

USING IVR TECHNOLOGY TO SURVEY MOOSE HUNTERS IN NEW BRUNSWICK

Gerald W. Redmond¹, Andre Arseneault² and Cynthia Lanteigne¹

¹Fish & Wildlife Branch, Department of Natural Resources & Energy, P.O. Box 6000, Fredericton, New Brunswick E3B 5H1; ²NBTel Interactive, One Brunswick Square, BS-2, P.O. Box 1430, Saint John, New Brunswick E2L 4K2;

ABSTRACT: For many wildlife agencies, hunter surveys provide useful data on hunter effort, harvests, hunter demographics and opinion on resource issues. Traditional formats for these types of surveys include either mail-out/mail-in survey forms or direct contact via telephone. Often these surveys are time-consuming and expensive for management agencies to conduct and the accuracy of some of the information obtained may be suspect because data are not collected until weeks or months following the end of hunting seasons. Low response rates are common because survey forms are often detailed and time-consuming for the hunter to complete, or the survey timing is inconvenient. In the fall of 1995, the New Brunswick Department of Natural Resources & Energy (DNRE) experimented with a new approach for obtaining moose hunter information by utilizing interactive voice response (IVR) technology. This two-step electronic process involved (i) leaving a brief explanatory/introductory message on the voice mail systems of more than 17,000 moose hunter applicants, inviting them to call a toll-free service and participate in an electronic telephone survey, and (ii) providing a brief four question IVR survey soliciting input on moose management issues. Herein we report on the results of the IVR survey, compare the costs and benefits of the IVR system to traditional survey methods used in New Brunswick, and suggest ways that emerging technologies might be adapted by wildlife agencies to effectively solicit input from resource users and stakeholders.

ALCES VOL. 33 (1997) pp.75-83

Surveys have been an important component of moose management programs and continue to receive widespread use throughout North America and Europe. They serve a variety of wildlife management purposes, including documenting resource user movements and distribution (Bontaites and Gustafson 1993; Child and Aitken 1989; Courtois and Crete 1993; Ferguson *et al.* 1989), estimating resource pressure (Courtois and Jolicoeur 1993; Garner *et al.* 1990; Hnilicka and Zornes 1994; Hooper and Wilton 1995), providing harvest estimates (Heydon *et al.* 1992; Hooper and Wilton 1995; Morris and Elowe 1993; Timmerman 1992) and specific biological information (Ferguson 1993; Modafferi 1992; Timmerman and Whitlaw 1992; Timmerman and Buss 1995), indexing population changes (Crichton 1993; Jaren 1992; Morris and Elowe 1993;

Oosenbrug *et al.* 1991), soliciting opinions on resource issues and programs (Alexander 1993; Boyle and Clark 1993; Hicks and McGowan 1992; Sigouin *et al.* 1995; Wedeles *et al.* 1989), and determining demographic information from clients (Hansen *et al.* 1995; Schwartz *et al.* 1992). Some wildlife agencies rely heavily on information obtained from surveys to guide annual management decision-making and long-term wildlife management directions and strategies.

Traditional Surveys- Their Use and Limitations

The actual methods and strategies employed to survey resource users can vary widely among jurisdictions and are usually influenced by the availability of personnel, financial costs of materials and salaries to carry-out the surveys, and the relative impor-

tance of the information for resource management purposes. The three traditional formats used to survey resource users are mail-out/mail-in questionnaires, telephone surveys, and direct contact with target clients. Each format has its own unique benefits and associated problems. New Brunswick has employed all three approaches for surveying users of fish and wildlife resources.

The advantages of mail surveys are that they can (i) reach most resource users since names and addresses are routinely collected when licences are sold, (ii) be completed at the convenience of the recipient, (iii) contain detailed visual information and background to facilitate informed responses from clients, and (iv) be designed to provide anonymity thus facilitating accurate responses to some types of questions. The drawbacks of mail surveys include (i) high handling and mailing costs, (ii) slow turn-around time to obtain and collate information, (iii) diminished reliability of some types of information (eg. number of days hunted, zone of hunt, number of animals/fish harvested, etc.) because clients are often surveyed weeks or months following the hunting, trapping, or fishing seasons, and (iv) biased sampling towards successful resource users, unless follow-up (costly and time consuming) reminder surveys are sent to non-respondents.

