indicate the direction of change. The results of the sensitivity analyses are presented in tabular form within each scenario.

The contents of a solution subset are represented in the tables by '*' if there has been no change in composition from the original subset. Subsets for which sensitivity analysis has resulted in new solutions contain the new solution elements. If the outcome of changing a parameter value was that no solution could be found, the corresponding subset became an empty set, represented as '-' in the tables.

6.4.1 Scenario I: Increase in Canal Traffic

The first development scenario chosen (out of many alternatives) for discussion will attempt to assess the impact of an increase in canal traffic on conflict patterns in the lakes under study. It is postulated that this would generate an increase in motorboating activity, general noise levels, and the number of people using the lake. The items relating to these activities for which inclusion of conflict indices will be necessary are as follows:

1. Number of motorboats
2. Noise levels
3. Boat speed limits
4. Number of people

Only those lakes located on the canal route were considered part of the scenario. This meant that Benson and Mosquito Lakes were excluded. The objective function used contained the conflict indices for the number of motorboats on the lake. All other items were included in the constraint functions.

The non-inferior solution set produced by the multiobjective programming model for the first scenario was as follows:

$$\mathbf{X} = ((O\text{-}I\text{-}N\text{-}S), (O\text{-}N\text{-}S), (N))$$

The first subset of the solution set may be interpreted as meaning that four lakes, Opinicon, Indian, Newboro and Sand, (O-I-N-S), were found to be optimal solutions when the

constraint levels for all activities were set at seven and were thus at their weakest. When the constraint became stronger in the second subset (O-N-S), one lake, Indian, was eliminated from the solution subset. The strongest constraint level that was reached in the non-inferior solution was constraint level five (N). Newboro was the only lake not to be eliminated at this level. The solution sets for the fourth subset and all subsequent subsets are not shown because they are empty sets. No lake could satisfy the constraint that all of its conflict indices in the constraint functions had to be less than or equal to four.

An interesting outcome of the scenario is that Newboro Lake shows its dominance as an optimal solution by its inclusion in all three solution subsets. At constraint level five, the strongest constraint level found in the non-inferior set, only Newboro Lake fulfills the conditions of the constraint functions. However, if the constraint level is permitted to rise to level 6 from level 5, Lakes Opinicon and Sand also appear as optimal solutions in subset two ie. they satisfy all the constraints of the model and they serve to minimize the value of the objective function. Jumping up to the next constraint level, level 7, all four of the larger lakes are included in the solution subset. Clear Lake was not included in any of the solution sets because of a high conflict index in the objective function (CI=7) and be-

cause of relatively high conflict indices among the constraint functions.

6.4.1.1 Scenario II Sensitivity Analysis: Variable Coefficients

When the conflict indices were inserted into the model, they became variable coefficients (c_{jk}) for the decision variables (x_{jk}). A sensitivity analysis on the coefficients resulted in all subsets experiencing changes in their composition at least once as shown in Table 12. In order to aid in interpretation of the table, the changes to the solution set caused by permutations to the variable coefficient for motorboating on Lake Opinicon will be examined and their meaning explained. Changes to this coefficient resulted in four new solution subsets being produced. Increasing the coefficient by one caused Lake Opinicon to be dropped from the first (I-N-S) and second (N-S) subsets. It did not cause a change in the composition of the third (*) subset. A decrease or weakening of the variable coefficient for motorboating by one unit also had repercussions on the solution set. Opinicon Lake became the sole solution element for the first (O) and second (O) subsets. The third (*) subset did not change.

TABLE 12

Scenario I Solution Sets Changes Arising from Unit Increases and Decreases of the Variable Coefficients (1)

Decision Variable	Coefficient Change	Solution Subset	Lake Opinicon	Indian	Newboro	Clear	Sand
motorboating	+1	1	I-N-S	O-N-S	O-I-S	*	O-I-N
		2	N-S	*	O-S	*	O-N
		3	*	*	*	*	*
	-1	1	O	I	N	O-I-N-S-C	S
		2	O	*	N	*	S
		3	*	*	*	*	*
noise	+1	1	*	*	*	*	*
		2	*	*	*	*	*
		3	*	*	*	*	*
	-1	1	*	*	*	*	*
		2	*	*	*	*	*
		3	*	*	*	*	*
speed limits	+1	1	O-I-N-S	O-N-S	*	*	*
		2	N-S	*	*	*	O-N
		3	*	*	-	*	*
	-1	1	*	*	*	*	*
		2	*	O-I-N-S	*	*	*
		3	*	*	*	*	*
people	+1	1	*	*	*	*	*
		2	*	*	*	*	*
		3	*	*	*	*	*
	-1	1	*	*	*	*	*
		2	*	*	*	*	*
		3	*	*	*	*	*
cruising	+1	1	*	*	*	*	*
		2	S-N	*	*	*	O-N
		3	*	*	-	*	*
	-1	1	*	*	*	*	*
		2	*	*	*	*	*
		3	*	*	*	*	*

(1) Original solution set: subset 1 = (O-I-N-S)
subset 2 = (O-N-S)
subset 3 = (N)

The third subset was least affected by the 50 permutations of the conflict indices. It changed only twice and, in both cases, was transformed into an empty (-) set. For all other permutations of the conflict indices, it maintained Newboro Lake as its optimal solution.

The Conflict Indices in the objective function were found to be the most sensitive to change. In all but one of the ten objective function permutations, a different non-inferior solution set was derived. The result was to be expected because of the fact that the objective function ultimately determines the final or minimum solution. It will be most sensitive to changes in the coefficients when all coefficients have the same value.

Permutations of the variable coefficients for noise levels and number of people using the lake did not affect any of the optimal solutions. The reason for this was their relatively low conflict indices. Changes to cruise control and speed limit conflict indices both resulted in the elimination of the third subset from one solution. This demonstrates the effect of the lower conflict indices held by Newboro Lake for these items in comparison to the other lakes.

6.4.1.2 Scenario I Sensitivity Analysis: Constraint Parameters

The constraint parameters for cruise and speed levels were the only two items to induce changes in the non-inferior set (Table 13). Inducing an increment of one in the constraint parameter for speed controls while maintaining all other constraint levels constant resulted in three changes occurring in the solution set. Indian Lake was excluded from the first (O-N-S) subset and Sand Lake was excluded from the second (N). Changes in this parameter also resulted in the third subset becoming an empty (-) set. A unit decrease of one in the parameter for speed controls only effected one change: Indian Lake was added to the second (O-I-N-S) subset.

An interesting result of the sensitivity analysis on the constraint parameters is that an increment of one in the constraint level twice (for the speed and cruising objective functions) resulted in the elimination of a solution set for subset three. The elimination of Newboro Lake from subset three shows the sensitivity of the model to attitudes towards speed and cruise controls displayed by cottagers on Newboro.

TABLE 13

Scenario I Solution Set Changes Arising From Unit Increases and Decreases of the Constraint Parameters (1)

Constraint Function	Solution Subset	Constraint Parameter Change +1	-1
motorboating	1	*	*
	2	*	*
	3	*	*
noise	1	*	*
	2	*	*
	3	*	*
speed limits	1	O-N-S	*
	2	N	O-I-N-S
	3	-	*
people	1	*	*
	2	*	*
	3	*	*
cruising	1	*	*
	2	N	*
	3	-	*

(1) Original solution set: subset 1 = (O-I-N-S)
subset 2 = (O-N-S)
subset 3 = (N)

6.4.2 Discussion of Results

Given that the decision-maker is interested in the lowest potential conflict areas, the selection of Newboro as the dominant lake in this scenario is not very difficult. Clear Lake does not appear in the solution set at all. The implications of these results are that for any increase in canal traffic levels, particular attention will have to be

paid to Clear Lake in order that the potential conflict with canal traffic does not become a real one. Indian Lake is another lake which may encounter problems because it is an optimal solution only at the highest level of permissible conflict. Possible solutions for averting conflict situations would be those which would lessen the impact of canal traffic on Clear and Indian Lakes. These might include stricter speed controls or no-landing restrictions.

6.4.3 Scenario II: Increase in the Number of Cottages (All Lakes)

The objective in the development of the second scenario was to discover on what lakes predicted conflict with or resistance to an increase in the number of cottagers would be the least. All lakes were included in the analysis. The Conflict Indices used as coefficients in the model were for the following items:

1. Number of waterskiers
2. Number of motorboats
3. Number of cottages
4. Fishing Quality
5. Noise levels
6. Swimming quality
7. Boat speed limits
8. Number of people

The second item, indicative of motorboating activity levels, was again used in the objective function.

The solution set to the model was found to be as follows:

$$Z = ((M),(M),(M))$$

This result reflects the overall dominance of Mosquito Lake in the solutions. Mosquito Lake is the only lake to both satisfy the constraints of the model and minimize the objective function for constraint levels seven, six and five. At constraint level four, Mosquito Lake was eliminated from the solution subset because the conflict index for swimming quality on the lake had a value of four. The solution process was therefore stopped at constraint level five, resulting in only three solution subsets being produced.

6.4.3.1 - Scenario II Sensitivity Analysis: Variable Coefficients

The sensitivity analysis of the coefficients was not very revealing with a permutation of only one positive and one negative unit. This was, again, because of the dominance of Mosquito Lake in the model. Only 7 of the 112 permutations produced changes in the non-inferior solution set. A listing of all successful permutations is

given in Table 14 . Changes in the objective function (motorboating) conflict indices created the greatest number of alternative solutions. The importance of the low conflict index accrued to Mosquito Lake for motorboating activity levels (CI=4) is demonstrated by the effect of an increase in that value. It results in four more lakes being included in the first (O-I-N-M-S) subset and two more in the second (O-M-S) subset. A decrease in the swimming quality conflict index for Mosquito Lake results in the addition of a fourth (M) subset to the solution set while an increase results in the removal of the third (-) subset.

TABLE 14

Scenario II Solution Set Changes Arising from Unit Increases and Decreases of the Variable Coefficients

Variable	Coefficient Change	Solution Subset	Lake				
			Opinicon	Indian	Newboro	Mosquito	Sand
motor-boating	+1	1	*	*	*	O-I-N-M-S	*
		2	*	*	*	O-M-S	*
		3	*	*	*	M	*
	-1	1	O-M	I-M	N-M	*	M-S
		2	O-M	*	*	*	M-S
		3	*	*	*	*	*
swimming	+1	1	*	*	*	*	*
		2	*	*	*	*	*
		3	*	*	*	-	*
	-1	1	*	*	*	*	*
		2	*	*	*	*	*
		3	*	*	*	*	*
		4				M	

6.4.3.2 Scenario II Sensitivity Analysis: Constraint Parameters

Permutations of the constraint parameters also revealed few changes in the solution set. Mosquito Lake stood up well to the sensitivity analysis. When swimming quality constraint levels were decreased for all lakes in relation to other constraint levels, the results were the same as for those when only Mosquito Lake's index was decreased: the subset for constraint level 5 was eliminated from the solution set. In addition, when the constraint level was decreased, Mosquito Lake became an optimal solution for the fourth (M) subset. The results are not shown here in tabular form because all other permutations had no effect on the composition of the solution set.

6.4.4 Scenario II Discussion of Results

The most obvious conclusion to be drawn from the results of this Scenario is that Mosquito Lake is the most suitable lake in the study region for cottage development. However, this conclusion must be set in its proper perspective. There are two points which throw doubts on the validity of the conclusion. The first point is related to the number of people on the lake. Internal consistency tests

were not performed on the statements which produced the Conflict Indices for Mosquito Lake because of few observations. This aspect of population size is not too serious because, as was explained earlier, it was assumed that those items which displayed consistency on the other lakes in the region were also consistent for Mosquito Lake. Another aspect of population size is illuminated by the conflict indices. The distribution structure of scores for Mosquito Lake is quite different from other lakes. The most probable reason for this is that only four cottagers responded to the 7-part questions, thus reducing the probability that any type of normal distribution of scores might emerge. A second point which should be considered is that the conclusion is based on only one component of the full-scale development model: the potential social conflict component. Other components such as physical carrying-capacity, development cost and accessibility have not been included. Physical carrying-capacity would impose the most serious restriction. Among other factors, it tends to decrease with the size and depth of the lake. Mosquito Lake has neither size nor depth. It is highly probable that this would be a serious restriction on its potential for future development.

6.4.5 Scenario III: Increase in the Number of Cottages (Selected Lakes)

The third scenario was developed in response to some of the questions raised by the second scenario with respect to the validity of results from the smaller lakes. In this scenario, only the four largest lakes were included: Opinicon, Indian, Newboro and Sand. It was felt that once the dominance of Mosquito Lake was removed from the model, important information could be learned about development potentials on the larger lakes. Except for the number of lakes involved, all conditions remained the same as in Scenario II. The resulting non-inferior solution set is presented below:

$$Z = ((O\text{-}I\text{-}N\text{-}S), (O\text{-}S))$$

Significantly, once the influence of Mosquito Lake is removed, all four of the larger lakes are included in the first solution set (O-I-N-S). There are only two subsets in the solution because of a preponderence of high conflict indices among the lakes for the activities included in the model. This caused the solution process to stop at constraint level six (O-S). Lakes Opinicon and Sand were the only lakes to satisfy the constraint functions and minimize the objective function at this level.

6.4.5.1 Scenario III Sensitivity Analysis: Variable Coefficients

In this scenario, 17 of the 64 coefficient permutations produced different non-inferior solution-sets. Results of all successful permutations are shown in Table 15 . As in previous scenarios, the most new solutions were produced by changing the variable coefficients of the objective function (motorboating). Eight of nine changes in the first subset were the result of objective function coefficient changes. This type of coefficient change also produced four alterations in the second subsets. In the constraint functions, the items for fishing, swimming quality, speed limits and number of people using the lake all showed sensitivity in their coefficients on at least one of the lakes, but no lake showed a consistent pattern of sensitivity.

6.4.5.2 Scenario III Sensitivity Analysis: Constraint Parameters

In three of four cases where constraint parameter changes altered the solution set, Opinicon Lake was eliminated from the second (M) subset (Table 16). This is a reflection of the relatively higher conflict indices found on Opinicon Lake in comparison to Sand Lake. All other solutions remained stable.

