B.C. MINISTRY OF ENVIRONMENT, LANDS AND PARKS

EVALUATION OF THE SOCIO-ECONOMIC BENEFITS OF THE OKANAGAN VALLEY EURASIAN WATER MILFOIL CONTROL PROGRAM

DECEMBER, 1991

Ference Weicker & Company
MANAGEMENT CONSULTANTS

EXECUTIVE SUMMARY

INTRODUCTION

Eurasian water milfoil *(Myriophyllum spicatum L.)* is an aquatic plant which was introduced to British Columbia waters about 1970. It produces a fibrous root system from which numerous stems grow to the surface in water up to 6 metres (20 feet) deep during spring and early summer, forming dense masses of vegetation which prevent or limit recreational use in a wide variety of aquatic systems.

Various control methods (mainly derooting and harvesting) are being used in the highest priority public use areas. Public information and more intensive control technologies are being used to reduce further spread to uninfested water bodies throughout the province. Harvesting often must be repeated twice during the June-September period because of rapid plant regrowth. Derooting methods are most often used in the fall to spring period to provide better and more long-lasting control, but both methods are slow and expensive.

In the Okanagan Valley, seven mainstream lakes and one upper elevation lake are now infested with Eurasian water milfoil. About 1,000 hectares of shoreline is affected and about 150 hectares of this area was treated in 1990 by the Okanagan Basin Water Board (OBWB) under a cost-share agreement with the Province. The Province provides technical advice, most of the control equipment, 75% of the operational funding and monitors the work performed. The OBWB administers the control program, hires and supervises machine operators, provides 25% of the funding, and priorizes the areas proposed for treatments.

Each year, plans for treatments are developed jointly by the Province and OBWB and must be submitted in advance with the proposed budget for approval by the Province. In fiscal year 1990-1991, the control program in the Okanagan Valley, including the provincial and local shares, cost about $350,000. This did not include acquisition of a new rototiller, refurbishment of old equipment, or the costs for provincial staff administration, advisory services or monitoring.

PURPOSE OF STUDY

The purpose of this study is to evaluate the benefits of the Okanagan Valley Eurasian Water Milfoil Control Program. The focus of this economic review is on the overall cost-effectiveness of

this activity, with the objective of providing guidance to the Province on the best allocation of available resources. The results of this review are intended to guide future aquatic plant management activities under cost-sharing and to improve long-term planning.

METHOD OF STUDY

The evaluation of the Okanagan Valley Eurasian Water Milfoil Control Program was conducted in two phases. The purpose of the first phase was to finalize the evaluation framework to be used and identify specific evaluation issues to be addressed during implementation of the evaluation. To do so, we reviewed relevant program and policy documentation and interviewed a sample of government representatives with the Ministry of Environment, Lands & Parks and the Ministry of Tourism as well as representatives of the OBWB, the Okanagan-Similkameen Tourist Association, and the three Regional Districts in the Okanagan Valley.

During the course of the second phase of the evaluation, we conducted a review of the available published statistics and studies in order to obtain an overview of the value of the resources and activities potentially affected by Eurasian water milfoil, including tourism, water-based recreation, real estate and agriculture. In addition, over 470 persons were surveyed to determine the effectiveness and impacts and benefits of the program, including:

- 13 program representatives;
- 60 tourism operators;
- 50 local residents;
- 75 beach users;
- 270 visitors;
- 5 real estate professionals.

Interviews were also held with representatives of aquatic plant control programs in Washington State, the Peachland Irrigation District and a private contractor providing weed control services in the Okanagan.

We then analyzed the information collected to determine the impacts and effects of the program and the effectiveness of the delivery system, and develop conclusions and recommendations regarding the program design and delivery mechanisms.

CONCLUSIONS

The major conclusions arising from our review of the Okanagan Valley Eurasian Water Milfoil Control Program are as follows:

1. **The rationale, objectives and activities of the program are still valid.**

A number of factors point to the continued relevance of the program, including:

- Experience has shown that eradication of Eurasian water milfoil is practically impossible once plants have become established. Therefore, continuous control is necessary to prevent further spread and to facilitate water-based recreational activities in most of the lakes affected.

- The magnitude of Eurasian water milfoil infestation has increased noticeably since its introduction in Okanagan Lake in 1971. By 1979, Eurasian water milfoil was known to be established in about 675 hectares in the Okanagan Valley and in about 800 hectares by 1986. It is estimated that about 1,000 hectares of shoreline are now infested with milfoil.

- Despite on-going control, Eurasian water milfoil continues to have an impact on local residents, tourism operators and beach users. Because substantial areas of 7 lakes affected cannot be treated due to control resource limitations, nuisance populations are controlled in important public beach and marina areas, as determined by local priorities. Of the 1,000 hectares of shoreline now infested with milfoil, only about 150 hectares was treated through the program in 1990. As a result, the control program remains unsatisfactory to some local users and tourism operators.

- The Okanagan region has experienced rapid population growth over the past 15 years, from 170,000 in 1976 to 225,000 in 1991 (up 37.2%). According to the Central Statistics Bureau, the population of the Okanagan will grow by another 15.3% by the year 2000, to 259,000.

- The number of visitors to the Okanagan has increased steadily over the last 10 years, from about 2.5 million in 1979 to 3.1 million in 1989 (up 23.2%). In particular, the completion of the Coquihalla Highway and the Okanagan Connector has made the region more easily accessible from the major population centre in the Lower Mainland.

- As a result of the increase in population and number of visitors to the region, the demand for water-based activities increased dramatically over the last 20 years. Beach use by residents and visitors increased from 3.9 million beach days in 1970 to an estimated 8.8 million beach days in 1990. Beach use is further projected to increase to 10.1 million beach days in 2000.

- The activities of the program are plausibly linked to the attainment of its intended impacts and objectives. The intended impacts and objectives of the Okanagan Valley Eurasian Water Milfoil Control Program were not stated in quantitative terms, so it is not possible to assess the extent to which the objectives have been accomplished. However, funding provided under the program stimulated a variety of control activities including harvesting, derooting, dredging, and the application of bottom barriers, which in turn have facilitated water-based recreational opportunities for both visitors and Okanagan residents.

2. The program has promoted further economic development in the Okanagan.

The benefits of the Okanagan Valley Eurasian Water Milfoil Control Program can be determined by assessing the potential economic impact of program termination. As Eurasian water milfoil is generally restricted to water depths of 6 metres (20 feet) or less, populations of the plant tend to be located in areas along the shoreline. Dense populations of the plant can interfere with and virtually eliminate opportunities for a wide variety of water-based activities such swimming, motor boating, water skiing, sailing and shore-based angling. In addition to restricting these opportunities for both residents and visitors to the Okanagan, uncontrolled milfoil infestation would also detract from the aesthetic appeal of the lakes.

Table I

SUMMARY OF THE REGIONAL AND PROVINCIAL BENEFITS OF THE OKANAGAN VALLEY EURASIAN WATER MILFOIL CONTROL PROGRAM

	Regional Benefits	Provincial Benefits
Tourism Operators:		
Impact on Revenues by Sector ($000) (1):		
Transportation	$ 19,120	$ 8,990
Restaurants	17,760	8,350
Accommodation	17,510	8,230
Shopping	15,220	7,150
Other	15,380	7,230
Total	$ 84,990	$ 39,950
Lakeshore Residents:		
Impact on Real Estate Values ($000) (2)	$ 133,000	-
General Public:		
Impact on Real Estate Values ($000) (3)	$ 227,000	-
Impact on Employment	1,700 Jobs	800 Jobs
Provincial Government:		
Impact on Revenues by Category ($000):		
Sales Tax	-	$ 2,500
Room Tax	-	130
Corporate Income Tax	-	360
Total	-	$ 2,990
Total Impact ($000)	Over $ 450,000	Over $ 40,000

Notes:

(1) Breakdown between sectors based on data from Visitor'89 and Resident Travel Survey (See Section A in Chapter IV for more details).

(2) Lakeshore residents are defined as those living on privately owned developed lakefront lots, as opposed to privately owned undeveloped lots. We have estimated in Section A that there are about 4,396 such lots which can be valued at about $1.33 billion, including $0.75 billion for land and $0.58 billion for improvements (See Section A in Chapter IV for more details).

(3) Defined as total impact on real estate values ($360 million) minus the impact on real estate values for lakeshore residents.

Based upon the results of this evaluation, we have concluded that termination of the program would have a significant impact upon the tourism industry and real estate values in the Okanagan. Termination of the program would lead to a projected decline in:

- Okanagan tourism revenues of about $85.0 million, including $58.0 million from BC resident visitors and $27.0 million from out-of-province visitors.

  As indicated in Table I, the main economic sectors impacted are the transportation sector ($19.1 million), the restaurant industry ($17.8 million), the accommodation sector ($17.5 million) and the shopping sector ($15.2 million). This potential loss in revenues represents 26.5% of total 1989 Okanagan tourism revenues, and about 46.5% of 1989 revenues occurring between the beginning of June and the end of August.

- Employment in the Okanagan tourism industry of about 1,700 positions.

  This potential loss represents about 19.6% of the regional workforce employed in the tourism industry and 1.9% of the total regional workforce.

- Real estate values in the region of about $360.0 million, including $133.0 million for properties located on the lakeshore.

  This potential loss represents about 3.8% of the total 1992 net taxable value of Okanagan properties.

3. **The program has also promoted further economic development at the provincial level.**

The Eurasian water milfoil control program also has had an impact on the overall BC tourism industry, in that some of the visitors to the Okanagan may have decided to visit another province or country in the event of uncontrolled milfoil infestation, resulting in a shift of revenues out-of-province. Termination of the program would lead to a projected decline in:

- BC tourism revenues of about $40.0 million, including $22.8 million from BC resident visitors and $17.2 million from out-of-province visitors.

As indicated in Table I, the main economic sectors impacted are the transportation sector ($9.0 million), the restaurant industry ($8.3 million), the accommodation sector ($8.2 million) and the shopping sector ($7.1 million). This potential loss in revenues represents 0.8% of total 1989 BC tourism revenues.

- Employment in the BC tourism industry of about 800 positions.

4. The impact of the program on provincial government revenues has been much greater than its cost.

Based on the loss in BC tourism revenues that are projected to occur in the event of program termination, the impact of the Okanagan Valley Eurasian Water Milfoil Control Program on provincial government revenues has been estimated at about $3.0 million, including:

- $2.5 million in sales tax revenues;
- $0.4 million in corporate income tax revenues;
- $0.1 million in room tax revenues.

5. The majority of local residents and tourism operators are satisfied with the program.

The majority of residents and tourism operators surveyed for the purposes of this study indicated that they were moderately satisfied, quite satisfied, or extremely satisfied with the program. Most of the respondents expressing satisfaction indicated that they had noticed a definite improvement over the last 10 years and that milfoil infestation was apparently well under control. Only 14.3% and 20.4% of residents and tourism operators respectively indicated that they were not satisfied or not at all satisfied with the program, usually because their area had not been treated in the recent past.

6. The program is delivered in a cost effective manner.

The results of our evaluation indicate that the practical experience gained from nearly 20 years of management has resulted in a streamlined and cost effective program. The

Ministry of Environment, Lands & Parks has publicized and shared the experience gained from a diverse and comprehensive management effort through the production of over 60 technical reports and information summaries, and participation in many public meetings, national and international workshops and technical symposia. Improved preventive maintenance on the harvesting and derooting equipment has over the years resulted in more reliable operation. In addition, comparison with a similar program in Seattle indicates that the cost per hectare harvested has been consistently lower in the Okanagan than in Metro Seattle over the last 6 years.

7. **The cost-share approach has worked well and has encouraged a reasonable and effective control program.**

Experience to date indicates that the cost-share approach has encouraged a reasonable and effective control program. The Okanagan Basin Water Board (OBWB) has played a crucial role in helping to establish local priorities for on-going management and to encourage political and public support for control activities, while the Ministry of Environment, Lands & Parks has played an important role in terms of funding, technical assistance and monitoring. Furthermore, there was a generally high level of cooperation between OBWB staff and Ministry staff, especially over the last few years.

RECOMMENDATIONS

The major recommendations arising from our review of the Okanagan Valley Eurasian Water Milfoil Control Program are as follows:

1. **Funding for the delivery of the program should continue to be provided.**

The reasons for recommending continuation of the program as delivered by the OBWB and the Ministry of Environment, Lands & Parks are as follows:

- The rationale, objectives and activities of the program are still valid;
- The specialized knowledge and experience acquired by the OBWB and the Ministry of the Environment, Lands & Parks over the years have resulted in an effective delivery mechanism for the program;

- The program has had a major impact on economic development in the Okanagan and the province;
- The majority of local residents and tourism operators surveyed were satisfied with the program;
- Most of program representatives, residents and tourism operators surveyed strongly supported continuation of the program;
- There are no other similar government programs in the Okanagan.

2. **The current 75/25 cost-share formula should be maintained.**

The current cost-share formula has worked well and should be maintained under a future agreement. Regional Districts do not have the necessary tax levy to assume a greater share of the program costs and the lakes, being located on Crown Land, are ultimately the responsibility of the province.

3. **Increasing emphasis should continue to be placed on derooting rather than harvesting as a means to control Eurasian water milfoil.**

Harvesting has traditionally been one of the mainstays of the program providing immediate control to large areas of heavy use at a reasonable cost. However, it has slowly been displaced by derooting as the leading control activity in the Okanagan over the past seven years. Indeed, derooting offers several advantages over harvesting. For example, derooting methods can, under suitable conditions, provide 80-95% effectiveness over one season. In addition, derooting is less intrusive than harvesting and can be performed during the off-season when plant biomass is reduced and water-based recreation is minimal. Expanded use of derooting techniques should permit reductions in areas requiring harvesting, allowing further reallocation of resources to other areas of the Okanagan.

4. **High priority should continue to placed on research concerning long-term solutions such as biological control technologies.**

The province should continue to carry out research using its own resources and to assist and encourage research by private individuals or groups. It was noted that harvesting and derooting are only short-term solutions that place a continuous financial drain on the province and local government. Although the use of biocontrol agents for Eurasian water milfoil such as insects or grass carp has been widely considered in North America, the only promising agent for use in the Okanagan so far was an aquatic insect discovered during ecological research by the Ministry of Environment between 1977 and 1981.

5. **The active cooperation and assistance of the federal government should be sought for research assistance and projects.**

Although the federal government has, in the past, conducted a number of studies on Eurasian water milfoil and other weeds, none of these studies produced results that were directly applicable to British Columbia and the Okanagan in particular. The federal government should again be approached to enlist its active participation in various research projects that could be of direct benefit to the Okanagan.

6. **Greater awareness of the program and its accomplishments should be promoted to the public.**

Although public education activities have been undertaken since 1974, factual information on the nature of Eurasian water milfoil and the technologies available for its control should continue to be made available to the public through the media, public libraries, public meetings and other suitable means. Public perceptions and understanding of control technologies may affect the level of public support and cooperation received and help correct certain misconceptions concerning the results that can reasonably be achieved by control activities. Similarly, the public should be made to understand that milfoil would break off naturally even if it was not harvested, resulting in the same accumulation of fragments on the lake shore (which has been the subject of many complaints).

7. **Delivery of substantial portions of the program under contract through the private sector should not be pursued.**

The experience of the Metro Seattle milfoil control program shows that the use of private contractors can provide cost stability by avoiding unforeseen contingencies such as

mechanical repairs and other unexpected, possibly high costs. Documentation obtained concerning the Metro Seattle program shows that the use of a private contractor can also reduce administrative time and free staff from project management tasks such as troubleshooting equipment problems, and hiring and supervising machine operators. All in all, the use of a private contractor to deliver the Metro Seattle program seems to have resulted in slightly higher operating costs and lower administration costs.

However, an approach similar to that adopted for the Metro Seattle Control Program, whereby the totality or the majority of the program is delivered by private contractors, may actually translate into a higher risk to the Okanagan and province. Given the relatively small number of qualified private contractors, the laws of supply and demand may make it difficult for the Okanagan to retain qualified private contractors should another jurisdiction in Canada or the Pacific Northwest dispose of a considerably larger budget for Eurasian water milfoil and weed control.

In addition, the Ministry of Environment, Lands & Parks and the OBWB have, over the last decade, developed a specialized knowledge and experience of Eurasian water milfoil which places them at an advantage vis-a-vis most private contractors. Finally, experience has shown that delivery through a private contractor is not necessarily more cost effective than delivery through a public agency because private contractors usually have to charge higher prices to cover their cost and earn a profit.

8. **A comprehensive "user-fee" structure for the Okanagan Valley Eurasian Water Milfoil Control Program should not be pursued.**

A user-fee system has occasionally been used by the OBWB in instances where treated areas were privately owned and it did not interfere with the treatment of priority areas. However, a comprehensive fee for service structure would be difficult to implement through a public agency for a number of reasons. For example, such a system may lead to some of the priority areas being ignored and not treated. In addition, scheduling of the equipment and control activities may be more difficult and a "user-fee" structure may require an increased operating and administration budget for the program which may exceed the value of the fees collected. However, the greatest difficulty associated with such a system would be to ensure that all beneficiaries of the control services assume a share of the costs that is directly proportional to the benefits received. Although some of the tourism operators

surveyed for the purposes of this study indicated a willingness to help cover the control costs for areas that are of direct concern to them, the current system of financing control activities with tax dollars is believed to ensure a better distribution of costs relative to the benefits received.

9. **Consideration should be given to expanding the program to include one or two more machines, preferably of the derooting type.**

Priority areas infested with Eurasian water milfoil are now too large to be completely controlled with the resources available. The use of one or two more machines, preferably of the derooting type, would in the opinion of most program representatives allow for a more acceptable compromise regarding the level of Eurasian water milfoil infestation and control.

10. **Consideration should be given to ensuring continuity of funding at a pre-determined level for a period of 2 or 3 years to further enhance the effectiveness of the program.**

Both the OBWB and the Ministry of Environment, Lands & Parks allocate considerable time every year to the establishment and negotiation of operating budgets for the following year. Continuity of funding for 2 to 3 years at a pre-determined level would substantially reduce the amount of time spent by both parties on budgetary considerations, thus allowing for a reallocation of resources to other facets of the program. In addition, such an approach would make it easier to attract and retain qualified and experienced private contractors by allowing the signing of multi-year contracts at a pre-determined price.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

LIST OF TABLES AND FIGURES, Continued

I. INTRODUCTION

A. BACKGROUND

Eurasian water milfoil *(Myriophyllum spicatum L.)* is an aquatic plant which was introduced to British Columbia waters about 1970. It produces a fibrous root system from which numerous stems grow to the surface in water up to 6 metres (20 feet) deep during spring and early summer, forming dense masses of vegetation which prevent or limit recreational use in a wide variety of aquatic systems.

Various control methods (mainly derooting and harvesting) are being used in the highest priority public use areas. Public information and more intensive control technologies are being used to reduce further spread to uninfested water bodies throughout the province. Harvesting often must be repeated twice during the June-September period because of rapid plant regrowth. Derooting methods are most often used in the fall to spring period to provide better and more long-lasting control, but both methods are slow and expensive.

In the Okanagan Valley, seven mainstream lakes and one upper elevation lake are now infested with Eurasian water milfoil. About 1,000 hectares of shoreline is affected and about 150 hectares of this area was treated in 1990 by the Okanagan Basin Water Board (OBWB) under a cost-share agreement with the Province. The Province provides technical advice, most of the control equipment, 75% of the operational funding and monitors the work performed. The OBWB administers the control program, hires and supervises machine operators, provides 25% of the funding, and priorizes the areas proposed for treatments.

Each year, plans for treatments are developed jointly by the Province and OBWB and must be submitted in advance with the proposed budget for approval by the Province. In fiscal year 1990-1991, the control program in the Okanagan Valley, including the provincial and local shares, cost about $350,000. This did not include acquisition of a new rototiller, refurbishment of old equipment, or the costs for provincial staff administration, advisory services or monitoring.

B. PURPOSE OF STUDY

The purpose of this study is to evaluate the benefits of the Okanagan Valley Eurasian Water Milfoil Control Program. The focus of this economic review is on the overall cost-effectiveness of

this activity, with the objective of providing guidance to the Province on the best allocation of available resources. The results of this review are intended to guide future aquatic plant management activities under cost-sharing and to improve long-term planning.

The evaluation of the program was conducted in two phases. The purpose of the first phase was to finalize the evaluation framework to be used to guide implementation of the evaluation. Consistent with the Terms of Reference established for the study, the specific evaluation issues to be addressed in the second part of the evaluation were identified as follows:

Rationale

1. To what extent are the rationale and intended impacts of the program still relevant?

2. In what manner and to what extent does Okanagan Valley Eurasian Water Milfoil Control complement, duplicate, overlap or work at cross-purposes with other provincial or federal programs available in B.C.?

Impacts and Effects

3. What is the economic and social value associated with the resources affected by Eurasian water milfoil populations in the Okanagan Valley lakes (e.g. beach and boater recreation, angling, tourism)?

4. What are the economic and social benefits generated by the existing control program, both locally and provincially? What would be the socio-economic impacts of unrestricted growth of this plant if the control program was terminated?

5. What is the relative distribution of program benefits amongst the affected groups (e.g. operators of commercial tourism facilities, lakeshore residents, general public)?

Program Design and Delivery

6. Was the program implemented in a manner conducive to the realization of the intended impacts and effects?

Table 1.1

NUMBER OF RESPONDENTS SURVEYED

	Number	Type of Survey
Program Representatives	13	Personal Interview
Tourism Operators	60	Telephone Interview
Local Residents	50	Telephone Interview
Beach Users	75	Personal Interview
Visitors	270	Self-Administered Questionnaire
Real Estate Professionals	5	Telephone Interview
Total	473	

7. Are there more effective ways to achieve the intended impacts and effects of the program?

C. METHOD OF STUDY

In the first phase of the study, we reviewed relevant program and policy documentation and interviewed a sample of government representatives with the Ministry of Environment, Lands & Parks, and the Ministry of Tourism as well as representatives of the OBWB, the Okanagan-Similkameen Tourist Association, and the three Regional Districts in the Okanagan Valley. Based upon this research, we refined the "logic" model for the Okanagan Valley Eurasian Water Milfoil Control Program, and finalized the evaluation framework to be used during the second phase of the evaluation.

As indicated in Table 1.1, over 470 persons were surveyed during the course of the second phase of the evaluation. A more detailed description of the methodology used is provided in the following paragraphs.

a. Review of Secondary Data

We conducted a review of the available published statistics and studies in order to obtain an overview of the value of the resources and activities potentially affected by Eurasian water milfoil, including tourism, water-based recreation, real estate and agriculture. In addition, we also examined letters of complaint and support that have been received regarding the program. A detailed list of the documentation reviewed is provided in Appendix I.

b. Survey of Program Representatives

To obtain feedback regarding the program rationale, impacts, effects, level of satisfaction with the delivery process, and program alternatives, we conducted in-depth personal and telephone interviews with representatives of the B.C. Ministry of Environment, Lands & Parks and the Okanagan Basin Water Board. A detailed list of the representatives surveyed is provided in Appendix II.

c. Survey of Tourism Operators

We conducted a telephone survey of 60 of the 244 accommodation and boat rental/marina operators located in the immediate vicinity of the affected lakes. The purpose of these interviews was to obtain information concerning the level of awareness of and satisfaction with the program, the impact that termination of the program would have on tourism operations, the willingness of operators to pay to expand the program, and recommendations as to how the program could be improved. A detailed list of the representatives surveyed is provided in Appendix III.

d. Survey of Local Residents

We conducted a telephone survey of 50 Okanagan residents selected randomly in the Kelowna, Osoyoos, Penticton, Summerland and Vernon areas. The purpose of these interviews was to determine their level of participation in water-based activities, the expenditures related to such activities, the level of public awareness of and satisfaction with the program, their willingness to pay to expand the program, the impact that program termination would have on the propensity of friends and relatives to visit, and their recommendations as to how the program could be improved.

e. Survey of Beach Users

We conducted a survey of 75 beach users consisting of both local residents and visitors in order to determine the characteristics of their beach use, as well as to establish features of Okanagan beaches which users found most attractive and most unattractive. In addition, resident beach users were surveyed in order to determine their level of expenditures related to water-based recreation, their awareness of and satisfaction with the program, their willingness to pay to expand the program, the impact that program termination would have on the propensity of friends and relatives to visit, and their recommendations as to how the program could be improved. Similarly, visitor beach users were surveyed to determine the impact of water-based recreational opportunities on their decision to visit the area and their length of stay in the region, as well as their alternative destination if they had not visited the Okanagan.

f. Survey of Visitors

In order to determine the relative importance of beach-oriented recreation in attracting visitors to the Okanagan and the proportion of visitors that would not come to the Okanagan or would have shortened their stay if water-based recreation was restricted by uncontrolled milfoil infestation, we conducted a survey of BC resident and out-of-province visitors through the operators of 70 accommodation facilities including motels, hotels, resorts and campgrounds. Managers of these facilities were asked to assist by distributing a short questionnaire to their guests and returning the questionnaires to us. Approximately 1,400 questionnaires were distributed (20 per facility), of which 270 (19.3%) were returned to us. This response rate is considered to be satisfactory, especially since the questionnaires required the cooperation of both the tourism operators and their clients.

g. Survey of Real Estate Professionals

To obtain feedback on the impact of Eurasian water milfoil on the value of lakeshore properties, we conducted interviews with 5 real estate professionals serving the Okanagan. A list of the representatives surveyed is provided in Appendix IV.

In addition, interviews were held with representatives of aquatic plant control programs in Washington State, the Peachland Irrigation District and a private contractor providing weed control services in the Okanagan. The purpose of these interviews was to obtain feedback on the comparative socio-economic benefits of the program, the impact of milfoil infestation on irrigation and drainage systems, and to obtain recommendations as to how the effectiveness of the program could be enhanced.

We then analyzed the information collected to determine the impacts and effects of the program and the effectiveness of the delivery system, and to develop conclusions and recommendations regarding the program design and delivery mechanisms.

D. STRUCTURE OF REPORT

The following chapter provides a brief description of the Okanagan Valley Eurasian Water Milfoil Control Program in terms of its history, program structure, and activities to date. Chapter III provides a review of the evaluation issues related to program rationale, while Chapter IV outlines

the major social and economic impacts of the program. Chapter V addresses the evaluation issues related to program design and delivery. The final chapter, Chapter VI, outlines the major conclusions and recommendations arising from the study.

II. DESCRIPTION OF THE OKANAGAN VALLEY MILFOIL CONTROL PROGRAM

This chapter provides a brief description of the Eurasian water milfoil and an overview of the Aquatic Plant Management Program and the Okanagan Valley Eurasian Water Milfoil Control Program.

A. EURASIAN WATER MILFOIL

Eurasian water milfoil (*Myriophyllum spicatum L.*) is a rooted, submersed aquatic plant which is characterized by rapid, dense growth. The plant primarily spreads through the production of numerous vegetative fragments, particularly in the early and late summer; reproduction by seeds appears to be rare. Fragmentation involves the breaking off of large mature vegetative parts or the abscission of the plant tips. The fragments may float, following water currents downstream, for several days until becoming heavier than water and sinking to the bottom. Root shoots will then develop from the bottom node. Fragments can also be transported by waterfowl, inadvertently while attached to boating, dredging, or ditch clearing equipment, or through the transplantation of other aquatic plant species.

Eurasian water milfoil may grow in water of up to 5 metres to 6 metres (15 feet to 20 feet) deep, limited by the penetration level of sunlight. The plant, which has demonstrated the capability to grow in a very wide range of habitats, typically commences growth early in the spring and, in summer, may grow at rates of up to 5 centimetres per day reaching the surface in water depths of up to six metres. Upon reaching the water surface, Eurasian water milfoil forms dense masses of vegetation which may serve to prevent or limit recreational use of the water resource.

Concerns about Eurasian water milfoil in British Columbia first became a management issue in 1971 when populations of the plant were identified as a concern in Okanagan Lake near Vernon. Since then, Eurasian water milfoil has spread rapidly downstream through all the mainstream Okanagan Valley lakes and into the Columbia River system in the United States.

