

PROGRAM EVALUATION

Benefits of the British Columbia Aquatic Plant Management Program

P. R. NEWROTH¹ AND M. D. MAXNUK²

ABSTRACT

Following about 20 yr of management of aquatic plants in the Province of British Columbia, the rationale, objectives, methods, results and costs of the Okanagan Valley part of that program have been assessed. Eurasian watermilfoil control projects in 16 British Columbia lakes are being implemented by the Water Quality Branch and five local agencies. The Province provides most of the control equipment, gives technical advice on control methods and approaches, provides 75% of the funding, and monitors performance. Local authorities administer control, decide on treatment priorities, hire staff to operate equipment and provide the remaining operating funds. A consultant was selected to review the socio-economic benefits of management in one of the cost-shared projects, implemented by the Okanagan Basin Water Board in eight Okanagan Valley lakes. The study reviewed available statistical data on the control project and the resources affected by Eurasian watermilfoil. Surveys of over 470 persons measured project effectiveness and benefits. Although treatments are made in only 15% of littoral areas affected in these lakes, analysis showed that control has promoted economic development, that most residents and tourism operators are satisfied, and that control is cost-effective. The analysis projected that termination of the control program (1990 cost \$350,000) would lead to about \$85 million decline of regional tourism revenues, and affect about 1700 tourism industry jobs and \$360 million of real estate values. Recommendations include support for cost-sharing, encouragement for more derooting as a control method and more research on other longer term control technologies, and greater efforts to advise the public on project results.

Key words: Eurasian watermilfoil, *Myriophyllum spicatum*, economic analysis, impacts, control.

¹Manager, Littoral Resources Section, Water Quality Branch, 765 Broughton St., Victoria, British Columbia, Canada, V8V 1X5.

²Head, Okanagan Unit, Littoral Resources Section, Water Quality Branch, #3, 4320 29th St., Vernon, British Columbia, Canada, V1T 5B8.

INTRODUCTION

A wide range of technical and scientific approaches have been applied during the evolution of aquatic plant management. Many fields of science and engineering have been used to help managers control nuisance aquatic plants with biological, mechanical and chemical approaches. However, application of economic analyses, especially with studies of social needs and attitudes, is rarely described in context with aquatic plant management (Thunberg 1991, Henderson 1991). Fishery managers historically have used economic assessments to help support their planning, and in some cases aquatic plants are addressed in their analyses (Milon *et al.* 1986).

Ongoing competition for resources now makes it essential that cost-benefit analysis be included with other technical analyses to support recommendations for action to limit adverse impacts of aquatic plants. This paper describes a recent use of economic and social data in analysis of management of Eurasian watermilfoil (*Myriophyllum spicatum* L.; EWM) in British Columbia (B.C.), Canada.

Details of the history and procedures of this program, managed by the Water Quality Branch, B. C. Ministry of Environment, Lands and Parks, were presented by Newroth (1986, 1988, 1990). Major program objectives have included:

- a. Aquatic plant documentation and mapping.
- b. Reducing spread of noxious exotic species, such as EWM.
- c. Developing and evaluating control measures for nuisance aquatic plants.
- d. Planning and monitoring cost-shared control programs.

There has been a consistent effort to document demonstration projects, and to learn from successes and failures. Measures of success of preventive approaches to reduce spread of EWM include the degree of public support and satisfaction and the rate of expansion of EWM infestations. While EWM is distributed in a variety of habitats in southern B. C., it is now known only in 80 water bodies of about 2000 that have been checked. The rate of spread apparently has

been slowed since only 20 new infestations have been found in the past 10 yr. Also, support for intensive management has been demonstrated by local authorities, which contribute 25% of control costs.

In respect to overall cost-effectiveness, the unit cost of treatments has declined from about \$4000/ha in 1981 to about \$3000/ha in 1990 (excluding equipment purchases and administrative costs).

Five agreements (75% Provincial, 25% local costs) for treatments of EWM in 15 lakes throughout B. C. are now being implemented. In 1991, the Okanagan Basin Water Board received a Provincial contribution of \$265,000 to treat 8 Okanagan Valley lakes. In common with other cost-sharing arrangements, this local agency is responsible for administering control, prioritizing treatments, hiring staff and providing the remaining 25% of funds.

Although there was strong political support for continued control (ongoing for a 10-yr period) and good cost-effectiveness was apparent, in 1991 the B. C. Treasury Board requested a socioeconomic study, with a budget ceiling of \$20,000.

PROCEDURES FOR ECONOMIC ANALYSIS

Ference Weicker & Company of Vancouver, B. C., was selected to review available statistical data on the control project and to identify the resources affected by EWM. They performed their review in two phases (Anon. 1991). A review of program details and initial meetings with Provincial and local representatives preceded development of a final evaluation plan, used in the second phase, which included:

- a. Reviews of available statistical information published by B.C. Ministry of Tourism and local and Federal government agencies on the value of the resources and activities (tourism, water-based recreation, real estate) potentially affected by EWM.
- b. In-depth personal and telephone surveys of 13 program representatives (local and Provincial agencies) to identify program impacts, effects, levels of satisfaction and alternatives.
- c. Telephone surveys of 60 of the 244 accommodation/boat rental and marina operators located immediately adjacent to affected Okanagan Valley lakes to determine their awareness and satisfaction with the program, the impact that control program termination would have on business, willingness of operators to pay to expand control and their recommendations for program improvement.
- d. Telephone surveys of 50 residents selected randomly in major Okanagan cities (Vernon, Kelowna, Penticton, Summerland and Osoyoos) to determine their levels of participation and expen-

ditures in water-based recreation, satisfaction with control, willingness to pay to expand the program, impacts that program termination would have on their visitors, and recommendations for improvement.