TABLE 15

Scenario III Solution Set Changes Arising from Unit Increases and Decreases of the Variable Coefficients (1)

Variable	Coefficient Change	Solution Subset	Lake			
			Opinicon	Indian	Newboro	Sand
motor-boating	+1	1	I-N-S	O-N-S	O-I-S	O-I-N
		2	S	*	*	O
	-1	1	O	I	N	S
		2	O	*	*	S
fishing	+1	1	*	*	O-I-S	*
		2	S	*	*	*
	-1	1	*	*	*	*
		2	*	*	O-N-S	*
swimming	+1	1	*	*	*	*
		2	S	*	*	*
	-1	1	*	*	*	*
		2	*	*	*	*
speed limits	+1	1	*	*	*	*
		2	S	*	*	O
	-1	1	*	*	*	*
		2	*	*	*	*
		3				S
people	+1	1	*	O-N-S	*	*
		2	*	*	O	*
	-1	1	*	*	*	*
		2	*	O-I-S	*	*
		3				S

(1) Original solution set: subset 1 = (O-I-N-S)
subset 2 = (O-S)

TABLE 16

Scenario III Solution Set Changes Arising from Unit Increases and Decreases of the Constraint Parameters (1)

Constraint Function	Solution Subset	Constraint Parameter Change	
		+1	-1
motorboating	1	*	*
	2	S	*
swimming	1	*	*
	2	S	*
speed limits	1	*	*
	2	S	O-I-S
	3		S

(1) Original solution set: subset 1 = (O-I-N-S)
subset 2 = (O-S)

6.4.6 Scenario III Discussion of Results

The dominance of any one lake in this scenario is not as evident as it was in the second scenario. All four lakes are found to minimize potential conflicts equally when the amount of conflict allowed is at its highest. This makes any decision on where to locate cottage developments at this level of conflict very difficult. If the next lowest constraint level is examined, it can be seen that two lakes appear most frequently in the solution set: Sand Lake and Opinicon Lake. In relative terms, the differences between the two lakes are so small as to make them almost inseparable. Both would seem to offer equal potential for conflict occur-

ring between cottagers and new cottage developments, but lower potential than that which might be found on Newboro and Indian Lakes. The results of this solution contrast strongly with those for the previous scenario. No lake dominates the solution set as Mosquito Lake did. The fact that the solution set contains no solution for minimization of the problem at a level less than constraint level six might be argument for declaring that no cottage development should occur on the lakes at all. On the other hand, the presence of all four lakes in the first subset suggests that all lakes have equal potential for development according to the social conflict indicator. Both arguments suggest different development strategies depending on how strong a constraint level is considered necessary.

6.5 SUMMARY AND CONCLUSIONS

This chapter has implemented the framework for analysis of potential conflicts which was developed in earlier chapters. Parameters of the multiobjective recreational development model were calculated by the use of 'conflict indices', and the model calibrated for three development scenarios.

The results from the model have been used to identify lakes in the study area on which potential conflict with development would be minimal. The model has not attempted to predict the level of conflict which might occur, but simply to indicate those lakes on which more or less potential conflict can be expected.

The task of the decision-maker is to select the level of relative conflict which he is prepared to accept by defining the constraint levels for the model. This action will result in one or several lakes of equal potential conflict being chosen for development. In the second development scenario presented in this chapter, if the decision maker had decided that development could proceed only on those lakes which satisfied the conditions of the model at the strongest (level 1) constraint level possible, Mosquito Lake would have been chosen for development. This result would have held even if higher levels of conflict with cottage development had been permitted on the lake. In this case, the solutions to the model present the decision maker with a clear-cut answer to the question of 'where should cottage development on the lakes proceed, given that potential conflicts with development must be minimized?'. Mosquito Lake is the only feasible and optimal solution for three successively stronger constraint levels.

The third development scenario attempted to examine the potential conflict arising from cottage development on only the four largest lakes. The results from this scenario do not present clear-cut answers to the problem of spatial resource allocation. The lakes which may be chosen for development will vary depending on the relative amount of potential conflict which is acceptable to the decision-maker.

The results from the first development scenario will be very useful to planners in that they indicate where the greatest potential conflicts with canal traffic increases may lie. The model does not provide the decision-maker with development alternatives in this case, because an increase in canal traffic will occur simultaneously on all lakes. However, it does indicate the consequences of a decision to increase activity levels in terms of relative impacts.

Chapter VII

SUMMARY AND CONCLUSION

The central theme of this thesis has been the development of a lake planning methodology for the analysis of recreational conflicts. It was postulated that over-use and multiple-use conflicts could be generated by increases in the amount and number of uses on a lake. The scope of the conflict analysis was limited to social conflicts, but the importance of considering physical conflicts was also noted.

Traditional methods of measuring the social quality of the recreational experience were reviewed and found lacking in several ways. The difficulty of measuring aggregate satisfaction in social carrying-capacity models was found to be a major weakness. The consequences of using aggregate satisfaction to determine capacity limits is that true satisfaction levels can easily be overestimated. Realizing that no immediate solution could be found for this problem, a new approach was suggested.

The approach was based on the estimation of the probable consequences of development with an instrument known as the conflict index. The index allows the planner or deci-

sion-maker to gain an understanding of some of the attitudes held by cottagers towards recreational activities and developments. This understanding can be expanded by use of a multiobjective programming model which facilitates comparison of potential conflicts among lakes and has the capacity for optimizing a set of non-commensurable objectives.

A case study application of the methodology was set in the Rideau Lakes area of Eastern Ontario. A questionnaire sent out to 474 home-owners on seven lakes was returned with a 78.7% response rate. The results were used to generate a profile of cottager characteristics on twelve variables. They were also used to derive the conflict indices which were subsequently inserted as parameters into the multiobjective programming model.

Three planning scenarios were developed. Two dealt with increases in cottage use on the lakes and the third postulated an augmentation in canal traffic. When all seven lakes were included in the cottage use scenario, it was discovered that the smallest and least-populated lake, Mosquito, was by far the best for development because it had the lowest potential for conflicts. However, the strong likelihood of other constraints such as physical carrying-capacity being present was noted. As a result, the three smaller lakes were eliminated from consideration in a dupli-

cation of the cottage use scenario. The outcome of the model was found to be quite different. No lake dominated any of the others and all were felt to have equal potential for development according to their social conflict indicator.

The difference between the two scenarios pointed to the impact of and necessity for including factors other than the social quality of the recreational experience in the model.

The canal traffic scenario did not produce as clear-cut results as the seven-lake cottage use scenario, but it did ascertain that Newboro Lake minimized development conflicts more often than any of the other lakes. The implications of this result were that Newboro Lake would probably be the least affected by increases in canal traffic. On the other hand, Clear Lake fared very poorly in the analysis and was expected to need careful management if canal use were to be increased.

7.1 LIMITATIONS OF THE MODEL AND SUGGESTIONS FOR FURTHER RESEARCH

A major limitation of the multiobjective programming model is that it is capable of providing 'optimum' solutions to recreational use conflicts for only one user group at a time. It would be feasible to combine the attitudes of sev-

eral user groups in one model, but the indifference curve of such a group would tend to obscure many of the conflicting viewpoints of the component groups which the planner is attempting to reconcile. Although this limitation may seem to be a disadvantage, it can also be thought of as an advantage because the viewpoints of all user groups and hence all potential conflict groups can be made explicit. In opting to use the model, the planner is forced to trade-off a certain degree of comprehensiveness for conciseness.

Another weakness and thus limitation of the methodology is that a great deal of detail is lost during the formulation of the conflict indices. This is largely a problem of measurement because of the nature of the ordinal data. It can only be resolved when more efficient statistical techniques are found for analysing ordinal data or when attitude measurement techniques become capable of taking interval or ratio measurements.

The nature of attitude measurement and its capacity for predicting behaviour is also suspect. The only way in which the effectiveness of this model can be tested is to verify the predicted patterns of behaviour under certain development conditions. There is enormous scope for research on the subject of correlating the attitudes and behaviour of recreationists. It is a crucial relationship because the

assumption of attitude-behaviour prediction is basic to many planning models, including the present one.

In conclusion, it is suggested that the methodology developed in this thesis may be of use to the planner in giving him a better understanding of the relationships, objectives and constraints inherent in lake planning. The methodology may not offer any final solutions to planning problems, but can reasonably be expected to decrease the number of alternative plans under consideration. It may also serve as a catalyst for the creation of new alternatives and solutions.

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Appendix A

LAKE USERS RECREATION SURVEY: QUESTIONNAIRE

The questionnaire used in this study contained 20 questions and was accompanied by an covering letter. A copy of the questionnaire is attached. A follow-up letter which was sent out four weeks after the initial mailing is also included.

UNIVERSITE D'OTTAWA
DEPARTEMENT DE GEOGRAPHIE
ET D'AMENAGEMENT REGIONAL

UNIVERSITY OF OTTAWA
DEPARTMENT OF GEOGRAPHY
AND REGIONAL PLANNING

February 10, 1978.

Dear Sir/Madame:

I am a graduate student in the Regional Planning Programme at the University of Ottawa and would like to ask your collaboration in a research project on the study of lake and cottage use in the Rideau Lakes area. I am enclosing a questionnaire, the purpose of which is to elicite your opinions on the quality and quantity of recreational activity on your lake, as well as your thoughts on the need for future lake planning.

Your name was chosen, along with the names of other land owners in the study area, by means of a search through the municipal assessment roles. Because your answers will be used to identify local planning problems on the lake and the location of hypothetical future recreational developments, it is especially <u>important</u> that your completed questionnaire be returned.

The anonymity of all respondents will be respected and individual opinions will be kept strictly <u>confidential</u>. Only aggregate results will be printed in the final report.

The questionnaire is directed not only to you, as the land owner, but also to all other users of your cottage and/or lot. Therefore, please feel free to confer with them on any part of the questionnaire when you are filling it out.

I look forward to receiving your replies as soon as possible.

Yours sincerely,

Virginia W. Maclaren,

Dear Sir/Madame:

Miss Maclaren is currently working on her Master of Planning degree in the Department of Geography and Regional Planning. As Chairman of that department, I would like to encourage your participation in the research she is undertaking. Interest in the project has been expressed by several local and provincial government agencies, and it appears that the results of her study will make a significant contribution to lake planning in the area.

Yours sincerely,

Michel Phipps,
Chairman, Department of Geography
and Regional Planning.

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GEOGRAPHY
AND REGIONAL PLANNING

March 17, 1978.

Dear Sir/Madame:

About a month ago, you were sent a short questionnaire on lake and cottage use in the Rideau Lakes area. Just in case you have not had a chance to return the questionnaire, I would like to assure you that it is still not too late to do so. Without your contribution, any assessment of the opinions of land and cottage owners in the area with respect to existing and future recreational developments will be unfairly biased in favour of those who have replied. Remember, all answers will be kept confidential.

If you have already returned the questionnaire, please accept my sincere thanks for your help. The response rate has been very high, indicating that cottage and lot owners are very concerned about the quality and quantity of recreational development on their lakes. I have been greatly encouraged by the many kind and helpful comments made throughout the questionnaires by respondents.

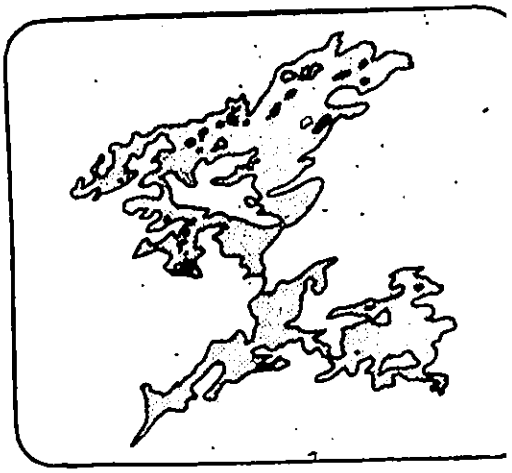
Thank you again.

Yours sincerely,

Virginia W. Maclaren.

Confidential

UNIVERSITY OF OTTAWA
DEPARTMENT OF GEOGRAPHY
AND REGIONAL PLANNING



LAKE USERS' RECREATION SURVEY

Please answer this short questionnaire. In Parts I and II, just check (✓) or fill in the shaded spaces.

PART I - I WOULD LIKE TO START OFF BY ASKING YOU A FEW QUESTIONS ABOUT YOUR LOT AND THE TYPE OF FACILITIES AND EQUIPMENT YOU HAVE ON IT.

1. Do you have a cottage on your lot? ☐ Yes ☐ No

2. How long have you had your a) cottage? ☐ Years b) lot? ☐ Years

IF YOU DO NOT HAVE A COTTAGE ON YOUR LOT, PLEASE GO TO QUESTION 4. QUESTION 3 IS FOR COTTAGE OWNERS ONLY.

3. Is your cottage your principal residence? ☐ Yes ☐ No

4. How long, on the average, does it take you to get to your cottage/lot from your principal residence? ☐ Hours ☐ Minutes

5. Did you use your cottage/lot in 1977? ☐ Yes ☐ No

6. When did you last use your cottage/lot? 19 ☐

7. Could you tell me your principal reasons for not using your cottage/lot in 1977?

a. _____
b. _____
c. _____

PLEASE CONSIDER ALL OF THE FOLLOWING QUESTIONS TO APPLY TO THE LAST YEAR IN WHICH YOU USED YOUR COTTAGE/LOT

8. Do you have (check shaded box if your answer is yes) -

cold running water ☐ hot running water ☐ pressurized water system ☐
hand-powered pump ☐ automatic dishwasher ☐ automatic clotheswasher ☐
indoor toilet ☐ outdoor privy ☐ indoor bathtub or shower ☐ electricity ☐
gas (propane) ☐ furnace or electric heating system ☐ air conditioning ☐
telephone ☐ direct road access ☐ septic tank ☐ leaching bed (tile field) ☐
holding tank ☐ connection to municipal sewage system ☐ boat dock ☐
canoe ☐ sailboat ☐ waterskies ☐ motorboat with engine up to 80 hp ☐
motorboat with engine between 25 and 80 hp ☐ motorboat with engine over 80 hp ☐

9. If you were to stand on the lakeshore at about the midway point of your property, approximately how many cottages could you see clearly: in front of you? ☐ Cottages; to your right? ☐ Cottages; to your left? ☐ Cottages

PART I. (Cont'd)

10. If one or both of your nearest neighbours on either side of you are cottagers, could you tell me how close their cottage is to yours?