B. THE AQUATIC PLANT MANAGEMENT PROGRAM

The Okanagan Valley Eurasian Water Milfoil Control Program receives the majority of its funding from the Aquatic Plant Management Program of the Water Quality Branch of the Water Management Division of the Ministry of Environment, Lands & Parks. As outlined in the

Information Bulletin, *"Aquatic Plant Management Program"*, there have been three major phases of the program reflecting the gradual emergence and spread of the Eurasian water milfoil problem and changes in policy over time. These three phases are briefly described below:

1. Documentation Phase (1972-75)

From 1972 to 1975, the primary focus of program activities was upon preliminary testing of control mechanisms (including mechanical harvesting and herbicides), collecting and reviewing literature related to the issue, and documenting the growth of Eurasian water milfoil colonies.

2. Control Development Phase (1976-80)

During the period of 1976 to 1980, the resources allocated to the program increased significantly. For example, total expenditures of the Okanagan program increased from $80,000 in 1975-76 to a high of $1.24 million in 1978-79. The additional resources were used to test, develop and apply various control technologies as well as to implement a public information campaign. Major capital investments were made during this period including the purchase of four harvesting machines and other mechanical control and support equipment.

3. Maintenance Phase (1980-present)

During the maintenance phase, cost-share agreements for control programs have been established with local agencies covering the Okanagan Valley, Shuswap Lake, Cultus Lake, Long Lake, Christina Lake, and Champion Lake areas. Under these agreements, the Ministry of Environment, Lands & Parks provides technical assistance, major control equipment and 75% of operational costs while the local agencies provide administrative and political support as well as 25% of the operating funding. The local agencies are also responsible for priorizing areas for treatment.

The Water Quality Branch has also been actively involved in public education activities since about 1974. The objectives of the education program are to alert the public to the problems created by Eurasian water milfoil and to encourage public cooperation in identifying new infestations and in reducing further spread. Communication vehicles have included press releases as well as highway warning signs, boater warning signs situated at boat launch sites, and boater warning cards designed to alert boaters of the importance of cleaning boating equipment prior to leaving infested areas.

Table 2.1

OKANAGAN VALLEY EURASIAN MILFOIL CONTROL PROGRAM
TOTAL AREA TREATED BY CONTROL METHOD (HECTARES)

Year (1)	Harvesting	Derooting		Driver Operated Dredging	Bottom Barriers	Total
		Rototilling	Cultivation			
1982-83	114.0	11.0	39.0	-	0.6	164.6
1983-84	109.4	17.4	20.0	0	0.1	146.9
1984-85	89.7	16.3	31.6	3.0	0.3	140.9
1985-86	108.2	37.0	20.2	-	0.5	165.9
1986-87	97.1	72.1	8.2	-	0.3	177.7
1987-88	90.8	60.8	10.7	-	N/A (2)	162.3
1988-89	74.5	75.4	4.0	0.02	0.2	154.1
1989-90	53.9	57.0	55.0	-	N/A (2)	165.9

(1) Operating year running from September 1 to August 31.
(2) No precise data available as the area treated was very small.

The Water Quality Branch has also funded research related to new control mechanisms, including development of new derooting technology and improvement of dredging and bottom barrier techniques. In recent years, the focus of this research has been to study the impact of aquatic insects (particularly *Cricotopus myriophylli* Oliver) on Eurasian water milfoil. The Branch has also been involved in documenting the size of Eurasian water milfoil populations in selected areas of the province including Shuswap Lake and Christina Lake. Other high priority lakes which have yet to be infested with the plant are inspected each year. However, a survey to quantify the extent of Eurasian water milfoil infestation in all affected lakes has not been undertaken in the Okanagan Valley since 1979.

C. PROGRAM ACTIVITIES

Eurasian water milfoil is established in approximately 800 to 1,000 hectares of Swallwell, Ellison, Wood, Kalamalka, Okanagan, Skaha, Vaseux and Osoyoos Lakes and interconnecting waterways, as well as in Tugelnuit and Gallagher Lakes and several ponds including Fraser Lake, the Kelowna Golf Course, and the Peachland Irrigation District stilling pond[1]. Experience has shown that eradication of Eurasian water milfoil is practically impossible once plants have become established. Therefore, cosmetic control is the only practical approach in most of the lakes affected. As a result of resource constraints, less than 20% of the area affected in the Okanagan Valley can be treated each year.

The control methods used for Eurasian water milfoil in the Okanagan Valley in recent years have included harvesting, derooting (rototilling and shallow water cultivation), diver operated dredging, and bottom barriers. Table 2.1 summarizes the total area treated by control method from 1982-83 to 1989-90. As indicated, the majority of the control activities involved harvesting until 1987-88. However, since that time, derooting (particularly rototilling) has displaced harvesting as the leading control method. An overview of the various control methods in terms of operating costs, capital costs, and treatment rates is provided in Table 2.2. A brief description of each of the methods in provided in the following paragraphs.

[1] -*"Review of Aquatic Plant Management Methods and Programs in B.C."*, Ministry of Environment, July, 1986, page 7.

Table 2.2

SUMMARY OF EURASIAN WATER MILFOIL CONTROL METHODS

Method	Operating Cost (1) ($ per ha)	Capital Cost ($ per unit)	Rate of Treatment (ha per day)
Harvesting	$1,200	$95,000	0.4
Rototilling	$400 - $1,300	$80,000	0.1 - 0.5
Shallow Water Cultivation	$125 - $400	$65,000	0.4 - 1.7
Diver-Operated Dredging	$2,500 - $19,000	$25,000	0.1 - 0.2
Bottom Barriers	$8,000 - $26,000	-	0.05 - 0.1

Source: "Review of Aquatic Plant Management Methods and Programs in British Columbia", Ministry of Environment, July, 1986.

(1): Excluding depreciation, transportation, launching expenses and administration costs.

1. Harvesting

Until recently, harvesting was the primary method for controlling Eurasian water milfoil. The harvesting period is generally limited to late spring and summer when the plants are near the surface and can be seen by the harvester operator. Disadvantages of the methodology are that it is intrusive (harvesting must occur during the tourist season) and it does not remove or kill root systems. Because of rapid regrowth, several harvests in the same area are usually necessary each year.

2. Rototilling

Rototilling is undertaken primarily in the late fall and winter months when the plant biomass is reduced, the water levels in the lakes are lower, and fragments are less numerous, less buoyant and less viable. The effective operating depth of the rototillers in about 3.5 metres. As indicated in Table 2.2, although this methodology is slower than harvesting in terms of treatment rates, the operating costs are similar. Unlike harvesting, however, rototilling removes the root; therefore, one tillage treatment frequently provides better control than three or four harvests.

3. Shallow Water Tillage

Shallow water tillage is a derooting process which uses a tractor modified to operate in water depths up to 1.25 metres to tow an agricultural cultivator. While this method is more restricted than rototilling in terms of operating depths, it is less expensive per hectare of area treated. Treatments by this method have generally been limited to the foreshore area in Kelowna and "motel row" in Osoyoos.

4. Diver-operated Dredging

As indicated in Table 2.2, diver-operated dredging is both a slow and expensive process. The methodology is practical only where underwater visibility is high and the target plant populations are small and relatively sparse.

Table 2.3

TOTAL AREA TREATED BY LAKE (HECTARES)

Year (1)	Okanagan Lake	Osoyoos Lake	Skaha Lake	Vaseux Lake	Wood Lake	Kalamalka Lake	Ellison Lake	Total
1982-83	69.2	36.0	20.1	16.9	13.8	8.6	-	164.6
1983-84	82.7	14.1	11.2	14.3	16.0	8.6	-	146.9
1984-85	60.1	25.1	19.3	13.2	10.9	12.3	-	140.9
1985-86	58.5	35.0	22.8	18.2 (2)	18.6	8.1	4.7	165.9
1986-87	85.4	28.1	24.9	16.1 (2)	13.9	8.4	6.6	177.7
1987-88	78.8	30.3	12.5	13.0 (2)	11.6	9.0	7.1	162.3
1988-89	77.0	25.2	18.4	15.9 (2)	11.1	3.3	3.2	154.1
1989-90	79.5	28.7	21.5	9.4	13.4	8.3	5.1	165.9

Notes: (1) Operating year of September 1 to August 31
(2) Includes Okanagan River channel

5. Bottom Barriers

Similar to diver-operated dredging, the application of bottom barriers is limited by the slow treatment rate and the high costs of materials and labour. In the Okanagan Valley, this method has been used primarily in Kalamalka Lake. The advantages of bottom barriers are that they provide for immediate control, minimize the risk of plant fragmentation and environmental damage, and are generally not limited by substrate conditions as is often the case with other technologies.

Table 2.3 summarizes the total area treated by lake for the period 1982-83 to 1989-90. As indicated, seven major lakes in the Okanagan Valley are treated with Okanagan Lake typically accounting for 40% to 60% of the treated area.

D. ADMINISTRATIVE STRUCTURE

The administrative structure of the Okanagan Valley Eurasian Water Milfoil Control Program consists of the Okanagan Basin Water Board (OBWB), the program staff, the Regional Districts of North Okanagan, Central Okanagan, and Okanagan-Similkameen, and the Ministry of Environment, Lands & Parks as outlined in Figure 2.1 and described in the following paragraphs:

1. Program Staff

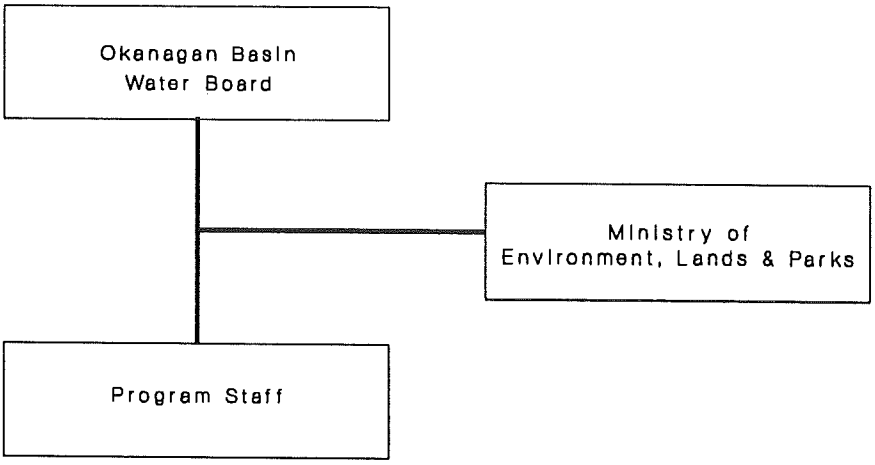
The only full-time employee of the program is the Field Supervisor. The Field Supervisor, who reports to the Administrator of the North Okanagan Regional District, is responsible for:

- Preparing operating budgets. The budgets are submitted for review to the OBWB and the Ministry of Environment, Lands & Parks;

- Preparing draft harvesting and derooting schedules. Draft harvesting schedules are generally prepared by the Field Supervisor during the early spring. The harvesting schedules tend to be relatively consistent from year to year. The draft derooting schedules are prepared during the late summer. In preparing the draft schedules, the Field Supervisor will take into consideration the effectiveness of activities in prior years as well as comments received from the public, the OBWB, the Ministry of Environment, Lands & Parks, and others. Highest priority for control of Eurasian milfoil is accorded to the public recreation areas and especially the beach

Figure 2.1

ORGANIZATIONAL STRUCTURE OF THE OKANAGAN VALLEY
EURASIAN WATER MILFOIL CONTROL PROGRAM



areas utilized by tourists. The draft schedules are reviewed by the OBWB and, depending upon their priorities, may be revised;

- Hiring and supervising of program staff involved in control activities. During the summer months, there are usually 9 to 10 staff members including a truck driver, harvester operators, and others working on special projects. During the winter, there are usually 7 to 8 staff members. The field workers are hired on a seasonal basis and are laid off for a short period between the end of the harvesting period and the beginning of the derooting period as well as during the colder months of winter when derooting is not undertaken;

- Preparation of monthly invoices for submission to the Provincial Government. The costs incurred by the program are paid by the OBWB. An invoice outlining the program expenditures including salaries is prepared at the end of each month for submission to the Ministry of Environment, Lands & Parks. The Provincial Government then reimburses the OBWB for 75% of the approved expenditures.

- Liaison with representatives of the Ministry of Environment, Lands & Parks.

The Field Supervisor also spends up to 25% of his time on activities other than the Okanagan Valley Eurasian Water Milfoil Control Program.

2. The Okanagan Basin Water Board

The Okanagan Basin Water Board (OBWB) consists of 9 members, including 3 elected representatives from each the Regional Districts of North Okanagan, Central Okanagan, and Okanagan-Similkameen. The Board arose out of a study in the early 1970's which, recognizing the interconnection of the water bodies in the Okanagan Valley, recommended that a single water authority be established for the Valley. Although management of the water systems largely remains with the Regional Districts, the OBWB has the authority to levy the Regional Districts for funding for the Okanagan Valley Eurasian Water Milfoil Control Program as well as the Sewage Water Assistance Fund. In addition to administering these programs, the OBWB is also active in promoting awareness and providing direction with respect to other water quality management issues. The operations of the OBWB are based in the offices of the North Okanagan Regional District.

Table 2.4

OKANAGAN VALLEY EURASIAN WATER MILFOIL CONTROL PROGRAM OPERATING EXPENDITURES BY YEAR, SEPTEMBER 1 TO AUGUST 30

Year	Harvesting	Derooting	Special Projects/ Other	Total
1982-83	$123,250	$ 26,572	$23,595	$173,417
1983-84	123,735	37,205	5,393	166,333
1984-85	98,875	55,126	80,886	234,887
1985-86	114,785	77,328	10,005	202,118
1986-87	89,697	144,033	10,435	244,165
1987-88	96,272	104,074	11,314	211,660
1988-89	96,476	120,749	98,095	315,271
1989-90	98,559	180,078	45,480	324,117

Table 2.5

OKANAGAN VALLEY EURASIAN WATER MILFOIL CONTROL PROGRAM SOURCE OF FUNDING FOR OPERATING AND CAPITAL EXPENDITURES FOR FISCAL YEARS ENDING MARCH 31

Fiscal Years	Provincial Funding			OBWB	
	Operating	Capital	Total	Operating	Total
1972-73	$ 0	$ 0	$ 12,000	$ 3,000	$ 15,000
1973-74	18,000	30,000	48,000	12,000 (1)	60,000
1974-75	60,000	0	60,000	0	60,000
1975-76	70,000	0	70,000	10,000	80,000
1976-77	55,000	45,000	100,000	100,000	200,000
1977-78	826,000	300,000	1,126,000	0	1,126,000
1978-79	991,000	250,000	1,241,000	0	1,241,000
1979-80	763,000	50,000	813,000	0	813,000
1980-81	645,000	80,000	725,000	43,750	768,750
1981-82	130,605	0	130,605	43,519	174,140
1982-83	116,733	0	116,733	38,911	174,602
1983-84	129,879	0	129,879	43,293	157,164
1984-85	126,488	0	126,488	42,163	162,788
1985-86	141,955	100,000	241,955	80,652 (1)	322,000
1986-87	169,885	0	169,885	56,628	226,513
1987-88	165,025	0	165,025	55,008	215,484
1988-89	165,000	0	165,000	75,000	220,000
1989-90	228,000	0	228,000	76,000	304,000

Note: (1) The OBWB also contributed to capital expenditures during that year.

3. Regional Districts of North Okanagan, Central Okanagan, and Okanagan-Similkameen

The Regional Districts provide 25% of the operating funding for the program and appoint the representatives on the OBWB. The administrator of the North Okanagan Regional District also serves the administrator of the OBWB.

4. Ministry of Environment, Lands & Parks

The Head of the Okanagan Unit, Littoral Resources Section of the Water Quality Branch of the Ministry of Environment, Lands & Parks serves as the Contract Administrator for the Okanagan Valley Eurasian Water Milfoil Control Program. Some of the functions performed by the Unit include reviewing invoices submitted by the OBWB to ensure that the goods and services were actually received and are related to the program, the provision of training to new program employees, the provision of technical advice to the program, the preparation of quantitative plant abundance measurements, monitoring and evaluating program activities, and reviewing annual plans and budgets. In addition to the Okanagan Valley program, the Unit is also involved with control programs in the Columbia-Shuswap and the Kootenay Boundary areas.

E. EXPENDITURES

Table 2.4 outlines the operating expenditures of the Okanagan Valley Eurasian Water Milfoil Control Program over the past 8 years. As indicated, the proportion of program expenditures related to derooting activities has increased sharply during this period, from 15% in 1982-83 to 56% in 1989-90.

Table 2.5 outlines the source of funding for all expenditures (capital and operating) related to the program over the past 19 years. It should be noted that Table 2.5 is based upon the fiscal year-end of March 31, while Table 2.4 uses the operating year-end of August 30 as its base. As indicated in Table 2.5, since 1981, the program has been funded on a cost-sharing basis whereby the Ministry of Environment, Lands & Parks provides 75% of the operating funds while the three regional districts in the Okanagan Valley provide 25%. In addition, the Ministry of Environment, Lands & Parks has also provided capital funding to purchase equipment for the program including harvesters (100% funded by the province) and rototillers (75% funded by the province; 25% funded by the OBWB).

F. PROGRAM MODEL

The Program Model for the Okanagan Valley Eurasian Water Milfoil Control Program is provided in the following paragraphs in terms of program activities, program outputs, and intended impacts and effects.

1. Activities

The primary activities involved in the program include:

a. Harvesting;
b. Derooting;
c. Special projects.

2. Outputs

The primary output of the program is the control of Eurasian water milfoil in areas selected for treatment. By controlling populations of the plant, the level of water quality is also improved.

3. Impacts and Effects

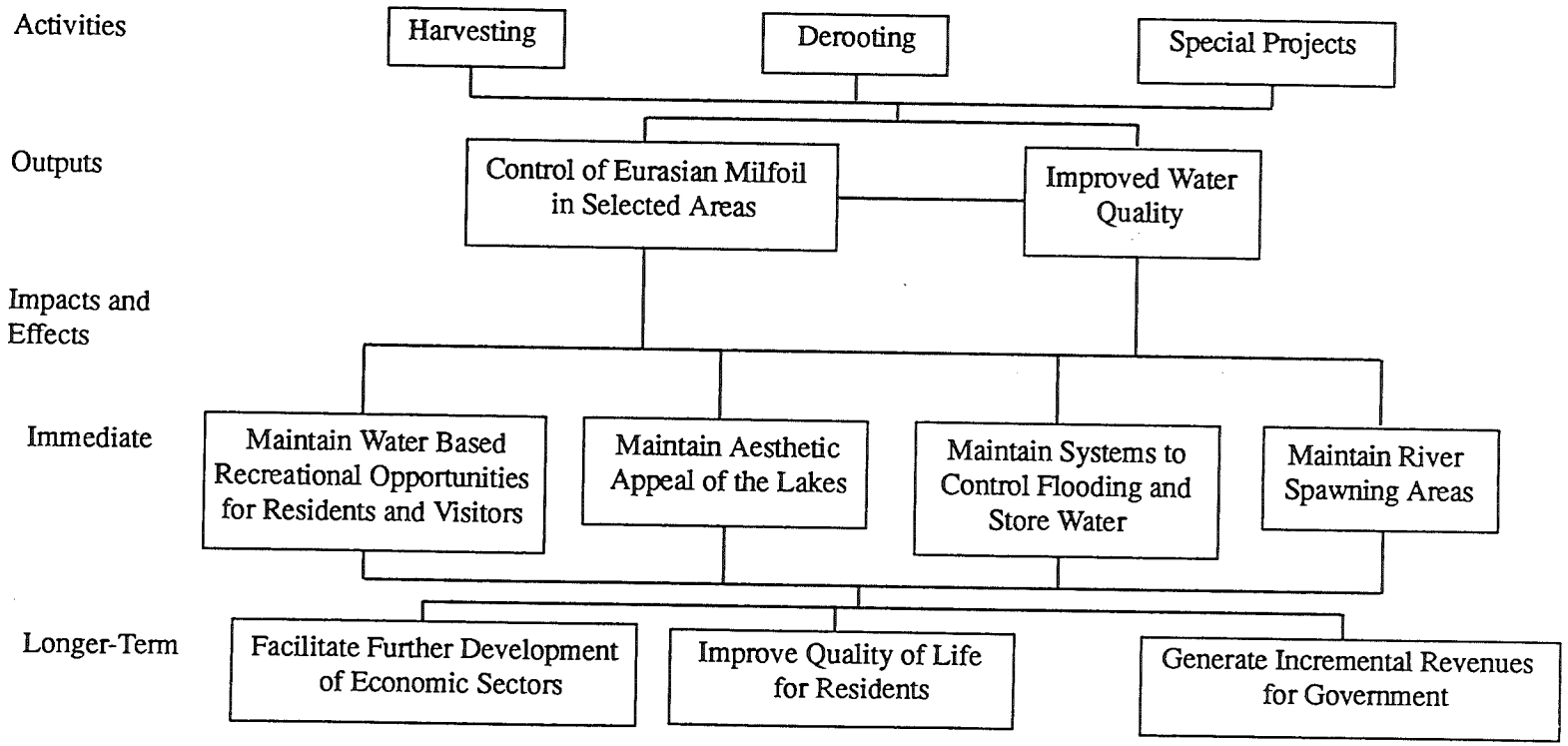
The intended impacts and effects of the program can be divided into those which would be realized in the immediate term and those that would be realized in the longer-term. The intended impacts and effects in the immediate term are to reduce the negative impacts of Eurasian water milfoil on:

- Water-based recreational opportunities for residents, visitors to the area from regions of B.C. and visitors from outside the province;
- The aesthetic appeal of the lakes;
- Systems to control flooding and provide water storage;
- River fish spawning areas.

FIGURE 2.2

OKANAGAN VALLEY EURASIAN WATER MILFOIL CONTROL PROGRAM

LOGIC MODEL



Over the longer-term, it is intended that the program will facilitate further development of economic sectors (most notably tourism) which would otherwise be constrained by Eurasian water milfoil, improve the quality of life for residents, and generate incremental revenues for government.

4. Logic Model

A logic model illustrating the interrelationships between the activities, outputs, and intended impacts of the program is provided in Figure 2.2 on the opposite page. As indicated, one of the major causal relationships is that the control of Eurasian water milfoil in selected areas will facilitate water-based recreational opportunities for visitors to the area. In turn, these opportunities will assist in the further development of the tourism sector in the Okanagan.

III. PROGRAM RATIONALE

This chapter presents and summarizes our findings with respect to program rationale, in terms of continued relevance and relationship to other programs.

A. CONTINUED RELEVANCE OF THE PROGRAM

The evaluation issue established with respect to the continued relevance of the program is as follows:

Issue 1: To what extent are the rationale and intended impacts of the Okanagan Valley Eurasian Water Milfoil Control Program still relevant?

In order to determine the perceived need for the program, we conducted a review of program documentation, a review of secondary data, and a survey of program representatives (including the Okanagan Basin Water Board members and staff as well as representatives of the Ministry of Environment, Lands & Parks), tourism operators, and residents. The major findings of our research as they relate to this issue are as follows:

1. **Eurasian water milfoil can have a major impact on local residents, tourism operators and beach users.**

   As Eurasian water milfoil is generally restricted to water depths of 6 metres (20 feet) or less, populations of the plant tend to be located in areas along the shoreline. This is also the area where water-based recreation tends to be concentrated. Dense populations of the plant can interfere with and virtually eliminate opportunities for a wide variety of water-based activities such as motor boating, water skiing, sailing, swimming and shore-based angling. In addition to restricting opportunities, the plant can also pose a safety risk, particularly to swimmers. For example, the dense growth associated with untreated Eurasian water milfoil populations is known to have contributed to drowning tragedies and the increased vegetation has been associated with "swimmers itch" problems.

2. **The program was designed to facilitate further development of economic sectors which would otherwise be constrained by the plant and to improve the quality of life for residents.**

The intended impacts and effects of the program in the short term were to reduce the negative impacts of Eurasian water milfoil on:

- Water-based recreation opportunities for local residents and visitors;
- The aesthetic appeal of the lakes;
- Systems to control flooding and provide water storage;
- River fish spawning areas.

Over the long term, it was intended that the program would facilitate further economic development of economic sectors (particularly tourism) which would otherwise be constrained by Eurasian water milfoil, improve the quality of life for local residents and generate incremental revenues for government.

3. **Because of its resilience, Eurasian water milfoil requires continuous control and treatment.**

Experience has shown that eradication of Eurasian water milfoil is practically impossible once plants have become established. Therefore, continuous cosmetic control is the only practical approach to prevent further spread and to facilitate water-based recreational activities in most of the lakes affected.

4. **The magnitude of Eurasian water milfoil infestation has increased over the last 15 years.**

Since its introduction in Okanagan Lake in 1971, Eurasian water milfoil has spread rapidly downstream through all the mainstream Okanagan valley lakes. By 1979, Eurasian water milfoil was known to be established in about 675 hectares in the Okanagan Valley and in about 800 hectares by 1986. It is estimated that about 1,000 hectares of shoreline are now infested with milfoil.

5. **Despite on-going control, Eurasian water milfoil continues to have an impact on local residents, tourism operators and beach users.**

Table 3.1

PERCEIVED IMPACT OF MILFOIL ON RESIDENTS AND TOURISM OPERATIONS

Question (Residents):

Have aquatic weeds, particularly Eurasian water milfoil, impacted upon the enjoyment that members of your household derive from any of these water-based recreational activities ? If yes, please give examples.

Question (Tourism Operators):

Does Eurasian water milfoil have an impact upon your business ? If yes, please describe this impact.

	Number of Respondents	%
Residents:		
Yes	26	52.0%
No	24	48.0%
Don't Know	0	-
Total	50	100.0%
Tourism Operators:		
Yes	22	36.7%
No	36	60.0%
Don't Know	2	3.3%
Total	60	100.0%

Sources: Survey of 50 Okanagan Residents
Survey of 60 Tourism Operators

Because substantial areas of 7 lakes affected cannot be treated due to control resource limitations, nuisance populations are controlled in important public beach and marina areas, as determined by local priorities. Of the 1,000 hectares of shoreline now infested with milfoil, only about 150 hectares was treated through the program in 1990. As a result, the control program remains unsatisfactory to some local users and tourism operators.

As part of this evaluation, we conducted a survey of 50 Okanagan residents selected randomly in the Kelowna, Osoyoos, Penticton, Summerland and Vernon areas. Similarly, we conducted a survey of 60 of the 244 accommodation and boat/marina facilities located in the immediate vicinity of the lakes. As indicated in Table 3.1, 52.0% of residents surveyed indicated that aquatic weeds, and particularly Eurasian water milfoil had some impact upon the enjoyment they derive from water-based recreational activities such as swimming and boating. Responses did not vary substantially between the 5 areas surveyed.

Similarly, 36.7% of tourism operators surveyed indicated that Eurasian water milfoil had an impact on their business, in that it prompted some of their clients to shorten their stay or decide to visit another region the following year. However, responses tended to vary depending on the area surveyed. For example, 8 of the 9 operators surveyed in the Oyama/Winfield/Wood Lake area (88.9%) indicated that milfoil had an impact on their business, while only 1 of the 10 operators surveyed in the Kelowna/Westbank area did so.

Furthermore, according to the report entitled *Water Based Recreation in the Okanagan Area, 1980 Review*, which compared Okanagan beach use in 1970 (prior to Eurasian water milfoil infestation) with use in 1980, aquatic weeds had become one of the main problems to residents and visitors in the intervening decade, despite on-going control programs.

6. A number of socio-economic factors have served to increase the need for Eurasian water milfoil control activities in the Okanagan Valley over the last 15 years.