Direct telephone surveys using live operators can be conducted quickly following various hunting (or other resource) seasons if telephone numbers are captured at the time of licence purchase, thus providing better opportunities to acquire reliable information while it is fresh in the minds of the clients. Telephone operators can often provide clarification of survey questions to help improve the reliability of responses. Sampling bias can be minimized because operators are able to encourage the recipient to provide information, even if they had limited harvest success. The drawbacks of telephone surveys include (i) the possibility of inconvenient

timing of surveys for clients, (ii) high staffing requirements to obtain meaningful sample sizes, (iii) high telephone and salary costs to conduct surveys, and (iv) reduced opportunity (compared to mail surveys) to provide detailed information such as maps and other visuals, to ensure reliable responses.

Direct contact for surveys, either in the field or at registration stations offers the best opportunity to obtain up-to-date information from clients. However, staffing requirements to obtain sufficient sample sizes and associated costs for salaries and transportation of survey personnel often is high. Clients may be inconvenienced by the interruptions and time to complete surveys resulting in non-compliance, unreliable, or biased data. The lack of anonymity associated with direct contact may reduce the accuracy of responses for some types of questions.

The actual design of surveys can have major implications on results and response rates. Boyle and Clark (1993), Wedeles *et al.* (1989), and Gollat and Timmermann (1987) provide insights into the complexity and importance of survey designs in soliciting useful information from moose hunters. Murphy and Daley (1995) and Dickson and MacLachlan (1992) describe the extensive knowledge base concerning methodological issues associated with mail surveys among a variety of professions. Improper survey designs can bias results and limit response rates leading to inappropriate decision-making and interpretation. Good surveys require careful planning, designing and timing to provide reliable information for resource managers.

A New Electronic Survey Format

Emerging technologies associated with telephone communication have advanced rapidly during the past decade. Improvements in facsimile (fax) technology have greatly enhanced the potential to use faxes in surveys and marketing (Murphy and Daley 1995; Vazzana and Bachmann 1994; Dickson

and Maclachlan 1992). Most rotary telephones have been replaced with sophisticated digital systems that can be more readily used for a variety of applications such as interactive voice response (IVR), voice-mail (TalkMail), electronic transfers of funds, credit/debit card validations and transactions, and various types of surveys and marketing promotions. Fibre-optic cable technology is quickly being deployed in many jurisdictions to facilitate and enhance communication networks.

Most IVR electronic surveys consist of two components: (i) an introductory message explaining the nature of the survey and inviting the recipient to participate, and (ii) the actual survey with instructions and response options. IVR surveys can best be delivered using digital telephone technology in areas of high touch-tone coverage. Although optional, wide availability and use of residential voice-mail boxes can facilitate effective electronic surveys by providing a convenient mechanism to leave introductory messages. IVR providers are widely available throughout North America to deliver the setup, voice-recording, call processing, and report summaries of electronic surveys. In most instances, wildlife management agencies need only provide input on the design and format of the survey questions; the service provider then conducts the survey and compiles the responses for clients in a timely and efficient manner.

New Brunswick's IVR Moose Hunter Survey

In collaboration with NB Tel Interactive, Saint John, New Brunswick, DNRE designed a simple electronic (IVR) survey consisting of four questions. The objectives were to test the IVR survey approach as an alternative to traditional survey formats and to obtain user-group input on three controversial issues that required immediate decisions by our agency. A traditional ten question mail-in survey

previously had been designed and distributed to approximately 5000 moose hunters when they purchased their licences during late summer 1995. In October, the IVR survey was developed to capture opinion on three of the (controversial) questions asked on the mail-in survey: (i) *Are you in favour of allowing up to two residents to hunt moose on 1 licence (party hunt)? Fewer permits would be issued, although more hunters would be able to participate in the hunt,* (ii) *Are you in favour of allocating less than 100 moose hunting licences to non-residents each year?, and (iii) Are you in favour of extending the moose hunting season to 6 consecutive days? Fewer permits would be available because hunter success rates are expected to increase.* A fourth question was added to the IVR survey to solicit opinion on the convenience of the electronic survey format. Respondents to the mail-in survey had the option to respond: yes, no, or no opinion.