Cottage on right: ☐ Feet

Cottage on left: ☐ Feet

11. If one or both of your nearest neighbours are not cottagers, could you tell me what king of land use activity (eg. marina, farm, campground) your neighbour is engaged in and how far it is from your cottage to the nearest structure on their land?

	Land Use Type	Distance to Nearest Structure
Right Neighbour	☐	☐ Feet
Left Neighbour	☐	☐

PART II - I WOULD NOW LIKE TO ASK YOU A FEW QUESTIONS ABOUT THE AMOUNT OF USE YOU MAKE OF YOUR COTTAGE/LOT, AND WHAT TYPE OF RECREATIONAL ACTIVITIES YOU PARTICIPATE IN. IF YOU ARE UNCERTAIN ABOUT EXACT DATES OR NUMBERS, PLEASE GIVE YOUR BEST APPROXIMATION.

1. How OFTEN was your cottage/lot used during the year by yourself, members of your family, or guests?

In [January / February / March], my cottage/lot was used on ☐ of 13 weekends and ☐ of 64 weekdays.
In [April / May], my cottage/lot was used on ☐ of 9 weekends and ☐ of 43 weekdays.
In [June], my cottage/lot was used on ☐ of 4 weekends and ☐ of 22 weekdays.
In [July], my cottage/lot was used on ☐ of 5 weekends and ☐ of 21 weekdays.
In [August], my cottage/lot was used on ☐ of 4 weekends and ☐ of 23 weekdays.
In [September / October], my cottage/lot was used on ☐ of 9 weekends and ☐ of 43 weekdays.
In [November / December], my cottage/lot was used on ☐ of 8 weekends and ☐ of 44 weekdays.

2. When there WERE people using your cottage/lot, could you tell me HOW MANY were there, on the AVERAGE,

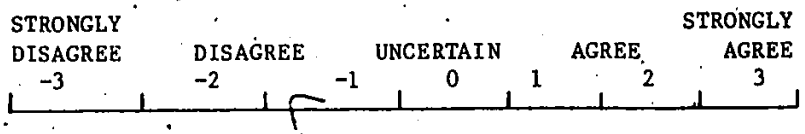
	Jan. - March. Sept. - Oct.	April - May Nov. - Dec.	June - Aug.
on weekends?	☐	☐	☐
on weekdays?	☐	☐	☐

3. With what degree of frequency do you feel each one of the following activities is participated in by users of your cottage/lot in comparison to the other activities listed?

	Most Frequently	Less Frequently	Least Frequently	Never
canoeing	☐	☐	☐	☐
motor-boating	☐	☐	☐	☐
sailing	☐	☐	☐	☐
sun-bathing	☐	☐	☐	☐
swimming/wading	☐	☐	☐	☐
water-skiing	☐	☐	☐	☐
fishing	☐	☐	☐	☐
visiting another private cottage or home	☐	☐	☐	☐
hiking/walking for pleasure	☐	☐	☐	☐
hunting	☐	☐	☐	☐
cross-country skiing	☐	☐	☐	☐
snowmobiling	☐	☐	☐	☐
snow-shoeing	☐	☐	☐	☐
other _____	☐	☐	☐	☐

PART III - THIS SECTION OF THE QUESTIONNAIRE CONTAINS A SET OF STATEMENTS DESIGNED TO EXPLORE SOME OF YOUR OPINIONS AND FEELINGS TOWARDS RECREATIONAL DEVELOPMENT AND ACTIVITY ON YOUR LAKE.

1. In this question, you are asked to rate a set of statements in terms of the extent to which you AGREE or DISAGREE with them, and then mark your position on the scale below.



I will give a brief example to explain how the technique works:

Motorboats should be banned from the lake. (-3) -2 -1 0 1 2 3

By circling a number at the appropriate end of the scale, the respondent has indicated that he/she STRONGLY DISAGREES with the above statement.

Most of the cottages on this lake are very attractive. -3 -2 -1 0 (1) 2 3

This time, the respondent has indicated a MILD degree of AGREEMENT with the above statement.

a) Waterskiing interferes too much with other activities on the lake. -3 -2 -1 0 1 2 3

b) The lake is big enough to accomodate a much higher level of motor-boating activity. -3 -2 -1 0 1 2 3

c) There are too many cottages on the lake. -3 -2 -1 0 1 2 3

d) Canal traffic passing through the lake seems to have decreased since last year. -3 -2 -1 0 1 2 3

e) The quality of fishing on the lake is satisfactory. -3 -2 -1 0 1 2 3

f) Shouting and loud noises from other lake users is a problem. -3 -2 -1 0 1 2 3

g) There is a need for the number of sailboats on the lake to be controlled. -3 -2 -1 0 1 2 3

h) The quality of the water in the lake for swimming could be better. -3 -2 -1 0 1 2 3

i) There should be a speed limit or size of engine limit on motor-boats. -3 -2 -1 0 1 2 3

j) There are too many people using the lake. -3 -2 -1 0 1 2 3

k) There should be restrictions on where non-local boats using the canal may cruise or land. -3 -2 -1 0 1 2 3

l) Canoeists interfere with my enjoyment of the lake. -3 -2 -1 0 1 2 3

m) The lake is just as pleasant for recreation now as it was when I first bought my cottage/lot. -3 -2 -1 0 1 2 3

PART III. (cont'd)

2. This question asks you to rank a number of criteria in terms of how important you feel they were in choosing a location for your cottage/lot, and how well the present site of your cottage/lot satisfies your expectations for this criterion.

The IMPORTANCE and SATISFACTION scales are shown below. Please indicate your position on each scale by circling the appropriate number.

What degree of IMPORTANCE do you attach to this criterion in choosing a location for your cottage/lot?

How well does the site of your present cottage/lot SATISFY this criterion?

NOT IMPORTANT			FAIRLY IMPORTANT		EXTREMELY IMPORTANT			CRITERIA	NOT AT ALL		ADEQUATELY			EXTREMELY WELL	
-3	-2	-1	0	1	2	3	a)	peace and quite	-3	-2	-1	0	1	2	3
-3	-2	-1	0	1	2	3	b)	good view	-3	-2	-1	0	1	2	3
-3	-2	-1	0	1	2	3	c)	privacy	-3	-2	-1	0	1	2	3
-3	-2	-1	0	1	2	3	d)	good swimming	-3	-2	-1	0	1	2	3
-3	-2	-1	0	1	2	3	e)	large lot	-3	-2	-1	0	1	2	3
-3	-2	-1	0	1	2	3	f)	good price for lot	-3	-2	-1	0	1	2	3
-3	-2	-1	0	1	2	3	g)	good price for cottage	-3	-2	-1	0	1	2	3
-3	-2	-1	0	1	2	3	h)	lake frontage	-3	-2	-1	0	1	2	3
-3	-2	-1	0	1	2	3	i)	good water quality	-3	-2	-1	0	1	2	3
-3	-2	-1	0	1	2	3	j)	size of lake	-3	-2	-1	0	1	2	3
-3	-2	-1	0	1	2	3	k)	close to friends	-3	-2	-1	0	1	2	3
-3	-2	-1	0	1	2	3	l)	good road access	-3	-2	-1	0	1	2	3
-3	-2	-1	0	1	2	3	m)	close to a provision centre	-3	-2	-1	0	1	2	3
-3	-2	-1	0	1	2	3	n)	not too far from permanent residence	-3	-2	-1	0	1	2	3

3. I would now like to ask you about your feelings with respect to possible future recreational development on the lake. In each of the following boxes, could you please indicate within what proximity you would 'TOLERATE' new types of development by using numbers from the KEY below.

1	AS A NEIGHBOUR
2	WITHIN LINE OF SIGHT
3	OUT OF LINE OF SIGHT BUT ON THE LAKE
4	NOT ON THE LAKE AT ALL

For example: Conference centre [3]

The respondent has indicated that he/she would not tolerate a new conference centre development as a neighbour, nor within line of sight. However, the respondent WOULD tolerate the development on the lake if it were out of line of sight.

The possible types of development are as follows:

Public Access Point (Boat Launch)		Marina		1 New Cottage	
Public Picnic Grounds		Provincial Park		10 New Cottages	
Private Campground		Trailer Park		Cottage Subdivision	
Children's Youth Camp		Tourist Lodge		(40+ cottages)	

PART IV - IN CONCLUSION, I WOULD LIKE TO ASK YOU A FEW QUESTIONS ABOUT YOUR VIEWS ON LAKE PLANNING.

1. Do you believe it would be a good idea to have a LAKE PLAN for your lake? Its purpose would be to illustrate how to achieve, in consultation with local, regional, and provincial interests, an appropriate mix of land and water uses which would impose a minimum level of strain on the lake environment.

☐ Yes
☐ No
☐ Undecided

2. There are a number of groups who would have a potential interest in the future planning of your lake and other lakes in the region. Of the following groups, which do you think should be involved in the planning of a lake such as yours (check the shaded boxes) and which do you feel should have the most say (put ranks in blank boxes) in the planning process?

		Should be Involved	Rank
a)	Cottage Owners	☐	☐
b)	Property Owners	☐	☐
c)	All people who use the lake	☐	☐
d)	Local Governments	☐	☐
e)	Provincial government agencies	☐	☐
f)	Federal government agencies	☐	☐
g)	Other _____	☐	☐

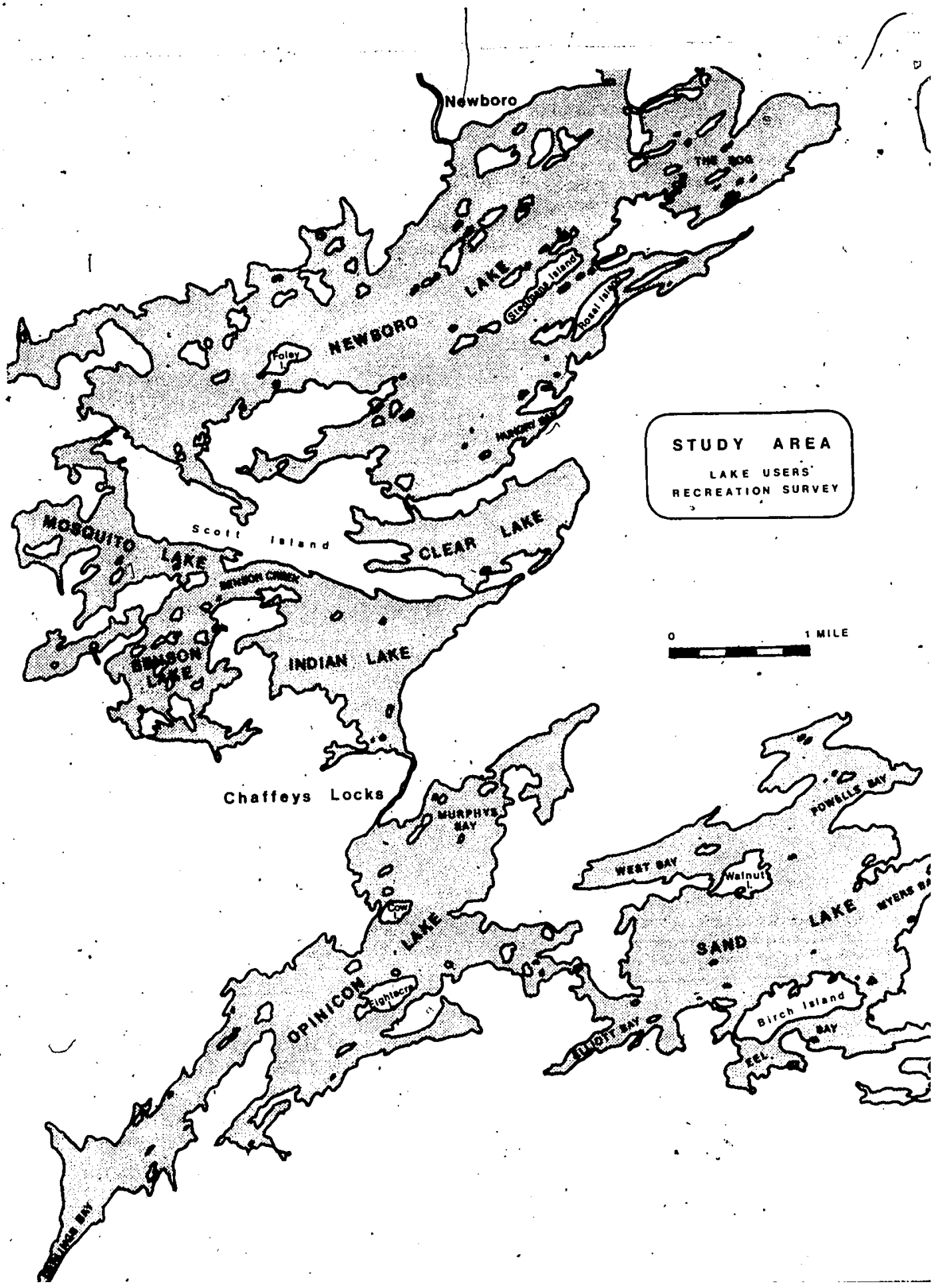
3. Do you have any comments, suggestions, or recommendations concerning cottage development or recreational lake development which you feel are important for lake planning in general or for the potential development of a plan for your lake?

4. In order to assist in defining the spatial distribution of development on the study lakes, could you please mark the location (with an X) of your cottage/lot on the accompanying map? (see over)

THAT WAS THE END OF THE QUESTIONNAIRE. I WOULD BE GRATEFUL IF YOU COULD RETURN IT AS SOON AS POSSIBLE IN THE ENVELOPES PROVIDED. THANK YOU VERY MUCH FOR BOTH THE TIME AND EFFORT YOU HAVE TAKEN TO PARTICIPATE IN THIS PROJECT.