According to program representatives surveyed during the course of the evaluation, the need for milfoil control activities in the Okanagan Valley has increased in recent years. Some of the factors leading to this increase include:

Table 3.2

POPULATION OF THE OKANAGAN, 1976-2000

	Census 1976	Census 1981	Census 1986	Proj 1991	Proj 1996	Proj 2000
Population:						
North Okanagan	46,865	54,350	55,045	57,086	60,099	63,049
Central Okanagan	71,245	85,230	89,725	104,433	115,509	126,206
Okanagan-Similkameen	51,525	57,200	59,094	63,541	66,890	70,198
Total	169,635	196,780	203,864	225,060	242,498	259,453
Total B.C.	2,466,610	2,744,470	2,889,207	3,203,184	3,514,355	3,755,096
Number of Households:						
North Okanagan	15,200	19,000	20,576	21,624	23,500	25,301
Central Okanagan	23,865	31,180	34,591	40,686	44,841	48,372
Okanagan-Similkameen	18,110	22,080	24,054	26,723	28,632	30,292
Total	57,175	72,260	79,221	89,033	96,973	103,965
Total B.C.	828,430	996,750	1,096,101	1,229,408	1,343,447	1,433,893

Source: Central Statistics Bureau, Ministry of Finance and Corporate Relations

- The Okanagan region has experienced rapid population growth over the past 15 years. As indicated in Table 3.2, the population of the Okanagan increased 32.7% between 1976 and 1991, from 170,000 to 225,000. According to the Central Statistics Bureau, the population of the Okanagan will grow by another 15.3% by the year 2000, to 259,000. By comparison, the population of B.C. increased only 22.6% between 1976 and 1991, and is projected to increase by another 17.2% by the year 2000.

- The number of visitors to the Okanagan has increased steadily over the last 10 years. As indicated in Table 3.3, the number of visitors to the Okanagan increased by 23.2% between 1979 and 1989, from about 2.5 million to 3.1 million. In particular, the completion of the Coquihalla Highway and the Okanagan Connector had an impact on travel time and patterns in the region, making the region more easily accessible from the major population centre in the Lower Mainland.

- As a result of the increase in population and number of visitors to the region, total recreational land use and residential land use on the lakeshore in the Okanagan as well as the demand for water-based activities increased dramatically over the last 20 years. For example, according to the report entitled *Water Based Recreation in the Okanagan Area, 1980 Review*, beach use by local residents and visitors increased from 3.9 million beach days in 1970 to 7.2 million beach days in 1980. The report further projected that beach use would increase to 8.5 million beach days in 1990 and to 9.9 million in 2000.

- The expectations of residents and visitors are changing. It was noted that residents' expectations in terms of water quality and weed control have increased over the last 10 years. Similarly, current trends in the tourism industry point to increasing visitor expectations in terms of product quality. Furthermore, the increasing mobility of tourists and the range of available travel alternatives have increased the level of competition in the tourism industry. As a result, the Okanagan must continue to offer a quality tourism product to remain competitive.

Table 3.3

VISITORS TO THE OKANAGAN, 1979-1989

Origin		Number of Visitors 1979	%	Number of Visitors 1989	%
BC Resident Visitors		1,197,000	48%	2,030,000	66%
Out-of-Province Visitors	(1)	1,297,000	52%	1,044,000	34%
Total	(2)	2,494,000	100%	3,074,000	100%

Sources: Visitor'79
Visitor'89
Resident Travel Survey

Notes: (1) Based on 899,000 visitors between May and October, 1979. Based on room rental revenues for that year, this period represented 69.3% of non-resident tourism activity (1,297,000 = 899,000/0.693).

(2) According to Visitor'79, non-resident visitors accounted for 52% of tourism activity in the region (2,494,000 = 1,297,000/0.52).

7. **The majority of program representatives, residents and tourism operators surveyed strongly supported continued funding of the program.**

Strong support for the program was expressed by virtually all of the program representatives and tourism operators surveyed. In addition, the majority of residents surveyed also recommended that the program be continued. It was generally believed that the discontinuation of the program would have a severe economic, social, ecological and political impact on the region.

B. RELATIONSHIP TO OTHER PROGRAMS

The evaluation issue established with respect to the relationship of the Okanagan Valley Eurasian Water Milfoil Control Program to other programs is as follows:

Issue 2: In what manner and to what extent does the Okanagan Valley Milfoil Control Program complement, duplicate, overlap or work at cross-purposes with other provincial or federal programs available in B.C. ?

In order to determine the extent to which the program complements, duplicates, or works at cross purposes to other government programs, we interviewed program representatives, tourism operators and local residents. With the exception of the Aquatic Plant Management Program of the B.C. Ministry of Environment, Lands & Parks discussed in the previous chapter (and from which the Okanagan program receives the majority of its funding), no other municipal, provincial or federal programs related to the control of aquatic weeds have been identified.

There are, however, similar weed control programs in the Lower Mainland and Vancouver Island that are 100% funded through local government and for which the Ministry of Environment, Lands & Parks provides technical input. It should also be noted that some of the tourism operators surveyed for the purposes of this evaluation indicated that they have occasionally hired the services of private contractors to clean up their lakeshore area, either in the absence of, or as a complement to, treatment through the Milfoil Control Program.

Table 4.1

ORIGIN OF VISITORS TO THE OKANAGAN, 1989

Origin	Number of Visitors	% of Category	% of Total
BC Resident Visitors:			
Southwest	1,130,810	55.7%	36.8%
Okanagan	256,840	12.6%	8.3%
High Country	206,900	10.2%	6.7%
Kootenays	131,990	6.5%	4.3%
Vancouver Island	89,180	4.4%	2.9%
Cariboo	71,350	3.5%	2.3%
North by Northwest	60,640	3.0%	2.0%
Rocky Mountain	46,370	2.3%	1.5%
Peace River	35,670	1.8%	1.2%
Total BC Residents	2,029,750	100.0%	66.0%
Non-BC Resident Visitors (1):			
Alberta	450,150	43.1%	14.6%
Ontario	102,350	9.8%	3.3%
Other Canada	123,240	11.8%	4.1%
Washington	91,910	8.8%	3.0%
California	41,780	4.0%	1.3%
Oregon	30,290	2.9%	1.0%
Other USA	81,460	7.8%	2.6%
Overseas	123,240	11.8%	4.1%
Total Non-Residents	1,044,420	100.0%	34.0%
All Visitors	3,074,170		100.0%

Sources: Visitor'89
Resident Travel Survey

Note (1): Visitor'89 only provides a breakdown by origin based on the number of party nights. For the purposes of this study, we have applied the same breakdown to the total number of visitors of 1,044,420.

IV. IMPACTS AND EFFECTS

This chapter summarizes our findings with respect to the regional and provincial impacts and effects of the Okanagan Valley Eurasian Water Milfoil Control Program.

A. VALUE OF AFFECTED RESOURCES

The evaluation issue developed with respect to the value of resources affected by Eurasian water milfoil populations is as follows:

Issue 3: **What is the economic and social value associated with the resources affected by Eurasian water milfoil populations in the Okanagan Valley lakes (e.g. beach and boater recreation, angling, tourism)?**

In order to identify and assess the economic and social impact of the program, we conducted a review of available secondary data and surveyed a sample of 60 tourism operators, 75 beach users, 50 local residents and 5 real estate professionals. The findings of our review with respect to this evaluation issue are summarized in the following paragraphs.

1. Tourism

This section presents a profile of the tourism industry in the Okanagan, using information largely drawn from the "Visitor '87" and "Visitor '89" surveys, the "B.C. Resident Travel Survey", as well as a survey of tourism operators.

a. Characteristics of Visitors to the Region

A brief profile of visitors to the Okanagan and their travel patterns is provided in the following paragraphs.

- Number of Visitors

As indicated in Table 4.1, approximately 3 million people visited the Okanagan in 1989. This number represents about 12.9% of all visitors travelling within BC in 1989 and includes both visitors who stayed for one or more nights in the Okanagan

as well as those who were excursionists travelling more than 50 kilometres from home but not staying overnight.

As indicated below, the Okanagan is a very popular vacation destination among both BC residents and visitors from outside the province. In 1989, the region ranked third amongst BC regions in terms of share of BC resident visitors and fifth in terms of share of non-residents visitors.

SHARE OF PERSON NIGHTS BY TOURIST REGION

Tourist Region	% of BC Resident Person-Trips	% of Non-Resident Party Nights
Southwest B.C.	55%	47%
Vancouver Island	18%	20%
Okanagan-Similkameen	8%	8%
North By Northwest	5%	4%
High Country	4%	6%
Kootenay Country	3%	2%
Rocky Mountain	2%	10%
Caribou Chilcotin	2%	2%
Peace River	2%	2%
Total	100%	100%

Sources: Visitor'89
Resident Travel Survey

- Origin of Visitors

As indicated in Table 4.1, approximately 2.03 million of the 3.07 million visitors to the Okanagan (66.0%) were BC residents and 1.04 million (34.0%) were visitors from outside the province.

The primary BC resident markets for the Okanagan in 1989 included Greater Vancouver (55.7% of all BC residents visitors and 36.8% of total visitors), the neighbouring regions of High Country (10.2% and 6.7%) and Kootenays (6.5% and 4.3%), as well as the Okanagan itself (12.6% of BC resident visitors and 8.3% of total visitors to the region originated from the Okanagan).

In 1989, primary non-resident markets included Alberta (43.1% of non-resident visitors and 14.6% of total visitors) and the Western United States (20.6% and 7.0%). Overall, Canadians made up almost two-thirds (65%) of the non-resident visitorship, followed by Americans (23%) and international visitors (12%). The reliance upon the Canadian market has declined since 1979, when Canadians comprised 71% of non-resident visitor volume, followed by Americans (24%) and international visitors (5%). The decline in Canadian market share was again most pronounced amongst Albertans whose overall market share decreased from 53% in 1979 to 44% in 1987. European visitors were the main contributors to the substantial growth in international traffic.

- Party Size

While the average size of BC resident parties travelling in the Okanagan is not readily available from the Resident Travel Survey, the average expenditures per party per trip and average expenditures per person per trip were $459.55 and $185.92 respectively in 1989. Therefore, the average size of BC resident parties travelling in the Okanagan can be estimated at 2.47 persons, which is slightly below the provincial average of 2.62. There is strong reason, however, to suggest that the average size of BC resident parties travelling in the Okanagan varies depending on the season. For example, the size of BC resident parties travelling within B.C in the months of June, July and August is typically 1.126 times higher than the yearly average (2.95 versus 2.62). The average size of BC resident parties travelling in the Okanagan during the months of June, July and August is therefore estimated at 2.78 persons.

Based on Visitor'89, the average party size of non-resident visitors to the Okanagan is 2.60 persons, slightly above the provincial average of 2.47. As was the case for BC residents, there is strong reason to suggest that the average size of non-resident parties travelling in the Okanagan varies depending on the season. For example, the size of parties travelling within B.C during the summer is typically 1.073 times higher than the yearly average (2.65 versus 2.47). The average size of non-resident parties travelling in the Okanagan during the summer is therefore estimated at 2.79 persons.

- Length of Stay

The average length of stay of parties travelling in the Okanagan varies depending on the place of origin. The average length of stay of non-resident visitors to the Okanagan was 3.58 days in 1989, much below the provincial average of 5.83 days.

According to the Resident Travel Survey, BC resident parties travelling in the Okanagan spent an average of 3.98 nights away from their home in 1989. However, it is likely that, of the 3.98 nights, some were actually spent outside the Okanagan by visitors on their way to or back from the Okanagan. It remains possible, however, to estimate the average length of stay of BC resident visitors by using some of the data contained in the Resident Travel Survey. Based on average expenditures per person per trip and per person per day of $185.92 and $60.77 respectively, the average length of stay of BC resident parties travelling in the Okanagan can be estimated at 3.06 days, slightly below that of non-resident travel parties. It is believed, however, that the average length of stay in the Okanagan of BC-resident parties is higher during the summer months than during the rest of the year. For example, parties travelling within B.C during the months of June, July and August typically stay 1.189 times longer than the yearly average (4.27 days versus 3.59). The average length of stay of BC resident parties travelling in the Okanagan during the summer is therefore estimated at 3.64 days.

As indicated below, the Okanagan ranked respectively fourth and fifth amongst BC tourist in terms of the average length of stay of non-resident and BC resident travellers throughout the year.

AVERAGE LENGTH OF STAY IN EACH TOURIST REGION (DAYS)

Tourist Region	BC Resident Visitors (1)	Non-Resident Visitors
Southwest B.C.	2.83	4.21
Vancouver Island	2.77	4.24
Okanagan-Similkameen	3.06	3.58
North By Northwest	3.52	3.88
High Country	2.48	2.18
Kootenay Country	3.51	2.91
Rocky Mountain	3.51	3.08
Caribou Chilcotin	3.38	2.91
Peace River	3.52	2.91
BC	3.70	5.83

Sources: Visitor'89
Resident Travel Survey

Note (1): Average length of stay was computed by dividing average expenditures per person per trip by average expenditures per person per day.

Among non-resident visitors, it should be noted that international travellers are likely to stay the longest in the Okanagan while Americans are likely to stay the shortest amount of time. As an illustration, according to Visitor '87, 59% of international visitors stayed 11 days or more, as compared to 26% of Canadians and 11% of Americans. In contrast, 35% of Americans stayed 3 nights or fewer as compared to 10% of Canadians and 4% of international visitors.

- Purpose of Trip

The tourism industry in the Okanagan is based primarily upon touring and visiting friends and relatives. As indicated below, 48% of non-resident visitors cited visiting friends and relatives or personal reasons as the main purpose of their trip in 1989. Next in order of frequency among non-resident visitors were touring (36%), business/conference (8%) and the outdoors (7%). Similarly, 49% of BC-resident visitors cited visiting friends and relatives or personal reasons as the main purpose of their trip in 1989. Next in order of frequency were the outdoors (14%), city (8%) and touring (7%).

MAIN PURPOSE OF TRIP OF VISITORS TO THE OKANAGAN

Purpose of Trip	BC Resident Visitors	Non-Resident Visitors
Visit Friends & Relatives/Personal	49%	48%
Touring	7%	36%
Business/Conference	13%	8%
Outdoors	14%	7%
City Trip	8%	1%
Other	9%	0%
Total	100%	100%

Sources: Visitor'89
Resident Travel Survey

- Accommodation

The leading forms of accommodation in the Okanagan in 1989 were staying with friends and relatives, motels and camping. As indicated below, staying with friends and relatives was the preferred accommodation for 44% of non-resident visitors, followed by motels (23%) and campgrounds (22%). Similarly, staying with friends and relatives was the preferred accommodation for 39% of BC resident visitors, followed by motels (21%). Overall, non-resident visitors were more likely than their BC counterparts to stay with friends and relatives (44% versus 39%) or in a campground (22% versus 13%).

ACCOMMODATION USED BY VISITORS TO THE OKANAGAN

Accommodation	BC Resident Visitors (1)	Non-Resident Visitors
Friends & Relatives	39%	44%
Motel	21%	23%
Campground	13%	22%
Hotel	14%	3%
Resort	4%	2%
Other	9%	6%
Total	100%	100%

Sources: Visitor'89
Resident Travel Survey

Note (1): The original percentages exceeded 100 when totalled in the survey. Each original percentage was recomputed so that total would add up to 100. Furthermore, these represent averages for BC as no breakdown specific to the Okanagan was available.

- Expenditures

Spending patterns and amounts vary according to origin markets. According to Visitor'89, non-resident visitors spent about $36.14 per person per day during their stay in the Okanagan in 1989, which represented only 65.8% of the provincial average of $54.90.

Average daily expenditure by BC resident visitors in the Okanagan are more difficult to determine. Over the course of the Resident Travel Survey, over 4,380 BC residents supplied information about their most recent trip in BC and approximately 1,046 of them also completed a trip diary on their next overnight trip in BC. While the diary was designed to obtain more detailed information concerning, among others, average daily expenditures, the sample size was insufficient to produce reliable detailed regional information. Furthermore, it was noted in the survey that diary responses were biased towards longer trips involving more people that might result in higher spending averages. For these reasons, the spending average of BC resident visitors in the Okanagan derived from the diaries ($60.77 per person per day) cannot be considered reliable.

It is, however, possible to estimate the average expenditures of BC resident visitors in the Okanagan based on the average expenditures of all BC residents travelling within BC. According to the Resident Travel Survey, BC residents spent an average of $45.35 per person per day while travelling within BC in 1989. Assuming that BC residents are similar to non-residents in that those travelling to the Okanagan spend only the equivalent of 65.8% of the provincial average, it can be estimated that BC resident visitors spent about $29.84 per person per day (65.8% of $45.35) during their stay in the Okanagan in 1989.

Therefore, non-resident visitors tend to spend much more than BC resident visitors during their stay in the Okanagan. As indicated below, leading categories of expenditures by non-resident visitors included accommodation ($8.75), restaurants ($8.02), transportation ($6.37), shopping/souvenirs ($5.93) and groceries ($3.57). Leading categories of expenditures by BC residents included transportation ($7.76), restaurants ($5.97), shopping/souvenirs ($5.97) and accommodation ($5.37). It is interesting to note that BC resident visitors spent more than non-resident visitors on transportation and shopping/souvenirs in both relative and absolute terms, while non-resident visitors spent more in both relative and absolute terms on accommodation, restaurants and groceries.

AVERAGE DAILY EXPENDITURES BY VISITORS TO THE OKANAGAN

Category	BC Resident Visitors	% (1)	Non-Resident Visitors	%
Accommodation	$ 5.37	18.0%	$ 8.75	24.1%
Transportation	7.76	26.0%	6.37	17.6%
Restaurants	5.97	20.0%	8.02	22.2%
Shopping/Souvenirs	5.97	20.0%	5.39	15.0%
Groceries/Beverage	1.79	6.0%	3.57	9.9%
Recreation/Entertainment	1.49	5.0%	2.92	8.1%
Tour Package/Cruise	0.60	2.0%	0.76	2.1%
Other	0.89	3.0%	0.36	1.0%
Total	$ 29.84	100.0%	$ 36.14	100.0%

Sources: Visitor'89
Resident Travel Survey

Note (1): This breakdown represents an average for BC as no breakdown specific to the Okanagan was available.

- Major Activities

Beach and lake shore related activities are the single most popular activity of non-resident visitors to the Okanagan. According to Visitor '89, the most popular activities for non-resident visitors to the Okanagan in 1989 were beach/lake shore (36%), shopping (36%) and sightseeing (33%), while 19% of visitors were just "passing through". Less popular activities, which included cultural performances, sporting events and visiting museums/galleries, were pursued much less than the provincial average. Despite the lack of specific data on activities undertaken by BC resident visitors while in the Okanagan, beach/lake shore activities are likely to rank among the most popular activities. For example, the Resident Travel Survey estimates that 39% of all BC residents travelling in BC in 1989 engaged in beach/lake shore activities.

In addition, some of the "best" aspects of the Okanagan as rated by non-resident visitors include the weather, the scenery, recreation and the lakes. According to Visitor'87, the characteristic of the Okanagan most praised by non-resident travellers in 1987 was the weather (49%), followed by the scenery (38%), family (25%), recreation (22%) and the lakes (19%).

- Mode of Travel

The most popular mode of transportation to and through the Okanagan is by automobile. As indicated below, approximately 54% of non-resident visitors travelled through the Okanagan using their own automobile in 1989, a rented automobile (19%) or an R.V. (19%). Canadian visitors used primarily their own automobile (68%), a rented automobile (12%) or an R.V. (18%), while American visitors used their own automobile (53%), a R.V. (35%), or a rented automobile (11%). More than half of international visitors (56%) travelled by rental car, with own automobile (12%), R.V. (11%), and bus (17%) serving as other important modes of transportation. Similarly, approximately 81% of BC resident visitors travelled through the Okanagan using their own automobile or a R.V. (4%). Some of the most commonly used transportation corridors in the region include Highways 1, 5 and 97.

TRANSPORTATION USED BY VISITORS TO THE OKANAGAN

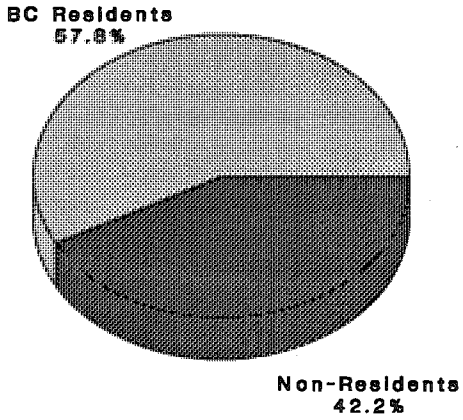
Transportation	BC Resident Visitors	Non-Resident Visitors
Own Auto	81%	54%
Rented Auto	1%	19%
Own Camper	4%	19%
Bus	5%	5%
Air	4%	4%
Other	5%	18%
Total	100%	(1) 119%

Sources: Visitor'89
Resident Travel Survey

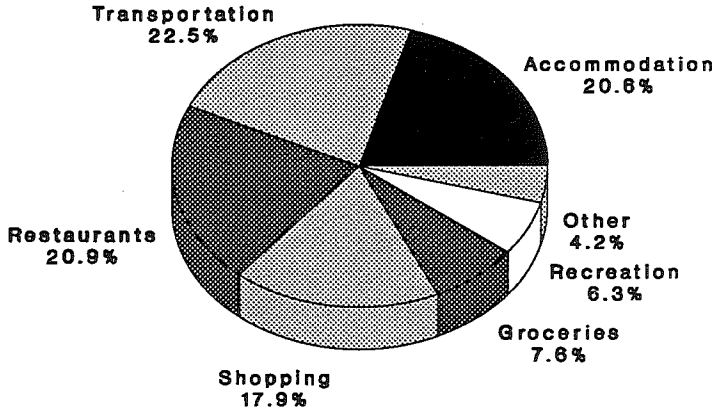
Note (1): Exceeds 100% because of multiple responses by some respondents.

Figure 4.1
1989 OKANAGAN TOURISM REVENUES
$ 320.6 MILLION

BY TYPE OF VISITORS



BY MAIN CATEGORIES



b. Revenues

Based on results from Visitor'89 and the Resident Travel Survey, it is estimated that the 3 million visitors to the Okanagan spent about 9.95 million nights in the region in 1989. Of this total, BC residents accounted for 62.4% or 6.21 million person nights (based on 2,029,750 persons staying an average of 3.06 days) while non-BC residents accounted for 37.6% or 3.74 million person nights (based on 1,044,420 persons staying an average of 3.58 nights).

Assuming that BC resident and non-resident visitors spend an average of $29.84 and $36.14 respectively per person per day, it can be further estimated total tourism revenues in the Okanagan in 1989 were about $320.6 million. Therefore, the Okanagan accounted for 12.9% of the total volume of overnight travel in BC but only 6.4% of revenues generated. Of total revenues, BC residents accounted for $185.3 million (6.21 million person nights at an average of $29.84 per day) while non-resident visitors accounted for $135.3 million (3.74 million person nights at $36.14). It is interesting to note that BC resident visitors accounted for 66.0% of the total volume of overnight travel in the region but only for 57.8% of revenues generated.

As indicated in Figure 4.1, these revenues were mostly captured by the transportation sector ($72.0 million or a 22.5% share of total revenues), restaurant facilities ($67.1 million; 20.9% share), accommodation facilities ($66.0 million; 20.6% share) and shopping facilities ($57.4 million; 17.9% share).

It should also be noted that the tourism industry in the Okanagan is highly seasonal, focusing primarily on the summer season. As indicated below, about 38% of all non-resident visitor parties and 33% of all BC resident visitor parties visited the Okanagan during the summer season (summer as defined in both the Visitor'89 and the Resident Travel Survey excludes most of the month of June).

Table 4.2

MONTHLY ROOM RENTAL EXPENDITURES ($ MILLION)
OKANAGAN-SIMILKAMEEN TOURIST REGION

		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
North Okanagan:														
Year	1985	0.47	0.58	0.71	0.75	0.70	0.95	0.94	1.52	0.81	0.64	0.46	0.54	9.09
	1986	0.56	0.61	0.80	0.77	0.90	1.06	1.56	1.69	1.06	0.77	0.52	0.58	10.89
	1987	0.64	0.66	0.95	0.84	1.00	0.98	1.48	1.59	1.07	0.73	0.54	0.66	11.13
	1988	0.69	0.82	0.95	0.83	0.94	1.07	1.70	1.78	1.13	0.77	0.59	0.79	12.08
	1989	0.78	0.82	0.97	0.81	0.78	1.04	1.56	1.96	1.24	0.87	0.68	0.96	12.48
Central Okanagan:														
Year	1985	0.67	0.71	0.88	0.85	0.85	1.12	2.35	2.55	1.04	0.74	0.53	0.76	13.05
	1986	0.67	0.70	0.99	0.82	1.10	1.54	2.65	2.99	1.30	0.88	0.74	0.66	15.05
	1987	0.60	0.85	1.06	0.89	1.11	1.50	2.81	3.04	1.38	1.01	0.72	0.76	15.73
	1988	0.78	0.89	1.17	0.76	1.18	1.82	7.27	3.44	1.74	1.06	0.76	0.91	21.77
	1989	0.90	1.11	1.41	1.04	1.54	1.80	3.57	3.78	1.93	1.20	0.85	1.12	20.27
Okanagan-Similkameen:														
Year	1985	0.41	0.54	0.58	0.62	0.80	1.25	2.94	3.39	1.09	0.66	0.30	0.36	12.95
	1986	0.32	0.38	0.57	0.54	0.89	1.42	2.86	3.60	1.34	0.84	0.34	0.44	13.54
	1987	0.45	0.54	0.69	0.62	1.11	1.40	2.90	3.76	1.36	0.83	0.36	0.39	14.41
	1988	0.47	0.50	0.64	0.70	1.06	1.27	3.37	3.89	1.70	0.98	0.52	0.52	15.60
	1989	0.52	0.57	0.87	0.72	1.24	1.52	3.69	4.53	1.91	1.08	0.52	0.53	17.69
Total Okanagan:														
Year	1985	1.55	1.83	2.17	2.22	2.35	3.32	6.23	7.46	2.94	2.04	1.29	1.66	35.09
	1986	1.55	1.69	2.36	2.13	2.89	4.02	7.07	8.28	3.70	2.49	1.60	1.68	39.48
	1987	1.69	2.05	2.70	2.35	3.22	3.88	7.19	8.39	3.81	2.57	1.62	1.81	41.27
	1988	1.94	2.21	2.76	2.29	3.18	4.16	12.34	9.11	4.57	2.81	1.87	2.22	49.45
	1989	2.20	2.50	3.25	2.57	3.56	4.36	8.82	10.27	5.08	3.15	2.05	2.61	50.44

Source: Central Statistics Bureau, 1990

VISITOR PARTIES TO THE OKANAGAN BY SEASON

Season	% of BC Resident Visitors	% of Non-Resident Visitors
Spring	28%	24%
Summer	33%	38%
Fall	23%	25%
Winter	17%	13%
Total	100%	100%

Sources: Visitor'89
Resident Travel Survey

Total tourism revenues occurring between the beginning of June and the end of August can be viewed as a function of the following factors:

- Total number of BC resident and non-resident parties visiting the region. Based on Visitor'89 and the Resident Travel Survey, these were estimated at 821,760 and 401,700 parties respectively in 1989.

- Times the proportion of tourism activity which occurs during the months of June, July and August. As a surrogate to the seasonal factors from the Visitor'89 and Resident Travel Survey which do not include the month of June, we will for the purposes of this study estimate the proportion of visitorship occurring between the beginning of June and the end of August based upon room rental revenues. As indicated in Table 4.2, 46.5% of room rental revenues were generated during these months in 1989. As a result, it can be estimated that a total of 568,910 parties visited the Okanagan during the months of June, July and August in 1989, including 382,120 BC resident parties and 186,790 out-of-province parties.

- Times the average length of stay in the Okanagan of both BC resident and non-resident parties travelling during these 3 months. Based on the above paragraphs, these were estimated at 3.64 days and 3.58 days respectively in 1989. As a result, it is estimated that a total of 2,059,630 party-nights were spent in the Okanagan during the months of June, July and August in 1989,

including 1,390,920 party-nights involving BC residents and 668,710 party-nights involving out-of-province visitors.