An introductory voice-mail message was designed and sent to 17,473 residents who had activated their voice-mail systems and who had applied to hunt moose via the New Brunswick moose draw IVR system (Redmond *et al.*, unpublished). At the time of the survey more than 90 percent of residential telephones in New Brunswick were digital, although only 62 percent of telephones actually had their voice-mail activated. The brief voice-mail message that was forwarded (i) identified the caller (Department of Natural Resources & Energy), (ii) provided background information about the IVR moose hunter survey, including the topics of questions to be asked, and (iii) invited the moose hunter of the household to participate in the brief survey by calling a toll-free number.

The actual four question IVR survey was designed to be completed in less than 2 minutes. It consisted of an introductory message thanking callers for participating in the survey and giving them a choice of service in

either English or French. The survey then began by providing background information on the first question and soliciting a response of either yes, no, or no opinion, by pressing a specific number on the caller's telephone keypad. Each caller also was given the option to review each question. This format was used for each of four questions that covered the topics of *party hunting*, *non-resident hunting*, an *extended season*, and the *convenience of electronic surveys* compared to the traditional mail-in surveys. Once the caller had completed the survey, he/she was thanked for their input.

The toll-free IVR survey line was connected for a six day period and the participation rate monitored on a daily basis. The ability to track the volume of calls is especially useful for maintaining survey efficiency; when response rates decline below some arbitrary level, the survey can be terminated and the results tallied and summarized.

Comparisons of the IVR and Mail-In Surveys

The entire IVR survey process was completed in less than two weeks; this involved survey development and setup, studio recording, sending voice-mail messages, processing calls, and preparing a summary document of responses. In comparison, the time frame for developing and implementing the mail-in survey was approximately 15 weeks from start to finish (Table 1). The actual government staff time committed to the IVR process was approximately one day compared to an estimated 8 weeks of staff time dedicated to the traditional mail-in survey. At the end of the survey period, 4,736 IVR calls had been processed representing a 27 percent response to the 17,473 voice-mail messages distributed to both successful and unsuccessful moose hunter applicants. There was no attempt to send reminder notices to those who did not respond to the invitation to participate in the survey. On the other hand,

the mail-in survey was distributed to 4,989 successful moose hunter applicants at the time of licence purchase, of which 2,580 successful and unsuccessful moose hunters completed and returned surveys, representing a 52 percent response from moose hunters (Table 1). Although reminders are not sent to moose hunters, the successful hunters are encouraged to complete their surveys at the time that they register their moose. In addition, the survey form requests that the survey be returned by a specific date.

The IVR survey was able to solicit responses from a broader cross-section of resident hunters than the mail-in survey was capable of reaching because the sample was derived from a large pool of moose hunter applicants. More than 50,000 residents annually apply to hunt moose in New Brunswick (Redmond *et al.*, unpublished). In most traditional surveys the objective is to strive for a high response rate (>50%) to ensure confidence that results are representative of the target population. IVR technology allows more precision and flexibility in obtaining the appropriate sample sizes for meaningful results because responses can be monitored and tallied electronically immediately upon receipt. When results to survey questions localize around certain means or levels then further sampling would be unnecessary and the survey stopped. This could result in substantial savings in call processing and toll charges.

Total cost of developing and implementing the IVR survey (\$8,942) was higher than the more labour-intensive mail-in survey (\$7,400) (Table 1). However, the estimated cost per completed questionnaire for the IVR format was \$1.88, which was 34 percent less than the \$2.87 per completed questionnaire using the mail-in format. These differences in costs must be interpreted with caution and may not be directly comparable. The IVR survey was based on only four questions compared to ten questions posed on the mail-

Table 1. Efficiency and costs of moose hunter surveys using electronic (IVR) format and traditional mail-in format, New Brunswick 1995.