Yours sincerely,

Virginia W. Maclaren.


Newboro
THE BOG
LAKE
Gladstone Island
Royal Island
NEWBORO
Foley I.
HANCOCK BAY
STUDY AREA
LAKE USERS
RECREATION SURVEY
MOSQUITO LAKE
Scott Island
CLEAR LAKE
SIMMON CREEK
SIMMON LAKE
INDIAN LAKE
0
1 MILE
Chaffeys Locks
MURPHYS BAY
POWELLS BAY
WEST BAY
Walnut I.
LAKE
SAND
OPINICON LAKE
Lighthouse
Cow I.
Birch Island
BAY
ELLIOTT BAY
EEL
Kashwakamak Bay

Appendix B

LAKE USERS RECREATION SURVEY: TABULATION OF DATA

The tables in this appendix represent the compilation of the raw data from the questionnaire survey. The number of cases for all entries is shown in brackets.

TABLE 17

COTTAGE IS PRINCIPAL RESIDENCE

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
YES	2.4% (2)	9.1% (7)	1.9% (1)	13.3% (2)	-	-	10.4% (11)
NO	97.6% (82)	89.6% (69)	98.1% (51)	86.7% (13)	100.0% (15)	100.0% (4)	89.6% (95)
NO RESPONSE	-	1.3% (1)	-	-	-	-	-

TABLE 18

COTTAGE WAS USED IN 1977

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
YES	96.4% (81)	96.1% (74)	100.0% (52)	100.0% (15)	100.0% (15)	100.0% (4)	97.2% (103)
NO	3.6% (3)	3.9% (3)	-	-	-	-	2.8% (3)

TABLE 19

FACILITIES AND EQUIPMENT

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
COLD RUNNING WATER	78.6% (66)	88.2% (67)	88.2% (45)	75.0% (12)	86.7% (13)	75.0% (3)	80.2% (85)
HOT RUNNING WATER	70.2% (59)	88.2% (67)	74.5% (38)	68.8% (11)	80.0% (12)	25.0% (1)	74.5% (79)
WATER SYSTEM (PRESSURIZED)	76.2% (64)	82.9% (63)	70.6% (36)	75.0% (12)	80.0% (12)	75.0% (3)	74.5% (79)
MANUAL PUMP	6.0% (5)	3.9% (3)	17.6% (9)	18.8% (3)	6.7% (1)	-	2.8% (3)
AUTOMATIC DISHWASHER	14.3% (12)	17.1% (13)	5.9% (3)	6.3% (1)	20.0% (3)	-	14.2% (15)
WASHING MACHINE	17.9% (15)	21.1% (16)	25.5% (13)	12.5% (2)	20.0% (3)	-	19.8% (21)
INDOOR TOILET	81.0% (68)	92.1% (70)	86.3% (44)	81.3% (13)	80.0% (12)	-	79.2% (84)
OUTDOOR PRIVY	21.4% (18)	11.8% (9)	17.6% (9)	18.8% (3)	46.7% (7)	100.0% (4)	42.5% (45)
BATHTUB OR SHOWER	65.5% (55)	86.8% (66)	70.6% (36)	68.8% (11)	80.0% (12)	25.0% (1)	71.7% (76)
ELECTRI-CITY	89.3% (75)	93.4% (71)	74.5% (38)	68.8% (11)	80.0% (12)	100.0% (4)	86.8% (92)
PROPANE	16.7% (14)	9.2% (7)	29.4% (15)	18.8% (3)	26.7% (4)	-	15.1% (16)
HEATING	38.1% (32)	42.1% (32)	25.5% (13)	50.0% (8)	40.0% (6)	25.0% (1)	40.6% (43)
AIR CON-DITIONING	1.2% (1)	2.6% (2)	2.0% (1)	12.5% (2)	6.7% (1)	-	0.9% (1)
TELEPHONE	58.3% (49)	60.5% (46)	27.5% (14)	56.3% (9)	60.0% (9)	-	50.0% (53)

TABLE 3 (cont'd)

FACILITIES AND EQUIPMENT

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
DIRECT ROAD ACCESS	77.4% (65)	93.4% (71)	35.3% (18)	87.5 (14)	40.0% (6)	-	60.4% (64)
SEPTIC TANK	75.0% (63)	88.2% (67)	76.5% (39)	75.0% (12)	73.35 (11)	-	82.1% (87)
LEACHING BED	58.3% (49)	78.9% (60)	62.7% (32)	62.5% (10)	60.0% (9)	-	67.9% (72)
HOLDING TANK	8.3% (7)	9.2% (7)	17.6% (9)	6.3% (1)	6.7% (1)	25.0% (1)	4.7% (5)
SEWAGE CONNECTION	2.4% (2)	-	-	-	-	-	0.9% (1)
BOAT DOCK	69.0% (58)	88.2% (67)	94.1% (48)	93.8% (15)	86.7% (13)	75.0% (3)	84.0% (89)
CANOE	58.3% (49)	61.85% (47)	52.9% (27)	68.8% (11)	33.3% (5)	50.0% (22)	52.8% (56)
SAILBOAT	33.3% (28)	30.3% (23)	21.6% (11)	37.5% (6)	26.7% (4)	25.0% (1)	73.6% (28)
WATER-SKIES	45.2% (38)	57.9% (44)	49.0% (25)	31.3% (5)	46.7% (7)	25.0% (1)	46.2% (49)
MOTORBOAT (ENGINE UNDER 25 HP)	58.3% (49)	53.9% (41)	64.7% (33)	50.0% (8)	73.3% (11)	75.0% (3)	52.8% (56)
MOTORBOAT (ENGINE 25 TO 80 HP)	38.1% (32)	40.8% (31)	56.9% (29)	18.9% (3)	40.0% (6)	25.0% (1)	42.5% (45)
MOTORBOAT (ENGINE OVER 80 HP)	14.3% (12)	23.7% (18)	15.7% (8)	6.3% (1)	33.3% (5)	-	10.4% (11)

TABLE 20

AVERAGE NUMBER OF COTTAGES IN SIGHT

NUMBER OF COTTAGES	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
IN FRONT	1.55	2.55	1.71	0.33	1.93	0.25	1.96
ON RIGHT	1.25	1.60	1.33	1.47	1.40	1.25	1.69
ON LEFT	1.13	2.12	1.33	1.40	3.467	1.00	1.24

TABLE 21

AVERAGE NUMBER OF WEEKENDS COTTAGE IN USE DURING THE YEAR

MONTH(S) (*)	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
JA/FE/MA (13)	0.46	2.74	0.33	4.20	0.60	1.25	2.11
APR/MAY (9)	2.46	3.12	1.90	4.53	3.00	5.00	3.50
JUNE (4)	3.01	3.38	2.48	4.09	3.00	2.46	2.50
JULY (5)	3.69	4.34	3.31	4.27	3.33	4.00	4.15
AUG (4)	3.12	3.44	2.67	3.47	3.00	2.50	3.31
SEP/OCT (9)	3.57	4.14	2.92	5.53	4.40	4.00	4.82
NOV/DEC (8)	0.49	1.07	0.08	3.00	0.33	0.00	1.08

* = TOTAL NUMBER OF WEEKENDS IN MONTH(S)

TABLE 22

AVERAGE NUMBER OF WEEKDAYS COTTAGE IS USED DURING THE YEAR

MONTH(S) (*)	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
JA/FE/MA (64)	0.29	5.35	0.64	9.40	1.13	0.25	5.43
APR/MAY (43)	3.38	6.22	3.69	6.40	2.93	5.25	7.99
JUNE (22)	5.3	8.90	6.77	6.40	4.73	2.50	7.62
JULY (21)	10.75	14.92	11.31	13.93	12.27	7.25	13.57
AUG (23)	11.87	14.61	11.15	11.87	13.20	7.00	13.69
SEP/OCT (43)	6.68	10.12	7.15	8.13	4.47	7.00	12.04
NOV/DEC (44)	0.30	4.14	0.25	7.20	0.80	0.50	4.73

* = TOTAL NUMBER OF WEEKDAYS IN MONTH(S)

TABLE 23

AVERAGE NUMBER OF PEOPLE USING THE COTTAGE ON WEEKENDS DURING THE YEAR

MONTH(S)	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
JA/MA-SE/OC	3.05	2.92	2.83	3.33	2.93	3.50	3.03
AP/MA-NO/DE	3.26	2.95	2.37	3.53	2.47	3.50	3.04
JUN/JUL/AUG	4.41	4.43	3.67	4.40	3.87	3.50	4.07

TABLE 24

AVERAGE NUMBER OF PEOPLE USING THE COTTAGE ON WEEKDAYS DURING THE YEAR

MONTH(S)	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
JA-MAR/SE-OC	2.01	1.94	1.98	2.20	1.27	2.00	1.80
JA-MAR/SE-OC	2.01	1.94	1.98	2.20	1.27	2.00	1.80
AP/MA-NO/DE	1.66	1.71	1.33	1.27	1.33	2.00	1.51
JUN/JUL/AUG	3.25	3.34	3.06	4.00	3.33	3.00	3.16

TABLE 25

RELATIVE FREQUENCY OF PARTICIPATION BY COTTAGERS IN RECREATIONAL ACTIVITIES: CANOEING

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NEVER	29.8% (25)	24.7% (19)	46.2% (24)	26.7% (4)	40.0% (6)	25.0% (1)	23.6% (25)
LEAST FREQUENTLY	10.7% (9)	14.3% (11)	9.6% (5)	20.0% (3)	40.0% (6)	-	17.9% (19)
LESS FREQUENTLY	17.9% (15)	35.1% (27)	32.1% (17)	33.3% (5)	20.0% (3)	25.0% (1)	21.7% (23)
MOST FREQUENTLY	51.2% (43)	23.4% (18)	9.6% (5)	20.0% (3)	-	25.0% (1)	26.4% (28)
NO RESPONSE	4.8% (4)	2.6% (2)	1.9% (1)	-	-	25.0% (1)	10.4% (11)

TABLE 26

RELATIVE FREQUENCY OF PARTICIPATION BY COTTAGERS IN RECREATIONAL ACTIVITIES: MOTORBOATING

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NEVER	17.9% (15)	5.2% (4)	5.8% (3)	13.3% (2)	6.7% (1)	-	6.6% (7)
LEAST FREQUENTLY	10.7% (9)	10.4% (8)	1.9% (1)	6.7% (1)	-	-	12.3% (13)
LESS FREQUENTLY	17.9% (15)	22.1% (17)	23.1% (12)	26.7% (4)	13.3% (2)	25.0% (1)	26.4% (28)
MOST FREQUENTLY	51.2% (43)	59.7% (46)	67.3% (35)	46.7% (7)	80.0% (12)	75.0% (3)	48.1% (51)

TABLE 27

RELATIVE FREQUENCY OF PARTICIPATION BY COTTAGERS IN RECREATIONAL ACTIVITIES: SAILING

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NEVER	52.4% (44)	50.6% (39)	54.8% (29)	53.3% (8)	53.3% (8)	50.0% (2)	52.8% (56)
LEAST FREQUENTLY	14.3% (12)	11.7% (9)	23.1% (12)	20.0% (3)	13.3% (2)	-	9.4% (10)
LESS FREQUENTLY	11.9% (10)	22.1% (17)	13.5% (7)	6.7% (1)	26.7% (4)	25.0% (1)	14.2% (15)
MOST FREQUENTLY	16.7% (14)	13.0% (10)	5.8% (3)	13.3% (2)	6.7% (1)	-	12.3% (13)
NO RESPONSE	4.8% (4)	2.6% (2)	1.9% (1)	6.7% (1)	-	25.0% (1)	11.3% (12)

TABLE 28

RELATIVE FREQUENCY OF PARTICIPATION BY COTTAGERS IN RECREATIONAL ACTIVITIES: SUN-BATHING

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NEVER	9.5% (8)	7.8% (6)	11.5% (6)	-	6.7% (1)	-	7.5% (8)
LEAST FREQUENTLY	17.9% (15)	7.8% (6)	13.5% (7)	6.7% (1)	6.7% (1)	-	18.9% (20)
LESS FREQUENTLY	26.2% (11)	24.7% (19)	23.1% (12)	33.3% (5)	26.7% (4)	25.0% (1)	19.8% (21)
MOST FREQUENTLY	70.2% (59)	67.5% (52)	54.6% (31)	66.7% (10)	53.3% (8)	75.0% (3)	62.3% (66)
NO RESPONSE	2.4% (2)	2.6% (2)	1.9% (1)	-	-	-	7.5% (8)

TABLE 29

RELATIVE FREQUENCY OF PARTICIPATION BY COTTAGERS IN RECREATIONAL ACTIVITIES: SWIMMING AND WADING

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NEVER	10.7% (9)	1.3% (1)	9.6% (5)	-	13.3% (2)	-	1.9% (2)
LEAST FREQUENTLY	3.6% (3)	3.9% (3)	5.8% (3)	-	6.7% (1)	-	8.5% (9)
LESS FREQUENTLY	13.1% (11)	24.7% (19)	23.1% (12)	33.3% (5)	26.7% (4)	25.0% (1)	19.8% (21)
MOST FREQUENTLY	70.2% (59)	67.5% (52)	54.6% (31)	66.7% (10)	53.3% (8)	75.0% (3)	62.3% (66)
NO RESPONSE	2.4% (2)	2.6% (2)	1.9% (1)	-	-	-	7.5% (8)

TABLE 30

RELATIVE FREQUENCY OF PARTICIPATION BY COTTAGERS IN RECREATIONAL ACTIVITIES: WATERSKIING

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NEVER	32.1% (27)	23.4% (18)	46.2% (24)	40.0% (6)	33.3% (5)	25.0% (1)	36.8% (39)
LEAST FREQUENTLY	27.4% (23)	20.8% (16)	15.4% (8)	26.7% (4)	20.0% (3)	25.0% (1)	18.9% (20)
LESS FREQUENTLY	21.4% (18)	35.1% (27)	17.3% (9)	6.7% (1)	40.0% (6)	25.0% (1)	23.6% (25)
MOST FREQUENTLY	13.1% (11)	18.2% (14)	19.2% (10)	20.0% (3)	6.7% (1)	25.0% (1)	14.2% (15)
NO RESPONSE	6.0% (5)	2.6% (2)	1.9% (1)	6.7% (1)	-	-	6.6% (7)