- Times the average size of BC resident and non-resident parties travelling in the Okanagan during the months of June, July and August, 1989. Based on the above paragraphs, these were estimated at 2.78 persons and 2.79 persons respectively. Therefore, an estimated 5,732,460 person-nights were spent in the Okanagan during the months of June, July and August in 1989, including 3,866,760 person-nights involving BC residents and 1,865,700 person-nights involving out-of-province visitors.

- Times the average expenditure per person per day by BC resident and non-resident visitors travelling in the Okanagan, which were estimated at $29.84 and $36.14 respectively in 1989.

Using this methodology, tourism revenues occurring between the beginning of June and the end of August, 1989 are estimated at $182.8 million. Of this total, BC residents accounted for $115.4 million (63.1%) while non-resident visitors accounted for $67.4 million (36.9%). Summer tourism revenues, therefore, represent about 57.0% of annual tourism revenues.

c. Employment

The tourism industry is a major employment generator in the region. Although there are no statistics available on direct and indirect employment in the tourism industry *per se*, the accommodation, food and beverage service operations alone were estimated to employ 9.5% of the regional workforce in 1986, or about 8,650 people.

In order to gain a better understanding of the importance of tourism in terms of employment, we conducted, as part of this evaluation, a survey of 60 of the 338 (17.8% coverage) accommodation facilities found in the Okanagan. In 1991, the facilities included in our sample employed a total of 836 people, including 242 full-time employees and 594 part-time employees. Assuming that these facilities are representative of the overall population of accommodation facilities in the region, it can be inferred that accommodation facilities alone in the Okanagan employ a total of about 4,700 people, including 1,360 full-time employees and 3,340 part-time employees.

Table 4.3

COMPOSITION OF BEACH USERS SAMPLE BY REGION

Region	Residents Number	%	Visitors Number	%	Total Number	%
Kelowna	10	45.5%	12	54.5%	22	100%
Oliver/Osoyoos	5	41.7%	7	58.3%	12	100%
Penticton	6	30.0%	14	70.0%	20	100%
Vernon	11	52.4%	10	47.6%	21	100%
Total	32	42.7%	43	57.3%	75	100%

Table 4.4

COMPARISON OF VISITING BEACH USERS SAMPLE TO ACTUAL VISITING POPULATION

	Sample Number	%	Total Population (1) Number	%
Length of Stay in Region (Days):				
BC Resident		10.22	3.06	
Non-BC Resident		11.48	3.58	
Total		10.90	3.23	
Origin (Party-Nights):				
BC Resident	184	39.1%	2,514,590	63.6%
Alberta	181	38.4%	620,640	15.7%
Other Canada	15	3.2%	311,040	7.9%
USA	59	12.5%	338,400	8.5%
Overseas	32	6.8%	169,920	4.3%
Total	471	100.0%	3,954,590	100.0%
Accom. (Party-Nights):				
Hotel	14	3.0%	219,220	5.5%
Motel	165	35.0%	934,700	23.6%
Resort	0	-	154,530	3.9%
Campground	176	37.4%	693,990	17.5%
Friends & Relatives	116	24.6%	1,790,310	45.3%
Other	0	-	161,840	4.2%
Total	471	100.0%	3,954,590	100.0%

Note: (1) Data based on Visitor'89 and the Resident Travel Survey

2. Participation in Beach-Oriented Recreation by Visitors and Residents

As part of this evaluation, a survey of beach users in the Okanagan was conducted to determine the preferences and behaviour patterns of beach users, as well as to establish features of Okanagan beaches which users found most attractive and most unattractive. The methodology and main findings of the survey are discussed in the following paragraphs.

a. Methodology

In order to allow for comparison of results over time, we developed a questionnaire utilizing some of the same questions contained in the 1970 and 1980 beach user surveys. Eight public beaches throughout the valley were selected to be included in the beach user survey. These beaches are:

- Gyro Beach (Kelowna)
- Hot Sands (Kelowna)
- Osoyoos Community Beach (Osoyoos)
- Okanagan Beach (Penticton)
- Skaha Beach (Penticton)
- Ellison Park (Vernon)
- Kalamalka Beach (Vernon)
- Paddlewheel Beach (Vernon)

As in earlier beach user surveys, the number of people to be interviewed at each beach was determined by the size of the population for the beach. To reach the quota of respondents and to minimize the possibility of bias, the interviewer selected approximately every 50th person on the beach.

Interviews were carried out in August, 1991 on warm sunny weekdays, most often during the afternoon. As indicated in Table 4.3, a total of 75 interviews were conducted, including 32 interviews with local residents and 43 interviews with visitors. About 29.3% of all beach users were conducted in the Kelowna area, 28.0% in the Vernon area, 26.7% in the Penticton area and 16.0% in the Oliver/Osoyoos area. As indicated in Table 4.3,

over 50% of beach users interviewed were generally visitors, except in Vernon where visitors represented only 47.6% of beach users.

Given the limited sample size and the variability of the composition of the population of beach users between and within individual beaches, it is difficult to assess the representativity of the sample vis-a-vis the total beach user population. Furthermore, it is unlikely that beach users are representative of the average summer tourist to the Okanagan or local resident. A sample taken at the beach is, by definition, biased towards those individuals who participate most frequently in beach/lake shore activities. As an example, Table 4.4 provides a comparison of visiting beach users included in our sample to the total population of visitors to the Okanagan as defined by Visitor'89 and the Resident Travel Survey. As indicated, there are several major discrepancies between the 2 groups:

- Visitors included in our sample spent an average of 10.90 nights in the Okanagan which is much higher than the averages derived from Visitor'89 and the Resident Travel Survey.

- BC residents, which account for 63.6% of total party nights spent in the region, represented only 39.1% of party nights in the sample. Similarly, Albertans and Americans, which represent only 15.7% and 8.5% of party nights spent in the region, represented about 38.4% and 12.5% respectively of party nights in the sample.

- Visitors staying with friends and relatives, which account for 45.3% of total party nights spent in the region, represented only 24.6% of party nights in the sample. Similarly, visitors staying in motels and campgrounds, which represent only 23.6% and 17.5% of party nights spent in the region, represented about 35.0% and 37.4% respectively of party nights in the sample.

b. Results

The following paragraphs contain a brief description of the survey results in terms of frequency of visitation, and attractive and unattractive features of Okanagan beaches.

Figure 4.2
FREQUENCY OF VISITS TO THE BEACH
BY RESIDENTS & VISITORS, SUMMER 1991

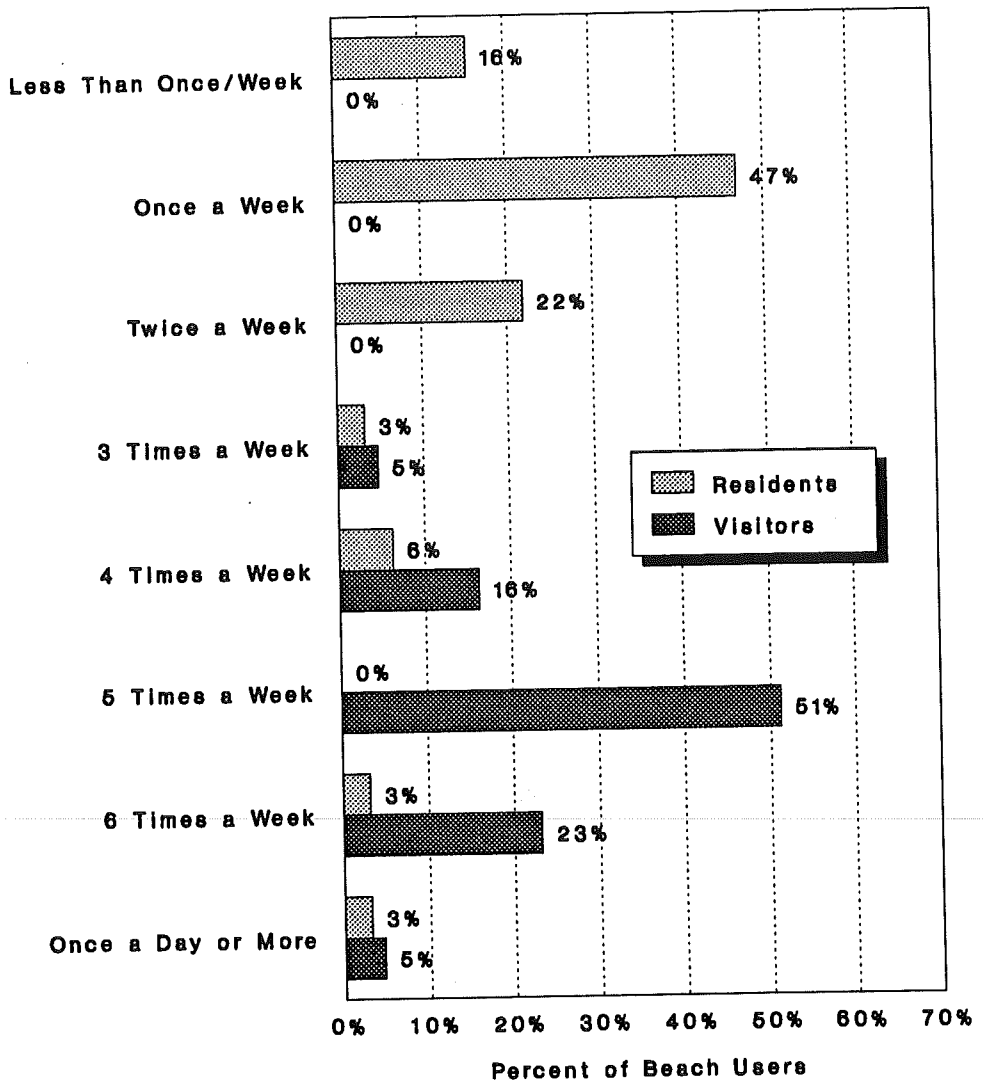


Figure 4.3
FREQUENCY OF VISITS TO THE BEACH
BY RESIDENTS, 1970 - 1991

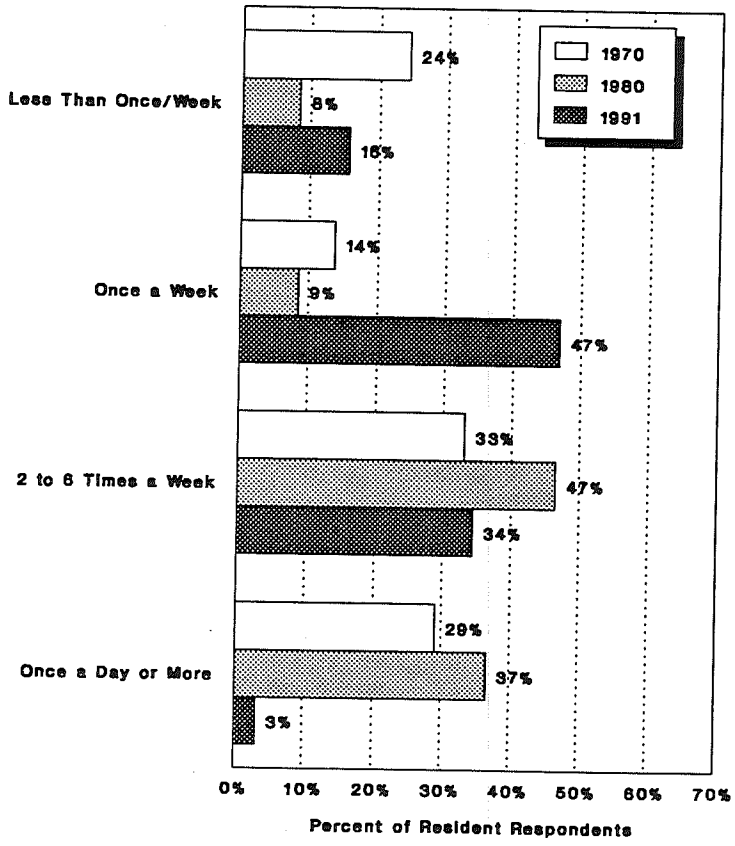


Figure 4.4
FREQUENCY OF VISITS TO THE BEACH
BY VISITORS, 1970 - 1991

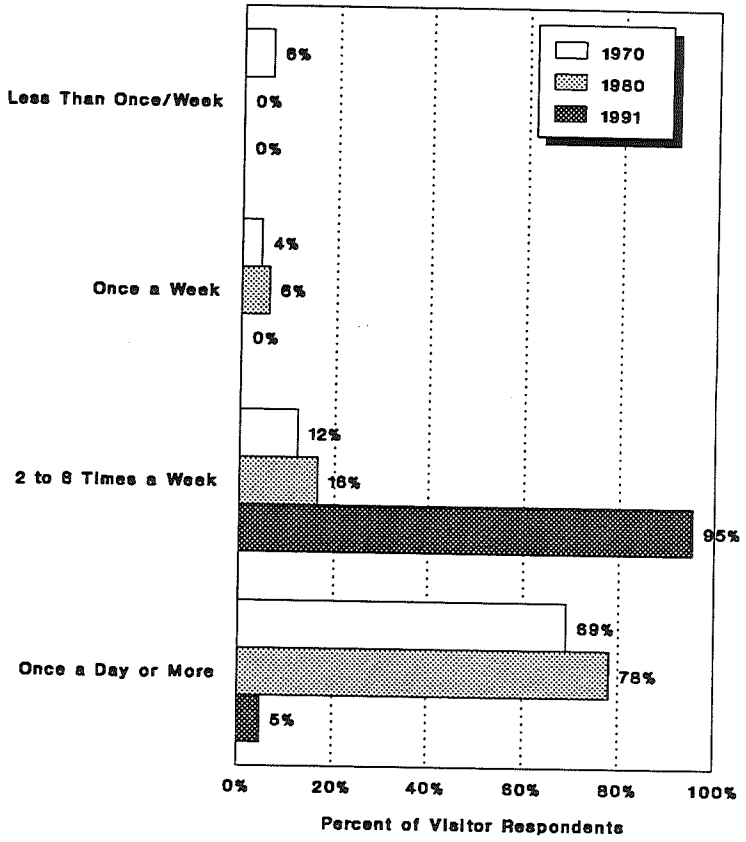


Figure 4.5
OKANAGAN BEACHES - ATTRACTIVE FEATURES
BY RESIDENTS & VISITORS, SUMMER 1991

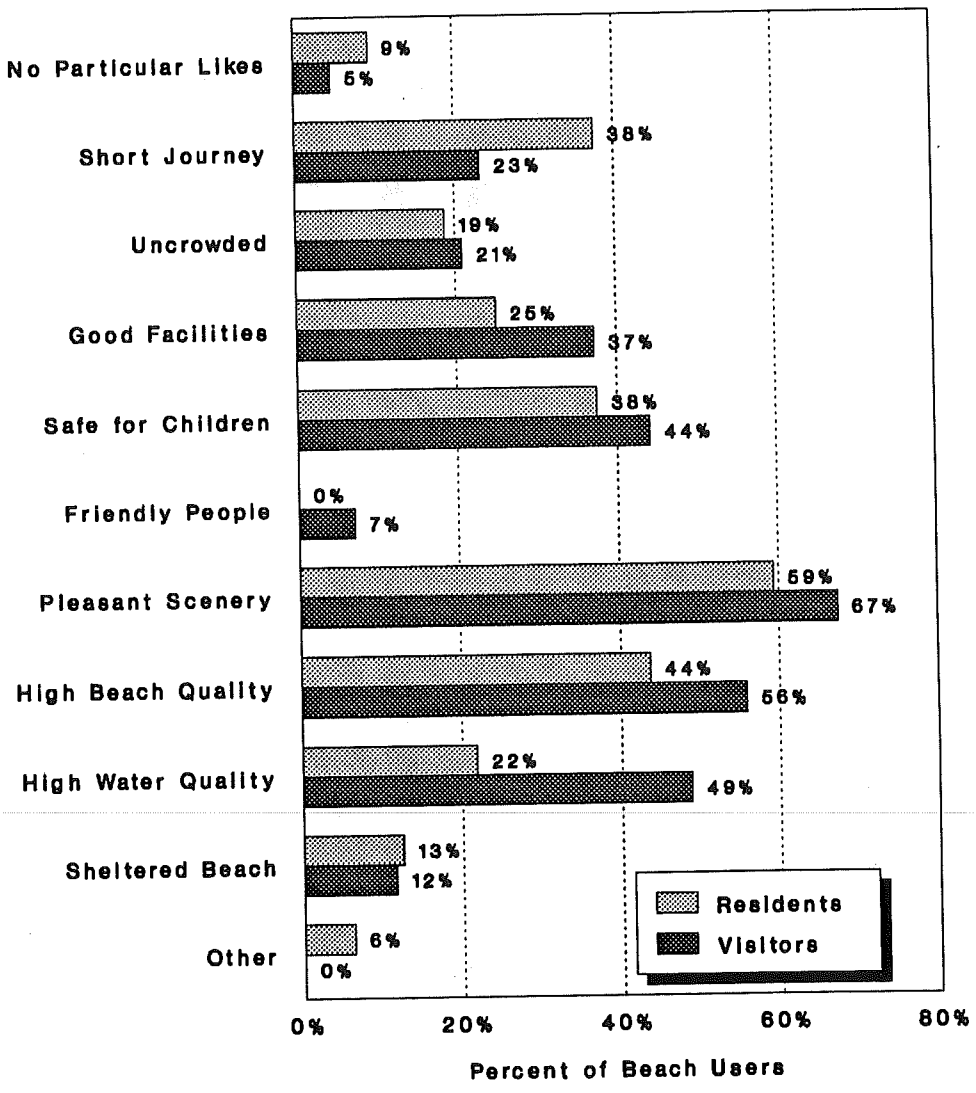


Figure 4.6
OKANAGAN BEACHES - ATTRACTIVE FEATURES
BY RESIDENTS, 1980 - 1991

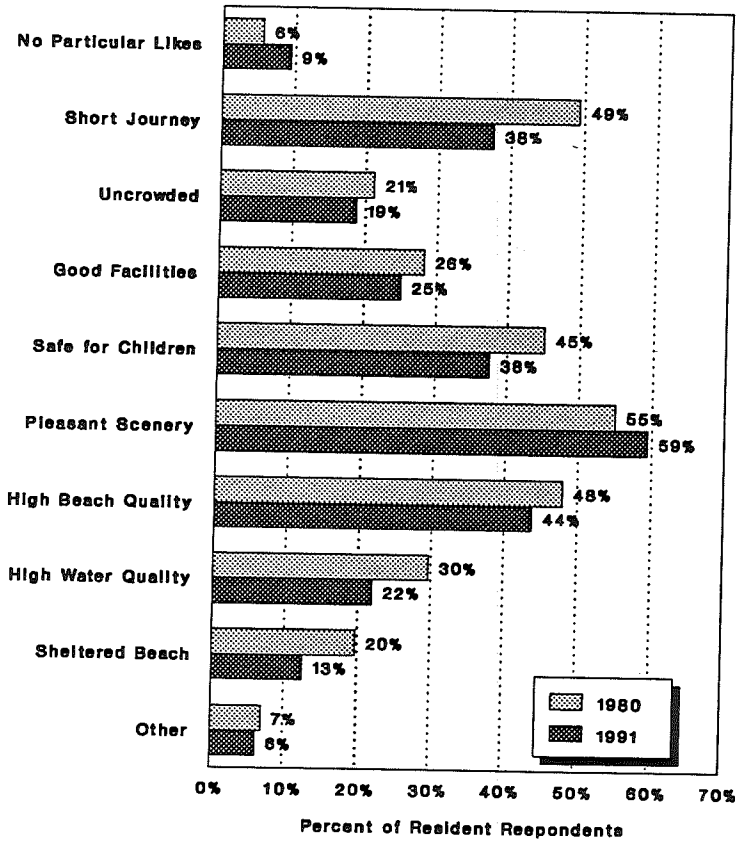
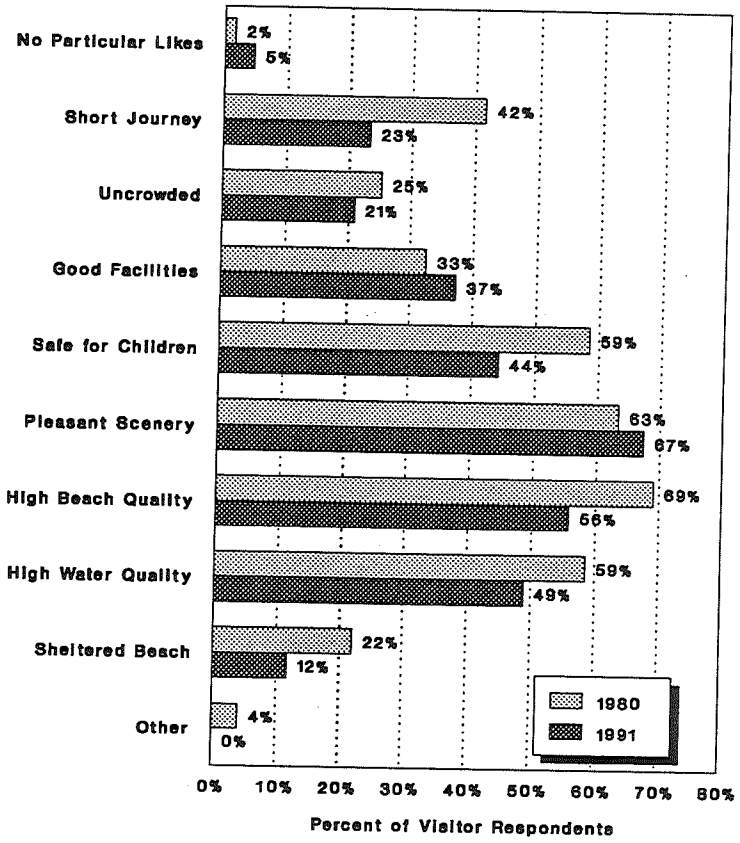


Figure 4.7
OKANAGAN BEACHES - ATTRACTIVE FEATURES
BY VISITORS, 1980 - 1991



- Frequency of Visits

As may be expected, visitors use the beach more frequently during their stay than residents during comparable time periods. Visitors included in our sample spent an average of 10.95 days in the Okanagan, of which 7.95 days were spent at the beach. As indicated in Figure 4.2, 79% of visitor respondents visited the beach 5 times a week or more during their stay, while the remaining 21% visited the beach between 3 and 4 times a week. The average beach visit frequency was 5.08 times per week. By contrast, residents included in our sample spent an average of 20.56 days at the beach between the beginning of June and the end of August, which represents about 1.71 visits per week. Only 6% of residents visited the beach 5 times a week or more and 85% visited the beach less than twice a week.

The comparison of these results to those of the 1970 and 1980 beach user surveys reveals an increase in the frequency of beach use by residents and a slight decrease in the frequency of beach use by visitors. As indicated in Figure 4.3, 84% of residents visited a beach at least once a week in 1991, versus only 76% in 1970. Similarly, only 5% of visitors in our sample visited a beach every day during their stay in 1991, versus 69% in 1970. However, whereas only 12% of visitors visited a beach 2 to 6 times a week in 1970, 95% of visitors did so in 1991, with 74% alone visiting a beach 5 to 6 times a week.

- Attractive and Unattractive Features of Okanagan Beaches

Beach users were asked to identify those features of Okanagan beaches which were particularly attractive or unattractive to them. The features most often praised by visitor beach users were pleasant scenery (67%), followed by high beach quality (56%), high water quality (49%), a safe beach for children (44%) and good facilities (37%). Resident perceptions were somewhat similar, with 59% praising the pleasant scenery, 44% praising the high beach quality, 38% praising the beach as safe for children and 38% praising the short journey from home.

These choices point to an acceleration of some of the trends observed in the 1980 beach user survey over the 1970 survey. In 1970, the features most often praised by residents were, in this order, high water quality, high beach quality and

Figure 4.8
OKANAGAN BEACHES - UNATTRACTIVE FEATURES
BY RESIDENTS & VISITORS, SUMMER 1991

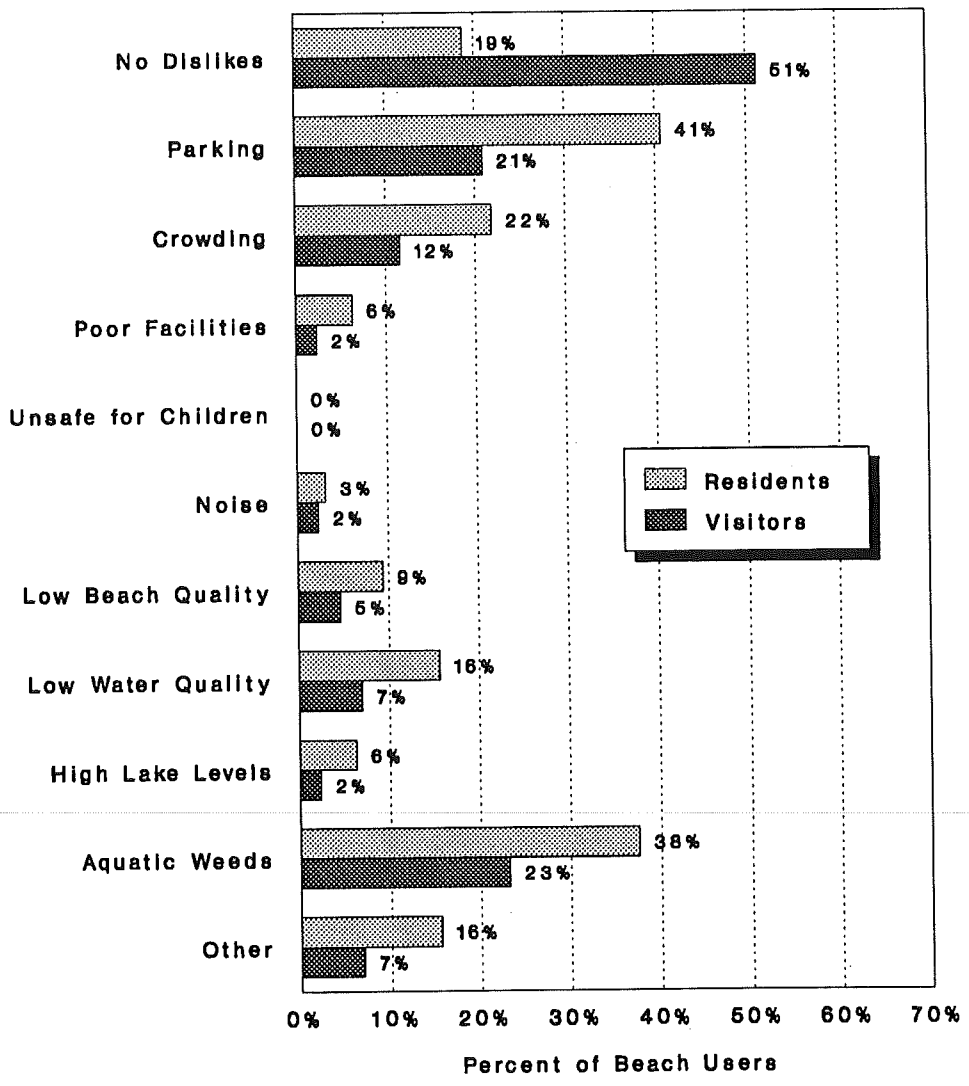


Figure 4.9
OKANAGAN BEACHES - UNATTRACTIVE FEATURES
BY RESIDENTS, 1980 - 1991

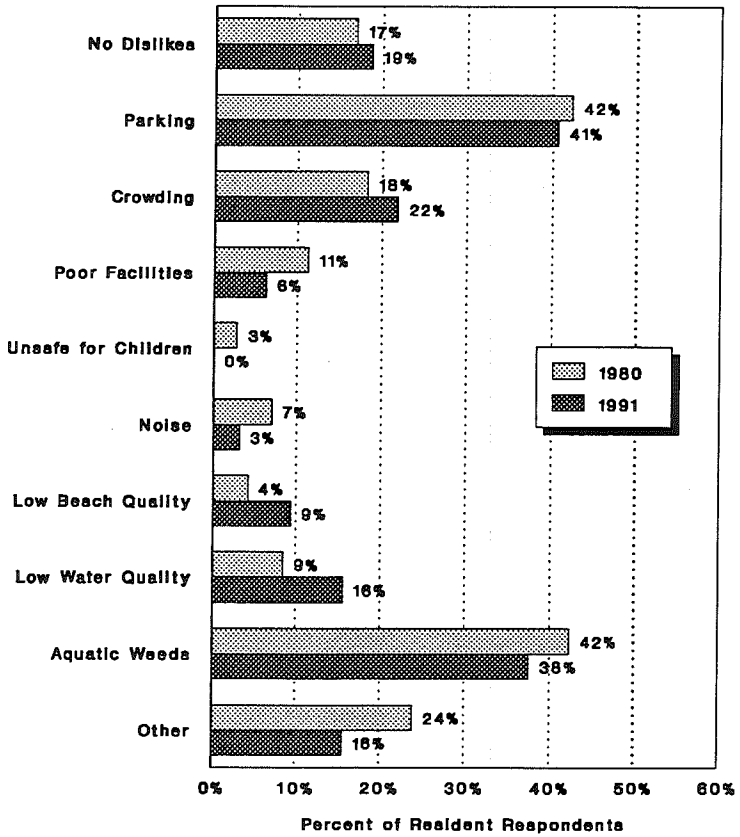
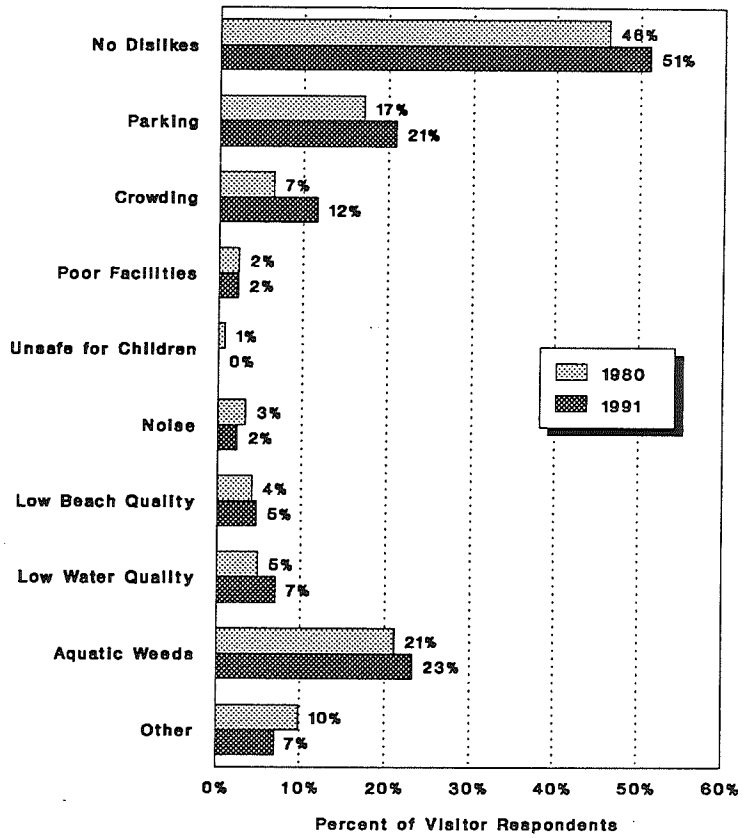


Figure 4.10
OKANAGAN BEACHES - UNATTRACTIVE FEATURES
BY VISITORS, 1980 - 1991



uncrowded conditions. These features were only the sixth, second and seventh by most popular features respectively in 1991, which would suggest that residents are comparatively less satisfied with those features than they were in 1970 and 1980, especially as they relate to water quality and crowding conditions. The pattern of responses given by visitor beach users has seen a similar, albeit not as pronounced, alteration. Whereas the 3 most often praised features in 1970 were high water quality, high beach quality and uncrowded conditions, these features ranked third, second and seventh respectively in 1991.