IVR Format	Mail-In Format
Sample Population: 17,473 4,989
No. of Responses: 4,736 2,580
Rate of Response (%): 27 52
Development and Implementation Costs:	
Voice-mail messages (17,473@\$0.16) \$ 2,796	Survey preparation (3 person-days (pd)).... \$ 450
Survey setup \$ 1,500	Typesetting (1 pd) \$ 150
Studio recording \$ 500	Printing and materials \$ 825
Call processing (4,736@\$0.45) \$ 2,131	Folding, stuffing and distribution \$ 650
1-800 Line toll. \$ 2,015	Return envelopes and postage \$ 1,725
	Open, check and sort surveys \$ 1,200
	Coding and keypunching \$ 2,100
	Data analyses and report \$ 300
Total Costs: \$ 8,942 \$ 7,400
Cost Per Completed Survey: \$ 1.88 \$ 2.87
Time Required for Development, Implementation, and Results: 2 Weeks 15 Weeks
Time Required for Agency Staff: 1 Day 8 Weeks

in survey. Additional questions for the IVR system would increase costs for survey set-up and studio recording. In addition, higher response rates would trigger additional call processing and toll charges. One would also expect to incur additional costs if response rates increased with mail-in surveys, particularly related to return postage, sorting, coding and keypunching.

The sample for the IVR survey (17,473) was taken from approximately 26,000 residents who had applied both electronically to the 1995 Moose Draw and who had activated their voice-mail systems on their digital telephones. It is important to note that the IVR survey represented both successful and unsuccessful applicants to the 1995 Moose Draw. Whereas, the sample population for the mail-in survey was derived from the 4,989 hunters who had purchased moose licences in 1995.

A comparison of responses to the three questions common in both the IVR and mail-in surveys showed significant differences on

two questions (Table 2). Seventy-one percent of respondents to the IVR survey were supportive of the concept of party hunting, which was significantly higher (Chi-square=35, 1 d.f.; $p < 0.001$) than the moose hunters that replied to the mail-in survey (64 percent support). Only 19 percent of respondents to the IVR survey supported the introduction of a limited non-resident hunt which was significantly lower (Chi-square=199, 1 d.f.; $p < 0.001$) than recorded for the mail-in survey (35 percent support). Support for the introduction of a 6-day moose hunting season was similar between IVR respondents (71 percent) and mail-in returns (72 percent) (Chi-square=0.9, 1 d.f.; $p > 0.25$). Ninety-four percent of respondents preferred the electronic survey format over the mail-in format.

The significant differences in responses to the party hunt and non-resident hunt possibly were an artifact of differences in sample sizes between the IVR (4,736) and mail-in (2,580) surveys. However, a more plausible

Table 2. Comparison of moose hunter responses from IVR and mail-in surveys, New Brunswick 1995.

Topic	IVR Survey ¹				Mail-In Survey ²			
	Yes	(%) ³	No	No Opinion	Yes	(%)	No	No Opinion
Support party hunting?	3104	(71)	1260	58	1581	(64)	882	117
Support non-resident hunt?	811	(19)	3542	51	786	(35)	1470	324
Support 6-day season?	3080	(71)	1258	53	1804	(72)	699	77
Prefer electronic survey?	4059	(94)	248	69	n/a	n/a	n/a	n/a

¹ Responses from a possible 17,473 moose hunter applicants contacted to participate in the survey during a 6 day period, 25-30 October, 1995.

² Responses from a possible 4,989 moose hunters who were given the survey at the time of licence purchase prior to the 3-day hunting season, 28 - 30 September, 1995.