TABLE 31

RELATIVE FREQUENCY OF PARTICIPATION BY COTTAGERS IN RECREATIONAL ACTIVITIES: FISHING

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NEVER	11.9% (10)	14.3% (11)	5.8% (3)	6.7% (1)	13.3% (2)	25.0% (1)	10.4% (11)
LEAST FREQUENTLY	16.7% (14)	27.3% (21)	11.5% (6)	13.3% (2)	6.7% (1)	-	26.4% (28)
LESS FREQUENTLY	20.2% (17)	15.6% (12)	21.2% (11)	40.0% (6)	33.3% (5)	50.0% (2)	24.5% (26)
MOST FREQUENTLY	48.8% (41)	40.3% (31)	59.6% (31)	26.7% (4)	46.7% (7)	25.0% (1)	31.1% (33)
NO RESPONSE	2.4% (2)	2.6% (2)	1.9% (1)	13.3% (2)	-	-	7.5% (8)

TABLE 32

RELATIVE FREQUENCY OF PARTICIPATION BY COTTAGERS IN RECREATIONAL ACTIVITIES: VISITING

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NEVER	15.5% (13)	15.6% (12)	11.5% (6)	6.7% (1)	6.7% (1)	25.0% (1)	10.4% (11)
LEAST FREQUENTLY	27.4% (23)	32.5% (25)	19.2% (10)	46.7% (7)	13.3% (2)	50.0% (2)	34.9% (37)
LESS FREQUENTLY	33.3% (28)	33.8% (26)	48.1% (25)	20.0% (3)	53.3% (8)	-	32.1% (34)
MOST FREQUENTLY	22.6% (19)	15.6% (12)	19.2% (10)	20.0% (3)	26.7% (4)	-	13.2% (14)
NO RESPONSE	1.2% (1)	2.6% (2)	1.9% (1)	6.7% (1)	-	25.0% (1)	9.4% (10)

TABLE 33

RELATIVE FREQUENCY OF PARTICIPATION BY COTTAGERS IN RECREATIONAL ACTIVITIES: HIKING AND WALKING

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NEVER	10.7% (9)	16.9% (13)	17.3% (9)	-	26.7% (4)	-	9.4% (10)
LEAST FREQUENTLY	21.4% (18)	16.9% (13)	30.8% (16)	-	6.7% (1)	25.0% (1)	18.9% (20)
LESS FREQUENTLY	29.8% (25)	29.9% (23)	26.9% (14)	20.0% (3)	33.3% (5)	50.0% (2)	35.8% (38)
MOST FREQUENTLY	36.9% (31)	33.8% (26)	23.1% (12)	66.7% (10)	33.3% (5)	25.0% (1)	26.4% (28)
NO RESPONSE	1.2% (1)	2.6% (2)	1.9% (1)	13.3% (2)	-	-	9.4% (10)

TABLE 34

RELATIVE FREQUENCY OF PARTICIPATION BY COTTAGERS IN RECREATIONAL ACTIVITIES: HUNTING

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NEVER	82.1% (69)	89.6% (69)	92.3% (48)	66.7% (10)	66.7% (10)	50.0% (2)	77.4% (82)
LEAST FREQUENTLY	9.5% (8)	5.2% (4)	1.9% (1)	6.7% (1)	20.0% (3)	-	3.8% (4)
LESS FREQUENTLY	2.4% (2)	2.6% (2)	1.9% (1)	13.3% (2)	13.3% (2)	-	7.5% (8)
MOST FREQUENTLY	-	-	1.9% (1)	-	-	25.0% (1)	0.9% (1)
NO RESPONSE	6.0% (5)	2.6% (2)	1.9% (1)	13.3% (2)	-	25.0% (1)	10.4% (11)

TABLE 35

RELATIVE FREQUENCY OF PARTICIPATION BY COTTAGERS IN RECREATIONAL ACTIVITIES: CROSS-COUNTRY SKIING

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NEVER	70.2% (59)	63.6% (49)	88.5% (46)	40.0% (6)	53.3% (8)	25.0% (1)	70.8% (75)
LEAST FREQUENTLY	14.3% (12)	22.1% (17)	3.8% (2)	20.0% (3)	33.3% (5)	50.0% (2)	13.2% (14)
LESS FREQUENTLY	7.1% (6)	9.1% (7)	3.8% (2)	13.3% (2)	6.7% (1)	25.0% (1)	3.8% (4)
MOST FREQUENTLY	2.4% (2)	2.6% (2)	1.9% (1)	13.3% (2)	6.7% (1)	-	0.9% (1)
NO RESPONSE	6.0% (5)	2.6% (2)	1.9% (1)	13.3% (2)	-	-	11.3% (12)

TABLE 36

RELATIVE FREQUENCY OF PARTICIPATION BY COTTAGERS IN RECREATIONAL ACTIVITIES: SNOWMOBILING

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NEVER	90.5% (76)	83.1% (64)	84.6% (44)	60.0% (9)	80.0% (12)	50.0% (2)	79.2% (84)
LEAST FREQUENTLY	2.4% (2)	11.7% (9)	3.8% (2)	6.7% (1)	13.3% (2)	-	3.8% (4)
LESS FREQUENTLY	1.2% (1)	1.3% (1)	3.8% (2)	6.7% (1)	-	-	2.8% (3)
MOST FREQUENTLY	1.2% (1)	1.3% (1)	5.8% (3)	20.0% (3)	6.7% (1)	25.0% (1)	2.8% (3)
NO RESPONSE	4.8% (4)	2.6% (2)	1.9% (1)	6.7% (1)	-	25.0% (1)	11.3% (12)

TABLE 37

RELATIVE FREQUENCY OF PARTICIPATION BY COTTAGERS IN RECREATIONAL ACTIVITIES: SNOW-SHOEING

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NEVER	84.5% (71)	79.2% (61)	92.3% (48)	40.0% (6)	86.7% (13)	75.0% (3)	71.7% (76)
LEAST FREQUENTLY	8.3% (7)	14.3% (11)	-	20.0% (3)	13.3% (2)	- (12)	11.3%
LESS FREQUENTLY	1.2% (1)	3.9% (3)	3.8% (2)	13.3% (2)	-	-	3.8% (4)
MOST FREQUENTLY	1.2% (1)	-	1.9% (1)	13.3% (2)	-	-	0.9% (1)
NO RESPONSE	4.8% (4)	2.6% (2)	1.9% (1)	13.3% (2)	-	25.0% (1)	12.3% (13)

TABLE 38

RELATIVE FREQUENCY OF PARTICIPATION BY COTTAGERS IN RECREATIONAL ACTIVITIES: OTHER

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NEVER	64.3% (54)	79.2% (61)	69.2% (36)	6.7% (1)	40.0% (6)	75.0% (3)	51.5% (61)
LEAST FREQUENTLY	2.4% (2)	1.3% (1)	-	-	-	-	0.9% (1)
LESS FREQUENTLY	3.6% (3)	3.9% (3)	3.8% (2)	13.3% (2)	-	-	2.8% (3)
MOST FREQUENTLY	15.5% (13)	7.8% (6)	23.1% (12)	26.7% (4)	20.0% (3)	-	19.8% (21)
NO RESPONSE	14.3% (12)	7.8% (6)	3.8% (2)	53.3% (8)	40.0% (6)	25.0% (1)	18.9% (20)

TABLE 39

STATEMENT1: WATERSKIING INTERFERES TOO MUCH WITH OTHER ACTIVITIES ON THE LAKE

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
STRONGLY DISAGREE	9.5% (8)	22.4% (17)	25.5% (13)	12.5% (2)	26.7% (4)	50.0% (2)	17.1% (18)
MODERATELY DISAGREE	35.7% (30)	31.6% (24)	27.5% (14)	18.8% (3)	6.7% (1)	50.0% (2)	37.1% (39)
DISAGREE	13.1% (11)	21.1% (16)	11.8% (6)	12.5% (2)	26.7% (4)	-	10.5% (11)
UNCERTAIN	7.1% (6)	7.9% (6)	5.9% (3)	12.5% (2)	13.3% (2)	-	12.4% (13)
AGREE	17.9% (15)	9.2% (7)	17.6% (9)	25.0% (4)	13.3% (2)	-	8.6% (9)
MODERATELY AGREE	10.7% (9)	3.9% (3)	5.9% (3)	12.5% (2)	6.7% (1)	-	12.4% (13)
STRONGLY AGREE	6.0% (5)	3.9% (3)	5.9% (3)	6.3% (1)	6.7% (1)	-	1.9% (2)

TABLE 40

STATEMENT 2: THE LAKE IS NOT BIG ENOUGH TO ACCOMODATE A MUCH HIGHER LEVEL OF MOTOR-BOATING ACTIVITY.

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
STRONGLY DISAGREE	-	1.3% (1)	3.9% (2)	-	6.7% (1)	25.0% (1)	2.9% (3)
MODERATELY DISAGREE	6.0% (5)	3.9% (3)	7.8% (4)	-	13.3% (2)	-	6.7% (7)
DISAGREE	7.1% (6)	5.3% (4)	11.8% (6)	-	13.3% (2)	-	10.6% (11)
UNCERTAIN	8.3% (7)	6.6% (5)	2.0% (1)	-	-	25.0% (1)	10.6% (11)
AGREE	7.1% (6)	14.5% (11)	21.6% (11)	-	-	25.0% (1)	10.6% (11)
MODERATELY AGREE	32.1% (27)	19.7% (15)	27.5% (14)	43.8% (7)	-	-	22.1% (23)
STRONGLY AGREE	39.3% (33)	48.7% (37)	25.5% (13)	56.3% (9)	66.7% (10)	25.0% (1)	41.3% (43)

TABLE 41

STATEMENT 3: THERE ARE TOO MANY COTTAGES ON THE LAKE

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
STRONGLY DISAGREE	6.0% (5)	7.9% (6)	5.9% (3)	6.3% (1)	13.3% (2)	25.0% (1)	7.7% (8)
MODERATELY DISAGREE	17.9% (15)	14.5% (11)	21.6% (11)	18.8% (3)	6.7% (1)	25.0% (1)	20.2% (21)
DISAGREE	25.0% (21)	18.4% (14)	27.5% (14)	37.5% (6)	6.7% (1)	-	19.2% (20)
UNCERTAIN	14.3% (12)	11.8% (9)	15.7% (8)	18.8% (3)	26.7% (4)	25.0% (1)	18.3% (19)
AGREE	17.9% (15)	21.1% (16)	13.7% (7)	-	20.0% (3)	-	18.3% (19)
MODERATELY AGREE	14.3% (12)	11.8% (9)	13.7% (7)	6.3% (1)	6.7% (1)	-	7.7% (8)
STRONGLY AGREE	4.8% (4)	14.5% (11)	2.0% (1)	12.5% (2)	20.0% (3)	25.0% (1)	8.7% (9)

TABLE 42

STATEMENT 4: CANAL TRAFFIC HAS INCREASED

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
STRONGLY DISAGREE	9.6% (8)	7.9% (6)	14.0% (7)	-	26.7% (4)	25.0% (1)	7.6% (8)
MODERATELY DISAGREE	19.3% (16)	21.1% (16)	18.0% (9)	-	13.3% (2)	25.0% (1)	21.0% (22)
DISAGREE	18.1% (15)	13.2% (10)	10.0% (5)	-	-	-	18.1% (19)
UNCERTAIN	33.7% (28)	30.3% (23)	44.0% (22)	86.7% (13)	6.7% (1)	-	33.3% (35)
AGREE	7.2% (6)	7.9% (6)	12.0% (6)	-	26.7% (4)	25.0% (1)	4.8% (5)
MODERATELY AGREE	7.2% (6)	10.5% (8)	2.0% (1)	6.7% (1)	13.3% (2)	25.0% (1)	13.3% (14)
STRONGLY AGREE	4.8% (4)	9.2% (7)	-	6.7% (1)	13.3% (2)	-	1.9% (2)

TABLE 43

STATEMENT 5: THE QUALITY OF FISHING IS UNSATISFACTORY

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
STRONGLY DISAGREE	2.4% (2)	2.6% (2)	-	-	6.7% (1)	25.0% (1)	2.9% (3)
MODERATELY DISAGREE	9.5% (8)	13.2% (10)	9.8% (5)	18.8% (3)	6.7% (1)	25.0% (1)	15.2% (16)
DISAGREE	13.1% (11)	18.4% (14)	13.7% (7)	25.0% (4)	6.7% (1)	50.0% (2)	19.0% (20)
UNCERTAIN	10.7% (9)	17.1% (13)	7.8% (4)	6.3% (1)	13.3% (2)	-	14.3% (15)
AGREE	13.1% (11)	11.8% (9)	15.7% (8)	-	6.7% (1)	-	14.3% (15)
MODERATELY AGREE	26.2% (22)	17.1% (13)	27.5% (14)	18.8% (3)	20.0% (3)	-	18.1% (19)
STRONGLY AGREE	25.0% (21)	19.7% (15)	25.5% (13)	31.3% (5)	40.0% (6)	-	16.2% (17)

TABLE 44

STATEMENT 6: SHOUTING AND LOUD NOISES ARE A PROBLEM

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
STRONGLY DISAGREE	23.8% (20)	25.0% (19)	29.4% (15)	18.8% (3)	46.7% (7)	75.0% (3)	24.8% (26)
MODERATELY DISAGREE	31.0% (26)	39.5% (30)	39.2% (20)	50.0% (8)	33.3% (5)	-	41.0% (43)
DISAGREE	21.4% (18)	13.2% (10)	9.8% (5)	12.5% (2)	6.7% (1)	25.0% (1)	7.6% (8)
UNCERTAIN	4.8% (4)	9.2% (7)	3.9% (2)	12.5% (2)	6.7% (1)	-	9.5% (10)
AGREE	13.1% (11)	9.2% (7)	7.8% (4)	-	-	-	6.7% (7)
MODERATELY AGREE	4.8% (4)	2.6% (2)	5.9% (3)	6.3% (1)	-	-	7.6% (8)
STRONGLY AGREE	1.2% (1)	1.3% (1)	3.9% (2)	-	6.7% (1)	-	2.9% (3)