Visitor beach users in 1991 appeared to be generally more satisfied with Okanagan beaches than were residents. Of the visitors surveyed, 51% claimed that they had no particular dislikes. Aquatic weeds, parking and crowding were the most frequently chosen unattractive features, and were cited by 23%, 21% and 12% of visitors respectively. By comparison, only 19% of residents had no particular dislikes, demonstrating a much lower level of satisfaction among members of the local population. The most frequently complained about aspects of Okanagan beaches were parking (41% of resident respondents), aquatic weeds (38%), crowding (22%) and low water quality (16%).

Comparison with unattractive features in the 1970 and 1980 surveys confirm the emergence over the last 20 years of parking, aquatic weeds and crowding as the most unattractive features of Okanagan beaches. Furthermore, dissatisfaction with the beach and water quality increased noticeably among residents and, to a lesser extent, among visitors to the Okanagan as indicated in Figures 4.9 and 4.10.

In addition to the above-mentioned unattractive features, beach users included in our sample offered some suggestions of their own. Among the most common of these complaints were lack of lifeguards and boats approaching swimming areas too closely.

c. Estimation of Total Beach Use by Residents and Visitors

Beach use can be seen as a function of 2 factors: the size of the tourist and resident populations in the summer months and their respective frequencies of beach attendance. Beach recreation can be measured in terms of beach days. For the purposes of this study,

we will define a beach day as the appearance at an Okanagan beach by either a resident or a visitor between the beginning of June and the end of August.

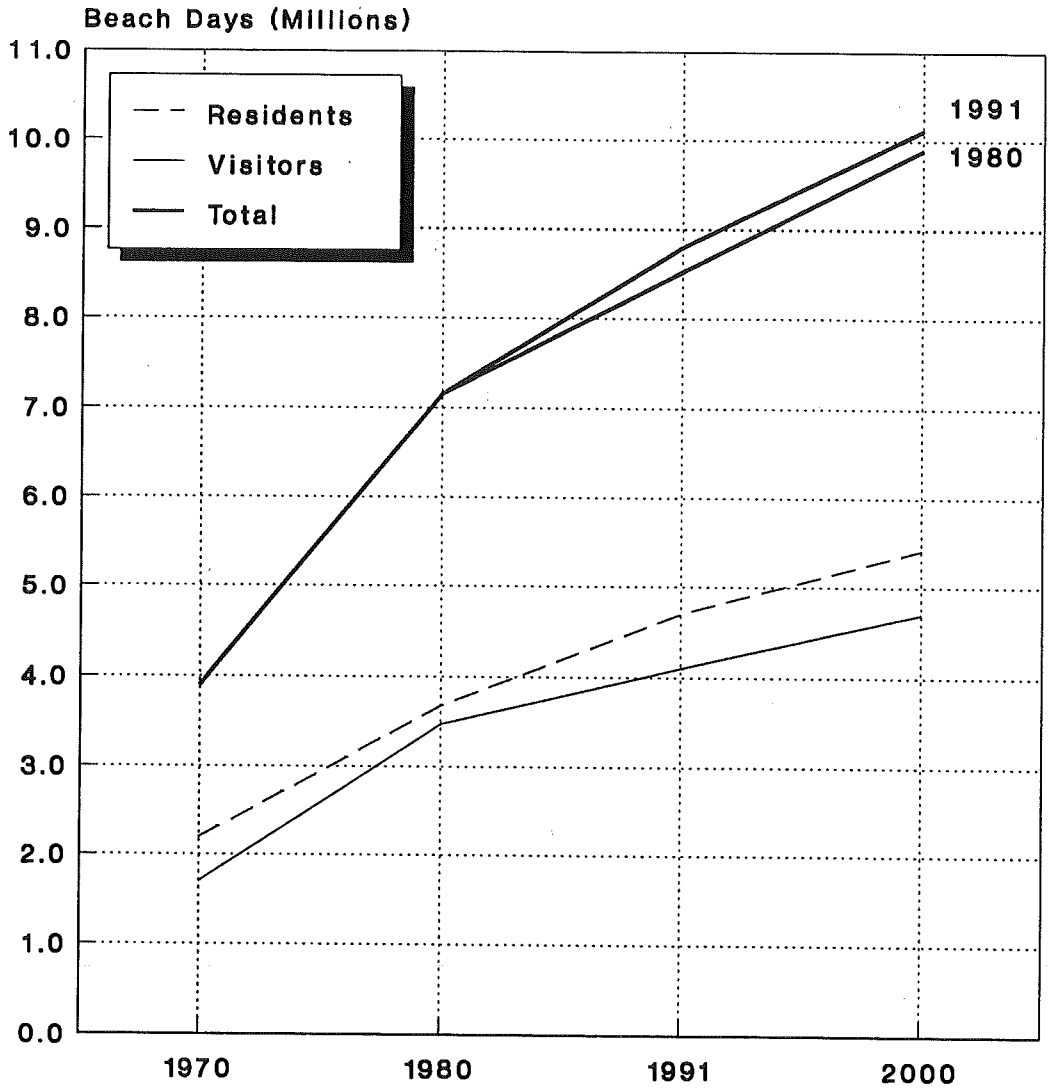
- Beach Use by Visitors

From our survey of beach users, we have determined that visitor beach users visited a beach an average of 72.6% of their vacation days in the Okanagan (7.95 days out of 10.95 days). Visitors staying in commercial accommodation tended to spend proportionately more of their vacations days at the beach (7.82 days out of 10.44 days or 74.9%) than those staying with friends and relatives (8.44 days out of 12.89 days or 65.5%). As shown in the preceding paragraphs, our beach user sample was not representative of all visitors to the Okanagan in terms of length of stay and may have been naturally biased towards those individuals who participated most frequently in beach/lake shore activities. However, there is strong reason to believe that the sample is fairly representative of the proportion of total vacation days spent by visitors at the beach. For example, earlier studies such as the *Water Based Recreation in the Okanagan Area, 1980 Review* established the beach visitation rate for visitors staying in commercial accommodation at 80% of vacation days, and that of visitors staying with friends and relatives at 54% of vacation days.

According to Visitor'89 and the Resident Travel Survey, 59.0% of all visitors to the Okanagan stayed in commercial accommodation while 41.0% stayed with friends and relatives. As a result, the beach visitation rate of visitors to the Okanagan can be determined as follows: [(0.59) x (0.749) + (0.41) x (0.655)] = 0.71.

The actual participation in beach-oriented recreation by visitors can now be determined by applying this beach visitation rate to the number of visitor days spent in the Okanagan during the months of June, July and August. We have determined in the preceding paragraphs that visitors spent a total of 5,732,460 person-nights in the Okanagan during these 3 months in 1989. Assuming that this number remained fairly stable between 1989 and 1991, summer visitors to the Okanagan devoted an estimated 4,070,000 beach days to water-based recreation in 1991, or an average of 2.44 days per summer visitor.

Figure 4.11
BEACH DAYS SPENT IN THE OKANAGAN
1970 - 2000



	1970	1980	1991	2000
Residents	2.2	3.7	4.7	5.4
Visitors	1.7	3.5	4.1	4.7
Total	3.9	7.2	8.8	10.1
Total (1980)	3.9	7.2	8.5	9.9

Sources:
Ference Weicker & Company
1980 Water-Based Recreation Review

- Beach Use by Okanagan Residents

The frequency of beach attendance by residents was determined through a telephone interview during which 50 residents were asked to estimate how often they visited the beach. The 50 residents surveyed visited the beach an average of 20.88 days between the beginning of June and the end of August 1991. This visitation rate was slightly higher than the 20 days recorded during similar studies in 1970 and 1980.

The participation in beach-oriented recreation by residents can now be determined by applying this beach visitation rate of 20.88 days per resident to the number of residents in the Okanagan, which was 225,060 in 1991 according to projections by the BC Ministry of Finance. Therefore, it can be estimated that Okanagan residents devoted a total of 4,699,000 beach days to water-based recreation in 1991.

- Total Beach Use

Based on the above paragraphs, it is estimated that participation in beach-oriented activities reached 8,769,000 beach days in 1991. Of this total, visitors from BC and outside the province accounted for 4,070,000 beach days (46.4%) and local residents for 4,699,000 beach days (53.6%).

As indicated in Figure 4.11, demand for beach-oriented recreation by visitors and residents has thus more than doubled between 1970 and 1991, from 3.9 million beach days to 8.8 million beach days, and is expected to reach 10.1 million beach days by the year 2000. This forecast is based on a total regional population of 259,450 people in the year 2000 (as per BC Ministry of Finance projections) spending an average of 20.88 days at the beach each summer. Furthermore, it has been assumed that the resident share of total beach days would remain stable at 53.6%. Therefore, of the projected 10.1 million beach days in the year 2000, it is estimated that visitors and residents will account for 4.7 million days and 5.4 million days respectively.

Table 4.5

1990 NET TAXABLE APPRAISED VALUES FOR GENERAL PURPOSES

		Area (Km^2)	General Purpose Assessment ($000)
North Okanagan	Areas Adjacent to Lakes:		
	District of Coldstream	76.5	$ 246,307
	Area A	137.4	141,787
	Area B	575.7	79,358
	Subtotal	789.6	467,452
	Other Areas:		
	City of Armstrong	5.1	61,569
	City of Enderby	4.2	44,591
	City of Vernon	22.9	641,172
	District of Spallumcheen	263.9	153,265
	Village of Lumby	5.2	27,220
	Area C	325.1	87,947
	Area D	1,780.9	57,590
	Area E	2,779.3	18,763
	Area F	1,895.8	89,872
	Subtotal	7,082.4	1,181,989
	Total	7,872.0	1,649,441
Central Okanagan	Areas Adjacent to Lakes:		
	City of Kelowna	228.4	$ 2,517,563
	District of Peachland	17.4	102,360
	Area A	334.4	199,390
	Area G	1,069.9	306,705
	Area H	372.2	313,069
	Area I	934.0	58,696
	Subtotal	2,956.3	3,497,783
	Other Areas	0.0	0
	Total	2,956.3	3,497,783
Okanagan-Similkameen	Areas Adjacent to Lakes:		
	City of Penticton	44.5	$ 771,335
	District of Summerland	69.7	246,645
	Town of Osoyoos	8.4	101,676
	Area A	313.1	53,001
	Area C	633.2	115,495
	Area D	990.9	143,612
	Area E	796.2	53,718
	Area F	719.6	54,752
	Subtotal	3,575.6	1,540,234
	Other Areas:		
	Town of Princeton	8.3	54,605
	Village of Keremeos	2.4	20,898
	Village of Oliver	2.5	60,215
	Area B	303.5	17,432
	Area G	2,211.2	55,670
	Area H	4,914.3	84,783
	Subtotal	7,442.0	293,603
	Total	11,017.7	1,833,237
Total Region	Areas Adjacent to Lakes	7,321.5	$ 5,505,469
	Other Areas	14,524.5	1,475,592
	Total	21,846.0	6,981,061

Source: 1990 Municipal and Regional Statistics based on Figures by BC Assessment Authority.

It should be noted that our estimate of 8.8 million beach days for 1991 is slightly higher than the 1980 prediction of 8.5 million beach days for 1990[1]. Indeed, the increase in the number of visitors to the Okanagan was larger than anticipated. We estimate that a total of 1,583,000 people visited the Okanagan during the months of June, July and August in 1991, which is much higher than the 1980 Basin Study prediction of 1,197,000.

3. Real Estate

Many desirable residential areas in the Okanagan front on beaches that are affected by Eurasian water milfoil. If milfoil infestation was not controlled, it is very likely that property assessments for taxation purposes would be reduced in some areas because of the adverse impacts of aquatic weeds. The following paragraphs provide a summary of the value of properties located in the Okanagan, of lake shore use and tenure, as well as an estimate of the relative value of lakefront properties.

a. Assessed Values

The real estate market has been very buoyant in the Okanagan over the last couple of years. As indicated in Table 4.5, the 1990 net taxable value of Okanagan properties was about $6.98 billion. Based on information supplied by the Regional Districts, the 1992 net taxable value has been estimated at about $9.42 billion, which represents an increase of 35.0% over 1990. In 1990, residential properties alone accounted for about 77% of the total assessed value or $5.37 billion. Not surprisingly, given the region's demographic profile, administrative areas directly adjacent to the main Okanagan Valley lakes, which account for only 33.5% of the region's total area, comprised about 78.9% of the total assessed value in 1990 or $5.50 billion. This figure, however, is not directly representative of the value of lakefront properties since some of these administrative subdivisions stretch far beyond the lake shores to which they are adjacent.

[1]-*"Water-Based Recreation in the Okanagan Area, 1980 Review"*, prepared for the Okanagan Basin Implementation Board

Table 4.6

LAKESHORE LAND USE & LAND TENURE, OKANAGAN BASIN, 1980

	Feet	Metres	Percent
Land Use:			
Public Access	13,899	4,236	1.0%
Public Recreation	81,791	24,930	6.1%
Residential	297,110	90,559	22.3%
Commercial	52,299	15,941	3.9%
Industrial	11,137	3,394	0.8%
Agricultural	29,035	8,850	2.2%
Road	120,351	36,683	9.0%
Rail	115,950	35,342	8.7%
Undeveloped	613,050	186,858	45.9%
Total	1,334,622	406,793	100.0%
Land Tenure:			
Transportation Routes	236,301	72,025	17.7%
Public Access, Developed	9,096	2,772	0.7%
Public Access, Undeveloped	4,803	1,464	0.3%
Municipal, Developed	40,679	12,399	3.0%
Municipal, Undeveloped	15,500	4,724	1.2%
Crown, Developed	40,089	12,219	3.0%
Crown, Undeveloped	32,141	9,797	2.4%
Crown Park Reserve	89,341	27,231	6.7%
Indian Reserve	179,741	54,785	13.5%
Private, Developed	329,715	100,498	24.7%
Private, Undeveloped	357,216	108,879	26.7%
Total	1,334,622	406,793	100.0%

Source: Water-Based Recreation in the Okanagan Basin, 1980 Review.

b. Lake Shore Land Use and Land Tenure

There is a total of 406.8 kilometres (1,334,622 feet) of shoreline around the main valley lakes in the Okanagan. Documenting the amount of lake shore frontage occupied by different types of land use and ownership for each of the main valley lakes in the Okanagan is beyond the scope of this study. However, results of the study entitled *Water Based Recreation in the Okanagan Area, 1980 Review* provide a good indication of the relative importance of various types of land uses and land tenure on the shoreline of the main valley lakes in the Okanagan.

About 186.8 kilometres (613,050 feet) of shoreline (45.9% of total shoreline) was undeveloped in 1980 as indicated in Table 4.6. The major developed land uses in 1980 were residential (22.3%), road and rail (17.7%) and public recreation (6.1%). Based on the demographic growth experienced by the region over the last 10 years, it is very likely that the total amount of shoreline developed for residential use now represents at least 25% of total shoreline. Over half (51.5%) of the shoreline was privately owned in 1980, and an additional 13.7% was located on Indian Reserves. The remaining land was mainly held by the Crown (12.1%) and municipalities (4.2%).

c. Estimated Value of Lakefront Properties

There are currently no published data concerning the total value of all lakefront properties in the Okanagan. It is, however, possible to derive a very broad estimate of this value based on the information at hand.

Based upon the 1980 study, a total of 209.4 kilometres (686,931 feet) of shoreline around the main valley lakes in the Okanagan was privately owned in 1980. This total consisted of 108.9 kilometres (357,216 feet) of undeveloped shoreline and 100.5 kilometres (329,715 feet) of developed shoreline. We will, for the purposes of this study, assume that these figures are still valid today. If we define the lakefront area as the total land area located within a distance of 40 metres (120 feet) of the lake shore, then the 686,931 feet of privately owned shoreline in the Okanagan can accommodate 9,159 typical 75 foot (front) x 120 foot (back) lots, including 4,763 bare lots and 4,396 developed lots.

Table 4.7

ESTIMATED VALUE OF LAKEFRONT PRIVATE PROPERTIES IN THE OKANAGAN

	Total Shoreline (Feet)	Private Undeveloped Shoreline (Feet)	Private Developed Shoreline (Feet)	Total Private Shoreline (Feet)	Estimated Number of Privately Owned 75x120 ft Bare Lots	Estimated Number of Privately Owned 75x120 ft Developed Lots	Total Estimated Number of Privately Owned 75x120 ft Lots	Average Price of a 75x120 ft Bare Lot ($000)	Average Price of a House on a 75x120 ft Lot ($000)	Estimated Value of Private Land within 120 ft of Lakeshore ($000)	Estimated Value of Improvements on Private Land within 120 ft of Lakeshore ($000)	Total Estimated Value of Private Property Within 120 ft of Lakeshore ($000)
North Okanagan:												
Okanagan Lake	287,941	60,701	74,030	134,731	809	987	1,796	$150	$300	$269,400	$148,050	$417,450
Kalamalka Lake	143,314	29,248	31,853	61,101	390	425	815	160	320	130,400	68,000	198,400
Total	431,255	89,949	105,883	195,832	1,199	1,412	2,611	$153	$306	$399,800	$216,050	$615,850
Central Okanagan:												
Okanagan Lake	358,470	136,719	100,761	237,480	1,823	1,343	3,166	$210	$320	$664,860	$147,730	$812,590
Wood Lake	55,660	3,400	9,450	12,850	45	126	171	170	300	29,070	16,380	45,450
Total	414,130	140,119	110,211	250,330	1,868	1,469	3,337	$209	$318	$693,930	$164,110	$858,040
Okanagan-Similkameen:												
Okanagan Lake	236,082	90,568	47,351	137,919	1,208	631	1,839	$150	$300	$275,850	$94,650	$370,500
Skaha Lake	95,190	4,730	24,270	29,000	63	324	387	150	300	58,050	48,600	106,650
Vaseux Lake	37,480	8,625	5,850	14,475	115	78	193	130	240	25,090	8,580	33,670
Osoyoos Lake	110,065	22,175	29,600	51,775	296	395	691	130	240	89,830	43,450	133,280
Tuc-El-Nuit	10,420	1,050	6,550	7,600	14	87	101	130	240	13,130	9,570	22,700
Total	489,237	127,148	113,621	240,769	1,696	1,515	3,211	$145	$278	$461,950	$204,850	$666,800
Total Region	1,334,622	357,216	329,715	686,931	4,763	4,396	9,159	$172	$300	$1,555,680	$585,010	$2,140,690

Sources: Water Based Recreation in the Okanagan Basin, 1980 Review
Interviews with real estate professionals in the region.

As part of this evaluation, we conducted a survey of several real estate professionals in the region to obtain up-to-date prices for lakefront bare lots and houses in the Okanagan. The results of this survey are shown in Table 4.7. As indicated, 75 x 120 ft waterfront bare lots in the Okanagan range in price from an average of about $130,000 in the Osoyoos area to an average of about $210,000 in the Kelowna South area. Similarly, houses located on waterfront properties range in price from an average of $240,000 in the Osoyoos area to an average of about $300,000 or more in the Central and North Okanagan. By applying these rates to the estimated number of bare and developed lots in each area, it can be estimated that private lakefront properties in the Okanagan have a total value of about $2.14 billion, which represents about 22.7% of the 1992 assessed value of all properties in the Okanagan. Of these $2.14 billion, it is estimated that land and buildings accounted for $1.55 billion and $585 million respectively. While these estimates do not purport to be fully accurate, especially concerning buildings (developed lots probably include campgrounds with a relatively lower improvement value), they provide a good indication of the relative value of lakefront properties in the Okanagan. These figures represent average prices of $18.87 per square foot of bare land and $33.66 per square foot of developed land.

4. Agriculture

As indicated in Table 4.8, the Okanagan is one of the leading agriculture producing areas in the province, encompassing approximately 6.8% of the total farm area in BC. The total area farmed in the Okanagan was approximately 163,830 hectares in 1986, or about 7.5% of the region's total land area.

In 1986, about 25,545 hectares or 15.6% of the region's total farm area was dedicated to the production of field crops. A further 10,040 hectares (6.1% of the total farm area) was devoted to the production of tree fruits. This placed the Okanagan as the largest tree fruit producing region in B.C. in 1986, accounting for 89.2% of the 11,250 hectares devoted to the production of tree fruits throughout the province.

Total invested farm capital was about $1.16 billion in 1986, which represented an average investment per farm of $293,670 and an average investment per hectare of $7,107. The latter figure was much higher than the provincial average investment per hectare of $2,691. Total sales were about $141.6 million in 1986 (13.4% of the provincial total). Although sales per farm were lower in the Okanagan in 1986 than the provincial average ($35,707 as compared to $55,552),

Table 4.8

MAIN CHARACTERISTICS OF THE OKANAGAN AGRICULTURE

	North Okanagan	Central Okanagan	Okanagan Similkameen	Total Okanagan	British Columbia	Regional Share
Number of Farms	1,234	1,053	1,678	3,965	19,063	20.8%
Area of Farms (Hectares)	61,370	25,029	77,254	163,833	2,411,060	6.8%
• Field Crops	16,638	2,051	6,856	25,545		
• Tree Fruits	547	4,296	5,196	10,039		
• Berries & Grapes	63	507	868	1,438		
Farm Capital ($000)	348,500	374,800	441,100	1,164,400	6,487,900	17.9%
Investment per Farm ($)	282,415	355,935	264,660	293,670	340,340	86.3%
Investment per Hectare ($)	5,679	14,867	5,749	7,107	2,691	264.1%
Sales ($000)	48,025	38,892	54,662	141,579	1,058,987	13.4%
Sales per Farm ($)	38,918	36,934	32,576	35,707	55,552	64.3%
Sales per Hectare ($)	782	1,554	708	864	439	196.8%

Source: Statistics Canada, 1986 Census

sales per hectare were much higher in the Okanagan than provincially ($864 versus $439), probably due to the nature of the crops being grown.

Assuming that the regional share of provincial revenues remained fairly stable between 1986 and 1989 (at 13.4%), it is estimated that the Okanagan agriculture sector generated revenues of $156.0 million in 1989 (13.4% of $1.16 billion). This translates into average sales per hectare of about $950.

B. ECONOMIC AND SOCIAL VALUE OF EXISTING PROGRAM

The evaluation issue developed with respect to the value of the Okanagan Valley Eurasian Water Milfoil Control Program is as follows:

Issue 4: **What are the economic and social benefits generated by the existing control program, both locally and provincially? What would be the socio-economic impacts of unrestricted growth of this plant if the control program was terminated?**

The impact of the program was measured using a mixture of data sources including secondary data, a survey of visitors, a survey of beach users, a survey of local residents, a survey of tourism operators and a survey of several real estate professionals. The findings of our review with respect to this evaluation issue are summarized in the following paragraphs.

1. Impact on Okanagan Tourism Industry

As Eurasian water milfoil is generally restricted to water depths of 6 metres (20 feet) or less, populations of the plant tend to be located in areas along the shoreline. This is also the area where water-based recreation tends to be concentrated. Dense populations of the plant can interfere with and virtually eliminate opportunities for a wide variety of tourism-related water-based activities such as motor boating, water skiing, sailing, swimming and shore-based angling. The following paragraphs provide a description of the economic impact of the program on the Okanagan tourism industry in terms of revenues and employment.

a. Revenues

We have determined in Section A that visitors spent an estimated 5.73 million person-nights in the Okanagan during the months of June, July and August, 1989, generating about $182.8 million in gross tourism revenues. Therefore, it can be estimated that summer visitors to the region spent about $31.90 per person per day while in the Okanagan in 1989. We can now determine the maximum economic value accruing to beach-oriented recreation by summer visitors by applying this average daily expenditure to the number of days spent on the beach by visitors in the Okanagan in 1989. Based on the preceding section, visitors to the Okanagan devoted an estimated 4.07 million beach days to water-based recreation in 1989. As a result, the maximum economic value accruing to water-based recreation by visitors to the Okanagan can be estimated at about $129.8 million. While this figure provides some general indication of the importance of water-based activities in terms of revenues, it is, however, not necessarily representative of the impact of the Eurasian water milfoil control program because this methodology assumes that all visitors who participated in beach/lake shore activities would not have stayed in the Okanagan had those opportunities not been available.