³ Calculated excluding “no opinion” responses.

explanation is that the samples were selected from somewhat different hunter populations; the mail-in survey respondents were from a pool of residents who had actually had an opportunity to hunt moose in New Brunswick during the 1995 season and were likely to have a different perspective towards party hunting and non-resident participation compared to the broader moose hunter applicant (IVR) population. The IVR sample was derived from a wider cross-section of potential hunters (applicants), most of whom were not successful in obtaining a moose licence in 1995. One could expect that their attitudes towards party hunting would be more favourable since most were unsuccessful in the draw and might view party-hunting as a way to improve their chances of eventually participating in the moose hunt. Likewise, it is not unexpected that the IVR respondents would be less agreeable to allowing non-residents the opportunity to hunt moose when most of them had been unsuccessful in the draw. The question pertaining to extending the moose hunting season to 6 days was likely perceived by both sample groups as having no real impact on their chances of obtaining a moose licence and thus the similarity in results for that question. Interest-

ingly, despite the differences on 2 of 3 questions, respondents to both surveys indicated similar general viewpoints on all of the questions posed. These results underscore the importance of careful planning when designing surveys to ensure that results will be representative of the clients surveyed and to avoid subtle biases.

Future Directions for Hunter Surveys

Using IVR technology to conduct surveys and process hunter applications can be effective, cost efficient and convenient to the public. More than 90 percent of respondents to the IVR moose survey indicated support for the electronic survey format over traditional mail-in surveys. However, part of the high positive response might have been attributed to the relative novelty of this survey approach. If in the future, IVR surveys become rather commonplace then recipients may view them as just another form of “junk mail” (Vazzana and Bachmann 1994).

Although New Brunswick’s mail-in moose survey has not been especially expensive to deliver, the IVR survey in this study was more cost-efficient on a “per-response” basis. It is important to note that IVR costs can vary substantially depending on the spe-

cific type of format used to solicit input (i.e., introductory messages to voice-mail boxes), length of the survey, sample sizes chosen, costs for call processing, and whether or not toll-free access is provided for recipients. Survey response rates will vary depending on how convenient, user-friendly, and impressionable the IVR system is perceived by recipients. Indeed, any additional "bells and whistles" will magnify costs.

Two clear advantages of IVR systems for wildlife agencies is the quick development, implementation and response time to obtain information from clients and the improved reliability of information that can be gathered quickly following the end of specific hunting seasons or during a controversy. A third important advantage of IVR surveys is that they can be conducted with minimal commitments of time by agency personnel.

It must be cautioned that IVR approaches may not be conducive to all types of surveys needed by wildlife management agencies. In our opinion, IVR surveys would not be the most appropriate tool for situations where detailed location or visual information or complex responses or feedback were required. In these situations, traditional mail or possibly fax surveys may be more appropriate (Murphy and Daley 1995; Vazzana and Bachmann 1994; Dickson and MacLachlan 1992). Opinion type surveys or those requiring quantitative or numerical responses would be especially well-suited to IVR technology. As computer and communication technology becomes more accessible to the general public, the options of using electronic mail (eMail) and the World Wide Web (WWW) or internet as vehicles for surveys will continue to expand. However, each new technology will spawn unique problems or constraints associated with it that must be carefully addressed in the design of surveys to ensure that samples/responses are representative of the particular user-group or population in question. Junk email and cumbersome WWW

home pages already pose problems and irritation for computer users. Considerable efficiencies can probably be realized by agencies that adapt quickly to available technologies as long as vigilance is maintained of the pitfalls that may plague emerging technologies. Agencies in New Brunswick are well-poised to take advantage of emerging communications technologies. Indeed, in the field of wildlife management, considerable information about New Brunswick's programs are now available through the World Wide Web, including results of limited-access draws (deer and moose), maps of Wildlife Management Zones, and information about applying for moose hunting opportunities. New IVR systems were developed in 1996 to allow non-residents to apply by telephone for moose and black bear hunting opportunities. Other similar applications are at various stages of development.

Novel ways of gaining acceptance of and participation in IVR surveys by specific user groups or the general public may include provision of response incentives (eg. random draws for merchandise, eco-tours, hunting trips, etc.) resulting in increased and representative response rates. Cooperation by clients to participate in surveys could also be augmented by providing a mechanism (preferably electronic) for them to obtain results of the surveys that they participated in.

Innovative approaches must continue to be explored for the delivery of wildlife management programs, especially during periods of fiscal restraint and staffing reductions. Surveys will continue to serve important functions in wildlife management programs for both decision-making and planning. Advances in computer and telephone/communications technology will provide numerous opportunities for wildlife agencies to reassess certain programs and deliver improved products and services in more efficient ways.

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