TABLE 45

STATEMENT 7: THE NO. OF SAILBOATS SHOULD BE CONTROLLED

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
STRONGLY DISAGREE	56.0% (47)	52.6% (40)	47.1% (24)	43.8% (7)	60.0% (9)	75.0% (3)	39.0% (41)
MODERATELY DISAGREE	28.6% (24)	28.9% (22)	31.4% (16)	43.8% (7)	26.7% (4)	25.0% (1)	37.1% (39)
DISAGREE	11.9% (10)	5.3% (4)	9.8% (5)	-	13.3% (2)	-	6.7% (7)
UNCERTAIN	2.4% (2)	9.2% (7)	5.9% (3)	6.3% (1)	-	-	10.5% (11)
AGREE	1.2% (1)	-	2.0% (1)	6.3% (1)	-	-	2.9% (3)
MODERATELY AGREE	-	2.6% (2)	2.0% (1)	-	-	-	1.9% (2)
STRONGLY AGREE	-	1.3% (1)	2.0% (1)	-	-	-	1.9% (2)

TABLE 46

STATEMENT 8: THE QUALITY OF WATER FOR SWIMMING IS POOR

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
STRONGLY DISAGREE	9.5% (8)	19.7% (15)	11.8% (6)	6.3% (1)	33.3% (5)	25.0% (1)	12.4% (13)
MODERATELY DISAGREE	17.9% (15)	28.9% (22)	23.5% (12)	6.3% (1)	20.0% (3)	25.0% (1)	23.8% (25)
DISAGREE	8.3% (7)	10.5% (8)	5.9% (3)	6.3% (1)	6.7% (1)	-	9.5% (10)
UNCERTAIN	7.1% (6)	6.6% (5)	5.9% (3)	25.0% (4)	6.7% (1)	-	9.5% (10)
AGREE	20.2% (17)	14.5% (11)	15.7% (8)	18.8% (3)	25.0% (4)	25.0% (1)	20.0% (21)
MODERATELY AGREE	19.0% (16)	14.5% (11)	19.6% (10)	12.5% (2)	-	25.0% (1)	10.5% (11)
STRONGLY AGREE	17.9% (15)	5.3% (4)	17.6% (9)	25.0% (4)	6.7% (1)	-	14.3% (15)

TABLE 47

STATEMENT 9: A SPEED OR ENGINE LIMIT IS NEEDED ON MOTORBOATS

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
STRONGLY DISAGREE	10.7% (9)	9.2% (7)	25.5% (13)	6.3% (1)	26.7% (4)	50.0% (2)	12.4% (13)
MODERATELY DISAGREE	8.3% (7)	9.2% (7)	17.6% (9)	12.5% (2)	20.0% (3)	-	19.0% (20)
DISAGREE	4.8% (4)	9.2% (7)	5.9% (3)	-	-	25.0% (1)	4.8% (5)
UNCERTAIN	11.9% (10)	7.9% (6)	9.8% (5)	12.5% (2)	6.7% (1)	-	12.4% (13)
AGREE	20.2% (17)	14.5% (11)	3.9% (2)	12.5% (2)	6.7% (1)	25.0% (1)	12.4% (13)
MODERATELY AGREE	17.9% (15)	18.4% (14)	11.8% (6)	25.0% (4)	-	-	10.5% (11)
STRONGLY AGREE	26.2% (22)	31.6% (24)	25.5% (13)	31.3% (5)	40.0% (6)	-	28.6% (30)

TABLE 48

STATEMENT 10: TOO MANY PEOPLE USE THE LAKE.

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
STRONGLY DISAGREE	7.1% (6)	9.2% (7)	17.6% (9)	-	13.3% (2)	75.0% (3)	11.4% (12)
MODERATELY DISAGREE	22.6% (19)	22.4% (17)	31.4% (16)	18.8% (3)	26.7% (4)	-	30.5% (32)
DISAGREE	26.2% (22)	25.0% (19)	19.6% (10)	31.3% (5)	-	25.0% (1)	12.4% (13)
UNCERTAIN	13.1% (11)	13.2% (10)	11.8% (6)	25.0% (4)	13.3% (2)	-	21.9% (23)
AGREE	25.0% (21)	19.7% (15)	9.8% (5)	12.5% (2)	-	-	14.3% (15)
MODERATELY AGREE	3.6% (3)	9.2% (7)	7.8% (4)	-	26.7% (4)	-	6.7% (7)
STRONGLY AGREE	2.4% (2)	1.3% (1)	2.0% (1)	12.5% (2)	20.0% (3)	-	2.9% (3)

TABLE 49

STATEMENT 11: THE LAKE NEEDS NON-LOCAL BOAT CRUISE CONTROLS

	OPINICON	INDIAN NEWBORO	BENSON	CLEAR MOSQUITO	SAND
STRONGLY DISAGREE	14.3% (12)	3.9% (3)	10.0% (5)	6.3% (1)	20.0% (3)	25.0% (1)	5.7% (6)
MODERATELY DISAGREE	10.7% (9)	7.9% (6)	14.0% (7)	12.5% (2)	6.7% (1)	-	14.3% (15)
disagree	9.5% (8)	13.2% (10)	16.0% (8)	-	13.3% (2)	50.0% (2)	8.6% (9)
uncertain	13.1% (11)	18.4% (14)	18.0% (9)	37.5% (6)	6.7% (1)	25.0% (1)	9.5% (10)
agree	21.4% (18)	10.5% (8)	10.0% (5)	12.5% (2)	-	-	20.0% (21)
moderately agree	14.3% (12)	26.3% (20)	14.0% (7)	12.5% (2)	6.7% (1)	-	21.9% (23)
strongly agree	16.7% (14)	19.7% (15)	18.0% (9)	18.8% (3)	46.7% (7)	-	20.0% (21)

TABLE 50

statement 12: the number of canoeists on the lake IS A PROBLEM

	opinicon	indian	newboro	benson	clear	mosquito	sand
strongly disagree	70.7% (58)	72.4% (55)	58.0% (29)	81.3% (13)	80.0% (12)	100.0% (4)	68.6% (72)
moderately disagree	19.5% (16)	14.5% (11)	32.0% (16)	12.5% (2)	6.7% (1)	-	19.0% (20)
disagree	4.9% (4)	5.3% (4)	8.0% (4)	-	13.3% (2)	-	6.7% (7)
uncertain	1.2% (1)	5.3% (4)	2.0% (1)	-	-	-	3.8% (4)
agree	1.2% (1)	-	-	-	-	-	-
moderately agree	-	1.3% (1)	-	6.3% (1)	-	-	1.0% (1)
strongly agree	2.4% (2)	1.3% (1)	-	-	-	-	1.0% (1)

TABLE 51

STATEMENT 13: THE LAKE IS NOT AS PLEASANT AS IT WAS WHEN THE COTTAGE WAS BOUGHT

	opinicon	indian	newboro	benson	clear	mosquito	sand
strongly disagree	17.9% (15)	26.3% (20)	23.5% (12)	6.3% (1)	26.7% (4)	50.0% (2)	24.8% (26)
moderately disagree	20.2% (17)	23.7% (18)	23.5% (12)	43.8% (7)	33.3% (5)	50.0% (2)	28.6% (30)
disagree	13.11% (11)	10.5% (8)	3.9% (2)	25.0% (4)	-	-	16.2% (17)
uncertain	1.2% (1)	2.6% (2)	-	-	13.3% (2)	-	3.8% (4)
agree	13.1% (11)	13.2% (10)	7.8% (4)	-	-	-	8.6% (9)
moderately agree	19.0 (16)	7.9% (6)	17.6% (9)	-	6.7% (1)	-	9.5% (10)
strongly agree	15.5% (13)	15.8% (12)	23.5% (12)	25.0% (4)	20.0% (3)	-	8.6% (9)

TABLE 52

IMPORTANCE OF COTTAGE SELECTION CRITERIA: PEACE AND QUIET

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT IMPORTANT	-	1.3% (1)	1.9% (1)	-	-	-	0.9% (1)
FAIRLY IMPORTANT	10.7% (9)	19.5% (15)	3.8% (2)	6.7% (1)	26.7% (4)	-	19.8% (21)
EXTREMELY IMPORTANT	89.3% (75)	76.6% (59)	90.4% (47)	93.3% (14)	73.3% (11)	100.0% (4)	75.5% (80)
NO RESPONSE	-	2.6% (2)	3.8% (2)		-	-	3.8% (4)

TABLE 53

IMPORTANCE OF COTTAGE SELECTION CRITERIA: GOOD VIEW

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT IMPORTANT	1.2% (1)		-	-	-	-	0.9% (1)
FAIRLY IMPORTANT	17.9% (15)	6.5% (5)	13.5% (7)	13.3% (2)	33.3% (5)	-	14.2% (15)
EXTREMELY IMPORTANT	81.0% (68)	89.6% (69)	82.7% (43)	86.7% (13)	66.7% (10)	100.0% (4)	81.1% (86)
NO RESPONSE	-	3.9% (3)	3.8% (2)	-	-	-	3.8% (4)

TABLE 54

IMPORTANCE OF COTTAGE SELECTION CRITERIA: PRIVACY

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT IMPORTANT	1.2% (1)	-	-	-	-	-	0.9% (1)
FAIRLY IMPORTANT	8.3% (7)	7.8% (6)	1.9% (1)	6.7% (1)	20.0% (3)	25.0% (1)	13.2% (14)
EXTREMELY IMPORTANT	90.5% (76)	89.6% (69)	94.2% (49)	93.3% (14)	80.0% (12)	75.0% (3)	82.1% (87)
NO RESPONSE	-	2.6% (2)	3.8% (2)	-	-	-	3.8% (4)

TABLE 55

IMPORTANCE OF COTTAGE SELECTION CRITERIA: GOOD SWIMMING

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT IMPORTANT	1.2% (1)	-	1.9% (1)	-	-	-	0.9% (1)
FAIRLY IMPORTANT	31.0% (26)	16.9% (13)	19.2% (10)	26.7% (4)	33.3% (5)	25.0% (1)	17.9% (19)
EXTREMELY IMPORTANT	67.9% (57)	79.2% (61)	75.0% (39)	73.3% (11)	66.7% (10)	75.0% (3)	77.4% (82)
NO RESPONSE	-	3.9% (3)	3.8% (2)	-	-	-	3.8% (4)

TABLE 56

IMPORTANCE OF COTTAGE SELECTION CRITERIA: LARGE LOT

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT IMPORTANT	3.6% (3)	7.8% (6)	1.9% (1)	6.7% (1)	6.7% (1)	-	0.9% (1)
FAIRLY IMPORTANT	26.2% (22)	24.7% (19)	28.8% (15)	33.3% (5)	46.7% (7)	75.0% (3)	35.8% (38)
EXTREMELY IMPORTANT	70.2% (59)	64.9% (50)	65.4% (34)	60.0% (9)	46.7% (7)	25.0% (1)	59.4% (63)
NO RESPONSE	-	2.6% (2)	3.8% (2)	-	-	-	3.8% (4)

TABLE 57

IMPORTANCE OF COTTAGE SELECTION CRITERIA: GOOD PRICE FOR LOT

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT IMPORTANT	3.6% (3)	3.9% (3)	-	-	13.3% (2)	-	-
FAIRLY IMPORTANT	36.9% (31)	45.5% (35)	34.6% (18)	66.7% (10)	60.0% (9)	-	32.1% (34)
EXTREMELY IMPORTANT	59.5% (50)	48.1% (37)	53.8% (28)	33.3% (5)	26.7% (4)	100.0% (4)	59.4% (63)
NO RESPONSE	-	2.6% (2)	11.5% (6)	-	-	-	6.6% (7)

TABLE 58

IMPORTANCE OF COTTAGE SELECTION CRITERIA: GOOD PRICE FOR COTTAGE

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT IMPORTANT	7.1% (6)	3.9% (3)	-	-	13.3% (2)	-	1.9% (2)
FAIRLY IMPORTANT	29.8% (25)	42.9% (33)	38.5% (20)	66.7% (10)	53.3% (8)	-	32.1% (34)
EXTREMELY IMPORTANT	60.7% (51)	50.6% (39)	50.0% (26)	26.7% (4)	26.7% (4)	100.0% (4)	56.6% (60)
NO RESPONSE	2.4% (2)	2.6% (2)	11.5% (6)	6.7% (1)	6.7% (1)	-	9.4% (10)

TABLE 59

IMPORTANCE OF COTTAGE SELECTION CRITERIA: LAKE FRONTAGE

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT IMPORTANT	1.2% (1)	-	-	-	-	-	0.9% (1)
FAIRLY IMPORTANT	7.1% (6)	9.1% (7)	5.8% (3)	20.0% (3)	20.0% (3)	-	10.4% (11)
EXTREMELY IMPORTANT	98.7% (77)	87.9% (67)	90.4% (47)	80.0% (12)	80.0% (12)	100.0% (4)	84.9% (90)
NO RESPONSE	-	3.9% (3)	3.8% (2)	-	-	-	3.8% (4)

TABLE 60

IMPORTANCE OF COTTAGE SELECTION CRITERIA: GOOD WATER QUALITY

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT IMPORTANT	1.2% (1)	-	-	-	-	-	0.9% (1)
FAIRLY IMPORTANT	6.0% (5)	1.3% (1)	5.8% (3)	6.7% (1)	-	-	3.8% (4)
EXTREMELY IMPORTANT	91.7% (77)	96.1% (74)	90.4% (47)	93.3% (14)	100.0% (15)	100.0% (4)	91.5% (97)
NO RESPONSE	1.2% (1)	2.6% (2)	3.8% (2)	-	-	-	3.8% (4)