Water-based recreation is only one motivation, albeit a strong one, for tourists visiting the Okanagan. It is, therefore, necessary to identify the impact of opportunities for water-based recreation on the propensity of tourists to visit the area and their average length of stay. To this end, we conducted a survey of 60 tourism operators and 270 parties visiting the Okanagan. The results of both surveys are discussed below.

- Survey of Tourism Operators

  According to our review of Accommodation 1991, there are about 250 tourism operations in the immediate area of the lakes, including:

  - 230 commercial accommodation facilities;
  - 1 tour company;
  - 2 fishing lodges;
  - 7 boat rental operations;
  - 7 other marina operations.

Table 4.9

ESTIMATED IMPACT OF MILFOIL CONTROL PROGRAM ON OKANAGAN TOURISM REVENUES BASED ON SURVEY OF TOURISM OPERATORS

Question **If it wasn't controlled, growth of Eurasian water milfoil would limit or even eliminate opportunities to swim, to boat, water ski or fish in waters up to 15 feet deep. In your opinion, what impact would termination of the program have on your business ? By how much, if any, do you estimate your revenues would decline ($ or %)?**

% Decline in Revenues	Number of Respondents	%
0% to 9%	1	1.7%
10% to 19%	7	11.7%
20% to 29%	8	13.3%
30% to 39%	3	5.0%
40% to 49%	5	8.3%
50% to 59%	10	16.7%
60% to 69%	3	5.0%
70% to 79%	2	3.3%
80% to 89%	3	5.0%
90% to 99%	0	0.0%
100%	4	6.7%
Subtotal	46	76.7%
Don't Know	14	23.3%
Total	60	100.0%

Average Decline: 43%

Sources: Survey of 60 Tourism Operators

As part of this evaluation, we conducted a survey of 60 of the 244 accommodation and boat/marina operators in the immediate vicinity of the lakes to try to determine the impact that program termination may have on their facilities. Each operator was asked to estimate this impact in terms of potential decline in revenues.

As indicated in Table 4.9, 14 of the 60 operators surveyed (23.3%) were unable to quantify the potential impact of program termination on their businesses. Of the 46 operators responding, 22 (47.8%) believed that they would experience a drop in revenues greater than 50%, including 4 operators (8.7%) who believed that program termination would force them out of business altogether. The average decline for all operators responding was 43% of revenues. The overall economic impact of the program can be estimated by extrapolating this result to the entire population of tourism operators in the immediate vicinity of the lakes, as follows:

- Total expenditures of visitors to the region during the months of June, July and August. Based on the preceding paragraphs, these were estimated to be $182.8 million in 1989;

- Times the proportion of the Okanagan tourism industry that is based in the area affected by Eurasian water milfoil. As a surrogate for this measure, we will use the ratio of the number of accommodation units in the immediate vicinity of the lakes to the total number of accommodation units in the Okanagan (77%).

- Times the average percent decline in revenues that would occur if the program was terminated (43%).

Using this methodology, the impact of program termination on tourism revenues can be estimated at about $60.5 million. While these results provide an indication of the economic impact of the program, they only represent the operators' best estimate of their clients' behaviourial reaction to uncontrolled milfoil infestation in the region. Because the latter is subjective and often unpredictable, the accuracy of the estimates is uncertain. Therefore, in order to assess the reasonableness of the responses given by the tourism operators and develop a second estimate regarding the impact of the program, we also conducted a survey of visitors to the Okanagan.

Table 4.10

COMPARISON OF VISITORS SAMPLE TO ACTUAL VISITING POPULATION

	Sample		Total Population (1)	
	Number	%	Number	%
Length of Stay in Region (Days):				
BC Resident		10.85	3.06	
Non-BC Resident		12.83	3.58	
Total		11.85	3.23	
Origin (Party-Nights):				
BC Resident	1,454	45.4%	2,514,590	63.6%
Alberta	1,465	45.8%	620,640	15.7%
Other Canada	81	2.5%	311,040	7.9%
USA	190	5.9%	338,400	8.5%
Overseas	9	0.4%	169,920	4.3%
Total	3,199	100.0%	3,954,590	100.0%
Accom. (Party-Nights):				
Hotel	112	3.5%	219,220	5.5%
Motel	708	22.2%	934,700	23.6%
Resort	333	10.4%	154,530	3.9%
Campground	1,982	61.9%	693,990	17.5%
Friends & Relatives	64	2.0%	1,790,310	45.3%
Other	0	0.0%	161,840	4.2%
Total	3,199	100.0%	3,954,590	100.0%

Note: (1) Data based on Visitor'89 and the Resident Travel Survey

- Survey of Visitors

In order to determine the relative importance of beach-oriented recreation as an attraction to visitors to the Okanagan and the proportion of visitors that would not come to the Okanagan or would shorten their stay if water-based recreation was restricted by uncontrolled milfoil infestation, we conducted a survey of BC resident and out-of-province visitors through the operators of 70 accommodation facilities including motels, hotels, resorts and campgrounds. Managers of these facilities were asked to assist by distributing a short questionnaire to their guests and returning the questionnaires to us. Approximately 1,400 questionnaires were distributed (20 per facility), of which 270 (19.3%) were returned to us. This response rate is considered to be satisfactory, especially since the questionnaires required the cooperation of both the tourism operators and their clients.

Table 4.10 provides a comparison of visitors included in our sample to the total population of visitors to the Okanagan as defined by Visitor'89 and the Resident Travel Survey. As indicated, there are several major discrepancies between the 2 groups:

- Visitors included in our sample spent an average of 11.85 nights in the Okanagan which is much higher than the averages derived from both Visitor'89 and the Resident Travel Survey.

- BC residents, which account for 63.6% of total party nights spent in the region, represented only 45.4% of party nights in the sample.

- Visitors staying with friends and relatives, which account for 45.3% of total party nights spent in the region, represented only 2.0% of party nights in the sample. This was to be expected given that the methodology used was targeted mostly at commercial accommodation facilities.

All survey results are tabulated by visitor origin and type of accommodation in Table 4.11 to accommodate for variations between visitor segments. Table 4.11 also provides a summary of the results of a similar survey conducted with 43 visitor

Table 4.11

IMPORTANCE OF WATER-BASED RECREATION IN DECISION TO COME TO THE OKANAGAN

Question 1: There is a government funded program designed to control Eurasian water milfoil, an aquatic plant that grows very well in shallow waters such as that found in beach areas. If it wasn't controlled, growth of milfoil could become so dense that it would limit or even eliminate opportunities to swim, boat, water ski or fish in waters up to 15 feet deep. Supposing that the opportunities to participate in these activities were limited, how likely is it that you still would have come to the Okanagan on this trip ?

Question 2: If you still had come, do you think you would have stayed for the same number of days ?

Question 3: If no, how many days would you likely have stayed ?

	BC Residents				Non-BC Residents				TOTAL	
	Using Commercial Accommodation		Staying with Friends & Relatives		Using Commercial Accommodation		Staying with Friends & Relatives			
	Party Nights	%	Party Nights	%	Party Nights	%	Party Nights	%	Party Nights	%
Question 1 - Visitors:										
No chance at all (0%)	453	31.8%	4	14.3%	471	27.6%	12	33.3%	940	29.4%
Unlikely (25%)	510	35.8%	10	35.7%	716	41.9%	23	63.9%	1,259	39.3%
Even chance (50%)	287	20.1%	0	-	209	12.2%	1	2.8%	497	15.5%
Likely (75%)	56	3.9%	14	50.0%	58	3.4%	0	-	128	4.1%
Definitively would (100%)	120	8.4%	0	-	255	14.9%	0	-	375	11.7%
Total	1,426	100.0%	28	100.0%	1,709	100.0%	36	100.0%	3,199	100.0%
Question 1 - Beach Users:										
No chance at all (0%)	43	29.0%	7	19.4%	18	8.7%	0	-	68	14.4%
Unlikely (25%)	67	45.3%	29	80.6%	62	30.0%	8	10.0%	166	35.3%
Even chance (50%)	38	25.7%	0	-	127	61.3%	8	10.0%	173	36.7%
Likely (75%)	0	-	0	-	0	-	19	23.8%	19	4.0%
Definitively would (100%)	0	-	0	-	0	-	45	56.2%	45	9.6%
Total	148	100.0%	36	100.0%	207	100.0%	80	100.0%	471	100.0%
Question 2 - Visitors:										
Yes	213	21.9%	0	-	521	42.1%	0	-	734	32.5%
No	474	48.7%	24	100.0%	605	48.9%	23	95.8%	1,126	49.8%
Don't Know	286	29.4%	0	-	112	9.0%	1	4.2%	399	17.7%
Total	973	100.0%	24	100.0%	1,238	100.0%	24	100.0%	2,259	100.0%
Question 2 - Beach Users:										
Yes	3	2.9%	6	20.7%	55	29.1%	53	66.3%	117	29.0%
No	48	45.7%	8	27.6%	112	59.3%	0	-	168	41.7%
Don't Know	54	51.4%	15	51.7%	22	11.6%	27	33.7%	118	29.3%
Total	105	100.0%	29	100.0%	189	100.0%	80	100.0%	403	100.0%
Question 3 - Visitors:										
Actual days spent	474	100.0%	24	100.0%	605	100.0%	23	100.0%	1,126	100.0%
Likely days spent	120	25.3%	12	50.0%	192	31.7%	6	26.1%	330	29.3%
Days lost	354	74.7%	12	50.0%	413	68.3%	17	73.9%	796	70.7%
Question 3 - Beach Users:										
Actual days spent	48	100.0%	8	100.0%	112	100.0%	0	-	168	100.0%
Likely days spent	14	29.2%	5	62.5%	45	40.2%	0	-	64	38.1%
Days lost	34	70.8%	3	37.5%	67	59.8%	0	-	104	61.9%
Summary - Visitors:										
Actual days spent	1,426	100.0%	28	100.0%	1,709	100.0%	36	100.0%	3,199	100.0%
Actual days lost	807	56.6%	16	57.1%	884	51.7%	29	80.6%	1,736	54.3%
Summary - Beach Users:										
Actual days spent	148	100.0%	36	100.0%	207	100.0%	80	100.0%	471	100.0%
Actual days lost	77	52.0%	10	27.8%	85	41.1%	0	0.0%	172	36.5%

beach user parties. While the latter survey is generally less representative given the limited sample size, it offers some valuable feedback concerning visitors staying with friends and relatives which can be used in combination with the results of the visitor survey to better determine the importance of water-based recreational opportunities for such visitors.

As indicated in Table 4.11, visitors were first asked whether they still would come to the Okanagan in the event of uncontrolled milfoil infestation. The survey results suggest that non-resident visitors staying with friends and relatives would be the most likely to cancel their trip to the Okanagan if water-based recreation activities were restricted (33.3%), followed by BC resident visitors using commercial accommodation (31.8%) and non-resident visitors using commercial accommodation (27.6%). Those visitors indicating that they still might have come to the Okanagan (i.e. who did not respond "0 Chance at all" to question 1) were then asked whether they still would have stayed for the same number of days. As indicated, non-resident visitors were twice as likely to stay for the same number of days than their BC resident counterparts (42.1% versus 21.9%). However, approximately one-half of visitors indicated they would have reduced their length of stay in the region.

As indicated in Table 4.11, the share of party-nights that would be lost in the event of uncontrolled milfoil infestation can be established as follows for each of the visitor segments:

- BC residents (commercial accommodation): 56.6%
- BC residents (friends and relatives): 57.1%
- Out-of-province (commercial accommodation): 51.7%
- Out-of-province (friends and relatives): 80.6%

As explained earlier, the visitor survey was biased to the extent that visitors staying with friends and relatives were under-represented. In particular, the above loss factors for visitors staying with friends and relatives were derived from a very small sample and are probably not representative of all such visitors (it seems indeed surprising that the loss factor would be 80.6% for non-resident visitors staying with friends when that of other non-resident visitors is only 51.7%; one would expect the extra motivation of visiting friends and relatives to result in a lower loss factor).

Table 4.12

ESTIMATED IMPACT OF MILFOIL CONTROL PROGRAM ON OKANAGAN TOURISM REVENUES BASED ON SURVEY OF VISITORS

	Number of Summer Party-Nights (1)	% Loss	Number of Summer Party-Nights Lost	Loss in Summer Revenues (2) ($000)
BC Resident Visitors (Commercial Accommodation)	844,290	56.6%	477,870	$39,640
BC Resident Visitors (Friends & Relatives)	546,630	40.6%	221,930	18,410
Subtotal BC Resident Visitors	1,390,920	50.3%	699,800	$58,050
Non-Resident Visitors (Commercial Accommodation)	374,480	51.7%	193,610	$19,520
Non-Resident Visitors (Friends & Relatives)	294,230	25.0%	73,560	7,420
Subtotal Non-Resident Visitors	668,710	39.9%	267,170	$26,940
Total	2,059,630	46.5%	966,970	$84,990

Notes:

(1) Based on data from Visitor'89 & the Resident Travel Survey (See Section A for further details).

(2) Based on the following:
BC Resident Visitors: average party size of 2.78 persons and average daily expenditure per person of $29.84;
Non-Resident Visitors: average party size of 2.79 persons and average daily expenditure per person of $36.14;

In order to alleviate this bias as well as to increase the representativity of the results as they pertain to visitors staying with friends and relatives, we have revised the loss factors for these visitors by combining the results from the visitor survey and the beach user survey. For example, it can be estimated that BC resident visitors staying with friends and relatives included in our samples spent a total of 64 (28 + 36) party-nights in the Okanagan, of which 26 (16 + 10) would be lost in the event of uncontrolled milfoil infestation. Using this methodology, the revised loss factors for each visitor segment can be established as follows:

- BC residents (commercial accommodation): 56.6% (unchanged)
- BC residents (friends and relatives): 40.6% (revised)
- Out-of-province (commercial accommodation): 51.7% (unchanged)
- Out-of-province (friends and relatives): 25.0% (revised)

The actual impact of program termination on tourism revenues can now be determined by applying these loss factors to the number of party-nights spent by each visitor segment in the Okanagan. As indicated in Table 4.12, an estimated 2.06 million party nights were spent in the region in 1989 between the beginning of June and the end of August, including 1.39 million party-nights involving BC residents and 0.67 million party-nights involving out-of-province visitors. Of this total, it is estimated that about 967,000 party-nights (46.9%) would be lost in the event of uncontrolled milfoil infestation, including 700,000 party-nights involving BC resident visitors and 267,000 party-nights involving out-of-province visitors.

Based on data from Visitor'89 and the Resident Travel Survey, it is further estimated that these lost party-nights would translate into lost revenues of $85.0 million annually, including $58.0 million from BC resident visitors and $27.0 million from out-of-province visitors. This potential loss in revenues represents 26.5% of total 1989 revenues, and about 46.5% of 1989 revenues occurring between the beginning of June and the end of August.

b. Employment

The impact of the Eurasian water milfoil control program on employment in the local tourism industry can be estimated using the common standard of one job per every $50,000

Table 4.13

EXPENDITURES ON WATER-BASED ACTIVITIES BY OKANAGAN RESIDENTS, 1991

Question: How much do you think that your household has spent purchasing goods or servies related to swimming, boating, water skiing, sailing or fishing in the Okanagan over the past 12 months ?

	Number of Parties/ Households	Total Expenditures
Okanagan Residents (1):		
$0 - $50	20	$ 650
$51 - $100	9	820
$101 - $150	2	300
$151 - $200	2	400
Over $200	1	300
Subtotal	34	2,470
Don't Know	16	-
Total	50	$2,470
Average Expenditure per Household: $72.65		
Okanagan Resident Beach Users (2):		
$0 - $50	10	$ 450
$51 - $100	5	425
$101 - $150	2	300
$151 - $200	2	400
Over $200	0	0
Subtotal	19	1,575
Don't Know	13	-
Total	32	$1,575
Average Expenditure per Household: $82.49		

Sources: (1) Telephone Survey of 50 Okanagan Residents
(2) Survey of 32 Resident Beach-Users

in tourism revenues. Using this methodology, it is estimated that the party-nights lost in the event of program termination would translate in the loss of about 1,700 employment positions in the region. This represents about 19.6% of the regional workforce employed in the tourism industry and 1.9% of the total regional workforce.

2. Economic and Social Value of Water-Based Recreation to Okanagan Residents

The issue of placing a value on the recreational opportunities available to local residents is more difficult. Given that access is already available free of any direct charge, local residents only incur minor economic costs in using Okanagan beaches. As part of this evaluation, we conducted a telephone survey of Okanagan residents as well as a survey of Okanagan resident beach users to determine the average yearly expenditures of Okanagan households on water-based recreational activities.

The results of both surveys are presented in Table 4.13. As indicated, the residents surveyed by phone at their home spent an average of $72.65 per household on goods and services related to water-based recreational activities in 1991, while those surveyed at the beach spent slightly more ($82.49). However, the latter figure cannot be considered representative of all Okanagan residents given the more limited sample size and the fact that a sample taken at the beach is by definition biased towards those individuals who participate most frequently in beach/lake shore activities and are thus likely to spend more money on the latter. As a result, we will assume for the purposes of this study that Okanagan residents spent on average $72.65 per household on water-based recreation in 1991. It can, therefore, be estimated that the 89,033 households in the Okanagan spent a total of $6.5 million on water-based recreation in 1991. It is very likely, however, that these expenditures would probably be invested in some other activity in the region if water-based recreation opportunities were limited or inexistant. Consequently, it can be inferred that the Eurasian water milfoil control program has little or no direct impact on resident expenditures.

There is, however, an important unpaid social value related to beach recreation by Okanagan residents. In order to derive an estimate of this value, we expressed the total cost of the program on a per household basis and asked a sample of 50 residents and 32 resident beach users whether they believed that amount (less than $5, including capital investments) was appropriate, high, or low given the importance to them of keeping the selected areas under control. Respondents were also asked whether they would be willing to pay more in taxes in order to expand the program. The purpose of this question was to gain an indication of the value placed upon high standards of

Table 4.14

SOCIAL VALUE OF WATER-BASED RECREATION TO OKANAGAN RESIDENTS

Question 1 The total cost of the program is equal to about $5 per household. Given the level of enjoyment that you derive from the lakes in the Okanagan, does this amount seem to you to be:

- Relatively low, given the benefits received
- About right
- Too expensive, given the benefits received

Question 2 Would you be willing to pay more in taxes in order to expand the program ?

- Yes (specify amount)
- No
- Don't Know

	Number of Residents	%	Number of Resident Beach-Users	%
Question 1:				
Low	20	40.0%	11	34.4%
About right	30	60.0%	20	62.5%
High	0	0.0%	1	3.1%
Total	50	100.0%	32	100.0%
Question 2:				
Yes	13	26.0%	7	21.9%
No	18	36.0%	16	50.0%
Don't know	19	38.0%	9	28.1%
Total	50	100.0%	32	100.0%
Amount:				
$ 5	9	69.2%	4	57.1%
$10	2	15.4%	2	28.6%
$15	0	0.0%	1	14.3%
$20	1	7.7%	0	0.0%
Over $20	1	7.7%	0	0.0%
Total	13	100.0%	7	100.0%
Average Amount	$8.46		$7.86	

Sources: Telephone Survey of 50 Residents
Survey of 32 Resident Beach Users

water and beach quality rather than a precise financial statistic. While answers to these questions do not purport to represent actual amounts taxpayers are willing to pay to preserve water-based recreational activities, they provide a good indication of their willingness to pay amounts which are in keeping with the costs of milfoil control in the Okanagan.

As indicated in Table 4.14, 60.0% of residents and 62.5% of resident beach users surveyed believed that the cost of the Eurasian water milfoil control program on a per-household basis ($5) is appropriate. A further 40.0% of residents and 34.4% of resident beach users surveyed indicated that the cost of the program is relatively low given the benefits received. While these results suggest that most residents believe that the importance of keeping milfoil infestation under control is well worth the $5 they are currently paying, it does not necessarily mean that most Okanagan residents are willing to pay more than they currently are.

As a matter of fact, only 26.0% of residents and 21.9% of resident beach users surveyed indicated that they would be willing to pay more in taxes in order to expand the program. By contrast, increased taxation was opposed by 36.0% of residents and 50.0% of resident beach users surveyed, most of whom indicated that they would prefer to see a reallocation of the current tax revenues. A further 38.0% of residents and 28.1% of resident beach users, respectively, were either unable or unwilling to provide an answer to this question.

Of the residents indicating a willingness to pay extra taxes in order to expand the program, most found it difficult to specify an amount because they were not familiar with the current cost effectiveness of the program. However, the median value for the combined responses of residents and resident beach users answering the question was about $8.00 per household per year, which is more than double the amount they are currently paying. These results would tend to confirm the significant value placed by Okanagan residents on water-based recreational activities.

The total amount that residents would be willing to pay to preserve water-based recreational activities can now be determined by applying these results to the number of households in the Okanagan. Assuming that 26.0% of all households would be willing to pay an additional $8 per year, the extra amount that Okanagan residents would be willing to pay to preserve water-based activities can be estimated at about $185,200.

Table 4.15

IMPORTANCE OF AVAILABILITY OF WATER-BASED RECREATION OPPORTUNITIES IN DECISION TO LIVE IN THE OKANAGAN

Question **On a scale of 1 to 5, how important is the availability of water-based recreation opportunities in your household decision to live in this area (for example, how likely would your family be to move if those opportunities were not available)?**

	Number of Respondents	%
1 - Not at all important	13	26.0%
2	3	6.0%
3 - Moderately important	18	36.0%
4	11	22.0%
5 - Extremely important	5	10.0%
Total	50	100.0%

Average Ranking: 2.84

Sources: Telephone Survey of 50 Residents

3. Impact on Real Estate Values

Eurasian water milfoil infestation and the accumulation of fragments at the water's edge can detract from the aesthetic appeal of the lake shores as well as from the desirability of residential areas developed adjacent to the water. For example, an economic brief prepared for the Okanagan Basin Water Board in 1976 concluded that infestation of Eurasian water milfoil reduced the value of lakefront property by 10% because of aesthetic degradation as well as reduced opportunities for swimming, boating and other recreational activities.

In order to develop a better understanding of the impact of the program on real estate values, we conducted a survey of 5 real estate professionals operating throughout the valley. All 5 respondents indicated that milfoil infestation has never come up as an issue or a consideration in any of the real estate transactions they have been involved with, mostly because it is fairly well kept under control in most residential lakefront areas with the possible exception of around Vaseux Lake. They indicated, however, that uncontrolled milfoil infestation would likely have an impact on lakefront real estate values. While most respondents found it difficult to place a value on this impact (all the more so since the demand for lakefront properties far exceeds the supply at this stage), they suggested that it would be reasonable to assume a 10% difference in value between 2 properties equivalent in their location, frontage and improvements, one with a clean beach and the other bordering on weed infestation.

It was also noted that the Okanagan has, over the last couple of years, attracted a large number of new residents who move to the region primarily because of the lifestyle and quality of life associated with the weather conditions and the lakes, as well as the comparatively lower cost of living. This was partly reflected in the survey of 50 local residents we conducted for the purposes of this study. As shown in Table 4.15, the availability of water-based recreational opportunities was a moderate to extremely important factor in their decision to live in the Okanagan for 68% of the residents surveyed. The remaining 32% of respondents indicated that the availability of these opportunities was not a factor in their decision to live in the region, usually because they were born and/or they grew up in the region.

Indeed, the 5 real estate professionals surveyed indicated that uncontrolled milfoil infestation could ultimately have an impact on real estate values throughout the region by making the Okanagan less attractive in the eyes of potential new residents. While again most respondents found it difficult to place a value on this impact, it was suggested that the latter probably would not exceed 2%.

The actual impact of the Okanagan Valley Eurasian Water Milfoil Control Program on real estate values can now be determined by applying these percentages to the assessed value of properties located in the Okanagan. Based on information supplied by the Regional Districts, the 1992 net taxable value of Okanagan properties has been estimated at about $9.42 billion. Of this total, we have estimated in Section A that lakefront properties accounted for about $2.14 billion, including $1.55 billion for land and $585 million for improvements. The impact of the program on real estate values can thus be estimated at about $360 million.

4. Other Regional Impacts

Eurasian water milfoil also has a variety of other impacts that are not easily quantifiable. Although detailed investigation of these impacts was beyond the scope of this study, they are summarized in the following paragraphs.

a. Impact on Water Use and Agriculture

The Peachland Irrigation District utilizes water from an upland stream for domestic and irrigation supply. A small stilling basin at the point of diversion is infested with Eurasian Water Milfoil. A dredge was used to remove accumulated silt in 1975 and it is probable that Eurasian Water Milfoil was introduced with this machine, which previously had been used for Eurasian water milfoil control in Okanagan Lake. The Irrigation District has attempted control of the well established plant population because of concerns about taste and odour of the water being supplied.

Eurasian water milfoil has demonstrated ability to grow luxuriantly in rapidly flowing water and may create hydraulic resistance. In the Okanagan River and lake system, which is regulated by dams to prevent flooding and to provide water storage, milfoil has interfered with regulation and control of discharges by threatening accurate measurements at stream gauging stations. In addition, milfoil grows so densely in a stretch of the Okanagan River downstream from Vaseux Lake that minor flooding can occur in the lake. However, data is not available on the actual impact of these minor floodings and interference with irrigation activities on the agriculture sector in the Okanagan. We have estimated in Section A that the Okanagan agriculture sector had sales of about $950 per farmed hectare in 1989.

b. Impact on Aquatic Ecosystems

Eurasian water milfoil is now estimated to occupy about 1,000 hectares of littoral area in watersheds in the Okanagan. Documentation by aerial photography and ground-truth mapping[2] confirmed that this exotic species dominated native vegetation as well as occupying habitats previously not supporting other macrophytes.

The impacts of Eurasian water milfoil on fishery resources were studied at an early stage of the Okanagan Valley infestation. At that time, little evidence was obtained to confirm adverse effects on salmonid fish or waterfowl. However, a 1979 survey showed that substantial numbers of juvenile non-salmonid fish (e.g. perch, crappies, sunfish, bass) are trapped in vegetation harvested in Okanagan lakes. Important game fish were never caught. The implications of ongoing harvesting and expansion of Eurasian water milfoil on predator-prey relationships and food-chains have not been explored in BC.

Eurasian water milfoil has now reached densities which interfere with some shore and river spawning salmonid species. Unless controlled, the plants interfere with spawning by covering spawning gravels and it is possible that, over time, accumulation of organic material and gravel compaction could cause further deterioration. In the Okanagan River downstream of Okanagan Lake, Kokanee spawning areas are also being occupied by Eurasian water milfoil, leading to some reduction of suitable spawning habitat. Kokanee is perceived as one of the most prized sports fish in the Okanagan Valley.

c. Impact on Water Quality

Eurasian water milfoil also has an impact on nutrient levels in mainstream Okanagan Valley lakes. While phosphorus releases from living milfoil tissue does not appear to have a measurable impact on water quality, phosphorus releases from milfoil tissue sloughing during the growing season are significant (ranging from 0.2% to 2.8% of total external phosphorus for individual Okanagan lakes). Milfoil has the potential to seasonally release more phosphorus in the Okanagan lake system than other individual sources such as storm sewers and industrial and fertilizer sources. In light of the low water turnover rate of some

[2]-*"Aquatic Plant Documentation, Okanagan Basin, 1979"*, P.H. Hepburn, Ministry of Environment

Table 4.16

LIKELIHOOD OF TRAVELLING TO ANOTHER B.C. REGION

Question 1: There is a government funded program designed to control Eurasian water milfoil, an aquatic plant that grows very well in shallow waters such as that found in beach areas. If it wasn't controlled, growth of milfoil could become so dense that it would limit or even eliminate opportunities to swim, boat, water ski or fish in waters up to 15 feet deep. Supposing that the opportunities to participate in these activities were limited, how likely is it that you still would have come to the Okanagan on this trip ?