- e. Interviews of 75 beach users (local and visitors) to determine reactions as for the group above and to define characteristics of their beach use and the attractive and unattractive features of Okanagan beaches. Visitors also were surveyed to determine the impact of water-based recreation on their decision to visit the area, the length of stay and alternative destinations.
- f. Analysis of 270 questionnaires (of 1400 distributed to 70 tourism operators) completed by B. C. and out-of-Province visitors to determine the importance of beach recreation in attracting visitors and the proportion of visitors that would have shortened their stay if recreation was restricted by EWM.
- g. Interviews of five real estate professionals to estimate values of lakeshore property, based on length of shoreline and market and tax-assessed values of bare and developed waterfront properties.

In addition to consultation with Provincial and local personnel associated with the control program, considerable baseline statistical information already was available to the consultants for the B. C. tourism industry and especially for this recreationally important Okanagan region.

RESULTS AND DISCUSSION

The Ference Weicker report (Anon. 1991) addressed specific evaluation issues; the main results within each area are outlined below.

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

EWM can have major impacts on recreation. Areas affected by this plant have increased over the past 15 yr and require continuous control. Despite annual control of 140 to 180 ha of high-use recreational areas since 1982, substantial area remains untreated (about 1000 ha in eight lakes); 37% of tourism operators said EWM impacted their business and 52% of residents indicated that aquatic plants impacted water-based recreation. Generally, both groups surveyed supported the program and believed that a severe impact would result from its termination.

In the Okanagan, population increased 33% in 15 yr, visitors increased 23% in 10 yr and beach-days increased from 3.9 million to about 8.5 million since 1970. Expec-

tations are increasing for better “product quality” and there now is increased competition from other travel destinations. These factors indicate that the resources affected by EWM (e.g., clean, safe beaches) are of increasing value.

2. *What social and economic value is associated with the Okanagan Valley water-based recreational resources affected by EWM?*

Findings in this area included tourism incomes, participation in water-based recreation and beach use, and real estate values. Based on the annual visits of 3 million visitors (who were estimated to have used beaches for over 4 million days), averaging over 3 nights stay and multiplying by the average expenditure of \$30/day (including accommodation, transportation and meals), the annual Okanagan tourism revenue totals \$320 million. \$185 million of this total is estimated to be contributed by B. C. residents and the remainder from outside the Province. Restricted only to visitors in summer months, this tourism revenue is estimated at \$182 million.

Interviews of 75 beach users at 8 public beaches showed increasing use of beaches by residents as compared to 1980 surveys and the emergence of parking, aquatic weeds and crowding as unattractive features of beaches. Beach use in 1991 by Okanagan residents was estimated at 4.7 million beach-days, plus over 4 million beach-days by visitors.

Property value for the 1.3 million feet of Okanagan lakefront was estimated by local real estate professionals to exceed \$2 billion, or about 23% of the 1992 assessed values.

3. *What local and Provincial economic and social benefits are generated by the control program?*

Ference Weicker estimated that summer tourism revenue was about \$130 million, calculated by multiplying the number of visitor beach-days (over 4 million) by their daily expenditure (\$32 per person). Based on combined surveys of tourism operators (46 respondents) and a visitor survey (270 respondents), it was estimated that about 47% of party-nights would be lost through failure to control EWM. This would result in loss of about \$84 million annually and translate into loss of 1700 employment positions of a total of 4700 tourism jobs in the Okanagan Valley.

About 60% of beach users felt the control program cost of about \$5/household in the Okanagan (there were about 89,000 households in this area in 1991) was appropriate. A willingness to pay up to \$185,000 extra annually for this program also was determined. Based on

realtors' estimates that uncontrolled EWM infestation could cause a 10% devaluation of a “weedy” waterfront property and reduce the overall value of lakefront real estate values by 2%, an impact of \$360 million was estimated on property values.

Provincial benefits were estimated by calculating the number of out-of-Province visitors who would not have visited another B. C. region if EWM were uncontrolled; application of this statistic was translated into lost revenue totaling \$40 million annually. In turn this would lead to a loss of Provincial revenue (sales, income and room taxes) totaling \$3 million.

4. *What is the relative distribution of program benefits to affected groups?*

Ference Weicker found that the control program benefits of about \$450 million, including both annual and longer term periods, were split among the tourism operators, the general public and the Provincial government. Tourism operators (transportation, restaurants, accommodation and shopping elements) were estimated to gain about \$85 million annually, with about 1700 Okanagan Valley jobs directly related to this economic activity. The general public was estimated to derive nearly \$230 million and lakeshore residents about \$130 million of the program benefits.