TABLE 61

IMPORTANCE OF COTTAGE SELECTION CRITERIA: SIZE OF LAKE

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT IMPORTANT	7.1% (6)	1.3% (1)	3.8% (2)	6.7% (1)	13.3% (2)	-	4.7% (5)
FAIRLY IMPORTANT	41.7% (35)	35.1% (27)	23.1% (12)	60.0% (9)	46.7% (7)	25.0% (1)	36.8% (39)
EXTREMELY IMPORTANT	51.2% (43)	61.0% (47)	69.2% (36)	33.3% (5)	40.0% (6)	75.0% (3)	54.7% (58)
NO RESPONSE	-	2.6% (2)	3.8% (2)	-	-	-	3.8% (4)

TABLE 62

IMPORTANCE OF COTTAGE SELECTION CRITERIA: CLOSE TO FRIENDS

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT IMPORTANT	31.0% (26)	32.5% (25)	34.6% (18)	40.0% (6)	26.7% (4)	50.0% (2)	33.0% (35)
FAIRLY IMPORTANT	44.0% (37)	36.4% (28)	40.4% (21)	53.3% (8)	53.3% (8)	50.0% (2)	37.7% (40)
EXTREMELY IMPORTANT	23.8% (20)	28.6% (22)	21.2% (11)	6.7% (1)	20.0% (2)	-	22.6% (24)
NO RESPONSE	1.2% (1)	2.6% (2)	3.9% (2)	-	-	-	6.6% (7)

TABLE 63

IMPORTANCE OF COTTAGE SELECTION CRITERIA: GOOD ROAD ACCESS

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT IMPORTANT	9.5% (8)	3.9% (3)	25.0% (13)	-	20.0% (3)	-	18.9% (20)
FAIRLY IMPORTANT	41.7% (35)	33.8% (26)	40.4% (21)	60.0% (9)	46.7% (7)	50.0% (2)	17.9% (19)
EXTREMELY IMPORTANT	47.6% (40)	59.7% (46)	28.8% (15)	40.0% (6)	33.3% (5)	50.0% (2)	58.5% (62)
NO RESPONSE	1.2% (1)	2.6% (2)	5.8% (3)	-	-	-	4.7% (5)

TABLE 64

IMPORTANCE OF COTTAGE SELECTION CRITERIA: CLOSE TO A PROVISION CENTRE

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT IMPORTANT	23.8% (20)	14.3% (11)	26.9% (14)	46.7% (7)	26.7% (4)	-	19.8% (21)
FAIRLY IMPORTANT	65.5% (55)	61.0% (47)	50.0% (26)	46.7% (7)	60.0% (9)	75.0% (3)	53.8% (57)
EXTREMELY IMPORTANT	10.7% (9)	22.1% (17)	17.3% (9)	6.7% (1)	13.3% (2)	25.0% (1)	18.9% (20)
NO RESPONSE	-	2.6% (2)	5.8% (3)	-	-	-	7.5% (8)

TABLE 65

IMPORTANCE OF COTTAGE SELECTION CRITERIA: NOT TOO FAR FROM PERMANENT RESIDENCE

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT IMPORTANT	29.8% (25)	19.5% (15)	32.7% (17)	26.7% (4)	13.3% (2)	-	18.9% (20)
FAIBLY IMPORTANT	39.3% (33)	48.1% (37)	50.0% (26)	33.3% (5)	66.7% (10)	75.0% (3)	37.7% (40)
EXTREMELY IMPORTANT	29.8% (25)	26.0% (20)	13.5% (7)	40.0% (6)	20.0% (3)	25.0% (1)	35.8% (38)
NO RESPONSE	1.2% (1)	6.5% (5)	3.8% (2)	-	-	-	7.5% (8)

TABLE 66

SATISFACTION WITH COTTAGE SELECTION CRITERIA: PEACE AND QUIET

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT AT ALL	3.6% (3)	2.6% (2)	-	-	-	-	3.8% (1)
ADEQUATELY	34.5% (29)	31.2% (24)	25.0% (13)	26.7% (4)	20.0% (3)	-	29.2% (31)
EXTREMELY WELL	58.3% (49)	61.0% (47)	73.1% (38)	73.3% (11)	73.3% (11)	100.0% (4)	62.3% (66)
NO RESPONSE	3.6% (3)	5.2% (4)	1.9% (1)	-	-	-	4.7% (5)

TABLE 67

SATISFACTION WITH COTTAGE SELECTION CRITERIA: GOOD VIEW

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT AT ALL	-	1.3% (1)	-	-	6.7% (1)	-	0.9% (1)
ADEQUATELY	14.3% (12)	10.4% (8)	19.2% (10)	13.3% (2)	13.3% (2)	-	12.3% (13)
EXTREMELY WELL	82.1% (69)	81.8% (63)	78.8% (41)	86.7% (13)	73.3% (11)	100.0% (4)	82.1% (87)
NO RESPONSE	3.6% (3)	6.5% (5)	1.9% (1)	-	6.7% (1)	-	4.7% (5)

TABLE 68

SATISFACTION WITH COTTAGE SELECTION CRITERIA: PRIVACY

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT AT ALL	3.6% (3)	3.9% (3)	-	-	-	-	3.8% (4)
ADEQUATELY	31.0% (26)	24.7% (19)	19.2% (10)	53.3% (8)	6.7% (1)	-	25.5% (27)
EXTREMELY WELL	619% (52)	66.2% (51)	76.9% (40)	46.7% (7)	86.7% (13)	100.0% (4)	66.0% (70)
NO RESPONSE	3.6% (3)	5.2% (4)	3.8% (2)	-	6.7% (1)	-	4.7% (5)

TABLE 69

SATISFACTION WITH COTTAGE SELECTION CRITERIA: GOOD SWIMMING

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT AT ALL	9.5% (8)	3.9% (3)	9.6% (5)	13.3% (2)	6.7% (1)	-	8.5% (9)
ADEQUATELY	44.0% (37)	19.5% (15)	40.4% (21)	53.3% (8)	13.3% (2)	50.0% (2)	32.1% (34)
EXTREMELY WELL	42.9% (36)	70.1% (54)	46.2% (24)	33.3% (5)	73.3% (11)	50.0% (2)	54.7% (58)
NO RESPONSE	3.6% (3)	6.5% (5)	3.8% (2)	-	6.7% (1)	-	4.7% (5)

TABLE 70

SATISFACTION WITH COTTAGE SELECTION CRITERIA: LARGE LOT

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT AT ALL	3.6% (3)	5.2% (4)	-	6.7% (1)	-	-	3.8% (4)
ADEQUATELY	36.9% (31)	31.2% (24)	28.8% (15)	46.7% (7)	6.7% (1)	-	30.2% (32)
EXTREMELY WELL	56.0% (47)	58.4% (45)	67.3% (35)	46.7% (8)	86.7% (13)	100.0% (4)	61.3% (65)
NO RESPONSE	3.6% (3)	5.2% (4)	3.8% (2)	-	6.7% (1)	-	4.7% (5)

TABLE 71

SATISFACTION WITH COTTAGE SELECTION CRITERIA: GOOD PRICE FOR LOT

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT AT ALL	1.2% (1)	1.3% (1)	-	-	-	-	2.8% (3)
ADEQUATELY	40.5% (34)	48.1% (37)	38.5% (20)	60.0% (9)	26.7% (4)	-	35.8% (38)
EXTREMELY WELL	56.0% (47)	45.5% (35)	51.9% (27)	40.0% (6)	86.7% (13)	100.0% (4)	61.3% (65)
NO RESPONSE	3.6% (3)	5.2% (4)	9.6% (5)	-	6.7% (1)	-	8.5% (9)

TABLE 72

SATISFACTION WITH COTTAGE SELECTION CRITERIA: GOOD PRICE FOR COTTAGE

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT AT ALL	1.2% (1)	1.3% (1)	-	-	-	-	2.8% (3)
ADEQUATELY	41.7% (35)	42.9% (33)	40.4% (21)	60.0% (9)	20.0% (3)	25.0% (1)	35.8% (38)
EXTREMELY WELL	52.4% (44)	48.1% (37)	50.0% (26)	40.0% (6)	60.0% (9)	75.0% (3)	50.9% (54)
NO RESPONSE	4.8% (4)	7.8% (6)	9.6% (5)	-	20.0% (3)	-	10.4% (11)

TABLE 73

SATISFACTION WITH COTTAGE SELECTION CRITERIA: LAKE FRONTAGE

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT AT ALL	-	2.6% (2)	-	-	-	-	3.8% (4)
ADEQUATELY	23.8% (20)	13.0% (10)	13.5% (7)	53.3% (8)	-	-	22.6% (24)
EXTREMELY WELL	72.6% (61)	79.2% (61)	84.6% (44)	46.7% (7)	93.3% (14)	100.0% (4)	68.9% (73)
NO RESPONSE	3.6% (3)	5.2% (4)	1.9% (1)	-	6.7% (1)	-	4.7% (5)

TABLE 74

SATISFACTION WITH COTTAGE SELECTION CRITERIA: GOOD WATER QUALITY

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT AT ALL	7.1% (6)	2.6% (2)	1.9% (1)	-	13.3% (2)	-	6.6% (7)
ADEQUATELY	38.1% (32)	20.8% (16)	50.0% (26)	66.7% (10)	20.0% (3)	50.0% (2)	21.7% (23)
EXTREMELY WELL	50.0% (42)	70.1% (54)	46.2% (24)	33.3% (5)	60.0% (9)	50.0% (2)	66.0% (70)
NO RESPONSE	4.8% (4)	6.5% (5)	1.9% (1)	-	6.7% (1)	-	5.7% (6)

TABLE 75

SATISFACTION WITH COTTAGE SELECTION CRITERIA: SIZE OF LAKE

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT AT ALL	-	2.6% (2)	-	--	-	-	0.9% (1)
ADEQUATELY	31.0% (26)	23.4% (18)	15.4% (8)	40.0% (6)	33.3% (5)	-	29.2% (31)
EXTREMELY WELL	65.5% (55)	67.5% (52)	82.7% (43)	53.3% (8)	60.0% (9)	100.0% (4)	64.2% (68)
NO RESPONSE	3.6% (3)	6.5% (5)	1.9% (1)	6.7% (1)	6.7% (1)	-	5.7% (6)

TABLE 76

SATISFACTION WITH COTTAGE SELECTION CRITERIA: CLOSE TO FRIENDS

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT AT ALL	2.4% (2)	6.5% (5)	5.8% (3)	6.7% (1)	-	-	9.4% (10)
ADEQUATELY	45.2% (38)	37.7% (29)	50.0% (26)	40.0% (6)	33.3% (5)	50.0% (2)	41.5% (44)
EXTREMELY WELL	48.8% (41)	50.6% (39)	40.4% (21)	53.3% (8)	60.0% (9)	50.0% (2)	43.4% (46)
NO RESPONSE	3.6% (3)	5.2% (4)	3.8% (2)	-	6.7% (1)	-	5.7% (6)

TABLE 77

SATISFACTION WITH COTTAGE SELECTION CRITERIA: GOOD ROAD ACCESS

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT AT ALL	4.8% (4)	1.3% (1)	23.1% (12)	-	20.0% (3)	100.0% (4)	14.2% (15)
ADEQUATELY	48.8% (41)	27.3% (21)	50.0% (26)	46.7% (7)	46.7% (7)	-	36.8% (39)
EXTREMELY WELL	41.7% (35)	66.2% (51)	23.1% (12)	53.3% (8)	26.7% (4)	-	42.5% (45)
NO RESPONSE	4.8% (4)	5.2% (4)	3.8% (2)	-	6.7% (1)	-	6.6% (7)

TABLE 78

SATISFACTION WITH COTTAGE SELECTION CRITERIA: CLOSE TO PROVISION CENTRE

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT AT ALL	4.8% (4)	1.3% (1)	7.7% (4)	-	6.7% (1)	-	4.7% (5)
ADEQUATELY	64.3% (54)	46.8% (36)	65.4% (34)	73.3% (11)	53.3% (8)	100.0% (4)	61.3% (65)
EXTREMELY WELL	27.4% (23)	46.8% (36)	23.1% (12)	26.7% (4)	33.3% (5)	-	27.4% (29)
NO RESPONSE	3.6% (3)	5.2% (4)	3.8% (2)	-	6.7% (1)	-	6.6% (7)

TABLE 79

SATISFACTION WITH COTTAGE SELECTION CRITERIA: NOT TOO FAR FROM PERMANENT RESIDENCE

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
NOT AT ALL	15.5% (13)	16.9% (13)	19.2% (10)	-	20.0% (3)	-	16.0% (17)
ADEQUATELY	44.0% (37)	40.3% (31)	48.1% (25)	53.3% (8)	26.7% (4)	50.0% (2)	45.3% (48)
EXTREMELY WELL	35.7% (30)	33.8% (26)	30.8% (16)	46.7% (7)	46.7% (7)	50.0% (2)	30.2% (32)
NO RESPONSE	4.8% (4)	9.1% (7)	1.9% (1)	-	6.7% (1)	-	8.5% (9)

TABLE 80

DEGREE TO WHICH COTTAGERS WOULD TOLERATE TYPES OF DEVELOPMENT: PUBLIC ACCESS POINT

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
AS A NEIGHBOUR	3.6% (3)	-	1.9% (1)	-	-	-	1.9% (2)
WITHIN LINE OF SIGHT	6.0% (5)	1.3% (1)	13.5% (7)	6.7% (1)	13.3% (2)	25.0% (1)	8.5% (9)
ON LAKE BUT NOT IN SIGHT	52.4% (44)	49.4% (38)	67.3% (35)	40.0% (6)	40.0% (6)	-	55.7% (59)
NOT ON LAKE AT ALL	35.7% (30)	48.1% (37)	15.4% (8)	53.3% (8)	46.7% (7)	50.0% (2)	29.2% (31)
NO RESPONSE	2.4% (2)	1.3% (1)	1.9% (1)	-	-	25.0% (1)	4.7% (5)