Question 2: If you hadn't come to the Okanagan, how likely is it that you would have visited some other region of BC instead ?

	BC Resident Visitors		Out-of-Province Visitors		Total	
	Party Nights	%	Party Nights	%	Party Nights	%
Question 1:						
No chance at all (0%)	457	31.4%	483	27.7%	940	29.4%
Unlikely (25%)	520	35.8%	739	42.3%	1,259	39.3%
Even chance (50%)	287	19.7%	210	12.1%	497	15.5%
Likely (75%)	70	4.8%	58	3.3%	128	4.1%
Definitively would (100%)	120	8.3%	255	14.6%	375	11.7%
Total	1,454	100.0%	1,745	100.0%	3,199	100.0%
Question 2:						
No chance at all (0%)	101	7.6%	323	21.7%	424	15.0%
Unlikely (25%)	267	20.0%	573	38.5%	840	29.7%
Even chance (50%)	224	16.8%	297	19.9%	521	18.5%
Likely (75%)	441	33.0%	200	13.4%	641	22.7%
Definitively would (100%)	301	22.6%	97	6.5%	398	14.1%
Total	1,334	100.0%	1,490	100.0%	2,824	100.0%
Summary:						
Potential days lost for Okanagan (1)	1,334	100.0%	1,490	100.0%	2,824	100.0%
Of which:						
100% Chance lost for the province	101	7.6%	323	21.7%	424	15.0%
75% Chance lost for the province	267	20.0%	573	38.5%	840	29.7%
50% Chance lost for the province	224	16.8%	297	19.9%	521	18.5%
25% Chance lost for the province	441	33.0%	200	13.4%	641	22.7%
0% Chance lost for the province	301	22.6%	97	6.5%	398	14.1%
Potential days lost for the province	523	39.2%	951	63.8%	1,474	52.2%

Source: Survey of 270 parties travelling to the Okanagan

Note (1): As defined by all respondents excepted those responding "Definitely would (100%)" to question 1.

Okanagan lakes, the milfoil control program appears to play an important role in maintaining overall water quality.

5. Provincial Benefits of the Eurasian Water Milfoil Control Program

The Eurasian water milfoil control program also has an impact on the overall BC tourism industry, in that some of the current visitors to the Okanagan may decide to visit another province or country in the event of uncontrolled milfoil infestation, resulting in a shift of revenues out-of-province. The following paragraphs provide a description of the economic impact of the program on the BC tourism industry in terms of revenues and employment, and of its related impact on government revenues.

a. Impact on BC Tourism Industry - Revenues

As indicated in the preceding paragraphs, the 270 visitor parties surveyed for the purposes of the evaluation were asked whether they still would come to the Okanagan in the event of uncontrolled milfoil infestation. Those visitors indicating that they might not have come to the Okanagan (i.e. who did not respond "Definitely would (100%)") were then asked whether they would have visited some other region of BC instead. As indicated in Table 4.16, 22.6% of the BC resident visitors who might not have come to the Okanagan would definitively have visited another BC region instead, while 7.6% definitely would not have. The remaining 69.8% of BC resident visitors indicated that there was a 25% to 75% probability that they would have visited another BC region. The results were very different for out-of-province visitors. The proportion of out-of-province visitors that definitively would or would not have visited another BC region stood at 6.5% and 21.7% respectively, while the remaining 71.8% indicated that they might have visited another BC region with a probability ranging from 25% to 75%.

Based on these results, it is possible to estimate the actual proportion of visitors not coming to the Okanagan who would not have visited another BC region in the event of uncontrolled milfoil infestation. For the purposes of this study, we will assume that per every 100 parties indicating a n% probability of visiting another BC region (n% being equal to 25%, 50% or 75%), only n% would actually do so while the remaining (1 - n%) would not. Using this methodology, we computed that, of the 1,334 party nights in our sample involving BC residents who would not have come to the Okanagan, 523 (39.2%)

Table 4.17

ESTIMATED IMPACT OF MILFOIL CONTROL PROGRAM ON B.C. TOURISM REVENUES BASED ON SURVEY OF VISITORS

	Number of Summer Party-Nights Lost (Okanagan)	% Loss	Number of Summer Party-Nights Lost (Province)	Total Loss of Revenue for the Province (1) ($000)
BC Resident Visitors	699,800	39.2%	274,320	$22,760
Out-of-Province Visitors	267,170	63.8%	170,450	17,190
Total	966,970	46.0%	444,770	$39,950

Note:

(1) Based on the following:
BC Resident Visitors: average party size of 2.78 persons and average daily expenditure per person of $29.84;
Non-Resident Visitors: average party size of 2.79 persons and average daily expenditure per person of $36.14;

would have been spent outside the province. Similarly, 951 of the 1,490 (63.8%) party-nights involving out-of-province visitors who would not have come to the Okanagan would have been spent outside the province.

The actual impact of program termination on BC tourism revenues can now be determined by applying these loss factors to the number of party-nights that would be lost in the Okanagan in the event of uncontrolled milfoil infestation. Based on the preceding paragraphs, an estimated 967,000 party nights would be lost in the Okanagan in the event of uncontrolled milfoil infestation, including 700,000 party-nights involving BC resident visitors and 267,000 party-nights involving out-of-province visitors. Of this total, it is estimated that about 445,000 party-nights (46.0%) would be spent outside the province, including 274,500 party-nights involving BC resident visitors and 170,500 party-nights involving out-of-province visitors.

Based on data from Visitor'89 and the Resident Travel Survey, it is further estimated that these party-nights spent outside the province would translate into lost revenues of $40.0 million annually, including $22.8 million from BC resident visitors and $17.2 million from out-of-province visitors. This potential loss in revenues represents 0.8% of total 1989 BC tourism revenues.

b. Impact on BC Tourism Industry - Employment

The impact of the program on employment in the BC tourism industry can be estimated using the common standard of one job per every $50,000 in tourism revenues. Using this methodology, it is estimated that the party-nights lost to the province in the event of program termination would translate in the loss of about 800 employment positions in B.C.

c. Impact on Provincial Government Revenues

The associated impact on provincial government revenues can be estimated by applying standard taxation rates to the $40.0 million loss in tourism revenues identified in the above paragraphs. Based on data from Visitor'89 and the Resident Travel Survey, we have estimated in Section A that total 1989 tourism revenues in the Okanagan were mostly captured by the transportation sector (22.5%), restaurant facilities (20.9%), accommodation facilities (20.6%) and shopping facilities (17.9%). The total loss in tourism revenues was

Table 4.18

ESTIMATED IMPACT OF MILFOIL CONTROL PROGRAM ON B.C. GOVERNMENT REVENUES

Sector	Loss in Tourism Revenues (1)	Loss of Sales Tax Revenues (2)	Loss of Room Tax Revenues (3)	Loss of Corporate Income Tax Revenues (4)	Total Loss of Tax Revenues
Accommodation:					
Rooms (20%)	$ 1,645,940	-	131,680	-	-
Liquor (48%)	3,950,260	395,030	-	-	-
Food & Other (32%)	2,633,500	158,010	-	-	-
Subtotal	8,229,700	553,040	131,680	74,070	758,790
Restaurants:					
Liquor (14%)	$ 1,168,940	116,890	-	-	-
Food & Other (86%)	7,180,610	430,840	-	-	-
Subtotal	8,349,550	547,730	-	75,150	622,880
Transportation	$ 8,988,750	539,330	-	80,900	620,230
Shopping	7,151,050	429,060	-	64,360	493,420
Other	7,230,950	433,860	-	65,080	498,940
Total	$ 39,950,000	2,503,020	131,680	359,560	2,994,260

Notes:

(1) Breakdown between sectors based on data from Visitor'89 and Resident Travel Survey (See Section A for more details). Breakdown between categories for accommodation and restaurant sectors based on data from Ministry of Tourism (Tourism Satellite Accounts).

(2) Tax rates used are 6% (general rate) and 10% (liquor).

(3) Tax rate used is 8%.

(4) Tax rate used is 9% (small businesses). Taxable income is assumed to be 10% of revenues.

broken down by sector using these percentages in Table 4.18. Lost revenues for the accommodation and restaurant sectors were further broken down into room, meal and liquor revenues based on Tourism Satellite Accounts data published by the Ministry of Tourism.

Standard taxation rates were then applied to each category of lost revenues in order to obtain an estimate of the total loss in sales tax, room tax and corporate income tax revenues incurred by the provincial government in the event of uncontrolled milfoil infestation. Using this methodology, the impact of the Eurasian water milfoil control program on government revenues can be estimated at about $3.0 million, including $2.5 million in sales tax revenues, $0.4 million in corporate income taxes and $0.1 million in room taxes. This figure is believed to be conservative and does not include the social costs associated with the loss of 800 employment positions province-wide in the event of program termination.

C. DISTRIBUTION OF PROGRAM BENEFITS

The evaluation issue developed with respect to the relative distribution of program benefits is as follows:

Issue 5: What is the relative distribution of program benefits amongst the affected groups (e.g. operators of commercial tourism facilities, lakeshore residents, general public) ?

This issue was addressed by assigning the impacts identified under the previous Section to the various affected groups. As indicated in Table 4.19, the total regional benefits of the Okanagan Valley Eurasian Water Milfoil Control Program can be estimated at over $450 million. Main beneficiaries include the general public (about $230 million), lakeshore residents (about $130 million) and tourism operators (about $85 million). Similarly, the total provincial benefits of the program can be estimated at over $40 million. Main beneficiaries include tourism operators (about $40 million), the general public and the provincial government (about $3 million).

Table 4.19

DISTRIBUTION OF PROGRAM BENEFITS AMONG AFFECTED GROUPS

	Regional Benefits	Provincial Benefits
Tourism Operators:		
Impact on Revenues by Sector ($000) (1):		
Transportation	$ 19,120	$ 8,990
Restaurants	17,760	8,350
Accommodation	17,510	8,230
Shopping	15,220	7,150
Other	15,380	7,230
Total	$ 84,990	$ 39,950
Lakeshore Residents:		
Impact on Real Estate Values ($000) (2)	$ 133,000	-
General Public:		
Impact on Real Estate Values ($000) (3)	$ 227,000	-
Impact on Employment	1,700 Jobs	800 Jobs
Provincial Government:		
Impact on Revenues by Category ($000):		
Sales Tax	-	$ 2,500
Room Tax	-	130
Corporate Income Tax	-	360
Total	-	$ 2,990
Total Impact ($000)	Over $ 450,000	Over $ 40,000

Notes:

(1) Breakdown between sectors based on data from Visitor'89 and Resident Travel Survey (See Section A for more details).

(2) Lakeshore residents are defined as those living on privately owned developed lakefront lots, as opposed to privately owned undeveloped lots. We have estimated in Section A that there are about 4,396 such lots which can be valued at about $1.33 billion, including $0.75 billion for land and $0.58 billion for improvements (See Section A for more details).

(3) Defined as total impact on real estate values ($360 million) minus the impact on real estate values for lakeshore residents.

V. PROGRAM DESIGN AND DELIVERY

This chapter summarizes our findings with respect to the design and delivery of the Okanagan Valley Eurasian Water Milfoil Control Program.

A. PROGRAM IMPLEMENTATION

The evaluation issue established with respect to program delivery is as follows:

Issue 6: Was the program implemented in a manner conducive to the realization of the intended impacts and effects?

In order to identify the main constraints and problems experienced during program implementation, as well as the level of satisfaction with the delivery process and the perceived cost effectiveness of the program, we interviewed program representatives, local residents, tourism operators and a private contractor providing milfoil control services in the Okanagan. The major findings of the evaluation with respect to this evaluation issue are summarized as follows:

1. The focus of the program has evolved over the years.

   It was recognized in about 1980 that containment of Eurasian water milfoil in most Okanagan Valley lakes was impossible, and that only cosmetic or semi-intensive management was possible. As a result, the focus of the program has since shifted from an attempt to eradicate Eurasian water milfoil populations to one of management and control of further spread of the plant.

2. The selection of sites to be treated has been consistent with the objectives established for the program.

   Annual treatment schedules were prepared based on the effectiveness of activities in prior years as well as comments received from the public, the Okanagan Basin Water Board (OBWB) and the Ministry of Environment, Lands & Parks. Highest priority for control was accorded to public recreation areas, especially beach areas used by tourists, resort-type areas and residential areas although some exceptions were made, mostly for aesthetic considerations.

Table 5.1

AWARENESS OF THE OKANAGAN VALLEY EURASIAN WATER MILFOIL CONTROL PROGRAM

Question **On a scale of 1 to 5, how familiar are you with the Eurasian Water Milfoil Control Program in the Okanagan?**

	Number of Respondents	%
Residents:		
1 - Not at all familiar	11	22.0%
2	4	8.0%
3 - Moderately familiar	32	64.0%
4	3	6.0%
5 - Extremely familiar	0	0.0%
Total	50	100.0%
Resident Beach Users:		
1 - Not at all familiar	3	9.4%
2	5	15.6%
3 - Moderately familiar	21	65.6%
4	3	9.4%
5 - Extremely familiar	0	0.0%
Total	32	100.0%
Tourism Operators:		
1 - Not at all familiar	8	13.3%
2	3	5.0%
3 - Moderately familiar	31	51.7%
4	16	26.7%
5 - Extremely familiar	2	3.3%
Total	60	100.0%

Sources: Telephone Survey of 50 Residents
Survey of 32 Resident Beach Users
Survey of 60 Tourism Operators

3. The activities of the program are plausibly linked to the attainment of its intended impacts and objectives.

The intended impacts and objectives of the Okanagan Valley Eurasian Water Milfoil Control Program were not stated in quantitative terms, so it is not possible to assess the extent to which the objectives have been accomplished. However, funding provided under the program stimulated a variety of control activities including harvesting, derooting, dredging, and the application of bottom barriers. The results of the evaluation indicate these activities have facilitated water-based recreational opportunities for both visitors and Okanagan residents. As evidenced in the previous chapter, this in turn has led to further development of the tourism sector in the Okanagan and to increased revenues for government.

4. Local residents and tourism operators are generally aware of the program.

Public education activities since 1974 have alerted the public to the problems created by Eurasian water milfoil and especially encouraged public cooperation in identifying possible new infestations and in reducing further spread. As part of this evaluation, we conducted a survey of 50 local residents, 32 resident beach users and 60 tourism operators located in the immediate vicinity of the affected lakes to determine the level of public awareness of the program. As indicated in Table 5.1, the majority of respondents surveyed were moderately familiar with the program. Most respondents indicated that they became aware of the program through the signs posted on various beaches or by actually witnessing milfoil control activities in the lakes. As could be expected given the direct impact of milfoil infestation on their operations, the 60 tourism operators surveyed were comparatively more familiar with the program than were residents or resident beach users. About 30.0% of tourism operators surveyed indicated that they were quite familiar or extremely familiar with the program, as compared to only 6.0% and 9.4% for residents and resident beach users respectively.

5. The majority of local residents and tourism operators are satisfied with the program.

Those respondents indicating that they were moderately familiar, quite familiar or extremely familiar with the program were asked whether they were satisfied with the program and its

Table 5.2

SATISFACTION WITH THE OKANAGAN VALLEY EURASIAN WATER MILFOIL CONTROL PROGRAM

Question **(If familiar with the program) On a scale of 1 to 5, how satisfied would you say that you are with the program?**

	Number of Respondents	%
Residents:		
1 - Not at all satisfied	1	2.9%
2	4	11.4%
3 - Moderately satisfied	22	62.8%
4	7	20.0%
5 - Extremely satisfied	1	2.9%
Total	35	100.0%
Resident Beach Users:		
1 - Not at all satisfied	0	0.0%
2	3	12.5%
3 - Moderately satisfied	12	50.0%
4	6	25.0%
5 - Extremely satisfied	3	12.5%
Total	24	100.0%
Tourism Operators:		
1 - Not at all satisfied	2	4.1%
2	8	16.3%
3 - Moderately satisfied	18	36.7%
4	18	36.7%
5 - Extremely satisfied	3	6.2%
Total	49	100.0%

Sources: Telephone Survey of 50 Residents
Survey of 32 Resident Beach Users
Survey of 60 Tourism Operators

outputs to date. As indicated in Table 5.2, the majority of residents, resident beach users and tourism operators surveyed indicated that they were moderately satisfied, quite satisfied, or extremely satisfied with the program. Most of the respondents expressing satisfaction indicated that they had noticed a definite improvement over the last 10 years and that milfoil infestation was apparently well under control. Only 14.3%, 12.5% and 20.4% of residents, resident beach users, and tourism operators respectively indicated that they were not satisfied or not at all satisfied with the program. Most respondents expressing dissatisfaction with the program indicated that their area had not been treated in the recent past. There was also some degree of confusion as to what milfoil control activities can or cannot achieve. For example, some respondents expressing dissatisfaction with the program were clearly under the impression that Eurasian water milfoil could be eradicated and did not understand why such was not the case.

6. The cost-share approach has worked well and has encouraged a reasonable and effective control program.

Experience to date indicates that the cost-share approach has encouraged a reasonable and effective control program. The OBWB has played a crucial role in helping to establish local priorities for on-going management and to encourage political and public support for control activities, while the Ministry of Environment, Lands & Parks has played an important role in terms of funding, technical assistance and monitoring. Furthermore, the majority of program representatives surveyed felt that there was a generally high level of cooperation between OBWB staff and Ministry staff, especially over the last few years.

7. The OBWB and Ministry of Environment, Lands & Parks have, over the years, developed a specialized knowledge and experience of Eurasian water milfoil which has in turn served to increase the effectiveness of the program.

For example, the Ministry of Environment, Lands & Parks has publicized and shared the experience gained from a diverse and comprehensive management effort through the production of over 60 technical reports and information summaries, and participation in many public meetings, national and international workshops and technical symposia.

Table 5.3

COMPARISON OF MILFOIL HARVESTING COSTS, OKANAGAN VALLEY AND METRO SEATTLE PROGRAMS

	1985	1986	1987	1988	1989	1990
Okanagan Valley Program:						
Total Area Harvested (Hectares)	90	108	97	91	74	54
Total Costs (1):						
Operating	$ 90,654	$ 106,910	$ 83,823	$ 90,122	$ 89,954	$ 86,699
Administration	8,221	7,875	5,874	6,150	6,473	11,861
Total	98,975	114,785	89,687	96,272	96,427	98,560
Total Costs per Hectare (1):						
Operating	$ 1,008	$ 990	$ 865	$ 990	$ 1,216	$ 1,605
Administration	92	73	60	68	87	220
Total	1,100	1,063	925	1,058	1,303	1,825
Metropolitan Seattle Program:						
Total Area Harvested (Hectares)	32	37	33	20	21	19
Total Costs (2):						
Operating	$ 48,861	$ 53,513	$ 40,499	$ 33,191	$ 40,775	$ 34,621
Administration	1,472	2,950	3,282	3,385	4,030	3,462
Total	50,333	56,463	43,781	36,576	44,805	38,083
Total Costs per Hectare (2):						
Operating	$ 1,527	$ 1,446	$ 1,227	$ 1,660	$ 1,942	$ 1,822
Administration	46	80	100	169	192	182
Total	1,573	1,526	1,327	1,829	2,134	2,004

Sources: Okanagan Valley Eurasian Water Milfoil Control Program, Annual Reports
1990 Annual Harvesting Report, Municipality of Metropolitan Seattle, Water Pollution Control Department

Notes: (1) In Canadian Dollars (Costs shown do not include major capital costs, depreciation on equipment and provincial monitoring, evaluation and administration costs).
(2) In U.S. Dollars (Totality of program is contracted out to private company).

8. Delivery of the program has generally been cost effective.

The majority of program representatives indicated that, although some parts of the program and testing of the technologies may appear, in hindsight, to have been ineffective, the practical experience gained from nearly 20 years of management has resulted in a streamlined and cost effective program. For example, improved preventive maintenance on the harvesting and derooting equipment has resulted in more reliable operation.

Indeed, the cost effectiveness of the program can be seen as a function of several factors, including:

- The total area treated;
- The quality of the treatment performed;
- The costs of these control activities;
- The benefits resulting from these control activities.

While it is possible to quantify the other factors, it was noted that the quality of treatment achieved is more subjective in nature and difficult to determine. During the term of the program, field assessments of treatment sites were generally carried out by Water Quality Branch staff, whose observations were made available to OBWB personnel to assist in technology selection and timing. Several indicators would tend to suggest that the quality of treatment was satisfactory. For example, based on the level of public satisfaction with the program described in the above paragraphs, it can be inferred that the quality of treatment performed was perceived to be satisfactory by most residents and tourism operators. Another indicator of relative satisfaction with the quality of treatment is the increased public use of many treated sites. As indicated in the previous chapter, beach use in the Okanagan more than doubled between 1970 and 1991, from 3.9 million beach days to 8.8 million beach days.

It is possible to derive an indication of the relative cost effectiveness of the Okanagan Valley Eurasian Water Milfoil Control Program through a comparison with other similar programs such as the Metropolitan Seattle program. As indicated in Table 5.3, the cost per hectare harvested appears to have been consistently lower in the Okanagan than in Metro Seattle over the last 6 years. It should be noted, however, that such a comparison can only provide a general indication of the overall cost effectiveness of the Okanagan Valley

program, due to a number of major differences between the 2 programs. For example, harvesting is the only control activity used in the Metro Seattle Program, and is entirely performed by a private contractor. The use of private contractors at a fixed price by the Metro Seattle program may have resulted in several cost advantages not available to the Okanagan program, including cost stability and the avoidance of unforeseen mechanical repairs and other unexpected costs. Furthermore, the total area harvested annually through the Seattle program has typically been much smaller than that harvested in the Okanagan. The larger size of areas treated in the Okanagan may have resulted in operating efficiencies not available to the Metro Seattle program. In addition, the costs shown in Table 5.3 do not necessarily reflect the actual costs of treatment because the schedules of treatment operations do not coincide with either the calendar year or the fiscal year of the agencies involved. Finally, costs may vary significantly from year to year depending on the amount of downtime or mechanical repairs required for the control equipment.

9. However, the overall effectiveness of the program may have been constrained by resource limitations.

The majority of the program representatives surveyed indicated that the total priority areas infested with Eurasian water milfoil are now too large to be completely controlled with the resources available. It was noted that tourism and residential development over the last 10 years have created a need to treat more areas as well as a need to treat some areas more frequently.

In addition, it was noted that resource limitations have also made it difficult to compare yearly growth and follow up on the progress achieved. The last comprehensive surveys of Eurasian water milfoil infestation in the Okanagan were undertaken in 1980, and the Water Quality Branch has not since had the staff resources to provide the detailed year-to-year mapping that was possible before 1980.

10. The use of private contractors to assist in Eurasian water milfoil control activities has produced mixed results to date.

Over the years, several private contractors offering aquatic control services have been used by the OBWB to assist in Eurasian water milfoil control activities. However, according to the majority of program representatives surveyed, only one of the private contractors used

produced satisfactory results from a control point of view. The majority of program representatives surveyed indicated that it was difficult to attract and retain qualified private contractors for a variety of reasons. It was noted that only a few contractors in the province possessed the necessary equipment or experience to deal effectively with Eurasian water milfoil control. It was also noted that the type of equipment required is expensive and does not lend itself to a profitable operation on a seasonal or short-term basis. The private contractor surveyed for the purposes of this study sustained a sizeable loss in the last year and recently sold his equipment to the OBWB.

B. PROGRAM ALTERNATIVES

The evaluation issue established with respect to program alternatives is as follows:

Issue 7: Are there more effective ways to achieve the intended impacts and effects of the Okanagan Valley Eurasian Water Milfoil Control Program?

In order to identify more effective ways to achieve the intended impacts and effects of the program, we interviewed program representatives, local residents, tourism operators and representatives in other regions. The major findings of the evaluation with respect to this evaluation issue are summarized as follows:

1. There is strong support to expand the program to include one or two more machines, preferably of the derooting type.

   The majority of the program representatives surveyed indicated that the total priority areas infested with Eurasian water milfoil are now too large to be completely controlled with the resources available. Most respondents, while recognizing the impossibility of controlling all of the infested areas, indicated that the use of one or two more machines, preferably of the derooting type, would allow for a more acceptable compromise regarding the level of Eurasian water milfoil infestation and control.

2. There is strong support for maintaining the current 75/25 cost-share formula.

The majority of program representatives surveyed indicated that the current cost-share formula has worked well and should be maintained under a future agreement. It was noted that Regional Districts do not have the necessary tax levy to assume a greater share of the program costs and that the lakes, being located on Crown Land, are ultimately the responsibility of the province.

3. Increasing emphasis should be placed on derooting rather than harvesting as a means to control Eurasian water milfoil.

Short-term and cosmetic in nature, harvesting has traditionally been one of the mainstays of the program providing immediate control to large areas of heavy use at a reasonable cost. However, harvesting has slowly been displaced by derooting as the leading control activity in the Okanagan over the past seven years. Indeed, derooting offers several advantages over harvesting. For example, derooting methods can, under suitable conditions, provide 80-95% effectiveness over one season. In addition, derooting is less intrusive than harvesting and can be performed during the off-season when plant biomass is reduced and water-based recreation is minimal. The majority of program representatives surveyed further indicated that expanded use of derooting techniques should permit reductions in areas requiring harvesting, allowing further reallocation of resources to other areas of the Okanagan.

4. High priority should continue to placed on research concerning long-term solutions such as biological control technologies.

The majority of program representatives, residents and tourism operators surveyed indicated that the province should continue to carry out research using its own resources and to assist and encourage research by private individuals or groups. It was noted that harvesting and derooting are only short-term solutions that place a continuous financial drain on the province and local government. Although the use of biocontrol agents for Eurasian water milfoil such as insects or grass carp has been widely considered in North America, the only promising agent for use in the Okanagan so far was an aquatic insect discovered during ecological research by the Ministry of Environment between 1977 and 1981. This research was then renewed through a B.C. Science Council grant to a master's student and discontinued again when the researcher obtained his Master's degree. It has since been renewed through a contract with a private consulting firm.

5. However, biological control methods involving exotic species should only be undertaken after a careful consideration and consultation with other jurisdictions.

   Program representatives indicated that because of the possible spread of the biological control species selected to the entire Columbia system, biological control involving exotic species should only be undertaken after careful consideration and consultation with the State of Washington and the U.S. government.

6. The active cooperation and assistance of the federal government should be sought for research assistance and projects.

   Liaison and exchange of information on the milfoil situation in the Okanagan and other parts of Canada is on-going between the provincial and the federal government. Although the federal government has, in the past, conducted a number of studies on Eurasian water milfoil and other weeds, none of these studies produced results that were directly applicable to British Columbia and the Okanagan in particular. Some of the program representatives felt that the federal government should again be approached to enlist its active participation in various research projects that could be of direct benefit to the Okanagan.

7. Greater awareness of the program and its accomplishments should be promoted to the public.

   Although public education activities have been undertaken since 1974, several program representatives indicated that factual information on the nature of Eurasian water milfoil and the technologies available for its control should continue to be made available to the public through the media, public libraries, public meetings and other suitable means. It was noted that public perceptions and understanding of control technologies may affect the level of public support and cooperation received and help correct certain misconceptions concerning the results that can reasonably be achieved by control activities. Similarly, several respondents noted that the public should be made to understand that milfoil would break off naturally even if it was not harvested, resulting in the same accumulation of fragments on the lake shore (which has been the subject of many complaints).

8. Delivery of substantial portions of the program under contract through the private sector is not likely to enhance overall program effectiveness.

As shown by the example of Eurasian Water Milfoil Control Program of the Municipality of Metropolitan Seattle, the use of private contractors can provide cost stability by avoiding unforeseen contingencies such as mechanical repairs and other unexpected, possibly high costs. Documentation obtained concerning the Metro Seattle program shows that the use of a private contractor can also reduce administrative time and free staff from project management tasks such as troubleshooting equipment problems, and hiring and supervising machine operators. All in all, the use of a private contractor to deliver the Metro Seattle program seems to have resulted in slightly higher operating costs and lower administration costs.