Ference Weicker calculated that impacts to the Provincial government totaling over \$40 million annually could be expected to result should EWM control not be continued. This included losses of visitors from outside the Province and the associated local employment, and tax revenues. About 22% of out-of-Province visitors polled in the Ference Weicker surveys indicated that they definitely would not have visited another B. C. region. Also 72% of visitors indicated a probability ranging from 25% to 75% that they might have visited another B. C. region.

Annual Provincial tax revenue losses totaling about \$3 million were calculated for general and liquor tax (\$2.5 million), room tax revenues (8% rate amounting to \$132,000) and corporate taxes (\$360,000).

5. *Did the program give the effects intended?*

Control activities have been prioritized in public use areas and Ference Weicker concluded that water-based recreation has been facilitated, furthering tourism and generating increased government revenues. Surveys of 50 residents, 32 resident beach users and 60 tourism operators indicated most were moderately familiar with the program. Tourism operators, who have the greatest personal investment in use of the water and were more

familiar with the program than either other group surveyed, showed the greatest percentage of respondents who were not satisfied. However, 86%, 88% and 80% of residents, resident beach users and tourism operators, respectively, indicated in the surveys that they were moderately to extremely satisfied with the EWM control program.

Respondents expressing dissatisfaction often were unhappy with the length of time between treatments in their area. Also, the polls indicated that dissatisfied respondents had expectations that EWM could be eradicated and did not understand that this was impossible.

Generally the program has been cost-effective based on a number of subjective factors, perceptions by residents and tourism operators and as indicated by the increased public use of many treated areas. Also, Ference Weicker compared the cost of the harvesting element of the Okanagan program with the Metropolitan Seattle harvesting program from 1985 to 1990. They concluded that the Okanagan project cost about half as much as the Seattle project (averaging about \$890 for work in Canada, compared to \$1604 for work in Washington, both expressed in \$U.S. per hectare).

6. *Are there more effective ways to achieve the intended results?*

Ference Weicker recommended expansion of the derooting component of the program to improve the overall level of control. Based on their surveys, they also recommended continuation of Provincial biocontrol research efforts to find long-term solutions to the EWM problem. They noted that survey respondents held misconceptions about the rates and capabilities of control methods and the natural fragmentation of EWM that might influence levels of public support and cooperation. Ference Weicker concluded that this could be resolved by increasing public information.

The present cost-sharing approach was supported and a user fee structure was considered difficult to implement. The need for more continuity in funding levels from year to year was recognized, saving time and permitting multi-year contracts. It was not recommended that private sector contracting be used for major program components. Ference Weicker felt that dependence on contrac-

tors might increase risk of delivery of a high quality program and probably would increase costs because of profit margins.

CONCLUSIONS

Provincial revenues attributed to the control program by Ference Weicker (\$3 million annually) greatly exceed the direct provincial cost-share contribution (\$265,000 in 1991), yielding a Benefit:Cost ratio of 11.3:1. The benefits to local businesses and the public are much greater, and the local Benefit:Cost ratio must be very high, considering that the 25% local contribution to control in 1991 was about \$90,000. The overall degree of satisfaction expressed by local residents, visitors and tourism operators constitutes strong endorsement of the Okanagan EWM control program.

LITERATURE CITED

- Anonymous. 1991. Evaluation of the socio-economic benefits of the Okanagan Valley Eurasian water milfoil control program. Ference Weicker & Company, Management Consultants, Vancouver, B. C. 88 pp.
- Henderson, J. E. 1991. Valuation of aquatic plant economic benefits. *In: Proceedings, 25th Annual Meeting, Aquatic Plant Control Research Program, Miscellaneous Paper A-91-3, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.* pp. 24-29.
- Milon, J. W., J. Yingling and J. E. Reynolds. 1986. An economic analysis of the benefits of aquatic weed control in north-central Florida. Economics Report 113, Food and Resource Economics Department, Agricultural Experiment Station, University of Florida, Gainesville, FL. 52 pp.
- Newroth, P. R. 1986. A review of Eurasian water milfoil impacts and management in British Columbia. *In: Proceedings, First International Symposium on Watermilfoil (*Myriophyllum spicatum*) and Related Haloragaceae Species.* Vancouver, B.C., Canada. Aquatic Plant Management Society, Inc. Washington, DC. pp. 139-153.
- Newroth, P. R. 1988. Review of current aquatic plant management activities in British Columbia. *In: Proceedings, 22nd Annual Meeting, Aquatic Plant Control Research Program. Miscellaneous Paper A-88-5, U.S. Army Engineer Waterways Experiment Station Vicksburg, MS.* pp. 66-71.
- Newroth, P. R. 1990. Prevention of the spread of Eurasian water milfoil. *In: Proceedings, National Conference on Enhancing the States' Lake and Wetland Management Programs.* Northeastern Illinois Planning Commission, Chicago, IL. pp. 93-100.
- Thunberg, E. M. 1991. Literature review of economic valuation of aquatic plant control. Miscellaneous Paper A-91-1, Aquatic Plant Control Research Program, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. 24 pp.