TABLE 81

DEGREE TO WHICH COTTAGERS WOULD TOLERATE TYPES OF DEVELOPMENT: PUBLIC PICNIC GROUND

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
AS A NEIGHBOUR	1.2% (1)	-	-	-	-	-	1.9% (2)
WITHIN LINE OF SIGHT	3.6% (3)	-	15.4% (8)	-	-	25.0% (1)	3.8% (4)
ON LAKE BUT NOT IN SIGHT	31.0% (26)	31.2% (24)	48.1% (25)	40.0% (6)	26.7% (4)	-	43.4% (46)
NOT ON LAKE AT ALL	61.9% (52)	66.2% (51)	34.6% (18)	60.0% (9)	73.3% (11)	50.0% (2)	47.2% (50)
NO RESPONSE	2.4% (2)	2.6% (2)	1.9% (1)	-	-	25.0% (1)	3.8% (4)

TABLE 82

DEGREE TO WHICH COTTAGERS WOULD TOLERATE TYPES OF DEVELOPMENT: PRIVATE CAMPGROUND

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
AS A NEIGHBOUR	-	-	-	-	-	-	0.9% (1)
WITHIN LINE OF SIGHT	3.6% (3)	1.3% (1)	15.4% (8)	-	6.7% (1)	25.0% (1)	-
ON LAKE BUT NOT IN SIGHT	40.5% (34)	31.2% (24)	48.1% (25)	20.0% (3)	26.7% (4)	-	34.9% (37)
NOT ON LAKE AT ALL	52.4% (44)	64.9% (50)	34.6% (18)	80.0% (12)	66.7% (10)	50.0% (2)	58.5% (62)
NO RESPONSE	3.6% (3)	2.6% (2)	1.9% (1)	-	-	25.0% (1)	5.7% (6)

TABLE 83

DEGREE TO WHICH COTTAGERS WOULD TOLERATE TYPES OF DEVELOPMENT: YOUTH CAMP

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
AS A NEIGHBOUR	3.6% (3)	-	-	-	-	-	2.8% (3)
WITHIN LINE OF SIGHT	4.8% (4)	6.5% (5)	7.7% (4)		6.7% (1)	25.0% (1)	4.7% (5)
ON LAKE BUT NOT IN SIGHT	46.4% (39)	37.7% (29)	50.0% (26)	26.7% (40	33.3% (5)	25.0% (1)	48.1% (51)
NOT ON LAKE AT ALL	44.0% (37)	53.2% (41)	40.4% (21)	73.3% (11)	60.0% (9)	25.0% (1)	39.6% (42)
NO RESPONSE	1.2% (1)	2.6% (2)	1.9% (1)	-	-	25.0% (1)	4.7% (5)

TABLE 84

DEGREE TO WHICH COTTAGERS WOULD TOLERATE TYPES OF DEVELOPMENT: PROVINCIAL PARK

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
AS A NEIGHBOUR	1.2% (1)	2.6% (2)	1.9% (1)	-	-	-	2.8% (3)
WITHIN LINE OF SIGHT	6.0% (5)	1.3% (1)	15.4% (8)	-	6.7% (1)	-	4.7% (5)
ON LAKE BUT NOT IN SIGHT	34.5% (29)	28.6% (22)	30.8% (16)	13.3% (2)	20.0% (3)	-	30.2% (32)
NOT ON LAKE AT ALL	54.8% (46)	64.9% (50)	48.1% (25)	86.7% (13)	73.3% (11)	50.0% (2)	57.5% (61)
NO RESPONSE	3.6% (2)	2.6% (2)	1.9% (1)	-	-	50.0% (2)	4.7% (5)

TABLE 85

DEGREE TO WHICH COTTAGERS WOULD TOLERATE TYPES OF DEVELOPMENT: TRAILER PARK

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
AS A NEIGHBOUR	-	-	-	-	-	-	0.9% (1)
WITHIN LINE SIGHT	1.2% (1)	-	5.8% (3)	-	-	-	-
ON LAKE BUT NOT IN SIGHT	11.9% (10)	11.7% (9)	25.0% (13)	-	20.0% (3)	-	18.9% (20)
NOT ON LAKE AT ALL	84.5% (71)	85.7% (66)	67.3% (35)	100.0% (15)	80.0% (12)	50.0% (2)	75.5% (80)
NO RESPONSE	2.4% (2)	2.6% (2)	1.9% (1)	-	-	50.0% (2)	4.7% (5)

TABLE 86

DEGREE TO WHICH COTTAGERS WOULD TOLERATE TYPES OF DEVELOPMENT: TOURIST LODGE

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
AS A NEIGHBOUR	-	-	-	-	6.7% (1)	-	1.9% (2)
WITHIN LINE OF SIGHT	4.8% (4)	3.9% (3)	11.5% (6)	-	-	-	0.9% (1)
ON LAKE BUT NOT IN SIGHT	38.1% (32)	36.4% (28)	53.8% (28)	20.0% (3)	40.0% (6)	-	38.7% (41)
NOT ON LAKE AT ALL	54.8% (46)	58.4% (45)	32.7% (17)	80.0% (12)	53.3% (8)	50.0% (2)	53.8% (57)
NO RESPONSE	2.4% (2)	1.3% (1)	1.9% (1)	-	-	50.0% (2)	4.7% (5)

TABLE 87

DEGREE TO WHICH COTTAGERS WOULD TOLERATE TYPES OF DEVELOPMENT: ONE NEW COTTAGE

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
AS A NEIGHBOUR	19.0% (16)	16.9% (13)	23.1% (12)	40.0% (6)	33.3% (5)	-	21.7% (23)
WITHIN LINE OF SIGHT	29.8% (25)	13.0% (10)	26.9% (14)	13.3% (2)	6.7% (1)	25.0% (1)	25.5% (27)
ON LAKE BUT NOT IN SIGHT	33.3% (28)	36.4% (28)	36.5% (19)	40.0% (6)	33.3% (5)	50.0% (2)	27.4% (29)
NOT ON LAKE AT ALL	13.1% (11)	28.6% (22)	9.6% (5)	6.7% (1)	26.7% (4)	-	17.0% (18)
NO RESPONSE	4.8% (4)	5.2% (4)	3.8% (2)	-	-	25.0% (1)	8.5% (9)

TABLE 88

DEGREE TO WHICH COTTAGERS WOULD TOLERATE TYPES OF DEVELOPMENT: TEN NEW COTTAGES

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
AS A NEIGHBOUR	2.4% (2)	-	-	6.7% (1)	13.3% (2)	-	1.9% (2)
WITHIN LINE OF SIGHT	11.9% (10)	7.8% (6)	1.9% (1)	-	13.3% (2)	25.0% (1)	4.7% (5)
ON LAKE BUT NOT IN SIGHT	39.3% (33)	29.9% (23)	63.5% (33)	53.3% (8)	13.3% (2)	-	49.1% (52)
NOT ON LAKE AT ALL	41.7% (35)	58.4% (45)	30.8% (16)	40.0% (6)	60.0% (9)	50.0% (2)	40.6% (43)
NO RESPONSE	4.8% (4)	3.9% (3)	3.8% (2)	-	-	25.0% (1)	3.8% (4)

TABLE 89

DEGREE TO WHICH COTTAGERS WOULD TOLERATE TYPES OF DEVELOPMENT: COTTAGE SUBDIVISION

	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
AS A NEIGHBOUR	-	-	-	-	-	-	-
WITHIN LINE OF SIGHT	3.6% (3)	3.8% (2)	-	-	-	-	2.8% (3)
ON LAKE BUT NOT IN SIGHT	19.0% (16)	16.9% (13)	40.4% (21)	40.0% (6)	20.0% (2)	25.0% (1)	34.9% (37)
NOT ON LAKE	72.6% (61)	79.2% (61)	53.8% (28)	60.0% (9)	80.0% (12)	50.0% (2)	57.5% (61)
NO RESPONSE	4.8% (4)	1.3% (1)	3.8% (2)	-	-	25.0% (1)	4.7% (5)

TABLE 90

RANKING OF PARTICIPATING GROUPS IN PLANNING PROCESS: COTTAGE OWNERS

RANK	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
1	63.1% (53)	75.3% (58)	63.5% (33)	46.7% (7)	73.3% (11)	25.0% (1)	69.8% (74)
2	15.5% (13)	14.3% (11)	15.4% (8)	26.7% (4)	20.0% (3)	50.0% (2)	15.1% (16)
3	6.0% (5)	5.2% (4)	5.8% (3)	13.3% (2)	-	-	2.8% (3)
4	4.8% (4)	-	3.8% (2)	-	-	-	-
6	-	-	-	-	-	-	0.9% (1)
NO RANK	10.7% (9)	5.2% (4)	11.5% (6)	13.3% (2)	6.7% (1)	25.0% (1)	11.9% (12)

TABLE 91

RANKING OF PARTICIPATING GROUPS IN PLANNING PROCESS: PROPERTY OWNERS

RANK	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
1	36.9% (31)	33.8% (26)	38.5% (20)	26.7% (4)	26.7% (4)	75.0% (3)	37.7% (40)
2	33.3% (28)	40.3% (31)	36.5% (19)	33.3% (5)	46.7% (7)	-	39.6% (42)
3	6.0% (5)	5.2% (4)	7.7% (4)	20.0% (3)	-	-	4.7% (5)
4	4.8% (4)	3.9% (3)	1.9% (1)	6.7% (1)	-	-	1.9% (2)
5	3.8% (3)	1.3% (1)	3.8% (2)	-	6.7% (1)	-	3.8% (4)
NO RANK	15.5% (13)	15.6% (12)	11.5% (6)	13.3% (2)	20.0% (3)	25.0% (1)	12.3% (13)

TABLE 92

RANKING OF PARTICIPATING GROUPS IN PLANNING PROCESS: ALL LAKE USERS

RANK	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
1	7.1% (6)	3.9% (3)	5.8% (3)	-	-	25.0% (1)	2.8% (3)
2	2.4% (2)	1.3% (1)	1.9% (1)	-	-	-	3.8% (4)
3	7.1% (6)	6.5% (5)	5.8% (3)	-	-	-	6.6% (7)
4	1.2% (1)	3.9% (3)	3.8% (2)	6.7% (1)	6.7% (1)	-	4.7% (5)
5	2.4% (2)	2.6% (2)	3.8% (2)	13.3% (2)	6.7% (1)	-	1.9% (2)
6	4.8% (4)	1.3% (1)	-	-	-	-	5.7% (6)
7	-	-	-	-	-	-	0.9% (1)
NO RANK	75.0% (63)	80.5% (62)	78.8% (41)	80.0% (12)	86.7% (13)	75.0% (3)	73.6% (78)

TABLE 93

RANKING OF PARTICIPATING GROUPS IN PLANNING PROCESS: LOCAL GOVERNMENTS

RANK	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
1	15.5% (13)	16.9% (13)	19.2% (10)	13.3% (2)	6.7% (1)	-	15.1% (16)
2	14.3% (12)	9.1% (7)	25.0% (13)	20.0% (3)	-	-	17.0% (18)
3	25.0% (21)	23.4% (18)	23.1% (12)	13.3% (2)	60.0% (9)	50.0% (2)	26.4% (28)
4	7.1% (6)	11.7% (9)	7.7% (4)	6.7% (1)	-	-	5.7% (6)
5	4.8% (4)	2.6% (2)	3.8% (2)	6.7% (1)	-	-	3.8% (4)
6	-	-	-	6.7% (1)	-	-	1.9% (2)
NO RANK	33.3% (28)	36.4% (28)	21.2% (11)	33.3% (5)	33.3% (5)	50.0% (2)	30.2% (32)

TABLE 94

RANKING OF PARTICIPATING GROUPS IN PLANNING PROCESS: PROVINCIAL GOVERNMENT AGENCIES

RANK	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
1	16.7% (14)	16.9% (13)	19.2% (10)	20.0% (3)	6.7% (1)	-	11.3% (12)
2	15.5% (13)	6.5% (5)	13.5% (7) &	13.3% (2)	13.3% (2)	-	12.3% (13)
3	13.1% (11)	13.0% (10)	23.1% (12)	20.0% (3)	-	-	15.1% (16)
4	13.1% (11)	16.9% (13)	19.2% (10)	20.0% (3)	26.7% (4)	25.0% (1)	19.8% (21)
5	3.6% (3)	6.5% (5)	5.8% (3)	-	6.7% (1)	-	5.7% (6)
NO RANK	38.1% (32)	40.3% (31)	19.2% (10)	26.7% (4)	46.7% (7)	75.0% (3)	35.8% (38)

TABLE 95

RANKING OF PARTICIPATING GROUPS IN PLANNING PROCESS:
FEDERAL GOVERNMENT AGENCIES

RANK	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
1	9.5% (8)	6.5% (5)	3.8% (2)	13.3% (2)	-	-	7.5% (8)
2	4.8% (4)	3.9% (3)	1.9% (1)	6.7% (1)	-	-	4.7% (5)
3	9.5% (8)	5.2% (4)	11.5% (6)	-	6.7% (1)	-	9.4% (10)
4	2.4% (2)	7.8% (6)	13.5% (7)	13.3% (2)	13.3% (2)	-	9.4% (10)
5	7.1% (6)	7.8% (6)	7.7% (4)	13.3% (2)	6.7% (1)	25.0% (1)	12.3% (13)
6	1.2% (1)	5.2% (4)	-	-	-	-	7.5% (8)
7	1.2% (1)	-	-	-	-	-	-
NO RANK	64.3% (54)	63.6% (49)	61.5% (32)	53.3% (8)	73.3% (11)	75.0% (3)	49.1% (52)

TABLE 96

RANKING OF PARTICIPATING GROUPS IN PLANNING PROCESS: OTHERS

RANK	OPINICON	INDIAN	NEWBORO	BENSON	CLEAR	MOSQUITO	SAND
1	-	-	5.8% (3)	-	-	-	1.9% (2)
2	2.4% (2)	1.3% (1)	1.9% (1)	6.7% (1)	-	-	0.9% (1)
3	-	1.3% (1)	-	-	-	-	-
4	-	-	1.9% (1)	-	-	-	0.9% (1)
6	1.2% (1)	1.3% (1)	-	-	-	-	0.9% (1)
7	-	-	-	-	-	-	0.9% (1)
NO RANK	96.4% (81)	96.1% (74)	90.4% (47)	93.3% (14)	100.0% (15)	100.0% (4)	94.3% (100)