However, the majority of program representatives surveyed indicated that an approach similar to that adopted for the Metro Seattle Control Program, whereby the totality or the majority of the program is delivered by private contractors, would actually translate into a higher risk to the Okanagan and province. Given the relatively small number of qualified private contractors, it was noted that the laws of supply and demand may make it difficult for the Okanagan to retain qualified private contractors should another jurisdiction in Canada or the Pacific Northwest dispose of a considerably larger budget for Eurasian water milfoil and weed control.

It was also noted that the Ministry of Environment, Lands & Parks and the OBWB have, over the last decade, developed a specialized knowledge and experience of Eurasian water milfoil which places them at an advantage vis-a-vis most private contractors in terms of overall program effectiveness. Finally, most program representatives indicated that delivery through a public agency is inherently more cost effective than delivery through private contractors because the latter usually have to charge higher prices to cover their cost and earn a profit. This was echoed by the private contractor surveyed for the purposes of this study, who indicated that his costs were superior to those of the provincially owned equipment and that he could not operate profitably at the price set in his contract with the OBWB last year.

9. A comprehensive "user-fee" structure for the program would be difficult to implement.

A user-fee system has occasionally been used by the OBWB in instances where treated areas were privately owned and it did not interfere with the treatment of priority areas. However, most program representatives surveyed indicated that a comprehensive fee for service structure would be difficult to implement for a number of reasons, especially through a public agency. For example, it was noted that such a system may lead to some of the priority areas being ignored and not treated. It was also noted that scheduling of the equipment and control activities would be more difficult and that a "user-fee" structure may require an increased operating and administration budget for the program which would exceed the value of the fees collected. However, respondents indicated that the greatest difficulty with such a system would be to ensure that all beneficiaries of the control services assume a share of the costs that is directly proportional to the benefits received. Although some of the tourism operators surveyed for the purposes of this study indicated a willingness to help cover the control costs for areas that are of direct concern to them, most program representatives felt that the current system of financing control activities with tax dollars ensures a better distribution of costs relative to the benefits received.

10. Consideration should be given to ensuring continuity of funding at a pre-determined level for a period of 2 or 3 years to further enhance the effectiveness of the program.

Some of the program representatives surveyed indicated that both the OBWB and the Ministry of Environment, Lands & Parks spend considerable time every year to establish and negotiate operating budgets for the following year. It was felt that continuity of funding for 2 to 3 years at a pre-determined level would substantially reduce the amount of time spent by both parties on budgetary considerations, thus allowing for a reallocation of resources to other facets of the program. In addition, it was noted that such an approach would make it easier to attract and retain qualified and experienced private contractors by allowing the signing of multi-year contracts at a pre-determined price.

VI. CONCLUSIONS AND RECOMMENDATIONS

This chapter summarizes the major conclusions which have been formulated as a result of our review of the Okanagan Valley Eurasian Water Milfoil Control Program and presents a series of recommendations designed to enhance the effectiveness of the program.

A. CONCLUSIONS

The major conclusions arising from our review of the program are as follows:

1. The rationale, objectives and activities of the Okanagan Valley Eurasian Water Milfoil Control Program are still valid.

A number of factors point to the continued relevance of the program, including:

- Experience has shown that eradication of Eurasian water milfoil is practically impossible once plants have become established. Therefore, continuous control is necessary to prevent further spread and to facilitate water-based recreational activities in most of the lakes affected.

- The magnitude of Eurasian water milfoil infestation has increased noticeably since its introduction in Okanagan Lake in 1971. By 1979, Eurasian water milfoil was known to be established in about 675 hectares in the Okanagan Valley and in about 800 hectares by 1986. It is estimated that about 1,000 hectares of shoreline are now infested with milfoil.

- Despite on-going control, Eurasian water milfoil continues to have an impact on local residents, tourism operators and beach users. Because substantial areas of 7 lakes affected cannot be treated due to control resource limitations, nuisance populations are controlled in important public beach and marina areas, as determined by local priorities. Of the 1,000 hectares of shoreline now infested with milfoil, only about 150 hectares was treated through the program in 1990. As a result, the control program remains unsatisfactory to some local users and tourism operators.

- The Okanagan region has experienced rapid population growth over the past 15 years, from 170,000 in 1976 to 225,000 in 1991 (up 37.2%). According to the Central Statistics Bureau, the population of the Okanagan will grow by another 15.3% by the year 2000, to 259,000.

- The number of visitors to the Okanagan has increased steadily over the last 10 years, from about 2.5 million in 1979 to 3.1 million in 1989 (up 23.2%). In particular, the completion of the Coquihalla Highway and the Okanagan Connector has made the region more easily accessible from the major population centre in the Lower Mainland.

- As a result of the increase in population and number of visitors to the region, the demand for water-based activities increased dramatically over the last 20 years. Beach use by residents and visitors increased from 3.9 million beach days in 1970 to an estimated 8.8 million beach days in 1990. Beach use is further projected to increase to 10.1 million beach days in 2000.

- The activities of the program are plausibly linked to the attainment of its intended impacts and objectives. The intended impacts and objectives of the Okanagan Valley Eurasian Water Milfoil Control Program were not stated in quantitative terms, so it is not possible to assess the extent to which the objectives have been accomplished. However, funding provided under the program stimulated a variety of control activities including harvesting, derooting, dredging, and the application of bottom barriers, which in turn have facilitated water-based recreational opportunities for both visitors and Okanagan residents.

2. The program has promoted further economic development in the Okanagan.

The benefits of the Okanagan Valley Eurasian Water Milfoil Control Program can be determined by assessing the potential economic impact of program termination. As Eurasian water milfoil is generally restricted to water depths of 6 metres (20 feet) or less, populations of the plant tend to be located in areas along the shoreline. Dense populations of the plant can interfere with and virtually eliminate opportunities for a wide variety of

Table 6.1

SUMMARY OF THE REGIONAL AND PROVINCIAL BENEFITS OF THE OKANAGAN VALLEY EURASIAN WATER MILFOIL CONTROL PROGRAM

	Regional Benefits	Provincial Benefits
Tourism Operators:		
Impact on Revenues by Sector ($000) (1):		
Transportation	$ 19,120	$ 8,990
Restaurants	17,760	8,350
Accommodation	17,510	8,230
Shopping	15,220	7,150
Other	15,380	7,230
Total	$ 84,990	$ 39,950
Lakeshore Residents:		
Impact on Real Estate Values ($000) (2)	$ 133,000	-
General Public:		
Impact on Real Estate Values ($000) (3)	$ 227,000	-
Impact on Employment	1,700 Jobs	800 Jobs
Provincial Government:		
Impact on Revenues by Category ($000):		
Sales Tax	-	$ 2,500
Room Tax	-	130
Corporate Income Tax	-	360
Total	-	$ 2,990
Total Impact ($000)	Over $ 450,000	Over $ 40,000

Notes:

(1) Breakdown between sectors based on data from Visitor'89 and Resident Travel Survey (See Section A in Chapter IV for more details).

(2) Lakeshore residents are defined as those living on privately owned developed lakefront lots, as opposed to privately owned undeveloped lots. We have estimated in Section A that there are about 4,396 such lots which can be valued at about $1.33 billion, including $0.75 billion for land and $0.58 billion for improvements (See Section A in Chapter IV for more details).

(3) Defined as total impact on real estate values ($360 million) minus the impact on real estate values for lakeshore residents.

water-based activities such swimming, motor boating, water skiing, sailing and shore-based angling. In addition to restricting these opportunities for both residents and visitors to the Okanagan, uncontrolled milfoil infestation would also detract from the aesthetic appeal of the lakes.

Based upon the results of this evaluation, we have concluded that termination of the program would have a significant impact upon the tourism industry and real estate values in the Okanagan. Termination of the program would lead to a projected decline in:

- Okanagan tourism revenues of about $85.0 million, including $58.0 million from BC resident visitors and $27.0 million from out-of-province visitors.

  As indicated in Table 6.1, the main economic sectors impacted are the transportation sector ($19.1 million), the restaurant industry ($17.8 million), the accommodation sector ($17.5 million) and the shopping sector ($15.2 million). This potential loss in revenues represents 26.5% of total 1989 Okanagan tourism revenues, and about 46.5% of 1989 revenues occurring between the beginning of June and the end of August.

- Employment in the Okanagan tourism industry of about 1,700 positions.

  This potential loss represents about 19.6% of the regional workforce employed in the tourism industry and 1.9% of the total regional workforce.

- Real estate values in the region of about $360.0 million, including $133.0 million for properties located on the lakeshore.

  This potential loss represents about 3.8% of the total 1992 net taxable value of Okanagan properties.

3. **The Okanagan Valley Eurasian Water Milfoil Control Program has also promoted further economic development at the provincial level.**

The program also has had an impact on the overall BC tourism industry, in that some of the visitors to the Okanagan may have decided to visit another province or country in the

event of uncontrolled milfoil infestation, resulting in a shift of revenues out-of-province. Termination of the program would lead to a projected decline in:

- BC tourism revenues of about $40.0 million, including $22.8 million from BC resident visitors and $17.2 million from out-of-province visitors.

  As indicated in Table 6.1, the main economic sectors impacted are the transportation sector ($9.0 million), the restaurant industry ($8.3 million), the accommodation sector ($8.2 million) and the shopping sector ($7.1 million). This potential loss in revenues represents 0.8% of total 1989 BC tourism revenues.

- Employment in the BC tourism industry of about 800 positions.

4. The impact of the program on provincial government revenues has been much greater than its cost.

Based on the loss in BC tourism revenues that are projected to occur in the event of program termination, the impact of the Okanagan Valley Eurasian Water Milfoil Control Program on provincial government revenues has been estimated at about $3.0 million, including:

- $2.5 million in sales tax revenues;
- $0.4 million in corporate income tax revenues;
- $0.1 million in room tax revenues.

5. The majority of local residents and tourism operators are satisfied with the program.

The majority of residents and tourism operators surveyed for the purposes of this study indicated that they were moderately satisfied, quite satisfied, or extremely satisfied with the program. Most of the respondents expressing satisfaction indicated that they had noticed a definite improvement over the last 10 years and that milfoil infestation was apparently well under control. Only 14.3% and 20.4% of residents and tourism operators respectively indicated that they were not satisfied or not at all satisfied with the program, usually because their area had not been treated in the recent past.

6. **The program is delivered in a cost effective manner.**

The results of our evaluation indicate that the practical experience gained from nearly 20 years of management has resulted in a streamlined and cost effective program. The Ministry of Environment, Lands & Parks has publicized and shared the experience gained from a diverse and comprehensive management effort through the production of over 60 technical reports and information summaries, and participation in many public meetings, national and international workshops and technical symposia. Improved preventive maintenance on the harvesting and derooting equipment has over the years resulted in more reliable operation. In addition, comparison with a similar program in Seattle indicates that the cost per hectare harvested has been consistently lower in the Okanagan than in Metro Seattle over the last 6 years.

7. **The cost-share approach has worked well and has encouraged a reasonable and effective control program.**

Experience to date indicates that the cost-share approach has encouraged a reasonable and effective control program. The Okanagan Basin Water Board (OBWB) has played a crucial role in helping to establish local priorities for on-going management and to encourage political and public support for control activities, while the Ministry of Environment, Lands & Parks has played an important role in terms of funding, technical assistance and monitoring. Furthermore, there was a generally high level of cooperation between OBWB staff and Ministry staff, especially over the last few years.

B. RECOMMENDATIONS

The major recommendations arising from our review of the program are as follows:

1. **Funding for the delivery of the Okanagan Valley Eurasian Water Milfoil Control Program should continue to be provided.**

The reasons for recommending continuation of the program as delivered by the OBWB and the Ministry of Environment, Lands & Parks are as follows:

- The rationale, objectives and activities of the program are still valid;
- The specialized knowledge and experience acquired by the OBWB and the Ministry of the Environment, Lands & Parks over the years have resulted in an effective delivery mechanism for the program;
- The program has had a major impact on economic development in the Okanagan and the province;
- The majority of local residents and tourism operators surveyed were satisfied with the program;
- Most of program representatives, residents and tourism operators surveyed strongly supported continuation of the program;
- There are no other similar government programs in the Okanagan.

2. The current 75/25 cost-share formula should be maintained.

The current cost-share formula has worked well and should be maintained under a future agreement. Regional Districts do not have the necessary tax levy to assume a greater share of the program costs and the lakes, being located on Crown Land, are ultimately the responsibility of the province.

3. Increasing emphasis should continue to be placed on derooting rather than harvesting as a means to control Eurasian water milfoil.

Harvesting has traditionally been one of the mainstays of the program providing immediate control to large areas of heavy use at a reasonable cost. However, it has slowly been displaced by derooting as the leading control activity in the Okanagan over the past seven years. Indeed, derooting offers several advantages over harvesting. For example, derooting methods can, under suitable conditions, provide 80-95% effectiveness over one season. In addition, derooting is less intrusive than harvesting and can be performed during the off-season when plant biomass is reduced and water-based recreation is minimal. Expanded

use of derooting techniques should permit reductions in areas requiring harvesting, allowing further reallocation of resources to other areas of the Okanagan.

4. **High priority should continue to placed on research concerning long-term solutions such as biological control technologies.**

The province should continue to carry out research using its own resources and to assist and encourage research by private individuals or groups. It was noted that harvesting and derooting are only short-term solutions that place a continuous financial drain on the province and local government. Although the use of biocontrol agents for Eurasian water milfoil such as insects or grass carp has been widely considered in North America, the only promising agent for use in the Okanagan so far was an aquatic insect discovered during ecological research by the Ministry of Environment between 1977 and 1981.

5. **The active cooperation and assistance of the federal government should be sought for research assistance and projects.**

Although the federal government has, in the past, conducted a number of studies on Eurasian water milfoil and other weeds, none of these studies produced results that were directly applicable to British Columbia and the Okanagan in particular. The federal government should again be approached to enlist its active participation in various research projects that could be of direct benefit to the Okanagan.

6. **Greater awareness of the program and its accomplishments should be promoted to the public.**

Although public education activities have been undertaken since 1974, factual information on the nature of Eurasian water milfoil and the technologies available for its control should continue to be made available to the public through the media, public libraries, public meetings and other suitable means. Public perceptions and understanding of control technologies may affect the level of public support and cooperation received and help correct certain misconceptions concerning the results that can reasonably be achieved by control activities. Similarly, the public should be made to understand that milfoil would break off naturally even if it was not harvested, resulting in the same accumulation of fragments on the lake shore (which has been the subject of many complaints).

7. **Delivery of substantial portions of the program under contract through the private sector should not be pursued.**

The experience of the Metro Seattle milfoil control program shows that the use of private contractors can provide cost stability by avoiding unforeseen contingencies such as mechanical repairs and other unexpected, possibly high costs. Documentation obtained concerning the Metro Seattle program shows that the use of a private contractor can also reduce administrative time and free staff from project management tasks such as troubleshooting equipment problems, and hiring and supervising machine operators. All in all, the use of a private contractor to deliver the Metro Seattle program seems to have resulted in slightly higher operating costs and lower administration costs.

However, an approach similar to that adopted for the Metro Seattle Control Program, whereby the totality or the majority of the program is delivered by private contractors, may actually translate into a higher risk to the Okanagan and province. Given the relatively small number of qualified private contractors, the laws of supply and demand may make it difficult for the Okanagan to retain qualified private contractors should another jurisdiction in Canada or the Pacific Northwest dispose of a considerably larger budget for Eurasian water milfoil and weed control.

In addition, the Ministry of Environment, Lands & Parks and the OBWB have, over the last decade, developed a specialized knowledge and experience of Eurasian water milfoil which places them at an advantage vis-a-vis most private contractors. Finally, experience has shown that delivery through a private contractor is not necessarily more cost effective than delivery through a public agency because private contractors usually have to charge higher prices to cover their cost and earn a profit.

8. **A comprehensive "user-fee" structure for the Okanagan Valley Eurasian Water Milfoil Control Program should not be pursued.**

A user-fee system has occasionally been used by the OBWB in instances where treated areas were privately owned and it did not interfere with the treatment of priority areas. However, a comprehensive fee for service structure would be difficult to implement through a public agency for a number of reasons. For example, such a system may lead to some of

the priority areas being ignored and not treated. In addition, scheduling of the equipment and control activities may be more difficult and a "user-fee" structure may require an increased operating and administration budget for the program which may exceed the value of the fees collected. However, the greatest difficulty associated with such a system would be to ensure that all beneficiaries of the control services assume a share of the costs that is directly proportional to the benefits received. Although some of the tourism operators surveyed for the purposes of this study indicated a willingness to help cover the control costs for areas that are of direct concern to them, the current system of financing control activities with tax dollars is believed to ensure a better distribution of costs relative to the benefits received.

9. **Consideration should be given to expanding the program to include one or two more machines, preferably of the derooting type.**

Priority areas infested with Eurasian water milfoil are now too large to be completely controlled with the resources available. The use of one or two more machines, preferably of the derooting type, would in the opinion of most program representatives allow for a more acceptable compromise regarding the level of Eurasian water milfoil infestation and control.

10. **Consideration should be given to ensuring continuity of funding at a pre-determined level for a period of 2 or 3 years to further enhance the effectiveness of the program.**

Both the OBWB and the Ministry of Environment, Lands & Parks allocate considerable time every year to the establishment and negotiation of operating budgets for the following year. Continuity of funding for 2 to 3 years at a pre-determined level would substantially reduce the amount of time spent by both parties on budgetary considerations, thus allowing for a reallocation of resources to other facets of the program. In addition, such an approach would make it easier to attract and retain qualified and experienced private contractors by allowing the signing of multi-year contracts at a pre-determined price.

APPENDIX I

LIST OF DOCUMENTATION REVIEWED

LIST OF DOCUMENTATION REVIEWED

- *Annual Reports of the Okanagan Valley Eurasian Water Milfoil Control Program,* 1982-83 to 1989-90;
- *"Aquatic Plant Documentation, Okanagan Basin, 1978",* P.H. Hepburn, Ministry of Environment;
- *"Aquatic Plant Documentation, Okanagan Basin, 1979",* P.H. Hepburn, Ministry of Environment;
- *"Review of Aquatic Plant Management Methods and Programs in B.C.",* Ministry of Environment, July, 1986;
- *"A Review of the Eurasian Water Milfoil Impacts and Management in B.C.",* Peter R. Newroth, Ministry of Environment, 1986;
- *"Review of Current Aquatic Plant Management Activities in B.C.",* Peter R. Newroth, Ministry of Environment, 1988;
- *"Valuation of Aquatic Plant Economic Benefits",* Jim E. Henderson;
- *"Plan of Study for Determining Economic Values of Aquatic Plant Management",* Jim Henderson;
- *"The Economic Devaluation of Lakefront Property in Heavily Weed Infested Areas of the Okanagan Lake System",* Okanagan Basin Water Board;
- *"Interim Reports of the Advisory Committee on the Control of Eurasian Water Milfoil in the Okanagan Lake System of British Columbia",* March, 1978.
- *"Water-Based Recreation in the Okanagan Basin, 1980 Review",* prepared for the Okanagan Basin Implementation Board;
- *"Water-Based Recreation in the Okanagan Basin",* Canada-British Columbia Okanagan Agreement, March, 1974;
- *"Thompson Okanagan Development Region Tourism Opportunities Development Strategy",* Ference Weicker and Company;
- *"Washington and Oregon Resident Travel Survey",* prepared for the Ministry of Tourism, 1985;
- *"Visitor '87, a Travel Survey of Visitors to B.C.",* B.C. Ministry of Tourism, Recreation and Culture;
- *"Visitor '89, a Travel Survey of Visitors to B.C.",* B.C. Ministry of Tourism and Provincial Secretary;

LIST OF DOCUMENTATION REVIEWED (CONT.)

- *"Resident Travel In British Columbia, A Survey of Residents Travelling in British Columbia"*, B.C. Ministry of Development, Trade and Tourism, 1991;
- *"Tourism Marketing Strategy for the Okanagan-Similkameen Regional District"*, Regional District of Okanagan-Similkameen, 1987;
- *"Okanagan-Similkameen Tourism Region: A TIDSA Regional Tourism Study"*, prepared for the Department of Regional Economic Expansion, 1980;
- *"Fishing Lodges and Resorts in British Columbia"*, funded under the Tourism Development Agreement;
- *"A Survey of Visitors to Kelowna"*, prepared for the Kelowna Chamber of Commerce;
- *"Penticton 1989 Visitor Survey"*, prepared for the Economic Development Commission of Penticton.

APPENDIX II

LIST OF PROGRAM REPRESENTATIVES SURVEYED

LIST OF PROGRAM REPRESENTATIVES SURVEYED

Okanagan Basin Water Board:

- Ms. Sharron Simpson, Chairman
- Mr. Alan Hill, Vice-Chairman
- Mr. Robert Hobson, Director
- Mr. Eric Hornby, Director
- Mr. Jake Kimberley, Director
- Mr. Geoff Paynter, Director
- Mr. Robert Shewfelt, Director
- Ms. Joan Yardley, Director
- Mr. Ted Takacs, Director

B.C. Ministry of Environment, Lands & Parks, Water Management Division:

- Mr. Mel Maxnuk, Biologist, Okanagan Unit, Littoral Resources Section, Water Quality Branch (Vernon)
- Mr. Peter Newroth, Ph.D., Manager, Littoral Resources Section, Water Quality Branch (Victoria)

Program Staff:

- Mr. Greg Armour, Field Supervisor

Regional Districts:

- Mr. Al Harrison, Administrator, Regional District of Central Okanagan (Kelowna)
- Mr. Peter Mackiewich, Administrator, Regional District of North Okanagan (Vernon)
- Ms. Vanessa Sutton, Administrator, Regional District of Okanagan-Similkameen (Penticton)

APPENDIX III

LIST OF TOURISM OPERATORS SURVEYED

LIST OF TOURISM OPERATORS SURVEYED

ABBOTT VILLA MOTOR INN
Kelowna

Ms. Barbara Dunn
BAYVIEW MOTEL
Peachland

Ms. Hilda Grskovic
BC MOTEL
Naramata

Mr. Brian Mosychuk
BELVEDERE RESORT MOTEL
Winfield

Mr. Steve Romanchuk
BEST WESTERN VILLAGER MOTOR INN
Vernon

Ms. Beth Wilson
BEST WESTERN TELSTAR INN
Penticton

Ms. Agnes Morris
CEDAR BROOKE CAMPGROUND
Summerland

Mr. Graham Atkin
COAST ROYAL ANNE HOTEL
Kelowna

Ms. Audrey Ross
COLDSTREAM BEACH RESORT
Vernon

Mr. Bob Macknui
CRYSTAL WATERS RESORT & CAMPGROUND
Oyama

Ms. Joyce Green
DAVIS COVE RESORT
Peachland

Mr. Nick Larigakis
DESERT MOTOR INN
Osoyoos

LIST OF TOURISM OPERATORS SURVEYED (CONT.)

Mr. Gary Raasch
DUTCH'S TENT & TRAILER COURT
Vernon

Mr. Alan Manson
FOUR SEASONS RESORT/OKANAGAN SEASONS MOTEL
Kelowna

Ms. Joyce Guerin
GOLDEN SANDS MOTOR INN
Penticton

Ms. Ray Mortier
GREEN BAY RESORT
Westbank

Ms. Evelyn Guenther
HOLIDAY PARK RESORT
Okanagan Falls

Mr. Saul Sigal
HOLIDAY PARK RV RESORT
Winfield

Mr. Mark Gibson
ILLAHIE BEACH
Penticton

Ms. Lopes
KOKANEE BEACH RESORT MOTEL
Winfield

Mr. Don Mills
LAKE OKANAGAN RESORT/MARINA
Kelowna

Mr. Gordon Morgan
LAKESHORE TENT & RV PARK
Summerland

Mr. Tony Gaigg
LAKESHORE VILLA RESORT, SCOTTISH COVE
Westbank

LAKESIDE MOTOR INN/MARINA
Vernon

LIST OF TOURISM OPERATORS SURVEYED (CONT.)

Mr. Dennis Culic
MISSION PARK INN
Kelowna

Ms. Noreen Roberts
NEWPORT BEACH RECREATIONAL PARK
Vernon

Mr. Theo Brouwer
OLIVER (GALLAGHER LAKE) KOA
Oliver

Ms. Edith Bouman
OWLS NEST RESORT
Oyama

Mr. Dorsey O'Keefe
PARADISE PARK BEACH RESORT
Westbank

Ms. Dot Mobert
PEACHLAND TRAILER INN
Peachland

Ms. Angie Satow
PILGRIM HOUSE MOTOR HOTEL
Penticton

Ms. Marylin Ducheneau
PONDEROSA POINT RESORT
Kaleden

Ms. Joyce McCee
RICHTER PASS MOTOR INN
Osoyoos

Ms. Josy Mucci
RIVERSIDE MOTEL
Penticton

Mr. John McFall
ROYAL ANCHOR RESORT MOTEL
Naramata

Mr. Robert Orr
SAFARI BEACH MOTEL/MARINA
Osoyoos

LIST OF TOURISM OPERATORS SURVEYED (CONT.)

Mr. Joe McWilliams
SAM'S BEACH RESORT
Winfield

Mr. Butch Burns
SANDMAN INN (PENTICTON)
Penticton

Ms. Elizabeth Ehlers
SANDY BEACH MOTEL
Osoyoos

Ms. Marina Williams
SECLUSION BAY RESORT
Westbank

Ms. Fran Seymour
SEYMOUR MARINA
Vernon

Mr. Dan Scott
SHADY LAGOON CAMPSITE & RV PARK
Osoyoos

Ms. Korsch
SIESTA MOTOR INN
Kelowna

Ms. Lorna Pawkins
SOUTH BEACH GARDENS
Penticton

Mr. Daniel Ponpis
SPANISH VILLA
Penticton

SPANISH FIESTA MOTEL
Osoyoos

Ms. Allen
STARDUST MOTOR INN
Penticton

Ms. Gurjit Virk
STARLITE MOTOR INN/MARINA
Osoyoos

LIST OF TOURISM OPERATORS SURVEYED (CONT.)

Mr. Malcolm Davies
SUMMERLAND MOTEL
Summerland

Mr. Jim Carney
SUNBEACH MOTEL
Osoyoos

Mr. Lou Hivon
SUNOKA MOTOR INN
Okanagan Falls

Ms. Anne Pospischil
THE SAHARA MOTEL
Osoyoos

Ms. Alice Monod
THE SWISS VILLAGE RESORT & MOTEL
Oyama South

Ms. Gabrielle Richter
TWEEN LAKES RESORT/MARINA
Oyama

Mr. Allan Patton
VASEUX LAKE CAMPGROUND
Oliver

Mr. Peter Carley
VERNON SLUMBER LODGE
Vernon

Mr. Peter Diakonow
WATERFRONT INN
Penticton

Mr. Marcello Baccichetto
WILD RAPIDS CAMPSITE & WATERSLIDE
Osoyoos

Ms. Lucie Siguerra
WOODS LAKE RESORT CAMPGROUND
Winfield

Mr. Louis Lionello
WRIGHT'S BEACH CAMP
Penticton

APPENDIX IV

LIST OF REAL ESTATE PROFESSIONALS SURVEYED

LIST OF REAL ESTATE PROFESSIONALS SURVEYED

Ms. Bettina Allpas, Sales Representative
NRS BLOCK BROS. REALTY LTD
Vernon

Ms. Kathy Foote, Sales Representative
NRS BLOCK BROS. REALTY LTD
Summerland

Mr. Dennis Jenkins, Sales Representative
NRS BLOCK BROS. REALTY LTD
Osoyoos

Ms. Florence Jontz, Sales Representative
NRS BLOCK BROS. REALTY LTD
Kelowna

Mr. Dave Larue, Sales Representative
NRS BLOCK BROS. REALTY LTD
Penticton

Vern A. Burkhardt
Queen's Printer for British Columbia©
Victoria, 1991